Karl Herkenrath

INVENTOR WITH LONG BREATH

The self-adjusting chain sprocket



The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

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Publication in the trade journal "Hebezeuge und Fördermittel" 5-99

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Publication from 1999 in the professional journal: Drive Technology 38 (Antriebstechnik) (1999) No. 6, pages 53 - 55

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Publication from 1999 in the journal: Glückauf-Forschungshefte, Journal for the Dissemination of Research Results in Mining 60 (1999) No. 3, October, pages 73 to 75

Energy and cost reduction by means of self-adjusting chain sprocket

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THE CHAIN INDUSTRY IS TURNING DEAF

My experiences with the various manufacturers of chains

Chain industry sales in Germany

Besides many, many other experiences with the chain industry I would like to mention the following experiences in particular:

RUD-KETTENFABRIK RIEGER & DIETZ IN AALEN

FIRST EPISODE WITH RUD

I rejoiced like a "snow king"

SECOND EPISODE WITH RUD

Now it's gonna be fun according to the motto:

THIRD EPISODE WITH RUD

FOURTH EPISODE WITH RUD

Chapter 4

The "farce" with Saarbergwerke AG and the state government in Saarland according to the motto:

"INITIATIVE FOR WORK IN SAARLAND."

By letter dated 14 December 1995, I wrote to the Deutsch-Französische Handels-Gesellschaft in Saarbrücken.

By letter of 15 December 1995 I addressed the Saarland Government, Ministry of Economic Affairs and Finance:

Presentation at Saarbergwerke AG (since 1998 part of Deutsche Steinkohle AG) and at Deutsche Steinkohle AG, which was and still is subsidized by the taxpayer with many billions of DM or Euro for decades.

With date of 24.04.1997 I turned to the SaarTech and presented the patent there also in writing and on 29 April 1997 a discussion took place

In the following time I found the company BOECKER & HERZOG GmbH in St. Ingbert and was able to win it as a licensee.

Once again betting on the wrong horse

But one thing at a time: First of all I wrote on 09.01.1998 "in high spirits" to Saarbergwerke AG:

In a letter dated 09.03.1998 I again wrote to Saarberg AG, Bergwerk Göttelborn

In a letter dated 9 March 1998, I wrote to the SPD parliamentary group in the Landtag, Mr Hans Albert Lauer in Saarbrücken:

Letter of 23.04.1998 from SAARBERG AG in Saarbrücken:

Two years time, work and money invested for free

Letter to Prime Minister Klimmt dated 3.1.1999

Why am I writing all this!

If nobody thinks any further, there would be no progress.

Letter of 3.1.1999 to Mr Bronder, Director of Mines

Inertia and immobility at Saarbergwerke?

I was not a competent manufacturer and supplier, but a small inventor.

New trial at DSK Deutsche Steinkohle AG in Herne, Germany

Answer of the State Chancellery of the Saarland

Answer from the Saarland Ministry of Economic Affairs

Since no prototype was available, the Deutsche Steinkohle AG had no interest

In October 1999 publication in the professional journal "Glückauf".

There was no reaction to this information sent to DSK.

Deutsche Steinkohle AG also did not react when a case of operation at the Ensdorf power plant occurred in 2001.

The BILLION GRAVE - The coal rip-off

A FURTHER "GUEST PLAY" WITH THE COMPANY ARNOLD & STOLZENBERG - a company of the Renold Group

The well-known company RENOLD wanted (allegedly) to conclude a license agreement with me.

This is how you gradually "cold" an inventor

I was generously offered a "license to my own patent."

I will again have a license agreement for RENOLD drawn up at my expense.

A rogue who thinks evil!!

I contact RENOLD AUTOMOTIVE in Calais

Apart from my expenses nothing has happened

Deterrent measures taken by industry

My various "shorter episodes" with some chain manufacturers:

Who can evade their own business?

I'm supposed to run open doors.

As expected, the "open doors" were quickly broken in, and the decision was changed again.

Chapter 5

Use of the "self-adjusting chain sprocket" in a portal scraper of the Ensdorf power plant

Thus, the patent could now BE FINALLY IMPLIED.

Publication in the Saarbrücker Zeitung on 16/17 June 2001

"Odyssey of an inventor with long breath

Patented chain sprocket by Karl Herkenrath from Saarbücken runs at Ensdorf power station

Publication in the journal Fördertechnik 9/2002:

"Low-noise, wear-reducing, cost-reducing

A new sprocket promises changes in conveyor technology

- Low noise has highest priority
- All teeth wear evenly
- The long way to practical use

Expert opinion no. L 4687 on the existing noise emissions due to the operation of a portal scraper for the automation of the coaling process at the Ensdorf power plant

1. Task

The client operates a coal-fired power plant in Ensdorf/Saar. A portal scraper was installed on the coal store to automate the coaling of the power plant.

- 4. Operating description
- 5. Immission points and guideline values according to TA-Lärm
- 6. Measurement of noise emissions

6.1Measuring instruments

- 6.2 Measuring time and weather
- 6.3 Carrying out the measurements
- 6.4 Measurement results
- 7. Determination of the additional load
- 8. Summary and discussion

Approval notice for the modification of the coal-fired power plant Ensdorf by the erection and operation of a new crane system for feeding the coal belts (portal scrapers).

PICTURES OF THE PORTAL SCRAPER 2001 and 2016

PHOTOS OF THE SELF-ADJUSTING CHAIN SPROCKET IN THE ENSDORF PLANT IN 2016 (after 15 years)

Below is a photo of the portal scraper from 2.9.2017:

Chapter 6

My very special INTENSIVE experiences with the company Ketten Wulf

License fees "fell into the water", for this I was commissioned to make drawings etc.

Has the self-adjusting chain sprocket been offered to any operator?

From Licensor to "Minor Employee"

I got too expensive in the long run.

My experiences from the beginning 1995

"Attracted" by the case of operation in Ensdorf it starts 2001

Maybe Ketten Wulf will make a license agreement with me if the trials are satisfactory.

LICENSE AGREEMENT of April 2002

According to Ketten Wulf, they had allegedly started to offer my sprocket on the market.

Publication in the trade journal: Konstruktion Juli/August 7/8-2002, published by Springer-Verlag VDI-Verlag GmbH & Co. KG, Düsseldorf 2002

Chain drives: low-noise and long service life

Pharmacist prices for clamping bushes

Letter of 31 December 2002 to Ketten Wulf concerning BAUXILIUM

Comments on the investigation report of 20.3.2003, which is subject to the "small coin PLAYING ON THE HANNOVER MESSE from 7. to 8.4.2003 together with Ketten Wulf Meetings at the Hannover Fair Tests for escalator chains Test chain sprocket VS030501 New design of the test sprocket Drawing 15-135-75-Sp-20 Note from 13.05.2004 of the Fraunhofer Institute NOW IT'S GOING TO BE "FUNNY"! Supplement to the License Agreement Instead of royalties, Ketten Wulf only had to pay for postage After four years of testing, my patience gradually broke.

As the monthly payments of Euro 345,-- gradually became too expensive, Ketten Wulf terminated the license agreement on 26.8.2005.

Chapter 7 The new patent EP 2 594 824

VISIT TO POWER PLANT ENSDORF 2011

As a conscientious designer, I wanted to wait for success and was therefore at the Ensdorf power station at the end of 2011.

THE PATENT IS FILED WITH THE EUROPEAN PATENT OFFICE IN A FURTHER IMPROVED FORM.

How does a good idea become a patent and how high are the costs?

It started an exciting time again.

The Patent Certificate

Publication in the trade journal "Hebezeuge und Fördermittel" Berlin 55 (2015)1-2

Inventor Herkenrath and his self-adjusting chain sprocket

Balance sheet after more than 13 years

Useful solution

Advantages and extended form

Chapter 8

My "next attempt" at the German Chain Industry

My 5th episode with the company RUD

Contact by the company IWIS

I knocked on the door of the machine and plant manufacturers.

I thought about marketing the self-adjusting sprocket myself.

The difficulty to find a manufacturer for sprockets

My unpleasant experiences with Ketten Wulf - continued -

Mail from Ketten Wulf on 14.4.2015

Comments on this letter:

Action brought by Ketten Wulf on 19.6.2015

Note to the application

The following should be said about the investigation report:

The investigation report ended with the following text (result):

Quote from Joseph Pulitzer

Notes on the "Bauxilium" project in Venezuela

Considerations on my part on the four-year investigations at Ketten Wulf

I don't want to say anything negative about Ketten Wulf, but a four-year attempt cannot be "hushed up".

Letter to the Minister of Economic Affairs Sigmar Gabriel of 12.1.2016

Ketten Wulf tries to intimidate me again

EXPLANATION OF THE RESEARCH REPORT OF THE COMPANY KETTEN WULF

Comment of the inventor on this from the year 2015:

Letter to the Patent Attorneys and Attorneys at Law of Ketten Wulf dated 30.1.2016

"Result:

Presentation of the patent EP 2594824 "Self-adjusting drive sprocket" Renewed reaction of Ketten Wulf

Chapter 9

I decided to offer the patent for sale worldwide because the German chain industry was obviously not interested in an acquisition.

Chapter 10

The current situation in the steel industry

Millions lost at Dillinger Hütte in Dillingen/Saarland

On 8 August 2017 there was another report in the Saarbrücker Zeitung, this time about the future of the Saarschmiede.

Who is interested in Germany as a business location? I always read: Germany as a business location must be preserved. If, on the other hand, I then experience that I don't even get an answer, I always ask myself, is Germany as a business location and the many jobs associated with it, as here at Dillinger Hütte, really of interest to someone from the board levels, or is all this just "empty talk"?

The difficulties of finding a sprocket manufacturer as a private individual

Jammering about cheap steel from Asia

The self-adjusting sprocket is not the philosopher's stone.

Chapter 11

Considerations from today's point of view

Examples for the use of the self-adjusting chain sprocket

CONCLUDING CHAPTER

How useful is it to apply for a patent for an invention in Germany?

The book of a soulmate "Die Asthma-Lüge" (The Asthma Lie)" by Christoph Klein

How stupid of me to invent a sprocket that reduces wear and tear by using it

Then the seed of my idea would have sprouted.

Annex 1 Miscellaneous drawings

Annex 2

Various publications:

Annex 3

Copies of various letters dated 28.8.2017 and 22.9.2017

Letter to Saarstahl AG dated 28.8.2017

Letter to Saarschmiede GmbH dated 28.8.2017

Letter to the Executive Board Chairman Dr. Heinrich Hiesinger of Thyssen Krupp AG dated September 22, 2017

Letter to President Benoît Battistelli at the European Patent Office Munich dated 22.9.2017

Letter to the Director General of the Deutsches Museum Munich dated 22.9.2017

Letter to the Director of the Technical Museum Vienna dated 22.9.2017

Letter to the Management Board of VSE Aktiengesellschaft dated 22.9.2017

Annex 4

Reactions to the worldwide presentation of the patent

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My long struggle with the German chain industry

The time of silence is finally over!

FOREWORD

As an employee I invented a patent "self-adjusting sprocket" in 1993, which was patented in 1995 (DE4317461 and EP 0599156). It was transferred to me by my then employer for self-utilization, since the company Krupp Fördertechnik did not manufacture chain sprockets.

My experiences with the German chain industry mainly refer to this patent, which I gave up in 2006.

Unfortunately, there is only one reference object, a portal scraper in the Ensdorf power station in Saarland, where the self-adjusting chain sprocket was installed in 2001.

In 2011, during a visit to the Ensdorf power station, I discovered that the self-adjusting chain sprocket was still in use there together with the same Ketten Wulf chain. Shortly afterwards, I applied for an improved version of the patent under the name "Self-adjusting drive sprocket"; it was granted in 2015 and has the number EP 2594824. This patent has valid industrial property rights in a total of ten countries and is for sale.

I am not aware of any case in which one and the same chain is used over such a long period of time.

As you will learn from the following chapters, among other things, I offered the first patent from 1993, which could have already brought billions of Euros in savings to operators of systems with chains of any kind, as early as the mid-1990s of the last century, and in my opinion there is no company from the chain industry that would not have known about this patent.

It becomes abundantly clear how a "small inventor" is systematically and de facto eliminated by the industry by either making unfulfillable demands or offering him a "sandwich" for the use of his patent, "abusing" a concluded license agreement for years of experiments without paying royalties, etc.

As you read this book, you will notice time and again that the arguments of the chain industry not to use this patent developed by me are based on the fact that the sense and purpose of the patent would lie with the chain sprocket, which is, however, complete "eyewash".

The self-adjusting sprocket is only a MEANS TO AN END, i.e. to EXTREMELY extend the service life of the chain, which is about 10 times more expensive than the sprocket.

In my subjective opinion, it is obvious that the chain industry is not interested in such marketing.

I literally "flattened my feet" and introduced the self-adjusting chain sprocket from Hamburg to Munich, patiently demonstrated the advantages to chain manufacturers for hours on end, invested a lot of time, money and sleepless nights, all in my spare time as I was an employee.

To enumerate all my efforts would make you tired, so that I only give you a representative representation of what happened at RUD in Aalen and my experiences with Deutsche Steinkohle AG and the Saarland state government.

My longer lasting "Dornenpfad" (Thorn Path) with Ketten Wulf is also comprehensively reproduced, the first experiences from the years 2001 to 2005 under chapter 6 and the most recent experiences from the years 2015/2016 under chapter 8. Here I have limited myself only to a part of the events in order not to bore the reader.

From these examples you can see how to be made a fool of as a "little inventor" in this country similar to the story about David and Goliath.

But like David, I will NEVER give up and will continue to make the outstanding properties of this ingenious invention known to the furthest corners of the earth.

I was and still am of the firm conviction that a chain sprocket and a chain form a unit and that the German chain industry as well as the plant manufacturers would be obliged to let the operators benefit from this invention.

Perhaps you are wondering about the large number of letters posted. I have deliberately inserted these here (originals are all with me), so that the operators learn, which headaches I made myself to accommodate this patent for the WELL of the operators with the chain industry. At that time, I was not interested in my profit, but I was primarily thinking

about the advantages for the operators and I wanted this patent to be used primarily in Germany in order to make a small contribution to maintaining Germany as a business location.

Meanwhile, my attitude towards this has changed. I'm at an age where I wouldn't have gone to the trouble of self-marketing in competition with the chain industry, so to speak, and I'm glad I never tried that at all, as I could only have failed. I will do everything I can to sell this patent to an appropriate manufacturer who will also use it and not let it disappear in the drawer so that it can be used by operators to save costs, and I must now honestly admit that after the many disappointing experiences I have had with the German chain industry, I am giving priority to a foreign buyer.

With regard to the attitude of the chain industry, I have to say to myself today: How extremely stupid of me to invent a chain sprocket with which a wear reduction of the chain is achieved, no, I should have invented a chain sprocket that increases the wear, this patent would certainly have been torn from my hand by the chain industry years ago.

Those of you who may have invented something yourself, applied for a patent and encountered similar difficulties can certainly put yourself in my position. This book is based on true events and all the letters reproduced are in my files.

I hope you enjoy reading this book.

Kempenich, 6 October 2017

The portal scraper in the Ensdorf power plant

The proof that a <u>sprocket with a single chain has</u> worked perfectly at Ensdorf power station since 2001 can be seen in the photo below, which I took on 26 August 2017:



Since the Ensdorf power plant will finally close at the turn of the year 2017 / 2018, I have decided to write down my experiences with the "self-adjusting chain sprocket" developed and patented by me as well as my experiences with several chain manufacturers and also the Deutsche Steinkohle AG (today RAG Deutsche Steinkohle AG) here.

At the same time, I wrote to the Deutsche Museum in Munich and the Technische Museum in Vienna on 22.09.2017, asking whether the two museums would be interested in exhibiting one of the two self-adjusting chain sprockets with a piece of the chain from Ketten Wulf there for posterity, provided that the owner of the portal scraper, VSE in Saarbrücken, agrees. The corresponding letters can be found at the end of the book. I will publish a reply later in the 2nd edition of the book.

Chapter 1

How did the idea of the "self-adjusting chain sprocket" come about?

One day I was sitting in the office looking at a very worn sprocket that was showing considerable signs of wear. I knew from my many years of experience as a design engineer that after a certain running-in phase, the chain load on each sprocket always occurred only on the first tooth in mesh and therefore only this one tooth was loaded. This inevitably results in the chain having to be replaced after a certain time for safety reasons. At the same time, the two sprockets are usually replaced by new ones.

I was wondering, how can you help that?

I had the idea to move the teeth so that the power transmission from the chain sprocket to the chain would be distributed over several teeth.

So, I took paper and pencil and sketched my first thoughts for a solution of this problem.

My thought was that it had to be achieved that several teeth would be involved in the power transmission, so that this would naturally result in a reduction in wear.

The forces are evenly absorbed by all meshing teeth

After a short time, I got the hang of it: With the self-adjusting chain sprocket developed by me, the forces of all teeth in mesh are absorbed evenly.

This considerably reduces the stress on the individual tooth and thus protects the chain.

A conventional sprocket has fixed teeth and only the first tooth works.

With the self-adjusting sprocket, however, the forces are evenly absorbed by all meshing teeth.

All teeth are movably arranged via bolts.

There are recesses on both sides of a tooth element which, in conjunction with the adjacent elements, accommodate an elastic round spring, such as from Connex AG, Switzerland.

The tooth elements arranged in this way form a radially stable gear rim with flexible tooth elements which are able to carry out small tilting movements and then transmit these to the neighboring teeth.

If a force acts on any tooth, a torque is generated by the movable arrangement, which is transmitted via the round springs to all following teeth, i.e. again to the first loaded tooth element.

In this way, all teeth are involved in the force distribution and not only the first tooth is loaded, as is the case with conventional sprockets.

The idea of movable tooth elements also has other positive aspects.

The self-adjusting sprocket can compensate for inaccuracies in the pitch of the chain and sprocket which cannot be completely avoided and which result from wear, chain elongation and/or manufacturing tolerances.

Inlet shocks are also cushioned by the round springs.

Replacement of individual teeth of the sprocket

If individual teeth of the new sprocket have to be replaced, the sprocket does not have to be disassembled and the chain does not have to be dismantled; this saves time and money. As regards the manufacturing costs of the self-adjusting sprocket, it should be noted that these are only slightly higher than the costs of manufacturing a conventional sprocket.

However, the use of the self-adjusting sprocket has the unbeatable advantage that the chain can be expected to have a significantly longer service life due to less wear, which results in enormous savings.

If necessary, the teeth can also be turned around

Further savings result from the fact that the teeth can easily be turned over with any signs of wear that may occur after years. Until now the complete sprocket had to be replaced.

Below is a schematic diagram of how it works

Each tooth segment of the sprocket is rotatably mounted under the center of the tooth and is provided with recesses on both sides to accommodate the transmission springs. There are springs between the individual teeth.

If any tooth is attacked by force, turning momentum will come up at that tooth. This turning momentum is transmitted via springs evenly to all following teeth. The friction losses are thereby reduced.



The chain force F on tooth 1 generates a clockwise torque and thus a counterclockwise torque acts on tooth 2 in the opposite direction to the force.

The chain and the tooth pitch prevent tooth 2 from tilting further and the spring 1 achieves a balance of the forces on teeth 1 and 2.



With the adjustment of teeth 1 and 2, tooth 3 moves out of the direction of force and thus the pitch distance changes.

As a result, tooth 3 is not involved in the transmission of force to the chain.

Nevertheless, tooth 3 is involved in torque transmission via spring 2; this compensates for the pitch change caused by wear with tooth 3.



After the forces on teeth 1 to 3 have been balanced, tooth 4 rotates against the direction of the force and tooth 4 is thus involved in the transmission of force to the chain via spring 3. Since the same torques act on each tooth, the load on chain and tooth is also the same. Thus 4 teeth are in mesh, of which 3 teeth carry almost 1/3 of the force.



For all subsequent teeth, systems 1 to 3 and then system 4 repeat themselves until the first tooth is reached again and the chain of moments on the teeth is closed. This process from system 1 to system 4 changes continuously from the first tooth to the second tooth etc.



Chapter 2

So, what happened to my idea of the self-adjusting chain sprocket?

At that time I was employed as a design engineer in conveyor technology at PWH Anlagen und Systeme GmbH in St. Ingbert in the Saarland.

After the "self-adjusting chain sprocket" had taken shape, it was registered with the European Patent Office on 26.5.1993 by my then employer.

The patent was granted and had the number DE 4317461 / EP 0599156.

The company Krupp Fördertechnik (today Thyssen Krupp) took over the company PWH sometime later, so that from then on the company Krupp Fördertechnik became my employer.

Since Krupp Fördertechnik was not interested in the patent, since they themselves did not manufacture sprockets, the patent rights were transferred to me in 1995. Since this original patent could only transfer compressive forces to the spring, I gave up this old patent in 2006.

However, I never let go of this invention, so I started to develop and improve the self-adjusting sprocket based on the old patent as early as 1995.

I also began to market the patent myself, but as an employee of Thyssen Krupp this was associated with difficulties. For this reason, I already started to visit the chain manufacturers at that time, because I was of the opinion - and still am today - that a chain and a sprocket form a unit and it would therefore be the task of the chain industry to offer this sprocket.

Publication in the trade journal "Hebezeuge und Fördermittel" 5-99

"A PATENT(IERT)ES CHAIN SPROCKET

Less wear - lower costs

The new, patented "self-adjusting chain sprocket" can contribute to the reduction of wear and thus of operating costs in both plate link and round link chains, which are designed for the highest requirements in conveyor systems.

Counteract wear on chain and chain sprocket

When using chains in modern conveyor systems, the operator must consider the wear of the chains and sprockets and regularly check their operational suitability. High wear means frequent replacement of these components. The associated downtimes of the plant result in considerable costs. With the aim of reducing wear and tear and thus increasing service life, the chain and especially the sprockets have been continuously improved technically. Today, link chains are made with rotating rollers over the pins in order to reduce the frictional forces between chain and sprocket. As far as the sprockets are concerned, an optimum tooth shape has proved its worth and is laid down in the various standards. For round link chains, a surface hardness up to a hardness depth of 10 to 20% of the diameter was achieved in order to counteract rapid wear.

The main cause of chain and sprocket wear lies in the torque transmission of this connection, since only the first three teeth of the sprocket, which mesh with the chain, transmit the full pulling force of the chain. As a result, the proportion absorbed by each individual tooth again depends on the wear of the chain in shape and elongation and on the wear on the tooth flanks. This "wear process", once set in motion, leads to the unitability of the chain sprocket in conjunction with the chain.

In order to counteract this negative effect without immediately replacing the entire chain drive sprocket system, various

manufacturers use spare sprockets with larger pitch in order to continue to use at least the stretched or only partially worn chain. Apart from the considerable time and cost involved in such a removal and installation, the negative wear effect remains.



What is the principle behind the "self-adjusting chain sprocket"?

Patent No. DE 4317461 C2 offers a new, wear-minimizing solution for sprockets. With this principle ("self-adjusting sprocket"), each individual tooth of the sprocket is movably arranged. Under the tooth tip of each tooth element there is a bolt on which this tooth element is rotatably mounted. At both ends of the toothed element, recesses are provided which, in conjunction with the adjacent toothed elements, accommodate an elastic round spring. The tooth elements arranged in this way with an odd number of teeth thus form a radially stable gear rim with internally flexible tooth elements which are able to carry out "tilting movements" and pass these on to the adjacent teeth. If a force acts on any tooth, the movable arrangement creates a torque on the tooth element, which is transmitted via the elastic round springs to each following tooth - up to the first loaded tooth element again. With this principle of an "endless scale", all tooth elements are involved in the force distribution. In contrast to the conventional rigid, unvielding sprocket, in which only three teeth are responsible for the power transmission, this new type of sprocket design applies uniform force to all tooth elements. In addition, shocks (e.g. inlet shocks) are cushioned and inaccuracies (e.g. production-related tolerances) are compensated by the moving tooth elements. The compensation of production-related tolerances on the chain sprocket is particularly important for chain conveyors which are operated with two parallel chains (e.g.

underground conveyors in mining). Higher speeds can also be driven with the same chain. The elastic round spring element between the movable tooth elements acts as a damping force transmission element. This round spring is dimensioned so that a balance of forces is built up between the first and the second tooth element in chain engagement. Via next tooth as transmission element, this principle will propagate over whole gear-rim. The end result is a "balance of forces" on the chain sprocket during operation, so that considerably less wear occurs on the chain and chain sprocket.



Model of the patented system "Self-adjusting sprocket".

Energy and cost savings

The use of the patent "self-adjusting chain sprocket" is of considerable advantage for the operators of conveyor systems. This makes it possible to use round link chains without surface hardening that achieve the same service life as hardened chains. Since the manufacture of surface-hardened round link chains requires a considerable amount of energy, purchasing costs are reduced by around 50%. Furthermore, an extremely favorable maintenance of the chain sprocket is possible without removing the chain.

HF 8421"

In the following time I did further investigations, drawings, calculations and finite element analyses (FEM), which I published in October 1999:

Publication from 1999 in the professional journal: Drive Technology 38 (Antriebstechnik) (1999) No. 6, pages 53 -55

"Cost reduction in conveyor systems through self-adjusting chain sprocket".

KARL HERKENRATH

With today's energy costs, the cost of manufacturing round link chains is very high. In addition, these machine elements, which are often used in conveyor technology as drive chains, wear out quite quickly. A way out is offered by a patented sprocket, which distributes the occurring loads better through elastic teeth and thus drastically reduces chain and sprocket wear.

Introductory remarks

When using chains (Fig. 1) in modern conveyor systems, the operator of the system must take into account wear of the chain and the sprockets. Due to this wear, the chains and sprockets must be checked regularly for their operational suitability and replaced if necessary. The high wear results in frequent changes of chains and sprockets. This inevitably results in frequent downtimes of a conveyor system. This results in considerable production downtime and maintenance costs for the plant operator, which must be taken into account in advance when designing a conveyor system.

The actual design of a modern drive chain is based on a construction by the Frenchman A. Galle from 1829 and has been standardized to this day as a "gallic chain". In the course of some technical developments the chain and especially the sprocket were improved. The design objective here has always been to reduce wear and tear in order to increase service life. Today, link chains are designed with rotating rollers on the pins in order to reduce frictional forces between chain and sprocket. As far as the sprockets are concerned, an optimal tooth shape has proved itself during the development, which is laid down in various standards. For round link chains, a surface hardness of up to 10 to 20 percent of the diameter was achieved in order to counteract rapid wear.

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1: Modelling of the chain / sprocket system

Wear occurrence

With regard to the power transmission system chain/sprocket, the following points can be noted. Wear is mainly caused by

- the power transmission from the sprocket to the chain,

- Longitudinal forces on the chain and the resulting elongation of the chain links,

- uneven pitch tolerances caused by inaccuracies in the manufacturing process and

- Chain running-in impacts into the chain sprocket (polygon effect, shock acceleration, etc.).

In summary, the largest source of wear in the chain/drive sprocket subsystem can be determined because the actual conveying distance itself hardly results in any relative movements of the chain links, which could significantly cause wear. So, the main reason for the wear of the chain and sprocket is the torque transmission from the sprocket to the chain. Only the first three teeth of the sprocket, which are in contact with the chain, transmit the full tensile force of the chain. This results in the fact that the proportion absorbed by each individual tooth again depends on the wear of the chain in the form of elongation and tensile flank wear. In other words, wear on the chain and sprocket again results in less favorable transmission of force to the individual meshing teeth, which in turn results in greater wear. This wear process, once set in motion, propagates steadily and faster until the chain sprocket and chain become unusable. Figure 2 shows the compressive stress in N/mm², based on point contact, on a commercially available rigid sprocket with a 2.0 percent increase in pitch due to wear. As expected, inadmissibly high compressive stresses occur on two to three teeth of the sprocket sprocket, which wears out the sprocket.



N: Compressive stress in N/mm², based on point contact, represented by a conventional rigid sprocket having a 2.0 percent pitch increase due to wear.

Self-adjusting chain sprocket reduces wear

In order to counteract the negative wear effect described above without immediately replacing the entire chain/drive sprocket system, various manufacturers use spare sprockets with larger pitches in order to be able to continue using at least the stretched or only partially worn chain. Apart from the considerable time and cost involved in such a removal and installation, the negative wear effect remains.

By using the "self-adjusting chain sprocket" (patent number DE 4317461 C2), the wear and consequently the operating costs of a system can be considerably reduced. The choice of chains, whether link chains or round link chains, is irrelevant. Both are frequently used in conveyor technology and are designed for the most demanding requirements.

Wear minimizing principle

Each individual tooth of the patented self-adjusting sprocket is movably arranged. A bolt is provided under the tooth tip of each tooth element, which rotatably supports this tooth element. Both ends of this tooth element are provided with recesses which, in conjunction with the adjacent tooth elements, accommodate an elastic round spring. The tooth elements arranged in this way with an odd number of teeth form a radially stable gear rim with internally flexible tooth elements which are able to carry out small "tilting movements" and transmit these to the adjacent teeth. If a force acts on any tooth, the movable arrangement creates a torque on the tooth element, which is transmitted via the elastic round springs to each following tooth - right up to the first loaded tooth element. This is the principle of an "endless scale" in which **all** tooth elements are involved in the force transmission. In contrast to the conventional rigid, unvielding sprocket, in which only three teeth play a decisive role in the power transmission, this new sprocket design applies the load evenly to all tooth elements. In addition, shocks (e.g. inlet shocks) are cushioned by this sprocket design:

Inaccuracies such as production-related tolerance deviations are compensated by the movable tooth elements. As a result, higher speeds can also be driven with the chain unchanged.

The elastic round spring acts as a damping force transmission element between the movable tooth elements. It is dimensioned in such a way that a balance of forces is built up between the first and second tooth element in chain engagement. Via next tooth as transmission element, this principle will propagate over whole gear-rim. As a result, an equilibrium of forces is achieved on the sprocket during operation, so that considerably less wear (**Fig. 3**) occurs on the chain and sprocket. Figure 3 shows the following:



Karl Herkenrath Diagramm.xls

3: Strain from point contact.

Tensile force of 120 kN on the first meshing tooth.



4: Load without wear

Load without wear (Fig. 4 - Fig. 3 in the illustration is erroneous).
With a seven-tooth sprocket which is subject to a tensile force of
120 kN - resulting from the torque - and a preload force of 12 kN, the
compressive stress on the first tooth flank is reduced by a factor of 1.5
or from 937 to 619 N/mm² by the self-adjusting sprocket (see Fig. 3).



5: Load with wear

2. Load with wear (**Fig. 5 - Fig**. 4 in the illustration is erroneous): With a pitch magnification of 2.0 percent and the same load as in point 1, the compressive stress is reduced by a factor of 1.9 or from 1,618 to 833 N/mm² due to the self-adjusting sprocket on the first tooth flank (see Fig. 3).

3: Inlet shock: The inlet shock of the self-adjusting chain sprocket is almost completely eliminated by the inner, elastic structure of the chain sprocket - if not completely absorbed by the round spring.

4: Tolerance deviations: The production-related tolerance deviations of the chain and sprocket are absorbed and compensated by the flexible toothed elements. This compensation on the chain sprocket is particularly important for chain conveyors which are operated with two parallel chains, such as underground conveyors in mining.

Inference

The use of the patent "self-adjusting chain sprocket" is of considerable advantage for the operators of conveyor systems. Round link chains can thus be used without surface hardening - and with the same service life. When manufacturing surface-hardened round link chains, the manufacturer requires a considerable amount of energy. Without surface hardening, purchasing costs are reduced by around 50 percent. Furthermore, an extremely favorable maintenance of the sprocket is possible without removing the chain. All in all, this new type of product allows considerable energy and cost reductions to be achieved.

Editor's note

Further information about the patented sprocket can be requested from our readers by entering the following code into the reader service card at the end of the magazine.

HERKENRATH336"

Publication from 1999 in the journal: Glückauf-Forschungshefte, Journal for the Dissemination of Research Results in Mining 60 (1999) No. 3, October, pages 73 to 75

"Ing. Karl Herkenrath

Energy and cost reduction by means of self-adjusting chain sprocket

At today's energy costs, the financial outlay for manufacturing and manufacturing round link chains is very high.

When using chains in modern conveyor systems, the operator of the system must take the wear of the chain and the sprockets into account. Due to this wear, the chains and sprockets must be checked regularly for their serviceability and replaced if necessary. This inevitably results in frequent downtimes, which result in considerable costs for the operator of such a plant. These must be taken into account by the operator in advance.

By using the self-adjusting sprocket/patent no. DE 4317461 C2 (Fig. 1), the wear and consequently the operating costs of such a system can be considerably reduced. The choice of chains, whether link chains or round link chains, is irrelevant. Both are used in conveyor technology and are designed for larger requirements.

The actual design of the chain is standardized, based on the construction of 1829 by the Frenchman A. Galle. In the course of some technical advancements the chain and especially the sprockets have been continuously improved. The aim was to reduce wear and tear and thus increase service life. Today, for example, plate link chains are designed with rotating rollers over the pins to reduce frictional forces between the chain and sprocket. As far as the sprockets are concerned, an optimal tooth shape has proven itself in the course of development, which is laid down in the various standards. For round link chains, a surface hardness up to a hardness depth of 10 to 20% of the diameter was achieved in order to counteract rapid wear.



Figure 1: System image of the self-adjusting chain sprocket

How does wear occur?

With regard to the chain - sprocket power system, the following points can be observed:

Wear is mainly caused by

- The transmission of force to the chain, and the resulting elongation of the chain links,
- the longitudinal forces on the chain, and the resulting elongation of the chain links,
- the uneven pitch tolerances resulting from production inaccuracies and
- the inlet impacts of the chains (polygon effects, impact acceleration).

In summary, the largest source of wear at the power transmission system chain - drive sprocket can be determined, since the actual conveying distance hardly results in relative movements of the chain links, which could cause wear significantly.

The main reason for the chain and sprocket wear is mainly due to the torque transmission between the chain and the sprocket, since only the first three teeth of the sprocket, which mesh with the chain, transmit the full pulling force of the chain. This results in the fact that the proportion absorbed by each individual tooth again depends on the wear of the chain in the form of elongation and the wear on the tooth flanks. In other words, wear on the chain and sprocket results in less favorable transmission of force to the individual meshing teeth, which in turn results in increased wear. Once set in motion, this process of wear and tear continues steadily and more rapidly until the chain sprocket becomes unusable in conjunction with the chain. Figure 2 shows the compressive stress, based on a point contact [N/mm²] on a rigid sprocket with 2% wear-induced pitch magnification.



Figure 2: Representation of the element mesh of half the system without deformation.

In order to counteract this negative effect without immediately replacing the entire chain-drive sprocket system, various manufacturers use spare sprockets with larger pitch in order to continue to use at least the stretched chain, or chain that is only partially worn out. Apart from the considerable time and cost involved in such a removal and installation, the negative wear effect remains.

How does the wear-minimizing principle of the selfadjusting chain sprocket work?

Each individual tooth of the patent sprocket is movably arranged. A bolt is provided under the tooth tip of each tooth element, which rotatably supports this element. Both ends are provided with recesses which, in conjunction with the adjacent tooth elements, accommodate an elastic round spring. The elements arranged in this way with an odd number of teeth thus form a radially stable elastomeric element with flexible components which are able to carry out tilting movements and transmit these to the adjacent teeth. If a force acts on any tooth, the movable arrangement creates a torque on the tooth element, which is transmitted via the elastic round springs to each following tooth - up to the first loaded tooth element again. This is the principle of an endless scale in which all tooth elements are involved in the force distribution.

In contrast to the conventional rigid, unyielding sprocket, in which only three teeth are decisively involved in the power transmission, this new sprocket design applies uniform force to all tooth elements. In addition, this sprocket design absorbs shocks such as infeed shocks and compensates for inaccuracies such as production-related tolerance deviations due to the moving tooth elements. As a result, higher speeds can also be driven with the chain unchanged. The elastic round spring element between the movable tooth elements acts as a damping force transmission element. This round spring is dimensioned in such a way that a balance of forces is built up between the first and second tooth element in chain engagement. Via next tooth as transmission element, this principle will propagate over whole gearrim.

The end result is a balance of forces on the sprocket during operation, which results in considerably less wear (Fig. 3) on the chain and sprocket.



Figure 3: Stress from point contact


Figure 4: Illustration of half the system without deformation, joint sprocket without wear

Figure 3 shows the following results:

Load without wear

In the case of a sprocket with seven teeth, a tensile force of 120 kN from the torque and a preload force of 12 kN, the load from compressive stress σ [N/mm²] is reduced by a factor of 1.5 or from 937 N/mm² to 619 N/mm² (Fig. 4) by the self-adjusting sprocket on the first tooth flank.

Load with wear

With a pitch magnification of 2% and the same load, the compressive stress σ [N/mm²] is reduced by a factor of 1.9 or from 1618 N/mm² to 833 N/mm² (Fig. 5) by the self-adjusting sprocket on the first tooth flank.

Infeed impact

The intake impact of the self-adjusting chain sprocket is almost completely eliminated by the inner, elastic structure of the chain sprocket, if not completely absorbed by the round spring.

Tolerance deviations

The production-related tolerance deviations of the chain and sprocket are absorbed and compensated by the flexible toothed elements. This compensation on the chain sprocket is particularly important for chain conveyors which are operated with two parallel chains. This is the case, for example, in underground mining.



Figure 5: Illustration of half the system without deformation, joint sprocket with 2% wear.

Summary

The use of the self-adjusting chain sprocket patent is a considerable advantage for the operators of conveyor systems. Round link chains can therefore be used for the same service life without surface hardening. The manufacture of surface-hardened round link chains requires considerable energy input from the manufacturer. Without surface hardening, purchasing costs are reduced by approximately 50%.

Furthermore, an extremely favorable maintenance of the chain sprocket is possible without removing the chain. All in all, this new type of patent allows considerable energy and cost reductions to be achieved. "

Chapter 3

THE CHAIN INDUSTRY IS TURNING DEAF

My experiences with the various manufacturers of chains

After the calculation with FEM was available, I looked for a manufacturer who wanted to use my patent.

In the following time I tried to find a suitable sprocket manufacturer and visited several chain manufacturers in Germany.

I was a designer by skin and hair and wanted to push through my idea of marketing the "self-adjusting sprocket" with the help of the German chain industry, since I was of the opinion from the beginning and still am today that a chain and a sprocket belong together and should be offered by the manufacturer of the chain. I have to say, however, that I have always thought only as a designer and wanted the best for the many operators of chain systems. For this reason, I was on "my way from "Pontius to Pilatus" to present my idea to the various chain manufacturers. They were totally enthusiastic about my idea in the beginning. This enthusiasm "subsided" after it became clear that - at least in my subjective opinion - one was interested in everything, but not in reducing the wear of the chains.

Now - as I have had to learn and understand over the years - it is extremely difficult to sell a product through manufacturers who reduce their sales. In my view, however, the use of this patent would also have given the manufacturers of chains in Germany a lot of new competitive opportunities vis-à-vis their foreign competitors and could have saved many jobs in the various branches of industry.

Chain industry sales in Germany

However, it should be borne in mind that German chain manufacturers only generate a relatively small proportion of their sales in Germany.

Below are three examples from the "Bundesanzeiger" (I omitted company names)

Example 1:

A steel processing German company manufactures chains and chain accessories for worldwide use.

The product range is divided into three divisions:

Conveying technology Mining

Conveying technology for bulk materials

Lifting, moving and securing loads

According to the annual report for 2014/2015 and the annual financial statements as at 30 September 2015, the distribution of sales is as follows:

Revenues before sales deductions were distributed as follows:

	Thousand Euros
Germany	17.382
Foreign countries	74.686

Example 2:

Another leading supplier of high-quality chain system for the mining, shipbuilding and industrial sectors generated the following distribution of sales revenues in 2015:

Germany	24 %
Southeast Asia / China	26 %
Turnover EG / with Switzerland	21 %
Sales Canada / USA	16 %
Sales Australia	12 %
Sales in other countries	1 %

Example 3:

For a third known chain manufacturer, the figures for 2015 were as follows:

	Thousand Euros
Germany	46.584,7
Other EU countries	20.774,1
Other foreign countries	15.931,4
Total	83.290,2

Here, the turnover attributable to Germany is higher than in the other two examples, but here, too, only 56 % is attributable to the German market.

¹) Source: Federal Gazette (Bundesanzeiger)

Besides many, many other experiences with the chain industry I would like to mention the following experiences in particular:

RUD-KETTENFABRIK RIEGER & DIETZ IN AALEN

One of my first contacts was the well-known manufacturer of round link chains, the company RUD-KETTENFABRIK RIEGER & DIETZ in Aalen, to whom I first offered my patent on 18.4.1995.

In the following I describe my various experiences with the company RUD in the period from 18.4.1995 to 2001 for the first patent and in February 2015 for the second patent, which was granted in January 2015, more about this later.

FIRST EPISODE WITH RUD

In a letter dated 18.4.1995, I addressed RUD for the first time with the following letter:

"Saarbrücken, 18.4.1995

Subject: Patent "Self-adjusting sprocket".

Dear management,

from years of experience in the field of conveyor technology, I hereby present my patent "self-adjusting chain sprocket".

In the course of my work I have noticed a considerable wear on the chain and the sprocket, which occurs again and again. From this experience I came 1993 on the idea to reduce the wear with the help of a "self-adjusting chain sprocket" substantially.

With conventional sprockets, the main load is only on the first meshing teeth. My self-adjusting sprocket, on the other hand, distributes the load evenly over all the teeth in mesh, and this considerably reduces wear on the chain and sprocket. In addition, production inaccuracies on the chain and sprocket are compensated. Due to this fact, more cost-effective manufacturing processes for sprockets, such as plasma or laser burning, can be considered.

As an inventor, I patented this invention of the "self-adjusting chain sprocket" at the German and European Patent Office on behalf of my employer PWH Anlagen & Systeme GmbH, a subsidiary of the Krupp Group (KRUPP Fördertechnik GmbH).

Since the Krupp Group does not manufacture sprockets, the patent was transferred to me for my own use. However, as an employee in the KRUPP Group, I can take advantage of the support, advice and assistance.

I hope my construction of the "Self-adjusting Sprocket" will find your appreciated interest and a possible use in your company. I would very much welcome a statement from you in the near future.

Respectfully

Appendix: Disclosure DE 43 17 461 A1 "Self-adjusting sprocket sprocket

On 05.05.1995 I got an answer from the company RUD-KETTENFABRIK RIEGER & DIETZ with the following content:

"Aalen-Unterkochen, the 05.05.1995

Self-adjusting chain sprocket

Dear Mr Herkenrath,

thank you for your letter from 18.04.95.

We are interested in your new design and would like to use it in consultation with you.

Please make suggestions to us to coordinate details of this process.

We would be pleased to hear from you and remain

kind regards

RUD-KETTENFABRIK"

I rejoiced like a "snow king"

I was happy like a "snow king", because at that time I had no idea that the whole chain industry obviously only wanted to "take me in its arms and stall me for years".

Wear reduction - ha, ha, ha, I should have invented a patent that increases the wear of the chains, that would have been something, but still no wear reduction!!!

Basically honest, from head to toe a designer of the "old school" I had no idea anything bad and was looking forward to the meeting taking place on 24.7.95 at 13.00 o'clock in the house of the company RUD, in which on the side of the company RUD Mr. Rieger, the owner of the company RUD, Mr. Dalferth as well as Mr. Bogdan participated as well as I on the other side.

In preparation for the appointment, I had made a list of notes, which I will reproduce below:

Preparation for the meeting on 24.7.1995:

Round link chains

This patent is comparable to the hardening of round link chains.

Technique

1. Modification of the patent drawing

1.1

In order to achieve an improvement and equality of the parts

1.2

The direction of force can be changed.

1.3

The patent of the "self-adjusting chain sprocket" is fully retained. Toothed segments that can be tilted circumferentially are arranged on a base body and supported by spring elements.

1.4

Patent rights received on 8.6.1995.

2.

The most varied accuracies can be achieved in the manufacture of the sprocket and the chain.

2.1

Chain and/or chain sprocket inaccurate (in mm range)!

2.2

Chain and/or chain sprocket accurate!

2.3

Both cases are covered by the self-adjusting chain sprocket.

