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**Datasheet for the decision
of 18 June 2013**

Case Number: T 2429/10 - 3.2.03

Application Number: 00850100.9

Publication Number: 1061319

IPC: F28F 1/42

Language of the proceedings: EN

Title of invention:

Fluid conveying tube and use of the same in a vehicle cooler

Patent Proprietor:

TitanX Engine Cooling Holding AB

Opponent:

Behr GmbH & Co. KG

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 104(1)

RPBA Art. 16

Keyword:

"Admissibility of late filed document (yes)"

"Apportionment of costs (no)"

"Novelty (yes)"

"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 2429/10 - 3.2.03

DECISION
of the Technical Board of Appeal 3.2.03
of 18 June 2013

Appellant: Behr GmbH & Co. KG
(Opponent) Mauserstr. 3
D-70469 Stuttgart (DE)

Representative: Grauel, Andreas
Grauel IP
Patentanwaltskanzlei
Presselstraße 10
D-70191 Stuttgart (DE)

Respondent: TitanX Engine Cooling Holding AB
(Patent Proprietor) Box 237
S-294 25 Sölvesborg (SE)

Representative: Gunnarsson, Ola Christoffer
Awapatent AB
Västra Esplanaden 9 A
Box 99
S-351 04 Växjö (SE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 10 November 2010
rejecting the opposition filed against European
patent No. 1061319 pursuant to Article 101(2)
EPC.

Composition of the Board:

Chairman: U. Krause
Members: C. Donnelly
E. Kossonakou

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division, posted on 10 November 2010, rejecting the opposition against European Patent no. EP-B-1061319.
- II. The opponent (hereinafter - the "appellant") filed a notice of appeal against this decision on 14 December 2010 and paid the fee the same day. The grounds of appeal were filed on 18 March 2011

The appellant referred to the following state of the art in the grounds of appeal:

D1: FR-A-489 717;

D2: US-A-2 017 201;

D3: GB-A-1 336 236;

D4: US-A-4 470 452;

D5: "Thermal and hydraulic performance of enhanced rectangular tubes for compact heat exchangers", pages 6,7,37,40,50 Figures 30,35,42, Doctor thesis by Carl-Olof Olsson, Chalmers University of Technology, Göteborg, Sweden, dated 21 February 1997.

- III. By letter of 5 August 2011 the patentee (hereinafter - the "respondent") replied to the arguments brought forward in the grounds of appeal and filed auxiliary requests 1 to 5.
- IV. In a communication dated 4 January 2013, pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion. In particular, the Board indicated that it intended to admit document D5 into the proceedings.

V. Oral proceedings were held on 18 June 2013. In conclusion of their cases the parties made the following requests:

The appellant (opponent) requested that the decision under appeal be set aside and that European patent No. 1061319 be revoked.

The respondent (patent proprietor) requested that European patent No. 1061319 be maintained as granted (main request submitted with letter dated 5 August 2011). Auxiliary requests 1 to 5 filed also with its letter of 5 August 2011 were withdrawn. The request for apportionment of costs was maintained.

VI. Claim 1 as granted reads:

"A fluid conveying tube for vehicle coolers, which on its inside comprises first and second opposite longitudinal primary heat exchange surfaces (11',12'), and flow-directing surface structures (16) which are arranged on the primary surfaces (11',12') and which each comprise a plurality of elongate directing elements (15) projecting from the primary surface (11',12'), the surface structures (16) being alternately arranged on the first and second primary surfaces (11',12') in such a manner that directing elements (15) succeeding in the longitudinal direction (L) of the primary surfaces (11',12'), are alternately arranged on the first and second primary surfaces (11',12') and are mutually inclined at a given angle (γ), characterised in that

each surface structure (16) comprises a laterally extending first row (17) of mutually parallel directing elements (15)."

