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**Datasheet for the decision  
of 24 October 2013**

**Case Number:** T 0759/11 - 3.2.03

**Application Number:** 03778297.6

**Publication Number:** 1558888

**IPC:** F28D 9/00, F28F 3/02

**Language of the proceedings:** EN

**Title of invention:**  
Heat exchange element and method or manufacture thereof

**Applicant:**  
Oxycom Beheer B.V.

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 123(2), 56

**Keyword:**  
"Added subject-matter (no)"  
"Inventive step (yes) - 2nd auxiliary request"

**Decisions cited:**  
-

**Catchword:**  
-



**Case Number:** T 0759/11 - 3.2.03

**DECISION**  
**of the Technical Board of Appeal 3.2.03**  
**of 24 October 2013**

**Appellant:** Oxycom Beheer B.V.  
(Applicant) Kaagstraat 13  
NL-8102 GZ Raalte (NL)

**Representative:** Nederlandsch Octrooibureau  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted 12 November 2010  
refusing European patent application  
No. 03778297.6 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman:** U. Krause  
**Members:** C. Donnelly  
I. Beckedorf

## Summary of Facts and Submissions

I. The appeal lies from the decision of the examining division, posted on 12 November 2010, refusing the European patent application No. 03 778 297.6.

II. In its decision, the examining division relied on the following prior art:

D1: US 4089 324;  
D10: US 2576 213 A  
D12: US1601637;  
D13: JP 62288492 A

and held that the subject-matter of the independent claims 1 and 12 did not involve an inventive step in view of a combination of US-A-2576 213 A (D10) and US-A-4089 324 (D1).

III. The applicant (hereinafter "the appellant") filed a notice of appeal against this decision on 14 January 2011 and paid the fee the same day. The grounds of appeal were filed on 10 March 2011.

IV. In a communication dated 6 June 2013, pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the Board informed the appellant of its provisional opinion. In particular, the Board indicated that it considered D1 to be the nearest prior art and raised questions with respect to Articles 84 and 123(2). It also drew the appellant's attention to the possible relevance of document EP-A-283937 to the subject-matter of the fourth auxiliary request filed with the grounds.

V. By letter of 13 September 2013 the appellant informed the Board that it would not attend the oral proceedings scheduled for 24 October 2013. With letter of 18 September 2013 it submitted an amended main request and first to fifth auxiliary requests referred to in its letter of 13 September 2013 but not filed at that time.

VI. Oral proceedings were held on 24 October 2013 in the absence of the appellant.

VII. In the written proceedings the appellant had requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims filed as main request with letter of 18 September 2013 or, alternatively, on the basis of one of the sets of claims filed as first to fifth auxiliary requests with said letter, with the option to direct independent method claims of all sets of claims according to the main request and to the first to fifth auxiliary request to a method of manufacturing a heat exchange element.

VIII. The independent apparatus claim 1 of the main request submitted with letter of 18 September reads:

"A heat exchange element comprising a formable laminate of a metal layer and a heat-seal layer, the laminate being provided on both surfaces with a plurality of generally corrugated fins (2,3) having a series of troughs, the fins being connected at the troughs under heat and pressure in heat conducting relationship with the laminate to increase the effective surface area thereof, the laminate being sealed under heat and

pressure to itself or to another similar laminate having fins on both surfaces to form a flow channel for a heat exchange medium the flow channel having fins on both an internal surface and an external surface."

The independent method claim 12 of the main request reads:

"A method of manufacturing a heat exchanger, comprising:  
providing a plastically deformable first metal laminate;  
providing a plastically deformable second laminate (104) having first and second surfaces;  
plastically forming the first laminate into a generally corrugated shape having a series of troughs;  
dividing the first laminate into sections;  
connecting sections of the first laminate to both of the first and second surfaces of the second laminate at the series of troughs to form a heat-transmitting wall with heat-conducting fins on (106,107) both sides; and  
sealing under heat and pressure the second laminate to itself or to another similar laminate to form a flow channel, wherein at least the first or the second laminate comprises a heat-sealable layer and the first and second laminates are connected together under heat and pressure by heat sealing at a first temperature."

Claim 1 of the first auxiliary request is identical to the main request except that the second to last line of the claim has been amended to read:

"...another similar laminate having fins on both surfaces to form an enclosed flow channel for a heat exchange medium the....."

Similarly in the independent method claim the corresponding text three lines from the end has been amended to read:

"...to form an enclosed flow channel, wherein at least the first or second laminate..."

