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Datasheet for the decision of 13 November 2023

Case Number: T 0568/21 - 3.5.02

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Language of the proceedings: EN

Title of invention:
Improved electrical connector

Patent Proprietor:
PILKINGTON Automotive Deutschland GmbH

Opponents:
SAINT-GOBAIN GLASS FRANCE
AGC Glass Europe

Relevant legal provisions:
EPC Art. 56, 84

Keyword:
Inventive step - main request and first auxiliary request (no)
Claims - clarity - second auxiliary request (no)

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Case Number: T 0568/21 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 13 November 2023

Appellant: (Opponent 1)	SAINT-GOBAIN GLASS FRANCE 18, avenue d'Alsace 92400 Courbevoie (FR)
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Respondent: (Patent Proprietor)	PILKINGTON Automotive Deutschland GmbH Otto-Seeling-Strasse 7 58455 Witten (DE)
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Party as of right: (Opponent 2)	AGC Glass Europe Avenue Jean Monnet 4 1348 Louvain-la-Neuve (BE)
Representative:	AGC Glass Europe Technovation Centre - IP Department Rue Louis Blériot, 12 6041 Gosselies (BE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 29 March 2021 concerning maintenance of the European Patent No. 2174384 in amended form.**

Composition of the Board:

Chairman	R. Lord
Members:	C.D. Vassoille
	W. Ungler

Summary of Facts and Submissions

I. The appeal of the opponent lies against the interlocutory decision of the opposition division with which it was found that the European patent no. 2 174 384 in the form of the then third auxiliary request met the requirements of the Convention.

II. The following documents are relevant for the present decision:

E1: DE 103 01 352 B3
D3: US 5,920,125

III. The board summoned the parties to oral proceedings. In a communication under Article 15(1) RPBA annexed to the summons to oral proceedings, the board informed the parties *inter alia* of their preliminary opinion that the subject-matter of claim 1 of the main request and of the first auxiliary request did not involve an inventive step under Article 56 EPC with regard to a combination of documents E1 and D3 and that claim 1 of the second auxiliary request did not meet the requirements of Article 84 EPC.

IV. As the respondent/proprietor, with letter of 12 October 2023, withdrew their request for oral proceedings, the oral proceedings were cancelled and the decision issued in writing.

V. The appellant (opponent 01) requested in writing that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested in writing that the appeal be dismissed (main request). As an auxiliary measure, the respondent requested that the patent be maintained in amended form in accordance with either the first or second auxiliary request, corresponding to the fourth and fifth auxiliary requests filed with letter of 12 November 2020 before the opposition division and refiled with the reply to the appeal.

Opponent 02 has not filed an appeal against the decision of the opposition division, but is a party as of right to the proceedings under Article 107 EPC. They have not submitted any requests or observations in the appeal proceedings.

VI. Claim 1 of the respondent's main request, corresponding to the third auxiliary request underlying the decision under appeal, has the following wording (feature numbering added in brackets):

"**(1-a)** A vehicle glazing (30) comprising:

(1-b) at least one pane of glazing material (31) provided with an electrical element (33), and

(1-c) an electrical connector (10) electrically connected to the electrical element (33) and adhered to a surface of the glazing (30)

(1-d) wherein the electrical connector is a flexible electrical connector (10) for connection to the electrical element (33) on the glazing (30) comprising:

(1-e) a connector body (11) having first (12) and second (13) connection portions and

(1-f) two or more electrical pathways (16) provided within the connector body (11) and extending between the first (12) and second (13) connection portions,

(1-g) the first connection portion (12) having a functional surface (14) to connect to the glazing (30)

(1-h) and on which at least two exposed areas of conductive material (15) are provided, each of which is in contact with a corresponding electrical pathway (16), for connection to the electrical element (33) on the glazing (30),

(1-i) wherein adhesive (19) is provided on the functional surface (14)

(1-j) such that, at a minimum, a peripheral band of adhesive is formed around each of the areas of conductive material (15) for adhesion to the glazing (30), and

(1-k) wherein the conductive material (15) is solder,

characterised in that

(1-l) each of the areas of conductive material (15) on the first connection portion has a thickness which is less than the thickness of the adhesive (19)."