Both parties referred to the following **feature analysis** used in the opposition proceedings:

O1 - A fluid conveying tube for vehicle coolers, which on its inside comprises first and second opposite longitudinal primary heat exchange surfaces (11',12'), and

O2 - flow-directing surface structures (16) which are arranged on the primary surfaces (11',12') and,

O3 - which each comprise a plurality of elongate directing elements (15)

O4 - projecting from the primary surfaces (11',12'),

O5 - the surface structures (16) being alternately arranged on the first and second primary surfaces (11',12') in such a manner that

O6 - directing elements (15) succeeding in the longitudinal direction (L) of the primary surfaces (11',12') are alternately arranged on the first and second primary surfaces (11',12') and

O7 - are mutually inclined at a given angle (γ),

K1 - each surface structure (16) comprises a laterally extending first row (17) of mutually parallel directing elements (15).

VII. The arguments of the parties relevant to the decision can be summarised as follows:

(a) **Appellant**

Admissibility of D5

D5 should be admitted into the proceedings since it was cited at the earliest possible opportunity with the grounds of appeal in response to the opposition division's decision not to admit the prior art cited in the contested patent. The subject-matter of D5 is prima facie relevant since it deals with partial spiral flow in flat tubes of heat-exchangers and suggests a modification to the V-shaped structures which leads to a structure comprising elongate directing elements which fall within the scope of the claim.

Apportionment of costs

Costs should not be apportioned. The filing of D5 was prompted by the respondent's surprising attitude to the status of the prior art cited by itself in the contested patent. It is not credible that the respondent was placed under an undue burden by having to familiarise itself with the content of this document when the relevant passages have been indicated and correspond essentially to those cited in the contested patent.

Novelty

The subject-matter of claim 1 as granted is not new in view of figure 42, page 50 of D5 (which corresponds to figure 1 of the contested patent).

The zig-zag directing element shown in figure 42 is not necessarily continuous and, as indicated at page 50, second paragraph, last three sentences and col. 2, lines 10 to 12 of the contested patent, may be

interrupted at each apex in order to facilitate manufacturing. Thus, figure 42 shows a laterally extending first row of four mutually parallel directing elements interspaced by the second arms of the zig-zags which can be considered as a second row of directing elements as specified for example in granted claim 3. The wording of the claim does not require all the elongate directing elements of a laterally extending row to be parallel.

Thus, the subject-matter of claim 1 lacks novelty.

Inventive step

The subject-matter of claim 1 does not involve an inventive step in view of a combination of the embodiment shown in figure 3 of D4 with either the modified pattern of directing elements shown in figure 7C of D4 or with the skilled person's general knowledge of the art.

Figure 3 of D4 discloses a device showing all the features of claim 1 with the exception of the directing elements succeeding in the longitudinal direction of the primary surface being alternately arranged on the first and second primary surfaces such that they are mutually inclined at a given angle.

However, when the arrangement shown in figure 7C is used in the device of figure 3 as suggested in D4 at column 6, lines 10 to 13 and 34 to 36, rows of inclined directing elements on alternate primary surfaces which are parallel are realised in conformity with the requirement of this feature.

Faced with the objective technical problem of improving heat transfer whilst minimising pressure loss, the skilled person would also come up with this solution on the basis of common general knowledge.

Thus, the subject-matter of claim 1 does not involve an inventive step in the light of the information given by D4 alone or in combination with the skilled person's general knowledge in the art.

The subject-matter of claim 1 as granted also does not involve an inventive step taking D3 as the closest prior art in combination with D2.

D3 discloses the features O1 to O4 and K1. Thus, claim 1 differs from the device shown in D3 by features O5 and O6. These distinguishing features have the technical effect of creating turbulence in fluid flowing through the tube. The objective technical problem is therefore one of improving the heat transfer characteristics of the tube.

Faced with this problem, the skilled person would turn to D2, in particular figure 6, which shows surface structures alternately arranged on the first and second primary surfaces comprising directing elements 29,30 according to O5,O6 and O7. The passage of D2 at page 3, left-hand column, lines 1 to 17 describes the advantages of this arrangement. Thus, the skilled person seeking to solve the above problem is given a direct hint at the claimed solution.