Claim 1 of the second auxiliary request is identical to the main request with the additional feature:

"wherein the heat exchange element further comprises a water-retaining layer provided on at least the fins on the external surface."

The independent method claim 12 of the second auxiliary request reads:

"A method of manufacturing a heat exchanger, comprising:  
providing a plastically deformable first metal laminate the first laminate comprises first and second surfaces, the first surface being provided with a water retaining layer;"  
providing a plastically deformable second laminate (104) having first and second surfaces;  
plastically forming the first laminate into a generally corrugated shape having a series of troughs;  
dividing the first laminate into sections;  
connecting sections of the first laminate to both of the first and second surfaces of the second laminate at

the series of troughs to form a heat-transmitting wall with heat-conducting fins on (106,107) both sides wherein the second surface of the first laminate is connected to the second laminate; and sealing under heat and pressure the second laminate to itself or to another similar laminate to form a flow channel, wherein at least the first or the second laminate comprises a heat-sealable layer and the first and second laminates are connected together under heat and pressure by heat sealing at a first temperature."

IX. The appellant's arguments can be summarised as follows:

Main request

The presence of fins on both surfaces finds adequate support in claims 1 and 9, in particular in combination with claim 10 as originally filed. The skilled person would see the flat tube embodiment described on page 4, lines 4 to 7 merely as a preferred variant which combines heat transfer and construction advantages. Thus, the requirements of Article 123(2) are met.

D10 describes a motor vehicle radiator assembled from non-laminated sheets using traditional welding and brazing techniques. The skilled person would not use the laminated sheets of D1 in its construction since a vehicle radiator must withstand significant pressures and temperatures as well as large structural and vibrational forces for which an adhesive connection is not suitable. Furthermore, the use of an adhesive layer would worsen the desired heat transfer characteristics. Thus, not only is there no hint or suggestion in the available prior art to use an adhesive type connection

in the vehicle applications, but also the skilled person would know that such a use would be contrary to the desired aim of improving heat transfer.

The structure of D1 does not disclose fins that enlarge the effective area of a heat exchange surface since the corrugated elements 1,1' are connected to the surface 4 in order to form a channel. It is generally understood that a fin is an element that protrudes into a flow such that the flow passes over both surfaces. In this manner increased effective area may be achieved for the surface on which the fins are located.

Thus, heat exchange takes place from one channel to another channel through the material of the channel and not along it. In particular, figure 7 of D1 does not show any elements which have a "fin" function. There is no reason why the skilled person would choose to provide fins on internal and external surfaces of a flow channel and any conclusion to the contrary could only be based on hindsight.

Thus, starting out from either D1 or D10 in combination with D10 or D1 respectively would not lead the skilled person to the subject-matter of either claim 1 or claim 12 in an obvious manner.



## Reasons for the decision

1. The appeal is admissible
2. Main and first auxiliary request
- 2.1 Added subject-matter, Article 123(2) EPC

- 2.1.1 The feature in claim 1 defining:

"the flow channel having fins on both an internal surface and an external surface" is not explicitly specified in the original claims and is based on the description at page 4, lines 4 to 7. Although this passage specifies the feature in combination with a flat tube wherein the fin sections on the interior surfaces support against each other, the board accepts the appellant's argument that the skilled person would see this embodiment as a preferred variant which combines heat transfer and construction advantages.

- 2.1.2 Thus, the requirements of Article 123(2) EPC are met.

- 2.2 Clarity, Article 84

- 2.2.1 The method claim 12 is directed at a heat exchanger whereas the steps actually specified are limited to producing a heat exchange element since several essential features of a heat exchanger are missing (e.g. fluid inlets and outlets). Thus, in accordance with the appellant's conditional request made in letter of 13 September 2013, the following examination will be made including the requested ex-officio amendment of

claim 12 in all requests to cover a heat exchange element.

2.3 Novelty/Inventive step, Article 54, 56

2.3.1 In the board's view D1 is the nearest prior art since this document discloses various forms of heat exchange elements made from laminated sheets. As argued by the appellant, D10 describes a motor vehicle radiator assembled from non-laminated sheets using traditional welding and brazing techniques.

2.3.2 The meaning of the term "fins" in the context of the application is described at page 3, lines 16 to 18 of the published description where it is stated that "the laminate may be formed into a convoluted shape or corrugated to form a plurality of fins thereby providing an increased area" (also see original claim 8). Thus, within the context of the application any convoluted shape, such as corrugations, can be considered as fins.