2.4

This sprocket reduces the infeed shock considerably.

3 Fabrication

3.1

Depending on the application, the tooth segments can be fired or even drop forged.

3.2 Only one toothed segment is required for each chain.

4. Commercial part

4.1

Exclusive license for round link chains and/or plate link chains.

4.2

Sales of chain sprockets

4.3

Percentage of sales. The wear of the chain is reduced and thus the chain is protected.

4.4

Share of turnover and cost savings.

In a letter dated 6 November 1995 I sent the following letter to RUD with the attachment "Advantages of the patented self-adjusting sprocket".

"November 6, 1995.

Subject: Patent "Self-adjusting sprocket".

Dear Mr Dalferth,

In all the discussions about the new construction, I have noted the advantages and different considerations. I have compiled these in a list "Advantages of the patented self-adjusting chain sprocket", which I have attached in the appendix for your information.

A decisive advantage, however, is that larger loads can be transferred with otherwise the same link chain. The load on the sprocket tooth and the plate chain pin is significantly reduced by the number of teeth in mesh. Higher chain speeds can also be permitted, since there is no longer any inlet impact. This and the other advantages, see list, make completely new applications possible.

This considerable competitive advantage is only possible with the "selfadjusting chain sprocket".

Yours sincerely

Annex: "Advantages of the patented self-adjusting sprocket".

Advantages of the patented self-adjusting chain sprocket

No.	Designation	Remark
1	Pitch error of chain & gear sprocket	Each individual pitch error adapts to the pitch of the chain by the self- adjustment of the toothed segments on the chain sprocket.
2	Error out: flank shape, flank lines	All individual flank shape errors and/or flank line errors on the tooth are compensated by the spring compensation between the tooth segments.
3	Error out: pressure angle	The tooth segment is in negative position before the mesh (load).
4	Error out: concentricity	Is compensated by the spring compensation of the tooth segments.
6	Shaft inclination in housing	With double strand chains, the torque at the sprockets is evenly distributed in each chain strand by the spring compensation.
7	Wave piercing	Same load in the chain strand
8	No play between chain and tooth	By distributing the load over several tooth segments.
9	Low noise	The spring balance has a damping effect (no inlet impact).
10	Good efficiency	Distribution to several tooth segments.
11	Maintenance free	Self-adjustment of the chain sprocket.
12	Tolerances	Insensitive - Spring compensation
13	Wear on teeth and chains (pins)	This is compensated by the self- adjustment of the chain sprocket.

14	Larger damage to the tooth head	The damaged tooth segment is no longer loaded; the force is taken over by the other tooth segments that are in mesh.
15	Larger damage to the chain pin	The damaged chain pin is no longer loaded; the force is taken over by the other chain pins which are in mesh.
16	High power density	Power transmission to several teeth
17	High-performance sprockets	New drives are possible, e.g. bucket sprocket drive, drum mills
18	Multiple teeth in mesh	All teeth in mesh are loaded evenly.
19	Burden sharing	Due to the distribution over several toothed segments, each of the chain pins is subjected to less load.
20	Cost-effective	Through series production of the individual teeth.

The next meeting then took place on 20.11.95 in St. Ingbert / Rohrbach, in which Messrs. Dalferth and Bogdan took part on the part of RUD.

In the truest sense of the word day and night I was mentally occupied with my "Self-adjusting Chain sprocket" and had given myself further thoughts for this second meeting and summarized them as listed below:

1. Technology

1.1

Model experience with "self-adjusting chain sprocket" and open questions?

1.2

Results from the experts.

1.3

Experimental experience? over the service life of the spring elements, inlet shock and wear.

2. Commercial part

2.1

Cost reduction through drop forged tooth segments.

2.2

This patent is comparable to the hardening of round link chains.

2.3

Sales of chain sprockets.

3. Comparison with other competitors

Round link chains

3.1

The round link chain manufacturer **pewag** from Austria offers a chain sprocket with exchangeable single teeth.

If the individual teeth wear out, they are replaced and brought to a new adjusted diameter of the only partially worn chain (hardness depth f=d x 10% to 20%).

Plate link chains

3.2

A comparison with the INTERTRACTOR plate link chains type: **D4E**; **D6D** with the RUD high-performance bucket elevator central chain type **RU80**; **RU150 shows** serious differences.

Туре	RU80	div.	D4E	RU150	div.	D6D
Breaking strength	800 kN	0%	800 kN	1500 kN	- 6,7%	1400 kN
Permissible force	80 kN	+62,5%	130 kN	150 kN	+ 40,0%	210 kN
Weight per m.	65,0 kg	-35,8%	41,74 kg	88,10 kg	- 22,6%	68,15 kg
Price per m				1654, DM		approx. 600,DM

4.

Patent agreement / Patent license agreement / License agreement

4.1

Exclusive license for round link chains and/or plate link chains

Single license exclusive license

Round steel link chain link chains

GermanyEurope - EG and other countries

When concluding the planned license agreement, any contact with other interested parties should be terminated.

There was another conversation on 22.11.1995 with Mr. Bollongino of the company RUD, in which according to my notes it was talked about that with conclusion of a license agreement between the company RUD and me **any contact to other prospective customers had to be broken off and the patent had** to be **kept free until the end of a longer trial period for the company RUD.**

So, if I had to sign a license agreement, I had no way of winning over other companies for the patent.

Valuable time went into the country.

On the other hand, since I was very interested in winning an important manufacturer of chains for my patent, who wanted to test the performance of the "self-adjusting sprocket" developed by me over a longer period of time, I agreed.

On 23.11.1995 I wrote the following letter to RUD following this discussion:

"Saarbrücken, 23.11.95

Patent "Self-adjusting chain sprocket" / Patent No. DE 43 17 461.12

Dear Mr. Bollongino,

With regard to our conversation on 22 November, I can inform you that I am positively disposed towards a test attempt to verify the efficiency of my patent of the "self-adjusting chain sprocket" out of my own interest.

The fact, however, that such an extensive and under real conditions running experiment takes a longer time and thus considerable disadvantages arise on my part, which would be there:

1. Contact interruption with any interested party, to keep the patent free until the end of the trial.

2. loss resulting from failure to conclude a contract.

3. If any use of the patent is discontinued until the end of the trial etc., I must make the following points (see supplement) in your and in my interest subject to conditions in order to make my patent available to you free of charge for testing purposes.

I am personally interested in concluding a contract with a renowned manufacturer of chain systems.

For this reason, I hope for a conclusion of a contract with your company and expect until the beginning of next week, 4 December 1995, your opinion and/or a prefabricated draft contract, which I can examine for my part on my interests.

I thank you for your interest and look forward to receiving your opinion soon by mutual agreement.

Respectfully

Karl Herkenrath 27.11.1995"

This letter to RUD was accompanied by the following two annexes:

Conditions for approval of a test attempt with the patent: Self-adjusting chain sprocket

Patent license agreement with the minimum contract conditions required for the patent

"Conditions for approval of a test experiment with the patent: Self-adjusting chain sprocket German Patent No.: DE 43 17 461.2-09 European Patent No.: EP 93 118 346.1-2306

As patent holder, I undertake, upon conclusion of a preliminary agreement, to promise the patent of the "self-adjusting chain sprocket" to RUD-Kettenfabrik Rieger & Dietz GmbH & Co. for the fixed period of time, and consequently to break off all contacts to existing interested parties approaching me. This results in the following points, which I make a condition for the approval of a test attempt:

1.1 Test object

The patent may only be used in the sense of an experimental procedure in which the patent itself is in the foreground as an experimental object.

1.2

Length of time

The duration of the experiment and the associated approval of the patent use is fixed by mutual agreement at 6 months.

1.3

Test results

The essential test results are continuously communicated to the patent holder and made available free of charge after completion of the test.

1.4 Insight

The patentee has the right (after consultation) as an uninvolved observer to inspect the test procedure. This does not give the patent holder any right to a say in the test procedure.

2.

Preliminary agreement

Establishment of a preliminary agreement which, if a final license agreement is concluded after the end of the trial, contains all contractual conditions for the patent (see Patent License Agreement) as well as these conditions of the trial.

3.

Compensation premium

A compensation premium in the amount of a minimum annual license fee (see Patent License Agreement) is to be paid immediately to the patentee if a final license agreement is not concluded after the termination of the test attempt. This amount is not recoverable in any case.

Condition for approval

Karl Herkenrath 24.11.1995"

"Patent License Agreement

minimum contractual conditions required for the patent

Self-adjusting chain sprocket

German Patent No.: DE 43 17 461.2-09

European Patent No.: EP 93 118 346.1-2306

1.

License/Most Favored

The exclusive license covers production, use and distribution.

2.

Transferability of the license

The transfer of the license or its incorporation into an undertaking directly or indirectly linked to the licensee requires the written consent of the licensor.

3.

Contract territory

Production and distribution in other territories within the European Community or outside it, including territories where no patent right exists, shall be permitted only by the licensee, directly or indirectly in liaison with the undertaking, if the contractual agreement is recognized.

4.

License fee/patent fees

Licensee shall pay to Licensor a royalty of 6% of the consideration charged to Licensee's customers for the Licensed Material, less sales tax (e.g. sales tax) or rebates.

5.

Minimum annual license fee/exercise obligation

From 1997 the licensee is obliged to pay the licensor a minimum license fee of DM 40,000, which is offset against the license fees.

6. Payment for surrender

The licensee is obliged to pay an amount of 40,000 DM (to my account) to the licensor after the contract has come into force, without crediting the license fee. This amount is not recoverable in any case.

7.

Audit law

The Licensor shall be entitled at any time to have the Licensee's accounts for the delivery of the Licensed Material audited by an auditor bound to secrecy.

8.

Non-aggression obligation

The licensee is obliged not to attack the contractual property rights himself or to have them attacked by third parties or to support others in the attack in any form whatsoever.

9.

Maintenance of contract protection rights

The licensee is obliged to maintain the contractual protective rights.

Patent License Agreement

Karl Herkenrath 24.11.1995

By letter dated 11 December 1995 RUD replied as follows:

"December 11, 1995.

Subject:

Patent "Self-adjusting chain sprocket" / Patent No. DE 43 17 46112

Dear Mr Herkenrath,

due to short-term travel the answer was unfortunately delayed, we apologize again.

As we already announced by telephone in advance, we unfortunately have to cancel.

The costs for the patent as well as the time expenditure for a necessary test and the associated financial expenditure are currently too high for us.

We regret once again that this decision has dragged on for so long.

Yours sincerely

RUD CHAIN FACTORY

RIEGER & DIETZ GmbH &. Co.

-Selling Quality Chains –

Signature-

ppa. M. Bollongino"

In December 1995 the first experiences with RUD ended.

After my invention had been published in June 1999 in the trade journal "Antriebstechnik", which dealt with round link chains, and an unexpectedly high number of responses came from the industry to this publication, I contacted RUD again in July 1999, one and a half years later.

SECOND EPISODE WITH RUD

In July 1999 my <u>second experiences</u> with the company RUD started.

On 4.7.1999 I sent the following fax to the company RUD:

"Telefax from Mr. Bollongino

. . .

Subject: Chain sprocket

I had checked: To the statement

Subject: Patent Publication of the "Self-adjusting Chain Sprocket

Dear Mr. Bollongino,

as we agreed by telephone, I will send you the excerpt from the publication in the trade journal issue June 99. I had not suspected such a large reaction from the various companies to this publication "Cost reduction in conveyor systems by selfadjusting chain sprocket". Now I have to find a new and potent licensee.

If the company RUD is interested in a cooperation, I would like an answer.

Sincerely yours

Signature"

After the fax of 4.7.1999 I called Mr. Dalferth from RUD several times and on 21.7.1999 the following letter came from RUD:

"Aalen-Unterkochen, 21 July 1999

Your property right "Self-adjusting chain sprocket"

Dear Mr Herkenrath,

thank you for your fax from 04.07.99.

In the meantime, we have also made several telephone calls.

We have checked your fax and your comments in-house and inform you that we are **fundamentally interested in the use of your property right**.

You mentioned that RUD could obtain a sole license for round steel chains and for the RUD central chain.

As mentioned above, we are interested in your design and would like you to make suggestions on how a license transfer can be contractually regulated.

In anticipation of your message, we welcome you to

RUD-KETTENFABRIK

i.V. Dipl.-Ing. (FH) Dalferth"

Due to the preceding letter of the company RUD of 21.7.21999 I contacted my patent attorney and sent the license agreement drawn up by him with not exactly low costs by letter of 27.7.1999 to the company RUD:

"RUD KETTENFABRIK

July 27th, 1999.

Dear Mr Dalferth,

attached, I have attached to you the license agreement which I have received from my patent attorney,

Dipl.-Ing. Otto Happe Patent Attorney - European Patent Attorney Meistersingerstrasse 34 D-45 307 Essen

I've had worked out.

If RUD agrees with this license agreement, I can still provide you, Mr. Dalferth, with some drawings and documents as well as calculations.

Yours sincerely, I remain in expectation of your message at short notice".

Now it's gonna be fun according to the motto:

Why can a Swabian read a menu in any language in the world?

Because he only reads the prices.

As is clear from the letter from RUD of 21.7.1999, i.e. 6 days before my letter of 27.7.1999 to RUD, on 21.7.1999 RUD was *interested in signing a* contract with me to *take over* a *license*, perhaps one had thought it would be completely "free"?

The following letter from RUD dated 10 August 1999 shows once again how a "little inventor" is totally kidded in this country.

A major manufacturer of chains had no problem whatsoever with driving a designer and inventor who worked for Thyssen Krupp as an employee "at expense" in a completely nonsensical way, because one should be able to assume that someone knows whether he wants to conclude a license agreement or not.

On 10.8.1999, about 14 days after sending the license agreement, I received the following letter from RUD:

"Aug 10, 1999.

Your property right "Self-adjusting chain sprocket"

Dear Mr Herkenrath,

by letter dated 27.07.99 you have sent us a license agreement for the use of your property right.

We have checked the process and also dealt again with your new construction.

As we have already announced by telephone, we cannot accept the license agreement. The construction does not bring so many advantages for us that we can agree a use according to your license agreement with you.

We're sorry we couldn't give you a better answer.

Yours sincerely

RUD-KETTENFABRIK

(signature)

Dipl-Ing. (FH) Dalferth"

This was the end of the second time- and cost-intensive EPISODE for me at RUD.

After the patent had finally been installed in a portal scraper at the Ensdorf power station in April 2001, I contacted RUD again on 30.7.2001 because I finally had a reference object in which two self-adjusting sprockets had been installed.

THIRD EPISODE WITH RUD

I quote below from my fax of 30.7.2001:

"Telefax to Mr. Scherle

• • •

Subject: Chain sprocket

I had checked: To the statement

"Letter from Mr Dalferth dated 10 August 1999.

Dear Mr. Scherle,

The patented chain sprocket is installed in a portal scraper in the Ensdorf power plant, which is a significant success. I have attached an excerpt of the Saarbrücker Zeitung from the 16th/17th June issue of Saarlouis.

Sound measurements showed a considerably lower sound power of approx.: 8 -12 dB, which can only be attributed to my newly developed and patented sprocket. These sound measurements could already be carried out in the first months of operation, which is only possible after some time in the case of a wear measurement.

Yours sincerely"

On 24 October 2001 I sent the following letter to RUD:

"October 24, 2001.

Subject: Patent "Self-adjusting sprocket".

Dear Mr. Dipl.-Ing. Kümmel,

as agreed with you in the telephone conversation on 23.10.01, I hereby present my patent "Self-adjusting chain sprocket".

In the course of my many years of activity in the field of conveyor technology, I have noticed a considerable wear of chain and sprocket sprocket, which occurs again and again. From this experience I had the idea in 1992 to reduce the wear considerably with the help of a "self-adjusting chain sprocket".

With conventional sprockets, the main load is only on the first meshing teeth. My "self-adjusting chain sprocket", on the other hand, distributes the load evenly and self-regulating on all teeth in mesh. This significantly reduces wear on the chain and sprocket. In addition, production inaccuracies on the chain and sprocket are compensated. Due to this fact, more cost-effective manufacturing processes for sprockets, such as plasma or laser burning as well as die forging, can be considered.

As an inventor, I patented this invention of the "self-adjusting chain sprocket" at the German and European Patent Office on behalf of my employer, PWH Anlagen & Systeme GmbH, a subsidiary of the KRUPP Group (KRUPP Fördertechnik GmbH).

Since the Krupp Group does not manufacture sprockets, the patent was transferred to me for my own use. However, as an employee in the KRUPP Group, I can take advantage of the support, advice and assistance.

I hope, my construction of the "Self-adjusting Sprocket" finds your appreciated interest and a possible use in your company. I would very much welcome a statement from you in the near future.

Yours sincerely

Annex:

Patent specification "Self-adjusting chain sprocket" DE 43 17 461 C2/EU 93118346.1

Design- and functional description / list of advantages and tooth segments Sprocket drawing R 22077 07 00 1 / 001 / XM-4d/Picture 1/3380927/3381254/3380863/3382632/3382633/3382661"

On 21 November 2001 RUD replied as follows:

"Nov 21, 2001 Dear Mr. Dipl.-Ing. Herkenrath,

many thanks for the transmission of your documents with the topic patent "selfadjusting chain sprocket".

Their documents were inspected again and checked for possible marketing by RUD.

After a detailed examination of the documents, we currently assume that it is not possible for us to market this sprocket principle at present. This decision was discussed in consultation with the management Mr. Dipl.Wi.-Ing. Otto Eberhard Rieger. In the following we take the liberty of explaining the reasons for this statement.

The round steel chains we produce are usually installed in power plants and cement works. The round steel chain itself is exposed to the abrasive material to be conveyed over the entire conveying length and must therefore be casehardened independently of the sprocket design in order to be able to withstand the abrasive materials that attack it. In addition, the sprockets in these systems are not only subject to wear due to abrasion, but are also generally subject to corrosive influences. The drive sprocket technology patented by you makes it necessary for the individual tooth segments to move over the entire operating period of the sprockets.

Based on our experience in the systems equipped by us, we assume that this mobility of the individual tooth segments will be so strongly affected by corrosion after a relatively short time by the large contact surfaces that the actual effect of the sprockets is lost.

However, these basic technical concerns are not the actual reason why we do not believe that these sprockets can be marketed. The main reason for our position is the significantly higher production costs for such sprockets compared to our existing system.

Through comparative calculations, we have determined a price that is approx. 30% higher than our standard calculation.

In today's highly competitive materials handling market, such price increases cannot be implemented on the market compared to comparable products, even if technical improvements and advantages are obvious.

We would like to express our sincere thanks for the offer to realize these bikes with RUD. Unfortunately, we currently see no possibility of exploiting this patent. Yours sincerely

RUD-KETTENFABRIK, Signature Hans Kümmel Enclosure: the documents submitted by you will be returned["].

With this letter one took the view that the movable tooth elements of the chain sprocket developed by me would already be worn out and/or rusted after relatively short time. As the case in Ensdorf after 16 years proves, this did not prove to be true!

Furthermore, reference was made to the allegedly significantly higher manufacturing costs.

It has to be said that the additional costs for the production of the selfadjusting sprocket were not significantly higher than those of a conventional sprocket.

What are the minor additional costs for a chain sprocket if the chain operated with it lasts at least 30 % longer, as was later discovered during the investigation on the chain simulator of Ketten Wulf? And here I am sure that the reduction in wear is still considerably higher than the 30% that was determined at the time.

How else would it be possible for two portal scrapers in the Ensdorf power station, which were initially shown in 2001, to still work perfectly with one and the same chain from Ketten Wulf after more than 16 years? More about that later.

Notice that:

The cost of a sprocket is only about 1/10 of the cost of a chain.

FOURTH EPISODE WITH RUD

In April 2003 I contacted the company RUD again regarding the patent, because in <u>2001 the self-adjusting chain sprocket had finally</u> <u>been used in the Ensdorf power station</u> and the new portal scraper with the chain from Ketten Wulf and the two self-adjusting chain sprockets had been working perfectly for a while.

"Attracted" by this application in Ensdorf, the company Ketten Wulf in Eslohe, another important chain manufacturer, contacted the company beforehand. She had signed a license agreement with me in 2002 and tested my patent since 2001.

Further details can be found in an extensive later chapter.

Therefore, I was full of enthusiasm and was looking for another **licensee for round link chains, so** I contacted RUD again.

On 15.4.2003 the following e-mail came in:

"From: Hans.Kuemmel@rud.de

•••

Subject: Self-adjusting sprockets

Dear Mr Herkenrath,

Thank you very much for contacting our house again. In order to check your documents with the new findings you mentioned, we would like to ask you to send them to us again, as they were completely returned to you the last time.

Yours sincerely

Hans Kümmel...

Leading the World in Chain Technology "

On 17.4. 2003 I answer this e-mail as follows:

"April 17, 2003.

Subject: Patent "Self-adjusting sprocket".

Dear Mr. Kümmel,

I have received your e-mail from 15.04.03 and hereby send you the new documents.

At the beginning of 2001, the first chain sprocket for a plate conveyor chain was installed in a portal scraper in the Ensdorf power station by KOCH from Wadgassen. Since this power plant is located in a residential area, very strict noise emission regulations were demanded here. By far the largest part of the noise reduction of approx. 8-12dB(A) is due to the new sprocket, as the inlet and outlet impact is significantly reduced. The chain is clamped on the sprocket, so no levering out of the chain from the sprocket is necessary. See the technical contribution Fördertechnik der dhf of 9/2002.

Low-noise, wear-reducing, cost-reducing.

From October 2001 to January 2003, Ketten Wulf carried out a test with **500,000** flexures in this laboratory. On the one side were the conventional chain sprockets and on the other side my patented chain sprocket, which were braced against each other with the same link chain. After this loading period, the wear on the rollers and on the joints of the link chains was measured. The results of the investigations are partly so astonishing that the wear was reduced by a **factor of 13 during** sliding movement. See technical article: Sonderdruck from issue 7/8 pages 35-37 in the journal Konstruktion,

Chain drive: low-noise and long service life

This article was written in June 2002. This is not the final report.

With the company Ketten Wulf I have concluded a license agreement for the patented sprocket construction for link chains, so I can still conclude a license agreement for sprockets for round link chains.

I hope my construction of the "Self-adjusting chain sprocket for round link chains" finds your appreciated interest and a possible use in your company. I would very much welcome a statement in the near future.

Yours sincerely -Signature Karl Herkenrath-Annexes:

Patent specification "Self-adjusting chain sprocket" DE 43 17 461 C2 / EU 93118346.1 / Publications drive technology; Glückauf; Design; i.e., /Advantage and tooth segment list / FEM calculation round link chains link & rigid chain sprocket / Copy built-in parts / Krupp drawing link chain 3380927; 3380863; 3380836 / Design and functional description chain sprocket drawing 001 / chain sprocket drawing XM-4d/ chain sprocket drawing R 22077 07, Karl Herkenrath 17 April 2003"

On 23 April 2003 I received the following e-mail from RUD:

"Subject: Self-adjusting sprocket.

From: <u>Hans.Kuemmel@rud.de</u> Dear Mr Herkenrath,

We have received your documents in the meantime. Thank you very much for sending it.

In order to have an additional look at the reference plant described by you, we would like to have the plant in the Ensdorf power plant visited by our field service employee Mr. Dipl. Ing. Karsten Bartnicki. Mr. Bartnicki was formerly employed at Koch Transporttechnik and is therefore a conveyor technology expert who is able to check the transferability of your patent to the usual applications for round steel chains. Mr. Bartnicki will contact you shortly to make an appointment with you.

Addresses: Karl Herkenrath

Senior Design Engineer

• • •

Karsten Bartnicki

B&W Engineering Yours sincerely

Hans Kümmel

On 11 May 2003 I contacted Mr. Bartnicki at B&W Engineering & Consulting GmbH:

"May 11, 2003.

Dear Mr. Bartnicki,

During the inspection of the installed chain sprocket in the portal scraper of the Ensdorf power station on 9 May 2003, we agreed that I would send you various documents. In the appendix I have enclosed some publications from the various
trade journals. All are based on the same basic text, see "Energy and cost reduction with self-adjusting chain sprocket".

Yours sincerely"

By letter dated 15 July 2003, RUD received another refusal, see letter below:

"Aalen, Unterkochen, 15 July 2003

Process: Your Patent No. DE 43 17 461 C2

Dear Mr. Dipl.-Ing. Herkenrath,

With reference to the on-site inspection of your patented sprocket in the conveyor of the Ensdorf power plant, together with our field service employee Mr. Bartnicki, we would like to inform you about the results of our in-house examination of your offer, a license agreement.

In our opinion, the principle of operation of the self-adjusting sprockets, presented and patented by you, can be implemented for approx. 15-20% of the sprockets manufactured by us. This is due to the fact that the mass of the sprockets we manufacture is used for the simplest and subordinate applications (scraper floor on manure spreaders, cleaning scrapers under rubber belts, chip conveyors, etc.). These are cast one-piece sprockets in which only the hub bore is machined. In addition, the number of teeth is rarely greater than 6 and the mimic of your patented sprocket cannot be accommodated in these confined spaces.

For the remaining 15% of sprockets, which represent an annual turnover of 70-100.000,-- \in for RUD, a license agreement is inconceivable, where between 12 and 18.000,-- \in license fees are incurred, because we assume that the production of the sprockets according to your system will already increase the costs for the end user by 50-70% due to the more expensive production, that the allocation of the license fees will not be accepted by the market and that the costs incurred by RUD for these sprockets cannot be added to the sales price.

We see a big problem in the fact that the round steel chain conveyors from RUD are not only compared with competitive products from other round steel chain manufacturers, but also with other chain systems (link chains, roller chains). With these alternative products, sprockets are already much cheaper than sprockets for round steel chains. These are mostly laser-cut or flame-cut discs which do not contain any cutting production.

If today's costs rise due to increased production costs for the sprockets, the complete round steel chain conveyor system will lose its competitiveness. For the reasons stated above, we must therefore refrain from a license agreement with fixed license fees.

However, we would be happy to check the performance of such a sprocket under real operating conditions in consultation with a plant manufacturer or operator.

Yours sincerely RUD-KETTENFABRIK .ppa. Günter Mettmann, Technical Office:,Hans Kümmel"

Comment on this letter of 15 July 2003:

Here again it is clearly emphasized how expensive the production of the self-adjusting sprocket is and how the market is not ready for it!!!

You really can only laugh:

What are the possible additional costs for this sprocket in view of the fact that a round steel chain could be used considerably longer?

This was the end of the chapter RUD, but there should be another small EPISODE in 2015, more of it later.

Chapter 4

The "farce" with Saarbergwerke AG and the state government in Saarland according to the motto:

"INITIATIVE FOR WORK IN SAARLAND."

In December 1995 I had the idea to contact the Deutsch-Französische Handelsgesellschaft in Saarbrücken to find a chain manufacturer in France.

After receiving the addresses, I also contacted various French manufacturers. These were - similar to the German chain manufacturers - at first "completely enthusiastic" about my idea.

After it became clear that a considerable reduction in wear could obviously be achieved with this, they went quite quickly to "diving station", as they say so beautifully: over there as over there.

My next point of contact was Saarbergwerke AG, who, in my opinion, should be interested in reducing wear due to the large number of chains.

By letter dated 14 December 1995, I wrote to the Deutsch-Französische Handels-Gesellschaft in Saarbrücken.

"Subject: Utilization of the patent "Self-adjusting chain sprocket."

Dear Mrs. Reichert,

I would like to instruct you to find a manufacturer of chain systems and chain sprockets in France who is willing to commercially exploit my patent.

The manufacturer should have the following requirements.

1.

The manufacturer should offer chain systems in Europe or worldwide.

2.

The manufacturer should manufacture sprockets himself and have a turnover of several million.

З.

The manufacturer can manufacture round link chains as well as link chains.

4.

The manufacturer should be prepared to accept the minimum terms and conditions required for the license agreement.

Yours sincerely"

On 27.01.1996 I got mail from the "Haus der Saar" Maison de la Sarre - Paris, which sent me a list with corresponding chain manufacturers from France.

By letter of 15 December 1995 I addressed the Saarland Government, Ministry of Economic Affairs and Finance:

"Subject: Patent "Self-adjusting sprocket"

Dear Mr. Weyand,

in the conversation on 15.12.1995 I presented you my patent of the "self-adjusting chain sprocket". My patent is also pending as a EUROPEAN PATENT REGISTRATION for France. For this reason I would like to ask you about the

Service Centre "Haus der Saar" Centre d'Affaires Maison de la SarreService Center Saarland House

in Paris to provide me with addresses, brochures and, if possible, sales figures of French chain manufacturers.

The following chain manufacturers are important for my research:

1.

Round steel link chains with chain sprocket production.

2.

Link chains with sprocket manufacturing.

З.

Round steel link chains with link chains and chain sprocket production.

It would help me a lot in my research, if I would receive the corresponding brochures or addresses from you as soon as possible.

Yours sincerely"

Presentation at Saarbergwerke AG (since 1998 part of Deutsche Steinkohle AG) and at Deutsche Steinkohle AG, which was and still is subsidized by the taxpayer with many billions of DM or Euro for decades.

On <u>**12.12.1996</u>** I contacted Saarbergwerke AG in Saarbrücken for the first time and presented my patent "Self-adjusting chain sprocket":</u>

"Saarbrücken, 12/12/1996

Saarbergwerke AG

Product area Central services

Mr. Marquardt

Management / Construction management / Material management

Subject: Patent "Self-adjusting chain sprocket

Dear management / design management / material management. From years of experience in the field of conveyor technology, I hereby present my patent "Self-adjusting chain sprocket".

In the course of my activities I have noticed a considerable wear and tear of chain and sprocket which occurs again and again. From this experience I had the idea in 1992 to reduce the wear considerably with the help of a "self-adjusting chain sprocket".

With conventional sprockets, the main load is only on the first meshing teeth. My "self-adjusting chain sprocket", on the other hand, distributes the load evenly and self-regulatingly on all teeth in mesh. This significantly reduces wear on the chain and sprocket. Furthermore, production inaccuracies on the chain and sprocket are compensated. Due to this fact, more cost-effective manufacturing processes for sprockets, such as plasma or laser burning as well as drop forging, can be considered. As an inventor, I patented this invention of the "self-adjusting chain sprocket" at the German and European Patent Office on behalf of my employer PWH Anlagen & Systeme GmbH, a subsidiary of the Krupp Group (KRUPP Fördertechnik GmbH). Since the Krupp Group does not manufacture sprockets, the patent was transferred to me for my own use. However, as an employee in the KRUPP Group, I can take advantage of the support, advice and assistance.

I hope, my construction of the "Self-adjusting Sprocket" finds your appreciated interest and a possible use in your company. I would very much welcome a statement from you in the near future.

Respectfully

Annex:

Patent specification "Self-adjusting chain sprocket" DE 4317461 C2 / EU 9311 8346.1 Sprocket 1 (CAD)

Application example round link chain:

Construction and functional description / Advantage - as well as tooth segment - List sprocket - Drawing R22077 07 00 1 / Pocket chain sprocket XM-4D-, Chain 34 x 126"

With date of 24.04.1997 I turned to the SaarTech and presented the patent there also in writing and on 29 April 1997 a discussion took place.

"April 24, 1997.

SaarTech

Mr. Mehlen

Subject: Patent "Self-adjusting sprocket".

Dear management / construction management / material management, from years of experience in the field of conveyor technology, I hereby present my patent "Self-adjusting chain sprocket".

In the course of my work I have noticed a considerable wear of chain and sprocket which occurs again and again. From this experience I had the idea in 1992 to reduce the wear considerably with the help of a "self-adjusting chain sprocket".

With conventional sprockets, the main load is only on the first meshing teeth. My "self-adjusting chain sprocket", on the other hand, distributes the load evenly over all teeth in mesh. This significantly reduces wear on the chain and sprocket. In addition, production inaccuracies on the chain and sprocket are compensated. Due to this fact, more costeffective manufacturing processes for chain sprockets, such as plasma or laser burning as well as drop forging, can be considered.

As an inventor, I patented this invention of the "self-adjusting chain sprocket" at the German and European Patent Office on behalf of my employer PWH Anlagen & Systeme GmbH, a subsidiary of the Krupp Group (KRUPP Fördertechnik GmbH). Since the Krupp Group does not manufacture sprockets, the patent was transferred to me for my own use. However, as an employee in the KRUPP Group, I can take advantage of the support, advice and assistance. I hope my construction of the "Self-adjusting Sprocket" will find your appreciated interest and a possible use in your company. I would very much welcome a statement from you in the near future.

Yours sincerely

Annex:

Patent specification "Self-adjusting chain sprocket" DE 4317461 C2 / EU 93118346.1; sprocket 1 (CAD) Application example round link chain: Design and functional description / list of advantages and toothed segments Sprocket sprocket drawing R 22077 07 00 1 / pocket chain sprocket XM-4D-; chain 34 x 126

Karl Herkenrath Construction Engineer & Inventor

Date: 24.04.97"

In the following time I found the company BOECKER & HERZOG GmbH in St. Ingbert and was able to win it as a licensee.

On December 15, 1997, I euphorically commissioned my patent attorney, Dipl.-Ing. Otto Happe from Essen, Germany, to rewrite the license agreement that had been prepared for the Zimmermann company (a "bailed out" licensee) to Boecker & Herzog GmbH, euphoric about the fact that I had now found a licensee and that the test could begin in the Saar mines:

",....

Dear Mr. Happe,

have received your letter of 11.12.97 and can also make you a pleasant message, with the SAARBERGWERKE (SBW) I have found a competent partner for the test of the chain sprocket. The SBW are therefore prepared to install the test sprocket in their conveyor system and the SBW will also bear the costs for installation, removal and support of the test.

So, I had to find a company that would be able to manufacture the test sprocket and cover the cost of this first test sprocket. I have found a suitable partner in B&H. This company B&H took over 75% of the former workshop from PWH, KRUPP kept the remaining 25%. B&H is therefore prepared to pay the cost of the first test sprocket to SBW if it also receives a license for the sprocket. I would therefore like to ask you to transfer the license agreement that you have proposed for Zimmermann to the company

Boecker & Herzog GmbH Peter Boecker Managing Partner Neue Bahnhofstr. 71-73 D-66386 St. Ingbert

to rewrite "

In a letter dated December 17, 1997, Mr. Happe sent me the draft and the finished license agreement was signed on January 5, 1998 by me and Boecker & Herzog.

At that time I was very happy to have found a licensee so that the first test sprocket could be installed at Saarbergwerke AG.

Once again betting on the wrong horse

Unfortunately I had to find out then in the next months that I had "**bet on the wrong horse**" again and this company was not even able to pay the 225,-- DM patent fees, let alone the license fees of at least 60.000,-- DM for the first three years according to the license agreement of 6.1.1998.

With letter of 13.08.98 to the company Boecker & Herzog I terminated the license agreement concluded on 5.1.1998, since after several requests the fees agreed upon in the agreement in the amount of

225,-- DM !! we're not paid.

I was lucky in my misfortune and could get this license agreement back in September 1998, before it would have ended up in the bankruptcy estate.

But one thing at a time: First of all I wrote on 09.01.1998 "in high spirits" to Saarbergwerke AG:

"SAARBERGWERKE AG Mr. Gießelmann

T-ZMU Underground Technology Department

Hirschbach

In den Rodhechen

D-66280 Sulzbach

Saarbrücken, 09.01.1998

Subject Patent "Self-adjusting chain sprocket" German Patent No.: DE 43 17 461 C2European Patent No.: 0 599 156

Dear Mr. Gießelmann,

I would like to inform you that **BOECKER & HERZOG GmbH and** its subsidiary BOECKER **& HERZOG MKA GmbH - Maschinen -Komponenten - Antriebe, both** located in St. Ingbert, have acquired from me the sole license rights for the manufacture and distribution of the "self-adjusting chain sprocket" invented by me. Therefore, no other company is entitled to reproduce or distribute my patent.

In particular **BOECKER & HERZOG MKA GmbH - Maschinen -Komponenten - Antriebe** as a workshop of the former PWH **ANLAGEN + SYSTEME GmbH brings the** necessary know-how from conveyor technology to manufacture the "self-adjusting chain sprocket".

I am very pleased that a Saarland company manufactures and distributes this new sprocket, and I would also like to thank you for the confidence you have placed in the **self-adjusting sprocket**.

I would like to ask you to support **BOECKER & HERZOG in the** underground use of the chain sprocket so that the advantages of the "self-adjusting **chain sprocket**" can be verified. I am very grateful for all the suggestions you have made based on your many years of experience with underground systems in the field of **self-adjusting chain sprockets.**

With your help and your experience from underground plants, it should be possible to make this patent a success and thus secure and/or even create jobs in Saarland.

Contact persons at **BOECKER & HERZOG** are Dieter Herzog, Managing Partner (Tel..) and Herbert Jakoby (Tel...).

BOECKER & HERZOG can be reached as follows:

I thank you in advance for your support.

With friendly GLÜCK AUF

Karl Herkenrath"

In a letter dated 09.03.1998 I again wrote to Saarberg AG, Bergwerk Göttelborn.

"SAARBERG AG

Bergwerk Göttelborn/Reden Mr. Mining Director Sersch

D-66287 Quierschied

Subject: Initiative for Work in Saarland

Dear Mr. Sersch,

I am owner of a German and European patent "Selbsteinstellendes Kettenrad" No.: DE 43 17 461 C2.

With this patent the wear on underground conveyor chains can be considerably reduced.

Since December 1996, I have been in contact with SAARBERGWERKE with the aim of using this "self-adjusting chain sprocket" in a pilot plant. In detailed discussions with the management of SAARBERGWERKE, I was able to

Mr. Gießelmann, Head of Department Technology underground Dept. T-ZMU ...

Mr. Schuster, Head of underground technology department T-ZMP ...

• • •

I'll be able to convince you of my invention.

The construction principle of the "self-adjusting chain sprocket" is easy to explain:

With conventional sprockets, the load on the first meshing tooth is the greatest, and so is the wear.

With the "self-adjusting chain sprocket" the load is distributed to all teeth in chain engagement. Each tooth element of the sprocket is movably mounted and connected to the adjacent tooth via round springs. If a tooth element is loaded by the chain, this tooth can tilt and transmit the force to the following tooth element via the round springs in such a way that a balance is created between the tooth elements. The load is distributed over all toothed elements; thus, the wear of the chain is considerably reduced (approx. 50%) and the service life is increased.

After several meetings and discussions with the gentlemen of the SAARBERGWERKE some conditions had to be fulfilled. It was therefore necessary to select a suitable system for the underground test. In addition, drawings had to be prepared for this, and a suitable manufacturer had to be found who fulfilled all the requirements of SAARBERGWERKE.

These necessary requirements were met at the beginning of November 1997. After getting to know some manufacturers of sprockets in France and North Rhine-Westphalia, I decided to go to Saarland and signed a license agreement with **Boecker & Herzog GmbH in St. Ingbert on** 5.1.1998.

Now only after one year all necessary conditions for the underground test were given. During the final discussion on 03.02.1998 with Mr. Gießelmann from SAARBERGWERKE and Mr. Jakoby from Boecker & Herzog further appointments were made for the use of the chain sprocket. The **sprocket test was** to be used at the **beginning of 1998 at** Göttelborn mine.

In a further meeting at Göttelborn mine, Mr Jakoby was informed that you, as director of the mine, could not carry out a test for lack of personnel. Thus, the entire work of one year is called into question, and a new conveyor system with the same technical conditions for underground use has to be found.

I have granted the sole license to a company in SAARLAND, as many jobs in the mechanical engineering sector have been lost here. Personally, I started 25 years ago at the PHB in Cologne (today KRUPP FÖRDERTECHNIK in St. Ingbert). At that time, PHB (PWH) in St. Ingbert employed about 1,800 people. Today KRUPP FÖRDERTECHNIK in St. Ingbert employs only about 250 people. A part of the workshop with approx. 50 persons was taken over by the company Boecker & Herzog GmbH in St. Ingbert.

This underground test is of particular importance for the further development of the "self-adjusting chain sprocket", as SAARBERGWERKE is a well-known and experienced operator of round link chains in Europe. If the underground test is successful, it is to be expected that other operators will use this sprocket and this would **secure jobs in Saarland** and which will create them. Sprockets are not only used in underground conveyor systems, but also in many other conveyor systems.

I ask you to help us with the execution of the first underground test run so that the test can be completed as quickly as possible and series production can also be started for other operators of round link chains.

With a friendly GLÜCK AUF Karl Herkenrath"

In a letter dated 9 March 1998, I wrote to the SPD parliamentary group in the Landtag, Mr Hans Albert Lauer in Saarbrücken:

"Subject: Initiative for Work in Saarland

Dear Mr. Lauer,

I am owner of a German and European patent

"Self-adjusting sprocket" No. DE 43 17 461 C2.

With this patent the wear on underground conveyor chains can be considerably reduced.

Since December 1996, I have been in contact with SAARBERGWERKE with the aim of using this "self-adjusting chain sprocket" in a pilot plant. In detailed discussions with the management of SAARBERGWERKE I was able to convince the gentlemen of my invention.

The construction principle of the "self-adjusting chain sprocket" is easy to explain:

With conventional sprockets, the load on the first meshing tooth is the greatest, and so is the wear.

With the "self-adjusting chain sprocket" the load is distributed to all teeth in chain engagement. Each tooth element of the sprocket is movably mounted and connected to the adjacent tooth via round springs. If a tooth element is loaded by the chain, this tooth can tilt and transmit the force to the following tooth element via the round springs in such a way that a balance is created between the tooth elements. The load is distributed over all toothed elements; thus, the wear of the chain is considerably reduced (approx. 50 %) and the service life is increased.

After several meetings and discussions with the gentlemen of the SAARBERGWERKE some conditions had to be fulfilled. It was therefore necessary to select a suitable system for the underground test. In addition, drawings had to be prepared for this, and a suitable manufacturer had to be found who fulfilled all the requirements of SAARBERGWERKE.

These necessary requirements were met at the beginning of November 1997. After getting to know some manufacturers of sprockets in France and North Rhine-Westphalia, I decided to go to Saarland and signed a license agreement with **Boecker & Herzog GmbH in St. Ingbert on** 5.1.1998.

Now only after one year all necessary conditions for the underground test were given. During the final discussion on 03.02.1998 with Mr. Gießelmann from SAARBERGWERKE and Mr. Jakoby from Boecker & Herzog further appointments were made for the use of the chain sprocket. The **sprocket test was** to be used at the **beginning of April 1998 at** Göttelborn mine.

In a further meeting at the Göttelborn mine, Mr Jakoby was informed that Mr Sersch, the director of the mine, was unable to carry out a test for lack of personnel. Thus, the entire work of one year is questioned and a new conveyor system with the same technical conditions for underground use has to be found.

I have granted the sole license to a company in SAARLAND, as many jobs in the mechanical engineering sector have been lost here. Personally, I started 25 years ago at the PHB in Cologne (today KRUPP FÖRDERTECHNIK in St. Ingbert). At that time, PHB (PWH) in St. Ingbert employed about 1,800 people. Today KRUPP FÖRDERTECHNIK in St. Ingbert employs only about 250 people. A part of the workshop with approx. 50 persons was taken over by the company Boecker & Herzog GmbH in St. Ingbert.

This underground test is of particular importance for the further development of the "self-adjusting chain sprocket", as SAARBERGWERKE is a well-known and experienced operator of round link chains in Europe. If the underground test is successful, it is to be expected that other operators will use this sprocket and that would secure jobs in Saarland and create some. Chain sprockets are not only used in underground conveyor systems, but also in many other conveyor systems.

I ask you to help us with the execution of the first underground test run so that the test can be completed as quickly as possible and series production can also be started for other operators of round link chains.

With a friendly GLÜCK AUF

Karl Herkenrath"

NOTE: There has been no response to this letter.

Letter of 23.04.1998 from SAARBERG AG in Saarbrücken:

",,23.04.1998

Dear Mr Herkenrath,

At the beginning of 1997 you presented the "self-adjusting chain sprocket" patented in your name to the Saarbergwerke for the first time. This new type of sprocket allows an even distribution of the chain force on the meshing teeth, which should significantly reduce the high forces or load peaks occurring on conventional sprockets. As a result, the wear on the chain teeth as well as on the contact surfaces of the chain is reduced.

