

(19)



(11)

**EP 2 960 609 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:  
**05.10.2022 Bulletin 2022/40**

(21) Application number: **14461546.5**

(22) Date of filing: **26.06.2014**

(51) International Patent Classification (IPC):  
**F28D 1/053** <sup>(2006.01)</sup> **F28F 9/02** <sup>(2006.01)</sup>

(52) Cooperative Patent Classification (CPC):  
**F28D 1/05366; F28D 1/05375; F28F 9/0214;**  
**F28F 9/0224; F28F 2225/08; F28F 2255/16;**  
**F28F 2265/32; F28F 2275/04; F28F 2280/04**

(54) **MANIFOLD, IN PARTICULAR FOR USE IN A COOLER OF A COOLING SYSTEM**

VERTEILER, INSBESONDERE ZUR VERWENDUNG IN EINEM KÜHLER EINES KÜHLSYSTEMS  
COLLECTEUR, EN PARTICULIER POUR UNE UTILISATION DANS UN SYSTÈME DE  
REFROIDISSEMENT D'UN REFROIDISSEUR

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB**  
**GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO**  
**PL PT RO RS SE SI SK SM TR**

(43) Date of publication of application:  
**30.12.2015 Bulletin 2015/53**

(73) Proprietor: **Valeo Autosystemy SP. Z.O.O.**  
**32-050 Skawina (PL)**

(72) Inventors:  
• **BEDEK, Adam**  
**31-207 Kraków (PL)**  
• **ROMANSKI, Grzegorz**  
**31-564 Kraków (PL)**

• **SZOSTEK, Dawid**  
**31-352 Kraków (PL)**

(74) Representative: **Valeo Systèmes Thermiques**  
**Service Propriété Intellectuelle**  
**ZA l'Agiot, 8 rue Louis Lormand**  
**CS 80517**  
**La Verrière**  
**78322 Le Mesnil-Saint-Denis Cedex (FR)**

(56) References cited:  
**EP-A1- 0 586 037 WO-A1-2004/048875**  
**WO-A1-2005/121683 FR-A1- 2 887 975**  
**US-A- 5 246 066 US-A- 5 289 873**  
**US-A- 5 509 199 US-A1- 2003 085 030**  
**US-B1- 6 564 863**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**EP 2 960 609 B1**

## Description

### Technical Field

[0001] The present invention relates to a manifold, in particular for use in a cooler of a cooling system.

### Background Art

[0002] There are known, for example from US2003/0155109 A1, manifolds consisting of two components, namely an inner housing and a covering profile, which is applied and bent on the inner housing. Both those elements are provided with plurality of corresponding slots for introduction of tubes of the cooling assembly/supplying a cooling medium, which tubes are introduced only into the covering profile. The inner housing is provided with a channel defined therein for the flow of the cooling medium. Such a solution, however, results in that it is required to use so-called "end-forming" process, for example by thinning the end of the inserted tube so that only the thinned part of the tube is inserted into the slot of the covering profile, while its non-thinned portion abuts against that covering profile to maintain permeability of the tubes. Manufacturing of the tubes is thus more complicated and additionally during the end-forming process an uncontrolled process of clogging or deforming of the tube channels (especially the extreme ones) may occur what is disadvantageous to the thermal efficiency of the cooler. The similar solutions are known, for example from US6564863 B1, EP0586037 A1, WO2004/048875 A1, US5246066 A, US2003/085030 A1, AND WO2005/121683 A1. WO-A-2005121683 discloses a manifold according to the preamble of claim 1.

[0003] The aim of the present invention is to provide a manifold that is simpler and less expensive to manufacture, by means of which the need for any additional processing of the pipes of the cooling assembly is avoided, and which at the same time ensures in any case permeability of the tubes of the cooling assembly, despite its deep insertion into the manifold.

