Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 12 December 2013

Case Number: T 0240/12 - 3.2.06

Application Number: 00850101.7

Publication Number: 1060808

IPC: B21C37/15, F28F3/04, F28D1/03

Language of the proceedings: EN

Title of invention:
Fluid conveying tube as well as method and device for manufacturing the same

Patent Proprietor:
VALEO SYSTEMES THERMIQUES

Opponent:
Behr GmbH & Co. KG

Headword:

Relevant legal provisions:
EPC 1973 Art. 54, 56, 83
EPC Art. 123(2)

Keyword:
Amendments - added subject-matter (no)
Inventive step - (yes)
Novelty - (yes)
Sufficiency of disclosure - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0240/12 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 12 December 2013

Appellant: (Opponent)	Behr GmbH & Co. KG Mauserstrasse 3 D-70469 Stuttgart (DE)
Representative:	Grauel, Andreas Grauel IP Patentanwaltskanzlei Presselstrasse 10 70191 Stuttgart (DE)
Respondent: (Patent Proprietor)	VALEO SYSTEMES THERMIQUES 8, rue Louis Lormand La Verrière 78320 Le Mesnil Saint-Denis (FR)
Representative:	Rolland, Jean-Christophe Valeo Systèmes Thermiques 8 Rue Louis Lormand BP 517 - La Verrière 78321 Le Mesnil Saint-Denis Cedex (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 6 December 2011 concerning maintenance of the European Patent No. 1060808 in amended form.**

Composition of the Board:

Chairman: M. Harrison
Members: M. Hannam
W. Sekretaruk

Summary of Facts and Submissions

I. An appeal was filed by the appellant (opponent) against the interlocutory decision of the opposition division which found that European patent No. 1 060 808 in an amended form met the requirements of the EPC. The grounds of opposition invoked by the appellant included Articles 100(a), (b) and (c) EPC, on the basis of which the appellant requested that the impugned decision be set aside and the patent be revoked.

II. The Board issued a summons to oral proceedings including a communication containing its provisional opinion, in which it indicated *inter alia* that the requirement of Article 83 EPC and the requirement of Article 123(2) EPC appeared to be met by the patent as amended before the opposition division. It furthermore indicated that the subject-matter of claim 1 appeared both to be novel and to involve an inventive step over the cited art.

III. The following documents are relevant for this decision:

E1 JP-A-07 158999
E2 JP-A-10 153393
E3 WO-A-86/07628
E4 GB-A-2 324 145
E5 US-A-5 890 288
E6 US-A-5 579 837
E7 JP-A-07 234085
E8 DE-T-19881141
E9 JP-A-09 122804
E10 EP-A-0 567399
E11 DE-A-3416840
E12 DE-A-3416841
E13 DE-A-3411863

E14 JP-A-10 047875
E15 DE-T2-69701076
E16 DE-T2-69703638
E17 DE-T2-69115986
E18 US-A-4 470 452
E19 GB-A-2 223 091
E20 EP-A-0 694747

IV. Oral proceedings were held before the Board on 12 December 2013. The appellant requested that the decision under appeal be set aside and that the European patent No. 1 060 808 be revoked. The respondent (proprietor) requested that the appeal be dismissed.

V. Claim 1 reads as follows:
'A method of manufacturing, starting from a blank (20) of metal material, an elongate fluid conveying tube, which is adapted to be mounted in a vehicle cooler and comprises at least two internal, elongate ducts (5, 6), characterized in that the method comprises the steps of forming, along two opposite edges of the blank (20), two upright edge portions (21, 22), which between themselves define an at least partly essentially flat web portion (23),
forming, after the step of forming the two upright edge portions (21, 22), a plurality of projections (8) in a given pattern on one side of the blank (20) by plastic deformation of the blank (20) for forming a projecting surface structure (8) on the web portion (23) of the surface of the blank (20), and
forming the web portion (23) such that the edge portions (21, 22) are brought into abutment against each other and against the web portion (23) for defining said ducts (5, 6).'

Claim 3 reads as follows:
'A device for manufacturing an elongate fluid conveying tube, which is adapted to be mounted in a vehicle cooler and comprises at least two internal, elongate ducts (5, 6), starting from a blank (20) of metal material, said device comprising
a feeder for feeding the blank (20) through the device, and a duct forming station (50),
characterized by
a surface forming station (40) which is designed to form, by plastic deformation of the blank (20), a plurality of projections (8) in a given pattern on one side of the blank (20) for forming a projecting surface structure (8) on a portion (23) of the blank surface, and
an edge forming station (30) for forming two opposite edges of the blank into two upright edge portions (21, 22), which between themselves define an at least partly essentially flat web portion (23), and wherein the duct forming station (50) is arranged for making the edge portions (21, 22) abut against each other and against the web portion (23) with a view to defining said ducts (5, 6), wherein the surface forming station (40), seen in the blank feeding direction through the device, is arranged downstream of the edge forming station (30) and is designed to form the surface structure (8) on said web portion (23).'