Against the background of this qualitative improvement, Saarbergwerke's support was promised to you in order to be able to test the applicability under the special, mining-specific conditions of underground operation. In order to be able to carry out such a trial run with a manageable risk and with minimal impairment of an ongoing production operation, however, minimum requirements must be placed on this new sprocket system.

These requirements were discussed in detail in several discussions between you, our responsible central office and the Göttelborn/Reden mine, which at that time signaled its readiness for such a trial operation. It must be ensured that your sprocket can withstand the breaking load of the chain. Since the system for load distribution to the meshing teeth requires the mobility of all components involved in the kinematic chain, any impairment due to contamination must be avoided at all costs.

In the meantime, your licensee Boecker & Herzog has agreed to produce such a sprocket as a prototype for test purposes. The completion date is not known at the moment.

The trial originally planned in Göttelborn/Reden cannot be carried out due to the special situation of our mine. However, our central office is currently trying to find a new location for such an underground test.

The widespread use of the "self-adjusting chain sprocket" in coal mining, especially in mining operations, which have to meet the

requirements for high availability and operational safety, and in which chain conveyors are exposed to enormous forces with minimal installation space, depends on the fulfilment of the aforementioned requirements.

From the point of view of all parties involved, this operating test and preliminary tests on the prototype will therefore provide clarity with regard to the fulfilment of these requirements placed on the sprocket.

With friendly Glückauf

SAARBERGWERKE AKTIENGESELLSCHAFT"

Two years time, work and money invested for free

After the company Boecker & Herzog from St. Ingbert went bankrupt in 1998, the license agreement with Boecker & Herzog burst like a "SEIFENBLASE". I informed Saarbergwerke, a meeting took place on 22.10.1998 and on 5. Nov. 1998 I wrote to **Deutsche Steinkohle AG**.

"Nov 5, 98.

Dear Mr. Bronder, Director of Mines,

referring to your letter of 23.04.1998 on the use of the "self-adjusting chain sprocket" in the Göttelborn/Reden mine.

The licensee, the company Boecker & Herzog in St. Ingbert, terminated the license agreement on 09.09.98 due to insolvency proceedings. This was followed on 22.10.98 by a meeting at the central office.

Participants:

• • ••

In this discussion for the Warndt mine operation, the demands were repeated that without a sufficient explanation of the different number of teeth, the Warndt mine operation would not be approved by the central service.

In the "self-adjusting chain sprocket", all teeth (also on pocket sprockets) are movably mounted and have a recess on both sides for receiving the round springs (tension bolts). If a tooth is loaded with a force, the tooth can twist and transmit this force to the following tooth via the round spring. So, this force (at circled track) affects onto all following teeth.

If the number of teeth is **odd,** the last round spring is loaded by the first and last tooth element, so that all teeth are clamped evenly. With

an **even** number of teeth, the last round spring is not loaded, and therefore this system must be held by the chain itself.

This explanation and graphic representation were not sufficient for Mr. Müller of the T-ZMU, and he insisted on a model to understand the differences. In order to show these differences between even and odd number of teeth, two models may even be necessary, each costing about 15,000 DM. In addition to these model costs, the manufacturing costs of approx. 18,000 DM for a possible test trial would be added. I pointed out the considerable costs to Mr. Müller and made a costeffective proposal.

In a test arrangement in the workshop it is quite possible to determine the real conditions on the "self-adjusting chain sprocket". A finished chain sprocket is built into a drive frame, connected to a counter frame and operated with a chain over a longer period of time. Also, with a FEM calculation the static conditions can be represented well, also this more economical suggestion was rejected.

Under today's economic conditions, no manufacturing company or potential licensee is in a position to take over approx. 30,000 to 50,000 DM with an uncertain outcome. In view of these high costs, Mr. Rochel of Hippenstiel was no longer interested in a license agreement.

For two years now I have invested a lot of time, work and money in order to use my innovative patent under Saarbergwerks conditions. Also, as a private individual and patent holder, I do not have an amount of this magnitude available.

It is incomprehensible to me that it was not possible to carry out the operation in the Göttelborn/Reden mine for operational reasons and that it now comes with demands which can be taken over by me and by no licensee.

With friendly luck"

The company Hippenstiel, which I had "opened" in the meantime after the bankruptcy of Boecker & Herzog (since its insolvency in 2015 belonging to the company THIELE in ISERLOHN) and which was interested in a license agreement, naturally did not want to *bear* the *risk in the range of 30,000 to 50,000 DM.*

At this point I must ask myself the question from today's point of view: How is it possible that a company like Saarbergwerke, which has received tax subsidies for decades and will continue to do so until 2018, was unable to cover the costs of model production and testing?

But that's logical: If you're subsidized, of course you don't have to worry about anything as a mining director.

What do you care about savings of an enormous order of magnitude?

To my knowledge, Saarbergwerke bought chains for 30 million DM annually at the time.

With a saving of at least 30 % - which according to today's knowledge is considerably higher - this would have amounted to an annual saving of DM 9 million.

Is there a cost of 50,000 -- DM in the weight?

Letter to Prime Minister Klimmt dated 3.1.1999

After hearing Prime Minister Klimmt's New Year's address on Saarländischer Rundfunk, I wrote the following letter on 3 January 1999:

"State Government of Saarland

Prime Minister Mr Klimmt

Am Ludwigsplatz 14

D-66117 Saarbrücken, Germany

January 3, 1999.

Subject: Initiative for Work in Saarland

Dear Prime Minister Klimmt,

I heard your New Year's address on Saarländischer Rundfunk. In this speech you spoke of Saarbergwerke's high level of technology and of the inflationary power of small businesses.

I have a patent DE 43 17 461 C2 "Self-adjusting sprocket", this reduces the wear on sprockets and chains. Since 1996 I have had contact with the SAARBERGWERKE; after a representation of the new technology of the chain sprocket in April 1997, I was promised an examination of the documents handed over. After this theoretical and technical examination had been completed in September 1997, I was assured of an operational test on a fixed conveyor system in underground operation. Now drawings and calculations had to be prepared for submission to SAARBERGWERKE and a manufacturer in Saarland had to be found for the production. On 6.1.1998 I signed a license agreement with the company BOECKER & HERZOG, which also included a free production of the test sprocket for the Saarbergwerke. Now that all the requirements had been met by SAARBERGWERKE, in January 1998 the underground operation was fixed for the beginning of April 1998. SAARBERGWERKE wanted to take over the installation and monitoring of the chain sprocket test in the underground plant. By letter from Mr Bronder, Director of the Göttelborn/Reden mine, I was informed on 23.4.98 that, following the restructuring and future closure and release of many miners, it would no longer be possible to deploy them. However, the Central Service Office T-ZMU had the task to search for a new place of operation; a discussion on this subject took place on 28 April 1998 in the Warndt mine. After BOECKER & HERZOG MKA GmbH in Rohrbach went bankrupt on 12.8.98, the cooperation with SAARBERGWERKE became more and more difficult. Now one or two models of the sprocket were demanded, which represents the difference between an even and an odd number of teeth, each of these nonsensical demands costs about 15000,-- DM. This demand of approx. 30000, -- DM plus the production costs of approx. 25000, -- DM for the first test sprocket was also too high for the manufacturer Hippenstiel from North Rhine-Westphalia. No company for machine elements is today economically able to spend such an amount of approx. 55000, -- DM for a test.

In order to reduce costs, I have suggested that a sprocket be manufactured for a specific installation and made available free of charge to SAARBERGWERKE. This test sprocket is installed in a drive frame in the central workshop and assembled into a small conveyor unit with chain, guide rails and tensioning frame. Measurements and tests can now be carried out on the sprocket over a period of time on this driven conveyor unit. Only when these tests have been successfully completed is an underground operation planned. This safety test means the lowest financial expenditure on both sides.

Why am I writing all this!

I have been working for Maschinenfabrik PWH for 25 years, now KRUPP Fördertechnik, and moved to Saarland with my family in 1988. In my professional life I had to witness the downfall of many engineering companies, including the traditional PWH company with its 100-year history. During my career in conveyor technology, I developed several patents that were registered on behalf of my employer. Since the KRUPP group does not build sprockets, this patent was transferred to me for my own use. However, I had to find out that the **chain industry has no interest in** reducing the wear of its chains. Such an important and experienced operator of chain conveyor systems as SAARBERGWERKE, with an estimated chain consumption of approx. **30,000,000 DM per year**, should be interested in an approx. **30% corresponding to 9,000,000 DM** wear reduction. The aim of the underground operation was to prove the wear reduction and the functional capability of the chain sprocket in mining operations. With the license agreement with the company BOECKER & HERZOG MKA GmbH in Rohrbach, a minimum annual turnover of 1,000,000 DM **was** contractually agreed after a successful underground operation, which meant turnover for the employees of the former PWH workshop. I am also of the opinion that with the patent "self-adjusting chain sprocket" an even higher turnover can be achieved.

As a private person I already had to spend considerable financial means for the maintenance of the German and European patent. In addition, there are lawyer's fees, drawings, calculations and trips to meetings with vacation days. All these expenses over several years I have made as a private person, because also in every technical discussion and thus also at the SAARBERGWERKE, the completely new innovation of the sprocket patent was confirmed to me. Of course, I have used all possibilities known to me in Saarland, also I have written to the new Deutsche Steinkohle AG Gesellschaft in the Saarland on 5 Nov. 98 to the attention of Mr. Bergwerksdirektor Bronder and have not received an answer until today. This new and innovative sprocket patent should not **fail due to human inertia at SAARBERGWERKE.**

If this New Year's speech on Saarländischer Rundfunk should not be just hollow words, I would ask you, Prime Minister Klimmt, for help with the SAARBERGWERKE, so that an underground operation is finally possible. In Saarland, many jobs will disappear in the coming years, and not only in mining. Now ideas and innovative products for the Saarland are in demand, even if they only achieve a relatively low turnover.

With friendly Glückauf

Karl Herkenrath"

If nobody thinks any further, there would be no progress.

Letter of 3.1.1999 to Mr Bronder, Director of Mines

On the same day, **3.1.1999**, I turned again to Mr. Bronder, Director of the Mine:

"3-Jan-99

Subject: Patent DE 43 17 461 C2 Self-adjusting chain sprocket

Dear Mr. Bronder, Director of Mines,

In my letter of 5.11.98 I informed you of the difficulties of using this patent in underground mining at SAARBERGWERKE.

Mr. Bronder, Director of Mines, you have certainly accompanied a large number of new developments technically and practically from your many years of work, and you know that there are some arguments in favor of and against every new development. With some new developments, the theoretical investigations and calculations can only be proven by a practical test. I am also at your disposal for a representation.

If there were no people who would think ahead and take into account the financial risks of failure, there would be no progress. As I informed you with the letter, these financial risks for SAARBERGWERKE are very low compared to a 30% chain saving. I also cannot understand that a technical improvement and a new development fail because of the inertia and immobility of the SAARBERGWERKE.

I would like to ask you to tell me whether SAARBERGWERKE is still interested in an underground operation, then I will try to find another operator.

With friendly Glückauf"

I had apparently hit the nerve with that letter.

Inertia and immobility at Saarbergwerke?

DSK replied on 11 January 1999:

As you can see from this, one decisively rejects "inertia and immobility".

",.... 11.01.1999

Dear Mr. Hergenrath (Note: even my name had been forgotten),

With astonishment we have taken note of your letter of January 3 of this year. All the more so after we have talked in detail with the engineers you know about the process you have described.

As was explained to us by the employees of the Workshops / Technical Services Saar department and by the potential operators, the proposed solution presented and patented by you still contains many inconsistencies and technical questions in the current development stage. These were last discussed in several meetings on 22.10.98 with you and representatives of Hippenstiel in our company, in detail with the request to explain the functional principle of your invention on the basis of a model.

You have still not complied with this demand, which was also expressed by the mine.

You will understand that in today's world of scarce financial and capacity resources, trial operations can only be carried out with a precisely calculated risk. In our opinion, the willingness of the Warndt / Luisenthal mine to agree to a trial operation after clarification of all technical questions represents the utmost concession to a competent manufacturer and supplier. We have followed this practice in the past and will continue to do so in the future.

It is not true to speak of Saarbergwerke's inertia and immobility in this context, but in our view this approach reflects the responsible work of our employees involved in this process. We assume after your letter that you want to lead your invention with another user to the product maturity and wish you much success with the further development.

With friendly Glückauf, Deutsche Steinkohle AG"

I was not a competent manufacturer and supplier, but a small inventor.

If you read this letter, especially the penultimate paragraph:

"You will understand that in today's world of scarce financial and capacity resources, trial operations can only be carried out with a precisely calculated risk. In our opinion, the willingness of the Warndt / Luisenthal mine to agree to a trial operation after clarification of all technical questions represents the utmost concession to a competent manufacturer and supplier. We have followed this practice in the past and will continue to do so in the future. "

then you can't get out of your amazement, that's a mockery.

I was not a competent manufacturer and supplier, but a "little inventor", an employee who spent most of his free time developing this patent further, travelling all over Germany, having license agreements drawn up, which then either - as in the case of RUD were "waste paper" again several days later, or some bankrupt vultures wanted to conclude a license agreement, but then went bankrupt or they did not want to produce the models required by Deutsche Steinkohle at their expense, for which I naturally had understanding.

But the fact that a company like Deutsche Steinkohle AG, which received billions in subsidies from the German taxpayer, was not in a position to produce the models it insisted on, is an insolence towards the taxpayer.

After the Deutsche Steinkohle AG in Sulzbach "no longer loved me very much" I tried my luck at the Deutsche Steinkohle AG in Herne.

Maybe they thought a little more "progressive" there.

New trial at DSK Deutsche Steinkohle AG in Herne, Germany

So, on **15.1.1999** I wrote to DSK Deutsche Steinkohle AG in Herne.

"DSK Deutsche Steinkohle AG

Ruhrkohle Westfalen AG

Department: T-ZMU Mr. Dr. Dauber

Shamrock 1

44623 Herne, North Rhine-Westphalia

15-Jan-99

Subject: Patent "Self-adjusting sprocket".

Dear Dr. Dauber,

Two years ago I presented my patent of the "self-adjusting chain sprocket" to the Saarbergwerke for the first time and the Saarbergwerke promised me after an examination of the documents an application in the underground operation. So, the Saarbergwerke had to find a suitable place of use, and I as the patent holder had to find a manufacturer who would bear the manufacturing costs. At the beginning of 1998 all necessary conditions were fulfilled and the start of underground operation was set for the beginning of April 1998. In a concluding discussion at the Göttelborn/Reden mine, this underground test could no longer be accepted due to a lack of personnel "Reduction of personnel - closure of the Göttelborn/Reden mine". A new underground operation has now been sought, and this operation has been faced with such high demands that, as a private individual, I cannot meet them. So it was demanded that one or two models represent the difference of an even and an odd number of teeth, each model costs about 15.000,-- DM.

I would like to ask you to help me with an underground operation in the **DSK Deutsche Steinkohle AG** group.

My idea:

In the course of my work in the field of conveyor technology, I have noticed a recurring, considerable wear on the chain and chain sprocket. From this experience I had the idea in 1992 to reduce the wear considerably with the help of a "self-adjusting chain sprocket". With conventional sprockets, the main load is only on the first tooth in mesh. My "self-adjusting chain sprocket", on the other hand, distributes the load evenly and self-regulatingly on all teeth in mesh. This significantly reduces wear on the chain and sprocket. In addition, production inaccuracies on the chain and sprocket are compensated. Due to this fact, more cost-effective manufacturing processes for sprockets, such as plasma or laser burning as well as drop forging, can be considered.

As an inventor, I patented this invention of the "self-adjusting chain sprocket" at the German and European Patent Office on behalf of my employer PWH Anlagen & Systeme GmbH, a subsidiary of the Krupp Group (KRUPP Fördertechnik GmbH). Since the Krupp Group does not manufacture sprockets, the patent was transferred to me for my own use.

Respectfully

Annex:

Patent specification "Self-adjusting chain sprocket" DE 4317461 C2 / EU 93118346.1; sprocket 1 (CAD)

Application example round link chain:

Design and functional description / list of advantages and toothed segments Sprocket sprocket drawing R 22077 07 00 1

Answer of the State Chancellery of the Saarland

One hardly believes it, but already on 25 January 1999 an answer came from the state chancellery of the Saarland:

"State Chancellery Saarland, 25.01.1999:

Dear Mr Herkenrath,

On behalf of Prime Minister Reinhard Klimmt, I would like to thank you for your letter of 3 January 1999 asking for your project for Saarbergwerke to be examined. Prime Minister Klimmt has asked me to answer your question.

Your letter of 3 January 1999 shows that you submitted your project 'Self-adjusting chain sprocket' to Saarbergwerke. I would therefore like to point out to you that the decision regarding the use of your patent is ultimately to be taken by the Saarbergwerke. It is not the task of the state government to intervene in the sovereign decision of a company.

However, I have forwarded your letter to the relevant Ministry of Economy and Finance in order to examine the matter within the framework of what the regional government can do. You will therefore receive an answer from the Ministry of Economy and Finance in the next few days.

Yours sincerely

- Signature

Rolf Bösinger"

Answer from the Saarland Ministry of Economic Affairs

On 31.3.1999 the announced answer of the Ministry of Economics of the Saarland came with the following content:

"Self-adjusting chain sprocket

Your letter of 03.01.1999 to Prime Minister Reinhard Klimmt, letter from the State Chancellery of 25.01.1999, C/4-Bö/Ke

Dear Mr Herkenrath,

As announced by Dr. Bösinger, we have contacted Deutsche Steinkohle AG in order to jointly search for opportunities that do justice to the interests of both sides.

DSK continues to maintain its offer to discuss with you and your partners the possibilities of testing your invention in practice. However, as Mr Bronder informed you in his letter dated 11.01.1999, the prerequisite is that you explain the functional principle of your development on the basis of a model and that you answer the critical questions of the responsible DSK employees.

The decision on a practical application presupposes that DSK can convince itself of the technical advantages of your proposal and assess calculable risks as accurately as possible. We are convinced that you will not ignore DSK's request for a discussion of the technical details of your development.

We hope that we have served you with our mediation attempt and wish you every success in the exploitation of your invention.

Yours sincerely

Signature - (Klaus Sehn)"

Although I had already made myself quite unpopular in Sulzbach, I nevertheless received an invitation from the DSK Deutsche Steinkohle AG to Herne for the **30.03.1999**.

So, I "booted" on 30.3.1999 to Herne and presented there again extensively my self-adjusting chain sprocket as I already knew it from Sulzbach.

I was to receive a reply by the end of April 1999. Since no answer came, I inquired on <u>12.6.1999</u>, how it looks then now, whether the DSK has an interest in a saving, since I had already noticed during the discussion on 30.3.1999 that for the **DSK no obligation existed to the saving.** Hereinafter my letter of 12.6.1999:

"DSK Deutsche Steinkohle AG

. . . .

"June 12, 1999.

Subject: Patent "Self-adjusting sprocket".

Dear Dr. Dauber,

as a private person I am owner of the patent DE 43 17 461 C2 "selfadjusting chain sprocket", which is able to reduce the chain wear (see appendix from the technical journal "Antriebstechnik vom Juli 1999"). In order to prove this reduction in wear, a practical test would have to be carried out. As a well-known consumer of chains with an annual turnover of several million marks, a considerable reduction in wear would have to be of decisive importance as well as economically interesting. On January 15, 1999, I sent you these documents with the request to introduce this patent. This presentation took place on 30 March 1999 at DSK in Herne with Mr Filipiak. I was to receive an answer at the end of April, but it has not been received to this day. I also had the impression during the discussion that there was no interest in reducing wear and costs.

Since I run this patent as a private person at my own expense, I have to pay all the costs myself. I also got the impression here that there is no compulsion for DSK to make savings, although German hard coal has been subsidized by the German taxpayer for many years with many billions.

I seriously wonder whether such behavior towards the public and the taxpayer is justified.

Yours sincerely Karl Herkenrath"
Since no prototype was available, the Deutsche Steinkohle AG had no interest

I received the negative reply on 15.6.1999.

"Karl Herkenrath

15.06.1999

Presentation of the patent "Self-adjusting sprocket".

Dear Mr Herkenrath,

With regard to your presentation of the patent on 30.04.1999 at our premises and your letter of 12 June 1999, the following situation arises:

Discussion of technology

The investigations on which the patent is based are based on drives for EKB with round steel chains according to DIN 764 - 3 A 23 - x 80 mm and tensile loads up to 120 kN. These dimensions and premises do not correspond to the current state of the art at DSK. Essentially, chains in accordance with DIN 22 252 are used in the version DMKB 26 x 92 mm to 48 x 144/150 with tensile loads of up to 600 kN. In the discussion on 30 March 1999, you personally asked whether your technology was transferable to the requirements mentioned. In addition, they could not ensure that, when adapting their technology, the designs were compatible with the drive drums used at DSK in terms of dimensioning.

With regard to the project planning you have carried out so far, there has not yet been a prototype of a sprocket according to your technology. You have not yet been able to implement a corresponding test bench run as a reference. Furthermore, there is no operating experience with regard to the sealing of the gaps in order to guarantee operational reliability or service life even under abrasive conditions.

Wear / cost reduction

Within the scope of operating point concentrations, the equipment at DSK has been adapted to the requirements. In addition to performance improvements, service life and availability were increased. As a result, the costs could be considerably reduced. Based on DSK's operating experience, corresponding standards are being revised in this context. For example, the technical requirements for drive drums are reformulated in DIN 22 256 "Sprockets and chain drums for chain conveyors and extraction plants".

Concluding consideration

The above-mentioned cross-cutting issues were openly presented to you and discussed jointly on 30 March 1999. During the interview you personally realized that your design does not currently meet DSK's technical requirements.

Considering all the above facts, we do not currently see any significant technical and economic advantages for your design. Likewise, a possible trial run without prior test bench runs would not be economically justifiable due to the imponderability.

Should you require further technical information as part of your development work, we will be happy to help you.

DEUTSCHE STEINKOHLE AG

(two illegible signatures)"

In October 1999 publication in the professional journal ''Glückauf''.

There was no reaction to this information sent to DSK.

In **October 1999** a report about the energy and cost reduction by means of self-adjusting chain sprocket was published in the technical journal "**Glückauf Forschungshefte 60 (1999) Nr. 3**", see under "Miscellaneous publications".

I informed Deutsche Steinkohle AG in Saarbrücken, in Herne and in Sulzbach on <u>21 November 1999 of the</u> fact that the **mining magazine Glückauf** had published this article in October 1999.

There was no answer!!

Deutsche Steinkohle AG also did not react when a case of operation at the Ensdorf power plant occurred in 2001.

After I was finally able to present a case of application in 2001, namely the installation in the Ensdorf power station, see Chapter

5, I sent the following fax to DSK on 23 June 2001, to the attention of Mr Bronder (as a reminder: Mr Bronder was the mining director at Deutsche Steinkohle AG, Saarbergwerke Hauptverwaltung in Saarbrücken)

"Telefax

To: DSK to Hd. Mr. Bronder

...

Subject: Chain sprocket

Were marked with a cross: For comment and information

Dear Mr Bronder,

The patented chain sprocket is installed in a portal scraper in the Ensdorf power plant, which is a significant success. I have attached an excerpt from the Saarbrücker Zeitung from the 16/17 June issue of Saarlouis.

Sound measurements showed a considerably lower sound power of approx. 8-12 dB, which can only be attributed to my newly developed and patented sprocket. These sound measurements could already be carried out in the first months of operation, which is only possible after some time in the case of a wear measurement.

At VSE's Ensdorf power station, the design and functional principle of the chain sprocket can be inspected on the portal scraper, enabling DSK to meet its promise in its letter of 11.01.1999.

Yours sincerely

Karl Herkenrath"

There was NO reaction to this fax either.

This makes it abundantly clear what interest a **company subsidized by** the state or the German taxpayer had and still has in cost savings.

If I read through the old writings again today in retrospect while writing this book, then I simply can no longer believe it.

DSK was **not concerned with clarifying technical problems**, but rather with the fact that a <u>company subsidized by the German</u> <u>taxpayer for decades every year to the tune of billions</u> was not prepared to have two models created, the **costs of** which would have amounted to a **maximum of DM 55,000**, which on the other hand would have resulted in a

annual savings of DM 9 million on chains

that would have made it happen.

(Annual expenditure for new chains: DM 30 million)

From me as a private person one expected that I should have these models manufactured at my expense, whereby of course still completely unclear was whether one would have used the patent at all after production of these models.

And when the patent was finally installed in a portal scraper in 2001, and I now had a reference and a prototype in operation, the DSK did not even react.

The BILLION GRAVE - The coal rip-off

On **21.11.2009 in the** "WeltN24 GmbH" under the heading "Economy" an interesting article was published about these subsidies with the name "MILLIARDENGRAB (BILLION GRAVE)" - Die ganze Wahrheit über die Steinkohle-Abzocke (the whole truth about the coal rip-off), by D.Schraven, D. Drepper, M.Klingemann:

I take the liberty of quoting this article in its entirety:

"For decades, taxpayers have been asked to pay for the preservation of the coal industry. And much stronger than necessary. This is because the profiteers themselves can determine the amount of the subsidies. These include well-known companies such as E.on, Hoesch, RWE and ThyssenKrupp.

The ambience was festive, the atmosphere was competitive at the German Coal Day at the beginning of November. A miner's choir on the stage of the Essen Philharmonic sang "Der Steiger kommt". A huge screen hung over the stage: "Globalisation needs security".

Trade unions, coal associations and mine operators demanded further billions for the last German mines - preferably for decades to come. Their main argument: In the event that no more coal comes from Australia to Germany, the domestic mines must be kept open. After the Bundestag elections, it is clear that the withdrawal from coal subsidies can hardly be shaken. The CDU/CSU and FDP have declared that they want to stick to the end of mining until 2018 in the forthcoming revision of the 2012 resolutions.

It would be the end of a decades-long watering can policy. According to estimates by the Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI), the German coal industry has received more than **140 billion euros in subsidies to date** - more than any other economic sector. The money was not only intended to secure the miners' jobs and the country's energy supply. Entire regions, the Ruhr area and the Saarland, should be protected from a crash in view of the economic structural change.

But according to research by "Welt am Sonntag", companies such as E.on, Hoesch, <u>RWE</u> and <u>ThyssenKrupp</u>, in short the shareholders of Ruhrkohle AG, have benefited most. Billions of subsidies ended up in their coffers via complicated settlement mechanisms. The state, i.e. ultimately the taxpayer, paid much more than was actually necessary under the agreements. There were few controls, even less transparency.

Especially since the founding of Ruhrkohle AG in November 1968, largescale subsidies have flowed into the mining industry. At that time, under pressure from the federal government, 25 mining companies, many of them owned by steel groups, merged to form a mammoth company called Ruhrkohle AG (later RAG).

The foundation was a quick birth. Within a few weeks, the company was set up to put an end to the great death of collieries in the district. Perhaps out of a hurry, a system was created that resembled a self-service shop.

Because the owners of RAG were at the same time the customers of the mine company. Her interest was not to achieve good coal prices for RAG - but to buy coal from her as cheaply as possible. RAG's losses were covered by the State.

The construction error was discovered early. RAG board member Hubert Grünewald, for example, noted in an internal note in February 1970 about the dilemma of his company: "Our contractual partners are predominantly our shareholders. The contracting parties have determined and agreed upon services with knowledge and understanding of the obligations transferred to Ruhrkohle AG which were obviously not performable at the time the contract was concluded". In other words, the owners knew that they were buying at dumping prices, relying on the willingness of the state to pay.

RAG's owner customers were particularly creative with regard to the supply contracts for blast furnace coke, which is needed for steel production. An example: between 1997 and 2005, they demanded discounts from the RAG coking plants Prosper and Kaiserstuhl in the Ruhr area. These benefits were calculated by the owner customers as follows: Coking plants should reduce coke prices by the proceeds from the sale of by-products such as tar or coke gas. The fact that this could lead to losses in the coking plants was accepted. As always, these losses should be compensated for by taxpayers through subsidies.

This seems difficult to understand, but coking plant directors report that prices have been depressed, especially for the sale of coke gas. Hoesch (now ThyssenKrupp Steel) is said to have demanded higher discounts, as if high-quality natural gas had been sold - although only the lower prices for coke gas were paid. Internally, the RAG reports on triple-digit million amounts that had to be borne by the state.

Another scam was the import of cheap coke for research purposes. In fact, the subsidy laws forced the groups to buy coke exclusively from RAG. Only for tests were small quantities of coke allowed to be imported from abroad. Unimpressed by this, however, the huts imported large quantities of cheap coke and simply indicated that they would use it for their research.

At the beginning of the 1990s, the RAG management was so angry about the loss of revenue "in the millions" that it considered bringing an action against its owners, according to coke oven directors: "We saw the trains with coke from Poland passing our window. They only refrained from filing complaints because "you can't sue your own mother," says a director who was involved in the discussions in the RAG. The losses for which the state had to answer would have been in the hundreds of millions. No precise figures can be provided due to the lack of data on import volumes. Another lever used to get the state to pay excessive subsidies was the price calculation for coal. The German steel companies and electricity giants should not suffer any disadvantage in international competition if they burn domestic coal, which is expensive to produce. RAG should therefore charge them only the price that the companies would have to pay for cheaper coal from abroad. This is the so-called third country coal price (DKP). The difference between production costs and DKP, i.e. RAG's losses, is then offset by the State.

The catch from the taxpayer's point of view: it is the steel and electricity companies themselves that provide the data on the basis of which the DKP is determined. The lower the foreign prices, however, the cheaper the companies get coal and coke in Germany. A control is hardly possible. The DKP is not simply the world market price, but a complicated theoretical price that is not comprehensible to outsiders.

But that was not enough for the customers. In the network of RAG's owner customers, a further system of price discounts was created that worked for years. For example, the Federal Audit Office reports that RAG customers regularly received discounts of between ten and 20 percent between 1998 and 2004. The reasons for the price reductions were difficult to understand, according to the internal report from 2005. For example, it was stated that coal was inferior or difficult to burn. According to the report of the Court of Auditors, the rebates alone caused subsidies to be around 1.5 billion euros higher than necessary during this seven-year period. Nevertheless, RAG's coal prices are still being depressed by these arguments to this day.

The Federal Office for Export Control (Bafa) is responsible for checking the data and arguments. It states that the information provided by RAG and its customers on coal prices is monitored on the basis of 'experience, cross-checks and investigations'. However, the competent department of the Authority has only seven staff for the control of hundreds of relevant operations. An expert from the Court of Auditors says: "There is no effective control. Nobody goes to the dumps and checks the quality of the coal." If RAG and the coal company's customers report quality deductions, this would be "accepted".

The review of the production costs, which are decisive for the subsidies, is also inadequate, criticise employees of the Court of Auditors. For example, Bafa has commissioned external experts to review the costs stated by RAG. However, these reports are not paid for by Bafa, but by RAG itself. The judges therefore pay their own judgments. There is hardly any public control. The reports are classified, like hundreds of other coal-related documents. Neither journalists nor politicians responsible for subsidy control can openly inspect original audit reports.

And so, according to the Court's report, RAG's production costs always rise as if by magic when the price of coal from third countries also rises - and they fall when prices abroad fall. In this way, does RAG ensure that the subsidies are used as fully as possible even in economically good years? In any case, the parallel development of costs and foreign prices prevents subsidies from being cut. On the review of prices by experts, a member of the Court of Audit says: "You can send hundreds of experts. They won't find anything. RAG has the figures and creates the facts." How are such processes possible at all? Reiner Priggen, a Green member of North Rhine-Westphalia's state parliament, has been trying for years to get clarity with limited success. He calls the RAG "a system of organized non-transparency" in which nobody has any real interest in clarification. A fundamental problem seems to be that RAG, for example, does not have an incentive to cut staff costs. Losses would be compensated anyway, explains an employee of the Federal Audit Office. So, the costs remain high, no matter what.

Manuel Frondel, energy expert at RWI, calls for a change in the system due to the opaque subsidy practice. "It would be so simple: RAG would have to receive a fixed amount and would then be interested in keeping its costs under control in order to make ends meet."

But such suggestions remain unheard. Politics is too closely interwoven with the coal industry. Dozens of federal, state and local politicians were or are active in different functions and at different hierarchical levels for the coal company. At the top, on the board of trustees of the RAG Foundation, is North Rhine-Westphalia's Minister President Jürgen Rüttgers (CDU) together with Michael Vassiliadis, Chairman of the Mining, Chemical and Energy Industries Union (IG BCE). The SPD is also represented: Joachim Poß, financial expert and deputy parliamentary leader of the Social Democrats in the Bundestag, sits on the supervisory board of the coal mining company RAG Deutsche Steinkohle.

In fact, the state has so far been very indulgent towards RAG. The coal company announces its need for subsidies, and the finance ministries of the federal government and the state of North Rhine-Westphalia then make the corresponding sums available in their budgets. RWI expert Frondel reports that in the past the state has often refrained from recovering overpaid subsidies from RAG. And this, even though it's about billions. Two years ago, the federal and state parliaments of Düsseldorf decided to invest up to another 21 billion euros in mining by 2018. Shortly afterwards, it was decided to split RAG into a "white" division called Evonik - with chemicals, energy and real estate business - and a "black" division. Since then only the black area with the collieries gets subsidies.

The assumptions used to calculate this sum ultimately come from RAG. A 2007 report by KPMG, an auditing firm, paid by RAG, stated that EUR 13 billion would have to be paid solely for withdrawing from coal mining. This involves costs for mining damage, pension obligations and tunnel protection.

The Federal Audit Office has criticized KPMG's statements. RAG's statements had not been critically examined. In addition, plausibility's or technical assessments had 'not been carried out in accordance with the order'. The Court of Auditors therefore urged renegotiations in autumn 2007. However, the auditors complained that the Federal Government had already agreed to assume the guarantee for damages whose "amount could not be estimated". This means that the state and taxpayers bear the risk of the consequential costs of mining and phasing out.

The former RAG owners, on the other hand, no longer have anything to do with it. Two years ago, ArcelorMittal, E.on, RWE and ThyssenKrupp Steel transferred their shares for one euro to the RAG Foundation, which is to handle the mining operations until 2018. In doing so, the companies have discharged themselves of their responsibility for consequential losses - although not their contractual advantages as customers.

RWE still gets coal from Ibbenbüren mine at a discount. Supposedly because his coal has low calorific values. E.on continues to purchase coke gas at prices agreed at a time when the energy group was still a co-owner of RAG. And the steel companies get the coke from the Prosper coking plant at conditions they would hardly have got on the free market.

Even the coal lobby hasn't given up yet. It is counting on continued support for the mining industry. At the beginning of November, at the Hard Coal Day in the Essen Philharmonic Hall, IG-BCE boss Vassiliadis called for new subsidies to be reviewed "ideology-free" during the revision of the phase-out decision planned for 2012. "

²⁾ Source: Welt24GmbH, 21.11.2009

After the self-adjusting chain sprocket in a portal scraper, built by Koch Transporttechnik from Wadgassen, was put into operation in April 2001 in the Ensdorf power station, I informed DSK of this on **23.6.2001**.

Although there was a clear case of use now, DSK didn't react with a single line, whereby one has to ask oneself again the question, which people are at the "top" in some companies and have the say there?

I will come back to the innovative engineer, Mr. Bertele from the Koch company, later.

At this point I would just like to mention that the company Koch Transporttechnik from Wadgassen was, so to speak, a "dwarf" compared to the Deutsche Steinkohle AG, and this company has used the self-adjusting chain sprocket in a portal scraper, without costly models, without a long test series, without a " naive miscal-culation" about model costs of DM 30.000,-- to 50.000,--. She made the two self-adjusting sprockets quite simply and installed them in the portal scraper - and they are still in use there in 2017.

As far as the planned use at Göttelborn mine is concerned, the company began mining coal in this mine in Saarland as early as 1887. It was always up to date and was one of the top pits of German mining in 1972.

As recently as 1990, 400 million marks were invested in a shaft about 1,200 metres deep. Above it stood a 90 metre high white winding tower, which was unique in the world at this height. Already 10 years later, on 1 September 2000, however, there was a shift in the shaft.

As a taxpayer you have to ask yourself, were 400 million marks only 10 years ago somehow justified?

A FURTHER "GUEST PLAY" WITH THE COMPANY ARNOLD & STOLZENBERG - a company of the Renold Group

Listen and marvel:

The well-known company RENOLD wanted (allegedly) to conclude a license agreement with me.

What does Wikipedia say about Renold:

"Renold plc. with its registered office in Wythenshawe, Manchester (UK) is the holding company of the Renold Group founded in 1879. The company was founded by Hans Renold from Aarau, Switzerland. Today, the company develops and manufactures drive and conveyor chains, gears, couplings and spindles and is active in 17 countries worldwide. Of the approximately 2,400 employees, 23.4 % are employed in Great Britain and 20.1 % in India and 14.9 % in the USA and 14.6 % in China and 14.4 % in Germany and 12.6 % in other countries. (as of 2014)

The German company Arnold & Stolzenberg GmbH has been the German branch of the group of companies since 1963 and is a 100% subsidiary of the Renold Group. In 2007, the German subsidiary was renamed Renold GmbH. At its location in Einbeck, Juliusmühle, more than 300 employees produce drive technology products, in particular high-performance roller chains.

In 2016, Renold acquired the tooth chain business of Aventics.

In October 1999 I contacted the company ARNOLD & STOLZENBERG in Einbeck. She showed interest in a license agreement for the "self-adjusting chain sprocket" and invited me to a meeting, which was to take place on 12.11.99 in the Einbek factory (Antriebstechnik Arnold & Stolzenberg) at 11.00 a.m..

This is how you gradually "cold" an inventor

When I read the following letter from 16.12.1999 while writing this book, I had to laugh about myself.



A few days before Christmas the company ARNOLD & STOLZENBERG wrote me the following letter. As you can read here, in the first three years they wanted to pay DM 1,600.00 a year in royalties, the 6%-unit license proposed by me from the 4th year onwards was too "lavish", they wanted to pay only 2% royalties in view of the difficult market.

The "special offer" came shortly before the "winter sale". As my current patent attorney informs me, license fees for sprockets in the range of 8 to 10% are common.

I was generously offered a "license to my own patent."

I can no longer believe it today, here people were not even ashamed to **offer** me a **license to my own patent** under certain conditions to be agreed, and this should **even be free for me, who would have thought that?**

"December 16, 1999.

"Self-adjusting chain sprocket" - License agreement

Dear Mr Herkenrath,

We would like to inform you of the following with regard to the license we are striving for:

- The licensee will be RENOLD PLC, Styal Road, Wythenshawe Manchester, M22 5 WL, England, therefore the license agreement must be concluded in English.
- We would like to acquire the worldwide and exclusive exploitation right for roller, bush, toothed and conveyor chains as well as other chains for the European patent 0 599 156 A1.
- The license fee of 1,600DM/year you have indicated for the first three years of our agreement can be included in the draft.
- From the 4th year of the agreement you think of a license fee of 6% of the turnover made with self-adjusting sprockets. In view of the difficult market in which we operate, we cannot agree with this approach. We're imagining a maximum of 2% here.
- In the event that we do not reach the minimum license fee (still to be agreed!) after the 4th year, you will receive a free nonexclusive license from us, which means that you can only grant sublicenses with restrictions (still to be agreed).

We would like to point out that all mentioned points are non-binding as long as there is no legally valid license agreement.

We kindly ask you to send us a draft contract for forwarding to the RENOLD lawyer.

Yours sincerely,

Arnold & Stolzenberg GmbH, -Signature, i.V. Dr. Erhard Vogt"

I will again have a license agreement for RENOLD drawn up at my expense.

I then wrote the following letter to my patent attorney Happe on 26 December 1999:

"December 26, 1999.

Dear Mr. Happe,

as I already told you, the company R U D - Kettenfabrik has rejected the license agreement.

The company Arnold & Stolzenberg expressed its interest in a license agreement for the "Self-adjusting chain sprocket" (see copy) in a letter dated 16 December 1999. I do not agree with some points of this offer and would like to ask you to change the license agreement. As a basis for the creation of a new license agreement with RENOLD and the necessary changes, I have taken the draft agreement to the company *R* U D.

1. Licensee

RENOLD PLC, Styal Road, Wythenshawe Manchester, M22 5 WL, England is the licensee.

I do not want to conclude the license agreement according to English law, but according to German law with a German place of jurisdiction.

2. §2 paragraph 2.1 This license is limited to the application areas of all types of link chains, roller chains, bush chains (round steel link chains are excluded). 3. §2 paragraph 2.3

The licensee undertakes to uphold European **and German** contract protection law.

4. §4 3.5

The Licensor will assist the Licensee with drawings for the first unwinding of the sprocket as well as for the setup of the test. The test arrangement must be documented in all phases by pictures and drawings with technical data. After completion of the test, the complete test results (as a copy) are to be transferred to the Licensor.

5. §4 4.1 no change.

6. I would like to keep all other points from the license agreement.

Yours sincerely"

My patent attorney then sent me a draft of the license agreement on December 30, 1999 (which, of course, was not free of charge for me, as Mr. Happe understandably had no heart for fun contracts).

On 3 January 2000 I wrote to ARNOLD & STOLZENBERG GmbH:

"January 3, 2000.

Dear Dr. Vogt,

I refer to your letter of 16.12.1999 and send you a draft of the intended license agreement.

As you will see from the draft, I have, as far as I have been able to, incorporated the information you have given into the draft Treaty.

Concerning the language regulation, I assume that it will be much easier for RENOLD to read a German text than it is for me to read an English text. I therefore ask for your understanding that I would like to conclude the contract in German.

As regards the amount of the license fee, I would point out that Section 4 (4.1, last sentence) of the draft agreement contains a provision which takes sufficient account of difficulties arising on the market.

I could only include the last point you raised in the draft treaty with a different wording, because it is not possible for me to be granted a license for my own patent. I refer to §4, point 4.4 (second and third paragraph) of the draft contract.

I have also limited the minimum license fee (see § 4 clause 4.4 second paragraph) to a lower value.

I ask you to submit this draft license agreement to the RENOLD attorneys for examination and to inform me as soon as possible of the necessary amendments which I will have registered by my patent attorney.

Yours sincerely"

In a letter dated 16 December 1999, ARNOLD & STOLZENBERG informed me, see above, that RENOLD in Manchester would become a licensee and asked for the contract to be drawn up.

After I had sent this draft contract - fortunately not according to English law, since it was too uncertain for me - now on 3 January 2000, SILENCE occurred.

A rogue who thinks evil!!

I contact RENOLD AUTOMOTIVE in Calais

So, I sent the following letter to RENOLD AUTOMOTIVE on May 12, 2000, in the following address F-62 102 Calais Cedex:

"May 12, 2000.

Patent: "Self-adjusting chain sprocket" / EP 0599 156 B1, EP 0 599 156 A1, DE 43 17 461 C2

Dear Mr. Christian Poeret,

Unfortunately, I write this letter in German, because I do not speak French. Although this patent is registered in France as a national patent, I ask for your indulgence.

I would like to present my patent "Self-adjusting chain sprocket", which you may already know from Dr. Vogt, an employee of ARNOLD & STOLZENBERG (a company of the RENOLD Group). At a representative meeting in England my patent was presented with a model as well as detailed explanations by Dr. Vogt and it was suggested to carry out a test with conveyor chains. After this I was asked to work out a license agreement, which I also submitted on 03.01.00 and which unfortunately has not been concluded until today.

This chain sprocket patent is not only suitable for conveyor chains, but also especially for timing chains, because the chain is firmly clamped on a chain sprocket. On the basis of my publications in well-known technical journals (see appendix) I presented my investigations as well as the FEM calculations with round link chains. The publication in the trade journal "Antriebstechnik", for example, was well received and I received over 80 enquiries almost all for timing chains, such as Daimler-Chrysler, Volkswagen, Stihl, Stey-Daimler-Puch, Storck, Troplast, etc. - as a positive response.

Brief description:

The chain is firmly clamped in the area of the sprocket, which is spanned by the chain, and cannot move on the sprocket.