### Disclosure of the Invention

[0004] The above object is achieved by a manifold according to claim 1 and the following dependent claims. The manifold comprises a housing which is a unitary element having a closed profile and which is provided with at least one longitudinal channel defined therein and also a plurality of slots on one of surfaces of the housing. The slots are in fluid communication with at least one longitudinal channel. The manifold further includes a covering profile superimposed on the housing and provided with a plurality of slots at positions corresponding to the positions of the slots of the housing. The covering profile is firmly connected to and sealed against the housing while the slots of the covering profile are adapted for receiving cooler tubes. At least one longitudinal channel of the

housing has on its surface a stopping means against which the cooler tubes may abut while the slots of the housing are also adapted for receiving the cooler tubes. The manifold according to the invention is characterised in that the housing has on its outer surface, near the slots, two opposite longitudinal projections.

[0005] The manifold developed in this way is simple and easy to manufacture. Through the use of the stopping means it is not necessary to machine the ends of the cooler tubes and it is ensured that the inlets/outlets of the tubes themselves are always exposed, thus providing the maximum permeability of the gas cooler assembly. Furthermore, the ends of the tubes are not in contact with the optionally plated parts, i.e. the covering profile. Thanks to that the risk of clogging of the channels with the plating material in its liquid phase associated with the capillary effect (rising of the molten solder into the slots) is less critical. Furthermore, the fact that the tubes are received in the interior of the housing causes that the gas cooler assembly comprising manifolds according to the invention is already quite stiff before the permanent connection of components, while its individual elements are fixed relative to each other, what considerably facilitates the permanent connection of all components of the assembly to each other, for example by brazing.

### Brief description of the drawings

[0006] The present invention is illustrated in its embodiments in the accompanying drawings, in which:

Fig. 1 shows an exploded perspective view of a manifold according to an example which is not part of the invention.

Fig. 2 shows a perspective view of the assembled manifold according to the example.

Fig. 3 shows a cross sectional view of the manifold according to the example with the flat tubes introduced.

Fig. 4 shows detail A of fig. 3.

Fig. 5 shows a cross sectional view of the manifold according to the invention with the flat tubes introduced.

Fig. 6 shows detail B of Fig. 5.

Fig. 7 shows the gas cooler assembly with the manifolds according to the invention.

### Embodiments of the Invention

[0007] The manifold 1 according to the example comprises a cap or covering profile 2 and an inner housing 4. The covering profile 2 is manufactured from a plate, preferably of aluminium and/or its alloys, having a thickness of 0.8 mm to 2 mm, preferably 1 mm, by means of pressing process and bent in such manner that it substantially replicates the external shape of the inner housing 4. By such a structure of the covering profile 2 it is easy to manufacture. The covering profile 2 made of alu-

minium and/or its alloys may be plated on its one or both sides and has a plurality of slots 3 arranged in a single row, into which flat tubes 17 of a gas cooler 19 are introduced during the use of the manifold 1. The slots 3 are precisely made slots, so that the flat tubes 17, having internal passages, are tightly received in these slots 3.

**[0008]** The inner housing 4 has a closed hollow profile, it is an unitary element, it is manufactured using an extrusion process, it has thick and solid walls, whereby it is resistant to high operational pressure, and it contains in its interior two separate longitudinal channels 5a and 5b for the flow of a cooling medium. The channels 5a and 5b are separated from each other by a reinforcing arch 7 in order to strengthen the structure of the inner housing 4 and the entire manifold 1. The inner housing 4 is also provided in its interior, i.e. on surfaces 6a, 6b of the channels 5a, 5b, with stopping elements 8, against which the inserted flat tubes 17 abut. In this example the stopping elements 8 are in the form of projections 8a extending along the channels 5a, 5b and from their surfaces 6a, 6b towards the interior of the channels 5a, 5b. Furthermore, also the inner housing 4 has a plurality of slots 10 at positions corresponding to the positions of the slots 3 in the covering profile 2, which the slots 10 need not be made with such accurate dimensions as the slots 3 of the covering profile 2, that is, their dimensions do not have to be exactly matched to the dimensions of the flat tubes 17, it is sufficient for the slots 10 to have a size larger than, or at least the same as, the size of flat tubes 17, and hence also the slots 3. This results in that the flat tubes 17 are received loosely in the slots 10 and tightly in the slots 3. The slots 10 can be made by a process using a milling saw, which process does not have to be precise, with the result that the inner housing 4 made in that way is simple and cheaper to manufacture. Furthermore, the slots 10 are in fluid communication with the channels 5a, 5b of the inner housing 4. Just like the covering profile 2, the inner housing 4 is also preferably made of aluminium and/or its alloys.