VI. The arguments of the appellant may be summarised as follows.

The requirement of Article 83 EPC was not met since the skilled person was not taught how to form the web portion. The plurality of projections furthermore prohibited the edge portions from being brought into

abutment against each other and against the web portion. An explanation of what the surface forming station entailed was also missing.

The requirement of Article 123(2) EPC was not met since a basis for forming the surface structure on the entirety of one side of the blank was not disclosed. Additionally, a basis for forming a plurality of projections in a given pattern after having formed the edge portions was not present. Furthermore, the addition of the word 'for' in the expression '..plastic deformation of the blank (20) for forming a projecting surface structure (8)..' in claim 1 was broader than the originally filed disclosure.

In claim 3 the feature 'a surface forming station which is designed to form, by plastic deformation of the blank, a plurality of projections in a given pattern on one side of the blank..' lacked a basis in the originally filed documents. Furthermore, the addition of the words 'is arranged' in the expression '..wherein the duct forming station is arranged for making the edge portions..' in claim 3, related to subject-matter extending beyond the content of the application as originally filed.

The subject matter of claim 1 lacked novelty (Article 54 EPC) in view of E1, E2 and E3, as did the subject-matter of claim 3 in view of E11 and E12.

Claim 1 lacked an inventive step (Article 56 EPC) starting from E5 or E6 in combination with E11, E12, E13 or E17. E5 disclosed all features of claim 1 save for the projections being formed after the edges are raised. The function of projections improving the heat exchanger performance was known, for example, from E2,

paragraph [0011]. The lacking chronology in E5 was evident in the figures of E11, where accurate folding was important for sealing of the two contacting edges. The embodiment of E11 disclosing extrusion of the metal blank (page 8, second full paragraph) indicated that, even in the event of the blank being folded, this would occur prior to the projections being formed. Further support for this view was to be found on page 6, last paragraph; and page 7, first paragraph. Furthermore on page 9, paragraphs 2 and 3, forming of the raised edges and the projections in a 'Walzensatz' (roller set) was disclosed, and this would require the edges to be raised prior to forming the projections.

E4 disclosed a method of manufacturing an elongate fluid tube and represented a suitable starting point to deprive, in combination with E11, E12, E13 or E17, the subject-matter of claim 1 of an inventive step.

E7, E8, E9, E10, E14, E15 and E16 each disclosed methods of manufacturing an elongate fluid tube which in combination with the teaching in any of E18, E19 or E20 deprived the subject-matter of claim 1 of an inventive step (Article 56 EPC).

Regarding claim 3, E5 disclosed all features save for a surface forming station for forming a plurality of projections on a portion of the blank, whereby the surface forming station was downstream of the edge forming station. These missing features were disclosed in E11. The skilled person furthermore had only 2 options as to when to form the projections; either before folding or after folding the edge portions.

E11 and E12 required accurate folding in order to achieve edge on edge sealing of the heat exchanger

tubes. The term 'doppelwandig' was used in E11 and E12 due to the two walls abutting edge to edge, as clearly disclosed in the figures of E11 and E12.

Alternatively, taking E13 as a starting point, this disclosed all features of claim 3 save for the duct forming station making the edge portions abut against each other and against the web portion and the surface forming station being arranged downstream of the edge forming station. E6 provided the teaching of bringing the edge portions to abut against each other and the web portion, while E11 or E12 suggested positioning the surface forming station downstream of the edge forming station.

The skilled person would be able to arrive at the invention of claim 3 simply through the knowledge gained from his training, particularly that a feeder, a duct forming station, a surface forming station and an edge forming station could be combined in any order to form a production line or a flexible manufacturing cell.

In response to the Board's written opinion and when asked by the Board, the appellant elected in oral proceedings not to make any oral arguments in relation to the matters of Article 83 EPC, Article 123(2) EPC and novelty and relied solely on its written submissions. Similarly in regard to the appellant's oral submissions on inventive step, apart from in relation to E2, E5, E6, E11 and E12, the appellant relied solely on its written submissions.

VII. The arguments of the respondent may be summarised as follows.

The figures 8a-8e and description clearly enabled the skilled person to carry out the claimed invention in accordance with Article 83 EPC.

