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Datasheet for the decision of 15 July 2025

Case Number: T 0641/22 - 3.2.01

Application Number: 13868315.6

Publication Number: 2942589

IPC: B23K33/00, F28D9/00, B23K101/14, B23K31/02, F28F9/02

Language of the proceedings: EN

Title of invention:
HEAT EXCHANGER

Patent Proprietor:
Sumitomo Precision Products Co., Ltd.

Opponent:
Linde GmbH

Headword:

Relevant legal provisions:
EPC Art. 83, 84, 123(2), 52(1), 56

Keyword:
Sufficiency of disclosure - main request (yes)
Claims - clarity - main request (yes)
Amendments - extension beyond the content of the application as filed (no)
Inventive step - main request (yes) - non-obvious modification

Decisions cited:
G 0001/24

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 0641/22 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 15 July 2025

Appellant: (Opponent)	Linde GmbH Dr.-Carl-von-Linde-Straße 6-14 82049 Pullach (DE)
Representative:	Meilinger, Claudia Sabine Linde GmbH Intellectual Property EMEA Dr.-Carl-von-Linde-Straße 6-14 82049 Pullach (DE)
Respondent: (Patent Proprietor)	Sumitomo Precision Products Co., Ltd. 1-10, Fusou-cho Amagasaki-shi, Hyogo 660-0891 (JP)
Representative:	Germain Maureau 12, rue Boileau 69006 Lyon (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 January 2022 concerning maintenance of the European Patent No. 2942589 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	V. Vinci
	O. Loizou

Summary of Facts and Submissions

I. The appeal lies against the interlocutory decision of the Opposition Division maintaining the European patent No. 2 942 589 in amended form.

In its decision, the Opposition Division found that the amended main request filed on 4 April 20219 met the requirements of Articles 83, 84 and 123(2) EPC. Furthermore the Opposition Division decided that the subject-matter of independent claim 1 of the main request involved an inventive step within the meaning of Articles 52(1) and 56 EPC in view of the following prior-art documents which are also relevant for the present decision:

D1: DE 10 2008 014978 A1

D2: GB 1 253 250 A

D3: Alpena *"The Standard of the brazed aluminium plate-fin heat exchanger manufacturers' association"*, third edition, 2010 with amendments May 2012; pages 1-8, 37-44 and 72-76.

D4: Plate fin heat exchangers, Guide to their Specification and Use, 1 st edition, 1987.

D5: An International Code *"2010 ASME Boiler & Pressure Vessel Code"*, Addenda, July 2011: The American Society of Mechanical Engineers, VIII, Division 1, Rules for construction of pressure vessels, ASME Boiler and Pressure Vessel Committee on Pressure Vessels, title, biographical data and

pages iii to xxxv of the contents,

pages 20 and 21 with UG-27 of the chapter *"Design"*,

pages 39 to 52 with UG-36 to UG-41 of the chapter "*Opening and Reinforcements*", and

pages 112 to 129 with UW-1 to UW-16 of chapter *"Requirements for pressure vessels fabricated by welding"*.

D6: *"Roloff/Matek Maschinenelemente"*, Normen, Berechnung, Gestaltung, 20. Edition, 2011, title, contents bibliographic information, part of chapter 6.2.5, pages 135-137.

II. With a communication in accordance with Article 15(1) RPBA dated 19 September 2024, the Board informed the parties of its preliminary assessment of the case.

Oral proceedings took place before the Board on 15 July 2025 by videoconference.

