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**Datasheet for the decision
of 7 November 2024**

Case Number: T 0335/22 - 3.5.04

Application Number: 15766327.9

Publication Number: 3190946

IPC: A61B1/05, H01L27/146, H04N5/225

Language of the proceedings: EN

Title of invention:
LOW PROFILE CIRCUIT BOARD CONNECTORS FOR IMAGING SYSTEMS

Patent Proprietor:
Cook Medical Technologies LLC

Opponent:
Strawman Limited

Headword:

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

Keyword:
Grounds for opposition - lack of patentability (yes)

Decisions cited:

Catchword:



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Case Number: T 0335/22 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 7 November 2024

Appellant: Strawman Limited
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 16 November 2021 rejecting the opposition filed against European patent No. 3190946 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chair B. Willems
Members: M. Paci
W. Ungler

Summary of Facts and Submissions

- I. The appeal is against the opposition division's decision dated 16 November 2021 rejecting the opposition against European patent No. 3 190 946 pursuant to Article 101(2) EPC.
- II. In the decision the following documents *inter alia* were cited:
- D2: US 4,831,456
D16: DE 201 14 939 U1
- III. The opposition division held that the grounds for opposition under Article 100(a) and (c) EPC did not prejudice the maintenance of the patent as granted. In particular, it held that the subject-matter of claim 1 of the patent as granted (main request then on file) was not obvious when starting from document D2 in combination with document D16. The opposition division did not decide on the six auxiliary requests then on file.
- IV. By letter dated 4 February 2022, the appellant-opponent filed notice of appeal.
- V. The appellant-opponent filed its statement of grounds of appeal on 19 April 2022. With the statement of grounds of appeal, the appellant-opponent filed *inter alia* document D16a (an English translation of D16).
- VI. The respondent-proprietor filed a letter of reply on 5 September 2022 together with claims according to auxiliary requests 1 to 7, replacing the previous auxiliary requests on file.

VII. In response, the appellant-opponent filed a letter on 18 January 2024 in which it requested that the auxiliary requests not be admitted into the appeal proceedings.

VIII. The respondent-proprietor filed a letter on 21 March 2024 together with further submissions and claims according to auxiliary requests 8 to 10.

IX. The board issued summons to oral proceedings and a communication under Article 15(1) RPBA. In this communication, the board gave *inter alia* the preliminary opinion that the subject-matter of claim 1 of the main request and auxiliary requests 1 to 4 did not involve an inventive step in view of documents D2 and D16 and that the board was inclined not to admit auxiliary request 5 into the appeal proceedings.

X. The board held oral proceedings on 7 November 2024.

During the oral proceedings, the respondent-proprietor withdrew its auxiliary requests 6 to 10 and the appellant-opponent withdrew its request that auxiliary requests 1 to 5 not be admitted into the proceedings.

The appellant-opponent's final requests were that the opposition division's decision be set aside and that the patent be revoked in its entirety.

The respondent-proprietor's final requests were that the appeal be dismissed (main request) or, alternatively, that the patent be maintained as amended on the basis of the claims of one of auxiliary requests 1 to 5.

At the end of the oral proceedings, the Chair announced the board's decision.

XI. Claim 1 of the patent as granted reads as follows:

*"An imaging system comprising:
an image sensor (110) comprising:
 an outer package (112) having an outer surface; and
 a plurality of solder balls (108a-108d) configured
 as a two-dimensional ball grid array integrated
 with the outer surface; and
a circuit board connector (102) comprising:
 a first planar surface (118);
 a second planar surface (120) opposite the first
 planar surface; and
 a side surface (122) facing the outer surface that
 intersects the ball grid array;
 a plurality of electrical connections that
 electrically connect a plurality of elongate
 conductive members (128a-128d) of electrical
 cabling (106) with the plurality of solder balls of
 the ball grid array, the plurality of electrical
 connections comprising:
 a plurality of first connection ends (130a-130d)
 disposed on the first planar surface and the second
 planar surface, each first connection end disposed
 adjacent to, electrically connected to, and bonded
 to one of the plurality of solder balls; and
 a plurality of second connection ends (132a-132d)
 disposed on at least one of the first planar
 surface or the second planar surface, each second
 connection end electrically connected and bonded to
 a respective one of the plurality of elongate
 conductive members of the electrical cabling,
 wherein at least one of the first planar surface or
 the second planar surface forms an angle with the*

outer surface of the outer package that is greater than zero degrees and less than 180 degrees."