Claim 1 met the requirements of Article 123(2) EPC since its subject-matter resulted from a combination of claims 1-3 as originally filed. Similarly claim 3 resulted from a combination of claims 5-7 as originally filed.

Claim 1 involved an inventive step (Article 56 EPC) over all document combinations since not one document disclosed the claimed order of forming the upright edge portions prior to forming the plurality of projections on the blank. This order of the steps ensured clean folding of the blank in order to enable the manufactured tube not to leak.

Neither E11 nor E12 disclosed raising of the edges prior to forming projections when using any process other than extrusion; nothing beyond these two processes occurring for example simultaneously in a single roll pair was disclosed. E11 and E12 also mentioned a double walled heat exchanger which was not technically possible with the alleged edge-on-edge arrangement of the upright edge portions; overlapping was required. The figures were schematic and no unambiguous information about edge-to-edge abutment could be drawn from them.

No document disclosed a device possessing the claimed sequence of a surface forming station downstream of an edge forming station found in claim 3, such that an inventive step must be recognised (Article 56 EPC). Whilst the skilled person could arrange the processing stations as claimed, there was no guidance in the cited

art to do so. E11 and E12 did not unambiguously disclose an edge-on-edge contact of the raised edge portions such that these documents would not guide the skilled person to modify the device known from E5 to reach the subject-matter of claim 3.

Reasons for the Decision

1. Article 83 EPC 1973

1.1 The Board finds that, contrary to the opinion of the appellant, the opposed patent discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

1.2 Paragraphs [0020] to [0022] of the patent, together with Figs. 8a-8e, clearly describe and depict the manner in which the claimed blank of metal material is formed in order to manufacture the elongate fluid conveying tube. The Board furthermore holds that the feature of claim 1 'forming the web portion' must be understood in the context of the patent as 'bringing the web into a certain form', since the patent is evidently not concerned with how the web portion itself is brought about. More particularly, the wording 'forming the web portion' does not stand alone but is defined in the context 'such that the edge portions are brought into abutment...'. The meaning ascribed to this terminology by the appellant is therefore not technically logical.

Regarding the alleged difficulty in bringing the edge portions into abutment against each other and against the web portion, the Board finds that the projections on the web portion would cause no hindrance to the skilled person carrying out the invention. For example,

as is shown in Fig. 8e, the edge portions abut one another and the web portion (i.e. the next position not shown in Fig. 8e) in positions where no projections are present. The skilled person thus has all information required as to how the edge portions are to be arranged, also in the presence of the projecting surface structure, and thereby also to form the ducts with, for example, surface/surface contact. The appellant's objection regarding the alleged undisclosed nature of the surface forming station is also clearly answered in paragraph [0021], where a 'rotating abutment member 41 and a rotating shaft 42 having projections on its peripheral surface 43' is discussed as forming pits on one side and projections on the opposite side of the band 20. The skilled person is thus clearly taught how at least one embodiment of the surface forming station is realised and would have no difficulty extending this concept over the whole scope of the term. The appellant's argument is therefore not accepted.

The Board thus finds that the requirements of Article 83 EPC are met.

2. Article 123(2) EPC

2.1 As regards claims 1 and 3, against which objection was raised in this regard, the Board holds that the requirement of Article 123(2) EPC is met. The subject-matter of claim 1 has a basis in a combination of claims 1-3 as originally filed, while the subject-matter of claim 3 has a basis in a combination of claims 5-7 as originally filed.

2.2 The appellant's argument that no basis exists for the surface structure being formed on the 'entirety' of one

side of the blank ('...auf dem gesamten Bereich' - see grounds of appeal page 11/35) appears to reside in an incorrect interpretation of the wording of claim 1. In particular, the word 'entirety' or an implicit limitation to the entirety of one side of the blank does not appear in the claim. Moreover, the feature of forming 'a plurality of projections in a given pattern on one side of the blank' is taken *expressis verbis* from originally filed claim 3, which is dependent from both claims 1 and 2 as originally filed. This feature thus has basis in the originally filed application, in the context of the combination of features now claimed.

Regarding the appellant's further contention that forming a plurality of projections in a given pattern after having formed the edge portions is not originally disclosed, the Board again refers to claim 3, which, being dependent on claim 2, together provide the basis for this combination of features.

The appellant also raised a further objection to claim 1 concerning the addition of the word 'for' in the expression '..plastic deformation of the blank (20) for forming a projecting surface structure (8)..'. To this objection the Board points out that, in the present method claim, the word 'for' is not simply used in the sense of being 'suitable for', but must be understood as a functional limiting feature representing one of the limiting requirements of this method step. Although the Board is not bound by these, reference can also be made to the Guidelines for Examination, F-IV, 4.13 (September 2013) in this regard. This amendment thus meets the requirement of Article 123(2) EPC.

