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Datasheet for the decision of 18 June 2019

Case Number: T 0821/17 - 3.2.03

Application Number: 10730573.2

Publication Number: 2454447

IPC: F28D1/02, F28D1/047, E21B36/00

Language of the proceedings: EN

Title of invention:
SUBSEA COOLER

Patent Proprietor:
FMC Kongsberg Subsea AS

Opponent:
Aker Solutions AS

Headword:

Relevant legal provisions:
EPC Art. 84, 56
RPBA Art. 12(4)

Keyword:
Claims - clarity (no)
Inventive step - (no)
Late-filed evidence - submitted with the statement of grounds of appeal - admitted (yes)
Late-filed request - admitted (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
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Beschwerdekammern

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Case Number: T 0821/17 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 18 June 2019

Appellant: (Opponent)	Aker Solutions AS Postboks 94 1325 Lysaker (NO)
Representative:	Protector IP AS Pilestredet 33 0166 Oslo (NO)
Respondent: (Patent Proprietor)	FMC Kongsberg Subsea AS P.O. Box 1012 3601 Kongsberg (NO)
Representative:	Onsagers AS Munkedamsveien 35 P.O. Box 1813 Vika 0123 Oslo (NO)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 20 January 2017 concerning maintenance of the European Patent No. 2454447 in amended form.**

Composition of the Board:

Chairman	G. Ashley
Members:	C. Donnelly
	G. Weiss

Summary of Facts and Submissions

I. The appeal lies from the interlocutory decision of the opposition division concluding that European Patent No. 2 454 447 could be maintained in amended form.

The opponent (hereinafter: the "appellant") appealed against this decision.

II. In its grounds of appeal the appellant relied on the following documents taken into consideration during the opposition proceedings:

P1: W02008/147219;
P2: US 5870976;
P3: US 5001906;
P4: US 6101821;
P5: US 2396810;
P6: US 7363962;
P7: EP 0272766;
P8: US 2792201;
P9: US 2933904;
P10: W003/050468;
P11: CE "What goes Round Comes Round" Offshore Engineer, pages 15 to 18, 1 December 2002.

The appellant also requested that the following documents not admitted by the opposition division, be allowed into the appeal proceedings:

P11b: P. Schramm et O. Pellerin, "Station de compression sous-marine d'Omen Lange", Journées Annuelles du Pétrole, Paris, 21 and 22 October 2008;
P11c: A Tesei, "La compressione sottomarina come frontiera", Assomineraria, 28 November 2007;

P12: Enlarged colour version of the drawing at the bottom right hand side of page 17 of P11.

The following further documents were filed for the first time with the grounds of appeal:

P11d: Affidavit of Phillipe Perrau dated 29 May 2017;
P11e: Affidavit of Olivier Perrin dated 19 May 2017;
P11f: Affidavit of Alberto Tesei dated 23 May 2017;
P11g1: Patent application MI2006A000294, mentioned in P11b and P11c;
P11g2:EP-1830070 A2, claiming priority from P11g1, published 5 September 2007;
P11h:Internet page print-out of the program of the conference "Hydrocarbures de l'extrème" relating to P11b, Paris October 2008;
P13: Heat and mass transfer, Anthony F. Mills Publishing, pages 243, 314 to 331, 594 to 595, 674 to 691, 701 to 702.

Additionally, the appellant requested that Mr. Olivier Pellerin be heard as a witness regarding the content of P11b and that Mr. Alberto Tesso be heard as a witness regarding the content of P11c.

III. By letter of 16 October 2017 the patent proprietor (hereinafter: the "respondent") submitted counter-arguments and auxiliary requests 1 to 11.

IV. By letter of 1 June 2018 the appellant made further submissions, in particular regarding the respondent's auxiliary requests.

V. In a communication dated , pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA),

annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion.

VI. By letter of 17 April 2019 the appellant made further submissions in response to the board's provisional opinion.

By letter of 9 May 2019 the respondent informed the board that it would not be attending the oral proceedings and submitted new auxiliary requests 6 to 11. The auxiliary requests 6 to 11 filed with letter dated 16 October 2017 were withdrawn.

VII. Oral proceedings were duly held on 18 June 2019 in the absence of the respondent. At the end of the debate the parties confirmed the following requests:

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

The respondent requested in writing that the appeal be rejected and the patent be maintained in amended form as upheld by the Opposition Division (main request) or alternatively that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of one of the auxiliary requests 1 to 5 filed with letter dated 16 October 2017 or on the basis of one of the auxiliary requests 6 to 11 filed with letter dated 9 May 2019.

