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D E C I S I O N
of 10 May 1995

Case Number: T 0342/92 - 3.4.1

Application Number: 86305758.4

Publication Number: 0213732

IPC: G01P 3/487

Language of the proceedings: EN

Title of invention:
Magnetic ring for detecting the rotation of an object

Applicant:
HONDA GIKEN KOGYO KABUSHIKI KAISHA, et al

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"
"Obvious analogous use of known technology"

Decisions cited:
-

Catchword:
-

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Case Number: T 0342/92 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 10 May 1995

Appellant 01): HONDA GIKEN KOGYO KABUSHIKI KAISHA
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 22 November 1991 refusing European patent application No. 86 305 758.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: G. D. Paterson
Members: H. J. Reich
R. K. Shukla

Summary of Facts and Submissions

I. European patent application No. 86 305 758.4 (publication No. 0 213 732) was refused by a decision of the Examining Division.

II. The reason given for the refusal was that the subject-matter of Claims 1 of the main and the five auxiliary requests filed during the oral proceedings held on 15 October 1991 did not satisfy the requirements of Articles 52(1) and 56 EPC having regard to documents:

D1: US-A-4 002 937,
D2: CH-A-295 518 and
D3: EP-A-0 081 225.

The Examining Division took the following view: Document D2 which generally deals with producing reinforcing magnets, discloses a magnetic member which is embedded in an injection moulding compound and forms an integral unit therewith. It thereby renders it obvious to simplify the production of the reinforcing ring of the magnetic ring element disclosed in the closest prior art according to document D1 by moulding it about the magnetic ring member as claimed in Claim 1 of the main request. Embedding parts of devices in resin material by moulding the resin about the parts to provide an integral composite structure is a very well known technique in many technical fields. This technique is often preferred for mass production of articles as it ensures simple manufacturing. An expert would consider the use of this technique as a matter of workshop practice. The features claimed additionally in Claims 1

of the auxiliary requests are obvious in view of a further reinforcing (one-piece) metallic ring member disclosed in document D1 and the one-piece magnetic ring member disclosed in document D3.

III. The Appellant lodged an appeal against this decision. In his Statement of Grounds of Appeal the Appellant maintained the six sets of claims underlying the appealed decision and argued inter alia that the aim of the invention as claimed is not only to provide a magnetic ring which can be more easily produced, but is also to provide a magnetic ring which is capable of withstanding mechanical stresses when being press fitted onto a rotary body.

IV. In a communication accompanying a summons to oral proceedings, the Board drew the Appellant's attention to the following:

(a) The closest prior art is represented by document D3 and not by document D1. A skilled person will find out the mechanical weakness of the conventional magnetic ring member disclosed in document D3 in practice, and can be expected to know that embedding by injection moulding protects bodies from mechanical shock and imparts mechanical strength; see as expert evidence:

D4: S. M. Lee: "Embedding" in Encyclopedia of Polymer Science and Engineering, Second Edition, John Wiley & Sons, in particular pages 792 to 795.

A skilled person is therefore able to recognise that in document D3, injection moulding compound 3 mechanically reinforces magnetic member 1 shown in Figure 1 of the document.

(b) Due to the fact that document D2 discloses on page 1, lines 36 to 38 that metallic member 4 protects the edges of the magnetic member 1 and is also embedded in reinforcing member 3, a skilled person has a technical reason to make additional use of this teaching in the magnetic ring member disclosed in document D3.

V. In reply, the Appellant withdrew his first and third to fifth auxiliary requests and filed by telecopy on 5 May 1995 the subject-matter of the above main and second auxiliary requests as a main and a sole auxiliary request, respectively.

Claim 1 of the **main request** reads as follows:

"1. A ring (1) to be attached to a rotary body (42) for producing an electrical signal in cooperation with a magnetic sensor (38) relative to which the rotary body rotates, comprising:

a magnetic ring member (2) made of synthetic resin material in which magnetic material is dispersed, the said magnetic ring member having an alternating magnetic property around a circumference thereof;

characterised in that

a reinforcing ring member (3) made of synthetic resin material extends around the magnetic ring member, the said reinforcing ring member being moulded about the magnetic ring member so that the magnetic ring member is at least partially embedded in the reinforcing ring member to form an integral unit therewith."

Claims 2 to 4 of the main request are dependent on Claim 1.

