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Title of invention:
Power inverter

Patent Proprietor:
Hitachi, Ltd.

Opponent:
Valeo Siemens eAutomotive France SAS

Relevant legal provisions:
EPC Art. 52(1), 54(1), 54(2), 56, 100(a)

Keyword:
Novelty - (yes)
Inventive step - (yes) - ex post facto analysis - could-would approach - problem and solution approach

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Case Number: T 0700/21 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 22 February 2024

Appellant: (Opponent)	Valeo Siemens eAutomotive France SAS 14 Avenue des Béguines 95800 Cergy (FR)
Representative:	Argyma 14 Boulevard de Strasbourg 31000 Toulouse (FR)
Respondent: (Patent Proprietor)	Hitachi, Ltd. 6-6, Marunouchi 1-chome Chiyoda-ku Tokyo 100-8280 (JP)
Representative:	MERH-IP Matias Erny Reichl Hoffmann Patentanwälte PartG mbB Paul-Heyse-Strasse 29 80336 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 9 March 2021 rejecting the opposition filed against European patent No. 2023473 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	T. Häusser
Members:	J. Thomas
	T. Karamanli

Summary of Facts and Submissions

I. This is an appeal by the appellant-opponent (hereinafter "the appellant") against the decision of the opposition division to reject the opposition against European patent No. 2 023 473.

II. The opposition had been filed against the patent in its entirety. Grounds for opposition were lack of novelty (Article 100(a) EPC in combination with Articles 52(1) and 54 EPC) and lack of inventive step (Article 100(a) EPC in combination with Articles 52(1) and 56 EPC).

III. The parties' final requests at the end of the oral proceedings before the board were as follows:

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

The **respondent**-patent proprietor (hereinafter "the respondent") requested that the appeal be dismissed, i.e. the European patent be maintained as granted, or that the decision under appeal be set aside and the case be remitted to the opposition division (auxiliary request') or that the European patent be maintained as amended according to the auxiliary request submitted with the reply to the statement setting out the grounds of appeal.

IV. The following documents are referred to in this decision:

D1: US 2003/0133257 A1
D2: EP 2 006 989 A2

D2*: WO 2007/083648 A1
D5: US 2003/0067748 A1

Document D2* is an international patent application under the PCT published in Japanese before the priority date of the impugned patent. Document D2, written in English, is the European patent application based on document D2* with corresponding content. Because of its language, document D2 is referred to below. However, any reference to document D2 implies a corresponding reference to the relevant content of document D2*. This has not been disputed by either party.

V. Claim 1 of the patent as granted reads as follows (the labelling in bold is added by the board according to the opposition division's labelling):

"*A power inverter, comprising:*
1a *a chassis (12) that comprises an upper opening (400, 402) at an upper end and a lower opening (404) at a lower end of the chassis (12);*
1b *a power module (300) that is housed in the chassis (12) and comprises a plurality of switching devices (328, 330) for an upper arm and a lower arm that make up an inverter circuit (144), a metal board (304) that releases heat generated by the plurality of the switching devices (328, 330), and a DC terminal (138) and an AC terminal (118);*
1c *a smoothing capacitor module (500) that comprises a DC terminal (502, 504) and smoothes a DC voltage applied to the DC terminal (502, 504) of the smoothing capacitor module (500), with the DC terminal (502, 504) of the smoothing capacitor module (500) electrically connected with the DC terminal (138) of the power module (300);*

1d *a gate drive circuit (174), housed in the chassis (12), that drives the power module (300); wherein:*
1e *the power module (300) is provided in a first region;*
1f *a semiconductor module for auxiliaries and the smoothing capacitor module (500) are provided in a second region;*
characterised in that
the power inverter further comprises
1g *a space that links the first region and the second region is created between a side of a coolant passage (19) and the chassis (12), and the DC terminal (502, 504) of the smoothing capacitor module (500) and the DC terminal (138) of the power module (300) are electrically connected with each other through the space,*
1h *an upper cover (10) and a lower cover (16) that cover the upper opening (400, 402) and the lower opening (404) respectively; wherein:*
1i *the coolant passage (19), on which the power module (300) is mounted, is provided substantially parallel to the upper cover (10) or the lower cover (16) in the chassis (12);*
wherein;
1k *the chassis (12) is provided with the first region between the upper cover (10) and the coolant passage (19) and*
1l *the second region between the lower cover (16) and the coolant passage (19), by providing the coolant passage (19) inside the chassis (12).*"