VIII. Claim 1 of the main request (i.e. in the version that the opposition division considered could be maintained and corresponding to auxiliary request 2 filed during the opposition proceedings) reads as follows:

"Subsea well fluid cooling unit comprising a first header pipe (48) adapted for communication with at least one hydrocarbon well and forming a common inlet, a second header pipe (48) adapted for communication with a flow line (10) and forming a common outlet, having its longitudinal axis substantially parallel with and in a distance from the first header pipe (48), there are arranged between the first and second header pipe (48), several sets of cooler coils (400); where each set (400) is formed such that the coils of the one set (400) is arranged in one plane and each set (400) is individually connected to the header pipes (48), wherein the header pipes (48) and the coils are arranged to guide the well fluid to be cooled such that the well fluid is cooled with seawater on the outside of the pipes,

characterised in that

at least one set of the cooler coils (400) comprises at least three straight pipes (40) and at least two 180 degrees bends (42, 44), and two connectors (46), for connection of the set (400) to the header pipes (48)."

Claim 1 of auxiliary request 6 filed with letter of 9 May 2019 (amendments with respect to claim 1 of the main request indicated in italics/underlined) reads as follows:

"Subsea *cooling unit, being a subsea* well fluid cooling unit, comprising a first header pipe (48) adapted for communication with at least one hydrocarbon well and forming a common inlet, a second header pipe (48) adapted for communication with a flow line (10) and forming a common outlet, having its longitudinal axis substantially parallel with and in a distance from the

first header pipe (48), there are arranged between the first and second header pipe (48), several sets of cooler coils (400); where each set (400) is formed such that the coils of the one set (400) is arranged in one plane and each set (400) is individually connected to the header pipes (48), wherein the header pipes (48) and the coils are arranged to guide the well fluid to be cooled such that the well fluid is cooled with seawater on the outside of the pipes,

characterised in that

at least one set of the cooler coils (400) comprises at least three straight pipes (40) and at least two 180 degrees bends (42, 44), and two connectors (46), for connection of the set (400) to the header pipes (48), *and in that the coil sets (400) are arranged with the plane of the coil sets (400) mainly in parallel*"

IX. The submissions of the **appellant** relevant to the decision can be summarised as follows:

(a) Main request and auxiliary requests 1 to 5, Clarity "subsea well fluid cooling unit", Article 84 EPC

The expression "subsea well fluid cooling unit" is ambiguous since it is not clear whether the term "subsea" refers to the well fluid or the cooling unit. Such ambiguity means that cooling unit could in fact be placed topside and that various other alternatives are possible.

(b) Admissibility of documents P11b, P11c and P11d,P11e and P11f

These documents could not have been submitted earlier and should be admitted into the proceedings since they were submitted in response to the reasoning of the contested decision and are particularly relevant to the late filed auxiliary requests.

(c) Auxiliary request 6, Inventive step, Article 56 EPC

The subject-matter of claim 1 according to auxiliary request 6 does not involve an inventive step in view of P1 in combination with the subsea cooler disclosed in P11b. In particular, P1 already suggests a cooler with a geometrical layout as specified in claim 1. The pipe arrangement in figure 1 of P1 is clearly not helical since the pipe runs are not shown as being sloped and no cross-section of the pipes is evident. A helical pipe arrangement is also not compatible with the requirement to be able to arrange multiple coil sets.

(d) Auxiliary requests 7 to 11, Inventive step, Article 56 EPC

Claim 1 of these requests merely specifies pipe dimensions and relationships between coil sets. As indicated by the authors of P1 at page 2, lines 36 to 38 of the description, such parameters would be calculated as a matter of routine by the person skilled in the art of heat-exchanger design.

X. The submissions of the **respondent** relevant to the decision can be summarised as follows:

(a) Main request and auxiliary requests 1 to 5, Clarity of "subsea well fluid cooling unit", Article 84 EPC

In the original wording of claim 1 as filed and granted (namely "subsea cooling unit"), the determinative term "subsea" clearly refers to the "cooling unit". This does not change with the expression "subsea well fluid cooling unit" since a well fluid will cease to be a subsea well fluid once it emerges from the subsea environment. Consequently, a cooling unit for cooling subsea well fluid must by necessity be located subsea.

(b) Admissibility of documents P11b, P11c and P11d,P11e and P11f

P11b and P11c were late filed during the opposition proceedings and the opposition division exercised its discretion correctly in not admitting them, since it was not proven that they were publically available before the priority date. These documents are also not relevant since they do not disclose connectors for connection of a set of cooler coils to the header pipes.