III. The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed.

IV. Independent claim 1 of the patent as maintained by the opposition division reads as follows (labelling of the features according to the appealed decision):

(a) *"A heat exchanger, comprising:*
(b) *a core; and*

(c) *a header tank having an opening, an entire peripheral edge of the opening being welded to the core, wherein*

(d) *the entire peripheral edge of the opening of the header tank has a bevel inclined from an internal surface of the header tank toward an external surface thereof at a predetermined bevel angle, the heat exchanger being characterised in that*

(e) *at least a portion of the peripheral edge of the opening of the header tank has a second inclined portion inclined from the external surface of the header tank toward the internal surface thereof at an angle larger than the predetermined bevel angle such that a thickness t of the header tank is reduced to a first thickness t1,*

(f) *the peripheral edge of the opening of the header tank is disposed substantially orthogonal to a surface of the core,*

(g) *only the bevel is welded from outside of the header tank, and*

(h) *the second inclined portion is inclined at an angle to have a length of t2 x 3 or more where t2=t-t1 is a reduced thickness".*

Reasons for the Decision

Article 83 EPC - Sufficiency of Disclosure

1. The patent as maintained complies with the requirements of Article 83 EPC as correctly found by the opposition division.

1.1 The appellant (opponent) held that - contrary to the assessment of the department of first instance - the patent as maintained did not comply with the requirements of Article 83 EPC.

1.1.1 In this respect the appellant emphasised that the contested patent did not contain any explanation or definition of what has to be actually understood under the expression *"internal surface of the header tank"* in feature (d) of claim 1 and that the internal surface of the header tank was not identified in the drawings by a reference number. By means of a first and a second annotated Figure 2 of the contested patent (see page 6 of the statement of grounds of appeal), the appellant argued that there were two possible locations and hence definitions of the internal surface of the header tank that could be envisaged. However, it was alleged that on one side the location of the internal surface indicated in the first annotated Figure 2 was not compatible with the limitation of feature (g) of claim 1 and, on the other side, the location of the internal surface according to the second annotated Figure 2, corresponding to the interpretation provided by the opposition division, did not render possible for the person skilled in the art to determine the extension of the angles θ_1 and θ2 defined in features (d) and (e). In the appellant's view, two reference planes were

required in order to measure the angles angles θ_1 and θ2. The mere orientation of the bevel (34) expressed in feature (d) was not sufficient to unambiguously determine their extension. The appellant concluded that in view of the lack of definition regarding the term *"internal surface of the header tank"* and of the inconsistencies deriving thereto, the person skilled in the art was not able to measure the angles θ_1 and θ2 and hence to put in practice without undue burden the invention as defined in independent claim 1 of the contested patent.

1.1.2 The arguments submitted by the appellant are not convincing for the following reasons:

The Board shares the view of the opposition division and the respondent that the person skilled in the art in the technical context of claim 1 understands that the *"internal surface of the header tank"* is the surface of the header tank on which internal pressure is applied (see Figure 1 and paragraph [0024] of the contested patent). The limitation imposed by feature (g) in the light of the above interpretation is consistent with the representation of the figures. Regarding the alternative definition provided by the appellant with their statement of grounds of appeal, the Board - in agreement with the respondent - takes the view that it is the result of an erroneous reading of feature (d) which indeed does not require that the bevel (34) is inclined starting from the internal surface of the header tank as shown in the first Figure 2 annotated by the appellant (opponent), but rather that the bevel is inclined from the internal surface of the header tank. In other words, the formulation adopted in feature (d) of independent claim 1 merely expresses the orientation of the bevel and not its

starting point. Therefore, the understanding of the person skilled in the art of the disputed term *"internal surface"* is unambiguous. Regarding the allegation that the angles Θ_1 and Θ_2 cannot be measured because the two reference planes required for the measurement are defined, the Board concurs with the opposition division and the respondent that the person skilled in the art in the light of common general knowledge and supported by Figures 2, 3, 5A and 5B which are part of the patent disclosure has not doubt that the reference planes to be considered for the measurement of the angles Θ_1 and Θ_2 are a plane parallel to the upper surface of the core and the plane containing the bevel and the second inclined surface as clearly (see in particular Figure 2 of the contested patent). Therefore, the measurement of the angles Θ1 and Θ2 does not to cause any difficulty for the person skilled in the art when reproducing the invention according to claim 1.

Article 84 EPC - Clarity

2. The patent as maintained complies with the requirements of Article 84 EPC as correctly found by the opposition division.