If a tooth segment leaves this area by rotation, the balance of forces on the tooth segments is slightly altered. The initial balance is restored after the following tooth segment enters the intervention zone. This slight change in the forces depends on the number of teeth in mesh and is therefore many times smaller than with conventional sprockets. So even on chains with my patented sprocket, much lower dynamic forces are transmitted.

Yours sincerely"

Annex:

License Agreement: Patent Specification: EP 0599 156 B1, EP 0 599 156 A1, DE 43 1 461 C2; Certificate & Documents

Apart from my expenses nothing has happened

First I didn't hear anything again until a letter from the company Arnold & Stolzenberg, Einbek dated 18 August 2000 with the following content came:

"August 18, 2000.

SELF-ADJUSTING CHAIN SPROCKET - LICENSE AGREEMENT

Dear Mr Herkenrath,

I would like to confirm our telephone call earlier this week to the effect that neither the conveyor chain sectors in England and the USA nor the automotive sector in France see any possibility of exploiting your patent.

Therefore, the license agreement cannot be concluded.

So also, the "Episode ARNOLD & STOLZENBERG" ended according to the motto:

Nothing but expenses.

Deterrent measures taken by industry

The withdrawal took place immediately after the effects of the wear reduction had been realized.

In my view, this is something to be said about:

Every time one had understood with the manufacturers, how a wear reduction affects the sales of the chains - and that was and is the business of the chain manufacturers - one made "lightning fast" a retreat, not without having "driven" me partly before also still on not insignificant costs, as you could already read in the previous chapters (for example by the elaboration of license agreements etc.).

I think to myself today that should serve as a "deterrent" so that I would stop promoting my patent as soon as possible. It's logical: the more expenses a "small inventor" has and sees no success in marketing, the more likely he is to give up.

My various "shorter episodes" with some chain manufacturers:

I don't want to bore you, so I'll pick only one episode out of my long experience with several manufacturers:

Who can evade their own business?

On 10.2.1997 I wrote to the management / construction department of the company W.D. Huth GmbH & Co. KG in Gevelsberg my letter, which was often sent. After that nothing happened, if I remember correctly, but on 5.7.1999 I sent a fax to this company and sent my meanwhile published publication in the trade magazine "Antriebstechnik", issue June 99.

I'm supposed to run open doors.

Oh, they were apparently enthusiastic there and sent me on 12.8.1999 the following reply letter:

",,12.8.1999

Dear Mr Herkenrath,

You have sent us by fax on 16.7.1999 a message about wear reduction in conveyor systems - here: self-adjusting sprocket - in which we are interested.

We are a well-established manufacturer of chains and sprockets on the market, so with an improvement to this machine component you will **run open doors**, as long as this improvement is effectively achieved and the production of these sprockets remains cost effective.

The owner of our company is interested in having an in-depth conversation with you. Therefore we kindly ask you to call us under telephone no. to make contact with Mr. Huth.

Yours sincerely

W.D. Huth GmbH & Co. KG"

As expected, the "open doors" were quickly broken in, and the decision was changed again.

Since I was constantly on the road, I can no longer remember the details of how this thing went on today. I only find a note in my documents that a Mr Kroll cancelled on 28.8.2000.

The process was repeated from producer to producer:

As soon as it became clear to a manufacturer what this reduction in wear meant, they backed down!

Chapter 5

Finally a "bright head", the technical manager at Koch Fördertechnik, Mr Wolfgang Bertele was interested in my patent.

Use of the ''self-adjusting chain sprocket'' in a portal scraper of the Ensdorf power plant

After the article "Kostenreduzierung bei Förderanlagen durch selbstjustiendes Kettenrad" had appeared in the trade journal "Antriebstechnik 38 (1999) Nr. 6", Mr. Wolfgang Bertele (head of design) from Koch Transporttechnik in Wadgassen contacted me. This one had the following problem:

At the Ensdorf coal-fired power plant, a new crane system, a PORTALKRATZER, was to be built to feed the coal belts. Since the power plant is located in the immediate vicinity of a housing estate, the power plant was only granted a building permit if certain sound power levels were not exceeded.

Otherwise the portal scraper would have had to be built with a complete enclosure.

Mr. Bertele - a man of common sense and vision - did not take months and years to realize the advantages of my patent, but he "went quickly to action" and asked me to make designs for him, which I did. We agreed that Koch Transporttechnik should receive a licence for the installation of the "self-adjusting chain sprocket" in a test plant, the portal scraper in Ensdorf.

At this point I would like to mention that the company Koch Transporttechnik was not even specialized in the

construction of chain sprockets, but Mr. Bertele immediately recognized the sense and purpose of this self-adjusting chain sprocket. Thus, this self-adjusting chain sprocket was built in the machine factory in Saareguemines, France, which belonged to the Koch company, in such a way that it still functions perfectly in 2017.

On 6.10.2000 I sent him a license agreement, which was already confirmed and signed on 16.10.2000:

"License Agreement

Between Karl Herkenrath Halbergstraße 68 D-66121 Saarbrücken, Germany -hereinafter referred to as LICENSOR and the company Koch Transporttechnik GmbH Karl-Koch-Straße 1 D-66787 Wadgassen -hereinafter referred to as LICENSEE

The Licensor is the sole owner of a patent self-adjusting chain sprocket, which has arisen from a work invention and has been transferred to the Licensor by the employer Krupp. The European patent application 93 118 346.1 (publication number 0 599 156 A1) was filed on 12.11.1993 for this self-adjusting chain sprocket. The publication of the reference to the grant of the patent took place on 05.02.1997. According to the communication of the European Patent Office dated 10.12.1997, no opposition has been filed against the grant of the patent.

The European patent is valid for Germany, France and Italy. In these countries, the European patent has the same effect as a national patent.

The Licensee would like to use the patented "self-adjusting chain sprocket" in a test plant (portal scraper) in Saarland and receives a license to install it in this conveyor system. This license includes the design, manufacture, installation and operation of the patented "selfadjusting sprocket". For this purpose, the Licensee shall transfer the following amounts to the two accounts:

.

(patent fees of DM 2, 177.32 and license fees of DM 322.68).

This license agreement is only valid once the total amount of DM 2,500 has been transferred to the aforementioned accounts.

LICENSOR Karl Herkenrath

LICENSEE Company Koch

(signature)

(signature and stamp)"

Thus, the patent could now BE FINALLY IMPLIED.

At the company CONNEX in Switzerland precision clamping bushes and heavy clamping pins were ordered and I informed the company Koch about this on 20.11.2000.

The Koch company built two self-adjusting chain sprockets without any problems; these were installed in the new portal scraper for the Ensdorf power plant and the plant went into operation in April 2001.

Publication in the Saarbrücker Zeitung on 16/17 June 2001

"Odyssey of an inventor with long breath

Patented chain sprocket by Karl Herkenrath from Saarbücken runs at Ensdorf power station



We did it

Wolfgang Bertele (left) and the Saarbrücken inventor and mechanical engineer Karl Herkenrath in front of the newly developed drive sprocket on the portal scraper of the power plant in Ensdorf.

Ensdorf/Saarbrücken (1x). Karl Herkenrath still knows exactly when he had the brilliant idea for his cog sprocket. On 19 November 1992 he drew first drafts on a piece of paper. In Dillingen, he had seen the heavily worn chain link of a large conveyor belt: "You have to change that," thought the mechanical engineer.

The principle of his new gear system is simple and ingenious. Everyone knows the gear sprocket and chain of a bicycle, where conveyor belts work like in mining. With a conventional gear sprocket, the forces transmitted to the sprocket via the chain only act on the first teeth of the gear sprocket, the others remain relatively unloaded and serve only to guide the chain. Thanks to the "self-adjusting chain sprocket" from Herkenrath, the forces are evenly distributed to all teeth. As a result, the conveyor belt runs quieter and chain wear is drastically reduced. In addition, the gear sprocket can be serviced without dismantling, only the teeth have to be replaced.

In May 1993 the Saarbrücken inventor applied for a patent for his sprocket, in June 1995 he was granted the patent DE 43 17 461 C2 for his "self-adjusting sprocket". This was the beginning of the odyssey: "I talked to various chain companies and travelled from Hamburg to Munich," he says. Not that the companies didn't like his idea, on the contrary. But they were not interested in the invention that increases the durability of chains. "These companies generate 90 percent of their sales through the sale of chains and only ten percent through cog s," says Herkenrath. The inventor was not interested in a one-off payment from the companies that would then let the patent disappear into the drawer. His search was unsuccessful until 1997. He then turned to Saarberg subsidiary Saar TECH, which expressed interest. The cog sprocket was to be used in the Göttelborn mine, but the closure put a spoke in the sprocket. Negotiations with Saarberg's successor Deutsche Steinkohle AG (DSK) were more difficult. "DSK wanted me to have a model made first, which would have cost me between 30,000 and 50,000 marks. I didn't!" A letter to the state government at the time, which had a mediating effect on DSK, was also unsuccessful.

Herkenrath tried to draw attention to his cog sprocket through publications in trade journals, to find a licensee. **Even the DSK magazine "Glückauf" reports positively about the bike**. He received over 100 inquiries, but no company could manufacture the sprocket. Herkenrath wanted "to drop the patent in August 2000."

For five years he has been paying patent fees of several thousand marks a year without any visible profit. He had already rejected the patents for some European countries. "The philosophy of the big manufacturers is: patent holders bleed out until they can no longer hold the patent, then anyone can rebuild it," says Herkenrath.

October 2000 the rescue. Wolfgang Bertele from the Wadgasser company Koch had read about the sprocket and was interested in the invention in connection with the construction of a conveyor belt in the Ensdorf power station. "In two months, everything was over," recalls Herkenrath. The company took over the patent fees, made drawings and had the gear sprocket manufactured as a single piece. Everything at your own risk. Since 2001, the cog sprocket has been running at the Ensdorf power station and the results are impressive. "The plant actually runs much more quietly," says Herkenrath.

Publication in the journal Fördertechnik 9/2002:

"Low-noise, wear-reducing, cost-reducing

A new sprocket promises changes in conveyor technology

The Saarbrücken mechanical engineer Karl Herkenrath developed a special chain sprocket years ago that has many advantages: it is low-noise, wear-reducing and cost-reducing. But what use is the best invention if there is no possibility of using the advantages in practice? The new cog sprocket has been in operation at the Ensdorf power plant since 2001. With the desired success.



Satisfied faces on the portal scraper (from left to right): Karl Herkenrath, Michael Faschinka (Koch Transporttechnik GmbH) and Dr. Wilhelm Zerressen (VSE AG, Ensdorf power plant)

The power station in Ensdorf near Saarlouis is a coal-fired power station. In the past, man-operated loaders shoveled coal from stockpiles onto belt conveyors for further transport in order to coal the heating blocks. For economic reasons, however, the plant management decided to automate this part of the material transport as well, by investing in a new portal scraper and modernizing the conveyor systems. The contract for the realization was awarded to Koch Transporttechnik GmbH in Wadgassen. The Koch group of companies develops and implements solutions in industrial plant construction and in conveyor and processing technology. Further product areas are environmental, rolling mill and coking plant technology as well as production and industrial plant service.

- Low noise has highest priority

The coal storage area, where the portal scraper has to work around the clock, is only 800 meters away from a residential area. The requirements to reduce noise emissions are correspondingly strict. Dr. Wilhelm Zerressen, head of the production/special tasks department at Ensdorf power station, is responsible for this project: "At the specified immission points in the neighbourhood, the portal scraper must make only a negligible contribution to the permissible noise level, it must practically no longer be audible.

Such values are very difficult to realize with a "normal" scratch. This is why Wolfgang Bertele, Technical Manager Conveyor Technology at Koch, was looking for noise-reducing solutions, including the use of plastic. Then he learned in the trade press about the self-adjusting chain sprocket. This sprocket, invented by mechanical engineer Karl Herkenrath and patented in 1993, promised not only considerable noise reduction but also noticeably less wear on the chain and sprocket.



The Ensdorf power station is located in the immediate vicinity of a residential area

Happy to have found a good solution, the Koch company had two drive sprockets and two reversing sprockets manufactured at its own risk, according to Karl Herkenrath. The investment was worth it. The new sprockets have been in use at the portal scraper in Ensdorf since summer 2001. And although - apart from a test plant at Ketten Wulf, with which Karl Herkenrath concluded a license agreement - no practical experience was available, there have been no problems so far. On the contrary:

"The noise emission measurement prescribed by the licensing authority

after commissioning showed that the permissible assessment levels of the portal scraper at the immission points were at least 5 dB (A) lower. The noise level is therefore no longer perceptible," explains Dr. Zerressen.



The self-adjusting chain sprocket integrated in the portal scraper



Thanks to the self-adjusting sprockets, the noise level of the system is significantly below the preset values.

What is the secret of the new sprocket? With a conventional chain drive, only a few teeth of the chain sprocket carry the main part of the tensile forces. The other teeth in mesh mainly serve as chain guides. The consequences are high stresses and rapid wear. In dhf 6/99 on page 24, inventor Herkenrath described in detail how this works.

- All teeth wear evenly

With the self-adjusting sprocket, the forces are evenly absorbed by all teeth. As a result, the stresses on the chain and sprocket are significantly lower. This is made possible by the fact that the self-adjusting sprocket - unlike conventional sprockets - consists of individual elements, with each element representing a tooth. All teeth are movably arranged via bolts. There are recesses at both ends of a tooth element which, in conjunction with the adjacent elements, accommodate a Connex elastic round spring.

The tooth elements arranged in this way form a radially stable gear rim with flexible tooth elements which are able to carry out small tilting movements and pass these on to the neighboring teeth. If a force acts on any tooth, a torque is generated by the movable arrangement, which is transmitted via the round springs to all following teeth, i.e. also to the first loaded tooth element. In this way, all teeth are involved in the force distribution. The clever idea of movable tooth elements also has other positive aspects. The patented sprocket can compensate for inaccuracies in the chain and sprocket pitch due to wear, chain elongation and/or manufacturing tolerances. Inlet shocks are also cushioned by the round springs. In addition, if individual teeth of the new sprocket have to be replaced, the sprocket does not need to be dismantled and the chain can remain where it is. This saves costs.

Apropos costs: "Due to its design, my invention is naturally more expensive than a conventional sprocket" admits Karl Herkenrath to our question, "but overall the self-adjusting sprocket quickly pays for itself. Please bear in mind that the chain alone has a longer service life due to less wear. Savings also result from the fact that the teeth can easily be turned over with signs of wear. Until now you had to change the complete sprocket. "

- The long way to practical use

The inventor from Saarbrücken is glad that he finally has a reference that works well in every respect. "In the beginning, I traveled a lot across Germany and introduced the patented sprocket," he reports. "They thought it was a good idea. But they were not interested in a product that prolongs the life of chains, because 90 percent of these companies' turnover is generated with chains and only 10 percent with gear sprockets'".



Commissioning of the plant in April 2001
Karl Herkenrath should finally have made it with this practical application. The extent to which this new component will establish itself in conveyor technology is difficult to assess. Much will depend on how the self-adjusting sprocket at Ensdorf power station will prove its worth in the long term. The odds are good. [Dd] Picture credits: Herkenrath dhf editorial office Koch Transporttechnik GmbH

Expert opinion no. L 4687 on the existing noise emissions due to the operation of a portal scraper for the automation of the coaling process at the Ensdorf power plant

VSE Aktiengesellschaft in Saarbrücken had commissioned TÜV Süddeutschland to provide an expert opinion on noise emissions. This was made available to me and below I quote the most important passages for this patent:

"Expert Opinion

Item No. L 4687

via

the existing noise emissions from the operation of a portal scraper

for the automation of coal handling at the Ensdorf power plant

in 66806 Ensdorf/Saar

Client:

VSE Aktiengesellschaft, Heinrich-Böcking-Strasse 10-14 66111 Saarbrücken, Germany

Issued on: January 28, 2002

1. Task

The client operates a coal-fired power plant in Ensdorf/Saar. A portal scraper was installed on the coal store to automate the coaling of the power plant.

The operator has commissioned TÜV Süddeutschland Bau und Betrieb GmbH to determine the noise pollution caused by the operation of the portal scraper in accordance with the permit issued by the Saarland Ministry of the Environment on 10 September 2001. With regard to external noise pollution at the immission points, in particular from public road traffic, the noise emission of the new plant in the local area shall be measured in accordance with DIN 45635 Part 1 "Noise measurement on machines" or DIN EN ISO 3746 "Determination of sound power levels of noise sources from sound pressure measurements". The immission components of the portal scraper can then be calculated using a dispersion calculation according to DIN ISO 9613-2 "Attenuation of sound propagation outdoors".

4. Operating description

The portal scraper (stockpile scraper) was erected on the coal storage site in the north-eastern area of the power plant site in order to replace the previous coaling with the aid of sprocket loaders. The stockpile scraper serves for the automatic reloading of the stockpiles which have been stored by the existing space loader. It is a device that moves on rails and uses a scraper tree to remove the coal from the stockpile in layers. The material is removed with the aid of approx. 2 m wide, slow-running scraper blades, which are guided by a chain. The device dips into the stockpile with the blades and clears the coal via a transfer chute to the conveyor belt system. The coal is then fed to the coaling belt via the belt support. During the conveying cycle, the device is moved along the stockpile to be dismantled according to the preselectable conveying capacity.

When the running gear moves on the rails, an acoustic warning signal in the form of a bell sounds on the fixed side and on the pendulum side. When the portal scraper is started, a siren is activated for approx. 10 seconds on the fixed side and on the pendulum side. According to the operator's estimation, the scratch with the start signal can be started up to 2 times in the loudest night hour.

5. Immission points and guideline values according to TA-Lärm

The Technical Instructions for Protection against Noise (TA-Lärm) serve to protect the general public and the neighborhood from harmful environmental impacts caused by noise from installations requiring and not requiring a permit which are subject to the requirements of Part 2 of the Federal Immission Control Act (BImSchG). The immission guide values laid down in the TA-noise are regarded as a basically correct concretization of the concept of harmful environmental impact in the sense of the BImSchG.

The relevant immission locations for built-up areas are 0.5m outside the centre of the open window of the room most affected by the noise and worthy of protection according to DIN 4109. Using these measurement regulations, the noise immissions from the portal scraper were investigated in accordance with the approval notice of the Saarland Ministry of the Environment dated 10 September 2001 for the modification of the Ensdorf hard coal-fired power plant by the erection and operation of a new crane system for feeding the coaling conveyors (portal scraper) (Ref.: E/3-200-Qu-01.29) at the immission points listed in Table 1 (see site plan in Annex 1). In addition, this table lists the relevant guideline values according to TA-noise and the permissible guideline value proportions for the portal scraper at night.

Table 1:

Immission points, night reference values according to TA noise and permissible reference value proportions (partial immission level) for the portal scraper at night in db(A).

Place of immission	Night	Partial
	benchmark	immission level
		for the portal
		scraper

IP1 Ensdorf: Stöckerweg	45 dB(A)	33 dB(A)
IP2 Ensdorf: Provinzialstraße	45 dB(A)	34 dB(A)
IP3 Saarlouis: Saarstraße	45 dB(A)	33 dB(A)
IP4 Saarlous: An der Kapellenmühle	40 dB(A)	35 dB(A)
IP5 Saarlous: Im Obstgarten	40 dB(A)	28 dB(A)
	40 dB(A)	

The daytime extends from 6 a.m. to 10 p.m. and the nighttime from 10 p.m. to 6 a.m., with the loudest night hour being used for the assessment during nighttime. Short-term noise peaks shall not exceed the guide value by more than **30 dB(A) during the** day and by more than **20 dB(A) at** night.

According to point 1.1 of the above approval notice, the emission sources of the portal scraper shall not exceed the sound power levels specified in Table 2.

Table 2:

Permissible sound power levels for the portal scraper

Emission source	Sound power level
Chain drive	96.0 dB(A)
Lifting winch	96.5 dB(A)
Crawler track fixed side	94.9 dB(A)
Crawler track pendulum side	92.7 dB(A)
Chain run	93.4 dB(A)
Reversing station	89.0 dB(A)
Material feeding	93.0
	dB(
	A)

This results in a total permissible sound power level of **102.6 dB(A)** for the portal scraper.

In addition, the notice of approval shall specify the following with regard to the chain drive:

"The operation of the conveyor chain shall be limited to the minimum necessary.

In the operating conditions in which the scraper blades do not remove any coal from the stockpiles (freewheeling operation), the chain drive must be switched off. Excluded from no-load operation are the brief shortage of coal caused by the geometry of the stockpile and the raising and lowering of the scraper arm.

When lifting and lowering the scraper arm, the scraper chain shall be operated at the lowest possible speed."

6. Measurement of noise emissions

6.1Measuring instruments

The following measuring instruments were used for the measurements:

Device, type, manufacturer, serial number Precision sound level meter, Type 2231, Brüel & Kjaer, ... Maximum cycle module, type BZ 7102, ... Microphone, Type 4155, ... Frequency filter, type 1625, ... Acoustic Calibrator, Type 4234, ...

The sound level meter used has a valid calibration certificate. It meets the requirements of DIN IEC 804 and DIN IEC 651 for accuracy class 1.

6.2 Measuring time and weather

The emission measurements were carried out on Sunday, 20 January 2002. The weather was mostly dry at a temperature of +7°C and a relative humidity of 68%. The air pressure was 1020 mbar.

6.3 Carrying out the measurements

The aim of the measurements was to spectrally determine the noise emission of the new portal scraper in the various operating conditions at DIN 45635 Part 1 "Noise measurement on machines" and DIN EN ISO 3746 "Determination of sound power levels of noise sources from sound pressure measurements".

The sound power level (emission) is a measure of the energy emitted by a machine, which flows through a surface enveloping the machine per unit of time. According to DIN 45635 Part 1, the radiated sound power LWA can be calculated from the measuring surface sound pressure level LPs and the measuring surface S as follows:

 $LWA = LP + 10 IGZ (S / _{so}),$

Wherein S_0 represents the reference area of $1m^2$. The measurements were performed spectrally in the octaves from 63 Hz to 8 kHz. The immission components due to the operation of the plants can thus be determined by means of a dispersion calculation according to DIN ISO 9613-2 "Attenuation of sound propagation outdoors".

Before starting and at the end of the measurements, the sound level meter was calibrated with the help of the internal reference voltage and the entire measurement chain was additionally checked with the acoustic calibration.

6.4 Measurement results

The measurement results are documented in calculation appendices 6 and 7. The emissions of the aggregates are presented in Table 3.

Table 3:

Sound power LWA of the portal scraper under different operating conditions (value rounded in whole numbers)

Aggregate	Pendulum side	Fixed side
Idling	90 dB(A)	93 dB(A)
- without trolley	91 dB(A)	95 dB(A)
- with trolley		93 dB(A)
Running gear without chain drive	89 dB(A)	94 dB(A)
Load run warning signal (bell with	100 dB(A)	101 dB(A)
impulse surcharge KI)	103 dB(A)	105 dB(A)
Start signal (siren)		

The reloading speed during load operation was 300 tons of coal per hour. The emission value when moving the portal scraper without the chain drive was not measured on the pendulum side.

Thus, the following total sound power levels (values rounded to whole numbers) are obtained for the operation of the portal scraper:

in neutral without undercarriage:	LWA = 94 dB(A) without impulse surcharge KI
in neutral with undercarriage:	LWA = 96 dB(A) with a pulse
	surcharge KI of 8 dB(A)
in load run:	LWA = 95 dB(A) with a pulse
	surcharge KI of 9 dB(A)

The impulse surcharge KI as the difference between the energy equivalent continuous sound level LAFeq and the mean clock material level LAFTeq is caused by the acoustic warning signal (bell on the pendulum side and on the fixed side) when the portal scraper moves. When the portal scraper is switched on, 2 sirens with a total sound power of **107 db(A)** sound for about 10 seconds on the pendulum side and on the fixed side.

7. Determination of the additional load

The sound propagation was calculated on the basis of DIN ISO 9613-2, which shows the correlations between sound emission (sound power level) and sound immission in the area of influence of the plant (expressed by the sound pressure level). In order to calculate the meteorological correction C_{met} , a value of 1 dB was assumed for the parameter C_0 at night in accordance with the specifications of the State Office for Occupational Safety, Immission Control and Health of the Saarland (LAIG). For the built-up areas and for the water areas of the Saar in the calculation area a soil factor G of 0 and for the undeveloped areas a value of 1.0 was applied. According to TA-noise, the loudest night hour is used as the

assessment time for the night reference value. The calculation results for the **additional load** caused by the operation of the portal scraper

at the immission points are compiled in Table 4 (see calculation appendices).

For the calculation of the sound propagation, a relative humidity of 70% at a temperature of 10°C was assumed.

For the calculation of the noise pollution by the portal scraper in the loudest night hour it was assumed that the plant

- in 80% of the time in load run,
- in 10% of the time in idle without undercarriage,
- in 10% of the time is operated at idling speed with running gear and
- The start siren sounds twice.

In view of the pollution at the immission points by public road traffic, in particular from the A 620 federal motorway, an impulse and a sound surcharge for the use of the bells as a warning signal can be dispensed with.

Table 4:

Permissible reference value shares and assessment level for the portal scraper on the coal storage site of the Ensdorf power plant in the loudest night hour in db(A)

Noise source	Place of immission				
	IP1	IP2	IP3	IP4	IP5
at night (22.00 - 06.00)					
Admissible guide value percentage at night	33	34	33	35	28
	25	28	25	28	23
Portal scraper					
Short-term noise peak					
(start siren)	39	42	39	43	38

8. Summary and discussion

In this report, the existing noise immissions from the operation of the new portal scraper on the site of the Ensdorf power plant were investigated. The immission locations listed in Table 5 were taken into account accordingly in the permit issued by the Saarland Ministry of the Environment on 10 September 2001 (see site plan in Annex 1). In addition, this table shows the permissible reference value proportions for the portal scraper at night.

Table 5:

Immission points, night reference values according to TA noise and permissible reference value proportions (partial immission level) for the portal scraper at night in dB(A).

Place of immission	Night	Partial
	benchmark	immission level
		for the portal
		scraper
IP1 Ensdorf: Stöckerweg	45 dB(A)	33 dB(A)
IP2 Ensdorf: Provinzialstraße	45 dB(A)	34 dB(A)
IP3 Saarlouis: Saarstraße	45 dB(A)	33 dB(A)
IP4 Saarlous: An der Kapellenmühle	40 dB(A)	35 dB(A)
IP 5 Saarlous: Im Obstgarten	40 dB(A)	28 dB(A)
	40 dB(A)	

Due to the extraneous noise situation at the immission points, the noise of the portal scraper at close range was spectrally determined on the basis of DIN 45635 Part 1 and DIN ISO 3746. The immission components of the plant could then be calculated using a dispersion calculation according to DIN ISO 9613-2 "Damping of sound during outdoor dispersion".

For the operation of the portal scraper the following sound power levels resulted in the sum:

in neutral without undercarriage:	Lwa = 94 dB(A) without impulse
	surcharge KI
in neutral with undercarriage:	Lwa = 96 dB(A) with a pulse
	surcharge KI of 8 dB(A)
in load run:	Lwa = 95 dB(A) with a pulse
	surcharge KI of 9 dB(A)

The impulse surcharge KI as the difference between the energy equivalent continuous sound level LAFeq and the average clock maximum level LAFTeq is caused by the acoustic warning signal (bell on the pendulum side and on the fixed side) when the gantry crane is moving.

When the portal scraper is switched on, 2 sirens with a total sound power of **107 dB(A)** sound for about 10 seconds on the pendulum side and on the fixed side.

The results for the **additional load** caused by the portal scraper of the Ensdorf power plant in the loudest night hour at the IP 1 to IP 5 immission points are compiled in Table 6. The load caused by the portal scraper at night is thus at least **5 dB(A)** below the permissible guideline values.

Table 6:

Permissible reference value shares and assessment level for the portal scraper on the coal storage site of the Ensdorf power plant in the loudest night hour in dB(A)

Noise source	Place of immission				
	IP1	IP2	IP3	IP4	IP5
at night (22.00 - 06.00)					
Night reference value according to TA-noise	45	45	45	40	40
	33	34	33	35	28
Admissible guide value percentage					
at night	25	28	25	28	23
Portal scraper					
Short-term noise peak					
(start siren)	39	42	39	43	38

The short-term noise peak caused by the start siren during commissioning of the portal scraper exceeds the relevant night guide values by up to 3dB(A), whereby according to TA noise the guide value may be exceeded by up to 20db(A) at night for a short time.

No 3 dB(A) were subtracted in the formation of the rating levels. According to Clause 6.9 of the TA-noise, a rating level reduced by 3 dB(A) is used for comparison with the immission guide values for monitoring measurements.

Environment Service Environmental reports Noise and vibration protection STEMPLE TÜV signatures ..."

A list of installations, a site plan etc. follows.

Interesting are the following documents:

Approval notice for the modification of the coal-fired power plant Ensdorf by the erection and operation of a new crane system for feeding the coal belts (portal scrapers).

"Appendix 2 to Opinion No. L 4687

...address etc. ...

NOTICE OF PERMIT

according to § 16 Abs. 4 BlmSchG

for the modification of the hard coal-fired power plant Ensdorf by the construction and operation of a new crane system for feeding the coaling conveyors (portal scrapers)

CHAPTER I

DECISION

At the request of VSE **AG**, **Heinrich-Böcking-Straße 10-14**, **66111 Saarbrücken**, dated 28 March 2001, the following modification of the Ensdorf hard coal-fired power plant to 66806 Ensdorf, Ensdorf district, parcel 13, parcel 100/26 - 100/33 is **approved:**

Erection and operation of a new crane system for feeding the coal charging conveyors (portal scrapers)

Technical data of the portal scraper

Maximum conveying	600.000	kh/h
capacity:		
Driving speed:		
- in reload mode	0.5 to 410	m/min
- in the proceedings		m/min
Speed of the scraper	0.23 to 0.69	m/s
chain:		
Main hoist speed:	4,4	m/min
Creep hoist speed	1,2	m/min

³⁾ Source: Expert opinion TÜV Süddeutschland No. L 4687 dated 28.1.2002

PICTURES OF THE PORTAL SCRAPER 2001 and 2016

Below some pictures of the portal scraper with the chain from Ketten Wulf as well as the two self-adjusting sprockets (neither the chain nor the sprockets were changed until 2017 even once!)



Acceptance of production at the Sarreguemines plant from 14.02. to 16.02.2001



Trial operation of the scraper at the Ensdorf power plant on 19.04.2001



Commissioning of the scraper system with chain sprockets at the Ensdorf power plant



Photo shoot with the Saarbrücker Zeitung in May 2001

PHOTOS OF THE SELF-ADJUSTING CHAIN SPROCKET IN THE ENSDORF PLANT IN 2016 (after 15 years)



Below is a photo of the portal scraper from 2.9.2017:



Chapter 6

My very special INTENSIVE experiences with the company Ketten Wulf

"Attracted" by the planned use of the "self-adjusting chain sprocket" in the Ensdorf power station, the KETTEN WULF company appeared on the scene in 2001 and suddenly showed interest in the patent. Of course, I had already drawn the attention of Ketten Wulf, as well as all other well-known manufacturers of chains, to the patent in 1995, with my already repeatedly reproduced letter; the first letter to Ketten Wulf I had received was dated 18 April 1995.

In the following, I once took the trouble to write, fax, draw from the five folders filled to bursting, and later to have the Fraunhofer Institute carry out measuring experiments, etc. I have been working with the company Ketten Wulf since the time of the "cooperation" with the company Ketten Wulf, to select a part of the letters and to reproduce them here. As you read it, you will see the incredible effort I have put into answering the questions and problems concerning the chain sprocket, to make drawings, to go to meetings from Saarland to Sauerland (according to my memory there were at least 50 visits!).

Actually, I was the licensor and according to the license agreement, Ketten Wulf should have paid me a license fee of at least DM24,000.00 (twenty-four thousand DM) for the first two years according to the license agreement of April 17 and 21, 2002, and at least DM36,000.00 (thirty-six thousand DM) for each additional year as agreed.

License fees "fell into the water", for this I was commissioned to make drawings etc.

Instead of paying license fees, as is usually the case, my licensee "kept me busy" with the preparation of drawings, dimensional checks, etc. etc., etc.

Since I was still happy to have found a chain company that wanted to test the self-adjusting sprocket on a chain simulator, had signed a license agreement with me, I looked the other way and at that time I was still convinced that soon many orders for the self-adjusting sprocket would be handled by my licensee.

Has the self-adjusting chain sprocket been offered to any operator?

When I think about it today, I ask myself, has Ketten Wulf seriously offered the self-adjusting sprocket to even one operator?

As you can see from the publication in the trade journal "Konstruktion" Juli/August 7/8-2002, which is also published here, great expectations were placed on the "self-adjusting sprocket".

Quote from Mr. Hermann Wilke, technical and commercial manager at Ketten Wulf: "With the customer requirements for shorter maintenance intervals and a longer service life, this system naturally suits us very well as a sales argument".

Of course, longer service life means first and foremost the service life of the chain and only secondly that of the sprocket. In June 2001, Ketten Wulf began testing the patent; the first wear measurement on a conveyor chain was successfully completed in March 2003 and resulted in a wear reduction of at least 30 %.

In July / August 2002, on the occasion of the publication in the trade journal "Konstruktion" (Design), it was not necessarily possible to assume this probably undreamt-of wear reduction of at least 30 %.

In my subjective opinion, this publication would never have been made if this magnitude of wear reduction had been known.

The other chain manufacturers were a bit more "foresighted" and didn't even test the sprocket in the first place, at least not officially!

After the conclusion of this successful test "the interest in the sprocket obviously waned", as I can see from an old memo about the course of the Hannover Fair, where I was able to present the sprocket on the stand of Ketten Wulf.

In preparation for the fair, I had taken the trouble to create an elaborate presentation with PowerPoint, which Ketten Wulf only had to add.

Unfortunately, this presentation was not available at the fair!

From Licensor to "Minor Employee"

After I of course wanted to "see" some of my license fees at some point, I got a contract about the modification of the license agreement at the end of April 2004 in such a way that the sum of EUR 12,271.01 due on 1.6.2004, corresponding to DM 24,000.00, does not need to be

paid, because up to this point not a single sprocket was sold and further development time was necessary!

Instead I should receive from 10.6.2004 a monthly sum in the amount of EURO 345, --, one could also say for the sake of jokes a kind of "orphan's pension".

So, I had become a minor employee.

Today I can only laugh about my naivety and good nature at that time.

Now it started with the EURO 345, -- from 10.6.2004.

After I had written to the company Ketten Wulf on 10.5.2005, that after this long time I would not see any need for action for another test and I expected that Ketten Wulf would bring my "self-adjusting chain sprocket" now slowly finally on the road to **success**, the company Ketten Wulf wrote me on 26.8.2005, that they terminated the license agreement from 17.4.2002 to 31.8.2005, signed with me.

I got too expensive in the long run.

I assume that in the long run I simply "became too expensive" and that people no longer felt like making monthly payments to me, even if these probably came from the postage account. Below I have listed a number of letters, faxes and e-mails from that time as "samples".

My experiences from the beginning 1995

On 12.6.1995 I contacted Ketten Wulf for the second time with the following letter:

"Saarbrücken, the 12.6.1995

Ketten-Wulf Betriebs GmbH

Subject: Patent "Self-adjusting sprocket".

Dear management,

with the letter of 18.04.1995 I offered you my patent of the "selfadjusting chain sprocket".

The considerable costs and competitive advantages as well as the reduction of wear and tear had prompted me to offer your company this patent.

Should there be a strong interest in this patent, I am also prepared for further detailed explanations.

I hope, my construction of the "Self-adjusting Sprocket" finds your appreciated interest and a possible use in your company. I would very much welcome a statement from you in the near future.

Respectfully"

Today I have to smile at my words myself: "Should there be a strong interest in this patent"...

This letter is filed in my documents, I had handwritten: Mr. Wilke and a telephone number noted and the word "no" as well as the letter then crossed out.

"Attracted" by the case of operation in Ensdorf it starts 2001

The next document I find is a fax from 18.4.2001 with the following contents:

"Telefax

Receiver: Chains Wulf

• • •

Topic: Sprocket

Dear Mr. Allebrodt,

I hereby confirm the meeting date on Friday, 20.04.2001 at 10.00 a.m. at your premises.

In this meeting I will present my patented sprocket in detail. For this I have prepared a model and various projector foils, which I will then explain in detail.

I will also present photos of the plant that has now gone into operation.

Furthermore, I will hand over and explain the drawings for the new order Bauxilium to you.

I hereby request that the construction and project management be present at this presentation.

I would also like to ask you to give me the opportunity to talk to the management.

Yours sincerely"

On 1.6.2001 I sent the following fax:

"Telefax

Receiver: Chains Wulf

Topic: Sprocket

Dear Mr. Wilke,

Thursday 31.05.01 I went to a photo shoot of the Saarbrücker Zeitung on the portal scraper in the power station Ensdorf. This portal scraper is equipped with a scraper chain from Ketten Wulf and a new chain sprocket. At this plant, which has been in operation for several weeks, sound measurements were carried out and compared with similar devices. This measurement showed that the sound power was approx. 7-12 dB lower, which was also clearly noticeable on the system. This considerable noise reduction is mainly due to the use of the new sprocket.

Yours sincerely"

Maybe Ketten Wulf will make a license agreement with me if the trials are satisfactory.

By letter dated 6 June 2001 I received mail from Ketten Wulf:

.... chains Wulf

. . . .

License agreement Herkenrath – Ketten Wulf from 19.04.2001

Dear Mr Herkenrath,

Many thanks for the presentation of your patent documents and your personal chain sprocket presentation in our company. After a thorough examination of your license offer, we consider it sensible to test the mode of operation or the wear and noise behavior of your patented sprocket design in comparison to a standard design on our test bench in order to be able to substantiate well-founded sales arguments for the new project.

If these attempts turn out to be satisfactory, we are prepared to sign the license agreement you have made.

If you agree, the further procedure should be agreed with you.

Yours sincerely

..."

"June 18, 2001.

Dear Mr. Wilke,

I received your letter of 13 June 2001 and immediately started with the calculations and design drawings.

In the appendix I have attached the two design drawings as a pause (as best I could). On the floppy disk there are twice the files as (15-AZ-36-Template 0 - 15 -4Z-36-Template 01 in. gone) in the different versions of AutoCAD14. Which of the files you can load, you must try out. Otherwise, I refer to the breaks. Should you have any further questions, you can contact me at Krupp by telephone under the number

For the rest of the process I ask you to send me the production drawings with parts list before releasing them for production, so that I can check them before my vacation on 11.07.01.

I am looking forward to a successful and good cooperation with Ketten Wulf.

Yours sincerely"

Letter of 8 October 2001 to Ketten Wulf, Mr Wilke

"October 8, 2001.

Dear Mr. Wilke,

I have attached the new drawings as a pause.

I changed the upper hole on the tooth segment for the sealing rubber \emptyset 12mm to \emptyset 10 mm. For a better removal and installation of the gear segments I increased the inner diameter of the gear rim from \emptyset 300 mm to \emptyset 310 mm, as well as the inner diameter hub from \emptyset 280 mm to \emptyset 290 mm.

For this sprocket the same Connex AG springs are used, which are also in stock.

Yours sincerely"

LICENSE AGREEMENT of April 2002

The following is the license agreement between Ketten Wulf and myself dated 17.4. and 22.4.2002, respectively

License agreement

between

Mr

Karl H e r k e n r a t h Halbergerstraße 68 D-66 121 Saarbrücken, Germany

- hereinafter referred to as LICENSOR -

and

the companies

Ketten wulf GmbH Zum Hohenstein 15 D 59 889 Eslohe-Kückelheim

represented by its shareholders

Messrs Erich Wulf, Günter Wulf

- hereinafter referred to as LICENSEE -

Preamble:

The LICENSOR is entitled to dispose of an invention concerning a self-adjusting chain sprocket. The European patent application 93 118

346.1 (publication number 0 599 156 A1) was filed on 12.11.1993 for this self-adjusting chain sprocket. The publication of the reference to the grant of the patent took place on 05.02.1997. According to the communication of the European Patent Office dated 10.12.1997, no opposition has been filed against the grant of the patent.

The European patent is valid for Germany, France and Italy. In these countries, the European patent has the same effect as a national patent.

The filing of the European patent application was initiated by the employer of the licensor, the company PWH Anlagen + Systeme GmbH. The company Krupp Fördertechnik GmbH has entered into the rights and obligations of PWH Anlagen + Systeme GmbH and has released the invention to the licensor on the basis of the Act on Employee Inventions (§ 16 para. 1 ArbEG), whereby it has reserved a non-exclusive right (§ 16 para. ArbEG) to use the invention. The patent application was then transferred to the LICENSOR.

The LICENSEE is interested in obtaining a license for the aforementioned European patent and the national patents based thereon.

The following is therefore agreed:

§ 1

1.1 'Contractual property rights' means the European patent mentioned in the preamble and the national patents for Germany, France and Italy based on it.

1.2 "Subject of the Contract" means any self-adjusting chain sprocket which has at least one characteristic of the Contract Proprietary Rights.

1.3 "Contract territory" means all countries for which a contract protection right has been applied for or granted.

2.1 The LICENSOR shall grant the licensee an exclusive, nontransferable license to the contractual property rights for the contract territory. This license is limited to the applications of all types of link chains, roller chains, bush chains, toothed chains and conveyor chains. This license does not apply to round steel chains. The licensee is entitled to grant sublicenses.

2.2 The LICENSOR undertakes to uphold the contractual protection rights for the duration of this contract and to arrange for all necessary measures to be taken in good time.

2.3 The costs for the maintenance and defense of the contractual protection rights shall be borne by the licensee, namely the licensee shall transfer the invoice amounts to the account of the patent attorney after presentation of the invoices of the patent attorney representing the licensor in matters of the contractual protection rights in sufficient time so that the relevant payment and/or measure can be carried out in due time.

2.4 The LICENSEE shall also bear the costs incurred by the licensor in connection with this contract.

2.5 The LICENSEE is entitled to offset the costs pursuant to section2.3 against the license fees due in the calendar year in question (§4).

2.6 A copy of the relevant European patent specification (publication number EP 0 599 156 B1) is available to the LICENSEE.

§ 3

3.1 The LICENSOR assures that it is not aware of any prior rights of use of third parties and that no knowledge of third parties was used when the invention came into being.

3.2 In addition to the insurance in accordance with section 3.1, the LICENSOR does not assume any liability for the protectability of the subject matter of the contract or the legal validity of the contractual property rights and not for the fact that no third-party property rights are infringed by the manufacture and/or use of the subject matter of the contract.

3.3 The LICENSOR does not assume any liability for the performance of the subject matter of the contract; nor for the producibility in series, for the marketability of the subject matter of the contract or for the fact that no comparable competing products are available. In particular, the LICENSOR assumes no liability for the fact that the subject matter of the contract is approved by authorities, investigation offices, technical inspection associations and similar institutions which have to decide on the usability. However, the LICENSOR will assist the LICENSEE in its efforts to obtain such an operating license, if required.

3.4 Should producer liability claims against the licensor arise from the exploitation of the subject matter of the contract which have their cause in the system of the subject matter of the contract, the licensee shall indemnify the licensor against such claims.

3.5 The LICENSOR shall support the licensee in an advisory capacity during the development and the first orders as well as during the production of one or more sprockets and provide the necessary drawings. If the sprocket is installed in a test facility, all phases must be documented by pictures or drawings with technical data. After completion of the test, the complete test results are to be handed over to the LICENSOR.

§ 4

4.1 In return for the granting of the license, the licensee shall pay the licensor a license fee amounting to 6% of the net sales proceeds for each object of the contract sold or for each individual part of the object of the contract sold, plus the applicable statutory value-added tax. If it is necessary to make special discounts in order to obtain orders, LICENSEE and LICENSOR may agree on a lower license fee in advance in special cases.

4.2 Net sales proceeds shall be understood as the gross invoice amount invoiced by LICENSEE to its customers, less the costs for freight, packaging and insurance contained therein, insofar as they are shown separately in the invoice, and excluding the statutory turnover tax invoiced to the customer. 4.3 For the purposes of the license fee pursuant to Clause 4.1, it shall be irrelevant whether the Contract Objects and/or their individual parts have been sold by the licensee or by one of its sub-licensees.