P11c,d and f were only filed with the grounds of appeal and could have been filed earlier during the opposition proceedings. These documents should not therefore be admitted.

(c) Auxiliary request 6, Inventive step, Article 56 EPC

The piping arrangement 10 of P1 is positioned in a duct 12. Since ducts usually have a cylindrical shape, the most likely interpretation of figure 1 is that the piping arrangement 10 is helical. The instructions on page 3, lines 36 to 38 of P1 to determine the number

and size of pipes necessary for maximum efficiency cannot be equated with instructions to determine a suitable geometrical layout.

(d) Auxiliary requests 7 to 11, Inventive step, Article 56 EPC

Claim 1 of these requests define increasingly more preferred versions of a subsea cooling unit which make it even more suitable for cooling a well fluid emerging from a hydrocarbon well. The cited prior art does not disclose or hint at the combination of the features specified.

Reasons for the Decision

1. Clarity, Article 84 EPC

1.1 Main request (claims which the opposition division considered could be maintained)

1.1.1 Claim 1 of the main request was amended during the opposition proceedings by the introduction of the expression "subsea well fluid cooling unit". Compliance with the requirements of Article 84 EPC must therefore be examined.

1.1.2 Contrary to the opinion of the respondent, it is considered that the determinative term "subsea" does not refer exclusively to the "cooling unit" and that it could also apply to the well fluid. Further, a well fluid from a subsea well does not cease to be a "subsea well fluid" once it emerges from the subsea environment since the expression is a definition of the fluid's origins. Consequently, there is no necessity that a

cooling unit for cooling subsea well fluid must be located subsea.

1.1.3 Consequently, as identified by the appellant, this expression lends itself to multiple interpretations namely:

i) a cooling unit placed topside, for cooling fluid from a subsea well;
ii) a cooling unit for cooling fluid coming from an onshore or subsea well, where the unit is arranged subsea;
iii) a cooling unit for cooling fluid from a subsea well, where the unit is arranged subsea;
iv) a cooling unit for cooling, using subsea well fluid as coolant;
v) a cooling unit for cooling a fluid inside a subsea well, arranged within the subsea well.

1.1.4 Therefore, the expression "subsea well fluid cooling unit" is unclear since the skilled person is not sure what kind of apparatus is claimed. In conclusion, the subject-matter of claim 1 according to the main request does not meet the requirements of Article 84 EPC.

1.2 Auxiliary requests 1 to 5

Since this expression is also used in claim 1 of auxiliary requests 1 to 5 the subject-matter of these requests also does not meet the requirements of Article 84 EPC.

2. Admissibility of auxiliary requests 6 to 11, Article 13 RPBA

Auxiliary requests 6 to 11 were filed shortly before the oral proceedings in reaction to issues arising fromthe board's provisional opinion. In view of the fact that the subject-matter of these requests constitute a legitimate attempt to establish a fall-back position in case the objections made against the higher ranked requests were upheld, they are admissible. The appellant did not contest this.

3. Admissibility of documents P11b to P11f, P11g1, P11g2 and P12, Article 12(4) RPBA

3.1 The opposition division exercised its discretion under Article 114(2) EPC not to admit P11b and P11c into the proceedings since they were filed after expiry of the opposition period and, on the basis of the evidence available, there were doubts as to whether the content of these documents had been made available to the public before the priority date of the patent.

3.2 In reaction to the reasoning of the opposition division, the appellant submitted documents P11d to P11f with its grounds of appeal in order to consolidate its argument that the content of P11b and P11c had been made available to the public. It also made a request that witnesses be heard to this effect.

3.3 The board is satisfied that the evidence on file is now convincing proof that P11b was made available to the public before the priority date of the patent. For this reason and in view of the fact that the late filed auxiliary requests 7 to 11 have been admitted into the proceedings, these documents are also admitted.

4. Auxiliary request 6, Inventive step, Article 56 EPC

4.1 The most realistic starting out point for assessing inventive step is P1 since it explicitly concerns a subsea cooling unit, being a subsea well fluid cooling unit intended for the same purpose(see P1, page 1, lines 4 to 5: "invention relates to a subsea cooler for cooling a hot fluid as a fluid stream produced from one or more subsea wells").

4.2 As indicated by the respondent, the piping arrangement 10 of P1 is positioned in a duct 12. However, as also recognised by the respondent, the geometry of the duct 12 is not directly and unambiguously derivable from figure 1 since it could be circular cylindrical or rectangular cylindrical. Nevertheless, it can be deduced that the piping arrangement 10 is not helical, as contended by the respondent, since a cross-section would have shown the piping runs on a diagonal slant and sections of the pipes would have been represented to make this clear. The notion of a helical piping arrangement is also not compatible with the possibility of multiple coils connected to the distribution units 22 (see page 3, lines 32 to 34). Therefore, figure 1 of P1 already suggests a geometrical layout comprising a header unit and multiple serpentine coils.

