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Datasheet for the decision of 9 November 2018

Case Number: T 0046/13 - 3.5.02

Application Number: 03020297.2

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Language of the proceedings: EN

Title of invention:
Proximity sensor

Patent Proprietor:
Omron Corporation

Opponent:
ifm electronic gmbh

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(1)

Keyword:
Inventive step - (yes)
Late-filed argument - procedural economy

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Case Number: T 0046/13 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 9 November 2018

Appellant: (Opponent)	ifm electronic gmbh Friedrichstrasse 1 45128 Essen (DE)
Representative:	ifm electronic gmbh ifm-Strasse 1 88069 Tettnang (DE)
Respondent: (Patent Proprietor)	Omron Corporation 801, Minamifudodo-cho, Horikawahigashiiru, Shiokoji-dori, Shimogyo-ku Kyoto-shi, Kyoto 600-8530 (JP)
Representative:	Kilian Kilian & Partner Aidenbachstraße 54 81379 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 8 November 2012 rejecting the opposition filed against European patent No. 1398878 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	R. Lord
Members:	G. Flyng
	R. Cramer

Summary of Facts and Submissions

I. The appeal is against the opposition division's decision rejecting the opposition against European patent number EP 1 398 878. The opponent is the appellant and the patent proprietor is the respondent.

II. **Independent claim 1 of the patent** reads as follows (feature references added):

a A proximity sensor (100) comprising:
b a cylindrical outer shell case (1);
c a detection coil assembly (22) which includes
c1 a coil (22a) and
c2 a core (22b) and
c3 which is fitted to a front-end side of the outer shell case (1);
d a plug-adaptable connector
d1 which is fitted to a rear-end side of the outer shell case (1); and
e a circuit assembly
e1 which is disposed between the detection coil assembly (22) and the connector and
e2 which incorporates an oscillation circuit
e2.1 using the coil (22a) as a resonant circuit
e3 for generating an output signal based on the oscillating condition of the oscillation circuit,
wherein the connector comprises:
d2 a conductive terminal assembly (5) which includes
d2.1 a plug-adaptable conductive terminal
d2.2 electrically connected with the circuit assembly and
d2.3 a pin holder (50) for holding the conductive terminal, and
d2.4 which is sized to be able to be inserted from the front-end side of the outer shell case (1); and

d3 a cylindrical holding member

d3.1 which has openings at both ends so as to enable the conductive terminal assembly (5) to be inserted,

d3.2 which also has a joint part inside to enable the conductive terminal assembly (5) to be positioned thereto, and

d3.3 which is fixed from the rear-end side of the outer shell case (1),

the circuit assembly comprises:

e4 a first circuit board containing a detection circuit board containing

e4.1 a detection circuit (21)

e4.2 which is equipped with the oscillation circuit using the coil (22a) of the detection coil assembly (22) as the resonant circuit element

e4.3 and which generates an object detection signal according to the oscillation circuit; and

e5 a second circuit board containing

e5.1 an output circuit (4)

e5.2 which drives an output element based on the object detection signal,

f the first circuit board is supported by and

f1 electrically connected with the detection coil assembly (22),

g the second circuit board is supported by and

g1 electrically connected with the conductive terminal assembly (5), and

h the detection coil assembly (22) and the conductive terminal assembly (5) are electrically connected with each other

h1 by way that the first circuit board and the second circuit board are electrically connected with each other

h2 via a flexible connection member (3) disposed therebetween.

Independent claim 3 of the patent reads as follows:

"A method for manufacturing a proximity sensor (100), comprising the steps of:

preparing a yet-to-be-completed product including:
a detection coil assembly (22) which includes a coil (22a) and a core (22b);
a circuit assembly which includes a detection circuit board containing an oscillation circuit using the coil (22a) as a resonant circuit element and a detection circuit (21) for generating an object detection output signal according to the oscillating condition of the oscillation circuit, and an output circuit board containing an output circuit for driving an output element based on the object detection output signal, the detection circuit board and the output circuit board being electrically connected with each other by a flexible connection part disposed therebetween; and
a conductive terminal assembly (5) including a plug-adaptable conductive terminal held by a pin holder (50);
the detection coil assembly (22), the circuit assembly (4) and the conductive terminal assembly (5) being electrically connected with each other;
a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly (5) to be inserted and which also has a joint part inside to enable the conductive terminal assembly (5) to be positioned to the holding member; and
a cylindrical outer shell case (1) for integrally accommodating the yet-to-be-completed product and the holding member;

inserting the yet-to-be-completed product from a front-end side of the outer shell case (1) from the conductive terminal assembly (5) side and press-fitting the detection coil assembly (22) through a coil case to the front-end side of the outer shell case (1);

press-fitting the holding member to a rear-end side (201B,301B) of the outer shell case (1); and fixing the conductive terminal assembly (5) to the joint part of the holding member by moving the pin holder (50) of the conductive terminal assembly (5) inside the outer shell case (1) through the openings of the holding member."

