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D E C I S I O N
of 9 June 1998

Case Number: T 0498/96 - 3.2.1

Application Number: 89830461.3

Publication Number: 0366623

IPC: F16D 7/08

Language of the proceedings: EN

Title of invention:
Transmission coupling with limitation of the transmissible torque

Patentee:
O.M.C. S.n.c. di Dante Cavalli & C.

Opponent:
Chr. Mayr GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 100(a), (b), 56

Keyword:
"Sufficiency of disclosure (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0498/96 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 9 June 1998

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 12 March 1996 revoking European patent No. 0 366 623 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: F. J. Pröls
Members: P. Alting van Geusau
J. H. van Moer

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 366 623 in respect of European patent application No. 89 830 461.3, filed on 24 October 1989, and claiming priority from the Italian applications IT 494188 U and IT 353189, filed in Italy on 28 October 1988 and 29 June 1989, respectively, was published on 4 August 1993 (cf. Bulletin 93/31).

The single claim of the patent reads as follows:

"Transmission coupling with limitation of the transmissible torque, of the type including two coaxial hubs (1, 2) which are linked to the elements to be coupled kinematically, these hubs (1, 2) having a plurality of equal rotating bodies (3) on their opposite transverse faces, these rotating bodies being stably housed in corresponding seatings with the possibility of rotating freely at least around their respective radial axes with respect to the said hubs (1, 2), and respectively the same number of seatings (4) for the said rotating bodies (3), said rotating bodies (3) and their respective seatings (4) being reciprocally distanced to such an extent that all the rotating bodies (3) are placed simultaneously in their respective seatings (4) for one single value of the reciprocal rotation of the said hubs (1, 2) around the common axis; the said rotating bodies (3) and the said seatings (4) being six and the angles at the centre defined by each pair of consecutive rotating bodies (3) are different from the others; characterised in that each of the said angles at the centre are not less than the angle at the centre which is immediately smaller plus the angle at the centre (δ) defined by each rotating body (3) or by each respective seating (4) and the greatest of the said angles at the centre is

different from each angle at the centre added to the immediately smaller angle and subtracted from the said angle at the centre (δ) defined by each rotating body (3) or by each seating (4); said angles at the centre defined by each pair of consecutive rotating bodies (3) being equal to 105°, 29°, 94°, 48°, 69° and 15°, consecutively."

II. Notice of opposition was filed by the respondent (opponent) on 4 May 1994 on the grounds of Article 100(a) and (b) EPC.

In respect of an alleged lack of novelty and inventive step the opposition was supported in particular by:

D1: DE-A-2 853 803.

III. By a decision posted on 12 March 1996 the Opposition Division revoked the patent on the ground that the small differences between the known and claimed angles vis-a-vis the angles known from the prior art disclosed in DE-A-2 853 803 (D1) did not appear to result in any special effect whatsoever and that therefore this slight modification of the prior art disclosed in D1 was not inventive. Since the opposition to the patent succeeded on the ground of Article 100(a) EPC the other ground (Article 100(b) EPC) advanced by the opponent needed no further consideration.

IV. On 6 May 1996 a notice of appeal was lodged against that decision, the appeal fee having been paid on 3 May 1996.

Together with the statement of grounds of appeal, filed on 4 July 1996, the appellant filed models A and B for comparison of the supporting abilities of the couplings in accordance with D1 and the patent in suit, respectively.

V. In a communication issued in preparation for oral proceedings auxiliarily requested by both parties the Board expressed the provisional opinion that it appeared from the explanations given by the appellant in conjunction with models A and B filed with the statement of grounds of appeal that the selection of the angles between the successive rotating bodies and seatings in accordance with the subject-matter of claim 1 of the patent in suit led to a different effect when compared to the known range of angles disclosed in D1.

It was noted that the respondent was of the view that the effects largely depended on the size (angle) of the seatings but as could be derived from the models A and B filed by the appellant, for equal sizes of the seatings the angle selection of the present patent provided better support than the angle selection in accordance with D1.

In respect of the issue of inventive step of the subject-matter an important issue to be discussed at the oral proceedings would be on what basis of prior art knowledge the skilled person was led to adopt in an obvious manner a selection of the set of angles in accordance with the granted claim 1 of the patent in suit.

VI. Oral proceedings were held on 9 June 1998.

The appellant requested setting aside of the decision under appeal and maintenance of the patent unamended.

