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D E C I S I O N
of 24 November 1993

Case Number: T 0948/91 - 3.4.2

Application Number: 84903294.1

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Language of the proceedings: EN

Title of invention:
Ionization type smoke sensor

Patentee:
Nohmi Bosai Kogyo Kabushiki Kaisha

Opponent:
Preussag AG Minimax

Headword:
-

Relevant legal norms:
EPC Art. 56, 84, 114(2)

Keyword:
"Late-filed document disregarded"
"Clarity (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0948/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 24 November 1993

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office dated 27 September 1991 and posted on 21 October 1991 concerning maintenance of European patent No. 0 156 915 in amended form.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division stating the text of the patent No. 0 156 915 forming the basis of the maintenance in amended form.

The Opposition Division had expressed the view that the patent in the form according to the main request of the proprietor of the patent met the requirements of the Convention, having regard to the following documents:

(D1) US-A-4 234 877,
(D2) JP-U-54-112 192 and
(D3) documents concerning the public prior use of the Minimax smoke detector IMX 1000 W according to annexes 1 to 8, submitted with the statement setting out the grounds of opposition.

II. During appeal proceedings the Board considered the following further documents filed by the appellant with the statement setting out the grounds of appeal:

(D4) DE-C-2 546 970 and
(D5) US-A-4 853 544.

III. At oral proceedings, held on 24 November 1993, the appellant handed over a specimen of a Preussag smoke detector, labelled IMX 1000 W, Art. No. 22027894. This detector is referred to under the number (D6) in the rest of the decision.

IV. The appellant requested that the decision under appeal be set aside and the patent revoked.

V. The respondent requested that the appeal be dismissed and

the patent maintained on the basis of the following documents as submitted at the oral proceedings:

claims:
- Nos. 1 to 4,

description:
- pages 4 to 7,
- columns 3, lines 1 to 65, and 4, lines 1 to 24,

drawings:
- Figures 1 to 4.

VI. The wording of Claim 1, on which the present decision was based, reads as follows:

"An ionization-type smoke detector comprising:
- an inner rear electrode (4), an inner intermediate electrode (6) and an outer front electrode (7), respectively, supported on an insulating base (1), a front surface of which is provided with corrugations, the intermediate electrode (6) being supported on the front end of a supporting portion of the insulating base (1) longitudinally extending from said corrugated front surface,
- an inner rear ionization chamber (8) constituted by said inner rear electrode (4) and said inner intermediate electrode (6),
- an outer front ionization chamber (9) constituted by said inner intermediate electrode (6) and said outer front electrode (7),
- a single radioactive source (2) provided to irradiate both of said ionization chambers (8,9),
- a circuit board (10) of insulating material and constituting a circuit to detect an electrical change of said front ionization chamber (9) connected to said respective electrodes (4,6,7), said circuit board (10) being arranged within said insulating base (1),

- an outer rear cover (11) covering said circuit board (10) and being connected to said insulating base (1),

wherein:

- a throughhole (1') is formed coaxially in said insulating base (1), having a diameter larger than that of a supporting means (3) of said inner rear electrode (4) bearing said radioactive source (2), said throughhole (1') communicating the rear and front parts of said insulating base (1),
- said supporting means (3) passes through said throughhole (1') and said inner rear electrode (4) is supported by said circuit board (10),
- said outer electrode (7) is supported on said insulating base (1) with an intervening substance (1'',7',11') interposed therebetween,
- said outer rear cover (11) rests upon the end surface of a rear end rim of said insulating base (1) and provides the rear cover of the detector,
- said intervening substance (1'',7',11') is provided at the rear end rim of said insulating base (1),
- said outer front electrode (7) longitudinally extends to and is supported at the outer side surface of the rear end rim of said insulating base (1), and
- said intervening substance (1'',7',11') is disposed between the rear end rim of said insulating base (1) and the rear end of the outer electrode providing a gap defined by an outer side surface of the insulating base (1) and an inner side surface of the outer electrode (7), the longitudinal length of said gap defining a further creepage distance between the intermediate (6) and outer (7) electrodes besides the longitudinal length of said supporting portion of the insulating base (1).".