III. The following documents are relevant to this decision (references as used in the contested decision):

D2: DE 196 25 589 A1
D7: DE 92 00 772 U1
D8: DE 33 21 666 A1
D12: DE 101 09 442 A1
D13: DE 32 44 449 A1

IV. In the contested decision the opposition division considered that document D7 represented the closest prior art (reasons, 8.3.1) and that document D8, which was cited as prior art in D7, could be taken into account to explain some of D7's features (reasons, see the note preceding point 8).

The opposition division found that documents D7/D8 did not disclose the features ***c2***, ***d3.1***, ***d3.2*** and ***h2*** of claim 1 (reasons, 8.3.2 to 8.3.2.6).

The opposition division considered that the circuit board 5 of D7/D8 could be considered as a second circuit board ***e5*** in the sense of claim 1 (reasons,

8.3.2.1). They considered that there were two possible ways of reading the flexible circuit board 18 of D7/D8 onto claim 1 (reasons, 8.3.2.5): It could correspond either to the first circuit board ***e4***, or to the flexible connection member ***h2*** of claim 1, but not to both. The opposition division stated that the parties had agreed on the former interpretation and following that interpretation they considered that documents D7/D8 did not disclose a flexible connection member according to feature ***h2*** (reasons, 8.3.2.6).

The opposition division found that starting from D7/D8 it was not obvious in view of document D12 to electrically connect the two circuit boards via a flexible connection member disposed between them (reasons, 8.3.3 *et seq*.).

The opposition division decided pursuant to Article 114(2) EPC to disregard *inter* alia document **D13** as it had not been submitted in due time and *prima facie* it was not relevant to the decision (see reasons, 9.3).

The opposition division considered various other inventive step arguments that had been raised by the opponent based on the documents cited in the grounds for opposition, before coming to the conclusion that the ground for opposition as to lack of inventive step did not prejudice maintenance of the patent as granted.

V. The submissions of the appellant (opponent) in the statement of grounds of appeal may be summarised as follows:

In one line of argumentation, the appellant argued that it was derivable from paragraph [0062] of the patent (see EP 1 398 878 B1) that when starting from documents

D7/D8, a flexible connection member disposed between the circuit boards did not solve the two problems stated in paragraph 8.1.2 of the contested decision (easier assembly of the proximity sensor and furnishing a broader model range, inducing lower storage cost), but rather solved the problem of providing a connection to the connector terminal assembly which was able to compensate for tolerances. According to paragraph [0062] this problem could be solved with a flexible connection member disposed between two circuit boards or, alternatively, with only one circuit board and with a flexible connection element disposed between the circuit board and the terminal pin assembly. Such an arrangement was known from documents D7/D8, so the essential idea of the invention lay not in a flexible connection between two circuit boards, but in a flexible connection to the terminal. Thus, claim 1 lacked an inventive step. According to the appellant, this argument also applied to document D12.

In another line of argumentation the appellant started from document D12 as closest prior art - an approach that had not been submitted in the first instance proceedings. The appellant argued (see page 5, last paragraph) that there were two sets of features not disclosed in document D12, namely:

- features ***d2.3***, ***d2.4***, ***d3.1*** and ***d3.2*** concerning the connector; and
- feature ***h2*** concerning the flexible connection between the two circuit boards.

The appellant argued that starting from document D12, the features concerning the connector were obvious in view of document D2 and the flexible connection between the two circuit boards was obvious in view of the combined disclosure of documents D7/D8.

VI. In the reply to the statement of grounds of appeal the respondent (patent proprietor) argued that claim 1 of the patent clearly defined the location of the flexible connection member between first and second circuit boards carrying different parts of the claimed circuit assembly. The respondent submitted that when starting from D7/D8 as closest prior art, which did not disclose such a flexible connection member, the claimed arrangement did solve the problems as set out in paragraph 8.1.2 of the contested decision. The respondent submitted that the combination of D12 with D7/D8 did not lead to the claimed arrangement because D12 also did not give any hint to a flexible connection member between first and second circuit boards (feature ***h2***).