The respondent requested dismissal of the appeal and revocation of the patent in its entirety.

VII. In support of its request the appellant essentially relied upon the following submissions:

In fact D1 did not disclose or hint at any of the characterising features of the claim of the patent in suit. It was true that the differences between the known and claimed angles was small but these small differences led to a considerable improvement of support of the coupling parts with avoidance of tilting. Though respondent denied the presence of tilting forces in the coupling of the type claimed such tilting forces were always present in the environment in which the transmission coupling was used and also D1 referred to the necessity to avoid tilting of the coupling parts.

The improved support of the coupling parts with respect to each other was achieved by a selection of the specific features defined in the characterising part of the claim and in particular by the selection of a sequence of angles which were different from those known from D1. No lead was derivable from the cited prior art to change the angles and there was no other evidence that the skilled person would consider a new distribution of angles with the view of improving the stability of the coupling when the torque limit was exceeded and the coupling parts rotated with respect to each other.

VIII. The respondent disputed the appellant's view and its arguments may be summarised as follows:

The coupling defined in the single claim of the patent in suit was nothing more than a mere copy of the coupling disclosed in D1 with some small irrelevant constructional deviations because the differences between the known angles and those specified in the claim of the patent in suit were too small to have any appreciable effect.

Moreover, the patent pretended to give a solution to a non-existing problem. Tilting of the coupling parts in D1 was not possible because the resultant axial force worked within the triangle defined by the supporting rollers so that no tilting moment could be formed. Tilting was not decisive either because after initiation of the respective rotation of the coupling parts the drive was immediately switched off so that no load was transmitted through the coupling. Anyhow, problems with tilting had never been encountered with the couplings known from D1.

The distribution of angles in accordance with D1 was based on simple manufacturing of the coupling parts by using the tooling available at the priority date of D1. No inventive activity could be seen in the selection of slightly different angles which could easily be achieved at the priority dates of the present patent by using readily available computer controlled machining equipment.

Reasons for the Decision

1. The appeal is admissible.

2. *Article 100(b) EPC*

2.1 In the opposition proceedings the respondent raised the objection of insufficiency of disclosure of the invention claimed.

The respondent did not base arguments on this ground of opposition in the appeal proceedings (it was nevertheless mentioned at the oral proceedings) but it was also not withdrawn and therefore the Board considers it appropriate to investigate this ground of opposition.

2.2 The Board is of the opinion that the features of the claim, in particular the first two characterising features, are not directly understandable in themselves even in the context of the features in the precharacterising part of the claim. This lack of clarity gives rise to a need for interpretation of the subject-matter of the claim, which interpretation is governed by Article 69 EPC according to which the description and drawings shall be used to interpret the claims.

Having regard to the description of the patent, in particular the explanations given in column 3, line 40 to column 4, line 23, it is specifically set out what these features of the claim mean in technical and mathematical terms and in particular in what conditions the angles at the centre as defined in the claim must satisfy. Furthermore the last lines of the claim unambiguously restrict the claimed teaching to the fixed angle values complying with the defined conditions.

Therefore, having regard to this disclosure of the description, the conditions of Article 100(b) EPC, which concerns the European patent as a whole rather than the content of a claim, are fully satisfied.

3. *Article 100(a) EPC*

3.1 Novelty

Novelty of the subject-matter of the claim of the patent in suit follows from the fact that none of the available prior art documents discloses a transmission coupling with limitation of the transmissible torque in accordance with the preamble of the claim in which the angles at the centre defined by each pair of consecutive rotating bodies is equal to 105°, 29°, 94°, 48°, 69° and 15°, consecutively.

Novelty was in fact not contested by the respondent.

3.2 Inventive step

3.2.1 The parties and the Board are in agreement that the transmission coupling disclosed in D1 represents the closest prior art and in fact the precharacterising part of the claim is based on this document.

3.2.2 An important condition for the correct functioning of the torque limiting coupling is that during relative rotation of the coupling parts in case the torque-limit is exceeded, the points of support for the rotating bodies should never find themselves on the same side of a diameter but should be distributed along the circumference as equidistant as possible. This condition avoids that the coupling parts tilt with respect to each other which would lead to mechanical instability (compare column 2, lines 4 to 11 of the description of the patent in suit and page 6, second paragraph, of D1).