VI. The appellant's arguments, insofar as they are relevant to the present decision, are summarised as follows:

Both documents D1 and document D2/D2* anticipated the subject-matter of claim 1 of the patent as granted in

its entirety since the features of claim 1 have to be interpreted in their broadest meaning.
If novelty were acknowledged, the subject-matter defined in claim 1 was at least not inventive over document D1 in combination with either the skilled person's common general knowledge or the teaching of document D5. For assessing inventive step, "*the chassis*" could be associated with structural units in document D1 using two alternative interpretations of document D1, neither of which was inventive.

VII. The respondent's arguments, insofar as they are relevant to the present decision, are summarised as follows:

Documents D1 and D2/D2* did not disclose all features of claim 1 of the patent as granted when properly reading claim 1, so that the subject-matter of claim 1 was new.

Concerning inventive step, the appellant's lines of arguments were based on "wishful thinking" since individual features were picked out of different documents and arbitrarily combined in order to arrive at the claimed subject-matter. The subject-matter of claim 1 was, however, not rendered obvious when starting from document D1 and combining it with either the skilled person's common general knowledge or the teaching of document D5. This applied to both alternative interpretations of "*the chassis*".
Especially the second alternative interpretation was based on hindsight.

Reasons for the Decision

1. The invention

The invention concerns a power inverter which comprises a chassis in which a power module and additional further electronic circuit elements like a smoothing capacitor, a gate circuit, switching devices and a further semiconductor module for auxiliaries are housed and advantageously cooled. The principal aims of the present invention concern the improvement of reliability and producibility of the device thereby reducing the footprint of the device by providing a very efficient cooling of the electronic components. In order to achieve these aims the chassis is provided with an upper and lower opening at its upper and lower ends which are closed by an upper and lower cover. A coolant passage is provided in the central area of the chassis parallel to one of the covers. In other words, the coolant passage represents a central part of the chassis and the chassis extends in the upper and lower directions having sidewalls thereby providing cavities in which the electronic components are housed. The upper and lower cavities (named "*first region*" and "*second region*" in claim 1 of the patent as granted) are connected by providing an open space between the coolant passage and the sidewall of the chassis. Hence, the chassis acts not only as supporting structure for the numerous electronic units which are efficiently cooled but also as the protective housing so that the entire structure becomes rather compact, easy to manufacture and provides efficient cooling.

2. Patent as granted - procedural issues

2.1 During the discussion of the novelty of the subject-matter of claim 1 of the patent as granted over document D1, the respondent argued for the first time at the oral proceedings before the board that features 1b and 1g were not disclosed in document D1.

2.2 The appellant considered the respondent's submissions to be very late. It assumed that the respondent had agreed in the appeal proceedings that features 1b and 1g were disclosed in document D1, since the disclosure of these features in document D1 had not been disputed by the respondent prior to the oral proceedings before the board. The question of the disclosure of features 1b and 1g in document D1 was also not an issue in the decision under appeal.

2.3 The board does not accept the appellant's view.

In the case at hand, the opposition division assessed novelty and found, *inter alia*, that document D1 failed to disclose at least features 1a, 1f and 1h of claim 1 as granted (emphasis by the board). The appellant challenged this finding and again raised the objection of lack of novelty with respect to document D1 in the appeal proceedings. This means that the appellant must convince the board that all features of claim 1 as granted are disclosed in document D1 for its objection of lack of novelty in respect of document D1 to be successful.

The fact that the disclosure of some features of claim 1 as granted in document D1 had not yet been discussed prior to the oral proceedings before the board therefore does not release the appellant from its duty to fully explain to the board its own objection of

lack of novelty at each stage of the appeal proceedings, if necessary. During the oral proceedings before the board, the board asked the appellant where, in its view, features 1b and 1g of claim 1 of the patent as granted were disclosed in document D1. The board considers that the appellant should be able to answer the board's question as to the disclosure of these features in document D1, even if this question was raised in detail for the first time at an admittedly quite advanced stage in the appeal proceedings.