(b) **Respondent**

Admissibility of D5

D5 should not be admitted into the proceedings since it is late filed and is no more relevant than the summary already given in the contested patent. It is prima facie irrelevant since it only discloses a surface structure comprising V-shaped elements.

Apportionment of costs

D5 is a very long document comprising over 100 pages and must be read in its entirety in order for the context of the specific passages cited by the appellant to be fully appreciated. Therefore, the late filing of this document placed an undue burden upon the respondent in the appeal proceedings since these should be limited to verifying whether the decision taken by the first instance was correct and not expanded to take into account completely new evidence and arguments which could have been presented earlier. It should be noted that even the reference to the cited prior art in the description of the patent was made at the last moment in the oral proceedings before the opposition division.

Novelty

The subject-matter of claim 1 is any case novel with respect to D5. D5 discloses a laterally extending row of four separate V-shaped rib elements, each V-shaped element pointing in the longitudinal direction of the tube. This cannot be considered to be the same thing as

a laterally extending row of mutually parallel directing elements.

Inventive step

As admitted by the appellant, the embodiment according to figure 3 of D4 fails to disclose the feature wherein the directing elements succeeding in the longitudinal direction of the primary surface are alternately arranged on the first and second primary surfaces such that they are mutually inclined at a given angle. Even if the skilled person did decide to replace the turbulator barrier configuration of figure 3 with that of figure 7C, the claimed arrangement is not obtained. As shown in the diagram of Annex 3 to the minutes of the oral proceedings before the opposition division transferring the pattern shown in figure 7C realises an arrangement in which the elongate directing elements succeeding in the longitudinal direction of the tube on the alternate primary surfaces are parallel to each other and are not mutually inclined. This is a major technical difference since, when the elements are parallel, a barrier is formed whereas by mutually inclining the elements a channel is created which imparts swirl to the flow. In general, D4 is silent as to the technical effect of the various patterns shown in figures 7A to 7G, in particular, there is no mention of using the turbulator barrier to create any specific partial flow patterns.

Furthermore, the only purpose of providing gaps in the turbulator barriers shown in D4 is to allow the interconnecting surfaces 130-130 to bow outwardly during soldering (see column 5, lines 37 to 44) in

order to take up tolerances when assembled with the heat transfer fins (see column 6, lines 11 to 15). Thus, the skilled person has no incentive to modify the turbulator barriers of D4 in the claimed manner since this document concentrates on the heat transfer to the heat-dissipating fins from the outside surface rather than the influence of internal flow patterns.

Consequently, starting out from D4 the skilled person would not arrive at the subject-matter of claim 1 in an obvious manner.

D3 does not disclose the features O2 and O4 since the structures of D3 are not surface structures of the primary surface and the welds of D3 do not project from the primary surface. The stampings 5,6 when placed in abutment with each other and welded together merely form additional internal wall elements distributed within the tube and extending between the lateral walls of the tube and act to strengthen the tube.

The skilled person has no incentive to replace the directing elements of D3 with those according to figure 6 of D2 since this would mean the stampings would no longer be in contact with each other resulting in a weaker structure.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of D5*
 - 2.1 In its contested decision (see page 3, first paragraph), the opposition division held that the prior art cited and summarised in the description of the contested patent in paragraph [0004] could not be admitted into the proceedings since not only must the citation be considered late filed but, in its view, the exact nature of the doctor thesis referred to was not known nor was it certain if it had ever been published. Furthermore, the opposition division was of the opinion that the citation did not disclose a plurality of elongate directing elements. Thus, the filing of D5 by the appellant with the grounds of appeal can be seen as a direct response to this decision.
 - 2.2 D5 bears a stamped date of "1997-02-21" (21 February 1997) on the cover page as well as indication that the thesis is "to be defended at the public viva voce, Friday 14 March, 1997". Thus, there is no doubt that the content of the thesis was made available to the public before the priority date (18 June 1999) of the patent. The content is also prima facie relevant since it is not merely cited in the patent, but discussed at length in paragraph [0004] of the description from which it is apparent that a plurality of elongate elements are disclosed since the apex of the V-shaped structures may be removed (see column 2, lines 11 to 12). Furthermore, figure 42 on page 50 of D5 corresponds to figure 1 of the patent selected by the

respondent as depicting the prior art (see paragraph [0013] "Figs 1-2 are a plan view and an end view, respectively, of a fluid conveying tube according to the prior art technique").