4.4 The LICENCE fee shall be invoiced semi-annually and shall be submitted no later than 15 days after the end of a calendar year. A list of the contract items sold shall be attached to the statement of account. The license fee shall be paid at the same time as the invoice is submitted.

4.5 Default occurs one month after the due date for payment of the LICENCE fee specified in Section 4.4. License fees paid in arrears shall bear interest at the discount rate of the Deutsche Bundesbank plus 1% on the due date.

§ 5

5.1 The LICENSEE is obliged to keep separate accounts for the delivery of contractual items, stating the delivery dates, the number and the customers.

5.2 The LICENSOR is entitled to have the aforementioned books and related documents audited by an authorized auditor at any time but not more than once per calendar year - at its own expense. The costs of the examination shall be reimbursed to the licensee if the result of the examination differs by at least 3% from the license statements since the last examination.

§ 6

6.1 This Agreement shall enter into force on 1.6.2002. It ends, without a termination being required, with the last expiring contract protection law.

6.2 Each party to the contract shall have the right to terminate the contract prematurely with immediate effect if the other party to the contract breaches the contract by failing to fulfil an obligation it has assumed and fails to remedy the breach within two months of the written warning by the other party to the contract. The right to assert claims for damages shall not be excluded by the termination.

6.3 The LICENSOR is entitled to an extraordinary right of termination in the event that the license fee paid for the first two contract years does not total at least DM 24,000.00 (twenty-four thousand DM) and for each subsequent year thereafter does not amount to at least DM 36,000.00 (thirty-six thousand DM). Notice of termination may be given three months before the end of the third contractual year.

6.4 In the event of termination of this contract before the expiry of the contractual property rights, the licensee may, unless distribution is prohibited by law or court order, place already manufactured contractual objects on the market for a period of six months after payment of the license fee. However, further manufacture of contractual items is not permitted.

§ 7

7.1 The place of performance for all obligations arising from this contract shall be the place of residence of the LICENSOR. The LICENSOR will inform the licensee immediately of any change in his current place of residence.

7.2 All disputes arising from the conclusion of the execution and termination of the contract shall be governed exclusively by German law. The Saarbrücken Regional Court has exclusive jurisdiction to decide on such disputes in the first instance.

§ 8

Should individual provisions of this contract be or become invalid, this shall not affect the validity of the remainder of the contract; the parties to the contract undertake to replace the invalid provision with a valid provision that comes as close as possible to the economic purpose of the invalid provision. Should the purpose of the contract not be achievable with effective regulations, each contracting party may terminate the contract without notice.

Saarbrücken, 21.4.2002 (Signature Karl Herkenrath) Eslohe-Kückelheim, 17.04.2002 (Stamp and signature Ketten-Wulf Betriebs GmbH

Letter Patent Attorney Dipl.-Ing. Otto Happe, Essen dated 24.4.2002

"Ketten-Wulf Betriebs GmbH' E. und G. Wu I f Zum Hohenstein 15

59 889 Eslohe-Kückelheim

April 24th, 2002

License agreement with Mr. Karl Herkenrath

Dear Mr. Wulf,

Please allow me to introduce myself to you as patent attorney of Mr. Karl Herkenrath, whom I have advised and represented for many years in all matters of intellectual property rights and for whom I am also active in matters of the abovementioned license agreement and in matters of contract protection rights.

Mr Herkenrath has given me a copy of the signed contract for forwarding to you. The copy of the contract is attached.

With reference to § 2, clause 2.4 of the contract, I take the liberty to attach my invoice.

The next annual fees - for the 10th patent year - for the patents (in Germany, France and Italy) will be due in November 2002. I will remind you of the due date of these annual fees in September of this year (cf. § 2, clause 2.3 of the license agreement) and will then also send you my invoices for the relevant fees.

Yours sincerely

(signature)

Patent Attorney"

According to Ketten Wulf, they had allegedly started to offer my sprocket on the market.

If one can believe the following publication, Ketten Wulf started to offer the new system on the market in 2002. I don't know how that applies, but read the article for yourself:

Publication in the trade journal: Konstruktion Juli/August 7/8-2002, published by Springer-Verlag VDI-Verlag GmbH & Co. KG, Düsseldorf 2002

Chain drives: low-noise and long service life

Chains and sprockets in conveyor systems are subject to constant wear, which not only necessitates the regular replacement of the chain and sprocket, but also causes additional costs. Another weak point of chain drives is the sometimes high noise level. Both problems can be considerably reduced by the "self-adjusting chain sprocket".



Figure 1: Self-adjusting sprocket in the test field: The individual tooth segments of the sprocket are clearly visible.
Chains and sprockets, which are exposed to the harshest conditions in many applications, must be checked regularly for their condition. Due to wear, frequent changing of chains in particular, but also of sprockets, is necessary. This results in high costs for the operator of the machine or plant. Once the chain and sprocket wear has reached a critical level, the process is accelerated. In the end, it even grows exponentially. The wear is mainly caused by:

the power transmission from the sprocket to the chain,

- Longitudinal forces on the chain and the resulting joint wear, which in turn prevents the chain and sprocket teeth from meshing exactly,
- Uneven pitch tolerances due to production inaccuracies,
- Chain running-in impacts (polygon effects, impact acceleration).

The largest source of wear is naturally in the contact area between chain and drive sprocket. In a conventional chain drive, only a few teeth of the chain sprocket carry the main part of the tensile forces. The other teeth in mesh serve more or less only to guide the chain. This circumstance leads to particularly high stresses and rapid wear.

This is exactly where the patented "self-adjusting chain sprocket" differs. In this innovative development, which has good chances of asserting itself on the market, the forces are evenly absorbed by the teeth. This results in considerably more favorable stress conditions for the chain and sprocket. The principle of the self-adjusting sprocket: Unlike the conventional sprocket, which is made "from one piece", the self-adjusting sprocket consists of many individual segments or elements, each element representing a tooth. Each tooth element is rotatably mounted by means of a pin. Both ends of the tooth element are provided with recesses, each of which holds an elastic round spring in connection with the adjacent element.

The tooth elements arranged in this way form a radially stable gear rim with inherently stable tooth elements which are able to carry out "tilting movements" and transmit these to the adjacent teeth. If a force acts on any tooth, the movable arrangement creates a torque on the tooth element, which is transmitted via the springs to each following tooth up to the first loaded tooth element again. This is the principle of an "endless scale" in which all tooth elements are involved in the force transmission.



Due to the mobility of the toothed elements, the sprocket can adjust to the conditions of the chain, so to speak. For example, inaccuracies in the pitch of chain and sprocket - whether caused by wear, chain elongation or manufacturing inaccuracies - can be compensated. The movable segments of the sprocket adapt to the conditions and the forces are evenly distributed to all teeth. In addition, shocks (e.g. inlet shocks) are cushioned by the springs. These factors result in a considerably reduced wear overall. Higher speeds can also be achieved with the chain unchanged.

This self-adjusting sprocket system can be used to drive all types of plate link chains as well as round link chains. Sprockets with link chains are in operation on a test stand at Ketten Wulf, Fig. 1, and a conveyor system in the Ensdorf power station. Figures 2 and 4 show a calculation of the chain sprocket for a round link chain. Figure 4 shows the comparison of rigid and articulated sprockets with a wear-induced pitch increase of 2%. It can be seen that the self-adjusting sprocket has considerably lower peak loads.



According to Karl Herkenrath, the inventor and patent holder of the self-adjusting sprocket, the only known disadvantage of the sprocket so far is the fact that it is more expensive than a conventional sprocket due to its design. However, cost savings result from the fact that individual defective teeth can also be replaced if necessary. This can be done without dismantling the sprocket and the chain can remain engaged.

The first practical application of the self-adjusting chain sprocket has been carried out since the beginning of 2000 (**note: this must mean 2001**) at a conveyor system in the Ensdorf power station, which was manufactured by Koch Transporttechnik. Strict official requirements regarding the maximum permitted sound power had to be met for this application, as residents were not allowed to be disturbed. The TÜV measurements carried out showed that the permissible limit values were clearly undercut (by 8 dB). With a conventional chain drive, this would not have been possible or only with considerable additional sound-absorbing measures. The chain conveyor system at the Ensdorf power plant has been in trouble-free operation for over a year now.



For the company Ketten Wulf in Eslohe-Kückelheim in the Sauerland region of Germany, one of the large German manufacturers of chains and chain drives, the expectations of reduced noise generation and lower wear due to the new sprocket were also promising. So, they decided to cooperate with the inventor and patent holder Karl Herkenrath and have now started to offer the new system on the market. The aim is to significantly increase the efficiency of the chain/sprocket system. Hermann Wilke, technical and commercial manager at Ketten Wulf: "With the customer requirements for shorter maintenance intervals and a longer service life, this system naturally suits us very well as a sales argument". 80 percent of Wulf's customers are plant manufacturers who are increasingly demanding maintenance-free plants. The machine and plant manufacturer have to adjust to this if he wants to stay in business.

At Ketten Wulf, tests with the self-adjusting chain sprocket have been running on an in-house test stand for about three quarters of a year. Hermann Wilke: "It looks as if our expectations are being fulfilled: On the one hand we observe a noise level reduced by about 50%, on the other hand the wear has visibly decreased compared to the conventional drive sprocket. "Although exact quantitative statements are still premature due to the high testing effort and the long test duration, Wilke is nevertheless convinced that the system will be very well received by the customer.



For Wilke, the argument that a chain manufacturer could evade its own business with extremely low-wear chain systems does not count: "In general, this is a product that the market wants. Today, customers are won through quality thinking and this also includes a long service life. We are problem solvers for our customers; if you think like that, you get more business and more tasks." Due to the cost structures for German companies, Wilke sees hardly any opportunities in the market for standard chains today anyway. "The mass business with chains is done abroad. We live on technical advice. 95% of our sales are special chains, i.e. customer-specific designs."



Fig. 5: Example of a wear measurement:

A test with the self-adjusting chain sprocket (lower curve) shows a significantly lower strand elongation than with the conventional chain sprocket.

Wilke sees important technical trends in chains primarily in the extension of service life and secondly in maintenance-free conveyor chains. In the latter case, the aim is to reduce the customer's services and eliminate environmental pollution caused by the loss lubrication that is still common. This is a growing market for companies with the appropriate know-how. The company Ketten Wulf also sees itself as an international technological leader in this field.

Of course, the company also places high expectations on the market success of the self-adjusting chain sprocket. Whether and to what extent self-adjusting sprockets will ultimately prevail in practice is probably difficult to predict. For the operators of conveyor systems, however, the advantages are obvious. For example, with the same service life of the chain/chain sprocket system, simpler and more costeffective chains could be used. Reduced spare parts and maintenance costs are just as important arguments today as the quieter running of chain drives. H.H.

Experiences of an inventor

The inventor of the self-adjusting chain sprocket is Karl Herkenrath, who came up with the idea in 1992 in his capacity as a design engineer at Krupp Fördertechnik, St. Ingbert. The patent was initially applied for by Krupp Fördertechnik, but since the company does not manufacture chain sprockets, the patent was released for Karl Herkenrath. Since 1995 Herkenrath tried to find a manufacturing company that would market the system accordingly. Herkenrath: "I travelled from Hamburg to Munich and tried to familiarize chain manufacturers with the system. I did receive some offers, but no company had any real interest in building the system and signing a license agreement with me."

Also, many chain manufacturers did not seem interested in reducing chain wear. After all, they generate up to 90% of their turnover with chains, a much smaller proportion with sprockets; the spare parts business with worn chains should not suffer.

Of course, Herkenrath did not want his patent to end up in the drawer of a large manufacturer. Nevertheless, in the year 2000 he was almost so far resigned that the patent had to be dropped. For years he has been paying the patent fees of several thousand DM per year without any visible success. If he had given up, every chain manufacturer could have copied his invention.



Karl Herkenrath, the inventor of the self-adjusting chain sprocket, was not discouraged and believed in its development.

But in October 2000 a glimmer of hope came. Koch Transporttechnik GmbH was interested in the chain sprocket in connection with the construction of a conveyor belt in the Ensdorf power station. Koch took over the patent fees and had the chain sprocket manufactured as a unique piece. Until today the drive runs there without any problems.

With the company Ketten Wulf a further serious interested party appeared shortly after on the plan. The Sauerland-based company signed a license agreement with Karl Herkenrath and is now ready to market the system.

Karl Herkenrath sees the reason for his difficulties in risk aversion and excessive bureaucratization in German companies. In his opinion, innovations are most likely to be possible in owner-managed companies where the owner can sometimes take a risk and think longterm.

HH"

On 3.9.2002 I received the following e-mail from Mr. Stiesberg concerning subscription approval:

""3.9.2002

Dear Mr Herkenrath,

Our purchasing department has just asked me to approve drawings 7.001.0627 and 7.003.1342 from Connex.

Since you are much deeper in this matter, I would ask you to relieve me of this task and to check the drawings for your concerns.

For your information I also enclose the corresponding graduated prices of the required Connex clamping bushings.

In order for this system to become marketable, in my opinion one should do without these "pharmacist prices" and change the system accordingly.

Yours sincerely"

Pharmacist prices for clamping bushes

A fax from CONNEX to Ketten Wulf dated 30.8.2002 states the following:

"Sender: CONNEX AG, Switzerland

Recipient: Wulf & Sohn GmbH & Co KG in Eslohe

Your Order No. E 68128070 dated 29.08.2002Our Offer No. 12647

Ladies and Gentlemen,

thank you for your order.

We kindly ask you to check whether we can carry out these on the basis of the following specifications and graduated prices. Please release our drawing if you place an order:

CONNEX precision clamping bushes type E, Form3 spec.

Spring steel 50CrV4, DIN 1.8159E 60x50x45 mm F3 spec.

1)	5 - 10 pcs.	45.15 Euro/piece net
	11 - 49 pcs.	33.85 Euro/ pcs. net
	50 - 99 pcs.	19.20 Euro / pcs. net
	from 100 pcs.	11.30 Euro / pcs. net

CONNEX heavy dowel pins type S special spring steel 50CrV4, DIN 1.8159S 50 x 45 mm special, drawing

2)	5 - 10 pcs.	52.85 Euro/piece net
	11 - 49 pcs.	39.65 Euro/piece net
	50 - 99 pcs.	22.45 Euro/piece net
	from 100 pcs.	13.20 Euro/piece net
		100

.

While reading this old e-mail I took a closer look at the "pharmacist prices" and the above-mentioned fax of the company Connex, whereby one must say first of all, the special features of the selfadjusting chain sprocket lie precisely in the fact that the teeth can move freely. In order to increase the service life of the teeth even further, these two parts, namely the clamping bush and the heavy dowel pin, are required.

And secondly, if you really want to sell sprockets, you probably expect to order quantities in excess of 100. Then I guess no one will go and order nine.

On 5.9.2002 I sent Mr Wilke at the company Ketten Wulf the following fax:

"FAX

An: Ketten Wulf

• • •

Subject: Chain sprocket

The box was marked with a cross: Urgent

Dear Mr. Wilke,

I have attached the draft of the article about the visit of Mr. Degenhard von trade journal "dhf" to the Ensdorf power station.

I would like to ask you to critically review and release or correct the elaboration as quickly as possible.

Please fax the reply with your approval note. No. ...

Yours sincerely

Karl Herkenrath

This fax: contains the handwritten note:

Approved with the correction on page 5

"Signature: ppa. Wilke" and came by fax on 6.9.2002

I sent two identical faxes to Dr. Zerressen of VSE and Mr. Bertele of Koch Transporttechnik GmbH.

Letter of 31 December 2002 to Ketten Wulf concerning BAUXILIUM

"December 31, 2002.

Dear Mr. Wilke,

as agreed by telephone, I have attached to you the description of the necessary changes to the BAUXILIUM order with explanation and sketch.

In order to be successful in the new year, health is of paramount importance, and I wish you every success.

During my lecture at your company I explained that there are two different systems of sprockets.

1. Odd number of teeth

If turning momentum is applied to any tooth of that system, turning momentum is transferred to all teeth of sprocket (neglecting friction). Here the first and the last tooth of the chain sprocket move against each other. It is therefore essential that there are tension pins between the movable springs to compensate and adjust the chain on the chain sprocket and to reduce wear.

2. Even number of teeth

If a torque is applied to any tooth on this system, all teeth of the sprocket will be loaded with the same torque (neglecting friction). The difference here is that the first and last tooth of the sprocket moves in the same direction. So, you can freely move the teeth (with rigid bolts) by hand.

2.1 Sprocket for Bauxilium application

An FEM calculation was carried out for this order; this can only be a static calculation of the stresses and not a dynamic one. This FEM calculation has shown that the chain sprocket can be divided into three stress ranges (see sketch).

2.1.1 Movable spring range

If tooth 1 (in pos. 1) is loaded (see also rotary field direction), this tooth can take spring travel from the springs of teeth 1, 8 and 7 and thus tilt around the bolt of tooth 1. This in turn has the consequence that tooth 2 can tilt in the opposite direction (see also direction of the rotary arrow), which leads to the roller lifting off by approx. 10 mm (in pos. 2) at 45°.

2.1.2 Transition area

The further rotation of the sprocket meshes with tooth 8, which ensures that the directions of rotation are reversed. Thus, the lifting of the roll of approx. 10 mm (in pos.3) was abruptly cancelled.

2.1.3 Chain tightly clamped

Due to the moment load on tooth 4, tooth 5 is moved in the opposite direction and thus all teeth are aligned and held by the chain via the equilibrium of forces and moments.

2.2 Correction

The inserted springs have been replaced by a fixed bolt, so tooth 1 can no longer take any spring travel to turn tooth 2. This measure no longer raised the role. Thus, the sudden load on the chain sprocket was no longer present.

2.3 Resume

These operational results also show that the even-toothed sprocket adapts and adjusts better to the conditions of the chain and sprocket. It is therefore necessary that sprockets with an even number of teeth are not equipped with springs, but with rigid pins. Which system, whether with even or odd number of teeth, adjusts better to the chain load and thus has less wear, can only be answered under operational conditions (under dynamic loads).

Yours sincerely"

Comments on the investigation report of 20.3.2003, which is subject to the "small coin

Ketten Wulf tested the patent on a chain load simulator. There is an **investigation report on** this from **20.3.2003**.

This was on my homepage for a longer time regarding the current patent EP 2594824, but had to be removed there, because it is subject to the so-called "small coin".

The so-called "small coin" is located, so to speak, at the "lowest border" of a work that is still protected by copyright. Above all, the photographs produced by Ketten Wulf in this investigation report are protected by copyright.

During this investigation on a chain simulator a conventional chain sprocket was compared with my "self-adjusting chain sprocket" and with all pictures of this investigation report one sees that the chain sprocket developed by me shows substantially less wear.

Since the investigation report cannot therefore be photocopied, I shall quote a few passages from it below:

It was about the wear behavior of two identical strands on two different sprockets, namely a Ketten Wulf sprocket and my self-adjusting sprocket. The investigation report ends with the words:

"Result:

As can be seen from the evaluations and the diagram, all test samples on the sprocket, Herkenrath show a lower wear compared to the Wulf chain sprocket. Furthermore, it can be seen from the tests that the Herkenrath chain sprocket has a particularly positive effect on increased wear.

Kückelheim, the 06.02.03 C. Kaiser

PLAYING ON THE HANNOVER MESSE from 7. to 8.4.2003 together with Ketten Wulf

Letter from Ketten Wulf dated 11.03.03:

"Hermann Wilke 11.03.03

Karl Herkenrath

Halbergstr. 68

66121 Saarbrücken

Dear Mr Herkenrath,

Please find attached your day ticket for the visit of our booth (hall 25, booth B32). Your accommodation from 7th to 8th is taken care of: The address of your accommodation is:

Pension Ruhnau

Klingerplatz 8

30655 Hannover

Phone and fax:...

We are looking forward to your visit!

Yours sincerely

Hermann Wilke



At the Hannover Fair on 7.4.2003 at the booth of Ketten Wulf.

In my documents I find a DIN A4 page with comments on the discussion at the Hannover Messe, which I reproduce below as follows:

Meetings at the Hannover Fair

Firm	Presentation of the patent	Meeting with	Remark	
Iwis ketten Joh. Winklhofer Albert-	Letter of 06.05.97	Mr Joh. Winklhofer Mr Thomas	Letter Meeting from	
Roßhaupter	Meeting on	Fink	10-11	
Straße 53	03.08.99	Mr Johann	a.m.	
D-81369		Mendle		
Munich,		Construction	Written	
Germany		Dr. Enrmann	cancellation on 04.09.00	
RENOLD	Discussion on	Dr. Vogt		
Arnold &	12.11.99Draft	Construktion	Written	
Stolzenberg	contract	Mr. Luthke	cancellation on	
D-37577 Einbek	011 50.12.99		10.00.00	
CONNEX	Dowel pins	Mr. Lütolf		
Industriestraße	-	Mr. Bucher		
CH-6260				
RUD-	Meeting on	Mr Rieger	Written	
KETTENFABRIK	24.07.95	Mr Dallferth	cancellation on	
D-73/32 Aalon-		wir Bogdann	11.12.95	
Unterkochen				
Hippenstiel		Mr Kurthen		
HEKO Ketten		Mr. Bertz		
GmbH				
Eisenbahnstr.2				
D-587739				
Wickede/Ruhr				
DEUTSCHE	Mr. Werner	PEWAG		
PEVVAG	Brach	wir Kosegger		
D-03094 Rad Hannaf				
Dau HUIIIEI				

"E-mail to Karl Herkenrath from 10.9.2003:

• • •

Subject: Sprocket construction

Dear Mr Herkenrath,

a customer from the bulk goods industry shows interest in your sprocket design. He wants to replace a sprocket according to your design with a conventional one.

Therefore, all functional dimensions, including the gentle pitch, must be taken over according to the enclosed drawing R-4073.

For the preparation of an offer I therefore ask you to provide us immediately with the corresponding design data, as we cannot solve this problem with the calculation program available to us.

Thank you for your efforts in advance.

Yours sincerely

Reinhard Stiesberg / Design Manager

Ketten Wulf

A few hours later the following e-mail came in:

•••

Subject: Drawing documents

Dear Mr Herkenrath,

hereby I send you the requested chain drawing as well as the Ketten Wulf standard sheets.

Yours sincerely

Reinhard Stiesberg / Design Manager

Ketten Wulf

A number of drawings were attached to this e-mail.

"E-mail to Karl Herkenrath dated 16.9.2003:

...

Subject: Sprocket construction

Dear Mr Herkenrath,

I just got the "green light" from our client. We can design the sprocket with 9 teeth and install it for testing. However, he would also like a spare sprocket of the same dimensions as the previous conventional design. This sprocket is currently being processed and I will send you the drawing immediately.

Yours sincerely

Reinhard Stiesberg / Design Manager

Ketten Wulf"

The following e-mail was received on 24 September 2003:

"E-mail to Karl Herkenrath dated 24.9.2003:

...

Subject: Revision of the calculation documents

Dear Mr Herkenrath,

Thanks again for supporting the test sprocket.

In the meantime, we have prepared the enclosed design drawing R-4193 according to these calculation documents.

While checking the same I noticed the small distance of 5,22mm between the flange of the sprocket and the lower edge of the plate of the chain. (The distance should be at least 10 mm!)

Therefore, please revise your calculations once again to achieve the necessary distance.

Yours sincerely

Reinhard Stiesberg / Design Manager

Ketten Wulf"

I replied to Mr Stiesberg a short time later and found my note:

Dear Mr. Stiesberg,

I have attached the new calculation (in Excel). Thank you for pointing out that the distance from the chain link should be at least 10 mm. I immediately changed the calculation in Excel to your note (see new calculation).

Karl Herkenrath

The following e-mail was received on 26 September 2003:

Subject: Production drawing

Dear Mr Herkenrath,

I hereby send you the updated drawing R-4193 according to which we will manufacture the sample sprocket, after approval of the customer.

Yours sincerely

Reinhard Stiesberg / Design Manager

Ketten Wulf"

My answer:

Dear Mr. Stiesberg,

I have received your production drawing. I noticed a little something in the parts list position 9. The flange disc pos. 9 (not 725...) but $Ø715 \times 430 \times 25$.

Karl Herkenrath

Under the date of **19 November 2003**, I find an e-mail from me to Mr. Wilke with copy to Mr. Kaiser at the company Ketten Wulf.

"Measurement tests on Ketten Wulf with plastic rollers

Dear Mr. Wilke, dear Mr. Kaiser,

In the past few days I have been on the phone with Mr. Kaiser and learned that the measurement tests have still not been completed. During the first measurement test in your laboratory on 18.07.03 I already pointed out that the lever ratios were chosen very unfavorably.

In order to explain the connections, I have added several data. Please see EXCEL calculation lever ratios 3rd column from below.

Calculation of lever ratios

- 1. EXCEL calculation lug hub 57,5 mm
- 2. EXCEL Calculation lug hub 10.0 mm
- 3. EXCEL Calculation lug hub 30,0 mm

With kind regards

Karl Herkenrath"

Berechnung der Hebelverhältnise am Zahn



F1 x a = F2 x b x 2

b x 2 F1 = 1 kN

F1ve

 $F1_{Vers.} = 15 \text{ kN}$

Hebelverhältnis des Kettenrades für den Messversuch von ketten wulf, siehe heierzu EXCEL Berechnung.

EXCEL Berechnu	ng Zahn-15-135-07	75-Vers
Hebelverhältnis	b/a = 0,58798	a/b = 1,70074
F2 = (F1 x a) / (2 x)	(x b) = 0,85037	F1Vers. x F2 = $12,75$ kN

EXCEL Berechnung Zahn-15-135-075-20Hebelverhältnis b/a = 0,74488a/b = 1,34250F2 = (F1 x a) / (2 x b) = 0,67125F1Vers. x F2 = 10,07 kN

EXCEL Berechnung Zahn-15-135-075Hebelverhältnis b/a = 1,59519a/b = 0,62688F2 = (F1 x a) / (2 x b) = 0,31344F1 Vers. x F2 = 4,70 kN

Stand vom 23.11.03 Hebelverhältnise am Zahn

Under the 26.11.2003 I find in my documents a note about a telephone discussion between Mr. Wilke of the company Ketten Wulf and me:

I noticed this:

The measurement test on 18.7.2003 was carried out without giving me any information about the sprocket, the load or the arrangement. Only on tel. inquiry with Mr. Kaiser on 18.11.2003 I received the chain traction force of **15 kN**.

2. Also, I do not understand that the calculation program Excel table is with Mr. Allebrodt. If you had used the program, you would have noticed that the coiled spring should have a diameter of \emptyset 25 mm and not a diameter of \emptyset 28 mm as described above.

For the Hannover Messe I wrote a very elaborate presentation with PowerPoint, which only had to be completed by Ketten Wulf. This was not present at all at the Hanover Fair.

You want as many different loads as possible to be carried out with one tension spring!

Tests for escalator chains

As my documents show, I was not the only one "occupied" with all kinds of drawings etc., but also the company Connex in Switzerland. Here are a few examples:

On 24.11.2003 I received the following fax from CONNEX:

"...project self-adjusting chain sprocket for escalators

Your call from 20.11.2003

Dear Mr Herkenrath

We refer to your conversation with Mr. Lütolf on 20.11.2003 and send you in the supplement our concept "Device for determining the spring deflection on dowel pins" according to our drawing no. 6.001.0824.

We'd run the tests for free. It would take two to three weeks to set up the device and carry out the tests.

We ask you to check and await your report as to whether we can carry out the tests on this basis.

If you have any questions, please do not hesitate to contact Mr. Lütolf (direct dial...).

Friendly greetings

CONNEX AG

.."

CONNEX Managementsystem

Reiden, 12.12.2003 Seite 1 / 1

Beilage 3

Einfederungsprüfungen	Weg	Kraft in kN			
nach Zchn. 6.001.0824	in mm	Stift 1	Stift 2	Stift 3	
	0.1	0.80	0.70	0.60	
Spannstift	0.2	2.10	2.00	1.90	
S 20 x 23 mm	0.3	3.80	3.70	3.70	
Werkstoff 50CrV4, vergütet	0.4	5.50	5.40	5.50	
	0.5	7.30	7.30	7.40	
Aufnahmebohrung	0.6	9,10	9.50	9.50	
20.8 +0.2/-0 mm	0.7	10.80	11.50	11.20	
	0.8	12.20	12.90	13.10	
	0.9	13.90	14.20	15.00	
	1.0	15.80	15.40	16.20	
	1.1	16.60	16.30	17.10	



Einfederungsprüfungen (2003.12.12) Herkenrath, DE-Saarbrücken , Spannstifte

On the same day I wrote the following e-mail to Mr Wilke:

"Sprocket measurement test

Dear Mr. Wilke,

I have received news from CONNEX from Switzerland that they are measuring the test with three different clamping pins S 18 x 23; S 20 x 23 and S 20 x 23 in the device I proposed. (See fax from CONNEX and drawing).

This measurement is necessary to adjust the spring force to the required lever ratios.

With kind regards

Karl Herkenrath"

On 1 December 2003, CONNEX inquired whether we agreed to this trial, to which I replied:

"Dear Mr. Bättig,

of course, we agree with the experimental setup.

In order to design the required size of the tension pin for the sprockets of escalators, we need these (S 18 x 23; S 20 x 23; S 22 x 23) different spring diagrams. The dowel pin to be used should have a diameter of approx. 0.3 mm. The maximum deformation is limited to 1.0 mm by a 1.0 mm smaller bolt from the inside diameter.

..."

After I had received the measured values from CONNEX at the beginning of January 2004, I informed Mr. Wilke on 8.1.2004:

"...Measuring test escalator chains

Yesterday I received the measured values in diagram form from CONNEX.

In the attachment are the drawings, calculations with cover letter. Kind regards"

On January 2004 I informed the company Ketten Wulf of the following:

"January 8, 2004.

Dear Mr. Wilke,

First of all, I would like to wish you a healthy and successful New Year 2004.

Subject: Measuring test of escalators chains

From CONNEX I received measured values of the coiled spring pins in diagram form, and I selected the coiled spring pin S 20 x 23 mm from the material 50CrV4.

Test chain sprocket VS030501

To analyze why the measurements could not be evaluated, I redrew the sprocket in CAD. During the construction, it was thought that the guide tongue should be led into the middle of the sprocket, which meant that the lever ratios of the tooth became less favorable and that the 4 mm separating cut was 122.16 mm long. This also means that the tooth can only rotate 1.55254 degrees until it collides with the next tooth. As a result of this slight rotation, the dowel pin is only deformed by approx. 0.04 mm.

New design of the test sprocket Drawing 15-135-75-Sp-20

• With the new sprocket it is not necessary to guide the guide tongue into the middle of the sprocket. The part of the chain that is in mesh with the sprocket is clamped on the sprocket, so it is not necessary to lever out the chain in the upper run. This was

also determined at the plant in the Ensdorf power plant. Thus, the hub ring can become larger, which means a significant improvement of the lever ratio of tooth and cut (is only 39.67 mm - **note**: 41.17 mm are handwritten). So, the tooth can turn around 3.80767 degrees. (See diagram Appendix 3).

In the attachment I have attached the CAD-AutoCAD drawing 15-135-75-Sp-20 and EXCEL calculations tooth 15-135-75-Sp-20, from which you can take the new diameters. The further details like fits and construction, construction etc. can be taken over similarly as in drawing R-4193. I would like to ask you to send me two copies of the finished drawing in original size by post before production.

Yours sincerely

Karl Herkenrath"

On 28 January 2004 I received the following e-mail from Ketten Wulf:

• • •

Subject: Silencer rail

Dear Mr Herkenrath,

Enclosed you will find the promised documents on the subject of the *silent running track*. All parts such as running-in rails, guides, rail holders and corresponding fastening elements are original parts from Thyssen's escalator production and have been integrated into our test bench on request.

You will surely understand that we want to change this as little as possible.

The tensile force specified by H. Kaiser was agreed by him with Thyssen during the construction of the test bench.

The maximum chain elongation for escalator ketene is not known as a percentage in our company. However, it will be considerably lower than with standard chains, because elongation of the chain, particularly different in the two strands, leads to immediate malfunctions of the step combs.

Yours sincerely

"

On 29 January 2004, I replied as follows:

• • •

Subject: Test sprocket

Dear Mr. Stiesberg - Design Manager,

Many thanks for the CAD drawing VS040123 according to my design and with the counterproposal in the dxf drawing VS040123-1.

In order to take into account, the customer's wish for installation in new and existing systems with the silent runner arch, I have created a new design drawing 15-135-075-Sp-20-Neu as well as a new calculation (see attachment).

Due to these changes, the lever ratios also change and the load on the dowel pin increases by approx. 34.8%. I have not taken the full load as a basis for the design of the dowel pins S 20 x 23 mm (which are already supplied), so a higher load can also be accommodated. It is also possible to install a larger dowel pin max. 25mm without changing the other diameters.

Thus, the sprocket for the new measurement test can be executed according to the new design drawing 15-135-075-Sp-29-New and calculation.

Please note that the internal tooth diameter is (460) and the hub diameter is (440 mm).

Yours sincerely

Karl Herkenrath

Note from 13.05.2004 of the Fraunhofer Institute

"Supplement of the report on the basis of the measurements of 29.04.04".

In the appendix you will find the table for the new measurement series as well as the graphic representation. **As expected, the curve is flatter than with the 1st Herkenrath model, so that an even more favorable force distribution to the individual teeth results**. Since the measured values determined were 65 mV instead of 45 mV, for example, the curve was standardized to 45 mV for display purposes.

A statement can be made about the absolute forces occurring in the tooth flanks after carrying out a measuring point calibration for the new teeth, which was not carried out before delivery due to lack of time. For comparison, the middle measuring point of the tooth was first used, because it is best comparable with the measuring point in the bore of the tooth of the 1st Herkenrath-sprocket.

The tests were carried out at the same speed, the measured chain tensile forces are also identical.

Dortmund, 13.05.04

H.-Georg Siebel-Achenbach"

There are innumerable measurements, evaluations etc., which I cannot list here all.
NOW IT'S GOING TO BE "FUNNY"!

On April 29, 2004, Ketten Wulf held a further discussion and a test measurement of the power transmission to the sprocket teeth of escalators.

On this occasion I "knocked carefully" how many sprockets have been sold since 2001, because according to license agreement item 6.3 on 1.6.2004, i.e. in about 4 weeks, the first payment of 24.000,-- DM should have been made (see license agreement).

On this occasion I learned that they hadn't sold a single piece in three years and that they needed more "development time".

Since it seemed - in my subjective opinion - that Ketten Wulf was not at all interested in using the patent I had developed, Ketten Wulf sent me a letter dated **June 28, 2004, supplementing the license** agreement: "Ketten Wulf Betriebs GmbH, (address....)

Mr.

Karl Herkenrath

Halbergstr. 68

66121 Saarbrücken, Germany

2004-06-28

Supplement to the License Agreement dated 17.04.2002

Dear Mr Herkenrath,

Please find attached the supplement to the license agreement of 17.04.2002 with the request to return a signed copy to us.

Yours sincerely

Ketten Wulf

Attachment"

Supplement to the License Agreement

"Supplement to the license agreement dated 17.04.2002 between

Mr Karl Herkenrath

and

company Ketten Wulf GmbH ...

The following is agreed according to the meeting of 29.04.2004:

1. No sprockets have been sold yet. More development time is needed.

According to Section 6.3 of the license agreement, a payment of EUR 12,271.01 (equivalent to DM 24,000.--) is due on June 1, 2004.

(3) This payment may be suspended on the following condition.

3.1 The license agreement dated 17.04.2002 remains valid.

3.2 A monthly payment shall be made on the 10th of each month, for the first time on 10.06.2004, in the amount of EUR 345.00 to the following account at Deutsche Bank.

3.3 The remaining amount according to the license agreement is due on 01.01.2007 as agreed.

Saarbrücken . .. Eslohe

(signatures)

Instead of royalties, Ketten Wulf only had to pay for postage

After signing this amendment, the license rights to the patent were practically "free of charge", a little bit had to be paid out of the "petty cash"; one could also say PEANUTS in New German.

On 11 October 2004 I wrote the following to Ketten Wulf:

"October 11, 2004.

Dear Mr. Wilke,

on Thursday, 7.10.04 I received the information from Mr. Kaiser that on Friday, 8.10.04 at 10 o'clock a further measurement of the chain sprocket will be carried out. A new sprocket was mounted on the measuring device you had ordered.

In this measurement, the chain link forces were measured using strain gauges from chains with steel and plastic rollers. These preliminary and rough results also prove that my theoretical considerations are correct, which have been confirmed here as well.

Here is a brief summary of the preliminary results that are still being processed by the Fraunhofer Institute.

The rough results show that the load on the plastic rollers is reduced by more than 50 %, which does **not increase** even with a **longer service life**.

According to the remarks of the Fraunhofer Institute, the movement of the teeth was prevented in the previous sprocket, in the new sprocket this movement was no longer hindered in the tooth.

3) Another measurement with a conventional new sprocket and a new chain with plastic rollers, the loads of the plastic roller shall be measured. This measurement is only available in new condition and cannot **be compared with the measurements of my patented sprocket**.

I would like to ask you to make sure that the final report is prepared by the Fraunhofer Institute as soon as possible so as not to lose any more time.

Yours sincerely"

After four years of testing, my patience gradually broke.

On 10 February 2005 I sent the following letter to the company Ketten Wulf, because my "patience thread" was slowly tearing

"February 10, 2005.

Dear and esteemed Mr Wilke,

With the following summary, I would like to inform you that - in my opinion - the measurement results of the scope of investigations carried out on sprockets 1 and 2 are not meaningful.

In all measuring experiments on the chain sprocket patented by me, a chain link was provided with strain gauges to measure the transmission of the tensile force in the link. This type of measurement must lead to comparable results with the same load and design - which is not the case. A rotary movement of the chain or tooth form has only a minor influence on the plate forces.

Measuring test with sprocket 1

Neither my dimensioning program nor the support of the design department was consulted for the design drawing. The result is that the lever ratios of the teeth have been chosen so unfavorably that they collide and block even with a small load on the teeth. This does not guarantee the principle of the "self-adjusting chain sprocket".

Measuring test with chain sprocket 2

As a template for the construction drawing, my design drawing was used, but the assembly of the sprocket was again so unfavorably designed that the movements of the teeth also block. Based on the research of the Fraunhofer Institute, this has been confirmed with the low difference value of only 5%. Measuring test with chain sprocket 3

A new measuring chain sprocket with a modified tooth shape was mounted on the trainer you had arranged. The tooth shape has only a minor influence on the power transmission of the "self-adjusting sprocket", since the point of contact of the roller with the tooth does not change significantly. The measurements by the Fraunhofer Institute showed that the forces on the roll are reduced by more than 50%.

Résumé

Since June 2001, considerable efforts have been made to test the patent. The first wear measurement on a conveyor chain was successfully completed in March 2003.

Personally, I see no need for further action to test the patent. The advantages of the "self-adjusting chain sprocket" are obvious. Rather, I think it is enormously important to gain acceptance for the "self-adjusting chain sprocket".

For my part, I have contributed with a very high level of personal commitment to supporting Ketten-Wulf in the successful market launch of the sprocket. However, management needs to get the "self-adjusting chain sprocket" on the road to success.

Well, after more than 3 years of cooperation I would be very happy if Ketten-wulf could gain further market shares.

Yours sincerely

As the monthly payments of Euro 345,-- gradually became too expensive, Ketten Wulf terminated the license agreement on 26.8.2005.

With letter of 26.8.2005 the company Ketten Wulf told me the following:

"Kückelheim, 26.08.2005

License agreement from 17.04.2002

Dear Mr Herkenrath,

We hereby extraordinarily terminate the license agreement concluded with you under the 17.04.2002 with effect from 31.08.2005, as we no longer see any possibility, based on the measurements of the Fraunhofer Institute for Material Flow and Logistics, of manufacturing a self-adjusting chain sprocket in accordance with the agreement.

Alternatively, we will terminate the contract in the absence of any other provisions in the contract, also by 31.08.2005.

We regret that the developments have not led to a functional product.

Yours sincerely

KettenWulf

- Signature

G. Wulf"

With this "selection" of several folders I would like to leave it at that.

If you ask yourself why I have reproduced so many letters, you will see under Chapter 8 that this plays a role, because Ketten Wulf claimed in 2015 that there had been only a "short" cooperation between the company Ketten Wulf and me. as if I was just a casual acquaintance, so to speak.

Chapter 7

The new patent EP 2 594 824

VISIT TO POWER PLANT ENSDORF 2011

As a conscientious designer, I wanted to wait for success and was therefore at the Ensdorf power station at the end of 2011.

I had given up the first patent in 2006, because the annual fees were getting higher and higher and I didn't see any sense in keeping this patent longer. However, the patent still kept me busy.

After my first wife died in 2004, I met my present wife in 2006. I had told her about the patent, but at first, she had relatively little interest in it and did not understand it properly. We bought a house together in the Eifel in 2008, got married, travelled and undertook a lot, so that the idea of the patent was pushed into the background for a while, but nevertheless I had to think again and again whether my self-adjusting sprocket sprocket installed in the Ensdorf power station in 2001 would still work and what had become of it. I still remember very well; in September 2011 I had the idea to call the Ensdorf power station and ask about the chain sprocket. On this occasion I learned that my sprocket used there would still work wonderfully. I asked to have a look at the portal scraper with the chain sprocket, which was no problem and I drove with my wife to Ensdorf.

A few days later we drove to Ensdorf and visited the portal scraper. My wife, who is technically very interested but hadn't thought about the sprocket yet, immediately understood what I was talking about, after I had described the functionality of this sprocket to her again and she could now see the sprocket herself. Shortly afterwards she gave me the idea to register this self-adjusting chain sprocket with the patent office in a new and improved form.



I was so enthusiastic about this idea that we stopped our short break prematurely over the weekend and "forged" plans for the new registration. My wife introduced me to a patent attorney whom she had known for many years and we contacted him immediately after our return. He worked out the new patent application and the patent was filed with the European Patent Office in November 2011. Since my visit in September 2011, my wife has been my most fervent admirer and since then has left no stone unturned in presenting this patent first to the chain industry (of which she did not expect much), then to the plant manufacturers and since autumn 2015 increasingly to operators all over the world, but again in sequence:

THE PATENT IS FILED WITH THE EUROPEAN PATENT OFFICE IN A FURTHER IMPROVED FORM.

As a conscientious designer, I would not have pursued the patent without proof that my invention was simply "ingenious" for my terms. But now I had the clear proof and the self-adjusting sprocket was registered in a further improved form as "self-adjusting drive sprocket" at the European Patent Office.

Those of you who have already applied for a patent for an invention at the European Patent Office know how long it takes to process it and how impatient you as an inventor are to wait for the patent to be granted, often with several years to go before a patent is granted or not.

19) Batentamt European Patent Office	
Office européen des brevets	(11) EP 2 594 824 B1
12) EUROPÄISCHE	PATENTSCHRIFT
 Veröffentlichungstag und Bekanntmachung des Hinwelses auf die Patenterteilung: 07.01.2015 Patentblatt 2015/02 	(51) Int Cl.: F16H 55/30 (2006.01)
21) Anmeldenummer: 12007544.5	<u>y</u>
22) Anmeldetag: 06.11.2012	
54) Selbsteinstellendes Antriebsrad Self-adjusting drive wheel Roue motrice à réglage automatique	
 84) Benannte Vertragsstaaten: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR 30) Priorität: 15.11.2011 DE 102011118515 43) Veröffentlichungstag der Anmeldung: 	 (72) Erfinder: Herkenrath, Karl 56746 Kempenich (DE) (74) Vertreter: Hauck Patent- und Rechtsanwälte Mörikestrasse 18 40474 Düsseldorf (DE) (56) Entgegenhaltungen:
22.05.2013 Patentblatt 2013/21 73) Patentinhaber: Herkenrath, Karl 56746 Kempenich (DE)	DE-C2- 4 317 461 JP-A- 2008 304 064 US-A- 4 881 930

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Beschreibung

[0001] Die vorliegende Erfindung betrifft ein selbsteinstellendes Antriebsrad.