**[0009]** As illustrated in fig. 2, the covering profile 2 is applied on and bent over the inner housing 4, in particular over its corners 9, so that, preferably, a larger portion of one of the outer surfaces of the inner housing 4, preferably an exposed surface 12 opposite to the surface on which the slots 10 are made remains uncovered by the covering profile 2. Of course, the covering profile 2 does not have to cover almost entire or entire surface of the inner housing 4. It is sufficient that the covering profile 2 covers at least that surface of the inner housing 4, in which the slots 10 are positioned, in such a case the covering profile 2 does not cover most of the housing 4, whereby the housing 4 is no longer positioned inside the bent covering profile 2, but rather these two elements are mutually adjacent. The covering profile 2 extends longitudinally beyond the profile of the inner housing 4, namely beyond ends 14 of the housing so as to form a seat 15 for a baffle/plug 16, preferably of aluminium and/or its alloys, for sealing the ends 14 of the inner housing 4 and

the entire manifold 1. However, there is no need to form such a seat, in which case the ends of both the covering profile 2 and the inner housing 4 are aligned with each other, as a result of which the plug 16 rests on both those elements. The covering profile 2 and the inner housing 4 are joined together and sealed against each other, as well as with respect to the plug 16, by brazing in a brazing furnace. This causes sealing of all contact edges between these elements. The manifold 1 assembled in this way has a substantially rectangular cross-section.

**[0010]** In use of the manifold 1 in the gas cooler assembly 19, the flat tubes 17, between which ribs 18 extend, are introduced into the slots 3, 10 in both components of the manifold 1. The tubes are firstly received tightly in the slots 3 and next loosely in the slots 10 and abut against the stopping elements 8 in the inner housing 4 with the result that their further movement into the inner housing 4 is prevented. This also results in that the outlets/inlets of flat tubes 17 will not be blocked/closed by the surfaces 6a, 6b of the channels 5a, 5b. Such configuration also allows precise and easy assembling of the entire gas cooler assembly, and it ensures that elements of the assembly assembled in such a way will not rotate or otherwise move relative to each other before/during brazing, while eliminating the need for using so-called "end-forming" process. The flat tubes 17 are secured to and sealed against the manifold 1 by brazing between the flat tube 17 and the covering profile 2, i.e. around the slots 3.

**[0011]** Figures 5 and 6 show an embodiment of the manifold 1 according to the invention. General design of the manifold 1 according to this embodiment is the same as in the example shown in figures 1-4. However, in this case, the inner housing 4 is provided only with a single longitudinal channel 5 being in fluid communication with the slots 10, and thus only one surface 6 of the longitudinal channel 5, i.e. the interior of the inner housing 4 is not divided by the reinforcing arch 7 into two separate channels 5a, 5b. The assembled manifold 1 has a configuration similar to cylindrical and due to the fact that such a configuration is naturally resistant to high pressure and the diameter of the tube is not large (of the order of several/several tens of millimetres) the use of the reinforcing arch 7 is not necessary. In this embodiment, the stopping element 8 is in the form of a notch 8b on the inner surface of the inner housing 4, i.e. the surface 6 of the longitudinal channel 5, at the slot 10. Moreover, the inner housing 4 has on its outer surface, near the slots 10, two opposite longitudinal projections 11. These projections 11 are main brazing points serving to enhance sealing process of the manifold 1 and also the process of joining its components together. By using the projections 11 an assembly is obtained, in which at least these two projections 11 and, hence, the inner housing 4, contact with the covering profile 2 over the entire length of the tube, thereby providing a correct and effective brazing. Furthermore, the projections 11 improve the effect of bending the covering profile 2 over the inner housing 4.