2.3 For these reasons the Board is prepared to admit those parts of D5 referred to in the grounds of appeal into the proceedings for further consideration.

3. *Novelty*

3.1 However, upon deeper analysis and listening to the parties arguments during the oral proceedings, the Board does not accept the appellant's argument that, if the apex is removed from each of V-shaped rib elements, shown in figure 42 on page 50, a surface structure comprising a laterally extending first row of mutually parallel directing elements would be formed since the board understands this feature to mean that all the elements forming the row are mutually parallel. Indeed, nothing else is illustrated or suggested in the patent. The rows of the modified structure suggested by the appellant would be comprised of directing elements wherein adjacent elements are inclined towards each other and only every other element would be mutually parallel. Granted claim 3, referred to by the appellant, specifies a second row similarly composed of mutually parallel directing elements, as shown for example in figure 4.

3.2 Thus, the subject-matter of claim 1 as granted is new.

4. *Inventive step*

4.1 The Board agrees with the respondent that the most relevant prior art is shown in D4, cited in the description of the patent at column 1, line 29.

4.2 The embodiment according to figure 3 of D4 displays the following features:

A fluid conveying tube for vehicle coolers, which on its inside comprises first and second opposite longitudinal primary heat exchange surfaces (120,122), and flow-directing surface structures (150) which are arranged on the primary surfaces (120,122) and which each comprise a plurality of elongate directing elements (152) projecting from the primary surface (120,122), the surface structures (150) being alternately arranged on the first and second primary surfaces (120,122) in such a manner that directing elements (152) succeeding in the longitudinal direction of the primary surfaces (120,122), are alternately arranged on the first and second primary surfaces (120,122) (see column 6, lines 15 to 19) and wherein each surface structure (150) comprises a laterally extending first row (150) of mutually parallel directing elements (152).

The device according to claim 1 differs therefrom in that the directing elements succeeding in the longitudinal direction of the primary surfaces, are alternately arranged on the first and second primary surfaces such that they are mutually inclined at a given angle.

4.3 D4 suggests (see col. 6, lines 34 to 37) that the preferred arrangement of the indentations shown in figure 3 may be replaced by any of a number of different patterns as shown in figures 7A to 7G. The patterns shown in figures 7D, 7F and 7G do not employ elongate directing elements, whilst those of figures 7A and 7E do not lend themselves for an application in a staggered arrangement since there is no apparent gap between rows which would allow this. The indentations of figure 7B are curved. Thus, of these alternatives, only that illustrated in figure 7C warrants further analysis. During the oral proceedings before the opposition division, the respondent presented an illustration of its understanding of the resulting arrangement when the pattern according to figure 7C replaces that of figure 3 in a staggered position (see Annex 3 to the minutes of the oral proceedings dated 29 September 2010). The appellant has not contested the validity of this representation, which shows the elongate elements on alternate primary surfaces to be parallel, but rather argued that a series of elongate elements which are parallel to each other are in any cases mutually inclined at a given angle and fall within the scope of the claim.

4.4 The Board does not accept this view since in its opinion the term "mutually inclined" excludes a configuration in which the directing elements of rows succeeding in the longitudinal direction of the primary surfaces are parallel. Indeed, the term "mutually parallel" is used in the claim to define the relative arrangement of the elongate directing elements in each of the laterally extending rows.