The underlying problem to be solved by the subject-matter of the claim of the of the patent in suit therefore relates to improvement of the stability of the coupling so as to be largely independent of the angular position of the two coupling halves (see column 2, lines 27 to 32 of the patent in suit).

3.2.3 The respondent submitted that in the coupling known from D1 the small axial displacement of the coupling resulting from the reciprocal rotation of the coupling halves, was used to activate a switch for switching-off of the drive (see D1, page 4, last paragraph and page 5, first line). Therefore, rotation of the coupling halves was carried out in no-load condition so that tilting during reciprocal rotation of the coupling halves was a non-existent problem which could not be the basis for a solution claimed in the patent in suit.

However, it is to be noted that in D1 tilting of the coupling parts is indeed referred to as problematic with the prior art arrangement discussed in the introduction to the description and in the statement of invention on page 6, second paragraph, specific reference is made to the support of the coupling halves in a manner that tilting is avoided.

Reference can also be made to the explanations in respect to Figure 4 on page 10, in which the importance of the angular distribution of the three supporting rollers for the avoidance of tilting is emphasised. In Figure 4 of D1 is depicted in what position the support of the coupling halves with respect to each other is considered most disadvantageous, i.e. the relative position of the coupling halves in which the angular distribution of the three supporting rollers is closest to the point at which two supporting rollers are closest to 180° and tilting may occur.

Moreover, the coupling disclosed in the patent does not necessarily include a switching arrangement of the form as used in D1 nor does it necessarily include accurate guiding means for the coupling halves with respect to each other. Vibrations could also be the cause that the resultant force is not always within the area formed by the triangle defined by the supporting rotating bodies. Therefore, depending on the use of the claimed coupling, improvement of stability during reciprocal rotation of the coupling halves is considered to be a valid technical problem encountered with the coupling of the general type as defined in the preamble of claim 1 of the patent in suit.

3.2.4 The above stated problem is solved by the subject-matter of claim 1, in particular in that there is a specific distribution of angles at the centre between the six consecutive rotating bodies of 105°, 29°, 94°, 48°, 69° and 15°, consecutively. As is explained in the

patent in suit such arrangement leads to a three point support in the disengaged state of the coupling with a maximum angle of about 142° between two supporting rotating bodies.

3.2.5 Having regard to the coupling known from D1, the distribution of the angles between the supporting rotating bodies B, D and F (see the following Figure) in the position depicted in Figure 4 is 135°, 90° and 135°, respectively.

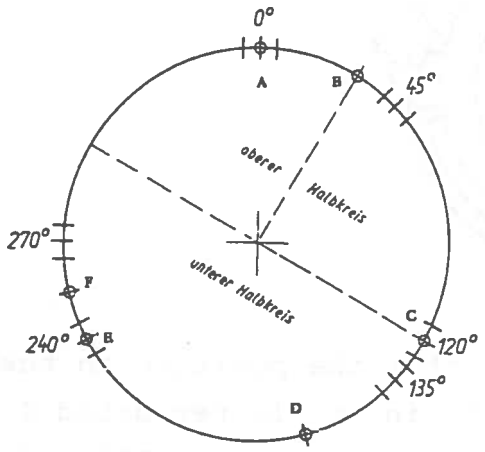
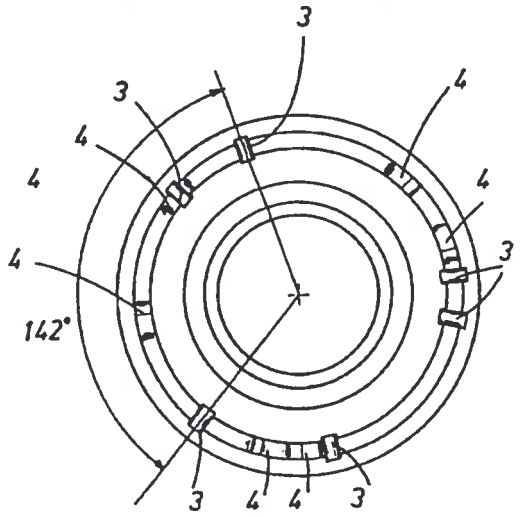