Claim 1 of the **auxiliary request** reads as follows:

"1. A ring (1) to be attached to a rotary body (42) for producing an electrical signal in cooperation with a magnetic sensor (38) relative to which the rotary body rotates, comprising:

a magnetic ring member (2) made of synthetic resin material in which magnetic material is dispersed, the said magnetic ring member having an alternating magnetic property around a circumference thereof;

characterised in that

a reinforcing ring member (3) made of synthetic resin material extends around the magnetic ring member, the said reinforcing ring member being moulded about the magnetic ring member so that the magnetic ring member is at least partially embedded in the reinforcing ring member to form an integral unit therewith; and the ring is further reinforced by a metallic ring member (4)."

Claims 2 and 3 of the auxiliary request are dependent on Claim 1.

VI. Oral proceedings were held on 10 May 1995 during which the Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main and auxiliary request as filed by telecopy on 5 May 1995.

VII. In support of this request the Appellant argued essentially as follows:

(a) It is accepted that the closest prior art according to document D3 discloses the features claimed in the precharacterising part of Claim 1 of the main and auxiliary request.

(b) Document D2 teaches on page 1, lines 13 to 20 to protect the parts of the magnetic member (1) which have a small cross section, and its edges by embedding the magnetic member in a metallic foil. An injection moulding mass which is only used in the embodiment of Figure 1 has the purpose to hold magnetic member 1 and the adjacent reinforcing metallic parts 2 and 4 together. There is no suggestion in document D2 that injection moulding compound 3 strengthens the magnetic member. Attributing a strengthening effect of injection moulding compound 3 to its relatively thick cross section in Figure 1 would be a hindsight interpretation of the prior art.

(c) The application clearly discloses in column 1, lines 40 to 45 that the object of the present invention is to improve the mechanical strength of the magnetic ring so as to facilitate its mounting by press fitting it onto a rotary body during the assembly process. The general technical knowledge evidenced by document D4, emphasises the protection of the surface of an element from the atmosphere, mechanical shock and vibration **during its use**. It does not teach to strengthen a fragile element so that its mounting is facilitated.

(d) Document D2 gives no hint to incorporate a metal ring into an integral unit of a magnetic ring member and a reinforcing ring member moulded about the magnetic ring in order to reinforce the synthetic resin ring as in Claim 1 of the auxiliary request.

VIII. At the conclusion of the oral proceedings, the decision was announced that the appeal was dismissed.

Reasons for the Decision

1. *Inventive step - Claim 1 of the main request*

1.1 From the closest prior art according to document D3 there is known (in the wording of Claim 1):

"A ring (see D3, Figures 4 and 6) to be attached to a rotary body for producing an electrical signal in cooperation with a magnetic sensor relative to which the rotary body rotates (D3, page 1, lines 3 to 5), comprising: a magnetic ring member made of synthetic resin material in which magnetic material is dispersed (D 3, page 6, lines 9 to 16), the said magnet ring member having an alternating magnetic property around a circumference thereof (D3, Figure 4)."

1.2.1 Starting from document D3, the objective problem underlying the invention as claimed in Claim 1 is - in line with the description of the present application, column 1, lines 40 to 45 and column 2, lines 24 to 28 - to endow the ring structure which is to be attached to a rotary body, with the mechanical strength and integrity which are necessary for press fitting and easy handling, in order to avoid damage of the ring during its assembly process and its use and to render the reliability and durability of the ring sufficient for practical purposes. A skilled person will find out the mechanical weaknesses of the conventional magnetic ring member disclosed in document D3 in practice. Therefore, in the Board's view, no contribution to inventive step is to be found in the definition of the above problem.

1.2.2 The description discloses that damage to the magnetic ring member is to be avoided during the assembly process **and** in use. Hence, the Appellant cannot be followed in his argument - as stated in paragraph VII-(c) above - that the technical object of the invention is limited to enabling assembly of the ring on to the rotary body by press fitting. Moreover, press fitting causes forces which are exerted from **outside** on the ring surface (i.e. mainly in radial direction on the interior circular surface of the ring). Forces exerted on the magnetic ring member in use and in assembling thus do not differ in their working direction. Hence, in assembly and in use the technical object which is achieved by the invention, is the same, namely protection of the magnetic ring member against damage caused by mechanical forces exerted on its surface from outside the ring member. Furthermore, Claim 1 defines the provision of the reinforcing ring member made of synthetic resin material "around the ring member" and does not limit the avoidance of mechanical damage to those surface parts of the ring which interact with the rotary body.