3. Patent as granted - ground for opposition under Article 100(a) EPC in combination with Articles 52(1) and 54 EPC - lack of novelty over document D1

3.1 The appellant argued that the subject-matter of claim 1 of the patent as granted lacked novelty in view of document D1. The opposition division and the respondent were of the opinion that document D1 did not disclose all features of claim 1.

3.2 Feature 1a

3.2.1 "*The chassis*" according to feature 1a of claim 1 corresponds to the combination of the thermal support 12 together with the flange 126 of document D1. This understanding of document D1 was the only one discussed in the proceedings with regard to the discussion on novelty. A second, alternative interpretation of "*the chassis*" (see point 5.3 below) was used for the discussion on inventive step, which however was never presented by the appellant with regard to novelty. In any case, in view of the considerations below it would not have been convincing.

3.2.2 The respondent asserted that the flange 126 was not a complete frame as shown in Figure 14, so that the claimed "*upper opening ... at an upper end*" of the chassis would be missing. The flange as shown in Figure 14 should therefore not be associated with an upper opening at the upper end of the chassis, since it did not completely surround the space on the upper side of the thermal support in which the electronics including the power module was installed.

3.2.3 In the board's view, Figure 14 shows only a partial, exploded view of the device of document D1 without representing the flange 126 in its entirety. In Figures 11 and 12 of document D1, the flange 126 is shown in its entirety thereby surrounding entirely an open space and forming a cavity 128. This is also supported by paragraph [0067] of document D1, which states that the "*integral flange 126 is formed on the thermal support*" and "*[t]he integral flange serves to support ... the circuit assembly ... and surrounds certain of the circuitry, such as to form a cavity 128 within which the circuitry is mounted*". Therefore, the board concludes that the flange 126 constitutes entirely surrounding sidewalls on the thermal support 12, so that both units together (thermal support 12 and flange 126) represent the claimed chassis provided with an upper opening at an upper end.

3.2.4 Document D1 further discloses that on the lower side of the thermal support 12 a box-shaped cover is mounted in which further electronics may be provided. The thermal support 12 being part of the chassis does consequently not provide a lower opening at its lower end, since there are no extensions on its lower side which could be identified with a structure forming a lower opening at a lower end of the chassis. At the lower end of that

chassis, i.e. on the lower surface of the thermal support, no "*lower opening*" is provided, but only an unlimited open space is present. However, an unlimited open space at the lower end of the thermal support is different from a chassis having "*a lower opening ... at a lower end of the chassis*", contrary to the appellant's allegation who considered the space limited by the box-shaped cover as falling under the wording of claim 1.

Therefore, the board concludes that part of feature 1a, namely that "*the chassis comprises ... a lower opening ... at a lower end of the chassis*", is not disclosed in document D1.

3.3 Feature 1b

3.3.1 The respondent asserted that the claimed "*metal board*" was not shown in document D1, since paragraph [0074] of document D1 referred to a "*plate 148 ... made of aluminum silicon carbide (AlSiC)*" which, in its opinion, meant that plate 148 was a ceramic plate but not a metal plate.

3.3.2 In the board's view, however, a plate or circuit board made of "a*luminum silicon carbide (AlSiC)*" is to be regarded as a "*metal plate*", since AlSiC is a "*metal-ceramic composite material*", which is also referred to as a "m*etal matrix composite*" and is a composite material with fibers or particles dispersed in a metallic matrix. The board therefore considers that plate 148 of document D1 is a "*metal board*".

3.3.3 The board therefore concludes that feature 1b is disclosed in document D1.

3.4 Features 1c to 1e

Features 1c to 1e were not contentious. The board has no reason to doubt that document D1 discloses these features.

3.5 Feature 1f

3.5.1 The respondent argued that feature 1f defined that a "*semiconductor module for auxiliaries and the smoothing capacitor module*" were provided in the second region below the thermal support. In the description of the impugned patent the auxiliaries were presented as modules for further components besides the power module (see paragraph [0043] of the impugned patent). In document D1, the electronic circuitry provided below the thermal support 12 related to electronic components of the power module itself, e.g. control circuitry 36, energy storage and conditioning circuitry 38 (see paragraph [0053]) or a second power module, but not a "*semiconductor module for auxiliaries and a smoothing capacitor*". Therefore, feature 1f was not disclosed in document D1.