In summary, therefore, the subject-matter of claim 1 is found to meet the requirement of Article 123(2) EPC.

2.3 Regarding the appellant's argument that the feature of claim 3 'a surface forming station which is designed to form, by plastic deformation of the blank, a plurality of projections in a given pattern on one side of the blank..' lacked a basis in the originally filed documents, the Board finds differently. This wording is found explicitly in claim 7 as originally filed which claim, being dependent from claims 5 and 6, provides a clear basis for the above feature in combination with those features in originally filed claims 5 and 6.

Regarding the addition of the words 'is arranged' in claim 3, the Board holds that this amendment also does not relate to subject-matter which extends beyond the content of the application as originally filed (Article 123(2) EPC). The addition is simply a linguistic amendment, in no way altering the substantive content of the claim.

In summary, therefore, the subject-matter of claim 3 meets the requirement of Article 123(2) EPC.

3. Novelty

3.1 The subject-matter of claim 1 is found to be novel (Article 54 EPC 1973) over E1, E2 and E3.

3.1.1 E1 discloses a method of manufacturing an elongate fluid conveying tube (see e.g. abstract and drawings 1-4I) yet, in comparison to claim 1, fails at least to disclose the step of
'forming, after the step of forming the two upright edge portions, a plurality of projections in a given

pattern on one side of the blank by plastic deformation of the blank'.

From the drawings of E1, particularly 3A, 3B and 3C, it is clear that the parts of the web P which could be considered as projections (3, 12 and 13) are introduced into the web P prior to forming two upright edge portions. The appellant's argument that P1 in drawing 3A shows upright edge portions is not accepted. This is confirmed as the next states of formation are visible in drawings 3B and 3C and these show no upright edge portion at the positions P1. The further paragraphs [0011] and [0014] cited by the appellant in this regard provide no information to the contrary.

The subject-matter of claim 1 is thus novel over E1 (Article 54 EPC 1973).

3.1.2 E2 discloses a method of manufacturing an elongate fluid conveying tube (see paragraphs [0009] - [0011] and the figures) which lacks the following steps of claim 1:
forming, along two opposite edges of the blank, two upright edge portions, which between themselves define an at least partly essentially flat web portion; and forming, after the step of forming the two upright edge portions, a plurality of projections in a given pattern on one side of the blank by plastic deformation of the blank.

The figures of E2 exclusively depict various views of the finished tube, rather than the method by which the fluid conveying tube is manufactured. The description, moreover, also fails to unambiguously define a chronology of the steps employed to manufacture the

tube, such that the claimed sequence of forming processes of claim 1 are not anticipated by E2.

The subject-matter of claim 1 is thus novel over E2.

3.1.3 E3 discloses a method of manufacturing an elongate fluid conveying tube (see page 6, line 32 onwards). The subject-matter of claim 1 differs from the method known from E3 at least through the step of:
forming, after the step of forming the two upright edge portions, a plurality of projections in a given pattern on one side of the blank by plastic deformation of the blank.

From page 6, line 37 - page 7, line 2 it is clear that the projections (called 'continuities' in E3 - see e.g. page 6, line 37) are formed in the strip blank prior to the strip being bent into the tubular form i.e. prior to the upright edge portions being formed. The method of E3 thus fails to disclose the claimed chronology of method steps in claim 1.

The subject-matter of claim 1 is thus novel over E3.

3.2 The subject-matter of claim 3 is found to be novel (Article 54 EPC 1973) over E11 and E12.

3.2.1 E11 discloses a device for manufacturing an elongate fluid conveying tube (see page 8, second full paragraph to page 9, third paragraph). The subject-matter of claim 3 differs from this 'extrusion embodiment' of E11 in that the claimed device comprises a duct forming station which is arranged for making the edge portions abut against each other and against the web portion with a view to defining said ducts. In E11 two separate half-channels are formed in order to define the duct,

each half having respective raised edge portions. The raised edges of a first half-channel are brought into abutment with the raised edges of a second half-channel (see the figures), rather than the claimed arrangement of two opposite edges of the same blank being brought into abutment. In E11 the raised edge portions are also not brought into abutment with the web portion, the only contact being with the raised edges of the other half-channel.

Considering the 'roll forming embodiment' of the device of E11 (as opposed to the extrusion device), this has no unambiguous disclosure of the surface forming station being located downstream of the edge forming station. The paragraphs of E11 cited by the appellant (at page 7 and page 9) merely indicate that the raising of the web edges and the introduction of projections to the web occur in a set of rolls ('in einem Walzensatz'). In this respect it is noted that no explicit chronology of these two forming processes is indicated in E11, nor can one be regarded as implicitly disclosed as it is conceivable for a single set of rolls to achieve these two forming processes simultaneously.