1.3 The Appellant's interpretation of document D2 in paragraph VII-(b) above does not take into account the text in document D2, page 1, lines 13 to 15, which reads: "Ihre mechanische Festigkeit (d. h. die der Dauermagnetkörper) läßt **namentlich** an Stellen kleineren Querschnitts sowie an Kanten oft zu wünschen übrig (their mechanical strength (i.e. that of the permanent magnet bodies) is insufficient **especially** at places with small cross section as well as edges)." Hence, document D2 aims also at improving the mechanical strength of the **overall** permanent magnetic body 1 as in the embodiment of Figure 1. It follows from the text of document D2 page 1, lines 36 to 38 that in the embodiment of Figure 1 the edge protection is realised by thin metal sheet 4. However, it would be evident to a

skilled person that in the embodiment of Figure 1 injection moulding compound 3 is provided not only on the three flat outer surfaces of the permanent magnet body 1 but also inside its central groove, i.e. - in line with the text page 1, lines 13 to 15 - at places of the permanent magnet body with a small cross section. For the above reasons, the Board takes the view that - contrary to the Appellant's argument in paragraph VII-(b) - a skilled person derives from document D2 that injection moulding compound 3 not only holds parts 1, 2, 4 together but represents the particular embodiment of the "mechanically protective layer" disclosed on page 1, lines 16 to 20 as the general inventive concept of the solution for contributing additional strength to the magnetic body. Document D2, page 1, line 20 indicates that the mechanically protective layer consist only " **insbesondere (in particular)**" of a sheet metal. None of the claims of document D2 is narrowed to a metallic mechanical protective jacket. In view of the above mentioned disclosure of document D2 the Board is satisfied that a skilled person would recognise in injection moulding compound 3 of the embodiment of Figure 1 of document D2 the following means (in the wording of Claim 1 of the present application) for mechanically protecting magnetic member 1:

"a reinforcing ... member made of synthetic resin material which extends around the magnetic ... member, the said reinforcing ... member is moulded about the magnetic member so that the magnetic member is at least partially embedded in the reinforcing member to form an integral unit therewith."

Thus, document D2 shows that the generally known technique of protecting a body from mechanical shock by embedding it by injection moulding (cf. for instance

document D4) had already been used in the prior art of the particular technical field of the invention, i.e. for mechanically strengthening a magnetic body.

1.4 In so far as the wording of Claim 1 covers a ring which is reinforced **only** by a synthetic resin material, the Board has the following observations to make.

A skilled person is able to see the reduced protection against torsional forces when leaving away a stiffening sheet metal 2 of the embodiment disclosed in Figure 1 of document D2. Also foreseeable is the lack of edge protection when eliminating sheet metal 4 from this embodiment. However, a skilled person can be expected to know that both these disadvantageous effects can at least be reduced by selecting an embedding material with an appropriate ratio of rigidity to flexibility and by providing a thickness so that the reinforcing member damps within its volume the forces which in practise may act upon the magnetic ring member. It lies within the routine skill of the skilled person to admit a foreseeable reduction of reinforcement by leaving away metal components 2 and 4 whenever such support of the reinforcing effect of injection moulding compound 3 is superfluous in view of practical needs. Therefore, the Board sees no technical hinderance in applying only conventional moulding compound 3 of document D2 on the surface of the magnetic ring member of the closest prior art according to document D3. This application results automatically in a ring shaped reinforcing member as claimed.

1.5 Damping is known to be a volume effect of the synthetic resin material. The injection moulding technique disclosed in document D2 will therefore act as an

effective reinforcing means when transferred from the magnetic rod as used in document D2 to the magnetic ring disclosed in document D3.

2. For the reasons set out above in paragraphs 1.1 to 1.5, Claim 1 of the main request does not involve an inventive step and is not allowable pursuant to Articles 52(1) and 56 EPC. Claims 2 to 4 of the main request fall because of their dependence on Claim 1.

3. *Inventive step - Claim 1 of the auxiliary request*

3.1 The wording of Claim 1 of the auxiliary request adds to that of Claim 1 of the main request the feature:

"and the ring is further reinforced by a metallic ring member (4)";

Further reinforcement of a magnetic body by a metallic member is used in the embodiment disclosed in Figure 1 of document D2; see sheet metal 4.

3.2 For the reasons set out in paragraphs 1.1 to 1.5 also Claim 1 of the auxiliary request is the result of an obvious use of the reinforcing technique disclosed in document D2 in a closely analogous situation according to document D3. For a skilled person, it would be a routine exercise of his discretion to use sheet metal 4 in combination with injection moulding compound 3 as disclosed in document D2.

4. Therefore, Claim 1 of the auxiliary request does not involve an inventive step and is not allowable pursuant to Articles 52(1) and 56 EPC. Claims 2 and 3 of the auxiliary request fall because of their dependence on Claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Beer G. D. Paterson