3.5.2 The appellant took the view that the printed circuit boards disclosed in document D1 in relation to Figures 2 to 4 were undoubtedly semiconductor boards and that they should be understood to mean any printed circuit board, since the precise meaning of the term "*auxiliaries*" was vague. Hence, the relevant disclosure of document D1 comprised a "*semiconductor module for auxiliaries*" and a "*smoothing capacitor*" as defined in claim 1.

3.5.3 The board disagrees with the appellant's considerations since claim 1 is precise in its definition of the

specific electronics provided in the second region, i.e. the space below the coolant passage, being "*a semiconductor module for auxiliaries and the smoothing capacitor module*". Document D1 also describes in detail the electronic units mounted above and/or below the coolant passages (see paragraphs [0053] and [0055]), which are electronic units that are part of the power converter itself or at least directly connected to it and do not serve as any auxiliaries.

3.5.4 Therefore, feature 1f is not disclosed in document D1.

The question of whether or not the electronic units mentioned in document D1 could also be used for any other auxiliary, as asserted by the appellant, relates to the assessment of inventive step rather than novelty.

3.6 Feature 1g

3.6.1 The board agrees with the respondent that document D1 does not disclose a space as defined in feature 1g. Associating in document D1 the claimed chassis with the thermal support 12 and the flange 126, no open space exists between the first and the second region inside the chassis, i.e. the thermal support has no opening on its lower surface for connection with the upper space or cavity surrounded by the flange 126. All connection paths between the electronics located on the upper and the lower sides of the thermal support 12 are provided outside the flange 126. In particular, the control circuitry board 36 shown in Figure 12 is on the outer side of the flange 126 (and hence the claimed "chassis") and the terminal strips 134 to which the connection pads 132 located in the upper cavity are connected are also outside the flange 126. The lower

side of the thermal support 12 is a closed, flat surface.

3.6.2 The appellant could not clearly indicate a space as defined in feature 1g to the board, either. None of the connections like the control circuitry board 36 are located between a side of the coolant passage and the claimed chassis.

3.6.3 Therefore, feature 1g is not disclosed in document D1.

3.7 Feature 1h

3.7.1 Feature 1h relates to the upper and lower covers that cover the upper and lower openings of the chassis. However, since there is no lower opening related to the chassis in the device of document D1, the part of feature 1h relating to the lower opening is necessarily missing (see point 3.2 with sub-points above).

3.7.2 Therefore, part of feature 1h is not disclosed in document D1.

3.8 Feature 1i

Feature 1i is undisputedly shown in document D1. The coolant passage and the upper cover are substantially parallel as e.g. shown in Figure 8 of document D1. This was not disputed by the respondent.

3.9 Feature 1k

Feature 1k is disclosed in document D1 since the first region is represented by the above-mentioned cavity 128 (see point 3.2 with sub-points above) which is arranged

between the upper cover 96 and the coolant passage. This was not disputed by the respondent.

3.10 Feature 1l

Feature 1l, defining the "*second region between the lower cover (16) and the coolant passage (19)*", is not disclosed in document D1 in the board's view, since the space below the thermal support 12 shown, for example, in Figure 13 of document D1 is only limited by the additional housing 146. Reading feature 1l correctly in combination with part of feature 1k, it must be read as follows: "*the chassis (12) is provided with the second region between ...*". Since the thermal support 12 in combination with the flange 126, which correspond to the claimed "*chassis*", are not provided with this second region but only with an unlimited open space, feature 1l is not disclosed in document D1 (see also point 3.2.4 above). Therefore, the appellant's argument that feature 1l was realised in document D1 by the region bounded by the box-shaped cover and the thermal support 12 could not convince the board.

3.11 In summary, the subject-matter of claim 1 of the patent as granted is not disclosed by document D1 in its entirety, since features 1f, 1g and 1l and those parts of features 1a and 1h which relate to the lower opening of the chassis are missing in document D1. The subject-matter of claim 1 of the patent as granted is therefore new over document D1 (Articles 52(1) and 54 EPC).

4. Patent as granted - ground for opposition under Article 100(a) EPC in combination with Articles 52(1) and 54 EPC - lack of novelty over document D2/D2*

4.1 Document D2/D2* discloses a power converter module (title, Figure 6) wherein coolant passages 28 are provided in the first base 11 and the second base 12 (Figure 6). The coolant passages are closed on the upper side by the semiconductor module 20 and on the lower side by the lower base of the second base 12. Various electronic units are provided above and below the first and second plates 11 and 12.