- XII. Claim 1 of the respondent-proprietor's **auxiliary request 1** reads as follows (with additions to claim 1 of the **main request** underlined and long identical passages replaced with "[...]"):

*"An imaging system comprising:
an image sensor (110) comprising:
an outer package (112) having an outer surface, the outer package housing inner electronic circuitry configured to capture images and convert the captured images to electronic signals; and
[...]"*

- XIII. Claim 1 of the respondent-proprietor's **auxiliary request 2** reads as follows (with additions to claim 1 of the **main request** underlined and long identical passages replaced with "[...]"):

*"An imaging system comprising:
an image sensor (110) comprising:
an outer package (112) having an outer surface, the outer package housing inner electronic circuitry configured to capture images and convert the captured images to electronic signals and the inner electronic circuitry being encased and protected by the outer package; and
[...]"*

- XIV. Claim 1 of the respondent-proprietor's **auxiliary request 3** reads as follows (with additions to claim 1 of the **main request** underlined, deletions ~~struck-through~~ and long identical passages replaced with "[...]"):

"An imaging system comprising:
an image sensor (110) comprising:
 an outer package (112) having an outer surface, the outer package housing inner electronic circuitry configured to capture images and convert the captured images to electronic signals and the inner electronic circuitry being encased and protected by the outer package; and
 a plurality of solder balls (108a-108d) configured as a two-dimensional ball grid array integrated with the outer surface; and
a circuit board connector (102) comprising:
 a circuit board (103), the circuit board (103) comprising a first planar surface (118), a second planar surface (120), and a side surface (122);
 ~~a~~ the second planar surface (120) opposite the first planar surface; and
 ~~a~~ the side surface (122) facing the outer surface that intersects the ball grid array;
 the circuit board connector (102) further comprising a plurality of electrical connections that electrically connect a plurality of elongate conductive members (128a-128d) of electrical cabling (106) with the plurality of solder balls of the ball grid array, the plurality of electrical connections comprising:
 [...]"

XV. Claim 1 of the respondent-proprietor's **auxiliary request 4** reads as follows (with additions to claim 1 of the **main request** underlined and long identical passages replaced with "[...]"):

"An imaging system comprising:
an image sensor (110) comprising:

[...]
a circuit board connector (102) comprising:
[...]
wherein at least one of the first planar surface or the second planar surface forms an angle with the outer surface of the outer package that is greater than zero degrees and less than 180 degrees, wherein the circuit board connector further comprises:
a first edge where the first planar surface meets the side surface; and
a second edge where the second planar surface meets the side surface,
wherein each of the plurality of solder balls is adjacent to the first edge or the second edge."

XVI. Claim 1 of the respondent-proprietor's **auxiliary request 5** reads as follows (with additions to claim 1 of the **main request** underlined and long identical passages replaced with "[...]"):

"An imaging system for an endoscope comprising:
[...]"

XVII. The respondent-proprietor's arguments as far as relevant for the decision may be summarised as follows.

Main request and auxiliary requests 1 to 5

The skilled person would not have combined document D16 with document D2, and even if they had, they would not have arrived at the subject-matter of claim 1 without an inventive step.

XVIII. The appellant-opponent's arguments as far as relevant for the decision may be summarised as follows.

Main request and auxiliary requests 1 to 5

The skilled person would have combined document D16 with document D2 and arrived at the subject-matter of claim 1 without an inventive step.

Reasons for the Decision

1. The appeal is admissible.

Patent as granted, inventive step when starting from D2 - Article 100(a) EPC

2. Interpretation of a feature in claim 1

The parties did not dispute that, for the reasons given in section 17 of the board's communication pursuant to Article 15(1) RPBA, the expression "*solder balls*" in claim 1 should be interpreted in the context of claim 1 and in the light of the description, in particular paragraph [0042], as meaning **elements made of solder and having the shape of a ball before being bonded to respective first connection ends.**

3. Distinguishing features

The parties concur with the opposition division's finding that the imaging system of claim 1 differs from the imaging system shown in Figures 8 and 9 of D2 only in that the former uses **solder balls** integrated with the outer surface whereas the latter uses **lead legs** (92 in Figures 8 and 9 of D2) projecting from the outer surface (column 5, lines 49 to 52 of D2).

The board also agrees with this finding.

4. Technical effect and objective technical problem

The opposition division held that no specific technical effect was achieved by this distinguishing feature when starting from Figure 2 of D2 and that the objective technical problem could thus be formulated as "*how to provide an alternative electrical interface for the imaging device 30 of D2*" (see point 5.2.4, second and third paragraphs of the Reasons for the decision).

