BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 364/91 - 3.4.2

Application No.: 83 830 159.6

Publication No.: 0 104 148

Title of invention: Method and apparatus for obtaining electrical signals correlated with the position of a mass of mercury in instruments and the like

Classification: G01D 5/20

D E C I S I O N
of 31 March 1993

Applicant: Floris, Pierluigi, et al

Headword:

EPC Articles 56 and 82

Keyword: "Main request: unity of invention (no)"
"Auxiliary request: inventive step (yes)"

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 364/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 31 March 1993

Appellant : Floris, Pierluigi
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Decision under appeal : **Decision of the Examining Division of the European Patent Office dated 21 December 1990 refusing European patent application No. 83 830 159.6 pursuant to Article 97(1) EPC.**

Composition of the Board :

Chairman : E. Turrini
Members : W.W.G. Hofmann
L.C. Mancini

Summary of Facts and Submissions

I. European patent application No. 83 830 159.6 (publication No. 0 104 148) was refused by decision of the Examining Division.

II. The reason given for the refusal was that the inventions defined in independent Claims 11 and 12 lacked unity (Article 82 EPC) and the subject-matter of Claims 1, 11 and 12 lacked an inventive step (Article 56 EPC), having regard to document

(D1) FR-A-1 363 419.

III. The Appellants lodged an appeal against the decision.

IV. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board cited

(D3) "IEEE Standard Dictionary of Electrical and Electronics Terms", published by The Institute of Electrical and Electronics Engineers, Inc., New York, NY, Second Edition 1977; page 533,

and expressed its provisional opinion that various amendments in the then valid claims and description violated Article 123(2) EPC and that, leaving out the non-disclosed features, the subject-matter of Claims 1, 11 and 12 lacked novelty having regard to D1.

V. Oral proceedings were held, during which the Board additionally mentioned the document

(D2) US-A-4 129 852 which had already been cited in the European Search Report.

At the end of the oral proceedings, the Appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 7 of a main request or Claims 1 to 4 of an auxiliary request, all handed over at the oral proceedings.

The independent Claims 1 and 2 according to the main request read as follows:

"1. A device for producing electrical signals corresponding to the position of a mercury mass movable within a vessel, wherein the position of the moving mercury mass within the vessel is detected by means of an electromagnetic proximity sensor, specifically an induction proximity sensor,
characterized in that said vessel (1, 2, 3) is partially filled with said mercury mass (M) and tiltable in a vertical plane,
that said proximity sensor (S) is provided at one end of said vessel (1, 2, 3),
said proximity sensor (S) being adapted for emitting a first kind of an electrical signal, wherein said mercury mass (M) collects against an active face of said proximity sensor (S), and a second kind of an electrical signal, when said mercury mass (M) is moved away from said active face of said proximity sensor (S).

2. A device for producing an electrical signal corresponding to the position of a mercury mass being movable within a U-shaped tubular channel, which is partially filled with said mercury mass,
wherein the position of the moving mercury mass within said tubular channel is detected by means of an electromagnetic proximity sensor, specifically an induction proximity sensor,

characterized in that said tubular channel is provided in a block (21),
wherein a plunger (27) is connected to a moving mechanical member and inserted with large clearance into one of the upright legs of said tubular channel,
that said proximity sensor (S) is inserted into the other vertical leg (23) of said tubular channel,
whereat the proximity sensor (S) is arranged at a level higher than the level of said mercury mass (M) in the same vertical leg (23), and wherein an electrical signal is produced when the level of said mercury mass approaches an active face (FS) of said proximity sensor."

Claims 3 to 7 are dependent on Claims 1 and/or 2.

Claim 1 according to the auxiliary request reads as follows:

"1. A device for producing an electrical signal corresponding to the movement of a movable mechanical member using the detection of the position of a movable mercury mass (M),
characterised in that
a plunger (27) is connected to the mechanical member and inserted with large clearance into one of the upright legs (22, 23) of an upright U-shaped tubular channel which is provided in a block (21) and partially filled with the mercury mass movable therein, the plunger (27) floating on the mercury mass (M),
and that for detecting the position of the movable mercury mass (M) within the tubular channel an electromagnetic induction proximity sensor (S) is provided, which proximity sensor (S) is inserted into the other vertical leg (23) of the tubular channel and arranged at a level higher than the level of the mercury mass (M) in the same vertical leg (23)."

Claims 2 to 4 are dependent on Claim 1.

VI. The arguments presented by the Appellants were essentially as follows:

Both Claims 1 and 2 according to the main request relate to arrangements of the proximity sensor in which the mercury mass approaches the active face of the sensor in a direction perpendicular to the said face and collects against this face, contrary to the arrangement according to D1 in which the surface of the column of mercury passes by the front face of the sensor in a direction parallel thereto. Therefore, in the present arrangement, the approaching mercury mass has a stronger influence on the electromagnetic field lines of the sensor.