VII. The appellant essentially argued as follows:

Claim 1 lacked clarity because an essential feature, i.e. the length of the gap mentioned in the last feature, was not defined.

The novelty of the subject-matter of Claim 1 was not disputed.

As to inventive step, starting from D1, the problem to be solved consisted in miniaturizing the smoke detector and, at the same time, providing an increased insulation resistance between the electrodes. No inventive step could be perceived in stating this problem. The claimed solution, consisting in the provision of a gap between the insulating base and the outer electrode, was obvious for the skilled person in view of the cited prior art, in particular a combination of D1 with D3 or D4.
With regard to the public prior use according to D3, the specimen of smoke detector D6 should be considered as a proof that the drawing of annex 8 of D3 was not speculative but indeed corresponded to a detector already sold before the priority date of the patent in suit.

VIII. The respondent essentially argued as follows:

The objection of lack of clarity of Claim 1 was not founded because the determination of a suitable length of the gap was a matter of design to be left to the skilled person's discretion. The invention consisted in the provision of a gap as claimed, not in determining its length.

The claimed detector could not be rendered obvious by D1, considered as the closest prior art, either taken alone, or in combination with other documents, in particular D3, in respect of which the appellant did not prove the public prior use, or D4, which did not mention the problem

underlying the invention and did not give any hint at the claimed solution.
With regard to D6, the appellant failed to prove that this detector was sold or used before the priority date of the patent in suit.

Reasons for the Decision

1. Article 123(2),(3) EPC

1.1 Claim 1 is essentially based on the originally filed Claim 1 with the following amendments, for which a basis in the application as filed is given between brackets:

- terminological amendments, like inner rear electrode, inner intermediate electrode, outer front electrode etc., which can clearly be inferred from the drawings,
- the front surface of the insulating base is provided with corrugations (see original Claim 6 and Figure 2),
- the intermediate electrode is supported on the front end of a supporting portion of the insulating base longitudinally extending from the corrugated front surface (see original Figure 2),
- a single radioactive source is provided (see original page 4, lines 22, 23 in conjunction with Figure 2),
- the circuit board of insulating material is arranged within the insulating base (see original page 2, lines 12, 13 in conjunction with Figure 2),
- the throughhole in the insulating base has a diameter larger than that of a supporting means of the inner rear electrode (see original Figure 2),
- the outer rear cover rests upon the end surface of a rear end rim of the insulating base, the intervening substance is provided at the rear end rim of the insulating base, the outer front electrode

longitudinally extends to and is supported at the outer side surface of the rear end rim of the insulating base and the intervening substance is disposed between the rear end rim of the insulating base and the rear end of the outer electrode providing a gap defined by an outer side surface of the insulating base and an inner side surface of the outer electrode, the longitudinal length of said gap defining a further creepage distance between the intermediate and outer electrodes besides the longitudinal length of said supporting portion of the insulating base (these features, although they are not expressis verbis mentioned in the original application, can clearly be inferred from page 5, lines 1 to 14 and Figure 2).

Dependent Claims 2 to 4 correspond to the originally filed Claims 2 to 4.

Furthermore, the originally filed documents have been amended so as to bring the description into conformity with the new claims and to meet the requirements of Rule 27(1)(b) EPC.

Therefore, the amended version of the patent, on the basis of which the appellant requests that the patent be maintained, does not contravene the requirements of Article 123(2) EPC since it does not include subject-matter extending beyond the content of the application as filed.

1.2 Moreover, the amendments are such that the wording of Claim 1 as granted has been specified either by better defining features already mentioned in the claim, or by adding further features, like e.g. the feature relating to the supporting portion of the insulating base.