2.1 With their appeal the appellant contested these findings of the opposition division and argued that the amendments introduced in features (e) and (g) resulted in lack of clarity under Article 84 EPC. Furthermore, they held that features (d), (e), (f) contained limitations that were structurally incompatible with each other, this circumstance also resulting in a non-compliance with the requirements of Article 84 EPC.

2.2 Regarding feature (g), the appellant pointed to an alleged contradiction between the claimed limitation that *"only the bevel is welded from outside of the header tank"* (emphasis added) and the representation in Figure 2 of the contested patent were the weld (36) also affected the straight portion connecting the starting point of the bevel (34) with the internal surface (according to the definition provided by the opposition division) of the header tank. At the oral proceedings the appellant referred to the conclusions in the Enlarged Board of Appeal decision G1/24 and specifically to the Reasons 20. highlighting the importance of the examining division carrying out a high quality examination of whether a claim fulfils the clarity requirements of Article 84 EPC. They observed that this fundamental principle was also emphasized in the Comments of the President of the EPO.

2.2.1 The Board does not see any contradiction between the limitation introduced by the amended feature (g) and the description and the drawings of the contested patent. As observed by the respondent, the straight horizontal portion connecting the starting point of the bevel 34 with the internal surface of the header tank is not mentioned in claim 1. The Board is convinced that the person skilled in the art reading the claim with a will to understand realizes that the the word *"only"* has the effect to exclude that portions of the external surface of the header tank other than the bevel (34), and in particular the second inclined surface (35) are also welded from the *"outside of the header thank"*. It follows that the scope of the claim does not exclude that the weld may affect the bottom edge of the header tank facing the core. Therefore, no inconsistency with the drawings and hence no lack of

clarity results from the amendment in feature (g).

2.3 The appellant maintained since no reference planes were defined in claim 1 that it was not clear how the angles θ_1 and θ2 had to be measured. They also alleged that by applying the definition of internal and external surfaces adopted by the opposition division in the appealed decision a further inconsistency regarding the angles θ_1 and θ2 shown in Figures 1, 2 5A and 5B of the contested patent arose.

2.3.1 The Board does not agree essentially for the same reasons given in respect of the corresponding objection raised under Article 83 EPC. Claim 1 defines the orientation of the bevel (34) and of second inclined portion (35) from (and not starting at) the inner and outer surface of the header tank respectively. The person skilled in the art understands that the angles recited in claim 1 are measured between a plane containing or being parallel to the rectangular bottom edge of the header tank and the respective inclined plane containing the flat surface of the bevel 34 and the second inclined portion 35 respectively. This is confirmed by Figures 1, 2, 5A and 5B and the corresponding description which according to the principle expressed in the Enlarged Board of Appeal's decision G1/24 shall always be consulted to interpret the claims.

2.4 Finally, the appellant saw a structural incompatibility between the requirements of features (d), (e) and (f) resulting from the amendments introduced in claim 1. In particular, they alleged that if features (d) and (e) were fulfilled it was not possible at the same time to meet the limitation of feature (f) that *"the peripheral edge of the opening of the header tank is disposed*

substantially orthogonal to a surface of the core".

2.4.1 Again, the Board cannot identify any structural incompatibility. In this regard the respondent correctly drew the attention to Figure 4, Step P6 of the contested patent showing how the rectangular peripheral edge of the header tank, i.e. the plane in which it lies, is disposed substantially orthogonal to a surface of the core (feature (f)), i.e. to the upper surface of the core. This is structurally compatible with features (d) and (e) that are embodied as shown in Figures 1 and 2.

2.5 For the reasons above the Board confirms the assessment of the opposition division that the subject-matter of claim 1 of the patent as maintained complies with the requirements of Article 84 EPC.

Article 123(2) EPC - Amendments

3. The patent as maintained also complies with the requirements fo Article 123(2) EPC as correctly found by the opposition division.

