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D E C I S I O N
of 4 August 1998

Case Number: T 0245/96 - 3.2.1

Application Number: 91105320.5

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IPC: F16H 57/02

Language of the proceedings: EN

Title of invention:
Transmission series

Patentee:
Sumitomo Heavy Industries, Ltd, et al

Opponent:
Sew-Eurodrive GmbH & Co
Deutsche Babcock Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Claim 1 (main request), novelty and inventive step (yes)"

Decisions cited:
G 0001/91

Catchword:
-



Case Number: T 0245/96 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 4 August 1998

Appellant I:
(Opponent)

Sew-Eurodrive GmbH & Co
Ernst-Blickle-Strasse 42
76646 Bruchsal (DE)

Representative:

Bohnenberger, Johannes, Dr.
Meissner, Bolte & Partner
Postfach 86 06 24
81633 München (DE)

Appellant II:
(Opponent)

Deutsche Babcock Aktiengesellschaft
46041 Oberhausen (DE)

Representative:

Radúnz, Ingo, Dipl.-Ing.
Patentanwalt
Ed.-Schloemann-Strasse 55
40237 Düsseldorf (DE)

Respondent:
(Proprietor of the patent)

Sumitomo Heavy Industries, Ltd
2-1 Ohtemachi 2-chome
Chiyoda-ku
Tokyo 100 (JP)

Representative:

Pfeifer, Hans-Peter, Dr.
Dr. H.-P. Pfeifer Dr. P. Jany
Patentanwälte
Beiertheimer Allee 19
76137 Karlsruhe (DE)

Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 25 January 1996
rejecting the opposition filed against European
patent No. 0 452 739 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: F. A. Gumbel
Members: F. J. Pröls
J. H. van Moer

Summary of Facts and Submissions

- I. The respondent is the proprietor of European patent No. 0 452 739 (application No. 91 105 320.5).
- II. The patent was opposed by the appellants (opponents) 01 and 02 on the grounds that its subject-matter lacked novelty and/or inventive step with respect to the state of the art (Article 100(a) EPC). The opposition was based on alleged prior uses according to

Enclosure 2(01) ("Anlage 2, 09.05.1995", filed by opponent 01) representing a matrix composed of 9 pairs of gearwheels selected from the opponent's catalogues and data sheets;

Table 2(02) ("Tafel 2", filed by opponent 02 on 19 June 1995) representing a matrix composed of 16 pairs of gearwheels selected from the opponent's catalogue.

Each prior use was supported by filed evidence such as catalogues, technical data sheets, letters of correspondence, delivery notes, invoices, technical drawings and the addresses of persons to be called as witnesses.

In addition the opponents also filed the following prior art documents:

"SEW-EURODRIVE, Handbuch der Antriebstechnik", München, Wien 1980, pages 224 to 229 (cited as Enclosure 4(01), "Anlage 4, 09.05.1995");

"Deutsche Normen, DIN 780, Teil 1, 2; May 1977 (3 pages, cited as Enclosure B1(01), "Anlage B1, 09.05.1995").

- III. With its decision posted 25 January 1996, the Opposition Division rejected the opposition.
- IV. Appeals against this decision were filed on 12 March 1996 (appellant 02) and on 21 March 1996 (appellant 01) and the fees for appeal were paid at the same time. The statements of grounds of appeal were filed on 28 May 1996 (appellant 02) and 29 May 1996 (appellant 01).

In their statements of appeal and also in later filed letters the appellants referred to the following further papers and a model all being evidence concerning the prior uses (as advanced in the opposition procedure):

Enclosure 12(01) (filed 29.05.96):

model ("Ritzel-/Rädersatz") with a base plate on which are arranged, in the form of a **matrix**, 16 pairs of gearwheels selected from the filed catalogues and data sheets;

Enclosure 15(01) and 16(01) ("Anlage 15 and 16", filed 29.05.96):

figures with graphic representations and matrices M2 and M1 each composed of 16 pairs of gearwheels selected from the filed catalogues and data sheets;

Enclosure 17(01) ("Anlage 17", filed 29.05.96):

graphic representation of the pairs of gearwheels as selected for the matrices M1 and M2 and arranged similarly as shown in Figure 3 of the patent in suit;

Table 2'(02), filed 28.05.96):

representing an adjusted ("bereinigte") matrix according to Table 2(02).

Appellant 02 further referred to the prior art document:

"Taschenbuch für den Maschinenbau, Dubbel", 1981, pages 452 to 454.

Furthermore, appellant (02) objected to the claimed teaching as representing a mere mathematical method (Article 52(2a) EPC).

V. In an annex to the summons to attend oral proceedings the Board informed the parties that the matrices shown in the Enclosures 2(01), 12(01) or 16(01), 15(01) and Table 2(02) were apparently drafted by the appellants immediately before they opposed the patent in suit or before filing of the appeal to support their argumentation so that inadmissible hindsight considerations could not be excluded.