Therefore, the amendments do not have the effect of extending the scope of protection conferred, so that the requirements of Article 123(3) EPC are also met.

2. Article 84 EPC

2.1 The appellant has raised the objection that Claim 1 is unclear because the length of the gap mentioned at the end of the claim is not defined, which feature is regarded as essential to the performance of the invention.

In the Board's judgement, the object underlying the patent, which consists in assuring high insulation resistances, i.e. high creepage distances, between the electrodes, in particular the intermediate and the front ones, of a smoke detector having miniaturized dimensions, is achieved by the claimed combination of the outer front electrode longitudinally extending to and supported at the outer side surface of the rear end rim of the insulating base and the intervening substance disposed between the rear end rim of the insulating base and the rear end of the outer electrode providing a gap defined by an outer side surface of the insulating base and an inner side surface of the outer electrode. The provision of such a longitudinal gap is essential to the performance of the invention, i.e. is necessary for the solution of the problem to which the invention relates. Its length, on the contrary, is considered as a matter of design to be left to the skilled person's discretion, who will be able to determine it depending on various factors, like the overall dimensions of the detector, its particular application etc.. Any length of the gap means some improvement of the creepage distance. The mention of a value or even a range of values would limit the scope of the claim in an undue manner.

Since neither the appellant's objection is considered as justified, nor does the Board have any further objections to raise, the requirements of Article 84 EPC are met.

3. Evidence presented

3.1 D5 has been published on 01 August 1989, while the priority date of the patent in suit is 05 September 1983. Thus, the content of D5 does not belong to the state of the art pursuant to Article 54(2) EPC. The fact that some subject-matter is mentioned as prior art in this document and that the document may be based on another patent application having a filing date identical with the priority date of the present patent, as pointed out by the appellant in the statement setting out the grounds of appeal (see page 2, second paragraph), does not constitute proof for the availability of this subject-matter to the public before the priority date of the present patent.

D5 is, therefore, disregarded by the Board.

3.2 D4 has been filed for the first time with the appellant's statement setting out the grounds of appeal. The only explanation given by the appellant for the late submission of D4 was the fact that, contrary to expectation, the Opposition Division considered the objection based on prior use D3, put forward in opposition proceedings, as not founded. This argument is not convincing since the respondent had contested from the very beginning of the opposition procedure that the public prior use had been proved and that the extent of the similarities between the devices according to the prior use D3 and the patent in suit was as alleged by the appellant; and the Opposition Division had also expressed its doubts.

Moreover, considering that the appellant Preussag AG

Minimax in Bad Oldesloe (DE) appears to be related to the patentee of D4, Preussag AG Feuerschutz in Bad Oldesloe (DE), the appellant ought to have known about the existence of D4 at the time of filing the statement of grounds of opposition.

Moreover, D4 is not more relevant than D1. D4 does not address the problem underlying the patent in suit, consisting in reducing overall dimensions of a conventional smoke detector according to D1 and yet assuring desired creepage distances between the electrodes. On the contrary, considering the relatively large space between the outer electrode 16, on the one side, and the intermediate electrode 32 and the base 12, on the other side, of the detector known from D4, which space may, as the respondent stated in point 6. of the letter of 07 July 1992, have the function of swirling the smoke entering the detector, it appears that miniaturization was not a result aimed at by D4. Therefore, this document would not give to the skilled person, starting from the detector according to D1, any additional suggestions useful for solving the stated problem of keeping sufficient creepage distances in a miniaturized detector.

Thus, in view of the foregoing, D4 is disregarded by the Board in accordance with Article 114(2) EPC.

3.3 At the oral proceedings of 24 November 1993 the respondent agreed with the appellant that the specimen D6 embodied the smoke detector to which the constructional drawings D3 relate, while contesting public prior use in connection with D6 as well as in connection with D3.