The opposition division did not specify what the technical effect and objective technical problem were when starting from Figure 8 of D2. However, it seems the division implicitly considered that they were the same as when starting from Figure 2 of D2.

The parties accept the opposition division's formulation of the objective technical problem, and so does the board.

5. Obviousness

5.1 Whether the skilled person would have consulted document D16

5.1.1 The respondent-proprietor argued that document D16 related to an optical light barrier used to monitor doors in elevators (D16a, paragraph [0003]) and thus was far removed from the claimed subject-matter and from document D2, which related to an imaging apparatus of an endoscope. Hence, the skilled person would not have been motivated to consult document D16 when starting from document D2 (see for instance point D.5.6 of the respondent-proprietor's letter dated 5 September 2022).

The appellant-opponent submitted that the skilled person would have found document D16 relevant because it related to an optical receiver (paragraph [0003] of D16a), which was similar to an image sensor, and because, like in D2, the optical receiver was electrically connected to a circuit board connector arranged perpendicularly to the optical receiver (see the last four full paragraphs on page 11 of the appellant-opponent's letter dated 18 January 2024).

The board concurs with the appellant-opponent.

- 5.1.2 The respondent-proprietor also argued that the skilled person would not have found document D16 relevant because D16 related to automated production (see paragraph [0004] of D16a) whereas the imaging system of document D2 was implicitly assembled by hand.

The appellant-opponent disputed that the imaging system of document D2 was assembled by hand.

The board notes that there is no evidence that the imaging system of document D2 was assembled by hand and thus regards the respondent-proprietor's assertion as speculative and unproven.

- 5.1.3 For the above reasons, the board concurs with the appellant-opponent that the skilled person starting from document D2 would have regarded document D16 as relevant for solving the objective technical problem identified in point 4. above.
- 5.2 Obviousness starting from document D2 in combination with document D16

5.2.1 The opposition division held that, in view of the obstacles underlined below, the skilled person would not have replaced the lead legs (92) of Figure 8 of D2 with solder balls as disclosed in D16 (see point 5.2.4 of the Reasons for the decision, the relevant part of which is reproduced below).

"In order to arrive at the subject-matter of claim 1 by using D16 the skilled person would have to:

- 1. Solve the objective technical problem by choosing a BGA as an alternative to the 'lead legs' 92 of D2, regardless of the fact that a BGA would lack the alignment function previously performed by the 'lead legs'.*
- 2. Recognise that the alignment function previously provided by the 'lead legs' is now missing and look for a solution for this additional problem.*
- 3. Reach for D16, despite the fact that D16 deals with and solves a different problem: D16 deals with the problem of connecting and aligning an individual circuit board to a BGA-based component, while this embodiment of D2 would require the connection and alignment of a sandwich construction of two circuit boards (fig. 8 (54+56+96)) to the BGA component.*
- 4. Modify the solution of D16 such that it provides the alignment function also for the situation in D2, i.e. for a sandwich construction of two boards. The skilled person would need to do that creatively, without any concrete hint as to how the solution of D16 would need to be modified to apply to such constructions.*
- 5. Perform this modification in such a way that an intersection exists between the circuit board connector (i.e. the sandwich construction of D2) and the BGA, as required by the claim. The skilled person would need to do this without knowledge of the intersection condition itself." (underlining by the opposition division)*

5.2.2 The appellant-opponent argued (see point 5.2.3 of its statement of grounds of appeal) that the solder balls of document D16 also provided an alignment function because the distance between two rows of solder balls essentially corresponded to the thickness of the printed circuit board 50 (paragraph [0025] of D16a and Figure 1 of D16). The skilled person would thus have been prompted to apply the teaching of document D16 to document D2 by replacing the lead legs (92) with solder balls in order to benefit from the advantages of automation and greater degree of freedom described in paragraphs [0004] and [0005] of D16a.

5.2.3 The respondent-proprietor concurred with the reasons given by the opposition division and also submitted the following arguments.

(a) The two rows of lead legs of D2 (92 in Figures 8 and 9) provided **an alignment function** in that they guided the circuit board connector (54, 96 and 56 in Figure 8) prior to soldering. In contrast, the solder balls of D16 (40 and 42 in Figure 1) did not provide any such alignment function. In fact, D16 did not mention any alignment. If at all, the alignment function was provided by the groove 13 and/or by the recess 15 and the projection 54 (see Figures 1 and 2). The solder material of the solder balls of D16 might break if used to guide the circuit board connector and would not hold the circuit board connector in place while melting. Hence, the skilled person would not have wanted to replace the lead legs of D2 with the solder balls of D16 because the alignment function of the lead legs would then have been lost.