3.1 The appellant maintained that - contrary to the assessment of the department of first instance - the introduction of the word *"only"* in features (g) of claim 1 as maintained to read "*only the bevel is welded from outside of the header tank"* infringed Article 123(2) EPC. The appellant did not dispute that the wording of feature (g) as amended *"per se"* could be derived from the description of the embodiment presented in paragraphs [0021] to [0037] of the A-Publication and specifically from paragraph [0028]. However, the appellant objected that according to the disclosed embodiment the teaching that only the bevel

(34) was welded from outside of the header tank was inextricably linked to further essential features, namely:

(1) the specific structural characteristics of the core and, inherently, of its surface (reference was made to paragraph [0023] of the A-Publication), and

(2) the location of the connection of the header tank to the core at its edge (reference was made to paragraph [0030] of the A-Publication), where the very narrow portion of the surface of the core available for the weld bead mandatorily imposed to weld only around the bevel (34).

The appellant also pointed to paragraph [0031] of the A-Publication teaching that the second inclined portion (35) could be provided only at the portions of the core (2) where the heat effect is desired to be reduced, instead of being provided at the entire peripheral edge of the opening of the header tank.

The appellant concluded that the omission in claim 1 of these structural features of the embodiment on which the amendment to feature (g) was allegedly based resulted in an unallowable intermediate generalisation infringing Article 123(2) EPC.

3.2 The arguments of the appellant are not convincing:

The Board cannot identify any evident inextricable link between the teaching of welding only the bevel (34) and the further features that in the appellant's view have been inadmissibly omitted in claim 1. As correctly pointed out by the opposition division and the respondent in their reply, the originally filed

description states that the preferred embodiment of the invention according to the contested patent is *"described merely as an example"* (see paragraph [0021] of the A-Publication). Furthermore, the wording at the end of paragraph [0023] makes clear that a core formed by stacking tube plates - as it is the case of the described embodiment - is just one of several possibilities. This is confirmed by paragraph [0036] stating that that *"Instead of the above-described plate-fin core 2 formed by brazing, e.g., tube plates together, another core having a different configuration may be adopted"*. Therefore, the Board cannot see why the person skilled in the art should consider the specific structural characteristics of the core of the the disclosed embodiment as being inextricably linked to the teaching of feature (g) of claim 1 of the patent as maintained. On the contrary, all these passages lead to the opposite conclusion. Furthermore, the Board does not see why the fact that according to the disclosed embodiment the header tank is connected to the core at its edge should be inextricably linked to feature (g). The person skilled in the art recognizes that reducing the heat input during the welding can be achieved for any location of the header tank on the surface of the core.

3.3 For the reasons above the Board confirms the findings of the opposition division that the omission of the features indicated by the appellant does not lead to any unallowable intermediate generalisation infringing Article 123(2) EPC.

Article 52(1) and 56 EPC - Inventive Step

4. Lack of novelty was never objected in respect to the subject-matter of independent claim 1 of the patent as

maintained by the opposition division.

4.1 The subject-matter of independent claim 1 of the patent as maintained meets the requirements of Articles 52(1) and 56 EPC as correctly found by the opposition division.

4.2 With their appeal the appellant maintained that - contrary to the assessment of the opposition division - the subject-matter of claim 1 was obvious in view of D1 in combination with D5, D2 or D6. In the alternative, inventive step was questioned in view of D3 or D4 as closest prior art in combination with D5 or D1.

D1 as closest prior art

4.3 At the oral proceedings before the Board the appellant relied in regard of this lines of inventive step attacks on the arguments presented in writing and did not make any further submissions. Since the parties did not comment on the preliminary opinion set out in the communication pursuant to Article 15(1) RPBA dated 19 September 2024 the Board, having considered all relevant aspects and arguments submitted in writing, sees no reason to deviate from its preliminary assessment which is hereby incorporated as its final findings and repeated below:

4.3.1 The parties agreed with the findings of the opposition division that document D1 did not disclose features (e) and (h) of independent claim 1 of the patent as maintained.