Oral proceedings before the Board were held on 4 August 1998.

At the oral proceedings the respondent submitted new claims 1 according to a main and an auxiliary request.

Claim 1 (main request) reads as follows:

"Transmission series having a variable gear stage (variation stage) with a pair of gears (5,6) in which the variation stage (3) within the series is defined by

(i) a range of permissible sizes $B_i = B_1 \dots B_m$ with respective centre distances $A_i = A_1 \dots A_m$ and

- (ii) a range of permissible nominal transmission ratios $I_i = I_1 \dots I_n$, said range being the same for all sizes B_i ,

so that the centre distances A_i and the transmission ratios I_i form a matrix $M = A_i, I_i$,

wherein

the graduation of the centre distances A_i and the graduation of the transmission ratios I_i are correlated in such a way that the same gearwheel (5) is incorporated in a variation stage sequence S_1, S_2, \dots comprising a plurality of variation stages of the series, whose centre distances A_i and transmission ratios I_i lie on the same diagonal of the matrix M."

Claim 1 (auxiliary request) has the following wording:

"Transmission series having a variable gear stage (variation stage) with a pair of gears (5,6) in which the variation stage (3) within the series is defined by

- (i) a range of permissible sizes $B_i = B_1 \dots B_m$ with respective centre distances $A_i = A_1 \dots A_m$ and
- (ii) a range of permissible nominal transmission ratios $I_i = I_1 \dots I_n$, said range being the same for all sizes B_i ,

so that the centre distances A_i and the transmission ratios I_i form a matrix $M = A_i, I_i$,

wherein

the graduation of the centre distances A_i and the graduation of the transmission ratios I_i are correlated substantially in accordance with the equation:

$$\frac{A_i}{A_{i-1}} = \frac{I_i + 1}{I_{i-1} + 1} = c = \text{const.}$$

whereby the same gearwheel (5) is incorporated in a variation stage sequence S_1, S_2, \dots comprising a plurality of variation stages of the series, whose centre distances A_i and transmission ratios I_i lie on the same diagonal of the matrix M."

VI. The appellants requested that the decision under appeal be set aside and that the patent be revoked.

The arguments in support of this request can be summarised as follows:

According to what was said in claim 1 of the patent in suit about the definition of the matrix, it would appear that the term "a range of permissible sizes with respective centre distances" and "a range of permissible nominal transmission ratios" could be interpreted as to allow undefined limits for the admissible value of one centre distance (A_i) in a row (i) of the matrix and also for the admissible value of a nominal transmission ratio (I_i) in a column (i) of the matrix. Thus, it would appear that claim 1 did not define clearly limited values for the graduated centre distances ($A_1 \dots A_m$) and the graduated nominal transmission ratios ($I_1 \dots I_n$) but rather allowed unlimited values within a certain range so that the transmission series as fabricated and sold by the appellants according to the prior uses would appear to lie within the scope of claim 1 of the patent in suit.

In particular, the pairs of gearwheels as drawn from the filed catalogues and data sheets could be easily arranged in a mini-matrix with only a few pairs of gearwheels so that the variation stage sequence(s) lying on one diagonal of the matrix and having the same gearwheel in each of its variation stages comprised at least two (i.e. the minimum number of a plurality) variation stage sizes of the series so that the mini-matrix fulfilled the conditions of present claim 1. In such a mini-matrix, even if the deviations from the exact graduations of A_i and I_i in the claimed matrix were restricted to $\pm 5\%$ (= range of tolerance or permissible variation according to the description and claim 10 of the patent in suit) the columns and the rows of the matrix could be inclined so that a matrix with a distorted structure was formed.

Furthermore, the organizing principle as claimed for the pairs of gearwheels could be formed without any inventive skill by a skilled person inspecting the known transmission series, finding out the regularities and then describing the known transmission series in a new mathematical form, particularly if the skilled person's considerations were based on the real object of the patent in suit, i.e. to make an identical series of transmission ratios available for each permissible transmission size or centre distance.

Another obvious way to find out the mathematical theory, as set out in dependent claim 9 of the patent in suit and representing a mathematical equivalent of the matrix according to claim 1 of the patent in suit, consists in adapting the known formulas for gears (e.g. "Taschenbuch, Dubbel, 1981, pages 452 to 454) according to the teaching set out in the "Handbuch der

Antriebstechnik", SEW-EURODRIVE, 1980
(Enclosure 4(01)), that the centre distances should be systematically graduated and the same gear set be used frequently within the transmission series.

For these reasons claim 1, both according to the main and the auxiliary request, was not patentable.