**[0012]** Fig. 7 shows the gas cooler assembly of the cooling system, in which manifolds 1 according to the invention are used. On the right-hand side of the gas cooler 19 there are arranged two separate manifolds 1, wherein one of them is used for supplying the cooling medium into the cooler, while the other is for discharging that medium. These manifolds 1 are provided on their exposed surfaces 12, uncovered by the covering profile 2, with apertures/ports 13 for connection to an external circuit of the cooling medium. These openings are in fluid communication with the channels 5, 5a, 5b of the inner housing 4. The manifold 1 shown on the left-hand side of the gas cooler 19 is not provided with such openings 13, as a result of which it is merely an intermediate element in the gas cooler assembly 19, i.e. the cooling medium flows into one of the manifolds 1 on the right-hand side of the assembly, flows through a portion of the flat tubes, flows into the manifold 1 on the left-hand side of the assembly, then flows again into the flat tubes 17, and flows out the other of the manifolds 1 on the right-hand side of the assembly. In other embodiments of the gas cooler assembly 19, one manifold 1 is used on each side of the assembly, each of which has an aperture/port 13, and one of the manifolds is an inlet manifold while the other is an outlet manifold. Similarly, it is possible to apply one manifold 1 on each side of the assembly, wherein one manifold does not have apertures/ports 13, and the other has two apertures/ports 13 for supplying and discharging the cooling medium.

**[0013]** Note that it is possible to replace the technical features between the above-described example and embodiment of the invention. For example, in the inner housing 4 having two separate channels 5a, 5b the stopping elements 8 in the form of the notches 8, 8b can be used, while in the inner housing 4 having a single channel 5, the stopping elements 8 in the form of the projections 8a can be used. It is also not necessary to use two stopping elements 8, in many practical applications only one is sufficient, furthermore the position of these elements in relation to the slots 10 can vary, i.e. adjacently to the slots 10 or at some distance from them. It is also possible to connect several manifolds 1 into one longer manifold, in such a case, the manifolds without plugs 16 are used and are firmly butt joined, and only the extreme ends of the manifolds are closed by plugs 16.

## Claims

1. A manifold (1), in particular for use in a cooler (19) of a cooling system, wherein the manifold (1) comprises a substantially rectangular cross-section, comprising:

a housing (4), which is a unitary element having a closed profile and has at least one longitudinal channel (5) defined therein and also a plurality of slots (10) on one of surfaces of said housing

(4), said slots (10) being in fluid communication with said at least one longitudinal channel (5); and

a covering profile (2) applied on said housing (4) and having a plurality of slots (3) at positions corresponding to the positions of said slots (10) of said housing (4), said covering profile (2) being fixedly connected to and sealed against said housing (4), said slots (3) of said covering profile (2) being adapted for receiving tubes (17) of said cooler (19);

said at least one longitudinal channel (5) has on its surface (6) a stopping means (8) against which said tubes (17) of said cooler (19) may abut,

and said slots (10) of said housing (4) are also adapted for receiving said tubes (17) of said cooler (19) **characterised in that** the housing (4) has on its outer surface, near the slots (10), two opposite longitudinal projections (11).