These first and second plates 11 and 12 are considered the claimed "*chassis*", which consequently do not provide an upper opening at the upper end of the first base 11 according to feature 1a of claim 1. The first base, and hence the chassis, has only an unlimited open space at its top. Therefore, features 1a, 1h and 1k relating to the upper opening at the upper end and the first space provided by the chassis between the coolant passage and the upper cover are not disclosed in document D2/D2*.

In addition, feature 1g is not shown in document D2/D2*, either. Even though a corresponding space for connecting the electronic units in the first and second region above and below the coolant passages are provided in document D2/D2*, this space is in a central area (see D2, paragraph [0060] and Figure 1) of the coolant passages and not between one side of the coolant passage and the chassis.

Finally feature 1f is missing in document D2/D2* for similar reasons as for document D1. The electronic units located in the space below the coolant passages are not to be equated with a "*semiconductor module for auxiliaries*".

4.2 The appellant considered the first and second bases 11 and 12 as representing "*the chassis*" comprising peripheral small walls. The appellant derived this information from the figures of document D2/D2*. In the board's view, this is not correct and the appellant's interpretation of the wording of claim 1 is too broad. As shown in Figure 1 of document D2/D2*, no peripheral walls can be recognised on the upper side of the first base 11. The "*chassis*" when represented by the first and second bases 11 and 12 does not provide an upper opening at its upper end. The appellant considered the upper openings being shown by a surrounding peripheral band on the base 11 shown in Figure 6. The board, however, is not convinced that this surrounding peripheral band refers to a three-dimensional small protrusion extending beyond the level of the inner part of the base 11. Nothing of this kind is discernible from the cross-section of the base 11 shown Figure 1. Nor did the appellant expressly refer to any further passage of document D2/D2* to support its assertion that the first base 11 had a short peripheral wall (see statement setting out the grounds of appeal, page 14, second sentence). Therefore, the board is not convinced that such short upper peripheral wall on the first base 11 is disclosed in document D2/D2* (see Figures 1, 3 or 4 of document D2/D2*).

Furthermore, contrary to the appellant's submission, it does not appear justified to consider the upper box-shaped cover as part of the chassis since, according to the wording of claim 1, the chassis is separately defined from the upper and lower covers and should therefore be considered as a separate entity.

4.3 Therefore, document D2/D2* does not disclose the subject-matter of claim 1 since at least features 1g

and 1f as well as parts of features 1a, 1h and 1k are not disclosed in document D2/D2*. The subject-matter of claim 1 of the patent as granted is therefore new over document D2/D2* (Articles 52(1) and 54 EPC).

5. Patent as granted - ground for opposition under Article 100(a) EPC in combination with Articles 52(1) and 56 EPC - lack of inventive step

5.1 Closest prior art

Both parties considered document D1 as a suitable starting point for assessing inventive step. The board agrees.

5.2 First interpretation of "*the chassis*"

5.2.1 The appellant argued lack of inventive step in a first attack by interpreting "*the chassis*" in document D1 as being the one explained under point 3.2.1 above for novelty, wherein "*the chassis*" is represented by the thermal support 12 in combination with the flange 126. The board agrees that this interpretation is reasonable.

5.2.2 Differentiating features

As set out in point 3. with sub-points above, the differentiating features, taking document D1 as closest prior art with the first interpretation of "*the chassis*", are features 1f, 1g, 1l and the parts of features 1a and 1h relating to the lower opening of the chassis.

5.2.3 Technical effects, objective technical problems

The differentiating features achieve different technical effects, since feature 1f is not synergistically related to the remaining differentiating features. The presence or absence of feature 1f has no effect on the other differentiating features. Feature 1f does not relate to the structural design of the chassis, whereas the remaining differentiating features relate to the structural design of the chassis and are therefore considered in combination. Therefore, two partial problems are to be formulated.

The respondent argued that all differentiating features contributed to a single problem which it saw in the optimisation and miniaturisation of the structural design of the device.