VII. In support of their request that the appeal be dismissed and that the patent be maintained on the basis of the main request or alternatively of the auxiliary request the respondent (patentee) contradicted the arguments of the appellants and put forward the following main arguments:

The product lines of the appellants and particularly the transmission series according to the alleged prior uses were suitable neither to destroy the novelty of the subject-matter of claim 1 of the patent in suit nor to lead the skilled person to the invention in an obvious manner.

The transmission series fabricated by the appellants not only comprised the pairs of gear wheels forming the matrices according to the Enclosures 2(01), 12(01), 15(01), 16(01) and Tables 2/2'(02) but also encompassed a great number of other gearwheels arbitrarily excluded from the matrices. Thus, these matrices were the result of a hindsight based selection of gearwheels out of a "cloud" of pairs of gearwheels as was shown in the patentee's Enclosure G (filed with the letter of 30 July 1998), representing a centre distance-transmission ratio diagram wherein all pairs of gearwheels listed in the appellants' catalogues and data sheets were represented and wherein the grey coloured smaller area contained the pairs of gearwheels selected for the matrices according to Enclosures 15(01). In contrast to that the matrix

according to the invention encompassed all pairs of gearwheels of the transmission series as shown in Enclosure H (filed with the respondent's letter of 30 July 1998). Thus, even if all sets of gearwheels selected by the appellants to draft the submitted matrices belonged to the state of art, they did not anticipate the teaching according to claim 1 of the patent in suit.

Furthermore, the prior art documents cited in the description of the patent in suit, i.e. "Turpak - eine neue Zahnradgetriebereihe" in Antriebstechnik, 2/1990, pages 40 to 45, DE-A-2 061 021 and DE-A-3 705 812 showed that in practice the known transmission series disclosed solutions which were far away from the invention. Therefore the claimed subject-matter was clearly inventive.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
2. *Main request*
 - 2.1 Articles 123(2) and (3) EPC
 - 2.1.1 Present claim 1 incorporates all of the features of granted claim 1 except that the word "encompasses" in the first sentence

"Transmission series having a variable gear stage (variation stage) with a pair of gears (5, 6) in which the variation stage (3) within the series encompasses"
...

was replaced by the words

"is defined by".

2.1.2 This amendment makes it clear that all available pairs of gears (variable gear stages, variation stages) of the claimed transmission series must be suitable for being integrated into a matrix according to the teaching of claim 1 of the patent in suit whereas the strict, literal meaning of the wording of claim 1 as granted did not expressively exclude individual variation stages of the series not being suitable to be arranged in a matrix according to the further teaching of claim 1.

2.1.3 The teaching of present amended claim 1 has been clearly disclosed by the embodiment in Figures 2 or 4 or 5 of the patent in suit which exclusively disclose 16 or 49 or 36 variation stages all being integrated into a matrix as claimed.

2.1.4 As results from the two paragraphs above there are no objections under Articles 123(2) and (3) EPC.

2.2 Subject-matter of claim 1 (main request)

According to the common definition in the field of mathematics a matrix is considered as a rectangular array of numbers or other elements which are arranged in horizontally extending rows and vertically extending

columns. The rows of the matrix are generally numbered from the top down and the columns from left to right or right to left (the latter is the case in the embodiments of the patent in suit).

In the present case each element (variation stage S_1, S_2, \dots) of the matrix M is represented by a pair of gears 5,6 (variation stage) and the rows and columns are numbered according to the values of centre distances ($A_i = A_1 \dots A_m$) of each pair of gears (each centre distance corresponding to the certain size $B_i = B_1 \dots B_m$) and the values of the nominal transmission ratios ($I_i = I_1 \dots I_n$) of each pair of gears respectively. Thus, the arrangement of the rows/columns represents a graduation of the centre distances and the transmission ratios, whereby the ranges of the graduated permissible centre distances and graduated permissible transmission ratios define the totality of the the elements (pair of gears 5,6) of the transmission series.

Therefore, the terms "range of permissible ..." as used in claim 1 clearly mean a series of fixed graduated values of centre distances A_i and nominal transmission ratios I_i which are correlated (as further defined in claim 1) "in such a way that the same gearwheel (5) is incorporated in a variation stage sequence S_1, S_2, \dots comprising a plurality of variation stages of the series, whose centre distances A_i and transmission ratios I_i lie on the same diagonal of the matrix M ."

This correlation gives a clear teaching for carrying out the invention as is demonstrated by the description relating to Figure 3 on page 4, lines 12 to 44 of the patent in suit. The description on page 4, line 45 to page 5, line 11 and page 5 lines 20, 21 of the patent

in suit further defines the limits within which deviations from the ideal conditions set out in claim 1 are permissible in practice without leaving the claimed teaching.