2. A manifold according to Claim 1, **characterised in that** said stopping means (8) is in the form of opposing projections (8a) on said surface (6) of said at least one longitudinal channel (5), said projections (8a) being directed towards the interior of said at least one longitudinal channel (5) and arranged at said slots (10) of said housing (4).
3. A manifold according to Claim 1, **characterised in that** said stopping means (8) is in the form of notches (8b) on said surface (6) of said at least one longitudinal channel (5), said notches (8b) being arranged at said slots (10) of said housing (4).
4. A manifold according to any one of the preceding Claims, **characterised in that** the size of said slots (10) of said housing (4) is at least equal to or greater than the size of said slots (3) of said covering profile (2).
5. A manifold according to any one of the preceding Claims, **characterised in that** said at least one longitudinal channel (5) includes two channels (5a, 5b) separated by a reinforcing arch (7), each said channel (5a, 5b) having its own stopping means (8) on its surface (6a, 6b).
6. A manifold according to any one of the preceding Claims, **characterised in that** said covering profile (2) is so applied on said housing (4) that one surface (12) of said housing (4) is exposed, said surface (12) having at least one port (13) in fluid communication with said at least one longitudinal channel (5) for connection to an external circuit of a cooling medium.
7. A manifold according to any one of the preceding Claims, **characterised in that** both said covering

profile (2) and said housing (10) are made of aluminium and/or its alloys and are connected to each other by means of brazing.

8. A manifold according to any one of the preceding Claims, **characterized in that** it is closed at both of its ends by a plug (16) .
9. A manifold according to claim 8, **characterized in that** said plug (16) is also made of aluminium and/or its alloys and is coupled to said covering profile (2) and said housing (10) also by means of brazing.
10. A cooler (19) comprising a manifold (1) according to any one of Claims 1-9.

#### Patentansprüche

1. Verteiler (1), insbesondere zur Verwendung in einem Kühler (19) eines Kühlsystems, wobei der Verteiler (1) einen im Wesentlichen rechteckigen Querschnitt aufweist, umfassend:

ein Gehäuse (4), das ein einheitliches Element mit einem geschlossenen Profil ist und mindestens einen darin definierten Längskanal (5) und auch eine Vielzahl von Schlitzen (10) auf einer der Oberflächen des Gehäuses (4) aufweist, wobei die Schlitze (10) in Fluidverbindung mit dem mindestens einen Längskanal (5) stehen; und

ein Abdeckprofil (2), das auf dem Gehäuse (4) angebracht ist und eine Vielzahl von Schlitzen (3) an Positionen aufweist, die den Positionen der Schlitze (10) des Gehäuses (4) entsprechen, wobei das Abdeckprofil (2) fest mit dem Gehäuse (4) verbunden und gegen dieses abgedichtet ist, wobei die Schlitze (3) des Abdeckprofils (2) zum Aufnehmen von Rohren (17) des Kühlers (19) angepasst sind; wobei der mindestens eine Längskanal (5) an seiner Oberfläche (6) ein Anschlagmittel (8) aufweist, an dem die Rohre (17) des Kühlers (19) anliegen können, und die Schlitze (10) des Gehäuses (4) ebenfalls zum Aufnehmen der Rohre (17) des Kühlers (19) angepasst sind,

**dadurch gekennzeichnet, dass** das Gehäuse (4) an seiner Außenfläche in der Nähe der Schlitze (10) zwei gegenüberliegende Längsvorsprünge (11) aufweist.

2. Verteiler gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Anschlagmittel (8) in Form von gegenüberliegenden Vorsprüngen (8a) auf der Oberfläche (6) des mindestens einen Längskanals (5) ausgebildet ist, wobei die Vorsprünge (8a) zum Innern des mindestens einen Längskanals (5) ge-

richtet und an den Schlitzen (10) des Gehäuses (4) angeordnet sind.

3. Verteiler gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Anschlagmittel (8) in Form von Kerben (8b) auf der Oberfläche (6) des mindestens einen Längskanals (5) ausgebildet ist, wobei die Kerben (8b) an den Schlitzen (10) des Gehäuses (4) angeordnet sind.

4. Verteiler gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Größe der Schlitze (10) des Gehäuses (4) mindestens gleich oder größer als die Größe der Schlitze (3) des Abdeckprofils (2) ist.

5. Verteiler gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der mindestens eine Längskanal (5) zwei Kanäle (5a, 5b) umfasst, die durch einen Verstärkungsbogen (7) getrennt sind, wobei jeder Kanal (5a, 5b) an seiner Oberfläche (6a, 6b) sein eigenes Anschlagmittel (8) aufweist.