VII. Claim 1 of the first auxiliary request differs from claim 1 of the main request in that feature (1-l) is amended as follows (emphasis added by the board):

"**(1-l)** the glazing (30) is curved, and in that each of the areas of conductive material (15) on the first

connection portion has a thickness which is less than the thickness of the adhesive (19)."

VIII. Claim 1 of the second auxiliary request differs from claim 1 of the main request in that feature (1-l) is amended as follows (emphasis added by the board):

"**(1-l)** the glazing (30) is curved, and in that each of the areas of conductive material (15) on the first connection portion has a thickness which is less than the thickness of the adhesive (19), so that when the electrical connector (10) is positioned on the glazing (30) such that each of the areas of conductive material (15) overlies a connection point of the electrical element (33), it is only the adhesive (19) that contacts the glazing (30) and not the conductive material (15)."

IX. The relevant arguments of the appellant can be summarised as follows:

The subject-matter of claim 1 of the main request did not involve an inventive step in view of a combination of document E1 with document D3. In particular, the subject-matter of claim 1 differed from the vehicle glazing of E1 only in feature 1-l, and the person skilled in the art would have taken account of document D3 when seeking solutions to the objective technical problem arising from the distinguishing feature.

The subject-matter of claim 1 of the first auxiliary request did not involve an inventive step. Claim 1 did not specify the degree of flexibility of the connector, and very low flexibility would therefore also fall within the scope of claim 1. Furthermore, the use of curved glazing was common practice and it was obvious

that a connector must have an appropriate degree of flexibility.

Claim 1 of the second auxiliary request did not meet the requirements of Article 84 EPC, since it is directed to a vehicle glazing with an electrical connector connected thereto, but the new feature added in claim 1 of the second auxiliary request concerned the establishment of the connection between the electrical connector and the vehicle glazing.

X. The relevant arguments of the respondent can be summarised as follows:

The subject-matter of claim 1 of the main request involved an inventive step in relation to a combination of document E1 with document D3. The subject-matter of claim 1 differed from E1 in features 1-d, 1-i, 1-j and 1-l. The distinguishing features were not rendered obvious to the person skilled in the art, in particular because document D3 would not have been taken into account when seeking a solution to the objective technical problem.

The first auxiliary request differed from the main request in that the characterising portion of claim 1 required the glazing to be curved. Neither of documents E1 and D3 disclosed a curved glazing.

The additional feature of claim 1 of the second auxiliary request defined more precisely the advantages resulting from the difference in thickness between the areas of conductive material and the adhesive, wherein the conductive material had a smaller thickness than the adhesive.

Reasons for the Decision

1. *Decision in the written procedure / Right to be heard (Article 113(1) EPC)*

The respondent withdrew their request for oral proceedings, see point IV. above. The only other request for oral proceedings by the appellant/opponent 01 was an auxiliary request.

The present decision is based on grounds and evidence on which the respondent had the opportunity to present their comments. In particular, the respondent had been informed of the reasons for the decision in the board's communication under Article 15(1) RPBA and the appellant's reply to it. Thus, the principle of the right to be heard under Article 113(1) EPC is fully respected.

The present decision could therefore be issued in writing without holding oral proceedings.

2. Main request - Interpretation of claim 1

2.1 Claim 1 of the main request suffers from a significant lack of clarity, since the claimed vehicle glazing is defined by features of the electrical connector which, however, refer to a status prior to connection to the vehicle glazing.

In particular, as stated by the appellant, claim 1 is contradictory in that, on the one hand, it refers to a vehicle glazing comprising the electrical connector, which is electrically connected to an electrical element of the glazing material pane and adhered to a

surface of the glazing. This clearly implies that the electrical connector is firmly attached to the glazing. According to paragraph [0022] of the patent, this is done by using a heating tool which ensures a substantially uniform thickness of the conductive material and of the adhesive.