1

[0002] Herkömmliche Kettenräder bestehen in der Regel aus Scheiben oder Ringen, in deren äußerem Umfangsbereich daran angeformte Zähne vorgesehen sind. Insbesondere bei Laschenketten sind jedoch Fertigungstoleranzen zwischen den einzelnen miteinander verbundenen Kettengliedern vorhanden, die bei der Umlenkung um das Kettenrad infolge unterschiedlicher Teilung zu einem erhöhten Verschleiß sowohl an den Kettengliedern als auch an den Zähnen des Kettenrades führen. Ferner nachteilig ist, dass infolge dieser Toleranzen sowie dem sich kurzfristig einstellenden Verschleiß nicht alle Zähne des Kettenrades gleichmäßig in Kraftrichtung belastet werden.

[0003] Zur Abhilfe dieses Problems hat man bereits ein selbsteinstellendes Kettenrad vorgeschlagen, das in der DE 43 17 461 C2 beschrieben ist und die eingangs erläuterten Merkmale aufweist. Bei diesem bekannten Kettenrad sind die Zahnsegmente mit in Umfangsrichtung verlaufenden, Überlappungsbereiche bildenden Ansätzen versehen, und in jedem Überlappungsbereich ist zwischen den Ansätzen der benachbarten Zahnseomente mindestens ein Federelement angeordnet. Jedes einzelne Zahnsegment ist somit bei vertikaler Anordnung des Grundkörpers um eine Horizontalachse gegenüber dem Grundkörper dreh- bzw. kippbar gelagert, wobei die Zahnsegmente in ihrer Form so ausgestaltet sind, dass jedes Zahnsegment die durch die Glieder der Kette auf es ausgeübte Dreh- bzw. Kippbewegung auf das in Umfangsrichtung nachfolgende Zahnsegment überträgt. Infolge der Dreh- bzw. Kippbewegung der einzelnen Zahnsegmente können durch Fertigung bedingte Toleranzen 35 und Dehnungen der Ketten im Betriebszustand unmittelbar am Kettenrad ausgeglichen werden, da nun sämtliche Zahnsegmente in gleicher Weise beaufschlagt werden.

[0004] Aus der JP 2008 304064 A ist ein Antriebsrad 40 bekannt, an dessen Umfang mehrere benachbart zuelnander angeordnete Zahnsegmente vorgesehen sind. Diese Zahnsegmente stoßen mit radialen Begrenzungsflächen gegeneinander. In gegenüberliegenden Ausnehmungen benachbarter Zahnsegmente ist jeweils ein elastisches nachgiebiges Federelement angeordnet, dass als Gummielement ausgebildet ist. Zwischen benachbarten Zähnen eines Zahnsegmentes ist jeweils ein sich bis in eine Ausnehmung erstreckender Spalt angeordnet, der im Betrieb des Antriebsrades eine Verbiegung der jeweiligen Zähne ermöglicht.

[0005] Der vorliegenden Erfindung liegt die Aufgabe zugrunde, ein selbsteinstellendes Antriebsrad zu schaffen, das sich durch einen besonders geringen Verschleß auszeichnet.

[0006] Diese Aufgabe wird erfindungsgemäß bei einem selbsteinstellenden Antriebsrad der angegebenen Art mit den Merkmalen des Anspruchs 1 gelöst. 2

[0007] Durch die erfindungsgemäße Ausgestaltung bzw. Anordnung wird eine besonders gute und gleichmäßige Kräfteverteilung erreicht. Mithilfe der speziell angeordneten und ausgebildeten Federelemente können sowohl Druck- als auch Zugkräfte übertragen werden. Die beweglichen Segmente sind insbesondere in beiden

Richtungen belastbar und übertragen die jeweiligen Kräfte auf das nachfolgende und zurückliegende Segment. Die erfindungsgemäß verwendeten Spannhülsen sind hierbei besonders geeignet, da sie im vorgespannten Zustand in den Ausnehmungen angeordnet sind und somit

auch die Übertragung von Zugkräften ermöglichen. [0008] Die seitlichen Begrenzungsflächen der Zahnsegmente sind durchgehend radial gerichtet, d.h. die ent-¹⁵ sprechenden Zahnsegmente weisen keine Ansätze wie beim vorstehend genannten Stand der Technik auf. Hierdurch lassen sich bei entsprechender Belastung die Zahnsegmente um ihre Befestigungspunkte am Grundkörper entsprechend drehen bzw. kippen, wobei ab-

- 20 wechselnde Bewegungen der benachbarten Segmente resultieren, d.h. das erste Segment kippt nach rechts, das zweite Segment kippt nach links etc. Insgesamt wird die durch die Kette aufgebrachte Kraft hierdurch auf besonders viele Zahnsegmente verteilt, so dass eine ent-25 sprechende Verschleißreduzierung erreicht wird.
- [0009] Die vorliegende Erfindung betrifft beliebig ausgebildete Antriebsräder, die mit flexiblen Antriebsorganen zusammenwirken, welche mit den hier beschriebenen Zahnsegmenten in Eingriff treten können. Solche
 30 Antriebsräder sind primär Kettenräder, die mit Ketten zusammenwirken.

[0010] Ein weiterer Vorteil des erfindungsgemäßen Antriebsrades besteht darin, dass dieses eine besonders geringe Geräuschentwicklung hervorruft.

- 5 [0011] In Weiterbildung der Erfindung ist zwischen benachbarten Zahnsegmenten ein radialer Spalt mit einer Breite von 2-6 mm, insbesondere 4 mm, vorhanden. Dieser Spalt wird durch die Spannhülsen zwischen benachbarten Zahnsegmenten überbrückt.
- Io012] Vorzugsweise ist zwischen benachbarten Zahnsegmenten radial außerhalb des Federelementes eine Dichtung vorgesehen. Diese Dichtung verhindert das Eindringen von Schmutz- bzw. Staubpartikeln in den radialen Spalt zwischen benachbarten Zahnsegmenten.
- ⁴⁵ Die Dichtung ist vorzugsweise in zwei gegenüberliegenden Ausnehmungen der radial verlaufenden Begrenzungsflächen von benachbarten Zahnsegmenten angeordnet und überbrückt somit einen entsprechenden Radialspalt. Beispielsweise kann als geeignete Dichtung 29 ein entsprechender Gummischlauch verwendet werden.
- ⁵⁰ ein entsprechender Gummischlauch verwendet werden. [0013] Die Ausnehmungen, in denen die Spannhülsen angeordnet sind, und/oder die Ausnehmungen, in denen die Dichlungen angeordnet sind, sind zweckmäßigerweise als Halbbohrungen mit halbkreisförmigem Querschnitt ausgebildet.

[0014] Die einzelnen Zahnsegmente sind in Umfangsrichtung im Abstand voneinander am Grundkörper befestigt. Vorzugsweise ist die Befestigung am Zahnseg-

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ment in Umfangsrichtung mittig angeordnet, so dass entsprechende Kippbewegungen in belden Richtungen erfolgen können. In Weiterbildung der Erfindung sind die Befestigungspunkte der Zahnsegmente am Grundkörper auf dem gleichen Teilkreisdurchmesser wie die Federelemente angeordnet. Bei anderen Ausführungsformen sind die Mittelpunkte der Federelemente radial versetzt zu den Befestigungspunkten angeordnet. Hierdurch lassen sich die entsprechenden Hebelverhältnisse beeinflussen und für den jeweiligen Anwendungsfall optimieren.

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[0015] Als Federelemente finden erfindungsgemäß Spannhülsen Verwendung. Solche Spannhülsen sind vorzugsweise als geschiltzter zylindrischer Körper mit geradlinigem oder zickzackförmigem Schiltz ausgebildet. Die Spannhülsen besitzen im unbelasteten Zustand einen größeren Durchmesser als die Ausnehmungen in den seitlichen Begrenzungsflächen und werden unter Vorspannung, d.h. im zusammengedrückten Zustand, in die Ausnehmungen eingesetzt, so dass sie benachbarte Zahnsegmente miteinander verspannen.

[0016] Der Grundkörper des selbsteinstellenden Kettenrades welst vorzugsweise in seiner Stimfläche einen Umfangsschlitz auf, in dem die einzelnen Zahnsegmente teilweise angeordnet sind und aus dem sie teilweise In Radialrichtung vorstehen. Die Befestigung der Zahnsegmente erfolgt dabei über Befestigungselemente, die sich durch Bohrungen in den Umfangsflanschen den Grundkörpers und in den jeweiligen Zahnsegmenten erstrecken. Bei diesen Befestigungselementen kann es sich 30 beispielsweise um Bolzen handeln, um die die Zahnsegmente drehbar bzw. kippbar gelagert sind. Die Lagerung der Zahnsegmente muss nicht unbedingt an zwei Umfangsflanschen des Grundkörpers erfolgen, sondern kann auch an einem Umfangsflansch durchgeführt werden, wobel der Grundkörper nur diesen einen Umfangsflansch besitzt. Hier kann das Zahnsegment beispielsweise zwei Außenflansche besitzen, die mit einem Umfangsflansch des Grundkörpers zusammenwirken. Die Erfindung wird nachfolgend anhand eines Ausführungs- 40 beispieles in Verbindung mit der Zeichnung im Einzelnen erläutert. Es zeigen:

- Figur 1 eine Draufsicht auf einen Teil eines selbsteinstellenden Kettenrades einer ersten Ausführungsform;
- Figur 2 eine Draufsicht auf ein selbsteinstellendes Kettenrad einer zweiten Ausführungsform mit angedeuteter Kette;
- Figur 3 eine vergrößerte Schnittansicht der Befestigung des Zahnsegmentes am Grundkörper; und
- Figur 4 eine vergrößerte räumliche Darstellung eines Federeiementes in Form einer Spannhülse.

[0017] Das in Figur 1 teilweise dargestellte selbsteinstellende Kettenrad besitzt einen scheibenförmigen Grundkörper 1, um dessen Umfang herum eine Vielzahl von Zahnsegmenten 2 angeordnet ist. Die Zahnsegmente sind über Befestigungselemente 6, die hier nur schematisch dargestellt sind, in Umfangsrichtung drehbar oder kippbar am Grundkörper 1 gelagert, und zwar zwischen zwei Umfangsflanschen des Grundkörpers 1 in

- einem entsprechenden Umfangsschiltz. Die Zahnseg mente 2 weisen in Radialrichtung durchlaufende seitliche Begrenzungsflächen 3 auf, wobei die beiden Begrenzungsflächen 3 von benachbarten Zahnsegmenten 2 zwischen sich einen Radialspalt von 4 mm bilden. Die Innenseite des Zahnsegmentes 2 ist an die Krümmung
 des Grundkörpers 1 angepasst und ebenfalls entsprechend gekrümmt ausgebildet, wobei zwischen Grundkörper und Zahnsegment ebenfalls ein Spalt von 4 mm vorhanden ist. Das Zahnsegment 2 kann somit eine entsprechende Kipp- oder Drehbewegung um die Achse des
- 20 Befestigungselementes 6 durchführen, das sich durch eine entsprechende Bohrung in den beiden Umfangsflanschen des Grundkörpers 1 und des scheibenförmigen Zahnsegmentes 2 erstreckt. Es kann sich hierbei beispielsweise um einen runden Bolzen handeln.
- [0018] Die seitlichen Begrenzungsflächen 3 der jeweiligen Zahnsegmente 2 sind mit halbzylindrischen Bohrungen 5 versehen, wobei zwei Halbbchrungen 5 von benachbarten Zahnsegmenten 2 eine Bohrung zur Aufnahme eines Federelementes in Form einer Spannhülse
- 8 bliden. Die entsprechende Spannhülse 8 ist in Figur 1 nur schematisch dargestellt. Sie ist unter Vorspannung in die von den beiden Halbbohrungen 5 gebildete Ausnehmung eingesetzt und verspannt die entsprechenden Zahnsegmente 2 miteinander.
- ³⁸ [0019] Radial außerhalb der Halbbohrung 5 befindet sich eine kleinere halbzylindrische Bohrung 4, dle mit der halbzylindrischen Bohrung eines benachbarten Zahnsegmentes eine Ausnehmung zur Aufnahme einer Dichlung in Form eines Gummischlauches bildet. Die Dich-
- 40 tung 7, die nur schematisch in Figur 1 dargestellt ist, verhindert den Eintritt von Staub- bzw, Schmutzpartikeln in den entsprechenden Radialspalt zwischen zwei benachbarten Zahnsegmenten 2.

 [0020] In Figur 1 sind ferner Telle 9 einer Kette darge stellt. Wenn die Kette mit dem Kattenrad in Kontakt tritt, werden die Zahnsegmente 2 um Ihre Befestigungselemente 6 gedreht bzw. verkippt, wobei die Dreh- bzw.
 Kipprichtungen von benachbarten Zahnsegmenten entgegengesetzt zueinander sind. Auf jeden Fall werden die
 von der Kette auf das Kettenrad und damit die Zahnsegmente ausgeübten Kräfte über die Spannhülsen 8 auf die anderen Zahnsegmente übertragen, so dass sich eine weitgehend gleichmäßige Beanspruchung sämtlicher Zahnsegmente ergibt, wodurch der Verschleiß der Kette

und des Keltenrades herabgesetzt wird. [0021] Figur 2 zeigt eine Ansicht einer weiteren Ausführungsform eines selbsteinstellenden Kettenrades. Das Keltenrad der Figur 2 besitzt einen scheibenförmi-

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gen Grundkörper 10, an dessen Umfang eine Vielzahl von Zahnsegmenten 11 über entsprechende Befestigungselemente 12 drehbar bzw. kippbar gelagert ist. Bei der hier dargestellten Ausführungsform sind insgesamt acht Zahnsegmente vorgesehen. Jedes Zahnsegment 5 11 besitzt zwei Zähne. Benachbarte Zahnsegmente sind durch einen Radialspalt 15 voneinander getrennt, den in Radialrichtung durchlaufende Begrenzungsflächen bilden.

[0022] Eine schematisch in Figur 2 dargestellte Kette 10 übt eine entsprechende Kraft F auf das Kettenrad aus, wodurch die entsprechenden Zahnsegmente 11 um die jeweiligen Befestigungselemente 12 in unterschiedliche Richtungen verkippt bzw. verdreht werden. Auch bei dieser Ausführungsform befinden sich zwischen benach- 15 barten Zahnsegmenten 11 entsprechende Federelemente, die als Spannhülsen 13 ausgebildet sind, und Dichtungen 14. Die Spannhülsen 13 übertragen die entsprechenden Kräfte zwischen den Zahnsegmenten 11. [0023] Figur 3 zeigt in vergrößertem Maßstab die Be- 20 festigung eines Zahnsegmentes 2 am Grundkörper 1. Das Zahnsegment 2 befindet sich zwischen den beiden Umfangsflanschen des Grundkörpers und ist an diesen mithilfe eines Schraubbolzens 6 drehbar gelagert. [0024] Figur 4 zeigt eine räumliche Darstellung einer 25

Spannhülse 8, die als geschlitzter zylindrischer Körper ausgebildet ist. Der Schlitz 19 ist hierbei zickzackförmig ausgebildet. Die Spannhülse 8 besitzt einen größeren Außendurchmesser als die zugehörige Ausnehmung 5, so dass sie im eingesetzten Zustand entsprechende Radialkräfte auf die beiden benachbarten Zahnsegmente ausübt. Auf diese Weise werden die von der Kette eingeleiteten Kräfte gleichmäßig auf die entsprechenden Zahnsegmente übertragen.

Patentansprüche

1. Selbsteinstellendes Antriebsrad, insbesondere Kettenrad, mit einem Grundkörper (1,10), an dessen 40 Umfang mehrere, mit demselben verbundene, jeweils um eine im Wesentlichen parallel zur Mittelachse des Grundkörpers (1,10) verlaufende Achse in Umfangsrichtung dreh- bzw. kippbare Zahnsegmente (2,11) vorgesehen sind, wobei zwischen be- 45 nachbarten beabstandeten Zahnsegmenten (2,11) mindestens ein elastisch nachgiebiges Federelement angeordnet ist, das in gegenüberliegenden Ausnehmungen (5) benachbarter Zahnsegmente (2,11) gelagert ist, die seillichen Begrenzungsflä-50 chen (3) der Zahnsegmente (2, 11) durchgehend radial verlaufen, die gegenüberliegenden Ausnehmungen (5) in den radial verlaufenden Begrenzungsflächen (3) benachbarter Zahnsegmente (2, 11) angeordnet sind und die elastisch nachgiebigen 55 2. The drive wheel according to claim 1, characterized Federelemente als Spannhülsen (8, 13) ausgebildet sind.

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- 2. Antriebsrad nach Anspruch 1, dadurch gekennzeichnet, dass zwischen benachbarten Zahnsegmenten (2, 11) ein radialer Spalt (15) mit einer Breite von 2-6 mm, insbesondere 4 mm, vorhanden ist.
- 3. Antriebsrad nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass zwischen benachbarten Zahnsegmenten (2, 11) radial außerhalb des Federelementes eine Dichtung (7, 14) vorgesehen ist.
- Antriebsrad nach Anspruch 3/ dadurch gekenn-4. zeichnet, dass die Dichlung (7, 14) in zwei gegenüberliegenden Ausnehmungen (4) der radial verlaufenden Begrenzungsflächen (3) von benachbarten Zahnsegmenten (2, 11) angeordnet ist.
- 5. Antriebsrad nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass die Zahnsegmente (2, 11) in Umfangsrichtung im Abstand voneinander am Grundkörper (1, 10) befestigt sind.
- Antriebsrad nach einem der vorangehenden An-6. sprüche, dadurch gekennzeichnet, dass die Befestigungspunkte der Zahnsegmente (2, 11) am Grundkörper (1, 10) auf dem gleichen Teilkreisdurchmesser wie die Federelemente liegen.
- Antriebsrad nach einem der vorangehenden An-7. sprüche, dadurch gekennzeichnet, dass die Spannhülsen (8, 13) als geschlitzter zylindrischer Körper mit geradlinigem oder zickzackförmigem Schlitz (19) ausgebildet sind.

35 Claims

- 1. A self-adjusting drive wheel, especially chain wheel, comprising a basic body (1, 10) at the circumference of which several tooth segments (2, 11) are provided which are connected with the basic body and which are each circumferentially rotatable or pivotable about an axis substantially extending parallel with respect to the central axis of the basic body (1, 10), wherein at least one elastically resilient spring member is located between adjacent spaced tooth seqments (2, 11) and which is supported in opposite recesses (5) of adjacent tooth segments (2, 11), the lateral limiting surfaces (3) of the tooth segments (2, 11) extend continuously radially, the opposite recesses (5) are located in the radially extending limiting surfaces (3) of adjacent tooth segments (2, 11) and the elastically resilient spring members are formed as tensioning sleeves (8, 13).
- in that a radial gap (15) with a width of 2-6 mm, especially of 4 mm, is present between adjacent tooth segments (2, 11).

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 The drive wheel according to claim 1 or 2, characterized in that a seal (7, 14) is provided between adjacent tooth segments (2, 11) radially outside of the spring member.

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- The drive wheel according to claim 3, characterized in that the seal (7, 14) is located in two opposite recesses (4) of the radially extending limiting surfaces (3) of adjacent tooth segments (2, 11).
- The drive wheel according to one of the preceding claims, characterized in that the tooth segments (2, 11) are fixed at the basic body (1, 10) circumferentially spaced from one another.
- The drive wheel according to one of the preceding claims, characterized in that the fixing points of the tooth segments (2, 11) at the basic body (1, 10) are located on the same pitch diameter as the spring members.
- The drive wheel according to one of the preceding claims, characterized in that the tensioning sleeves (8, 13) are formed as slotted cylindrical body with linear or zigzag slot (19).

Revendications

- 1. Roue motrice à réglage automatique, en particulier 30 roue à chaîne, comprenant un corps de base (1, 10) sur le pourtour duquel sont prévus plusieurs segments dentés (2, 1-1) reliés à celui-ci, pouvant être respectivement mis en rotation ou inclinés dans la direction périphérique par rapport à un axe s'éten-35 dant pratiquement parallèlement à l'axe central du corps de base (1, 10), au moins un élément ressort élastiquement déformable qui est monté dans des évidements (5) opposés de segments dentés (2,11) voisins étant disposé entre des segments dentés (2, 40 11) volsins espacés, les surfaces de délimitation (3) latérales des segments dentés (2,11) s'étendant radialement en continu, les évidements (5) opposés étant disposés dans les surfaces de délimitation (3) latérales s'étendant radialement de segments den-45 tés (2, 11) volsins et les éléments ressorts élastiquement déformables étant conçus comme des douilles de serrage (8, 13).
- Roue motrice selon la revendication 1, caractérisée 50 en ce qu'une fente (15) radiale ayant une largeur de 2 - 6 mm, en particulier de 4 mm, est située entre segments dentés (2, 11) voisins.
- Roue motrice selon la revendication 1 ou 2, caractérisée en ce qu'un joint d'étanchéité (7, 14) est prévu radialement à l'extérieur de l'élément ressort entre segments dentés (2, 11) volsins.

 Roue motrice selon la revendication 3, caractérisée en ce que le joint d'étanchéité (7, 14) est disposé dans deux évidements (4) opposés des surfaces de délimitation (3) s'étendant radialement de segments dentés (2, 11) voisins.

 Roue motrice selon l'une quelconque des revendications précédentes, caractérisée en ce que les segments dentés (2, 11) sont fixés sur le corps de base (1, 10) a distance les uns des autres dans la direction périphérique..

 Roue motrice selon l'une quelconque des revendications précédentes, caractérisée en ce que les points de fixation des segments dentés (2, 11) se trouvent sur le corps de base (1, 10) sur le même diamètre de cercle partiel que les éléments ressorts.

 Roue motrice selon l'une quelconque des revendications précédentes, caractérisée en ce que les douilles de serrage (8, 13) sont conçues comme des corps cylindriques fendus à fente (19) rectiligne ou en forme de zigzag.









How does a good idea become a patent and how high are the costs?

For those readers who have not yet dealt with patent applications, the following is an overview of how a patent application proceeds:

The patent remains "secret" for the first 18 months after filing and is only published 18 months after the filing date.

In a letter dated 24.3.2013, it was announced that the technical preparations for the publication of the above-mentioned European patent application had been completed and that the application would be published on 22.5.2013 with the European search report, i.e. exactly 18 months after the application for the patent had been filed.

It started an exciting time again.

After the text for the application was ready, the patent was applied for at the European Patent Office on 14.11.2011. The official fees for an application were not particularly high, they amounted in this case only to

	€	60,
In addition, of course, there were the costs for the patent attorney, in my case they were:		
	€	1.309,
On 29.11.2012 there were further		
	€ ′	1.365,
due for filing fee and search fee plus patent attorney fees in the amount of		
	€ ′	1.220,
On 22.1.2013, fees amounting to		
	€	357,

for studying and sending the European search report.

In November 2013, the designation fee of € 555,-- and the examination fee of € 1,555,-- plus the lawyer's office, i.e. a total of

€ 2.824,--

due.

On 1.9.2014 I have paid the patent grant fee including the attorney's fees in the amount of

€ 1.533,80

was paid.

On 15.9.2014 it was finally time:

The European Patent Office informed my patent attorney that the Examining Division intended to grant a European patent.

As of 6.11.2014, the grant fee in the amount of

€ 915,--

be paid to the Patent Office.

At the end of October 2014, the payment of the third annual fee, preparation of submissions, etc. was due with a total of

€ 1.006,45

to pay. If you add the numbers, you will find that a patent is not exactly cheap.

But there's more:

The Patent Certificate

The patent was then granted with a certificate dated 7 January 2015.

٣	Patent Office Office européen des brevels			
	URKUNDE	CERTIFICATE	CERTIFICAT	
	Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Ver tragsstaaten erteilt worden ist.	It is hereby certified that a European patent has been granted in respect of the invention described in the patent specifica- tion for the Contracting States designated in the specification.	Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.	
3	Summittee Sterry N	E unersa catert No.	Speciel at working of	
	COD MACTOR W.CT. W	2594824	Steven of Open of	
	Patentinhaber	Proprietor of the patent	Titulaire da brevet	
	56746 Kempe	inich/DE		
	Mancher, den 07.01.15		Benoit Battistelli Pidsident des Europaischen Patentants President of the Europaischen Patent Office	

Originally, I intended to obtain intellectual property rights for Germany, Austria, Great Britain and France.

On 28.2.2015 I paid costs in the amount of

€ 952,--

for the initiation of the national phases for the granting of a European patent in Germany, Austria, Great Britain and France

Since the patent claims are to be filed in English and French as well as in German, further costs in the amount of

€ 1.011,50

on.

After a patent has been granted, it is possible to decide within 3 months in which countries the patent is to be maintained , because the patent application is initially filed for all European states.

So I had time until the end of February 2015 to think about which countries the patent should be validated for, so that the national phases could be initiated.

After some consideration I decided for the other countries: Switzerland, Spain, Italy, Czech Republic, Poland and Romania.

With the invoice dated 15 April 2015

for the validation of the European patent in the newly added countries as well as foreign costs for the initiation of the national phases in the 9 countries.

On 15 September 2015, the 4th annual fees were due for the countries France , Switzerland, Spain, the Czech Republic, Poland and Romania. For Germany there was only one official fee, total costs.

€ 1.964,48

On 18 August 2015, the 5th annual fee for the maintenance of the German patent , i.e. the so-called basic application, was due for the last time because the opposition period against the granted patent had not yet expired:

 € 167,35
 An important criterion is also the decision of the patent office on the expiry of the deadline for filing an opposition. In this case it was the communication of 11.11.2015.
 At the end of October 2016, the 5th annual fee for

the 10 countries were due, costs for this:

€ 3.155,44 As the annual fees increase every year, at the end of October 2017 costs amounting to

€ 4.037,96

due.

A patent application as well as the maintenance of a patent is therefore quite expensive fun. And when big companies have a "small inventor" work out several license agreements for the sake of a **joke**, see chapter 3, which are then not signed or even conclude a license agreement, for which no license fees are paid, then this is a pretty strong piece.

After the patent was granted, I contacted the trade journal "Hebetechnik und Förderzeuge", which published the following article in early 2011:

Publication in the trade journal "Hebezeuge und Fördermittel" Berlin 55 (2015)1-2

Inventor Herkenrath and his self-adjusting chain sprocket

Balance sheet after more than 13 years



Still convinced of his invention: Karl Herkenrath

In 1999 the Saarland inventor Karl Herkenrath presented in this magazine the "self-adjusting sprocket" which he had developed since 1992 and which was intended to contribute to the reduction of chain and sprocket wear and thus to the reduction of conveyor operating costs (1). The reduced noise emission was also mentioned as a further advantage. A pilot project was launched in 2001 with the application as a drive sprocket of a portal scraper conveyor in the Ensdorf coal-fired power plant. This example - unfortunately the only one so far - shows that the chain sprocket has fulfilled the expectations in tough use over 13 years and can therefore be recommended for similar applications in conveyor technology.

Useful solution

Under the headline "Odyssey of an inventor with long breath" an article was published in June 2001 in the "Saarbrücker Zeitung" about the

use of a new self-adjusting chain sprocket in a scraper conveyor of the coal-fired power plant Ensdorf in Saarland. After a long search and argumentation, the designer Karl Herkenrath had found a company that put his invention, patented in 1994, into practice and used its advantages. The self-adjusting sprocket distributes the forces evenly over all teeth. The conveyor belt runs quieter, the wear of the chain is drastically reduced. The gear sprocket can be maintained without dismantling, only the teeth have to be changed. The chain manufacturers mentioned at the time were not interested in an invention that would increase the durability of chains. "These companies generate 90% of their turnover through the sale of chains and only 10% through gear sprockets", Herkenrath analyses at the end of the 1990s and wanted to drop the patents for financial reasons. So, it was a stroke of luck that the company Koch from Wadgassen (today FLSmidth Wadgassen GmbH) came across the invention in connection with the construction of a conveyor belt in the Ensdorf power station. At own risk the patent fees were taken over, drawings were made and the gear sprocket was manufactured in special construction. In 2001, the deployment started at the conveyor.

Today, after 13 years, there are still no signs of wear on the selfadjusting chain sprocket. What was still theory at that time and was presented by the inventor on the basis of finite element calculations with a round link chain could be proven in Ensdorf by the results achieved under practical conditions. Also, the noise development at the plant has not changed negatively until today. Since the power plant is located near a residential area, the noise development for the new conveyor system was not allowed to exceed a value specified by the environmental authority.

Experience has shown that a scraper conveyor with long-link roller chains produces a constant "rattling noise" due to the polygon effect of the chain sprocket. Due to the considerable noise pollution caused by the conventional chain sprocket, the conveyor system in Ensdorf would not have been commissioned at the time without the housing. Therefore, it was decided to equip the scraper conveyor with the self-adjusting chain sprocket.

The sound measurements carried out by TÜV Süddeutschland (expert opinion no. L 4687) showed that no further sound insulation measures were necessary.



Use of the "self-adjusting chain sprocket" in a scraper conveyor of the Ensdorf coal-fired power plant

Advantages and extended form

Inventor Karl Herkenrath, now 73 years old but still young, is pleased that no repairs have yet been necessary in Ensdorf due to wear on the chain and self-adjusting chain sprocket. This proved that the selfadjusting sprocket adapts to the different conditions of the chain and chain pin. Fewer repairs also mean less downtime, which is essential for continuous use of the conveyor system.

Herkenrath sees another advantage of his invention in the fact that the self-adjusting sprocket can also be retrofitted into a wide variety of systems, such as conveyor systems and escalators with long-link roller

chains, since the tooth shape of the self-adjusting sprocket is almost identical to that of a conventional sprocket. The only difference is that with "his" sprocket, the individual teeth are movably arranged and can therefore adapt to the different conditions of wear and elongation. Each individual tooth can perform minor rotational movements, which it then transmits to the neighboring teeth. The power transmission is not taken over by the first meshing tooth only, as is the case with a conventional sprocket, but by several teeth simultaneously.



Dismantled chain pins show no signs of wear after long service life

The self-adjusting sprocket in extended form was newly registered as a patent at the German Patent and Trademark Office in 2010 (**note to be** read 2011) and at the European Patent Office as a "self-adjusting drive sprocket".

Herkenrath offers professional advice to all interested parties. On the basis of a drawing of the conventional sprocket and other technical data, the inventor submits a free offer for the use of the self-adjusting sprocket. Contacts can be made by e-mail at <u>info@selbsteinstellendes-kettenrad.com</u> or via the homepage at <u>www.selbsteinstellendes-kettenrad.com</u>

literature

1] A patented sprocket. Less wear - lower costs. Lifting and handling equipment, Berlin 39 (1999)5, p. 230.

Chapter 8

My "next attempt" at the German Chain Industry

After I had filed a new patent application in 2011 and the patent was granted on January 7, 2015, I made a new "start" via the chain industry and offered the new patent to the individual companies for purchase, of course with reference to the success in the Ensdorf power plant.

I also wrote to Ketten Wulf, who had tested the predecessor patent over a longer period of time and - as you already know from the previous chapters - had produced an investigation report with VERY GOOD RESULTS.

Initially, Ketten Wulf did not react to my offer at all. They didn't even think it necessary to answer me at all.

Some of the companies I wrote to at the end of January / beginning of February 2015 contacted me and we arranged a visit to the respective companies to present the patent there. Here are some examples:

My 5th episode with the company RUD

Some other chain manufacturers, among others the company RUD invited me in February 2015 to a conversation on the Peace Island in Allen.

This date in February 2015, I took this date together with my wife and there they managed to let me hold a detailed lecture about the selfadjusting sprocket, they pretended to be "totally stupid", when you had never heard anything about this sprocket! And this despite the fact that I had already presented the predecessor patent at RUD there several times in 1995, 1999, 2001 and 2003.

On this occasion we also talked about the many years of attempts at Ketten Wulf and Mr. Wesch "slipped away" the remark:

"Mr. Wilke said at the time that sooner or later we wouldn't get past this self-adjusting sprocket."

A few days later, he received an e-mail with the remark "that RUD is continuing on its path".

Contact by the company IWIS

I had also written to the company Iwis in Munich, which according to a publication in "Merkur" on 11.4.2009 had published that 40 kilometers of chains leave the workshops of the company Iwis in Munich every day. Thus, timing chains for more than 30,000 cars were delivered there every day.

⁴⁾ Source: Merkur, 11.4.2009

To my surprise, on February 4, 2015, I received a call from the managing director, Mr. Johannes Winklhofer, who wanted to consider taking over my patent because, according to his statement, he did not want to rely on the findings of Ketten Wulf.

Under the 20.2.2015 I find in my documents the following E-Mail to Mr. Johannes Winklhofer of the company IWIS, which I give here once again:

"Dear Mr. Winklhofer,

I will come back to your call from 4.2.2015 and would like to inquire briefly whether you have already had time to deal with this matter.

Parallel to my offer to the chain industry, I recently started to offer the patent for sale to other branches of industry, such as large machine factories etc., as I assume that these companies are not interested in who manufactures and sells which chains and to what extent.

For this action I have set a date for the end of April. If the patent cannot be sold by the end of April at a price commensurate with the invention and the resulting possibilities for the industry, I will start at the beginning of May to inform all operators - initially in Europe - about the invention, to show them the economic advantages and of course to point out that the chain industry has been informed about the considerable reduction in wear since 2003, but the operators are deliberately not informed about these considerable advantages, because of course they want to sell kilometer-long chains and the wear is naturally of little interest to one.

I invented this patent, have worked intensively on it for many years, had at first only the research report (theoretical and practical) from Ketten Wulf (Fraunhofer Institute), but now after more than 13 years I finally have the practical proof, how good this sprocket is and I will leave no stone unturned to bring this sprocket onto the market.

In the meantime, I am increasingly assuming that the chain industry is not interested in a much more economical solution for the operator, as it naturally wants to sell chains and a reduction in wear is not of interest to the chain industry. Perhaps it is different in your work, but my previous experience has shown that.

If you are interested in acquiring the patent, please contact me.

I hope you have a nice weekend and remain

with kind regards"

This e-mail was shortly followed by the reply that the tests had not yet been completed. After that I haven't heard from the company IWIS.

I knocked on the door of the machine and plant manufacturers.

At the same time, I had made the completely senseless effort to offer the patent to about 1,000 larger companies, mainly from the mechanical engineering industry, because I thought for a moment that a manufacturer outside the chain industry could also sell this sprocket.

The reactions to this round disk were positive throughout, people were taken with my idea and that would have been possible without further ado. Here, however, the essential factor of spare parts sales must not be ignored, so that in my opinion neither the chain industries nor plant manufacturers can be interested in a wear-reducing invention in order not to evade the business themselves.

The other companies were companies, mainly from the mechanical engineering sector, which had nothing to do with chains and were therefore not interested in such a patent.

I thought about marketing the self-adjusting sprocket myself.

After it was finally clear to me that I would not make any progress with the chain industry and that mechanical and plant engineering was out of the question, I first had the idea of selling my self-adjusting drive sprocket, patented in January 2015, on my own.

Dillinger Hütte came to mind as one of the first contacts. This is a smelting works in Dillingen an der Saar, which still had more than 5,000 employees in 2015. I had been there years before and knew that Dillinger Hütte had many chains in use.

I made an appointment with a friendly gentleman from the Central Services department and drove with my wife to Dillingen. This man immediately understood the advantages of the self-adjusting sprocket and promised to get me involved with the management to ensure that one or two systems would be equipped with this self-adjusting sprocket as soon as I made him an offer with the cost of this selfadjusting sprocket.
The difficulty to find a manufacturer for sprockets

Then I immediately went to work and tried to find a manufacturer of sprockets who could build this self-adjusting sprocket.

However, this project turned out to be extremely difficult and dragged on forever until I realized why it was so.

Here I am now of the firm conviction that I would not have found a manufacturer for this sprocket at all with the relevant sprocket manufacturers, who would have built the self-adjusting sprocket, since these are dependent again on orders from the chain industry. Nobody said that so clearly, but it's obvious to me.

Another problem of a "small inventor" is that as a "Mister No Name", as it were, it is very difficult to reach those responsible at the operators. But I had managed to get an appointment with RWE near Bergheim to present the self-adjusting sprocket there.

So, I prepared myself again for a lecture, presented the advantages of this self-adjusting chain sprocket to some gentlemen there in detail, when suddenly the mindless question came from the last bank: "Do we need this then?

At the beginning of 2015, even a smaller chain manufacturer from the Ruhr area drew my attention to this attitude of individual companies.

Nowadays only a few people feel truly connected to their employer, most of them only do service by the book. However, this completely overlooks the fact that this disinterest may risk one's own job.

My unpleasant experiences with Ketten Wulf - continued

Mail from Ketten Wulf on 14.4.2015

After I had started to make the newly granted patent known worldwide, I received mail from the patent attorneys and lawyers FRITZ from Arnsberg as a representative of the company Ketten Wulf. Remember, Ketten Wulf were the "gentlemen" who tested and tested the predecessor patent. First came the registered letter with acknowledgement of receipt dated 14.4.2015, reproduced below:

.."14.4.2015

Ketten-Wulf Betriebs-GmbH ./. company Karl HerkenrathPublication of investigation report and others

Dear Mr Herkenrath,

we represent Ketten-Wulf Betriebs-GmbH, Zum Hohenstein 15, 59889 Eslohe, Germany. A corresponding power of attorney is guaranteed by a lawyer.

In the name and on behalf of our client we have the following to inform you:

1st investigation report

Our client has been made aware by customers that you are not able to access any information on your website.

www.selbsteinstellendes-kettenrad.de

to make our client's investigation report available to the public. We have attached the investigation report in question as Annex 1 to this letter. The investigation report could be freely downloaded from the above-mentioned website, where your company is listed in the imprint, on the date of dispatch of this letter.

a)

By publishing this investigation report, you are violating general confidentiality obligations between contractual partners.

As you may know, there was a license agreement between you and our client concerning the patent for a self-adjusting chain sprocket (still named here under the European patent application 98 118 346.1 publication number 0 599 156 A1).

Although the contract has been terminated, there is a general obligation of confidentiality for contractual partners, in particular license contract partners, even beyond the end of the contract. It follows the principle of good faith and the duty of consideration of contractual partners, §§ 241 II, 242 BGB.

The investigation report in question was handed over to you in accordance with the agreement (§ 3.5 of the license agreement). Nevertheless, it can be seen from the distribution list that the investigation report is to be treated confidentially, since only one final group of persons is named for its distribution. Furthermore, our client did not consent to the publication of this investigation report, so that by publishing this investigation report you have breached your duty of confidentiality.

b) Furthermore, by publishing the investigation report entrusted to you, you violate competition law regulations.

There is no question that you and our client are competitors if you offer sprockets or even just construction plans or patents for the

construction of sprockets and our client - as you may know - designs and distributes chains and in particular sprockets.

According to § 18 I UWG, anyone who makes unauthorized use of the technical documents or regulations entrusted to him in the course of business for the purposes of competition or for self-interest or communicates them to someone shall be punished with a custodial sentence of up to two years or a fine.

Within the framework of the license agreement between you and our client, it was agreed under § 3.5 that after completion of the test, the complete test results shall be handed over in copy to the licensor. In this respect, you have been entrusted with technical documents or regulations of a technical nature in the course of trade, which you, however, use without authorization for the purposes of competition and communicate to the public. This act is unauthorized because you have not been granted permission to do so by our client.

A violation of § 18 I UWG also releases the liability according to § 3 I i.V.m. §§ 4 No. 8 I and 9 UWG, as well as § 823 II BGB.

c) You also violate copyright regulations by publishing the investigation report.

The research report is a copyrighted work within the meaning of § 2 I No. 7 UrhG, namely a representation of a scientific or technical nature which represents a personal intellectual creation of the author.

The research report represents a personal spiritual creation, in that it first precedes our client's logo on the first page in the upper left corner. The preparation of the results is also creative and not purely technical, in that text blocks and tabular results are presented alternately with pictorial material.

Furthermore, the illustrations in the investigation report are photographs in accordance with § 72 I UrhG.

You publish the copyright-protected investigation report without being entitled to a suitable right of use, i.e. unlawfully. You also published the report in the knowledge that it was unlawful, as you had to be aware that you did not have the right to use the report.

Pursuant to § 97 UrhG, the person who unlawfully infringes the copyright or another right protected under the Copyright Act may be sued by the infringing party for the removal of the impairment, or for an injunction if there is a risk of repetition. In addition, anyone who acts intentionally or negligently is obliged to compensate the injured party for the resulting damage.

2nd "Inventor's Comment on this from the Year 2015"

Furthermore, our client has noticed that in the "Inventor's Commentary on this from the Year 2015" on the above-mentioned website, among other things, you are mentioning:

"The fact is, however, that after testing the self-adjusting sprocket over a period of several years, one apparently came to the conclusion that one did not want to market this sprocket because it was obviously too good and one was understandably primarily interested in selling chains. This also results from the devastating results with conventional sprockets in comparison to the self-adjusting drive sprocket from the investigation report, which is also published here, see "Investigation report". (Appendix 2).

a) With these remarks you violate competition law regulations, in particular § 4 No. 7 UWG.

Accordingly, anyone who disparages or denigrates the marks, goods, services, activities or personal or business circumstances of a competitor is acting unfairly.

They introduce there with the words "*Fact is however...* a factual assertion, which is however untrue in its conclusion and is only therefore generally degrading or denigrating. It's not true that they "didn'*t want to market* your self-adjusting sprocket *because it was obviously too good and you were understandably primarily interested in selling chains*".

b) With these statements you simultaneously violate § 4 No. 8 UWG.

Pursuant to § 4 No. 8 UWG, anyone who claims or disseminates facts about a competitor's enterprise which are likely to damage the enterprise's operations or the enterprise's credit is acting unfairly unless the facts are demonstrably true. These requirements are also met.

3. Offer to buy a patent

Our client has received a letter sent by you to a company for 'Absaug-Oberflächen- und Filtertechnik' in which you offer your newly registered patent "Offer to purchase a patent". (Appendix 3). It says, among other things:

"A well-known chain manufacturer, Ketten-Wulf, tested the selfadjusting sprocket extensively in its laboratory between October 2001 and January 2003. There is a detailed report on this, which I would be happy to send you if you are interested. The results speak for themselves and of course this chain manufacturer was and is not interested in reducing the wear of its chains".

With these remarks you also violate competition law regulations, in particular § 4 No. 7 and No. 8 UWG.

Here again the activities of our client, i.e. a competitor, are reduced and denigrated. On the one hand, it is not true that Ketten-Wulf is not interested in reducing the wear of its chains. Furthermore, the factual assertion that "...naturally, this chain manufacturer was and is not interested in reducing the wear of its chains" suggests the existence of a negative business model, namely that our client deliberately distributes sprockets with unnecessarily high wear in order to generate corresponding sales. This assertion is also denigrating and disparaging according to § 4 No.7 UWG.

Also, the statement quoted above "... naturally this chain manufacturer was and is not interested in a wear reduction of his chains" fulfills the fact of the denigration according to § 4 No. 8UWG, since it is suitable because of its negative and otherwise untrue statement to damage the operation of our client. It is obvious that clients who would believe this untrue factual claim would be reluctant to place orders with our client regarding sprockets.

4. Declaration of discontinuance and undertaking Our client will not accept the above-mentioned breaches of competition and copyright laws, or breaches of general confidentiality obligations, and hereby requests you to make a cease-and-desist declaration. We enclose a wording proposal.

...."

Comments on this letter:

In the above-mentioned letter, Ketten Wulf accuses me of having used documents entrusted to me for self-interest and of having communicated them to others. That this is somehow "embarrassing" for a manufacturer who tested a patent for four years that still works today after more than 16 years is something I can well imagine, of course, but threatening me with imprisonment is not just nonsense, it's a lot of impudence.

I see it in such a way that I left MY invention to Ketten Wulf as licensee in trust in "good faith" in order to make something out of this patent for the benefit of the operators! At the time I was not interested in "making" a lot of money out of the patent, otherwise I would not have agreed to such ridiculous rewards.

With regard to the §§ 241 II, 242 BGB cited above, I have been accustomed for two years to examining the pleadings of the other side in detail, especially with regard to cited paragraphs or ancient decisions of higher regional

courts, since I simply would not have thought it possible until then that about 50% of the pleadings submitted to the court were simply invented and lied to me.