6. Verteiler gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Abdeckprofil (2) so auf dem Gehäuse (4) angebracht ist, dass eine Oberfläche (12) des Gehäuses (4) freiliegt, wobei die Oberfläche (12) mindestens eine Öffnung (13) in Fluidverbindung mit dem mindestens einen Längskanal (5) zum Anschluss an einen externen Kreislauf eines Kühlmediums aufweist.

7. Verteiler gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sowohl das Abdeckprofil (2) als auch das Gehäuse (10) aus Aluminium und/oder dessen Legierungen bestehen und mittels Hartlötens miteinander verbunden sind.

8. Verteiler gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** er an seinen beiden Enden durch einen Stopfen (16) verschlossen ist.

9. Verteiler gemäß Anspruch 8, **dadurch gekennzeichnet, dass** der Stopfen (16) ebenfalls aus Aluminium und/oder seinen Legierungen besteht und mit dem Abdeckprofil (2) und dem Gehäuse (10) ebenfalls mittels Hartlötens verbunden ist.

10. Kühler (19), umfassend einen Verteiler (1) gemäß einem der Ansprüche 1-9.

#### Revendications

1. Tubulure (1), en particulier pour une utilisation dans un radiateur de refroidissement (19) d'un système

de refroidissement, la tubulure (1) présentant une coupe transversale essentiellement rectangulaire, comprenant :

un logement (4), qui est un élément d'un seul tenant ayant un profil fermé et comportant au moins un canal longitudinal (5) défini dans celui-ci et également une pluralité de fentes (10) sur une des surfaces dudit logement (4), lesdites fentes (10) étant en communication fluidique avec ledit au moins un canal longitudinal (5) ; et un profilé de recouvrement (2) appliqué sur ledit logement (4) et comportant une pluralité de fentes (3) à des positions correspondant aux positions desdites fentes (10) dudit logement (4), ledit profilé de recouvrement (2) étant raccordé fixement audit logement (4) et appliqué hermétiquement contre celui-ci, lesdites fentes (3) dudit profilé de recouvrement (2) étant propres à recevoir des tubes (17) dudit radiateur de refroidissement (19) ;

ledit au moins un canal longitudinal (5) comportant sur sa surface (6) un moyen d'arrêt (8) contre lequel peuvent venir buter lesdits tubes (17) dudit radiateur de refroidissement (19), et lesdites fentes (10) dudit logement (4) étant également propres à recevoir lesdits tubes (17) dudit radiateur de refroidissement (19),

**caractérisée en ce que**

le logement (4) comporte sur sa surface extérieure, à proximité des fentes (10), deux saillies longitudinales (11) opposées.

2. Tubulure selon la revendication 1, **caractérisée en ce que** ledit moyen d'arrêt (8) se présente sous la forme de saillies (8a) opposées sur ladite surface (6) dudit au moins un canal longitudinal (5), lesdites saillies (8a) étant orientées en direction de l'intérieur dudit au moins un canal longitudinal (5) et placées au niveau desdites fentes (10) dudit logement (4).
3. Tubulure selon la revendication 1, **caractérisée en ce que** ledit moyen d'arrêt (8) se présente sous la forme d'encoches (8b) sur ladite surface (6) dudit au moins un canal longitudinal (5), lesdites encoches (8b) étant placées au niveau desdites fentes (10) dudit logement (4) .
4. Tubulure selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la taille desdites fentes (10) dudit logement (4) est au moins égale ou supérieure à la taille desdites fentes (3) dudit profilé de recouvrement (2).
5. Tubulure selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit au moins un canal longitudinal (5) comprend deux canaux (5a, 5b) séparés par un arc de renforcement (7), chacun

desdits canaux (5a, 5b) comportant son propre moyen d'arrêt (8) sur sa surface (6a, 6b).