2.3 Novelty

2.3.1 The prior art documents as set out in the description of the patent in suit and the prior art document Enclosure 4(01) "Handbuch der Antriebstechnik" undisputably do not disclose the claimed series.

2.3.2 It clearly follows from the appellants' argumentation that the matrices according to the Enclosures 2(01), 12(01), 15(01), 16(01) and the Tables 2(02) and 2'(02) have been drafted by the appellants immediately before they opposed the patent or during the following procedures. This finding, already communicated with the Board's "Annex to the summons to attend oral proceedings" (posted 18 November 1997), remained uncontradicted by the Appellants. Furthermore the alleged prior uses were merely advanced to prove that all the gearwheels and variation stages arranged in the matrices have already been made available to the public before the priority date of the patent in suit by the filed catalogues and data sheets. The witnesses had also been offered only to prove the availability of the gearwheels concerned. No evidence was filed or offered which could or should prove that all pairs of gears listed in the gearwheel series according to the catalogues and data sheets were suitable to be installed in a single matrix according to claim 1 of the patent in suit. On the contrary, the catalogues and the technical data sheets show that the matrices filed by the appellants have been built up by a selected portion among the numerous combinations of gearwheels listed in the catalogues and data sheets.

Thus, the series of gearwheels according to the catalogues and the data sheets of the alleged prior uses do not fulfill the conditions as set out in amended claim 1 being clearly restricted by its wording "is defined by" in the sense that all pairs of gears of the series must be suitable to be arranged in a matrix as described in claim 1 (see paragraphs 2.1.1 and 2.1.2 above).

Therefore, the transmission series according to the alleged prior uses do also not disclose the teaching according to claim 1.

2.3.3 The subject-matter of claim 1 is considered to be novel.

2.4 Inventive step

2.4.1 As stated in paragraphs 2.3.2 above the series of gearwheels as listed in the catalogues and data sheets apparently cannot be completely arranged in a matrix as defined in claim 1. The practicability of selecting a limited portion of suitable pairs of gears from the complete and listed series is only given if the theory for the matrix to be built was previously known. Indeed the "Handbuch der Antriebstechnik" (Enclosure 4(01)), pages 225 to 229, describes several ways how to draft transmission series wherein the centre distances are systematically graduated. There however identical **pairs** of gears are used for several transmissions. These series obviously differ from the series defined in claim 1 of the patent in suit. Also the transmission series as set out in the preamble of the description of the patent in suit (see paragraph VII above) refer to solutions which lead away from the claimed solution. These prior art series clearly show that the teaching of claim 1 is so far away from all known solutions that it was not possible for a skilled person inspecting the

lists of gears according to the alleged prior uses to find out certain regularities of the gears and then to formulate the mathematical teaching reflecting these regularities.

This result is also true for the argumentation of appellant (02) that the mathematical equivalent of the claimed series as set out in claim 9 of the patent in suit could be found by the skilled person if the known formulas for gears (e.g. as disclosed in "Taschenbuch, Dubbel, 1981, pages 452 to 454) were adapted to the teaching of Enclosure 4(01), since the transmission series according to the latter prior art document are completely different from the present solution.

- 2.5 The ground of opposition based upon Article 52(2a) EPC (unpatentable subject-matter) was first introduced into the appeal proceedings by the appellant (02).

According to the decision of the Enlarged Board of Appeal G 1/95, OJ EPO 1996, 615 in a case where a patent has been opposed on the grounds of lack of novelty and inventive step the ground of unpatentable subject-matter is considered as a fresh ground for opposition.

This fresh ground for opposition, which in the present case is in substance not considered to challenge the patentability of the patent in suit which obviously does not concern a scientific theory as such, may not be introduced into the proceedings without the agreement of the patentee, which in fact was not expressively given, and is therefore not to be further considered.

2.6 For the above reasons the Board comes to the conclusion that claim 1 according to the main request and consequently also claims 2 to 10 dependent thereof are suitable for maintenance of the patent.

3. Since the main request is accepted the auxiliary request need not be considered.

Order

For these reasons it is decided that:

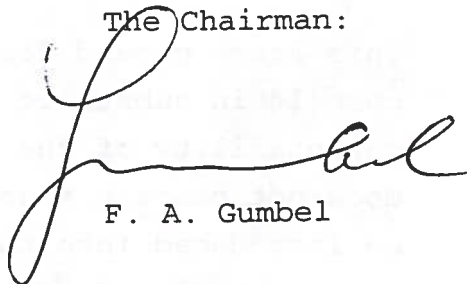
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of the following documents:
 - Claim 1 and description page 4 submitted at the oral proceedings (main request)
 - Claims 2 to 10, description pages 2, 3 and 5 and drawings as granted.

The Registrar:



N. Maslin

The Chairman:



F. A. Gumbel