- 4.5 Thus, the teaching of D4 alone does not lead the skilled person to the subject-matter of claim 1.
- 4.6 The objective technical problem with respect to D4 is that identified by the respondent as one of combining a sufficiently high heat exchange capacity with a sufficiently low pressure drop. The above distinguishing feature contributes to solving this problem since, instead of constituting a barrier (D4 refers to "turbulator barriers 150" e.g. see col. 5, line 22) which would tend to increase pressure loss, the directing elements form parallel channels which impart a spiral motion to the fluid which would lead to comparatively less pressure loss whilst at the same improving heat transfer from the inside surface of the tube.
- 4.7 In all the embodiments of D4 the only purpose of providing gaps in the turbulator barrier is to allow the interconnecting surfaces 130-130 to bow outwardly during soldering (see column 5, lines 37 to 44) in order to take up tolerances when assembled with the heat transfer fins (see column 6, lines 11 to 15). There is no mention of using the turbulator barrier to create any specific partial flow patterns.
- 4.8 Thus, starting out from D4 and faced with the above problem, the skilled person's principle objective would still be to ensure that the turbulator barrier is discontinuous so as to improve the radiator tube's capability to dilate into a crowned construction capable of taking up tolerances when assembled with the heat transfer fins (see column 6, lines 11 to 15) thereby ensuring better heat transfer from the outside

surface of the tube. The skilled person is therefore given no incentive by D4 to use general knowledge in the art to modify the turbulator barriers of D4 in the claimed manner since this document concentrates on the heat transfer to the heat-dissipating fins from the outside surface rather than influence of internal flow patterns. Indeed, in this respect, D4 is silent as to the technical effect of the various patterns shown in figures 7A to 7G.

4.9 The skilled person would therefore not obtain the subject-matter of claim 1 in an obvious manner starting out from D4 and using common general knowledge in the art.

4.10 The appellant has also suggested that the subject-matter of claim 1 is obvious taking D3 as the nearest prior art in combination with D2.

D3 discloses a heat-exchanger in which the opposing stampings 5,6 are formed so as to contact each other (see page 1, lines 69 to 76) with a view to strengthening the tubes as well as improving heat transfer.

4.11 D2 (see figure 6) discloses surface structures comprising single directing elements 29,30 alternately arranged on the first and second primary surfaces. The effect of these elements is to cause the fluid to be alternately directed towards the sides of the interior of the tubes, thereby also creating turbulence which increases heat transfer (see page 3, left-hand column, lines 1 to 17).

4.12 However, the Board is of the opinion that the skilled person faced with the problem of improving heat transfer would not combine the teachings of D2 with D3 without the benefit of hindsight since not only does D2 relate to single directing elements as opposed to a laterally extending rows of elements, but also it would be necessary to abandon the strengthening aspect of having opposing and contacting directing elements which is the essential aspect of the construction of the tube according to D3.

4.13 Thus, the subject-matter of claim 1 as granted meets the requirements of Article 56 EPC since it involves an inventive step.

4.14 Since the respondent's main request has been allowed there is no need to consider its auxiliary requests.

5. *Apportionment of costs*

5.1 As reasoned above in connection with the admissibility of D5, the board considers the filing of D5 with the grounds of appeal to be a legitimate response to arguments made by the opposition division concerning the validity of the prior art cited in the contested patent. It is also difficult to believe that the respondent was faced with an undue burden in re-acquainting itself with the content of prior art cited at length in its own application. Further, the appellant had clearly indicated the sections of the thesis that it intended to rely on to support its arguments and which essentially correspond to the content of paragraph [0004] and figure 1 of the patent. Therefore, the board cannot see any circumstances in

the present case which would justify ordering an apportionment of costs which deviates from the principle that each party must bear its own costs pursuant to Article 104(1) EPC and Article 16 RPBA.

Order

For these reasons it is decided that:

1. The appeal is dismissed.
2. The request for apportionment of costs is refused.

Registrar:

Chairman:

C. Spira

U. Krause