In this regard, the board notes that different features can contribute independently to the solution of the same problem by providing a different solution to the same problem but without any synergistic or combined effect between the individual features. A combined effect of several differentiating features implies a concrete interaction between the features, i.e. the elimination of one feature has a direct impact on the other features or has consequences for them so that it might be necessary to modify them. This is not the case here since the presence or absence of feature 1f has no consequence for the other differentiating features. Moreover, the effect of this feature is merely to use the space below the coolant passage in a certain way.

The **first partial problem** solved by feature 1f is seen in the specific use of the space available in the chassis below the coolant passage.

The **second partial problem** solved by the combination of the remaining differentiating features (part of feature 1a, part of feature 1h and features 1g and 1l) is seen in an advantageous structural design of the chassis or the power converter, simplifying manufacture and construction, ensuring favourable reproducibility, achieving a compact device and providing an easy access to the different electronic components for maintenance.

5.2.4 Obviousness based on the combination of document D1 and the skilled person's common general knowledge

The solution to the **first partial problem** as provided by feature 1f is considered obvious to the skilled person for the following reasons. Document D1 teaches that various electronic components can be installed in the second region. Therefore, the skilled person understands that it is irrelevant where the available components are exactly located and that the specific selection of electronic devices mounted above or below the coolant passage is of no importance. The selection of a semiconductor module for auxiliaries and the smoothing capacitor to be installed in the second region according to feature 1f is consequently one possibility out of several ones, which are, however, arbitrary. Consequently, this arbitrary selection cannot contribute to inventive step because it is obvious for the skilled person.

The solution to the **second partial problem** as provided by the remaining differentiating features, namely part of feature 1a, part of feature 1h, feature 1g and feature 1l, is not considered to be obvious when starting from document D1. The problem of an increased producibility and reliability can be solved in many different ways which are however not obvious to the

skilled person. Moreover, document D1 remains silent as to a reduced footprint, the provision of a compact device or an improved cooling of the electronic devices going beyond what has already been achieved with the design of document D1. Many modifications are possible which might provide advantages for the producibility and reliability which are however not straightforward to the skilled person based on its common general knowledge. Document D1 provides no hint to any such modification, either.

In particular, when starting from the structure of the power inverter of document D1, the creation of a space between the side of a coolant passage and the chassis as defined by feature 1g is closely related to the general idea (see point 1. above) to combine the chassis and the housing in a single unit, thereby reducing the size of the device and omitting the outer shell (housing 94) of the device of document D1. Even if the omission of the housing is not explicitly defined in the wording of claim 1, the provision of the electric connections of the components installed above and below the coolant passage through the claimed space (feature 1g) inside the chassis is motivated by the idea to reduce the overall size of the device and render it compact. Therefore, the provision of feature 1g is motivated by the reduction in size and is, in the board's view, not obvious to the skilled person when starting from document D1 and using its common general knowledge. Even the general idea of a reduction in size is nowhere hinted at in document D1 and the solution by omitting the outer housing is not straightforward. Therefore, the provision of feature 1g requires inventive skills.

Furthermore, in order to arrive at the subject-matter of claim 1, the skilled person would have to foresee peripheral walls on the lower side of the thermal support in order to arrive at the differentiating features 1a, 1h and 1l. This simplifies the design of the power inverter since - as indicated above - the chassis not only serves to support the electronic components but also to provide the sidewalls of the protective casing for them. In order to complete the housing structure, it is only necessary to install a lower cover on the lower opening of the chassis (features 1a and 1h). The board cannot see any reason why the skilled person would foresee, when starting from document D1, sidewalls on the lower side of the thermal support, i.e. why it would attach lower box-shaped sidewalls on the support and foresee a (flat) lower cover. There are no incentives in document D1 to consider these modifications. Both modifications (the space according to feature 1g and the second region/ lower opening at the lower end of the chassis according to features 1a, 1h and 1l) require quite significant modifications of the overall design of "*the chassis*" compared to the one known from document D1 which do not represent standard solutions. Apart from the missing hint, various other solutions to the above-mentioned problem are possible and conceivable and the proposed solution is not common standard but would occur to the skilled person only with the benefit of hindsight.

Therefore, the subject-matter of claim 1 is not obvious when starting from document D1 and combining it with the skilled person's common general knowledge.

5.2.5 Obviousness based on the combination of documents D1 and D5

For the following reasons the subject-matter of claim 1 is not obvious when combining the teaching of documents D1 and D5, either.