2.3.3 Although the independent apparatus claim 1 has been amended in response to the Board's provisional opinion by additionally specifying that "the another similar laminate" has "fins on both surfaces", a corresponding amendment has not been made to the independent method claim 12. Thus, in the Board's opinion the feature "another similar laminate" in the independent method claim includes planar laminates similar to the first or second laminates.

2.3.4 Furthermore, the independent method claim 12 also fails to specify clearly any steps resulting in the flow

channel having fins on both an internal surface and an external surface as is required by claim 1.

2.3.5 Accordingly D1 describes:

a method of manufacturing a heat exchange element, comprising:  
providing a plastically deformable first metal laminate (1,2);  
providing a plastically deformable second laminate (3,4) having first and second surfaces; plastically forming the first laminate into a generally corrugated shape having a series of troughs (see figures 1 to 8);  
connecting sections of the first laminate to both of the first and second surfaces of the second laminate at the series of troughs to form a heat-transmitting wall with heat-conducting fins on both sides (see figures 3 and 7); and  
sealing under heat and pressure the first laminate to another similar laminate to form an enclosed flow channel (see figure 7), wherein at least the first or the second laminate comprises a heat-sealable layer and the first and second laminates are connected together under heat and pressure by heat sealing at a first temperature.

2.3.6 Thus, the subject-matter of claim 12 differs therefrom by the steps of:

(i) dividing the first laminate into sections before connecting them to both of the first and second surfaces of the second laminate.

(ii) sealing under heat and pressure the second laminate (instead of the first laminate) to another similar laminate to form an enclosed flow channel.

2.3.7 As regards feature (i) D1 refers to a method of manufacturing a corrugated coated foil as a continuous sheet (see figure 8 and col. 4, line 67 to col. 5, line 1) as well a method of manufacturing a continuous heat exchange element by adding further rolls to supply smooth layers of coated aluminium (see figure 9, col. 5, lines 4 to 15). However, faced with the problem of producing heat exchange panels of a limited length, as shown for example in figure 10 of D1, the skilled person has only two choices; either to cut the laminates to length before joining or after joining. The various advantages and disadvantages of each technique as regards cutting and joining are readily appreciated by the skilled person who would then choose one or the other as a function of circumstances such as the depth of each channel.

2.3.8 As regards feature (ii), D1 shows several configurations (see figures 5 and 6) where the corrugated first laminate is joined to another corrugated (or "similar") laminate to form an enclosed channel. Therefore, in the light of all the examples shown in D1, the skilled person considering further heat-exchanger variants combining flat and corrugated sheets to increase heat exchange would see such a combination as obvious.

2.3.9 Thus, the subject-matter of claim 12 according to the main and first auxiliary request does not involve an inventive step.

3. Second auxiliary request

3.1 Article 123(2)

Claim 1 comprises the additional feature

"wherein the heat exchange element further comprises a water-retaining layer provided on at least the fins on the external surface."

3.1.1 Claim 12 comprises corresponding amendments in that the first feature has been modified to read:

"providing a plastically deformable first metal laminate the first laminate comprises first and second surfaces, the first surface being provided with a water retaining layer;"

and additionally specifying:

"wherein the second surface of the first laminate is connected to the second laminate"

3.1.2 The basis for these amendments is page 11, lines 3 to 6 and lines 11 to 12 and claim 17 as filed. Thus, the requirements of Article 123(2) are met.

3.2 Inventive step

3.2.1 Whilst the provision of a water retaining layer is known in the context of dewpoint coolers (see for example JP-A-62288492 D13), the exchanger elements disclosed in D1 are neither intended nor suitable for

operation in this manner since they are primarily intended for use as solar collectors. The skilled person faced with the problem of improving the performance of heat exchange elements according to D1 would not have any reason to include a water retaining layer on at least one of the surfaces since this would have a negative effect of cooling the channels. Thus, even if the skilled person did consult D13 he would not contemplate combining their teachings.

3.2.2 Thus, the subject-matter of claims 1 and 12 according to the second auxiliary request involves an inventive step.

3.2.3 Dependent claims 2 to 11 and 13, 14 specify further embodiments/steps of the apparatus and method of claims 1 and 12 respectively.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
  
2. The case is remitted to the Examining Division with the order to grant a patent with claims 1 to 14 according to the second auxiliary request as attached to the minutes of the oral proceedings (Annex A) and a description and figures to be adapted.

Registrar:

Chairman:

C. Spira

U. Krause