2.2 On the other hand, according to feature 1-l of claim 1, each of the areas of conductive material on the first connection portion has a thickness that is less than the thickness of the adhesive. This is in clear contradiction to the final (connected) state of the electrical connector, where the conductive material and the adhesive have a uniform thickness.

2.3 Therefore, as correctly noted by the appellant, and as also stated in paragraph [0022] of the patent, feature 1-l has to be interpreted such that it refers to a state of the electrical connector, and in particular of its first connection portion, which is prior to the application of the heating tool to the first connection portion.

3. Main request - Inventive step (Article 56 EPC)

3.1 The subject-matter of claim 1 of the main request does not involve an inventive step under Article 56 EPC with regard to a combination of documents E1 and D3.

Distinguishing features

3.2 In the decision under appeal, the opposition division concluded that the subject-matter of claim 1 of the now main request differed from E1 in features 1-d, 1-i, 1-j and 1-l of claim 1, which are as follows (emphasis added by the board):

(1-d) wherein the electrical connector is a **flexible** electrical connector (10) for connection to the electrical element (33) on the glazing (30)

(1-i) wherein **adhesive** (19) is provided **on the functional surface** (14)

(1-j) such that, at a minimum, a peripheral band of **adhesive is formed around each** of the areas of conductive material (15) for adhesion to the glazing (30), and

(1-l) each of the areas of conductive material (15) on the first connection portion has a **thickness which is less than** the thickness of the adhesive (19).

3.3 While it was not in dispute between the parties that document E1 did not disclose feature 1-l, the appellant argued that document E1 additionally disclosed features 1-d, 1-i and 1-j.

3.4 As regards feature 1-d, the board agrees with the appellant that a particular degree of flexibility of the electrical connector cannot be derived from claim 1. The term "flexible" in the overall context of claim 1 can thus at most be understood in functional terms as meaning that the electrical connector must be sufficiently flexible for a connection to a (possibly curved) glazing. This is in accordance with the description in paragraphs [0013] and [0022] of the patent.

However, the electrical connector in document E1 must necessarily also have this property in order to be connected to the vehicle glazing as intended. The mere

fact that E1 does not use the term "flexible" does not contradict this understanding of E1.

The respondent's argument according to which "flexible" implies that the electrical connector has a higher degree of flexibility than the average does not convince the board. In particular, it is not at all clear what the "average flexibility" is, and the respondent did not provide any further explanations in this regard.

The respondent further argued that in the case of the connector according to the patent, the greater degree of flexibility was achieved by the use of a connector body 11 which comprises a single foil of a suitable plastic, together with an adhesive which adds very little in terms of stiffness. The board is not convinced by the respondent's argument, because this specific structure of the electrical connector is not defined in claim 1.

Therefore, the board concluded that document E1 at least implicitly discloses feature 1-d of claim 1 in a direct and unambiguous manner.

3.5 As regards features 1-i and 1-j, the board does not consider these features to be directly and unambiguously derivable from document E1.

Document E1 in paragraph [0032] might indeed disclose the provision of an adhesive seal 17 on the electrical connector 7 prior to the connection to the vehicle glazing. However, according to features 1-i and 1-j, the adhesive is explicitly provided on the functional surface of the connector such that at least a peripheral band of adhesive is formed around each of

the areas of conductive material for adhesion to the glazing. Document E1 does not directly and unambiguously disclose either that the adhesive may be provided on the functional surface of the connector (which is the surface on which the exposed areas of conductive material are provided, see feature 1-h), or that the adhesive is formed around each (and not all) of the areas of conductive material.

3.6 Therefore, the board arrived at the conclusion that the subject-matter of claim 1 of the main request differs from the vehicle glazing of E1 in features 1-i, 1-j and 1-l.

Objective technical problem

3.7 It was not in dispute between the parties that the objective technical problem, when starting from E1 and having regard to the distinguishing features, can be considered to be at least that of how to provide a vehicle glazing comprising an electrical connector which prevents short circuits and splashing of conductive material during and after connection of the electrical connector to the vehicle glazing. The respondent has also referred to the third problem mentioned in paragraph [0009] of the patent, but this would only have become relevant if it had been concluded that E1 did not disclose feature 1-d.