4.3.2 Given distinguishing features (e) and (h), the appellant explained that the technical problem underlying the contested patent was to provide of a

heat exchanger with a header tank to which a nozzle can be reliably connected. The appellant focused on the embodiment in Figure 5B of the patent also covered by claim 1 and observed that the length L depicted therein was not specified in claim 1. Therefore, in their opinion, the wording of claim 1 also covered embodiments in which the second inclined portion (35) was located very close to the opening of header tank facing the core. The appellant put forward that the wording of feature (e) *"a thickness t of the header tank is reduced to a first thickness t_1"* could be equivalently construed as meaning *"such that a first thickness t_1 of the header tank is increased to a thickness t"*. Under this assumption, the appellant argued that the person skilled in the art aiming to solve the problem of the connection of the header tank to the core would obviously consider to introduce in the heat exchanger of D1 a reinforcement of the header tank according to the teachings of section UG-37 of D5, thereby arriving without inventive step to a heat exchanger comprising features (e) and (h) of claim 1, i.e. structured according to Figure 5B of the contested patent. In this context reference was also made also to the norms UG-27 and UG-28 and to Figures UG-40(f), UW-16.1 (f-1) and (f-2) of D5.

4.3.3 The arguments of the appellant are not convincing:

4.3.4 Starting from D1 and given the distinguishing features (e) and (h), the Board concurs with the formulation of the technical problem underlying the contested patent as defined by the opposition division and supported by the respondent, namely:

to reduce the area of the core affected by heat during welding of the header tank to the core without

compromising the mechanical strength of the connection.

In the Board's view, the formulation of the technical problem resulting from the distinguishing features (e) and (h) cannot be limited and simplified in the way suggested by the appellant. In fact it is technically plausible that the geometry suggested for the peripheral edge of the header tank according to the distinguishing features (e) and (h) and the location of the weld only on the first bevel according to feature (g) in combination synergistically result in the pursued reduction of the area of the weld bead and hence of the input of heat necessary for welding into the core without thereby negatively affecting the strength of the connection.

4.3.5 That said, the Board concurs with the respondent that the subject-matter of claim 1 must be strictly construed and assessed for inventive step on the basis of the exact text adopted. Therefore, the Board - in accordance with the respondent - does not see why the person skilled in the art confronted with the limitation of feature (e) that *"a thickness t of the header tank is reduced to a first thickness t_1"* should construe and read this feature as suggested by the appellant, i.e. *"such that a first thickness t_1 of the header tank is increased to a thickness t"*. As convincingly explained by the respondent in their reply, the scope of protection resulting from these formulations is not equivalent. The reading of the appellant is even less justified not only in view of the wording of feature (e) itself explicitly requiring a reduction of the thickness t and not an increase of the thickness t_1, but also in view of the manufacturing process of the header tank presented in the description according to which the thickness is indeed reduced by

removing material from the header tank and not increased by adding material thereto. The basic premises of the reasoning of the appellant in support of the alleged lack of inventive step are thus incorrect.

4.3.6 Furthermore, the Board concurs with the opposition division and the respondent that the person skilled in the art does not find either in D1 nor in D5 any hint to the above technical problem, let alone to the technical solution as a whole defined in claim 1 which is based on the idea to create a bevel and a further differently inclined portion by reducing the thickness of the header tank in proximity of the core and not by adding material as suggested in D5. The Board cannot see why the person skilled in the art starting from D1 and aiming to reduce the area of the core which could be negatively affected by heat input during welding should be motivated to extract in isolation from D5 the reinforcement solutions referred to by the appellant and to modify the geometry of the peripheral edge of the header tank of D1 accordingly in such a way to fulfil features (e) and (h) of claim 1, let alone that the Board does not see how feature (h) of claim 1 can be considered to be directly and unambiguously disclosed in D5.

4.4 Regarding the combination of D1 with D2 or D6, the appellant merely referred to or copied arguments submitted during the first instance proceedings. The Board has thus not been provided with reasons why the conclusion of the opposition division dismissing these lines of inventive step attack are non convincing and should thus be reversed. In any event, the Board does not see any reason to deviate from the assessment of the opposition division essentially for the same

reasons presented in respect of the combination of D1 with D5.