The subject-matter of claim 3 is thus novel over each of the above embodiments of E11 (Article 54 EPC 1973).

3.2.2 E12 discloses a device for manufacturing an elongate fluid conveying tube (see page 6, third paragraph to page 9, second paragraph). In the same manner as explained above for E11, two embodiments are disclosed in E12: an embodiment employing extrusion for forming a half-channel with upright edges; and an embodiment employing roll forming to form the upright edges. As explained for E11, and applying equally to E12, the

embodiment employing extrusion lacks the feature of the device comprising a duct forming station which is arranged for making the edge portions abut against each other and against the web portion with a view to defining said ducts. Alternatively, the embodiment employing roll forming lacks an unambiguous disclosure of the surface forming station being located downstream of the edge forming station.

The subject-matter of claim 3 is thus novel over the above embodiments of E12 (Article 54 EPC 1973).

4. Inventive step

4.1 Claim 1

The Board finds that the subject-matter of claim 1 involves an inventive step (Article 56 EPC 1973) for the following reasons.

4.1.1 E5 discloses the following features of claim 1:
A method of manufacturing (col.1, lines 66 onwards), starting from a blank (col.2, lines 1-3) of metal material, an elongate fluid conveying tube, which is adapted to be mounted in a vehicle cooler (col.1, lines 12-13) and comprises at least two internal, elongate ducts (40,42), wherein the method comprises the steps of
forming, along two opposite edges of the blank (see Fig.5), two upright edge portions (48,50 in relation to Fig.7), which between themselves define an at least partly essentially flat web portion (30),
and forming the web portion (30) such that the edge portions (48,50) are brought into abutment against each other and against the web portion (30) for defining said ducts (40,42; Figs.8-11).

The subject-matter of claim 1 thus differs from the method known from E5 solely through the feature: 'forming, after the step of forming the two upright edge portions, a plurality of projections in a given pattern on one side of the blank by plastic deformation of the blank for forming a projecting surface structure on the web portion of the surface of the blank'. The parties raised no objection to this finding.

The technical effect of the presence of projections is to increase the heat transfer of the heat exchanger through inducing turbulent fluid flow in the tubes, as is generally known to the skilled person and also indicated in paragraph [0011] of E2. The sequence of steps involving forming the two upright edge portions prior to forming the projections enables a precise folding of the edge portions without the outer edges of the blank becoming irregular, which would result in sealing difficulties along the irregular edge. The objective technical problem resulting from this characterising feature is thus seen as how to improve the technical performance of a heat exchanger whilst maintaining its sealing.

E11 is not considered to provide the appropriate guidance or teaching to the skilled person as to how to modify E5 in order to reach the subject-matter of claim 1.

Firstly, there is no unambiguous disclosure in E11 of an 'edge to edge' contact between the respective raised edges 2 of the two half-channels 1 ("Halbschalen 1") which are combined to form the serpentine, fluid containing channel. Thus, the need for accurate folding in order to avoid leakage is not a requirement in E11,

such that the skilled person would not look to E11 for a solution to the objective problem. Secondly, E11 provides no hint to guide the skilled person to carry out the forming of the two upright edge portions chronologically before forming a plurality of projections in the blank. Only in the case of extrusion is this the case in E11, which is unrelated to the problems caused by bending as in E5. The skilled person would thus not extract from E11 the guidance to modify the method known from E5 in order to reach the subject-matter of claim 1.

4.1.2 Regarding the appellant's assertion that the figures of E11 indicated an edge to edge contact and thus a similar need for accurate folding to that in the present patent, the Board notes that figures are to be regarded as schematic representations of an invention, rather than detailed drawings from which such exact information can be extracted. Nothing in E11 indicates anything to the contrary. Whilst the figures may appear to show an edge to edge contact of the raised edges, alone they cannot be relied upon to provide an unambiguous disclosure of such a physical feature. It is also noted that the appellant failed to provide a passage from the description of E11 which would justify such an interpretation of the figures. Indeed, the indication in E11 that the channel formed in E11 is a double-walled product ('doppelwandig') - see e.g. page 6, line 6 - speaks against the appellant's interpretation of the figures, since a double-wall evidently refers to an overlap of the walls so as to make them double, whereas an edge-to-edge abutment would result merely in two half single walls, which as argued by the respondent would involve an alignment of edges in a serpentine form which would be technically highly problematic and thus unrealistic.