Obviousness

3.8 The opposition division's main argument in favour of an inventive step in the decision under appeal was that the skilled person confronted with the objective technical problem could have consulted a skilled person in the field of electronics and solder connections of

chips to circuit boards. However, according to the opposition division the person skilled in the art would not have applied the solution of document D3 to the vehicle glazing of document E1 in view of the different materials and dimensions of the vehicle glazing compared to a circuit board and in view of an electrical connector with first and second connection portions compared to a semiconductor chip (see point 11.2 of the reasons for the contested decision).

3.9 The respondent essentially argued that the skilled person would not have considered the remote and highly specialised technical field of interconnection structures for joining a semiconductor device to a chip carrier when seeking solutions to the objective technical problem.

The board does not agree with the respondent that the skilled person would not have considered document D3 when seeking a solution to the objective technical problem. The appellant has correctly argued that document D3 refers to an electrical connector in the form of a semiconductor chip.

Furthermore, the electrical connector referred to in claim 1 of the main request does not have any features which are so specific to vehicle glazing that a person skilled in the art, when seeking a solution to the objective technical problem, would restrict their search to the field of vehicle glazing or electrical connectors specifically for vehicle glazing. Rather, it would be immediately apparent to a person skilled in the art that the objective technical problem in the case at hand is not specific to vehicle glazing, but may clearly concern other technical fields involving an electrical connector that is applied to a substrate.

The person skilled in the art would therefore naturally look to other technical fields which are promising in the sense that they might provide solutions to the objective technical problem.

3.10 Electrical connectors for connecting semiconductor chips to substrates may be of different dimensions and also may imply the use of different materials, as found by the opposition division. However, the principles used there can also be applied in a general way to the area of vehicle glazing comprising electrical connectors. The person skilled in the art would recognise this immediately and include the relevant technical areas in the search for solutions to the objective technical problem.

Moreover, in order to do this, the skilled person would not have to be an expert in these other technical fields, as the respondent has argued. On the contrary, the skilled person clearly has sufficient knowledge in the field of the electrical aspects of vehicle glazing with regard to solder connections, which would allow him to understand corresponding developments in other fields of technology as well.

Therefore, the board concludes that the person skilled in the art, in this specific case, would have considered document D3 when starting from document E1 and being confronted with the objective technical problem of how to provide a vehicle glazing comprising an electrical connector that prevents short circuits and splashing of conductive material during and after its connection to the vehicle glazing.

3.11 Furthermore, document D3 discloses the claimed solution to the objective technical problem, which is in

particular the provision of an adhesive layer between the semiconductor chip and the substrate, which is formed around each of the areas of conductive material. Document D3 therefore directly and unambiguously discloses features 1-i and 1-j.

3.12 The board also considers document D3 to directly and unambiguously disclose feature 1-l of claim 1 of the main request. In this context, the board does not agree with the respondent that the problem addressed in document D3 is different. On the contrary, document D3 explicitly refers to the problem that the solder, when liquefied, may not be held in place. Reference is made to document D3 in column 4, lines 54 to 59, where the following is stated:

> "In the configurations wherein solder bumps 3 are not present or wherein solder bumps are low melting solder, it will be desirable to include some means to maintain the solder material 7 in place when it liquifies such as by employing adhesive member 8 and/or employing dam structures at the ends of pads 4."

With this in mind, the skilled person would immediately understand that document D3 provides a solution to the objective technical problem of how to prevent short circuits and splashing of conductive material during and after connection of the electrical connector to the vehicle glazing.

It is further clear from the above description in connection with figures 2 and 2A of document D3 that each of the areas of conductive material on the first connection portion has a thickness that is less than

the thickness of the adhesive, as required by feature 1-l.

3.13 The respondent argued that the disclosure of document D3 was ambiguous in this respect, as it disclosed in column 5, lines 9 to 11 the following:

> "In the preferred aspects of the present invention employing solder balls 3, the thickness of adhesive member 8 is less than that of the solder balls 3".