With interest in a fraudulent craftsman botched you throw nevertheless once a view of the following homepage: www.eifeluebersetzungen.com

My wife is currently writing another factual report on this case, which will also be published as a book in a few months' time. Until then, the events are listed as a kind of "diary" on the above-mentioned homepage. Let us return to the aforementioned letter from the patent attorneys and attorneys at law Fritz dated 14.4.2015.

Well trained by the experiences with this charlatan of craftsmen I have just looked in the Internet once after the mentioned paragraphs and notice there the following:

§ 241 Obligations arising out of the contractual obligation

(1) ¹ The creditor shall be entitled to claim performance from the debtor by virtue of the obligation. ²The benefit may also consist of an omission.

2. The obligation may, by virtue of its content, require any party to have regard to the rights, interests and interests of the other party.

§ 242Performance in good faith

The debtor shall be obliged to effect performance in such a way as to be fair and faithful, having regard to custom and usage, requires.

Was I a "debtor" of Ketten Wulf or do the chain industry and the plant manufacturers owe the many operators the use of a considerably wear-reducing patent, whereby a small contribution to the preservation of Germany as a business location would be possible?

§ 823Duty to pay damages

(1) Anyone who intentionally or negligently injures the life, body, health, freedom, property or any other right of another person unlawfully shall be obliged to compensate the other person for the resulting damage. (2) ¹The same obligation shall apply to any person who violates the protection of another law. ²If, according to the content of the law, an infringement of this law is possible without fault, the obligation to pay compensation shall only apply in the event of fault.

Another hint to the "photographs" from the investigation report:

§ 72 Pictures

(1) Photographs and products similar to photographs shall be protected in accordance with the provisions of Part 1 applicable to photographic works.

2. The photographer shall have the right under paragraph 1.

3. ¹The right referred to in paragraph 1 shall expire fifty years after the photograph has appeared or, if its first authorized communication to the public has taken place earlier, after the photograph has appeared, but already fifty years after its production, if the photograph has not appeared or has lawfully been communicated to the public within that period. ²The period shall be calculated in accordance with section <u>69</u>.

The fact that the invention was successful could undoubtedly already be seen from the investigation report of 20.3.2003. The final report, which in my opinion should have been even better, was no longer handed over to me.

And from today's result that the self-adjusting chain sprocket patented by me still functions perfectly after more than 16 years in the portal scraper in Ensdorf, one can probably draw no other conclusion, at least that's how I see it.

According to the above letter, the investigation report was a copyrighted work of the Ketten Wulf company, but the patented self-adjusting chain sprocket was a personal intellectual creation of mine.

I was never interested in harming Ketten Wulf in any way, I just wanted to make it clear that at least this company knew exactly about the sprocket I had developed and patented.

I do not want to tire the reader with the further mutual writings.

Action brought by Ketten Wulf on 19.6.2015

On 15.7.2015 I was served with a complaint by Ketten Wulf from the Cologne Regional Court. I reproduce this application in its entirety below, which is further evidence of how "small inventors" are treated by industry in Germany:

",,19.06.2015

"statement of claim

of the company Ketten Wulf ...

represented by: FRITZ Patent- und Rechtsanwälte Partnerschaft mbH, ...

against

Mr. Karl Herkenrath, In der Hardt 23, 56746 Kempenich, Germany

-defendant -

unfair competition (reduction, disparagement, etc.)

Amount in dispute: provisionally estimated EUR 75,000.00

In the name and on behalf of the plaintiff, we bring an action and claim:

the defendant is ordered to refrain from imposing a fine of up to EUR 250 000.00 on the defendant, or up to six months as an alternative on the defendant in disciplinary detention, in the course of business activities, if a fine of up to EUR 250 000.00 is to be imposed by the court on the defendant for each case of infringement of the rules

1.

to establish and disseminate the claim that the applicant is not interested in marketing the defendant's self-adjusting sprocket because it would thereby sell fewer chains, in particular as shown in Annexes K6, K7 and K8;

2.

to inform third parties, in particular competitors, of a dispute between the parties without cause and without explanation of the objective facts, in particular as happened in Annex K13;

З.

reproduce and/or make publicly available, without the consent of the applicant, the investigation report in accordance with Annex K3.

4.

to provide information and invoice to whom the allegations pursuant to Section I.1. were made, who was informed of the dispute pursuant to Section I.2. and where and for how long the information was made publicly available and how often the reproduction pursuant to Section I.3. took place

III. To compensate the applicant for all damage which it has suffered and will continue to suffer as a result of the acts referred to in points I.1 to I.3 above.

IV.

Orders the defendant to pay the costs.

Justification:

The plaintiff was founded in 1925 in Kückelheim (Sauerland). In its 90year history, it has developed from a simple link chain manufacturer to one of the world's leading manufacturers of conveyor chains, drive chains and sprockets.

Over 1,400 employees at locations in Europe, America and Asia develop, produce and distribute individual solutions for the plaintiff in the field of conveyor and drive technology.

Today, the plaintiff's high-quality products are used all over the world in a wide variety of industries. The plaintiff's family business sees itself as responsible for its employees and all people in its corporate and location environment. The applicant also assumes responsibility for the region. After all, it sees itself as responsible for training the next generation. She founded a training center and currently employs 67 trainees.

The plaintiff also attaches great importance to environmental policy.

Continuous research and development and quality initiatives ensure that the applicant's products are of the highest quality.

All in all, these factors justify the applicant's excellent reputation.

Proof of the good reputation: expert opinions

As **Annex K 1**

we attach press reports and extracts from the applicant's website.

II.

The defendant developed a so-called "self-adjusting chain sprocket" in 1993. For this development, the European patent application "Self-adjusting drive sprocket" was filed with the file number 93 118 346. This notification was abandoned in 2006. After further research and testing, the defendant filed a patent application in 2010 for a further developed sprocket (EP 2594 824 and DE 10 2011 118 515). For years, the defendant has been trying to market the patent himself. He contacts and visits chain manufacturers to introduce them to the self-adjusting sprocket.

The defendant is 75 years old today. He makes intensive efforts to sell or license his patent.

In doing so, however, he unnecessarily and inadmissibly disparages and denigrates the plaintiff. He also publishes documents requiring secrecy in an inadmissible manner.

It also informs competitors of the current situation without there being any reason to do so. The applicant contests that decision. III.

The parties are competitors. The applicant develops, manufactures and distributes chains and sprockets. The defendant applies his patent to sprockets and their technology and seeks a buyer who will ultimately apply the patent. According to his own statements, the defendant has already written to over 5,000 companies. In addition, he continuously posts information on his website <u>www.selbsteinstellendes-kettenrad.com</u>. As

Annex K2

we attach the defendant's offer to purchase EP 2 594 824 or to take a license.

The parties are therefore in competition with each other in the field of chain and sprocket technology.

IV.

The parties briefly cooperated between 2001 and 2005. The plaintiff had the technical possibilities to test the wear behavior of the sprockets developed by the defendant on a so-called chain load simulator. During the trial period from October 2001 to January 2003, corresponding investigations were carried out. We attach a copy of the applicant's investigation report of 20.03.2003 as

Annex K3

at.

Meanwhile, in April 2002, the parties signed a license agreement for the use of a European patent application concerning a self-aligning chain sprocket. A copy of the contract will be attached as a

Annex K4

at.

However, the plaintiff exercised its right of termination in 2005.

Although the test series initially led to some positive results, the invention of the defendant was ultimately of no interest to the plaintiff. In practice, the sprockets did not deliver the desired results.

During a project in Venezuela in 2002, it was discovered that the use of self-adjusting sprockets with an even number of teeth causes

problems. The defendant therefore recommended the use of fixed bolts. For the plaintiff, this meant that it could also use a normal segment sprocket, so that the self-adjustment function became obsolete.

We attach a copy of the note on this subject of 19.12.2002 (signed by *Mr Wilke from the applicant) as* **Annex K 4 a.**

In a project in Brazil, the self-adjusting sprockets were tested in abrasive material and later replaced by normal segments, as no significantly longer service life was found compared to normal sprockets. The structure with the filigree mechanical tilting elements appeared doubtful for the abrasive and dusty or sticky use in bulk solids.

After the chain has run into the first tooth gap of the self-adjusting chain sprocket, the full chain tension still acts on the chain link, so that the plaintiff is of the opinion that the chain sprocket does not reduce wear.

Proof: Expert opinion

The cooperation between the parties thus ended in 2005, and since then the defendant has repeatedly tried to market his invention.

It is the good right of the defendant to market his invention and to offer his patent applications or patents for sale to third parties.

However, it is contrary to the legitimate interests of the applicant if it disparages and denigrates the applicant, publishes confidential documents and also communicates the current dispute to third parties.

V.

First, the applicant's reduction is set out by the defendant.

As Annex K 5

we hand over a printout of the defendant's website <u>www.selbsteinstellendes-kettenrad.com</u> from the homepage of the defendant's homepage.

As

Annex K 6

we hand over a printout of the article "Development of the selfadjusting drive sprocket".

There he first describes the development of the drive sprocket until the middle of page 2. Then it says:

"After several discussions and lectures the company Ketten Wulf decided on 17.04.2002 to conclude a contract with me to carry out further tests, which also happened. This contract was then terminated on 26.08.2005 without giving reasons.

If you look at the **investigation report**, the reasons are obvious: the reduction in wear was considerably greater (**at least 30 %**) than could have been foreseen by Ketten Wulf and there was no interest in such a large reduction in wear.

If you read the article by Ketten Wulf from the year 2002, see the **publication of the company Ketten Wulf on my homepage,** then the self-adjusting chain sprocket is praised in the highest tones, which also corresponds to the facts.

Towards the end of the investigation, however, it had to be said in this company that we had "leaned out of the window" far too far when writing this report, we want, despite all the **alleged understanding of the poor operator who has to change chain and sprocket frequently, which is associated with considerable costs, not to** forget of course our turnover. We are chain manufacturers and wear reduction back - wear reduction back, but it should not go so far that a

wear reduction of at least 30% is apparent here! (emphasis in the original).

Elsewhere, it is stated in an unanswered letter to the applicant:

"Ketten Wulf: The first company to write to, as they had done the investigation at that time, see above, at least 30% signs of wear. There was no reaction at all from here, although I have learned that there is a "deep frost" alert there.

On the same website you can find a "Commentary of the inventor Karl Herkenrath from the year 2015", which we call the "Commentary of the inventor Karl Herkenrath from the year 2015".

Annex K7

It says, among other things:

"The fact is, however, that after testing the self-adjusting sprocket over a period of several years, one has apparently come to the conclusion that this sprocket should not be marketed because it was obviously too good and one was understandably primarily interested in selling chains. This also results from the devastating results with conventional sprockets in comparison to the self-adjusting drive sprocket from the investigation report, which is also published here, see "Investigation report".

I was then only verbally told in July 2004 (**note from me: that must mean 2005**) that they were not interested in a further cooperation with me, completely without giving any reasons "But the reasons are obvious".

In his efforts to sell his patents and commercialize his development, the defendant also uses cover letters, as they are known as

Plant K8

are attached. According to his own statements, the defendant has sent such a letter as the one to the company Schuko H. Schulte-Südhoff GmbH in Bad Laer to over 5,000 companies. It says, among other things. "A well-known chain manufacturer, Ketten-Wulf, tested the selfadjusting sprocket extensively in its laboratory between October 2001 and January 2003. There is a detailed report on this, which I would be happy to send you if you are interested. The results speak for themselves and naturally this chain manufacturer was and is not interested in reducing the wear of its chains.

. . .

...

... (the dots are in the statement of claim)

I am in parallel negotiations with some chain manufacturers, but I am of the opinion that the chain industry is still not interested in marketing the self-adjusting drive sprocket, as this of course represents a certain conflict of interest.

The invention enables the operators of such plants to change the chains only at longer intervals, which of course means considerable financial savings.

Chain manufacturers can of course sell fewer chains as a result and have had some difficulty in offering this considerably improved system so far."

In these representations, and in particular in the passages cited above, the defendant accuses the plaintiff of rejecting the defendant's selfadjusting sprocket, if necessary, in consultation with other chain manufacturers (see 'the chain manufacturers'), in order to be able to sell more chains in its own interest.

This constitutes an unfair reduction of the plaintiff as a competitor pursuant to §§ 3, 4 No. 7 UWG. It states that anyone who disparages or denigrates the goods, services, activities or personal or business circumstances of a competitor is acting unfairly.

The reproach of allegedly not using innovative ideas to profit from the sale of additional chains is dishonorable and suitable for disparagement and disparagement. The accusation is similar to the accusation against the so-called light bulb cartel (also called Phoebus cartel). In 1924, this association of lamp manufacturers is said to have defined and technically implemented a maximum service life of 1,000

hours for light bulbs, although a longer service life was possible. Allegedly, this was for the benefit of the customer, ultimately to maximize profit. Today, this fact is discussed as "planned obsolescence", i.e. targeted wear and tear of products.

The applicant strongly rejects the allegation of 'planned obsolescence'.

The defendant's allegations create a serious risk that the applicant will also be accused of 'planned obsolescence' and that this will damage its excellent reputation.

It is particularly reprehensible that in 2015 the defendant is still resorting to a short cooperation that dates back more than 10 years. The defendant has no legitimate interest whatsoever in communicating the transactions to third parties in order to promote his sales success.

It is obvious that nobody is interested in the developments and inventions of the defendant. His invention has only been technically implemented once. We present an article from the trade magazine "Hebezeuge, Fördermittel, Berlin 55 (2015)".

Annex K9

It reports on the futile efforts of the defendant.

The plaintiff never tried to hinder the marketing of the defendant's inventions. It is therefore all the more reprehensible if the defendant now instrumentalizes a business relationship dating back a long time in order to establish a conspiracy theory which is ultimately intended to lead his sales efforts to success at the plaintiff's expense.

In a weighing within the framework of the proportionality test, the behavior of the defendant must be regarded as unfair. He claims, without any evidence and in the manner of a conspiracy theory, that the applicant, on the principle of 'planned obsolescence', rejects the use of its chain sprockets and promotes the sale of its own chains and thus acts ultimately reprehensible and harmful to the public. The statements are also not to be evaluated as expressions of opinion, since the assertions are presented as facts and in the published statement of the defendant are also described as facts ("Fact is...", cf. Annex K7).

The principle of competition law is that anyone may offer his goods and services by highlighting the merits of his products or services, including, where appropriate, in the context of a settlement. This principle is violated by anyone who disparages or denigrates the products or services or the business relationships of others in order to advertise their own products or services. This applies in particular if the assertion suitable for disparagement and disparagement relates to a fact that occurred more than a decade ago and is only exploited in one's own interest. There is no legitimate interest in disseminating this assertion, for example for the purpose of correction or clarification.

VI.

In a letter dated 14.04.2015, the defendant was warned, among other things, against these statements. We will attach a copy of the warning letter as a

Annex K 10 at.

The corresponding explanations can be found under section 2.

The defendant replied by letters of 15 and 16.04.2015, which we consider as

Annex K 11

attach.

The defendant first comments on the published investigation report (see below). However, it is clear from the reply that the defendant's sole concern is to put the applicant under pressure. On the last page of the letter of 15.04.2015 it says:

"If I hear anything else from you, then I will set up a new link on my homepage, which is called: Reaction of the company Ketten Wulf to the publication of the investigation report, both in German and English. As a first contribution I will post your letter of 14.4.2015 as PDF there. Or is your letter of 14.4.2015 also "secret"?" In his letter of 16.04.2015, he again pointed this out and added:

"I cannot imagine that this is advantageous for your client if it is always stated here, unfortunately the investigation report cannot be published.

• • •

. . .

... (the dots are in the statement of claim)

You can think about that, and if you prefer, if the homepage is possibly changed as mentioned above, I will get legal advice and will change the homepage accordingly, always with reference to the investigation report, which cannot be published, but the investigation results with the super results for me cannot be denied".

Subsequently, the defendant mentions that he has so far offered the patent to 3,765 companies worldwide. He threatens to write to these companies again with reference to the warning.

The plaintiff wanted to avoid an escalation. In a letter dated 23.04.2015, she made it clear that she was not interested in hindering the defendant in the sale of his patent.

It would only be a matter of not being reduced in the manner undertaken by the defendant (and not publishing the investigation report, see below).

A copy of this letter dated 23.04.2015 will be added as Annex K 12 at.

Subsequently, by letter of 27 April 2015, the defendant replied in accordance with

Annex K 13.

In it he confirms that to date 5,200 companies have introduced the chain sprocket and that it continues every day. On page 5 it is again threatened that statements of the plaintiff will in future be placed on a new link in the homepage.

This will certainly make an impression on the operators of the plants and will certainly not be an 'advertisement' for the plaintiff, it says. Also, on page 7 this threat is repeated once more.

VII.

At the end of this letter dated 27.04.2015, it is noted that several of the plaintiff's competitors named in the letter received a copy of the letter for information. The defendant thus informs competitors of the plaintiff of the dispute concerning the investigation report and the reduction without any reason. It also refers to the homepage <u>www.selbsteinstellendes-kettenrad.com</u>, where the defendant's note can also be read.

It is unfair to inform the plaintiff's competitors without any reason pursuant to the letter of 27 April 2015. If two parties are at odds, this is initially only a matter for both parties. The sending of a letter to competitors, which is entirely one-sided and is to the detriment of the applicant, without further explanation, is also liable to disparage or denigrate the applicant in the eyes of the competitors and to denigrate it there, Paragraphs 3, 4(7) and 4(8) of the UWG.

In the context of a weighing up, it must also be taken into account here that the contacts between the parties have already ended 10 years ago and that there is no reason at all to involve third parties, in particular not direct competitors. This serves only to exert pressure on the applicant and is therefore unfair per se.

VIII.

The plaintiff does not only defend itself against the disparagement, denigration and denigration, but also against the dissemination and public disclosure of the 2003 investigation report. It is to be assumed that an implied non-disclosure agreement was concluded between the parties during the cooperation.

Due to the cooperation, a relationship of loyalty and trust existed within the framework of which tacit secrecy is regularly agreed upon (cf. BGH 1963, 181, 183 - Stapelpresse). This applies in particular in cases of joint development and research (cf. BGH GRUR 1978, 297 - Hydraulic chain belt drive; BGH Mitt. 1999, 362 – Herzklappenprothese (Heart valve prosthesis); BpatG GRUR 1998, 653 - Adjustable vibration damper for motor vehicles; BGH GRUR 1993, 466, 468 - Preprint dispatch).

According to case-law, it is considered common practice that the parties to such cooperations naturally assume a non-disclosure agreement and refrain from a written agreement. This conviction is also supported by the fact that according to life experience with a new technical development, a common interest of all those involved in secrecy is to be expected (cf. BGH GRUR 1978, 297, 299 -Hydraulischer Kettenbandantrieb).

A legitimate interest of the defendant does not exist. He is promoting the sale of a patent he filed in 2010. The investigation report from 2003 cannot therefore concern this patent application. At that time, a patent applied for in 1993 existed, which the defendant abandoned in 2006.

Anyone wishing to acquire a patent application from 2010 is probably not interested in an investigation report from 2001 to 2003. The defendant is trying to establish a connection here that does not exist in this way.

However, publication is not only prohibited by tacit agreement. The investigation report contains photographs in which the applicant's photographic rights are reserved for exclusive use. The defendant was not granted public access.

The investigation report itself also enjoys copyright protection at least according to the principles of the "small coin" and may not be made publicly accessible without the consent of the plaintiff.

IX.

The plaintiff tried to avoid litigation. However, the defendant considers that it cannot market its 'invention' without disparaging the applicant and without publishing the confidential investigation report. The defendant does not wish to acknowledge the applicant's legitimate interest and even threatens to continue denigrating the applicant. Therefore, the applicant considers that an action is the only way to enforce its rights.

Х.

The court seised has local jurisdiction, since the defendant carries out the contested acts throughout the country. He spreads them over the Internet and sends thousands of letters.

XI.

To pay the court costs we enclose a crossed cheque in the amount of EUR 2.358,00.

signed Hoffmann -Lawyer-"

So much for the statement of claim.

Note to the application

I leave it to the reader to think his part on this.

The following should be said about the investigation report:

The only document I published was the investigation report of 20.03.2003, which was sent to me. It had been contractually agreed that this had to be sent to me for free use, which also happened. There was no non-disclosure agreement between Ketten Wulf and me.

As far as the photo rights to the pictures are concerned, I can imagine very well that nobody should get knowledge of these pictures, because on the chain simulator 500,000 flexures were simulated over an operating time of 2 years and ALL pictures of the self-adjusting chain sprocket developed by me showed quite considerably less wear than the conventional chain sprocket.

The investigation report ended with the following text (result):

<u>"Result:</u>

As can be seen from the evaluations and the diagram, all test samples on the Herkenrath chain sprocket show less wear compared to the Wulf chain sprocket. Furthermore, it can be seen from the tests that the Herkenrath chain sprocket has a particularly positive effect on increased wear.

Kückelheim, 06.02.03"

Quote from Joseph Pulitzer

I would like to close this chapter with a quote from Joseph Pulitzer (* 10 April 1847, † 29 October 1911).

"There's no crime, no trick, no fake, no vice, no trick that doesn't live from secrecy. Brings these secrets to light, describes them, makes them ridiculous before all eyes. And sooner or later, public opinion will sweep them away. It may not be enough to make a name for oneself but it is the only means without which all others fail."

By the way, Joseph Pulitzer can be safely quoted because he died in 1911.

Notes on the "Bauxilium" project in Venezuela

The statement of claim referred to a project in Venezuela in which the use of the self-adjusting sprocket did not lead to the desired success.

This is true and has the following background:

At the time I was employed at Thyssen Krupp as a designer and was also entrusted with the "Bauxilium" project. To my superiors at that time I **pointed out several times quite decidedly that** with this project a **self-adjusting chain sprocket with a UNGERADEN number of teeth** should be inserted, since in this case a chain sprocket with an even number of teeth was not suitable in my opinion.

However, one of my colleagues, who was a little disappointed, managed to get a sprocket with an even number of teeth built into this project against my express protest, probably because the planning for this project was largely completed and the number of teeth no longer wanted to be changed.

See also:

Letter of 31 December 2002 to Ketten Wulf concerning BAUXILIUM

Chapter 6), from which I quote the most important passages below:".

"... necessary changes to the BAUXILIUM order with explanation and sketch attached.

... Which system, whether with even or odd number of teeth, adapts better to the chain load and thus has less wear, can only be answered under operational conditions (under dynamic loads)".

It is quite conceivable that this sprocket makes sense even with an even number of teeth, it depends on the application, e.g. with several idler pulleys, where this advantage can then be used. It is also conceivable to use the self-adjusting sprocket for large gear sprockets or drive rods in order to distribute the load over several teeth and reduce wear. This, however, requires further research, which I believe could have been carried out over a period of four years.

With regard to the case in Brazil, which has also been mentioned, I do not recall that. By the way, it is quite possible that in a possibly existing application in Brazil the sprocket was simply not built correctly or there are other reasons.

In any case, it is an undeniable fact that the Ensdorf power station has been using a portal scraper since 2001, which works perfectly with two self-adjusting sprockets developed by me and a chain from Ketten Wulf. In my opinion, this puts the following statement ad absurdum.

"The structure with the filigree mechanical tilting elements seemed doubtful for the abrasive and dusty or sticky application in the bulk material sector".

I think there is no better proof of the absolute suitability of the self-adjusting sprocket than the Ensdorf power station, where the two self-adjusting sprockets installed there have worked perfectly with the same Ketten Wulf chain for over 16 years.

Considerations on my part on the four-year investigations at Ketten Wulf

As far as the investigations and allegedly planned marketing at Ketten Wulf are concerned, I ask myself:

- How was it possible that over 4 years went by without a single sprocket being sold?
- > Did anyone outside the chain industry know about this patent?
- > Is it permissible at all not to exploit a patent as a licensee?
- Is it customary for a new patent to take years for investigations to take place without patented parts being used in practice?

That cannot be, otherwise Koch Transporttechnik would not have used the self-adjusting sprocket 2001 in the portal scraper in Ensdorf without having carried out any inspection.

Unfortunately, it is not the case that the sprocket itself was introduced to the customer! And here I ask myself, of course, which operator reads a design journal?

I don't want to say anything negative about Ketten Wulf, but a four-year attempt cannot be "hushed up".

I don't want to give the impression that I want to "let off" myself negatively about Ketten Wulf. The company Ketten Wulf is completely indifferent to me, but it is not acceptable that a WELTFIRMA tests a product for several years, finds it very good (investigation report), then "drops it", just because it was probably so good (my subjective opinion on it) and then years later pretends as if these investigations with dozens of visits to the house Ketten Wulf did not exist at all. That's a big one!

I am only interested in TRUTH and it is true that in this company my patent has been tested over several years to the fullest satisfaction and the company Ketten Wulf has **announced** the advantages of this invention even in the publication in July/August 2002, and this at a time when the final results of the investigation report were not yet available.

From today's point of view, I say to myself that I should have immediately put the first letter of the patent attorneys and attorneys Fritz from 14.4.2015 on the Internet and made the press aware of how certain companies "exploit" patents and try to silence "little inventors". If I had done that, I would probably have saved myself about 10.000,-lawyer's and court costs, because the judge had no choice but to grant the motion, although I had the impression that he did not like it, only had to comply with the law and pointed out to me the right to quote regarding the investigation report.

Letter to the Minister of Economic Affairs Sigmar Gabriel of 12.1.2016

"Minister Sigmar Gabriel c/o Federal Ministry of Economics and Energy Scharnhorststraße 17

11019 Berlin

Presentation of the patent EP 2594824 "Self-adjusting drive sprocket".

Dear Minister,

I would like to take the liberty of presenting to you a patent which I have developed and which can be used to achieve a wear reduction of more than 30 % in drive and conveyor chains.

This type of sprocket or drive sprocket is **unique in the** world and is characterized by the special feature that **ALL teeth** are involved in the power transmission to the chain and thus the load is distributed to the individual teeth and the chain in the case of the sprocket sprocket developed by me. The reason for this is that the teeth are movable, whereas with a conventional sprocket the teeth are rigid and after a certain period of wear only the first tooth carries the load of the chain.

This leads to the fact that the **chain**, which has to be **replaced depending on its size** partly with a **very high financial and working expenditure**, **lasts substantially longer**, because it is **not so strongly loaded by the movable teeth of the sprocket**.

This can also be seen very clearly from the PowerPoint file on my homepage: <u>www.selbsteinstellendes-kettenrad.com.</u>

I have been dealing with the problem of enormous wear and tear and high noise levels for over 22 years. The idea for the predecessor patent arose when looking at a heavily worn chain link. I then dealt intensively with the problem and applied for the first patent DE4317461/ EP 0599156 through my employer in 1993 - then still as an employee of PWH - later Thyssen-Krupp. The PWH company was then taken over by the Thyssen-Krupp company, which transferred the patent rights to me in 1996.

After the patent belonged to me at that time, I made further improvements to the original patent. The self-adjusting chain sprocket was used in 2001 at the Ensdorf power station in a portal scraper where it has been running flawlessly for over 14 years. Here the **FIRST CHAIN is still** in use.

Between 2001 and 2003, the patent was tested on a chain simulator at a large German chain manufacturer, Kettenwulf in Eslohe.

In the journal Konstruktion 7/8-2002 an article was published and the company Kettenwulf was named as contact person, because they had concluded a license agreement with me for the marketing of the self-adjusting sprocket.

The test ran until 2003 and had an excellent result (wear reduction of at least 30%).

The company Kettenwulf sent me the investigation report at my free disposal and WITHOUT any CONDIDENCE, but it had to be removed from my homepage in November 2015, see **EXPLANATION TO THE EXAMINATION REPORT OF THE COMPANY KETTEN WULF, as the investigation report is subject to the so-called "small coin".**

After the results of the test had been determined, some time passed until the license agreement 2004 (**Note 2005**) was terminated WITHOUT SPECIFICATION of reasons.

As a conscientious designer, I wanted to wait and see how my invention would prove itself in practice.

In 2010 I was at the Ensdorf power station and could see that the selfadjusting sprocket was still working and running **WITHOUT chain wear.**

In November 2011 I was again at the Ensdorf power station and on this occasion a complete chain link was removed, see the photo below. From this it can be seen that even after 10 years of use there is virtually no wear on the chain link pins:



Since I had been occupied in the whole years again and again with improvements at the patent at that time, I applied in the year 2010 (note 2011) the patent **NEW and IMPROVED**, under the No. **EP 2594824**.

This new patent EP 2594824 was granted on 7 January 2015 and it has intellectual property rights in the 10 European countries:

Germany - Austria - Switzerland - France - Great Britain - Italy - Spain - Romania - Czech Republic and Poland.

After wasting some time at the beginning of 2015 offering the patent for sale to German chain manufacturers, I have now been busy for several months offering this patent for sale to plant constructors and chain manufacturers worldwide and, above all, explaining the enormous advantages of the patent to operators how:

- The self-adjusting drive sprocket can be used worldwide for ALL KETTEN (link chains, roller chains, round link chains, etc.),
- there are innumerable application possibilities, as for example in mines all over the world,
 - in power stations,
 - in the steel industry,
 - in the paper industry,
 - in the wood industry,

in machine and plant construction, in the bulk material industry, in the automotive industry, in the wood industry, in waste incineration plants, in water treatment, etc. etc.

- a wear reduction of at least 30 % is achieved, see Ensdorf power plant
- the noise is reduced,
- the chain only has to be changed at longer intervals,
- Downtimes for the systems are reduced,
- labour costs are reduced.

It should be noted here, through the three publications:

Publication from 1999 concerning round steel chains

Publication in the journal "Konstruktion" 7/8-2002

Publication 01/2015 in the trade journal Hebezeuge + Fördermittel

which you can find on my homepage <u>www.selbsteinstellendes-</u> <u>kettenrad.com</u> along with further information about the patent, both the predecessor patent and the new patent EP 2584824 in question have been known to experts, i.e. chain manufacturers and plant constructors, for years; for most operators, on the other hand, this is absolutely "new territory".

As I can see from the reaction to my circulars and the statistics on my homepage, the patent is very popular all over the world, and it is now known, for example, up to "Sao Tome and Principe" and "Tuvalu".

The companies I wrote to are mainly operators, who are now naturally asking themselves:

• why didn't we know this system before?

- how is this possible, since there were already publications in the relevant trade journals in 1999, 2002 and 2015, which of course subscribe only to the plant manufacturers, chain manufacturers etc., not the operators,
- where can you buy a self-adjusting sprocket, where is the equipment manufacturer where you can order this sprocket?

For these reasons, I have taken the liberty of presenting this patent to you, as I believe that, in difficult times, there is a need for a patent to be granted.

of increasingly scarce resources,

a high burden on the environment,

Reduction of noise pollution for employees, local residents, etc. (see FIRST USE OF THE SELF SETTING CHAIN SPROCKET 2001 IN THE ENSDORF POWER STATION), which at **the time could only go into operation** because the self-adjusting chain sprocket was used,

and of course, also in the sense of worldwide competition.

is not unimportant, whether one must change a chain in larger time intervals or not.

Because as Victor Hugo says:

"Nothing is more powerful than an idea whose time has come."

If I have aroused your interest and you are interested in further information, please contact me.

For today, I remain kind regards Karl Herkenrath"

Ketten Wulf tries to intimidate me again

At the end of January 2016, I received the following letter from the lawyers Fritz und Partner, which they had sent to my lawyer in Cologne:

"Attorneys at Law HMS BarthelmeßGörzel Tim Christian Berger

.

27.01.2016

Ketten-Wulf Betriebs-GmbH ./ Karl Herkenrath-33 O 127/15 – Regional court

Dear Mr. Berger,

The dispute before the Regional Court of Cologne was ended by mutual consent. Your client has also changed his website. However, the current websites once again put our client in a bad light. I enclose excerpts from the current website.

On the website there is still a page with the headline "Explanation of the investigation report of the company Ketten Wulf". However, there is no explanation of the investigation report under this heading. Because this is no longer allowed to be shown. There is a reason why the investigation report can no longer be found there. Your client writes that our client does not want the results to be made public. This is wrong. Your client has no rights to use the report. Moreover, the misrepresentation is again a disparaging insinuation.

Your client is no longer interested in publishing such a page. He may not publish the investigation report and has no interest in publishing his inaccurate opinion on it. He is certainly not allowed to give his
opinion a large black cross. This reinforces the disparagement of our client.

The next page is a commentary of your client from the year 2015. It is already the question whether your client does not violate the obligation to cease and desist. Because your client again indicates that our client does not use the wear-reducing sprockets in order to sell more chains. Your client should not comment on this issue either. For this too makes our client appear in a bad light once again. In doing so, your client also clearly goes beyond his expression of opinion. For he justifies his opinion with alleged facts.

We strongly advise your client to leave our client completely out of the equation in his efforts to sell his patent. Our client expressly asked us not to send a warning to Mr Herkenrath at first, but to inform you first. Therefore, please make sure that your client changes the websites in such a way that there are no references to our client any more. We give your client until the

February 15th, 2016.

We will then review this again.

With kind collegial greetings

(signature)

(Mr. Hoffmann)

Annex:

- internet excerpts

EXPLANATION OF THE RESEARCH REPORT OF THE COMPANY KETTEN WULF

Unfortunately I had to remove the investigation report, which was published here until 23.11.2015, because the company Ketten Wulf sued me for failure to publish this investigation report, because they did not want the results of the several years long investigation on a chain load simulator about the wear behavior between a conventional sprocket and my self-adjusting sprocket to be accessible to the public. This investigation was also carried out in cooperation with the Fraunhofer Institute.

In the course of the license agreement between Ketten Wulf and myself there was no secrecy agreement at that time. Nevertheless, Ketten Wulf is of the opinion that this investigation report is subject to the so-called "small coin". To the explanation: To the term "small coin" stands in Wikipedia:

"As a **smalle coin**

<u>German copyright law</u> refers to <u>works</u> that are located at the lowest boundary of a work that has just been protected by copyright. The term refers to designs which fulfil the requirements of the copyright concept of a work and are thus in principle eligible for legal protection. However, they have only a small creative expressiveness (so-called <u>height of creation, design or work</u>); this in turn makes the worthiness of protection doubtful.

German law has always accepted the *small coin* as worthy of copyright protection - except in the case of <u>commercial graphics</u> or applied art serving a commercial purpose."

I do not wish to comment further on this.

At first, I wanted to quote from this investigation report, but I decided not to pay any further attention to this report. I hadn't hired him here anyway to defame Ketten Wulf in any way, but merely to inform the operators that my invention of the self-adjusting chain sprocket had been known to the chain industry in Germany since 2003.

The best proof of the perfect functioning of the self-adjusting sprocket is its use in the Ensdorf power station, where the sprocket has been working perfectly for over 14 years and where very little wear has occurred on the pins to this day, see "Development of the sprocket", so that it can be assumed that the reduction in wear in the EP 2594824 patent in question and further improved here will still be far more than 30 %.

For this reason, I have completely removed the investigation report here and will not quote any further from it.

Finally, I would like to mention again that this self-adjusting sprocket can be used with ALL chain shapes.

Kempenich, 25 November 2015

Karl Herkenrath

Comment of the inventor on this from the year 2015:

This article from the journal "Konstruktion" 7/8-2002 refers to the old patent DE 4317461 / EP 0599156, which is a predecessor patent to the current patent EP 2594824.

As can be seen from the article, Ketten Wulf considered itself to **be** an international technology leader at the time and commented in the article that, as a manufacturer of chains and chain drives, a reduction in wear and reduced noise was also of great interest to them, **irrespective of the fact that the** use of such a self-adjusting sprocket would result in a **loss of turnover**, as the chains could only be sold at longer intervals.

However, one year later the Kettenwulf company had completed the investigations and **only at that time** the results of the tests concerning the conventional sprocket in comparison to my self-adjusting sprocket were available and a wear reduction of more than 30 % resulted. These **results** were probably **not yet known when the article was published**.

After another time had passed, I had asked myself several times how the matter with the sprocket would go on now, in July 2004 I was told orally that they were no longer interested in a further cooperation with me (the company Kettenwulf was a licensee at that time), this is completely without giving reasons. In my subjective opinion, I can only see the reasons in the unexpectedly high wear reduction of 30%.

As already mentioned, this investigation report refers to the old patent, whereby the **wear reduction of the** now **valid patent EP 2594824 should be even higher,** as this patent was further developed and improved by me.

Letter to the Patent Attorneys and Attorneys at Law of Ketten Wulf dated 30.1.2016

(After that I have heard nothing more from the company Ketten Wulf)

"January 30, 2016.

Your letter dated 27.1.2016 to Mr Tim Berger, lawyer Your reference: 11171/15 TB 13 TB

Dear Mr. Hoffmann,

Mr Berger has sent me the above letter for your information and comments.

I would like to inform you of the following:

It is correct that on my homepage a page with the headline "Explanation of the investigation report of the Ketten Wulf company". Under this heading there is indeed an explanation of this report in such a way that I write there that your client does not want this investigation report to be published, otherwise she would hardly have sued me for omission. However, it is a fact - and this time "fact" is really the initiation of a fact by means of provable documents - that your client has been subject to an investigation lasting several years. There are two folders with different letters from your house, letters from the Fraunhofer Institute, etc. I've also been in your client's work several times. Not to forget, there was a **license agreement**, which includes, among other things, that all **research results** had to be **communicated to** me, which also happened.

I can very well imagine that your client no longer wants to know about this whole investigation today - mind you, that is only my subjective opinion - but this investigation cannot be "hushed up".

I have not published a misrepresentation here, but have simply written that your client does not want a publication. The last sentence on the first page should, in my opinion, be more accurate:

"Our" client is no longer interested in publishing such a page. I can well imagine.

On page 2 it says:"Because your client again indicates that our client does not use the wear-reducing chain sprockets in order to be able to sell more chains. Your client should not comment on this issue either. For this too makes our client appear in a bad light once again. Your client also clearly goes beyond an expression of opinion. Because he justifies his opinion with "alleged facts".

I do not know how you came up with such nonsense and allow me to correct that below:

On my homepage you can find - as well known - a publication from July/August 7/8-2002 of the journal Konstruktion. On page 36 of this journal, the following can be found at the bottom right:

Hermann Wilke (as a reminder, this was the employee of your client who was entrusted with the matter at the time): "It looks as if our expectations are being fulfilled: On the one hand we observe a noise level reduced by 50 %, on the other hand the wear has visibly decreased compared to the conventional drive". Although exact quantitative statements are still premature due to the high testing effort and the long test duration, Wilke is nevertheless convinced that the system will be very well received by the customer.....

The next paragraph then says:

The argument that a chain manufacturer could evade its own business with extremely low-wear chain systems does not count for Wilke.

Now we have another important quote for you from the same *Mr Wilke, a former employee of your client:*

"In general, this is a product that the market wants. Today, customers are won through quality thinking and this also includes a long service life. We are problem solvers for our customers; if you think like that, you get more business and more tasks." Here again <u>my modest and completely subjective opinion</u>: That your client today probably wishes to shoot this Mr. Wilke on the moon, if he would still live, I can imagine very well. But it is a fact that Mr Wilke spoke these words to the editor of the newspaper at that time, otherwise they would hardly be there!

But it goes on.

Due to the cost structures for German companies, Wilke sees hardly any opportunities in the market for standard chains today anyway.

Now Mr Wilke quotes again: "The mass business with chains is done abroad. We live on technical advice. 95 % of our turnover is accounted for by special chains, i.e. "customer-specific versions".

Further, the writer of the article explains in the journal "Konstruktion":

"Wilke sees important technical trends in chains primarily in the extension of service life and secondly in maintenance-free conveyor chains. In the latter case, the aim is to reduce the customer's services and eliminate environmental pollution caused by the loss lubrication that is still common. This is a growing market for companies with the appropriate know-how. Ketten Wulf also sees itself as an international technological leader in this field.

Of course, the company also places high expectations on the market success of the self-adjusting chain sprocket. It may be difficult to predict whether and to what extent chain sprockets will ultimately prevail in practice. For the operators of conveyor systems, however, the advantages are obvious. For example, with the same service life of the chain/chain sprocket system, simpler and more cost-effective chains could be used. Reduced spare parts and maintenance costs are just as important arguments today as the quieter running of chain drives".

Dear Mr. Hoffmann,

if you read my publication carefully, you will notice that I referred

ONLY to the magazine mentioned above.

I have referred in my presentation only to the publication at that time and in no way reproduced my - in your opinion - incorrect opinion nor do I justify my opinion with alleged facts, **I only reproduce what is in the publication and was and is accessible to everyone**, whereby in my subjective opinion the operators did not know this publication at that time in the magazine. That is - as said - however, only a guess of mine!

I would like to mention the following: The company RUD Ketten had invited me to an interview about my patent on 6 February 2015 in Aalen. I took this appointment with my wife. Mr. Rupert Wesch was present on the RUD side as well as a young man whose name I had forgotten.

In the course of this conversation we came to talk about the investigation in the house of your client and Mr. Wesch explained literally: "Mr. Wilke said at that time that sooner or later we would not be able to get past this self-adjusting chain sprocket".

Firstly, there are a lot of written documents and secondly, the competitors of your client are and were informed about the fact that there was this examination of the predecessor patent in the house of your client. This was also the result of a phone call from 4.2.2015 and an e-mail from 27.2.2015 from Mr. Johannes Winklhofer, head of IWIS.

As you may have already discovered on my homepage, a few weeks ago I also presented the patent to the Minister for Economic Affairs, Mr Sigmar Gabriel, whom I will inform today about your client's renewed attempt to intimidate me.

You write in your last paragraph that you strongly recommend that I leave your client completely out of the game in my efforts to sell the patent.

I can imagine the wish of your client very well, but unfortunately an examination of the predecessor patent in the house of your client for several years simply cannot be "undone" now, even if you would like to do that afterwards. Mind you, this is again only my subjective opinion.

It makes absolutely no difference whether Mr Wilke has died in the meantime or not; he was an employee of your client at the time and your client is responsible for all statements or actions made by an employee. Goethe and Einstein etc. are also constantly quoted, after all they are no longer alive. And in my opinion VW is certainly not very happy about any publications either. What am I reading about this on the Internet in "Die Welt" (21.9.2015):

"The powerful ones at Volkswagen had just made a makeshift exit from at least some of the hotbeds of fire, which glow all over the VW world, and there it is again." That's just a quote from the newspaper "Die Welt". And I have also quoted on my homepage only what is written in the magazine "Konstruktion" and have not given my opinion on it.

Finally, I would like to quote the last sentence from the investigation report at the time:

"Result:

As can be seen from the evaluations and the diagram, all test samples on the Herkenrath chain sprocket show less wear compared to the Wulf chain sprocket. Furthermore, it can be seen from the tests that the Herkenrath chain sprocket has a particularly positive effect on increased wear.

Kückelheim, 06.02.03"

If your client should sue me again because of the current entries on my homepage, then I look forward to that calmly. At the next court hearing I will then call in the **press**, which will certainly be interested in such an approach.

A copy of this letter will be sent to Mr Sigmar Gabriel, Minister for Economic Affairs, following my letter of 12 January 2016.

Yours sincerely"

2nd Letter to the Minister of Economic Affairs Sigmar Gabriel of 30.1.2016

""30.1.2016

Presentation of the patent EP 2594824 "Self-adjusting drive sprocket" Renewed reaction of Ketten Wulf

Dear Minister,

I would like to inform you once about the following process, which clearly shows how parts of the industry (namely the company Ketten Wulf in Eslohe) tries to intimidate a "small" inventor.

As already communicated to you in my letter of 12.1.2016, the predecessor patent was extensively tested between 2001 and 2003 at Ketten Wulf in Eslohe. I have two folders with documents about these tests, which were made available to me according to the license agreement concluded with me.

In the year 2002 an article was published in the journal Konstruktion, which I posted on my homepage.

The test on a chain simulator ran until 2003 and confirmed - as already announced - a wear reduction of at least 30%.

I had initially posted this investigation report, for which there **was no secrecy agreement whatsoever**, on the homepage, but had to remove it again because it was "still worthy of protection" (so-called small coin).

Thereupon I changed two articles on my homepage accordingly and pointed out to the readers that the investigation report can no longer be stopped and explained this.