The board cannot see any incentive for the skilled person to consider document D5 when starting from document D1 and attempting to find a solution of the second partial problem. The overall structural designs of the devices disclosed in documents D1 and D5 are significantly different from each other. This can be seen by comparing Figure 8 of document D1 and Figure 8 of document D5. Furthermore, document D5 does not suggest a compact device that offers the advantages mentioned above. Four to five electronic components are arranged laterally next to each other; in addition several circuit boards are arranged one above the other and the (smoothing) capacitor 520, which needs cooling, is not provided on the cooling passage but laterally distant to the coolant passage. Hence, the device is far from being compact and, considering the location of the capacitor 520, does not appear to provide an improved cooling efficiency.

Therefore, when starting from document D1 it is not evident for the skilled person to consult document D5 to solve the above-mentioned second partial problem, let alone with the help of which features it would succeed in doing so. The appellant did not provide a convincing argument why the skilled person *would* do so; that it *could* do so, is in the board's view not sufficient for convincingly arguing obviousness.

In the board's view and in accordance with the opposition division, the combination of document D1 with document D5 is based on hindsight. The combination of document D1 with document D5 as presented by the

appellant, requires the specific selection of features taken out of context from document D5 in order to somehow integrate them into the device of document D1 and thereby arrive at the subject-matter of claim 1. Even if admittedly individual differentiating features are disclosed in document D5, it cannot be concluded that the skilled person would in an obvious manner select them for integration into the device of document D1 without any hint whatsoever to do so. The board considers this an arbitrary cherry-picking of individual features based on hindsight which does not correspond to the correct assessment of inventive step based on the well-established problem and solution approach (*Case Law of the Boards of Appeal of the EPO*, 10th Edition, 2022, I.D.2 and I.D.6, first paragraph).

Therefore, the subject-matter of claim 1 is not obvious when starting from document D1 and combining it with the teaching of document D5.

5.2.6 In summary, based on the first interpretation of the term "*the chassis*" in document D1, the subject-matter of claim 1 is based on an inventive step, when combining the teaching of document D1 either with the common general knowledge of the skilled person or with the teaching of document D5.

5.3 Second interpretation of "*the chassis*"

The appellant argued lack of inventive step in a second attack using a second, alternative interpretation of "*the chassis*" in document D1 after the board's conclusion at the oral proceedings that feature 1g is not disclosed in document D1. In that second, alternative interpretation, the appellant considered

that the housing 94 shown e.g. in Figures 8 and 10 of document D1 represented "*the chassis*" so that a connection between the electronics housed in the lower part could be realised through a space that links the first region with the second region between a side of the coolant passages and the chassis.

The board is of the opinion that the association of the housing 94 of document D1 with the claimed "*chassis*" is already based on hindsight. When comparing the overall claimed structure of the power inverter and the structure of the device of document D1, it is evident that it is not the housing 94 that corresponds to the claimed "*chassis*" but the combination of the thermal support 12 with the flange 126. The housing 94 shows only an upper end with an upper opening, thereby providing a first region (feature 1k). According to feature 1a, the chassis must also comprise a lower opening at the lower end of the chassis. However, the bottom of the housing 94 constitutes the lowest end of the power inverter without any further components provided below or needing a further lower cover.

In addition, in the board's view, the meanings of the terms "chassis" and "housing" are in the present context different insofar as a chassis is a supporting frame and provides the structural support for the units mounted on it whereas a housing is an enclosing entity protecting against outside disturbances. Taking these different meanings into account the skilled person would not identify the housing 94 in document D1 with the claimed "*chassis*". Rather, as indicated above, it would identify this feature with the combination of the thermal support 12 and the flange 126.

Therefore, the board comes to the conclusion that the assessment of inventive step cannot convincingly be based on the second alternative interpretation of "*the chassis*".

5.4 In view of the above the board concludes that the subject-matter of claim 1 of the patent as granted involves an inventive step (Articles 52(1) and 56 EPC).

6. Conclusion

Since none the grounds for opposition raised by the appellant prejudices the maintenance of the patent as granted, there is no reason in the case at hand to set aside the impugned decision to reject the opposition according to Article 101(2), second sentence, EPC. Consequently, there is no need to consider the respondent's auxiliary requests. Since the appellant's request cannot be granted, the appeal is unsuccessful.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero T. Häusser

Decision electronically authenticated