Notwithstanding the foregoing, it is apparent from the overall disclosure of document D3 that, in order to maintain the low melting solder in place during liquefaction, the solder material must have a thickness less than that of the adhesive member. This is confirmed by the drawings, in particular figures 2 and 2A, which illustrate precisely this teaching.

Consequently, even if the skilled person were to be confused by the disclosure in column 5, lines 9 to 11, this would not prevent them from immediately recognising the essence of the teaching of D3 in relation to the use of the adhesive surrounding the conductive material corresponding to what is claimed in features 1-i, 1-j and 1-l. This teaching not only could but would have been applied by the person skilled in the art to the vehicle glazing disclosed in E1 regardless of any differences in dimensions and materials.

The board therefore concluded that the subject-matter of claim 1 of the main request does not involve an inventive step in view of a combination of document E1 with document D3.

4. First auxiliary request - Inventive step (Article 56 EPC)

4.1 Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the glazing is defined as being curved.

4.2 The subject-matter of claim 1 of the first auxiliary request does not involve an inventive step in view of a combination of document E1 with document D3.

The respondent essentially argued that due to the improved structure of the electrical connector attached to the vehicle glazing, the connector possessed superior flexibility, which was particularly advantageous when the connector was attached to a curved glazing. In this context, the respondent referred to further advantages of a flexible connector in combination with a curved glazing.

4.3 Although documents E1 and D3 do not expressly refer to curved vehicle glazing, curved vehicle glazing was undoubtedly in common use at the effective filing date of the patent and, for this reason alone, the feature "curved glazing" cannot in itself contribute to an inventive step. This was also not argued by the respondent. Rather, with this additional feature the respondent seeks to justify a narrower interpretation of the feature "flexible electrical connector".

However, neither the degree of curvature of the vehicle glazing nor the correspondingly required flexibility of the electrical connector is defined in claim 1. The term "flexible" in the overall context of claim 1 can therefore, as essentially already explained above in relation to the main request (see point 3.4), at most

be understood functionally to mean that the electrical connector must be sufficiently flexible to be suitable for connection to the glazing which is curved in some way.

The additional definition of a curved glazing is therefore not suitable to limit the required degree of flexibility of the electrical connector in any way compared to claim 1 of the main request. Therefore, the board's reasoning in the above paragraph 3. regarding inventive step of the subject-matter of claim 1 of the main request also applies to claim 1 of the first auxiliary request.

4.4 Consequently, the board has come to the conclusion that the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step within the meaning of Article 56 EPC.

5. Second auxiliary request - Clarity (Article 84 EPC)

5.1 Claim 1 of the second auxiliary request *inter alia* comprises the following additional feature:

"so that when the electrical connector (10) is positioned on the glazing (30) such that each of the areas of conductive material (15) overlies a connection point of the electrical element (33), it is only the adhesive (19) that contacts the glazing (30) and not the conductive material (15)."

5.2 The additional feature does not concern the claimed vehicle glazing in its final form, but a step in the process of its manufacture. Only after the positioning of the electrical connector is the heating tool applied, which leads to the melting and flowing of the

conductive material, see paragraph [0018] of the patent. It is therefore not clear from the wording of claim 1 of the second auxiliary request how the manufacturing feature in question contributes to the definition of the claimed vehicle glazing and the scope of protection is thus not clearly defined by claim 1.

It is further to be noted that the amendment of claim 1 of the second auxiliary request is not based on the granted claims, so that unlike the lack of clarity mentioned above for the main request, it is open to be objected to under Article 84, in line with G 3/14.

It is also to be noted that the respondent, despite having been informed of the above view in the board's communication under Article 15(1) RPBA, did not put forward any further arguments in support of the clarity of claim 1.

5.3 It therefore only remains for the board to conclude that claim 1 of the second auxiliary request does not meet the requirements of Article 84 EPC.

6. Result

Since the respondent's main request and the first auxiliary request do not meet the requirement of Article 56 EPC and the second auxiliary request does not meet the requirements of Article 84 EPC, the board had to accede to the appellant's main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

K. Boelicke R. Lord

Decision electronically authenticated