It thus follows that, absent an unambiguous disclosure of an edge to edge contact (i.e. edge-to-edge abutment) between the upright edge portions in E11, the alleged common requirement between the present patent and E11 of achieving very precise folding in order to avoid leakage at the surfaces to be joined is also missing.

4.1.3 The appellant's argument that, also in the non-extrusion method of E11, E11 discloses forming two upright edge portions before forming the plurality of projections is unconvincing.

The last paragraph on page 6 mentions the forming of two half-channels with edges bent upwards and provided with projections by way of rolls or a press, yet does not clearly disclose a chronological order for these two processes; considering the wording alone, the processes could indeed occur simultaneously.

The first full paragraph on page 7, lines 1-4 discloses a half-channel being extruded prior to projections being introduced. However, the method in E5 starts from a planar sheet of material 30 (see Fig.5) which is subsequently bent into the required shape, such that the skilled person would not consider an extrusion process with a downstream forming of projections as providing a hint to the claimed chronology of method steps, not least since the extruding process directly dictates that projections can only be introduced afterwards.

Lines 4-7 of the first full paragraph on page 7 disclose an alternative manufacturing process whereby the edges are raised and the projections are introduced

on passing through rolls, yet without any particular indication of chronology of steps.

Finally on page 9, third paragraph of E11, an advantageous feature of production by rolls is disclosed, by way of which the edges are raised and the projections introduced 'in einem Walzensatz'. Whilst this expression can indicate a series of rolls and/or pairs of rolls arranged in series, it could equally be interpreted as a single pair of rolls. In this latter case the edges would be raised and the projections introduced concurrently, such that, again here, the chronological separation of the two forming processes of raising the edges prior to the introduction of projections into the blank is not unambiguously disclosed.

4.1.4 The appellant's argument, that the extrusion embodiment of E11 would suggest the chronology in claim 1 of raising the edges prior to forming the projections, is also unconvincing. The skilled person would clearly appreciate that, for the extruded half-channel embodiment, projections can only be formed in the web portion downstream of the extrusion die. Yet, if the upright edge portions are formed by folding, no such chronological restriction is placed on the method steps; the projections could be formed before, concurrently with, or after the edges have been raised. Without any reason disclosed in E11 to select one of these options over any other, it is pure conjecture to suggest that the claimed chronology of raising the edge portions prior to forming the projections is unambiguously disclosed in E11.

4.1.5 The Board thus finds that E11 fails to unambiguously disclose the forming of two upright edge portions along

two opposite sides of the blank prior to forming a plurality of projections in the blank.

The Board thus concludes that starting from the method of manufacturing an elongate fluid conveying tube known from E5 and combining this with the teaching of E11 would not lead the skilled person to the subject-matter of claim 1 without exercising an inventive step (Article 56 EPC 1973).

4.1.6 The Board finds that E12 (see Figs. 1 and 2) discloses essentially the same method for manufacturing a fluid conveying tube as that disclosed in E11. As such, E12 is able to provide no teaching of how to modify the method known from E5 beyond that of E11. The appellant offered no argument differing from this view. The subject-matter of claim 1 thus involves an inventive step (Article 56 EPC 1973) also in view of a combination of E5 and E12.

4.1.7 E13 discloses a method of forming serpentine heat exchanger tubes for a boiler (see claim 1 and figures), in which method the the raised edges are formed either simultaneously with or after the projections have been formed in the web (see claim 2 and page 13, first full paragraph). Thus E13 also provides no hint as to how to modify the method known from E5, in order to reach the subject-matter of claim 1.

4.1.8 The method known from E17 also discloses the forming of projections (see page 6, second paragraph; 'gekrümmten Vorsprüngen'), however this always occurs before the two upright edge portions are formed (by way of folding the strip into a u-shaped cross-section). Further embodiments disclosed from page 13, paragraph 2 - page 14, paragraph 1 make no suggestion of forming the

upright edge portions prior to the forming of the projections, such that E17 is also unable to provide a hint for the skilled person to modify the method of E5 in order to reach the subject-matter of claim 1.

4.1.9 E6 also discloses a method of manufacturing an elongate fluid conveying tube (see e.g. Figs.5A-5D; col.3, line 40 - col.4, line 3). The subject-matter of claim 1 differs from the method known from E6 in that the method comprises the steps of:

a. forming, along two opposite edges of the blank, two upright edge portions; and

b. forming, after the step of forming the two upright edge portions, a plurality of projections in a given pattern on one side of the blank by plastic deformation of the blank for forming a projecting surface structure on the web portion of the surface of the blank.