Moreover, according to present Claims 1 and 2, the sensor directly produces the desired electrical signals, whereas according to D1 the current of the sensor controls the movement of a servomotor which shifts the contact on a variable resistor, the current through which might then be used as a signal.

Thus, these features of Claims 1 and 2 correspond to a common inventive concept in the sense of Article 82 EPC and also involve an inventive step in the sense of Article 56 EPC.

Reasons for the Decision

1. The appeal is admissible.

2. Claim 1 according to the main request essentially corresponds to the original Claim 2. The fact that the

mercury mass collects against an active face of the proximity sensor is disclosed on page 6, lines 9 to 11 of the original description.

Claim 2 according to the main request essentially corresponds to the original Claim 8, and the features regarding the block, the level of the proximity sensor and the level of the mercury mass approaching the active face of the sensor are disclosed on page 7, lines 6, 16 to 19 and 22 to 25 of the original description.

Claims 3 and 4 are based on the original Claim 3. The additional features of Claim 5 are disclosed on page 3, line 6 and page 7, lines 2 to 4; those of Claims 6 and 7 on page 8, lines 2 to 5 (the fact that Claims 6 and 7 contain references, among others, to Claim 5 (which comprises an embodiment unrelated with Claims 6 and 7), is an obvious error).

Claim 1 according to the auxiliary request corresponds in substance to Claim 2 according to the main request discussed above (without the final feature thereof regarding the level of the mercury mass approaching the active face of the sensor). The reference to the movement of the mechanical member was already contained in original Claim 8 and described on page 7, lines 2 and 3, and that to the plunger floating on the mercury mass on page 7, lines 13 to 15.

Dependent Claims 2 to 4 of the auxiliary request correspond to Claims 5 to 7 of the main request.

The description according to the auxiliary request has been adapted to the set of claims.

The description according to the main request would need an adaptation to the set of claims. The Board did not, however, require of the Appellant such adaptation, in view of the findings presented below.

Thus, there is no objection under Article 123(2) EPC to the present application documents.

3. Main request

3.1 The set of claims according to this request comprises two independent Claims 1 and 2.

Both of these claims relate to a device for producing an electrical signal corresponding to the position of a mercury mass movable within a partially filled vessel. Moreover, according to both claims the position of the moving mercury mass is detected by means of an electromagnetic induction proximity sensor which produces an electrical signal when the mercury mass comes close to the active face of the sensor.

All of these features common to Claim 1 and Claim 2 are known from D1 (cf. in particular Figure 3 and corresponding text) which describes the detection of the displacements of a column of mercury in a partially filled manometer tube by means of an electromagnetic induction sensor. When the column of mercury approaches the active face of the sensor (cf. also page 2, left-hand column, lines 11 to 14), the sensor acts on a servomechanism by means of an amplifier (page 3, left-hand column, lines 9 to 11), i.e. the sensor produces an electrical signal.

It should be mentioned that, contrary to the Appellants, the Board does not consider the current flowing through the resistor 38, but the variation of the current coming

directly from the detector 33, to be the signal corresponding to the electrical signal mentioned in present Claims 1 and 2.

3.2 All of the remaining features of Claims 1 and 2 go into different directions.

In the case of Claim 1, the purpose is to indicate the tilt, in a vertical plane, of the vessel. The vessel is tiltable, and the proximity sensor is provided at one end thereof. A first kind of signal is emitted when the mercury collects against an active face of the proximity sensor. A second kind of signal is emitted when the mercury mass moves away from the active face of the proximity sensor.

In the case of Claim 2, the purpose is to indicate the movement of an independent, movable mechanical member (while the vessel, i.e. the tubular channel, remains stationary). Consequently, the vessel is U-shaped, a plunger is connected to the mechanical member and inserted into one of the upright legs of the vessel, the proximity sensor is inserted into the other vertical leg of the vessel, and the proximity sensor is arranged at a level higher than the level of the mercury mass.

Thus, regarding problems and solutions, Claims 1 and 2 have no concept in common beyond that which is already known from D1.

3.3 The Appellants have argued that according to both Claims 1 and 2 the mercury mass approaches the active face of the proximity sensor in a direction perpendicular to this face, contrary to the arrangement described in D1. However, such a definition regarding the orientation of

the proximity sensor is contained neither in Claim 1 nor in Claim 2; the fact that the sensor is provided at one end of the vessel, or that the sensor is inserted into a vertical leg of the tubular channel, gives no indication as to the orientation of the active face (or the axis) of the sensor.

The feature that the mercury collects against the active face of the proximity sensor (which might mean direct contact), is only contained in Claim 1 and thus does not constitute a feature common to both independent claims.

Moreover, the orientation of the sensor with respect to the movement of the mercury mass and the minimum distance reachable between the mercury and the sensor are features which a person skilled in the art would easily choose without encountering unexpected effects, so that these features, even if they were contained in both claims, would not represent an inventive concept in the sense of Article 82 EPC.