VII. The Board summoned the parties to attend oral proceedings. In a communication annexed to the summons the Board stated that they tended to share the respondent's view that feature ***h2*** was not disclosed either in the prior art documents D7 and D8 taken together, or in the prior art document D12. Hence, the Board was not convinced that this feature of claim 1 was obvious in view of the prior art cited by the appellant. The Board stated that the same applied for independent method claim 3, which comprised the same feature.

VIII. In a reply to the summons dated 10 September 2018 the appellant submitted new lines of argumentation that had not been presented in the grounds of appeal. The appellant submitted that:

- The opposition division's decision to disregard document D13 was not tenable. Document D13 was *prima facie* relevant. The variant described at page 7, lines 20 and 21 was not incompatible with the

arrangement of documents D7/D8 because in this variant there was no wall portion between the chambers of the housings 31 and 41.

- Document D13 disclosed a flexible connection between two circuit boards, as the opposition division had acknowledged in point 9.3.1 of the reasons. Furthermore, documents D7/D8 and D13 concerned an inductive proximity sensor with the same basic construction and aimed to improve assembly.
- The subject-matter of claims 1 and 3 of the patent lacked an inventive step over the combination of documents D7/D8 and D13.
- Claims 1 and 3 also lacked an inventive step when starting from document D1 as closest prior art, it being obvious in view of D13 to use a modular arrangement of two circuit boards, connected together by a flexible connection member in order to facilitate assembly.

IX. With a reply to the summons dated 9 October 2018 the respondent filed sets of claims according to second to fifth auxiliary requests. Furthermore, the respondent drew attention to the fact the statement setting out the grounds for appeal had not challenged the opposition division's decision to disregard document D13 and that consequently the preliminary opinion of the Board did not address this issue. Hence, if D13 were to be admitted the respondent would be confronted with a discussion regarding D13 during the second instance oral proceedings for the first time.

X. Oral proceedings were held on 9 November 2018 as scheduled.

(a) The appellant requested that the decision under appeal be set aside and that the European patent No. 1 398 878 be revoked.

(b) The respondent requested that the appeal be dismissed, or alternatively that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of one of the second to fifth auxiliary requests filed with the letter of 9 October 2018.

(c) The question whether claim 1 of the main request (patent as granted) met the requirements of Article 56 EPC in view of the combination of documents D7/D8, D12 and D2 was discussed with the parties.

(i) The appellant argued that the invention lacked an inventive step starting from from documents D7/D8 as closest prior art. They argued that D7/D8 disclosed a rigid circuit board (referenced 5 in D7 and 1 in D8), which corresponded to the claimed second circuit board ***e5***, and a flexible circuit board (referenced 18 in D8). It was evident to the skilled person from figure 1 of document D8 and the corresponding figure 5 of document D7 that the portion of the flexible circuit board 18 upon which the resonant circuit capacitor 16 and coil 17 were mounted was exactly flat, and so must be held rigid on a substrate that was indicated by a dashed line. This rigidly-held portion of the flexible circuit board

18 corresponded to the first circuit board ***e4*** of claim 1 and the rest of it corresponded to the flexible connection member ***h2*** of claim 1. Hence, D7/D8 disclosed both of these features.

(ii) The respondent maintained that D7/D8 did not disclose an arrangement of two circuit boards connected with each other by a flexible connection element disposed between them, and pointed to paragraph [0022] of the patent for the advantages of such an arrangement.

(iii) After the Board's deliberation the Chairman announced that they had come to the conclusion that the subject-matter of claim 1 of the main request was not rendered obvious by the combination of documents D7/D8, D12 and D2.

(d) The admittance of document D13 and the inventive step objections based on it was then discussed with the parties.

(i) The Board drew attention to the provisions of Articles 12(2), 13(1) and 13(3) RPBA.

(ii) The appellant submitted that in their appeal grounds they had not contested the opposition division's decision to not admit document D13 into the proceedings because it was only later that they had come across the statement at page 7, lines 20 and 21 and realised its significance. This statement, that the section of wall between

the chambers of the housings 31 and 41 can be missing, meant that the mechanical arrangement of the sensor in D13 was not incompatible with the arrangement of D7/D8, contrary to what the opposition division had held in point 9.3.1 of the reasons for the decision.

(iii) The respondent submitted that there was no justification for the appellant not having raised this matter with the appeal grounds. If document D13 were to be admitted at this late stage it would be appropriate to remit the case to the department of first instance for further examination, which would not be in accordance with the need for procedural economy. Furthermore, the cited passage did not mean that D13 disclosed a one-part housing and hence, did not change the opposition division's finding that the mechanical arrangement of the sensor in D13 was incompatible with the arrangement of D7/D8.