(b) According to Figure 1 of D2, there was **a stand-off spacing** between the outer surface of the image sensor and the circuit board connector. This spacing was important for heat dissipation and would be missing if the lead legs were replaced with solder balls according to D16. Hence, the skilled person would not have wanted to replace the lead legs of D2 with the solder balls of D16.

(c) The circuit board connector of D2 was **a sandwich construction** made out of two circuit boards (54, 56) held together by a substrate integrating member (96). This had an impact on both the weight and size of the board. In contrast, the circuit board connector (50) of D16 consisted of a single circuit board. This difference would have dissuaded the skilled person from replacing the lead legs of D2 with the solder balls of D16.

(d) Documents D2 and D16 were published 25 years and 11 years, respectively, before the priority date of the patent in suit. In those 11 years before the priority date of the patent in suit, no-one had combined those teachings. This was **a secondary indication** of the presence of an inventive step.

5.2.4 The board's view is set out below.

As pointed out by the appellant-opponent, the distance between the two rows of solder balls 40 and 42 in document D16 is such that it essentially corresponds to the thickness of the printed circuit board 50 (paragraph [0025] of D16a and Figures 1 and 2 of D16). Since the printed circuit board is to be placed between these two rows of solder balls, it necessarily (implicitly) provides an alignment function for

properly positioning the printed circuit board relative to the solder balls (40, 42) and the substrate (12). This alignment function implicitly operates in two directions: (1) in a direction perpendicular to the rows of solder balls because the board must fit between the two rows of solder balls, and (2) in a direction parallel to the rows of solder balls because the solder balls (40, 42) must be opposite the electrical connection pads (56, 58) on the board.

The respondent-proprietor is correct that the board 50 is aligned with the substrate 12 in direction (1) above by the groove 13 and/or the recess 15 formed in the substrate 12 (Figure 1). However, this does not alter the fact that the solder balls also allow the board 50 to be aligned with the substrate 12 in directions (1) and (2). Moreover, wording such as "*an elongated groove 13 can be cut out*", "*a further recess 15 can be provided within the groove*", "*Instead of the groove 13*" and "*provided that no groove 13 is provided*" in lines 175 to 189 in paragraph [0025] of D16a implies that the groove 13 and the recess 15 could be dispensed with. The respondent-proprietor's argument that solder balls might break is speculative. As to the argument that solder balls would not be able to hold the circuit board connector in place while melting, the board agrees with the appellant-opponent that the circuit board connector would typically be held in place by other mechanical means during soldering. In this respect, the board notes that D2 does not contain any disclosure that the circuit board connector is held in place solely by the lead legs during soldering.

For the above reasons, the board does not regard **arguments (1) and (2)** of the opposition division (see

point 5.2.1 above) and **argument (a)** of the respondent-proprietor (see point 5.2.3 above) as persuasive.

As to **arguments (3) to (5)** of the opposition division (see point 5.2.1 above) and **argument (c)** of the respondent-proprietor (see point 5.2.3 above), the board cannot see any technical reason why the fact that the circuit board connector (54, 56 and 96) of Figure 8 of D2 is a sandwich construction, and thus is presumably thicker than the substrate 12 of D16, would discourage the skilled person from applying the teaching of D16 to D2.

As to **argument (b)** of the respondent-proprietor (see point 5.2.3 above), the board notes that document D2 does not disclose why there is a stand-off spacing between the outer surface and the circuit board connector in Figure 8. The board regards it as speculative to assume that the skilled person would construe it as being essential for heat dissipation in the endoscope of D2, all the more so because the endoscope disclosed in the patent specification does not have any such spacing.

Regarding **argument (d)**, the respondent-proprietor is correct that both documents D2 and D16 had been published for 11 years before the priority date of the patent in suit but no-one had combined their teachings. However, in the board's view, this is only a secondary indication of inventive step and does not carry the same weight as the above technical reasons why the skilled person would have wanted to apply the teaching of D16 to the endoscope of D2.

5.3 Conclusion on obviousness

For the above reasons, the board considers that the subject-matter of claim 1 of the patent as granted does not involve an inventive step in view of prior-art documents D2 and D16.

6. Conclusion on the patent as granted

For the above reasons, the ground for opposition under Article 100(a) EPC prejudices the maintenance of the patent as granted.