Hearing the witnesses offered in opposition proceedings by the appellant in order to clear up the disputed facts, was

considered unnecessary by the Board since establishing whether or not the public prior use of the detector according to D3 or D6 had been proved would have had no influence on the conclusions regarding inventive step drawn in section 5. below (see, in particular, sections 5.4 and 5.5). The question whether the public prior use occurred, may be left open.

4. Article 54(1) EPC

In the appeal proceedings novelty of the subject-matter of Claim 1 has not been disputed by the appellant. Therefore, no detailed discussion of this point is required. Nevertheless, it appears appropriate to analyse the features of the detector according to D1, considered as the closest prior art document, in order to find out the differences between the detector according to Claim 1 and the known one, which differences will then be considered when assessing inventive step in section 5. below.

Using the terminology of Claim 1, D1 relates to an ionization-type smoke detector comprising the following features (see Figure 4 and the related description part):

(a) an inner rear electrode 4b, an inner intermediate electrode 4c and an outer front electrode 4a, respectively, supported on an insulating base 19, a front surface of which is provided with corrugations, the intermediate electrode being supported on the front end of a supporting portion of the insulating base longitudinally extending from said corrugated front surface,

(b) an inner rear ionization chamber constituted by said inner rear electrode and said inner intermediate electrode,

(c) an outer front ionization chamber constituted by

said inner intermediate electrode and said outer front electrode,

(d) a single radioactive source 21 provided to irradiate both of said ionization chambers,

(e) a circuit board 17 of insulating material and constituting a circuit to detect an electrical change of said front ionization chamber connected to said respective electrodes,

(f) an outer rear cover 11 covering said circuit board and being connected to said insulating base,

(g) a throughhole being formed coaxially in said insulating base, having a diameter larger than that of a supporting means of said inner rear electrode bearing said radioactive source, said throughhole communicating the rear and front parts of said insulating base,

(h) said supporting means passing through said throughhole and said inner rear electrode being supported by said circuit board,

(i) said outer electrode being supported on said insulating base with an intervening substance 20 interposed therebetween,

(j) said outer rear cover resting upon the end surface of a rear end rim of said insulating base and providing the rear cover of the detector, and

(k) said intervening substance being provided at the rear end rim of said insulating base.

With regard to features (j) and (k), it should be noted that the portion of the insulating base 19 in contact with the ring 16 (see Figure 4 of D1) can be considered as a "rear end rim". Indeed, it is placed at the rear side with respect to the front portion supporting the intermediate electrode 4c and, at the same time, forms an end extremity of the base 19.

The smoke detector of Claim 1 is distinguished from that according to D1 by the following features:

(e') the circuit board is arranged within the insulating base,

(l) the outer front electrode longitudinally extends to and is supported at the outer side surface of the rear end rim of the insulating base,

(m) the intervening substance is disposed between the rear end rim of the insulating base and the rear end of the outer electrode providing a gap defined by an outer side surface of the insulating base and an inner side surface of the outer electrode, the longitudinal length of the gap defining a further creepage distance between the intermediate and outer electrodes besides the longitudinal length of the supporting portion of the insulating base.

5. Article 56 EPC

5.1 Starting from the detector according to D1, the objective problem underlying the patent in suit is seen in the provision of high insulation resistances, i.e. long creepage distances, between the electrodes, in particular the intermediate and the front electrodes, of a smoke detector having reduced dimensions.

Miniaturization is a quite normal characteristic of modern detectors. Providing high creepage distances is a permanent concern of the skilled person occupied with the measurement of very low currents. This problem is directly correlated to the dimensions of the detector and, therefore, the miniaturization thereof. In view of this, no contribution to inventive step can be perceived in the statement of the problem, per se.

5.2 The stated problem is solved by the detector according to Claim 1, in particular by the combination of features (l) and (m) (see section 4. above), i.e. the creepage distance between the intermediate and the outer electrodes is increased by the provision of the gap according to said features (see page 5, lines 10 to 14).