(iv) After deliberation by the Board the Chairman announced that the Board had decided to exercise its discretion under Article 13 RPBA by not admitting document D13 and the inventive step objections based on it into the proceedings.

(e) This decision was given at the end of the oral proceedings.

Reasons for the Decision

1. Inventive step over the prior art cited in the grounds for appeal - documents D7, D8, D12 and D2

1.1 Document D7 discloses in figures 1 to 4 a part of a proximity sensor which has a cylindrical case 1 and a transparent connector insert 4. The transparent connector insert is adapted to transmit light from an LED 3 to openings 2 in the cylindrical case 1. The LED 3 is held on a circuit board 5 (see page 4, lines 18 to 27). The transparent connector insert 4 is a plug-adaptable connector which comprises a conductive terminal assembly having the features ***d***, ***d1***, ***d2***, and ***d2.1*** to ***d2.4*** of claim 1 of the contested patent (hereinafter "claim 1"). That has not been disputed.

Furthermore, it has not been disputed that the circuit board 5 of document D7 can be considered as a "second circuit board" containing an output circuit which drives an output element (LED) and which is supported by and connected with the terminal assembly in the sense of features ***e5***, ***e5.1***, ***e5.2***, ***g*** and ***g1*** of claim 1.

1.2 The connector arrangement in figures 1 to 4 of D7 is proposed as an improvement to a prior art proximity sensor that is depicted as a whole in figure 5 of D7 and that is cited as being known from the document which is being referred to in these proceedings as document D8 (see D7, page 1, lines 12 to 14).

1.3 Document D7 does not describe the lower part of the proximity sensor shown in figure 5, but the Board

concurs with the opposition division and the parties that the skilled reader would use the disclosure of document D8 to supplement that of D7 for this part of the proximity sensor. Figure 1 of D8 is substantially identical to figure 5 of D7, apart from having different reference numerals, and it would be evident to the skilled reader that they depict the same proximity sensor.

1.4 Hence, using the disclosure of document D8 (see figure 1 and page 4, lines 20 to 26) the skilled reader would determine that in figure 5 of document D7:

- the component referenced 17 is a resonant coil (*D8: Schwingspule 17*);
- the component adjacent the coil 17 is a resonant circuit capacitor (*D8: Schwingkreiskondensator 16*);
- the component to which the coil and capacitor are connected is a flexible circuit board (*D8: flexible Leiterplatte 18*); and
- the flexible circuit board is connected to the circuit board 5 (*D8: Hybrid 1*).

Hence, the Board considers that the flexible circuit board shown in figure 5 of D7 and referenced 18 in figure 1 of document D8 can be considered to be a "first circuit board containing a detection circuit board" in the sense of feature ***e4*** of claim 1.

Furthermore, the Board considers that the resonant coil 17 and the resonant circuit capacitor 16 of documents D7/D8 are parts of a detection coil assembly and form an oscillation circuit of a detection circuit which generates an object detection signal in the sense of features ***c, c1, c2, c3, e4.1, e4.2*** and ***e4.3*** of claim 1.

Furthermore, the Board considers that in documents D7/D8 the detection coil assembly and the conductive terminal assembly are electrically connected with each other (feature ***h*** of claim 1) by way that the flexible circuit board referenced 18 in D8 (i.e. first circuit board) and the circuit board referenced 5 in D7 (i.e. second circuit board) are electrically connected with each other (feature ***h1*** of claim 1).

1.5 Whereas in documents D7/D8 the flexible circuit board 18 is electrically connected directly to the "Hybrid 1"/"circuit board 5" (cf. D7, figure 5 and D8, figure 1 and page 4, lines 23 to 26), according to feature **h2** of claim 1 the first and second circuit boards are electrically connected "via a flexible connection member (3) disposed therebetween". Hence, the Board concurs with the finding of the opposition division that documents D7/D8 do not disclose (at least) feature ***h2*** of claim 1.

1.6 The appellant has argued that starting from the prior art of documents D7/D8 the problem solved by feature ***h2*** is that of providing a connection to the connector terminal assembly which was able to compensate for tolerances. The Board does not find this argument convincing because the flexible circuit board 18 of documents D7/D8 already provides a connection from the detector end to the connector terminal assembly which would be able to compensate for tolerances. Hence, this proposed technical problem is not formulated objectively in the light of the technical contribution of feature ***h2*** over the prior art.