In view of this, P1 discloses:

a subsea cooling unit, being a subsea well fluid cooling unit, comprising a first header (22) adapted for communication with at least one hydrocarbon well and forming a common inlet, a second header (24) adapted for communication with a flow line (20) and forming a common outlet, having its longitudinal axis

substantially parallel with and in a distance from the first header (22), there are arranged between the first (22) and second headers (24), several sets of cooler coils (see page 3, lines 29 to 39); where each set is individually connected to the headers (22,24), wherein the headers (22,24) and the coils are arranged to guide the well fluid to be cooled such that the well fluid is cooled with seawater on the outside of the pipes (see page 1, lines 30 to 32; page 3, lines 4 to 8; page 3, line 41 to page 4, line 2), and wherein
at least one set of the cooler coils comprises at least three straight sections of pipe and at least two 180 degrees bends (see figure 1), and two connection means, for connection of the set to the headers (22,24: see figure 1 - where the coils are connected to the headers).

4.3 In the wording of the claim, the subject-matter of claim 1 differs nominally from the apparatus disclosed in P in that:

- the headers are "header pipes";
- each set of cooler coils is formed such that the coils are arranged in one plane and comprise distinct straight pipes and bend components;
- the coil sets are arranged with the plane of the coil sets mainly in parallel;
- the connection means comprise two connectors.

4.4 The combined technical effect of the above distinguishing features is to facilitate the construction and sizing of the cooler. Therefore, starting from P1, the objective technical problem to be solved is a conventional one of how to construct a cooler with a suitable geometrical layout which can be sized for various operational requirements.

4.5 The person skilled in the art of heat-exchanger construction confronted with the above problem would not only rely on general knowledge and conventional practice in the field, but also look at the design and layout of other heat-exchangers used in a subsea environment, such as those shown in P11b. This document shows subsea heat-exchangers (see slide 21 "Module de compression"[Compression module] - "Echangeur externe du moteur" [external heat-exchanger for the motor]) used for cooling the well-fluid gas used itself for cooling the electric motor of a subsea compressor (see slide 23 "Caractéristiques du compresseur sous marin GE" [Characteristics of the subsea compressor GE] et "Moteur électrique haute vitesse refroidi par le gaz" [High-speed electric motor cooled by the (well) gas"] and slide 24 "Blue- C^{TM} - Subsea.

In both P1 and the compressor motor cooler of P11b, sea-water is used to cool hot gaseous well-fluid. In particular, slide 21 of P11b shows in the figure entitled "Echangeur externe du moteur" that:

- the headers are "header pipes",
- each set is formed such that the coils of the one set is arranged in one plane and the set comprises distinct straight pipes and bend components,
the coil sets are arranged with the plane of the coil sets mainly in parallel,
- the connection means comprise two connectors.

4.6 As regards the feature of the "connectors", there is no specification or example in the description of the patent as to what such a "connector" could be. It is evident that each coil set must be provided with some kind of connector to connect it to the manifold.

Additionally, the figure of slide 21 clearly shows a separate element connecting each coil set to the header pipe.

4.7 Thus, P11b provides the skilled person with a clear teaching as to how to construct a subsea cooling unit of P1 which meets the specification of claim 1 according to auxiliary request 6. Consequently, the subject-matter of claim 1 does not involve an inventive step.

5. Auxiliary requests 7 to 11

These requests only define specific dimensions (pipe diameter D, bend radius R and length of straight pipe sections L) of the elements making up the coils and the relationship between the coils (distance between straight sections S, distance between the planes formed by neighbouring sets) making up the heat-exchanger.The board agrees with the statement by authors of P1 at page 3, lines 36 to 39 that:

"The piping arrangement of the cooler is not shown in detail since such coil systems are well known to those skilled in the art and such persons will be able to determine the number and size of pipes necessary for maximum efficiency, i.e. the amount of cooling desired."

Accordingly, the parameters specified in auxiliary requests 7 to 11 would be calculated as a matter of routine design procedure by the skilled person looking to maximise cooling efficiency, without the need to exercise any inventive activity.

Therefore, the subject-matter of claim 1 according to auxiliary requests 7 to 11 does not involve an inventive step.

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:

C. Spira G. Ashley

Decision electronically authenticated