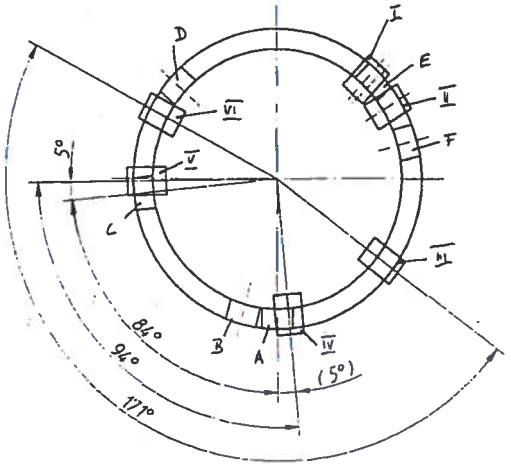
Fig.4

However, as was shown by the appellant and this was not disputed by the respondent, contrary to what is stated in D1 the position shown in Figure 4 of D1 is **not** the most disadvantageous position, rather this position is found when the upper coupling halve is rotated clockwise further over 15°. In that position the distribution of the angles between the supporting rotating bodies A, D and E is 165°, 75° and 120°, respectively.

In the arrangement in accordance with the claimed coupling the most disadvantageous position in respect of stability is the one depicted in Figure 3 of the patent in which the largest angle between consecutive rotating bodies is 142° and in so far there is indeed an improvement to a more uniform distribution when compared to the distribution in D1.



3.2.6 The respondent considered that the position in the coloured sketch referred to in its letter dated 4 May 1995, in which three rotating bodies (II, III and VI) run on the ring projection 8 (patent in suit), two rotating bodies (I and IV) are entering seatings and one (V) is leaving a seating, was in fact the most disadvantageous position, because the angle between two supporting rotating bodies became 171°.



However, the rotating bodies IV and V enter and leave their seatings at the same time and consequently the support is transferred from the one to the other during transition. In D1 both rotating bodies enter their seatings at the same time and totally loose their supporting function. The position in the coloured sketch as indicated by the respondent cannot therefore be seen to represent a more disadvantageous position than the one depicted in Figure 3 of the patent in suit.

3.2.7 The respondent also argued that the effects largely depended on the size (angle) of the seatings but as can be derived from the models A and B filed by the appellant, for equal size of the seatings and rotating bodies the angle selection of the present patent effectively allows a more favourable angular distribution between the supporting rotating bodies, which, in fact, was not anymore denied by the appellant during the oral proceedings.

3.2.8 Considering the small differences between the known angular distribution and the claimed distribution the improvement of the widest gap of 165° to 142° is substantial and could not be foreseen on the basis of the disclosures of D1 or common knowledge of the skilled person.

Having regard to the fact that many other possibilities for improvement of the stability of the coupling halves during rotation are at the disposition of the skilled person, for example the use of more than 6 supporting rotating bodies or the provision of accurate guiding means between the two coupling halves, there was, in the opinion of the Board no obvious lead to change the known angular distribution in the manner as claimed.

3.2.9 The respondent considered that even when admitting the existence of a small improvement the claimed angular distribution was obvious in view of the more sophisticated machine tools available at the priority date of the patent in suit with which any angular distribution could easily be achieved, when compared to the situation at the priority date of D1. The coupling defined in the claim of the patent in suit was therefore the result of simple optimisation based on the teachings of D1 without the exercise of any independent inventive quality.

The Board cannot follow such line of argumentation. No lead whatsoever is derivable from D1 that improvement of stability could be achieved by changing the angular distribution known from D1. The disclosure of D1 rather leads to the conclusion that the angular distribution of D1 could not be further improved because according to D1 as depicted in Figure 4, in the most disadvantageous position the largest angle between two supporting rotating bodies was 135° and there was no obvious reason to call this conclusion in question. Only after the appellant's recognition that the conclusions of D1 as concerns the alleged most disadvantageous position according to Figure 4 were wrong (see point 3.2.3, paragraph 3) could the necessity of an improvement be anticipated and even then no lead is derivable from D1, or any of the other cited documents (not any longer referred to by the respondent), that a new angular distribution would be the answer to the stability problem.

4. The Board therefore comes to the conclusion that the subject-matter of the single claim of the patent in suit can neither be derived in an obvious manner from the cited prior art nor is otherwise obvious to the skilled person and accordingly involves an inventive step within the meaning of Article 56 EPC.

This claim is therefore acceptable.

The grounds of opposition do therefore not prejudice maintenance of the patent as granted.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained unamended.

The Registrar: The Chairman:

S. Fabiani F. Pröls