1.7 The Board is also not convinced by the appellant's argument that it would be evident to the skilled person from figure 5 of document D7 and the corresponding

figure 1 of document D8 that the portion of the flexible circuit board 18 upon which the resonant circuit capacitor 16 and coil 17 were mounted was exactly flat, and so must be held rigid on a substrate indicated by a dashed line.

Firstly, figure 5 of D7 shows how the circuit boards would be arranged with the prior art connector assembly disclosed in document D8. With the connector assembly as proposed in figures 1 to 4 of document D7, the circuit board 5 would not be arranged diagonally as is shown in figure 5, it would be arranged axially as shown in figure 1. With this change in the positioning of the circuit board 5 it is a matter of speculation what effect that would have on the arrangement of the flexible circuit board and the detection circuit 16, 17 mounted on it. Secondly, there is no suggestion in D7 or D8 that the dashed line in figure 5 of D7 indicates a flat surface upon which the portion of the flexible circuit board 18 bearing the resonant circuit capacitor 16 and coil 17 is held rigid. Thirdly, even if it was disclosed that this portion of the flexible circuit board 5 was held rigid, that would not *per se* give any incentive to the skilled person to replace the flexible circuit board 5 by a (rigid) circuit board and a separate flexible connection member.

1.8 For these reasons, the Board concludes that feature ***h2*** of claim 1 is not obvious in view of document D7 and document D8.

1.9 Further to the above, neither of the other prior art cited in the grounds for appeal (i.e. documents D12 and D2) discloses an arrangement according to feature ***h2***, i.e. in which two circuit boards are electrically

connected with each other via a flexible connection member disposed therebetween.

1.10 For these reasons the Board considers that no combination of the documents cited in the grounds for appeal would lead in an obvious way to feature ***h2*** of claim 1, regardless of which of these documents the skilled person were to start from.

The same applies to claim 2 of the patent, which is dependent on claim 1, and also to claim 3 of the patent, which includes the feature that "the detection circuit board and the output circuit board [are] electrically connected with each other by a flexible connection part disposed therebetween".

Hence, the claimed invention involves an inventive step in the sense of Article 56 EPC over the prior art cited in the grounds for appeal, i.e. documents D7, D8, D12 and D2.

2. Admittance of document D13 and the inventive step objections based on it

2.1 In the first-instance proceedings the opposition division decided pursuant to Article 114(2) EPC to disregard *inter alia* document **D13** as it had not been submitted in due time and *prima facie* it was not relevant to the decision (see reasons, 9.3.2). They held that although D13 showed an oscillation circuit on a circuit board and a detection circuit on a circuit board, both connected to each other via a flexible connection member, the skilled person would not take D13 into account because the mechanical arrangement of the sensor in D13, which showed multiple housings was

incompatible with the arrangement of D7/D8 (see reasons, 9.3.1).

2.2 In their statement of grounds of appeal the appellant did not challenge this finding and did not in any way base their case on document D13.

After oral proceedings had been arranged the appellant amended their case, referring to document D13 for the first time in the appeal and arguing that in view of the statement at page 7, lines 20 and 21, that the wall portion between the chambers of the housings 31 and 41 can be absent, the mechanical arrangement of D13 was not incompatible with that of documents D7/D8.

The appellant confirmed during the oral proceedings before the Board that they had only come across this passage in document D13 when preparing their response to the Board's summons and that they had not referred to this passage in the first-instance proceedings.

2.3 According to Article 12(2) RPBA the statement of grounds of appeal ... shall contain a party's complete case, but according to Article 13(1) RPBA any amendment to a party's case after it has filed its grounds of appeal ... may be admitted and considered at the Board's discretion. The discretion shall be exercised in view of *inter alia* ... the current state of the proceedings and the need for procedural economy.

2.4 In the present case the Board considered that it would not be reconcilable with the need for procedural economy to admit this change to the appellant's case at this stage of the appeal proceedings. The Board considered that were the change to be admitted, it would be appropriate to remit the case to the

opposition division for further examination, as had been requested by the respondent. That would entail a lengthy delay in the proceedings, caused purely by the failure of the appellant to submit their case fully both before the opposition division and with their appeal grounds. For these reasons the Board decided not to exercise their discretion under Article 13(1) RPBA to admit this change to the appellant's case. Consequently, document D13 and the arguments based thereon have to be disregarded.

3. Conclusion

In view of the above the Board considers that the case submitted by the appellant does not give cause to set aside the contested decision and accedes to the respondent's request to dismiss the appeal.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. H. A. Patin R. Lord

Decision electronically authenticated