As mentioned above in point 4.1.1, E5 lacks only the above feature 'b' of claim 1 of the present patent. As E6 lacks the further feature 'a', it presents a less promising starting point for, in combination with E11, E12, E13 or E17, depriving the subject-matter of claim 1 of an inventive step.

The subject-matter of claim 1 is thus considered to involve an inventive step (Article 56 EPC 1973) over a combination of E6 and E11, E12, E13 or E17.

4.1.10 The appellant argued further that E4 disclosed a method of manufacturing an elongate fluid tube and represented a suitable starting point to deprive, in combination with E11, E12, E13 or E17, the subject-matter of claim 1 of an inventive step. To these combinations of documents the Board notes that E4, as the selected

starting point, fails to disclose, similarly to E5, the projecting surface structure being formed after the step of forming the two upright edge portions. When combined with any one of E11, E12, E13 or E17 therefore, the subject-matter of claim 1 must similarly involve an inventive step with reasons essentially identical to those presented in points 4.1.1 to 4.1.8 above for the case when starting from E5 and combining with E11, E12, E13 or E17.

4.1.11 Regarding the further inventive step arguments of the appellant, the Board concurs with it insofar as E7, E8, E9, E14, E15 and E16, similarly to E5, lack the following feature of claim 1:
'forming, after the step of forming the two upright edge portions, a plurality of projections in a given pattern on one side of the blank by plastic deformation of the blank for forming a projecting surface structure on the web portion of the surface of the blank'.

The appellant maintained that E10 disclosed this feature, yet, not least in view of the arrangement shown in Figures 2 and 4, it is clear that the projections (or turbulence creating features 22 and 30 respectively) can only be formed prior to forming the duct i.e. prior to forming the two upright edge portions. Thus E10 also lacks the above identified feature.

Each of E18, E19 and E20 discloses projections which are introduced into the blank material prior to forming the two upright edge portions (see E18, Fig.5; E19, Figs.14 and 16(A); E20, Figs.7-9). Indeed, the appellant does not argue differently. It follows, therefore, that none of these cited documents discloses the forming of the upright edge portions prior to

forming the plurality of projections. A combination of any of the documents E7-E10, E14-E16 or E18-E20 with any other of these documents also cannot be considered to deprive the subject-matter of claim 1 of an inventive step (Article 56 EPC 1973).

4.1.12 In summary therefore, in view of the documents cited by the appellant in relation to inventive step and the arguments presented by the appellant in support of its objection, the subject-matter of claim 1 is considered to involve an inventive step (Article 56 EPC 1973).

4.2 Claim 3

The Board finds that the subject-matter of claim 3 involves an inventive step for the following reasons.

4.2.1 E5 discloses the following features of claim 3.
A device for manufacturing (see e.g. col.4, lines 32-33) an elongate fluid conveying tube, which is adapted to be mounted in a vehicle cooler and comprises at least two internal, elongate ducts (see Fig.11), starting from a blank (30) of metal material, said device comprising
a feeder for feeding the blank (30) through the device, and a duct forming station, wherein the device includes:
an edge forming station (60,62; Fig.7) for forming two opposite edges of the blank into two upright edge portions, which between themselves define an at least partly essentially flat web portion, and wherein the duct forming station (see Figs.8-11) is arranged for making the edge portions abut against each other and against the web portion with a view to defining said ducts.

The parties were in agreement, and the Board finds no reason to find differently, that the subject-matter of claim 3 differs from the device known from E5 in that the claimed device further includes:
a surface forming station which is designed to form, by plastic deformation of the blank, a plurality of projections in a given pattern on one side of the blank for forming a projecting surface structure on a portion of the blank surface, and
wherein the surface forming station, seen in the blank feeding direction through the device, is arranged downstream of the edge forming station and is designed to form the surface structure on said web portion.

The objective technical problem being addressed by the invention may thus be seen as providing a device to allow a more accurate manufacture of a fluid conveying tube.

E11, as explained for claim 1 above, does not unambiguously disclose a device capable of achieving an edge on edge contact between the raised edges 2 of the half-channels 1. Furthermore, the teaching of positioning a surface forming station downstream of the edge forming station, when considering the embodiments in E11 involved with bending (as in E5), cannot be unambiguously extracted from the document. It thus follows that, starting from the device known from E5 and combining this with the teaching of E11, in order to solve the objective technical problem, would not lead the skilled person to the subject-matter of claim 3 in an obvious manner.