Furthermore, I quoted from the publication in the journal "Konstruktion" and now receive the enclosed letter from the lawyers Fritz und Partner from Arnsberg, which I have answered with the letter also enclosed in the attachment.

Since I do not denigrate the company Ketten Wulf in any way, I will not change my homepage and the articles posted there remain unchanged so. If I should get again a warning or the company Ketten Wulf should sue me again, then I will switch on the press, because such a behavior is in my eyes a smooth impertinence.

The tests were undoubtedly carried out over a period of several years at Ketten Wulf and I quote the final sentence from the investigation report below:

"Result:

As can be seen from the evaluations and the diagram, **all test samples on the Herkenrath chain sprocket show less wear compared to the Wulf chain sprocket.** Furthermore, it can be seen from the tests that the Herkenrath chain sprocket has a particularly positive effect on increased wear. Kückelheim, 06.02.03"

In my opinion, it is not acceptable for a large company to sign a license agreement with an inventor, carry out tests for years that have led to this result and **then years later no longer want to "remember" these things.**

Concerning the statements of the former employee of the company Ketten Wulf, Mr. Wilke, concerning from the magazine "Konstruktion", I can quite imagine that this Mr. Wilke, who is said to have died in the meantime, would be most likely "shot at the moon" by the company Ketten Wulf (this is my subjective opinion on this), but I stand on the point: What is true, must also remain true.

One cannot test my self-adjusting sprocket for years in the company Ketten Wulf, one year before the end of the tests in the magazine "Konstruktion" one can "sound **out" the advantages** one expects from the use of the self-adjusting sprocket, at the end of the tests come to such an excellent result, end the matter by terminating the license agreement and years later **forbid oneself to be "reminded" of these events** (see letter of RAe Fritz of 27.1.2016). Of course we have to say that this is about MILLIARDEN savings which could be achieved by the operators of this sprocket worldwide, since all conceivable chains can be equipped with this sprocket; in addition, there is a 50% reduction in noise (see Mr Wilke's quote in the magazine "Konstruktion" as well as a not inconsiderable reduction in environmental pollution.

I would be happy to present my self-adjusting chain sprocket to you in Berlin and would bring along all documents, including the investigation report, which were made available to me by Ketten Wulf at the time.

Furthermore, there are already some foreign interested parties with whom I am in negotiations. As long as the sprocket is not yet sold to an adequate company, I will continue to introduce the self-adjusting sprocket worldwide.

I would be very pleased to hear from you on this matter and remain for today

kind regards

Annexes: Letter of the lawyers Fritz from Arnsberg of 27.1.2016 My reply of 30.1.2016"

Chapter 9

I decided to offer the patent for sale worldwide because the German chain industry was obviously not interested in an acquisition.

My "biggest fan - my wife - started in 2015 to **introduce** the selfadjusting sprocket worldwide to the operators, but also to the plant manufacturers and the few **chain manufacturers**.

At this point I would like to point out that the self-adjusting chain sprocket can be used globally for ALL KETTEN (link chains, roller chains, round link chains, fork link chains, etc.).

There are **countless possible applications**, some of which I would like to list below:

Use in the automotive industry Use in mines Use in the chemical industry Application in the insulation industry Use in the beverage industry Use in the glass industry Use in the wood industry Use in power plants Use in the food industry Application in machine and plant construction Use in mill construction Use in waste incineration plants Use in the palm oil industry Use in the paper industry Use in passenger transport (escalators, moving walks) Use in recycling plants Use in the bulk materials industry Use in the steel industry Use in steel water construction Use in water treatment Use in the cement industry etc.

The sprocket reduces wear on chains in:

Equipment for paper transport Plants for the transport of bulk materials Plants for the defibration of logs bush conveyors bottle washers blast furnace applications scraper conveyors Paternoster systems Log transports sintering plants chip conveyors Steel mill applications Continuous casting applications Transport of boards conveyor belts troughed chain conveyors rolling mill applications

etc.

After I had decided in April 2015, after the European patent had been granted, to have the patent protected in certain countries, I decided in favour of these countries:

Germany, Austria, Switzerland, France, Spain, Italy, Great Britain, Czech Republic, Poland and Romania.

My wife, who has had a translation agency for many years, had the sales offer for this patent translated into over 30 languages and we published these letters on my homepage.

Since then I have received many, many e-mails in which people are enthusiastic about this brilliant idea.

The sad thing about this is that there are relatively few chain manufacturers around the world who - in my subjective opinion - are not interested in reducing wear.

Chapter 10

The current situation in the steel industry

Millions lost at Dillinger Hütte in Dillingen/Saarland

On 21 March 2017 the Saarbrücker Zeitung published an article about Dillinger Hütte's loss of millions in Dillingen/Saarland.

The topic was that 400 of the 5,100 jobs that had been created were to be cut due to the difficult market conditions.

Although Dillinger Hütte is operating at full capacity, it had a loss of 80 million euros before interest and taxes in 2016.

CEO Fred Metzken stated that steel prices had come under pressure worldwide due to overcapacities and that European manufacturers were suffering from low-cost exports, especially from Asia, with rising purchase prices for coking coal and iron ore.

On 9.9.2017 I was in Saarland and took the following two pictures in front of a gate of Dillinger Hütte (Saarstahl AG):





On 8 August 2017 there was another report in the Saarbrücker Zeitung, this time about the future of the Saarschmiede.

Even before I had discovered the two preceding articles on the Internet, on 28 August 2017 I had sent the letter reproduced in **Appendix 3 to the** Chairman of the Board of Saarstahl AG, Mr Metzgen, who was also mentioned in the above articles. I have to mention that I was personally at the Dillinger Hütte in 2015 and presented the self-adjusting sprocket there, as already described above. It had met with great approval in the technical field, as a huge number of chains were in use at the Dillinger Hütte.

Until the book's final completion on October 6, 2017, I have not yet received an answer from either Saarstahl AG or Saarschmiede GmbH.

Who is interested in Germany as a business location? I always read:

Germany as a business location must be preserved.

If, on the other hand, I then experience that I don't even get an answer, I always ask myself, is Germany as a business location and the many jobs associated with it, as here at Dillinger Hütte, really of

interest to someone from the board levels, or is all this just "empty talk"?

What does it teach you? You should only invent things where other companies can earn a lot of money. Under no circumstances should you invent a part that reduces wear!

Today I tell myself that the only way to sell the self-adjusting sprocket would have been to set up my own business, start a small company to build sprockets and then present the product to the operators. I have to say that I have been a designer all my life and the way into an uncertain independence was too risky for me as a well paid employee, especially since I was already in my mid-50s.

The difficulties of finding a sprocket manufacturer as a private individual

In addition, it was almost impossible to find a manufacturer for this sprocket. In my subjective opinion this was so difficult because nobody from the manufacturers of sprockets "dared" to act against the interests of the powerful chain industry and to produce such a sprocket. I can understand that in so far as these companies would then possibly also have become unemployed, at least until the selfadjusting chain sprocket would have prevailed with the operators and that is in Germany unfortunately an extremely lengthy process.

For this reason and because of my age, I rejected the idea of selfmarketing the self-adjusting chain sprocket in spring 2015 and want to sell the patent to a manufacturer who uses this patent for the benefit of his customers.

For example, the use of the "self-adjusting chain sprocket" patent developed by me could save millions of euros in chains at Dillinger Hütte, see the example in Ensdorf, whereby it must be said that the Ensdorf power plant will be closed at the end of 2017 because Saarstahl AG and Saarschmiede GmbH will not extend their lease agreements with the power plant.

It doesn't matter how you personally feel about power plants, in any case both at the Ensdorf power plant and at Saarstahl AG and Saarschmiede GmbH and many, many other companies from all possible sectors, such as the cement industry, the recycling industry, the food industry, the printing industry and so on, and billions of euros could have been saved if the chain industry had used this patent and improved it even further.

Jammering about cheap steel from Asia

Cheap steel from Asia has been flooding the European market for years and European industry is desperately resisting.

So, I have to ask myself, why was and isn't a sprocket used, which has a much longer service life, so that the chains driven with the sprocket, which cost about 10 times the sprocket!!!, can be used much longer?

The self-adjusting sprocket is not the philosopher's stone.

I don't consider the chain sprocket I developed to be the "philosopher's stone", but I think perhaps the use of such a chain wear-reducing sprocket could make a very small contribution to maintaining Germany as a business location and Europe as well.

Chapter 11

Considerations from today's point of view

The longer I think about this matter, the more often I ask myself: Are all innovative engineers retired?

Examples for the use of the self-adjusting chain sprocket

As mentioned above, the self-adjusting sprocket can be used in many industrial applications.

An example of this is the recycling industry, as recycling is becoming increasingly important.

According to a study by the Federal Institute for Geosciences and Natural Resources, the recycling of recyclable materials is becoming increasingly important - as we all know from our own experience.

When I think about how the amount of household rubbish for two people increases from year to year and then I drive through our small village with almost 2,000 inhabitants, I am sometimes speechless about the many rubbish bins I encounter there.

The recycling of all this rubbish is becoming more and more extensive and chains are used extensively in the corresponding companies.

According to a press release issued by the Federal Statistical Office in June 2017, the amount of waste generated in Germany in 2015 was around 402 million tonnes. This means that the volume of waste was roughly constant compared to 2014.

About half of the waste generated was construction and demolition waste.

It is precisely in this area that round link chains and link chains are used in the corresponding devices.

Approximately 317 million tonnes of all waste is recycled, corresponding to a recycling rate of 79%. More than 274 million tonnes were recycled and only a small proportion disposed of in landfills. ⁵⁾ Source: Federal Statistical Office (Statistisches Bundesamt)

In 2015, there were a total of 15,791 waste disposal facilities in Germany.

Chains and sprockets are logically used on each of these waste disposal systems.

And on all of these waste disposal plants, ENBEABLE savings could be made if the chains used there had a longer life because the wear of the chains would be reduced.

The use in recycling plants is only one of many applications of this self-adjusting chain sprocket.

The technical manager at Koch Fördertechnik, Mr. Bertele, installed this until then completely unknown chain sprocket in the Ensdorf power station in 2001 and this still works perfectly in 2017.

He didn't test it for years until it "fell over", as was later the case with Ketten Wulf. He just put it in.

So, I have to ask myself, what has been experimented on at Ketten Wulf for years?

CONCLUDING CHAPTER

How useful is it to apply for a patent for an invention in Germany?

Sometimes I ask myself: What have I done wrong?

You have to ask yourself the question: How purposeful is it to apply for a patent for an invention?

Ideas alone are not enough, as an inventor you need a lot of patience, you need to be a very special species of man, convinced of your invention, fight for it and stand up for it. But is all the effort worth it?

Couldn't you do something different with your time and money?

At Humboldt-Universität to Berlin you can read the following on this topic. The question was asked:

"How and when does a patent make money?"

The answer is:

"Never! A patent, its maintenance and possible defense against patent infringers cost money. A patent is a right of prohibition against third parties. However, it is an essential condition for an invention to make a profit and for it to flow to the inventor and not to a competitor.

Revenue can be generated by licensing or by selling the patent.

For this type of exploitation, we contact interested companies, negotiate the form of licensing and the duration of the license."

My first patent application, which my then employer, Krupp Fördertechnik, left to me in 1995 because it did not build chain sprockets, had already cost me a lot of money for the maintenance of the industrial property rights from 1995 to 2006, namely for traveling, drawing up pointless license agreements which were not signed after all, etc. etc. and a lot of time which I could have spent differently.

I had no income at all, except for the ridiculous \in 345,-- from Ketten Wulf for the months June 2004 to August 2005 = \in 5.175,-- in total, see chapter 6.

Originally, payments for the first two years of the license agreement were agreed in the amount of DM 24,000.00 and from the third year on at least DM 36,000.00 were to be paid.

The reason for this monthly "pocket money" was that Ketten Wulf, despite its own announcement in the trade journal "Konstruktion Juli/August 7/8-2002", had allegedly not sold a single sprocket in this long period.

What can I say? Today I no longer believe that they ever intended to sell this sprocket there.

The book of a soulmate "Die Asthma-Lüge" (The Asthma Lie)'' by Christoph Klein

A few days ago, by chance, I came across a book with the title: "The Asthma Lie" - How lobbying and politics destroy a brilliant product idea - a true story.

This is a very interesting book, which I would like to recommend to the readers of my book, because here an inventor, who like me comes from the Rhineland and calls himself a "Rhenish concrete skull", describes how powerful lobbyism is. Here there were beneficiaries, the pharmaceutical industry, who ultimately managed to get a useful invention off the market that would have saved health insurance companies over 50 billion euros between 1998 and 2012 alone.

Since 2011, the European Court of Justice in Luxembourg has had an action for damages amounting to billions of euros pending, for which I wish Mr Klein every success. If you've read this book, you might say: 'Chapeau'!

One simply does not believe many things as long as one is not oneself affected by something; then one suddenly has a completely different perspective on many things.

It is quite clear that as a private person you can only sell a patent like my "self-adjusting sprocket" to a company that uses it, this is actually only a chain manufacturer, through which the companies buy chains and sprockets, because a chain and a sprocket are a kind of unit. A chain cannot work without a sprocket and a sprocket is useless without a chain.

It has always been important to me that this patent does not end up somewhere in the "drawer" and if you invent a patent which achieves such a high wear reduction of the chains, then it is certainly understandable that as a chain manufacturer you want to know as little as possible about it and the principle can be explained many, many times in detail and then still leave your fingers off!

I am quite sure that the entire chain industry had already fully understood my system in 1995.

Perhaps I should have behaved just like the German physicist Wilhelm Conrad Röntgen (*27 March 1845 in Lennep, today a district of Remscheid; † 10 February 1923 in Munich), who had waived a patent on the X-ray apparatus he had developed so that it could spread more quickly.

But that wouldn't have helped me either, because the chain industry wouldn't have used this patent even then. In my opinion, it would be the duty of the chain manufacturers to offer operators from the most diverse branches of industry a chain with a longer service life through less wear and tear, in order to make a contribution to maintaining Germany as a business location.

But as you can see from the three examples listed in Chapter 3 of the Bundesanzeiger, at least these three companies only generate a fraction of their turnover in Germany. So, what cares about the business location Germany, chains are used everywhere in the world, and to a much greater extent than in Germany.

How stupid of me to invent a sprocket that reduces wear and tear by using it

Today I have to say to myself: How extremely stupid of me to invent a chain sprocket with which a wear reduction of the chain is achieved, no, I should have invented a chain sprocket that increases the wear, this patent would have been torn from my hand on the part of the chain industry certainly immediately

The sprocket I invented does not have to be the latest state of the art, there are certainly many variations for each specific case, as is always the case with inventions.

While writing this book I read the documents of the predecessor patent again and quoted

some letters here. I didn't do that to discredit one of the mentioned companies, you can't force anyone to buy a patent, but I hope that by reproducing many of these letters I've managed to show the reader clearly how difficult it is to let the operators benefit from such a patent. My wife always says to me: Why didn't you start your own business? I would have strapped the sprocket to the top of the car and driven to the operators.

But that's easier said than done. When the first patent was made available to me by my then employer, I was already in my mid-50s and until then always working as an employee with a good salary. At this age one does not go so simply any more here and gives up a safe position, gets into debt, in order to manufacture chain sprockets with an own enterprise and to distribute also still. That's why I turned to the chain manufacturers.

For my part, like the author of "The Asthma Lie", I am a Rhenish concrete skull and will continue to make the idea of the self-adjusting chain sprocket known across all borders. My database has enabled me to present this patent in 132 countries around the world and I hope that many operators in non-patented countries have now managed to reproduce the patent in their works.

Then the seed of my idea would have sprouted.

One thing I have already achieved through my publications and my publicity in any case:

The time of silence is finally over!

Everything that's good will prevail! But for this it is absolutely necessary that an operator has knowledge of good technical and cost-saving innovations.

And now - dear operators of any chain driven equipment - it is up to you to increase the pressure on the equipment manufacturers and chain manufacturers to approach them so that you too can benefit from such a wear reducing solution, because I am sure that the selfadjusting sprocket has long been built in the USA, Canada, China and many other countries around the world.

Kempenich, 6 October 2017

Karl Herkenrath

Annex 1 Miscellaneous drawings









Annex 2

Various publications:

<u>Publication from 1999 in the</u> professional journal: Drive Technology 38 (1999) No. 6, pages 53 - 55

<u>Publication in the trade journal</u> "Hebezeuge und Fördermittel" 5-99

<u>Publication in the journal "Glückauf-Forschungshefte</u>" K 7415Zeitschrift zur Verbreitung von Forschungsergebnissen im Bergbau. 60 (1999) No. 3, October, pages 73 to 75

Saarbrücker Newspaper 16./17.2001

<u>Publication in the journal "Konstruktion" July/August 7/8-2002</u> "Chain drives: low-noise and long service life

<u>Article in the journal Fördertechnik 9/2002:</u> "Low-noise, wear-reducing, cost-reducing A new chain sprocket promises changes in conveyor technology

<u>Hoists + conveyors from the year 2015</u> "Inventor Herkenrath and his self-adjusting chain sprocket balance after more than 13 years".

Annex 3

Copies of various letters dated 28.8.2017 and 22.9.2017

If answers should come here, these will be considered in a 2nd edition of this book.

Letter to Saarstahl AG dated 28.8.2017

"Mr. Fred Metzgen Spokesman of the Management Board c/o Saarstahl AG Bismarckstraße 57-59

66333 Völklingen

28.8.2017

Self-aligning sprocket decommissioning of Ensdorf power plant at the end of 2017

Dear Mr Metzgen,

From an article in the Saarbrücker Zeitung of 14.6.2017, I learn that the shutdown of the Ensdorf power plant, which has been known to me for some time, is due, among other things, to the fact that electricity is to be purchased more cheaply in future.

Since you have probably made this decision for economic reasons, I wonder why you do not then use the "self-adjusting chain sprocket" developed and patented by me in your plant, which has been driving a Kettenwulf chain at the Ensdorf power station for 17 years, whereby this chain has not yet had to be replaced once in a while. This is not only a sensation, but also a huge cost saving.

As you can see from my homepage: www.selbsteinstellendes-kettenrad.com, I have further improved the self-adjusting sprocket used in the power plant at that time and registered it in 2010 in an improved form. I offer this patent for sale worldwide.

As long as the patent is not sold yet, you are welcome to get a free license to build and use this sprocket.

The company Kettenwulf has tested the self-adjusting sprocket used in the power station Ensdorf over a longer period of time on a chain simulator and has achieved excellent results, see my homepage.

If you are interested, I am of course happy to present the sprocket to you.

For today, I remain with kind regards"

Letter to Saarschmiede GmbH dated 28.8.2017

"Mr. Martin Baues c/o Saarschmiede GmbH Bismarckstraße 57-59

66333 Völklingen

28.8.2017

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If you are interested, I am of course happy to present the sprocket to you.

For today, I remain

with kind regards"

Letter to the Executive Board Chairman Dr. Heinrich Hiesinger of Thyssen Krupp AG dated September 22, 2017

""22.9.2017

"Dr. Heinrich Hiesinger Chairman of the Executive Board c/o Thyssen Krupp AG Thyssenkrupp Allee 1

45143 Essen

Self-adjusting chain sprocket Fusion Thyssen Krupp AG - Tata Steel

Dear Dr. Hiesinger,

A few days ago I saw you on television and then I had the idea to present my patent "Self-adjusting chain sprocket", which could be used in the steel industry for example to save millions in conveyor chains, drive chains etc.

This patent EP 2594824, granted in 2015, has by the way been known at Thyssen Krupp for about two years, as I regularly inform more than 190 Thyssen-Krupp addresses worldwide about newsletters.

The predecessor patent of the patent for sale today was even developed by me as a former employee of PWH Anlagen & Systeme GmbH, a subsidiary of the Krupp Group (KRUPP Fördertechnik GmbH), today Thyssen Krupp in St. Ingbert, applied for a patent by my then employer and left to me in 1995, since no sprockets were built at Krupp Fördertechnik.

The self-adjusting chain sprocket was installed in 2001 at the Ensdorf power station in Saarland together with a Ketten Wulf chain and still works today, and has done so for over 16 years, see the photo below, which I took on 26 August

2017:



In my opinion, the use of this "self-adjusting chain sprocket" could make a small contribution to maintaining Germany as a business location.

This patent is up for sale and should actually be ideally suited for the new merger of Thyssen-Krupp and Tata Steel.

All details about the patent can be found on my homepage:

www.selbsteinstellendes-kettenrad.com

as well as in my book to be published in a few days:

"Erfinder mit langem Atem (Inventor with long breath)"

Why is it so difficult to realize a groundbreaking invention for plant operators?
The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

in which - as you can already see from the subtitle - I also draw particular attention to the conflicts of interest between the chain manufacturers and the plant manufacturers on the one hand and the many plant operators, be they the steel industry, the paper industry, the recycling industry, etc., and myself on the other.

I am writing you this letter because Thyssen Krupp is both a plant constructor and an operator.

I have been informing operators and plant constructors all over the world about patent EP 2594824, granted in 2015, for about two years now, as the operators obviously had no idea about this patent before.

I have to say to myself, however, that it is a poverty testimony both for the German chain industry and for major plant manufacturers, such as Thyssen Krupp, that a patent which reduces chain wear by at least 30%, probably even more, has to be offered abroad at all.

I always read about cheap steel from Asia, Russia, the preservation of Germany as a business location. If these words were taken seriously at board level, would there even be such a thing that a patent, the use of which could contribute to maintaining Germany and Europe as a business location, would have to be offered abroad?

At the end of August 2017, I also wrote to Mr. Fred Metzgen, Spokesman of the Board of Saarstahl AG, and Mr. Martin Baues of Saarschmiede GmbH, drawing their attention to the patent. I will be surprised if there are answers here, which I will publish in my 2nd edition of the book as well.

If I have aroused your interest in the patent, please contact me.

Yours sincerely

Letter to President Benoît Battistelli at the European Patent Office Munich dated 22.9.2017

""22.09.2017

Mr President Benoît Battistelli c/o European Patent Organisation European Patent Office Bob-van-Benthem-Platz 1

80469 Munich, Germany

My various inventions

Dear President Battistelli,

I would like to inform you once about the following procedure:

In 1993 I invented a "self-adjusting chain sprocket" as an employee of PWH Anlagen und Systeme GmbH in St. Ingbert, then Krupp Fördertechnik and today Thyssen-Krupp. The company Krupp Fördertechnik gave me the patent rights in 1995, because Krupp Fördertechnik did not build any sprockets.

Despite intensive efforts on my part in the German chain industry, this patented "self-adjusting chain sprocket" was only installed once in a portal scraper in the power station in Ensdorf in the Saarland, because at that time the company Koch Transporttechnik from Wadgassen was faced with the problem that the sound power levels of this portal scraper could not be exceeded because the power station bordered a residential area.

An extremely capable and forward-looking designer from Koch Transporttechnik, Mr. Wolfgang Bertele, built this sprocket, which I invented, into this portal scraper for the first time and the two sprockets still function perfectly after more than 16 years, and that with one and the same chain from Ketten Wulf. To my knowledge, such a long service life of a chain has not yet existed for a comparable case.

Below you can see a picture I took on August 26, 2017:

< Picture as in the letter to Thyssen Krupp>

I have presented this "self-adjusting sprocket", which can reduce wear by at least 30 %, to the German chain industry for years, which of course had no interest in reducing wear.

I am currently writing a book about all my experiences with the chain industry, which will be available in a few days as an ebook under the title:

"Erfinder mit langem Atem (Inventor with long breath)"

Why is it so difficult to realize a groundbreaking invention for plant operators?

The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

You can see more details on my homepage:

www.selbsteinstellendes-kettenrad.com

from the

"Attracted" by its use in the Ensdorf power station, Ketten Wulf suddenly became interested in the patent after I had already presented it to them in 1995.

From 2001 to 2005 this self-adjusting sprocket was tested at Ketten Wulf and in 2002 Ketten Wulf signed a license agreement with me.

About this test, which was carried out on a chain simulator (on the one hand a conventional chain sprocket, on the other hand my self-adjusting chain sprocket), there is an interim report after about two years, which already ended with a wear reduction of more than 30 % - I never got to read a final report.

In June 2004, the first license fees in the amount of DM 24,000.00, corresponding to \in 12,271.01, would have been due. Shortly before that date, Ketten Wulf persuaded me to give up this payment and instead offered me a "sandwich" of \in 345 per month, on the grounds that **they had not sold a single sprocket yet**.

A patent is an industrial property right granted by a sovereign for an invention and a patent is only granted if an invention must be commercially applicable.

This should probably also be taken for granted when concluding a license agreement with a major chain manufacturer.

In my opinion, it cannot be the intention of the European Patent Office to grant patents which are not implemented by the industry responsible for them, even though a license agreement has been concluded.

In my case, it was like inventing a component for a tire, which meant that the tire didn't even have to be changed during the entire life of the car.

Which tire manufacturer can you sell such a patent to and so I was with the selfadjusting sprocket. After I discovered during a visit to the Ensdorf power station in 2011 that this sprocket is still in use there, I filed a new patent application for the improved version in 2011, it was granted in January 2015 and has the number: EP 2594824.

Even today, after more than 16 years, this self-adjusting chain sprocket still functions with one and the same chain in the Ensdorf power station. However, the Ensdorf power plant will be closed at the end of 2017/2018 and then this only reference project will no longer exist.

I described this process today to the Deutsches Museum in Munich and the Technische Museum in Vienna and asked them to inform me if there might be a possibility that one of the two sprockets could be preserved together with a piece of chain in the museums for posterity.

With regard to the new patent, which has intellectual property rights in 10 countries, I began here in 2015 to present this patent worldwide primarily to the many, many operators who had no idea of this money-saving opportunity.

This is another proof of how "small inventors" are handled in Germany, so that such a patent has to be offered for sale worldwide.

I don't want to claim that my patent is the "egg of Columbus", but in my opinion, the use of this self-adjusting chain sprocket could save millions of euros in many, many industries and that would be a small contribution to maintaining Germany as a business location and Europe as a business location.

Finally, I would like to mention that I have made the following inventions or that I am partially active as a co-inventor:

- > Drive for the bucket sprocket of a bucket sprocket excavator,
- Self-adjusting chain sprocket
- > Method for stacking bulk material in a warehouse,
- > Device for transmitting energy during rotary movements,
- > Pivot drive for the superstructure of a conveyor,
- Self-adjusting drive sprocket

Mr Battistelli, as President of the European Patent Office, I felt the need to inform you of this matter and I would be very interested to hear your opinion on this matter.

For further information please do not hesitate to contact me. I would be very pleased to hear from you and I remain for today

with kind regards"

Letter to the Director General of the Deutsches Museum Munich dated 22.9.2017

""22.9.2017

General Director Prof. Dr. Wolfgang M. Heckl c/o Deutsches Museum Munich

80306 Munich, Germany

Invention "Self-adjusting chain sprocket", installed in 2001 in a portal scraper in the Ensdorf power station in Saarland, Germany

Dear Prof. Dr. Heckl,

I have often visited your museum, including the "Mine" department.

In 1993, as an employee of PWH Anlagen und Systeme GmbH in St. Ingbert, later Krupp Fördertechnik, today Thyssen Krupp, I invented a self-adjusting chain sprocket which was patented (DE 4317461/ EP 0599156).

After the company Krupp Fördertechnik had made the patent available to me in 1995, since no sprockets were built at Krupp Fördertechnik, I further developed this patent and tried to place it with the German chain industry.

However, this company showed little or no interest in marketing the sprocket, as it quickly became apparent that the self-adjusting sprocket reduced wear by at least 30 %.

I am currently writing a book about all my experiences with the chain industry, which will be available in a few days as an ebook under the title:

"Erfinder mit langem Atem (Inventor with long breath)"

Why is it so difficult to realize a groundbreaking invention for plant operators?

The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

In 2001, an intelligent and courageous designer named Wolfgang Bertele from the former Koch Transporttechnik company in Wadgassen became aware of the

patent because he was faced with the problem of using a chain sprocket in a portal scraper planned for the Ensdorf power station. Otherwise this portal scraper would have had to be completely enclosed.

We quickly agreed that the company Koch Transporttechnik should get a license for the installation of this "self-adjusting chain sprocket" and to install it in the portal scraper as a "pilot project" so to speak. Within a few months the job was done, the portal scraper has been working with the two self-adjusting sprockets since summer 2001.

This pilot project **still exists today - after more than 16 years** -, the chain from Ketten Wulf as well as the two self-adjusting sprockets still work and the chain has not had to be replaced once before. To my knowledge, there has never been a case in which a single chain in a portal scraper would have reached such a biblical age.

The company Ketten Wulf, "attracted" by the planned use in the Ensdorf power station, also appeared on the map in 2001 and tested the self-adjusting chain sprocket in its Sauerland plant over a period of more than 4 years.

About this test, which was carried out on a chain simulator (on the one hand a conventional chain sprocket, on the other hand my self-adjusting chain sprocket), there is an interim report after about 2 years, which already ended with a wear reduction of more than 30 % - I never got to read a final report.

Ketten Wulf signed a license agreement with me in 2002, but did not pay any license fees etc. These and other stories from my experiences with the German chain industry can be read in a few days.

This is a blatant example of how a "small inventor" is treated in this country and how such an invention is withheld from the operators.

In 2011 I applied for the patent in an improved form, it was granted under no. **EP 2594824**, has industrial property rights in 10 countries and since then I present this patent worldwide.

You can see more details on my homepage:

www.selbsteinstellendes-kettenrad.com

Enclosed I send you an excerpt from the Saarbrücker Zeitung of 16th and 17th June 2001. The following is a small paragraph from this publication:

",.... In May 1993 the Saarbrücken inventor applied for a patent for his sprocket, in June 1995 he was granted the patent DE 43 17 461 C2 for his "self-adjusting sprocket". This was the beginning of the odyssey: "I talked to various chain companies and travelled from Hamburg to Munich," he says. Not that the companies didn't like his idea, on the contrary. But they were not interested in the

invention that increases the durability of chains. "These companies generate 90 percent of their sales through the sale of chains and only ten percent through cog sprockets," says Herkenrath. The inventor was not interested in a one-off payment from the companies that would then let the patent disappear into the drawer. So, his search remained unsuccessful until 1997..."

Below is a picture of the portal scraper I took on August 27, 2017:

< Picture as in the letter to Thyssen Krupp>

My question to you now is:

The Ensdorf power plant will be closed at the end of 2017/2018 and the portal scraper will certainly be dismantled.

Would it be possible for one of the two sprockets built into this portal scraper to be exhibited with a piece of the chain in your museum?

As the owner of the Ensdorf power plant, I have asked VSE, with the enclosed copy of the letter, to inform me whether they agree to this if you, as director of the Deutsches Museum in Munich, agree to a takeover.

I will also write to the Technical Museum in Vienna and express my wish regarding the exhibition of the second sprocket and a piece of the chain.

I think that it is actually a poverty testimony for the German chain industry that as a small inventor of such a patent one has to offer the new patent abroad at all and I think it would be a nice gesture if this built-in and over 16 years perfectly functioning patented self-adjusting chain sprocket is preserved for posterity in the Deutsches Museum.

For further information please do not hesitate to contact me. I would be very pleased to hear from you on this matter. In anticipation of your message.

kind regards

Annexes"

Letter to the Director of the Technical Museum Vienna dated 22.9.2017

""22.9.2017

Dr. Peter Kostelka c/o Technical Museum Vienna Mariahilfer Strasse 212

A-1140 Vienna

Invention "Self-adjusting chain sprocket", installed in 2001 in a portal scraper in the Ensdorf power station in Saarland, Germany

Dear Dr. Kostelka,

I would like to draw your attention to an invention of mine from 1993, which I made as an employee of PWH Anlagen und Systeme GmbH in St. Ingbert, later Krupp Fördertechnik, today Thyssen Krupp, namely a "self-adjusting sprocket", which was patented at that time under No. DE 4317461/ EP 0599156.

After the company Krupp Fördertechnik had made the patent available to me in 1995, since no sprockets were built at Krupp Fördertechnik, I further developed this patent and tried to place it with the German chain industry.

However, this company showed little or no interest in marketing the sprocket, as it quickly became apparent that the self-adjusting sprocket reduced wear by at least 30 %.

I am currently writing a book about all my experiences with the German chain industry, which will be available in a few days as an ebook under the title:

"Erfinder mit langem Atem (Inventor with long breath)"

Why is it so difficult to realize a groundbreaking invention for plant operators?

The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

In 2001, an intelligent and courageous designer named Wolfgang Bertele from the former Koch Transporttechnik company in Wadgassen became aware of the patent because he was faced with the problem of using a chain sprocket in a portal scraper planned for the Ensdorf power station. Otherwise this portal scraper would have had to be completely enclosed.

We quickly agreed that the company Koch Transporttechnik should get a license for the installation of this "self-adjusting chain sprocket" and to install it in the portal scraper as a "pilot project" so to speak. Within a few months the job was done, the portal scraper has been working with the two self-adjusting sprockets since summer 2001.

This pilot project **still exists today - after more than 16 years** -, the chain from Ketten Wulf as well as the two self-adjusting sprockets still work and the chain has not had to be replaced once before. To my knowledge, there has never been a case in which a single chain in a portal scraper would have reached such a biblical age.

The company Ketten Wulf, "attracted" by the planned use in the Ensdorf power station, also appeared on the map in 2001 and tested the self-adjusting chain sprocket in its Sauerland plant over a period of more than 4 years.

About this test, which was carried out on a chain simulator (on the one hand a conventional chain sprocket, on the other hand my self-adjusting chain sprocket), there is an interim report after about 2 years, which already ended with a wear reduction of more than 30 % - I never got to read a final report.

Ketten Wulf signed a license agreement with me in 2002, but did not pay any license fees etc. These and other stories from my experiences with the German chain industry can be read in a few days.

This is a blatant example of how a "small inventor" is treated in Germany and a meaningful invention is denied to the operators.

In 2011, I filed a new patent application in an improved form, it was granted under the number **EP 2594824**, has industrial property rights in ten countries and since then I present this patent worldwide.

You can see more details on my homepage:

www.selbsteinstellendes-kettenrad.com

Enclosed I send you an excerpt from the Saarbrücker Zeitung of 16th and 17th June 2001. The following is a small paragraph from this publication:

",.... In May 1993 the Saarbrücken inventor applied for a patent for his sprocket, in June 1995 he was granted the patent DE 43 17 461 C2 for his "self-adjusting sprocket". This was the beginning of the odyssey: "I talked to various chain companies and travelled from Hamburg to Munich," he says. Not that the companies didn't like his idea, on the contrary. But they were not interested in the invention that increases the durability of chains. "These companies generate 90 percent of their sales through the sale of chains and only ten percent through cog sprockets," says Herkenrath. The inventor was not interested in a one-off payment from the companies that would then let the patent disappear into the drawer. So, his search remained unsuccessful until 1997..."

My question to you now is:

The Ensdorf power plant will be closed at the end of 2017/2018 and the portal scraper will certainly be dismantled.

Would it be possible for one of the two sprockets built into this portal scraper to be exhibited with a piece of the chain in your museum?

Below you can see a picture of the portal scraper, which I took on 27.8.2017:

< Picture as in the letter to Thyssen Krupp>

As the owner of the Ensdorf power plant, I have asked VSE, by means of the attached copy of the letter, whether it agrees with this if you agree to a takeover.

I also wrote to the Deutsches Museum in Munich and expressed my wish regarding the exhibition of the second chain sprocket as well as a piece of the chain.

I think that it is actually a poverty testimony for the German chain industry that as a small inventor of such a patent one has to offer the new patent outside of Europe and I think it would be a nice gesture if the old built-in and over 16 years perfectly functioning patented self-adjusting chain sprocket is preserved for posterity in your museum in Vienna.

For further information please do not hesitate to contact me. I would be very pleased to hear from you on this matter. In anticipation of your message.

kind regards

Annexes

Letter to the Management Board of VSE Aktiengesellschaft dated 22.9.2017

""22.9.2017

Dr. Gabriel Clemens Dr. Hanno Dornseifer c/o VSE Aktiengesellschaft Heinrich-Böcking-Straße 0-14

66121 Saarbrücken, Germany

My invention "Self-adjusting chain sprocket", installed in 2001 in a portal scraper in the Ensdorf power station in Saarland, Germany

Dear Dr. Clemens, dear Dr. Dornseifer,

I would like to ask you to check whether it is possible that after the closure of the power plant at the turn of the year 2017/2018, one of the self-adjusting chain sprockets with a piece of the chain installed there could be handed over to the Deutsche Museum in Munich and the Technische Museum in Vienna, provided that the two museums I have written to today are interested in it.

So that you know what this is all about, I will briefly describe below how the two self-adjusting sprockets were installed:

In 1993, as an employee of PWH Anlagen und Systeme GmbH in St. Ingbert, later Krupp Fördertechnik, today Thyssen Krupp, I invented a self-adjusting chain sprocket which was patented (DE 4317461/ EP 0599156).

After the company Krupp Fördertechnik had made the patent available to me in 1995, since no sprockets were built at Krupp Fördertechnik, I further developed this patent and tried to place it with the German chain industry.

However, this company showed little or no interest in marketing the sprocket, as it quickly became apparent that the self-adjusting sprocket reduced wear by at least 30 %.

I am currently writing a book about all my experiences with the chain industry, which will be available in a few days as an ebook under the title:

"Erfinder mit langem Atem (Inventor with long breath)"

Why is it so difficult to realize a groundbreaking invention for plant operators?

The enormous conflicts of interest between the chain manufacturers / system operators on the one hand and the operators or myself on the other hand.

In 2001, an intelligent and courageous designer named Wolfgang Bertele from the former Koch Transporttechnik company in Wadgassen became aware of the patent because he was faced with the problem of using a chain sprocket in a portal scraper planned for the Ensdorf power station. Otherwise this portal scraper would have had to be completely enclosed.

We quickly agreed that the company Koch Transporttechnik should get a license for the installation of this "self-adjusting chain sprocket" and to install it in the portal scraper as a "pilot project" so to speak. Within a few months the job was done, the portal scraper has been working with the two self-adjusting sprockets since summer 2001.

This pilot project **still exists today - after more than 16 years** -, the chain from Ketten Wulf as well as the two self-adjusting sprockets still work and the chain has not had to be replaced once before. To my knowledge, there has never been a case in which a single chain in a portal scraper would have reached such a biblical age.

The company Ketten Wulf, "attracted" by the planned use in the Ensdorf power station, also appeared on the map in 2001 and tested the self-adjusting chain sprocket in its Sauerland plant over a period of more than 4 years. In 2002 she signed a license agreement with me.

About this test, which was carried out on a chain simulator (on the one hand a conventional chain sprocket, on the other hand my self-adjusting chain sprocket), there is an interim report after about two years, which already ended with a wear reduction of more than 30 % - I never got to read a final report.

These and other stories and "little stories" can be read in a few days in my book.

In 2011 I applied for the patent in an improved form, it was granted under no. **EP 2594824**, has industrial property rights in 10 countries and since then I present this patent worldwide.

You can see more details on my homepage:

www.selbsteinstellendes-kettenrad.com

Enclosed I also send you an excerpt from the Saarbrücker Zeitung of 16th/17th June 2001, which was published on the occasion of the commissioning of the portal scraper.

The following is a small paragraph from this publication:

",.... In May 1993 the Saarbrücken inventor applied for a patent for his sprocket, in June 1995 he was granted the patent DE 43 17 461 C2 for his "self-adjusting sprocket". This was the beginning of the odyssey: "I talked to various chain companies and travelled from Hamburg to Munich," he says. Not that the companies didn't like his idea, on the contrary. But they were not interested in the invention that increases the durability of chains. "These companies generate 90 percent of their sales through the sale of chains and only ten percent through cog sprockets," says Herkenrath. The inventor was not interested in a one-off payment from the companies that would then let the patent disappear into the drawer. So his search remained unsuccessful until 1997..."

My question to you now is:

Would you agree that the two chain sprockets and a piece of the chain each be made available to the two museums, provided that they show an interest in them?

Since the Ensdorf power station will be closed, I assume that the portal scraper will also be dismantled and unfortunately my only reference object will disappear.

For further information please do not hesitate to contact me. I would be very pleased to hear from you on this matter. In anticipation of your message.

kind regards

Annex"

Annex 4

Reactions to the worldwide presentation of the patent

A small excerpt from the many positive reactions to the presentation of the patent, most of which came from operators. Every now and then it happens that an angry plant constructor no longer wants to be contacted, but even from these ranks not a single negative reaction came yet.

E-Mail from Germany:

"Good luck. I'm afraid the manufacturers are happy with the wear."

E-Mail from Germany:

...that in our product portfolio - flight control and landing gear systems we do not use sprockets or, if necessary, would not develop them ourselves and procure them as purchased parts."

E-mail from Germany of a large operator:

...We would like to disregard your offer to acquire the patent. However, we might be interested in the self-adjusting drive sprocket. Please let us know by whom it is made.

E-Mail from Germany:

...CHECK TO your successful design.

E-Mail from Germany:

...congratulations on your idea and the resulting patent. We have read your presentation with great interest. This is always a success of a consistent implementation of an idea to the finished product. And your test results speak for themselves.

Unfortunately, our pumps are not equipped with chain drives....

E-Mail (energy supply company) from Germany:

...."The development of conveyor systems or specific system components of conveyor systems does not belong to our range of tasks, this is the competence and affair of the various system manufacturers. As a rule, we purchase complete systems directly from these manufacturers..."

E-mail from Switzerland:

...we have checked your offer. We consider the idea with the selfadjusting sprocket to be very innovative, unfortunately we do not produce it ourselves.

E-Mail from Finnland:

...your idea is somewhat interesting and we would like to kindly ask your first quotation of this.....

E-Mail from Russian Federation:

", Thanks for the offer. I will try to offer Your patent to my clients..."

Email from Paraguay:

"...why am I not surprised? Your husband has already recognized the background very well. Welcome to the world of capitalism! Good solutions are only good if the industry can profit from them, it seems. I am sure that your husband, as a brilliant inventor, is in very good company, because there are certainly inventions which the little man would enthusiastically welcome, but which are bad for the purse of internationally active corporations (car engines, power generation, medicines, etc.) and thus suppressed or bought up and concealed. Just don't give up!"

E-Mail from Yemen:

"Thank you for your introduction e-mail.

For your information we are a commission agent trading company established in 1990 acting mainly in cement industry as we are

representing well-known companies like BEUMER, IKN, RHI ..etc. If you are interesting in Yemen market you are welcome..."

E-Mail from China:

"Thank you for your email showing us your technology and your warm heart in contributing the technological development of the world. We appreciate your studies and effort spreading the technology around the world.

We will try our best to pass on your spirit.

Please let us know if you need any support in China...."

E-Mail from Saudi-Arabian:

...Your patent looks to be very useful. But please write how we can cooperate with you...."

E-mail from Australia:

Checked your website. Great invention. Maybe the strategy should be changed? Crowdfunding projects often run very positively.

Sources

- ¹) Source: Federal Gazette (Bundesanzeiger)
- ²⁾ Source: WorldN24GmbH, 21.11.2009

³⁾ Source: Expert opinion TÜV Süddeutschland No. L 4687 dated 28.1.2002

- ⁴⁾ Source: Merkur, 11.4.2009
- ⁵⁾ Source: Federal Statistical Office (Statistisches Bundesamt)

My long struggle with the German chain industry



Since 1995 I have tried to make a small contribution to maintaining Germany as a business location.

In 1993 I registered the "self-adjusting sprocket" I invented through my employer and since 1995 I have been trying to convince the chain industry to offer this sprocket to operators who would save billions.

For more than 16 years now, two of the self-adjusting chain sprockets have been working in a portal scraper at the Ensdorf power station, without having to replace the Ketten Wulf chain even once.

This book gives you an impression of how the industry in Germany has been trying for years to bleed a "little inventor" dry, so to speak. But although I have long had grey hair, I do not give up similar to the story of David and Goliath.

In 2011 I filed an improved version of the patent with the European Patent Office and it has the number EP 2 594 824.

In 10 countries in Europe industrial property rights exist.

Since 2015, operators all over the world have been informed about this patent, because:

The time of silence is finally over!