Auxiliary requests 1 and 2 - inventive step (Articles 52(1) and 56 EPC)

7. The respondent-proprietor explained that auxiliary requests 1 and 2 had been filed to distinguish the claimed subject-matter from another prior-art document (D1) and did not dispute that the additional features of claim 1 of auxiliary requests 1 and 2 (see points XII. and XIII. above) were disclosed in document D2.

8. Conclusion on obviousness

For the above reasons, the board considers that the subject-matter of claim 1 of auxiliary requests 1 and 2 does not involve an inventive step in view of prior-art documents D2 and D16.

9. Conclusion on auxiliary requests 1 and 2

For the above reasons, auxiliary requests 1 and 2 are not allowable.

Auxiliary request 3 - inventive step (Articles 52(1) and 56 EPC)

10. The respondent-proprietor argued that the additional features of claim 1 of auxiliary request 3 (other than those already present in claim 1 of auxiliary request 2; see point XIV. above) made it clear that the circuit board connector of claim 1 comprised a single circuit board. In contrast, the circuit board connector of Figure 8 of D2 was a sandwich construction comprising two circuit boards (54, 56) held together by a substrate integrating member (96). There would have been no motivation for the skilled person to replace the sandwich construction of D2 with a single circuit board.

11. The appellant-opponent submitted that the sandwich construction shown in Figure 8 of D2 formed by first and second circuit boards (54, 56) held together by a substrate integrating member (96) was itself a "*circuit board*". As supporting evidence, the appellant-opponent referred to the expression "*integrated circuit board*" used to refer to the sandwich construction in the following passage in column 5, lines 52 to 57 of D2:

*"First and second circuit boards 54 and 56 each having flat lands 94 at two edge portions are integrally bonded to each other by **substrate integrating member 96**. One end portion of **the integrated circuit board** is inserted between upper and lower lead legs 9 and is soldered thereto."* (emphasis added by the board)

12. The board concurs with the appellant-opponent.

13. Conclusion on obviousness

For the above reasons, the board considers that the subject-matter of claim 1 of auxiliary request 3 does not involve an inventive step in view of prior-art documents D2 and D16.

14. Conclusion on auxiliary request 3

For the above reasons, auxiliary request 3 is not allowable.

Auxiliary request 4 - inventive step (Articles 52(1) and 56 EPC)

15. The respondent-proprietor argued that the additional features of claim 1 of auxiliary request 4 (see point XV. above) distinguished the claimed imaging system from that of D2 in an inventive manner.

16. The appellant-opponent pointed out that the only difference from document D2 introduced by those additional features was that solder balls were used instead of lead legs. This was the same difference as for the main request. The feature that each of the lead legs was "*adjacent to the first edge or the second edge*" was disclosed in Figure 8 of D2. Hence, by replacing the lead legs of D2 with solder balls according to the teaching of D16, the skilled person would have arrived at the additional features of claim 1 of auxiliary request 4.

17. The board concurs with the appellant-opponent.

18. Conclusion on obviousness

For the above reasons, the board considers that the subject-matter of claim 1 of auxiliary request 4 does not involve an inventive step in view of prior-art documents D2 and D16.

19. Conclusion on auxiliary request 4

For the above reasons, auxiliary request 4 is not allowable.

Auxiliary request 5 - inventive step (Articles 52(1) and 56 EPC)

20. The respondent-proprietor argued that adding that the imaging system was "*for an endoscope*" in claim 1 of auxiliary request 5 (see point XVI. above) meant that the imaging system was limited to an endoscope and the skilled person would not have consulted document D16, which related to an optical light barrier used to monitor doors in elevators.

21. The appellant-opponent pointed out that this was essentially the same argument as put forward by the respondent-proprietor regarding the main request and found non-persuasive by the board (see section 5.1 above). Moreover, the appellant-opponent noted that according to the established case law of the boards of appeal, the expression "*An imaging system for an endoscope*" should be construed as meaning "*An imaging system suitable for an endoscope*".

22. The board concurs with the appellant-opponent.

23. Conclusion on obviousness

For the above reasons, the board considers that the subject-matter of claim 1 of auxiliary request 5 does not involve an inventive step in view of prior-art documents D2 and D16.

24. Conclusion on auxiliary request 5

For the above reasons, auxiliary request 5 is not allowable.

25. Overall conclusion

In the absence of any request which meets the requirements of the EPC, the patent must be revoked.

Order

For these reasons it is decided that:

26. The decision under appeal is set aside.

27. The patent is revoked.

The Registrar:

The Chair:



B. Brückner

B. Willems

Decision electronically authenticated