D3 or D4 as closed prior art

4.5 The appellant disputed the view of the opposition division that documents D3 and D4 could not represent a promising starting point for the invention, in particular when comparing their technical content to that of D1. They stressed that both D3 and D4 related to international standards which had to be mandatorily met when welding a header tank provided with radial nozzles onto the core of a head exchanger. It was pointed out that - according to the EPO *"Guidelines"* - the number of distinguishing features was not the only criterium to be considering for determining the closest prior art document. The appellant referred in particular to Figures 1-5 of D3 and 4.1 of D4 showing a heat exchanger with a header tank provided with radial nozzles and welded onto a core identical to that shown in Figure 4 of the contested patent. Reference was also made to the specific passages under points 1.1.2, 5.2, 5.3 and 5.15.5 of D3 and on pages 2.2, 4.3, 5.1, 5.5 and 5.6 of D4. The appellant acknowledged that the subject-matter of claim 1 of the patent as maintained differed from the technical content of D3 or D4 in the features (d), (g), (e) and (h). They argued that features (d) and (g) in combination solved the partial problem regarding the connection of the header tank to the core, while features (d) and (g) in combination addressed the different partial problem to design a header thank suitable for connection with a nozzle. The so-called partial-problem approach was thus justified when assessing inventive step. The appellant further argued that the person skilled aiming to solve the first partial technical problem would consider to adopt

the connection shown for example in Figure UW-13.2 (e-1) of D5 or in alternative in Figures 1 and 2 of D1 in the heat exchanger of D3, thereby fulfilling features (d) and (g) of claim 1. Furthermore, in order to solve the second partial technical problem mentioned above, the person skilled in the art would look at D5 which was referred to in E3 (see points 5.3 and 5.15.5) and adopt in the known heat exchanger one of the solutions shown for example in Figure UG-40 or UW-16.1 (f-1) and suggested for reinforcing the region of the opening of the header tank on which the nozzle is to be connected. In this context the appellant insisted in the re-formulation of feature (e) of claim 1 (see point 4.3.5 above). The appellant thus concluded that the person skilled in the art, starting from D3 and aiming to solve the 2 partial technical problems presented above would necessarily apply the standards of D5 and additionally - if required - the information available in D1, and thus arrive without inventive step to the solution of claim 1 and in particular to a heat exchanger according to Figure 5B of the contested patent. Also in the context of this inventive step attack the appellant explained with the aid of a sketch shared on the screen with the Board and the respondent that the fact that the length L indicated in Figure 5B was not defined in the claim 1 justified a broader interpretation of its subject-matter. The same arguments and conclusions were extended to the combination of D4 with D5.

4.6 Also these lines of inventive step attack are not convincing:

Firstly, the Board shares the view of the opposition division that D3 and D4 do not represent a promising starting point for the invention, in particular if

compared with the disclosure of D1. Beside the fact that they fail to disclose four essential technical features of claim 1, they do not address the objective technical problem as correctly formulated by the opposition division (see point 4.3.4 above) and do not show any detail of the welded connection between the header tank and the core. D1 - on the contrary - discloses in detail at least a possible way to carry out this connection and in particular the idea of reducing the thickness of the header tank by providing a bevel.

4.6.1 That said, for the same reasons presented under point 4.3.4 above, the Board recognizes a clear synergistic effect achieved by the distinguishing features (d), (e), (g) and (h) taken in combination, whereby the partial problem approach adopted by the appellant cannot be followed. Finally, a combination with the teaching of document D5 does not render obvious the subject-matter of claim 1 of the patent as maintained essentially for the same reasons given under point 4.3.6 above in respect of the combination of D1 with D5.

4.7 Therefore, the Board decides that the conclusion of the opposition division that the subject-matter of claim 1 of the patent as maintained involves an inventive step over the prior art within the meaning of Articles 52(1) and 56 EPC is to be confirmed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Grundner G. Pricolo

Decision electronically authenticated