3.4 For these reasons, the set of claims according to the main request lacks unity of invention (Article 82 EPC), and therefore this request is not allowable.

4. Auxiliary request

4.1 The set of claims according to this request comprises only one independent claim. Therefore, no doubt arises regarding unity of invention (Article 82 EPC).

4.2 Novelty

4.2.1 In partial agreement with Claim 1, document D1 (cf. in particular page 1, left-hand column, lines 25 to 34; page 1, last line, to page 2, left-hand column, line 17;

page 3, left-hand column, lines 5 to 11; Figures 1 and 3) discloses a device for producing an electrical signal corresponding to the movement of a mercury mass partially filling an upright U-shaped tubular channel, wherein for detecting the position of the movable mercury mass within the channel an electromagnetic induction proximity sensor is provided which is arranged at a level higher than the level of the mercury mass in the same vertical leg.

However, D1 does not mention a mechanical member the movement of which is to be indicated, nor a plunger connected with the mechanical member and inserted with large clearance into one of the upright legs of the tubular channel so that it floats on the mercury mass, nor the fact that the proximity sensor is inserted into the other vertical leg of the tubular channel.

4.2.2 In correspondence with the preamble portion of Claim 1, D2 (cf. in particular Figure 1 and corresponding text) relates to a device for producing an electrical signal corresponding to the movement of a movable mechanical member, using the detection of the position of a movable mercury mass.

However, in the known case the mercury containing vessel itself is movable (the mercury reacts to a tilting movement thereof) and is directly fixed to the movable member, i.e. the axle of a vehicle, whereas according to Claim 1 the mechanical member is an independent part connected to a plunger which floats on the mercury mass. Contrary to the known case, the vessel for the mercury according to Claim 1 is an upright U-shaped tubular channel provided in a block, and into one upright leg of this channel the plunger is inserted. Moreover, according to Claim 1, the means for detecting the position of the

movable mercury is not a resistance wire or coating, but an electromagnetic induction proximity sensor inserted into the other upright leg of the tubular channel and arranged at a level higher than the level of the mercury mass.

4.2.3 D3 provides a definition of the term "proximity switch", but does not describe any device using such a switch.

4.2.4 The subject-matter of Claim 1 is therefore novel in the sense of Article 54 EPC.

4.3 Inventive step

4.3.1 Since Claim 1 according to the auxiliary request is clearly directed to indicating the movement of a movable mechanical member (the detection of the position of a mercury mass only being a means for reaching this goal), document D2, in which it is also the movement of a mechanical member which is to be detected, is considered to represent prior art closer to the claimed subject-matter than that according to D1. (The choice of D2 as the basis for the preamble portion of Claim 1 (Rule 29(1) EPC) is therefore justified.)

Consequently, the problem to be solved lies in generating electrical signals in dependency on the movement of a mechanical member (cf. present page 3, lines 7 to 9). The device for detecting this movement should be able to remain stationary while the mechanical member is moving (cf. present page 6, lines 3 to 6).

4.3.2 For solving this problem, present Claim 1 provides a plunger which is connected to the mechanical member and inserted with large clearance into one of the upright legs of an upright U-shaped tubular channel which is provided

in a block and partially filled with the mercury mass movable therein, the plunger floating on the mercury mass, and a proximity sensor being inserted into the other vertical leg of the tubular channel and arranged at a level higher than the level of the mercury mass. With regard to this solution, D2 could not contribute any suggestions since the constructional principle of D2 is limited to fixing the vessel to the mechanical member which must be tilting, and thereby tilting the vessel itself.

Although the mercury containing vessel according to D1 has the form of a U-shaped tubular channel and thus resembles the vessel specified in Claim 1, document D1 - even in combination with D2 - also could not lead a person skilled in the art to the solution specified in Claim 1 since it serves quite a different purpose (indicating pressure differences) and consequently neither describes nor is able to stimulate the idea of using a plunger for transmitting the movement of a mechanical member to the column of mercury.

The feature of Claim 1 that the sensor for the position of the mercury in the tube is an electromagnetic induction proximity sensor, might per se be considered obvious in view of D1; in combination with the other features of Claim 1, however, it leads to a non-obvious construction which is simple and avoids the disadvantages, like sparks or heat, linked with the passage of electrical current through mercury (cf. original page 1, lines 1 to 5 and page 6, lines 18 to 23).

4.3.3 For the above reasons, the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC.

4.4 The subject-matter of dependent Claims 2 to 4 of the auxiliary request is also inventive by virtue of the dependence of these claims on Claim 1.

All claims according to the auxiliary request therefore define patentable subject-matter (Article 52(1) EPC).

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 grant a patent based on the following documents of the auxiliary request:

Description: pages 1, 1a, and 2 to 7;

Claims: 1 to 4; and

Drawing: Figure 1;

all handed over at the oral proceedings.

The Registrar: The Chairman:

P. Martorana E. Turrini