4.2.2 Regarding the appellant's interpretation of the term 'doppelwandig', the Board notes that claim 1 and page 6, first full paragraph of E11 mention the fluid

containing part of the boiler comprising a double-skinned fin ('doppelwandige Lamelle'). From the figures it is clear that such a double skin can only be present if, where the raised edges are connected, the edges overlap each other at least partially in order to create the double skin; all other portions of the fluid containing channel are clearly single skinned. The appellant's argument that the term 'doppelwandig' in the context of E11 refers to a single-skinned fin which comprises two walls joined together edge to edge, goes against all usual interpretations of the expression. An element described as 'doppelwandig' must, over at least a portion of its extension, possess a double wall i.e. two essentially parallel skins separating two regions related to the element. Questioned as to why the fin in E11 was described as 'double-skinned' if only a single skin was to be understood, the appellant's assertion that it was not responsible for the drafting of E11 does not absolve its need to interpret the teaching of E11 in a technically and linguistically consistent manner. In the view of the Board this is only possible through the opposing edges of the respective raised portions in E11 overlapping at least partially in order to produce the described double-skinned fin.

Lacking the requirement to achieve edge-on-edge contact of the raised edges 2 in E11, the document is clearly not directed to a similar manner of accurate folding of the raised edges as is required in the opposed patent, which explicitly indicates, in paragraph [0014], a need for minimising irregularities occurring during the forming of the blank.

4.2.3 The Board also does not concur with the appellant's view, that since only two options are available for where to position the surface forming station relative

to the edge forming station, the selection of any particular one was obvious when considering the device itself. Firstly it is noted that three options exist for where to position the surface forming station, namely upstream of, simultaneously with or downstream of the edge forming station. Secondly, it is indeed true that the skilled person could select any one of these three possibilities. Yet, the appellant has been unable to show why the skilled person would chose the claimed option of the surface forming station being located downstream of the edge forming station. Only with the knowledge disclosed in the opposed patent in paragraph [0014] regarding the benefit of forming perforations in the blank after forming the upright edge portions (corresponding to positioning the surface forming station downstream of the edge forming station) would the skilled person have reason to consciously select the claimed arrangement out of the three available options.

Furthermore, as already reasoned in relation to claim 1, E11 fails to unambiguously disclose the plurality of projections being formed after the step of forming the two upright edge portions of the blank in anything but an extrusion process. Thus it follows that E11 also fails to disclose a device for manufacturing a fluid conveying tube comprising processing stations arranged in such an order that the surface forming station is downstream of the edge forming station (i.e. which is also the order, in which the forming processes are defined in claim 1).

4.2.4 The subject-matter of claim 3 thus involves an inventive step (Article 56 EPC 1973) over a combination of E5 with E11.

4.2.5 E12 discloses a method of manufacturing a fluid conveying tube utilising identical manufacturing steps to those in E11 at least insofar as the production of the half-channels and the joining of the half-channels to create the fluid conveying tube is concerned. Nothing to the contrary was argued by the appellant. It thus follows that E5 combined with E12, similarly to the combination of E5 with E11, also fails to deprive the subject-matter of claim 3 of an inventive step.

4.2.6 Regarding the appellant's assertion that E13 in combination with E6 and E11 or E6 and E12 would allow the skilled person to arrive at the subject-matter of claim 3 without involving an inventive step, the Board does not concur with this view. E13, as identified by the appellant (see grounds of appeal, page 31/35), lacks the following features of claim 3:
the duct forming station is arranged for making the edge portions abut against each other and against the web portion; and
the surface forming station, seen in the blank feeding direction through the device, is arranged downstream of the edge forming station.

The objective technical problem to which these features provide a solution may be seen as the provision of a device allowing a more accurate manufacture of an elongate fluid conveying tube.

As already argued above (see points 4.2.3 - 4.2.5), neither E11 nor E12 unambiguously discloses the surface forming station being arranged downstream of the edge forming station. The combination of E13 with E6 and E11 or with E6 and E12 thus does not deprive the subject-matter of claim 3 of an inventive step (Article 56 EPC 1973), since even with this combination, the skilled

person does not arrive without inventive skill at a device having all the features of claim 3.

4.2.7 Regarding the argument of the appellant that the skilled person would assemble the claimed device simply with his understanding of production line design, this is mere conjecture. It is to be acknowledged that the skilled person would no doubt be aware of the individual stations of the device included in claim 3, and the function which they each perform, yet combining these in the particular order presented (for the purpose of manufacturing a fluid conveying tube) is not something which the skilled person is taught, particularly not in view of the lack of guidance on this matter provided in the documents presented by the appellant as prior art.

4.2.8 Thus, in view of the documents cited by the appellant in relation to inventive step and the arguments presented by the appellant in support of its objection, the subject-matter of claim 3 is also found to involve an inventive step (Article 56 EPC 1973).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. H. A. Patin M. Harrison

Decision electronically authenticated