(The further feature (e'), which is also not known from D1, does not contribute to the solution of the same problem. It follows from the description as filed, page 6, lines 15 to 21, that the provision of the circuit board within the insulating base, the rear side of which is covered by the rear cover, offers the advantage of protecting the circuit board, in particular against external noise, if the rear cover is metallic. For this reason, the feature (e') is not considered, and indeed it does not have to be considered, when assessing inventive step.)

5.3 D1 refers to an ionization-type smoke detector which intermittently detects smoke and minimizes an erroneous alarm issuance caused by electrical noises, insects or the like (see column 2, lines 3 to 7). The document neither explicitly addresses the problem of miniaturizing the detector, nor that of providing high creepage distances. However, the skilled person at once infers from Figure 4, showing the constructional details of the detector, that the corrugations at the rear and front surfaces of the insulating base 19 have the function of increasing the creepage distances between the electrodes. Indeed, this is a constant care of the designer of this kind of detector. Moreover, the skilled person would recognize that the creepage distance between the intermediate and the front electrodes is increased by the presence of the insulating substance 20. Assuming that this substance 20 is removed without replacement and the outer electrode is brought

into contact with the insulating base 19, a decrease of the creepage distance in suit would follow. The same conclusion would be drawn in the case that the substance 20 were replaced by a ring obtained by removing the part of the substance 20 extending in the longitudinal direction. Depending on the length of such a ring in the transversal direction, a transversal gap might be formed between the insulating base 19 and the front electrode, which however would not increase the creepage distance. It, therefore, follows that, even though the problem of the creepage distances in the detector is not explicitly considered in the document, the skilled person will nevertheless conclude that the removal or reduction of the intervening substance 20, as represented in Figure 4, would entail a worsening of the characteristics of the detector, although, of course, the substance 20, due to its form, could be a hindrance to miniaturizing the detector. D1 thus gives no hint at a modification in the sense of Claim 1. Namely, according to the invention as claimed, the fact that the front electrode is shaped and supported according to feature (l) mentioned above offers the advantage that an intervening substance with reduced dimensions can be used, acting as a simple spacer in a gap between the insulating base and the front electrode (see feature (m)). This solution is suitable to be used in a miniaturized detector, and the gap thus created solves the problem of providing a long creepage distance.

D1, therefore, does not render obvious the subject-matter of Claim 1.

5.4 Neither would a combination of D1 with D3 or the corresponding D6 directly lead to the claimed detector, assuming that D3 or D6 would belong to the state of the art according to Article 54(2) EPC (see section 3.3 above). Indeed, the detector according to D3 or D6 shows

the following differences as compared to the claimed one:

- two radioactive sources are placed in two different ionization chambers,
- no separate circuit board is used, arranged within the insulating base and protected by a rear cover,
- though a longitudinal gap is shown between the outer front electrode and the base supporting the inner electrodes, it differs from the claimed one in that the outer electrode is only brought into contact with the rear cover acting as circuit board.

The latter difference is particularly essential since the contact of the outer front electrode with the circuit board opens up another creepage path for the current. The type of gap defined in Claim 1 is therefore neither disclosed in D1, nor in D3 and D6.

Thus, even if it were established that D3 and D6 formed part of the state of the art, they could not render the claimed detector obvious.

5.5 Therefore, having regard to the preceding, the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC.

6. It follows that Claim 1 and also the dependent Claims 2 to 4 are allowable.

7. Since the patent and the invention to which it relates meet the requirement of the Convention, the patent can be maintained as amended (Article 102(3) EPC).

Order

For these reasons, it is decided that:

The decision under appeal is set aside.
The case is remitted to the first instance with the order to maintain the patent with the following documents as received at the oral proceedings:

claims:
- Nos. 1 to 4,

description:
- pages 4 to 7,
- columns 3, lines 1 to 65, and 4, lines 1 to 24,

drawings:
- Figures 1 to 4.

The Registrar: The Chairman:

P. Martorana E. Turrini