6. Tubulure selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit profilé de recouvrement (2) est appliqué sur ledit logement (4) de telle sorte qu'une surface (12) dudit logement (4) soit exposée, ladite surface (12) comportant au moins un orifice (13) en communication fluidique avec ledit au moins un canal longitudinal (5) à des fins de raccordement à un circuit extérieur d'agent de refroidissement.
7. Tubulure selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit profilé de recouvrement (2) et ledit logement (10) sont tous deux constitués d'aluminium et/ou ses alliages et sont raccordés l'un à l'autre par brasage.
8. Tubulure selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'elle** est fermée à ses deux extrémités par un obturateur (16).
9. Tubulure selon la revendication 8, **caractérisée en ce que** ledit obturateur (16) est également constitué d'aluminium et/ou ses alliages et est accouplé audit profilé de recouvrement (2) et audit logement (10) également par brasage.
10. Radiateur de refroidissement (19) comprenant une tubulure (1) selon l'une quelconque des revendications 1 à 9.

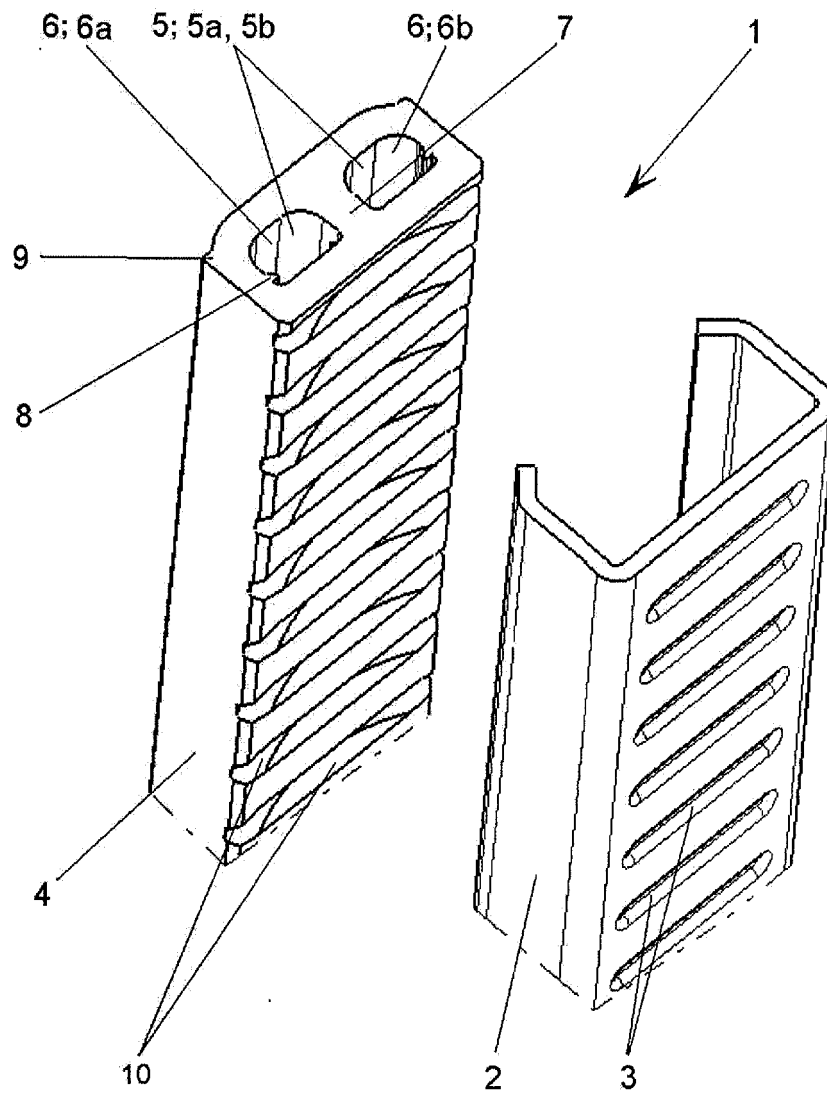


Fig. 1

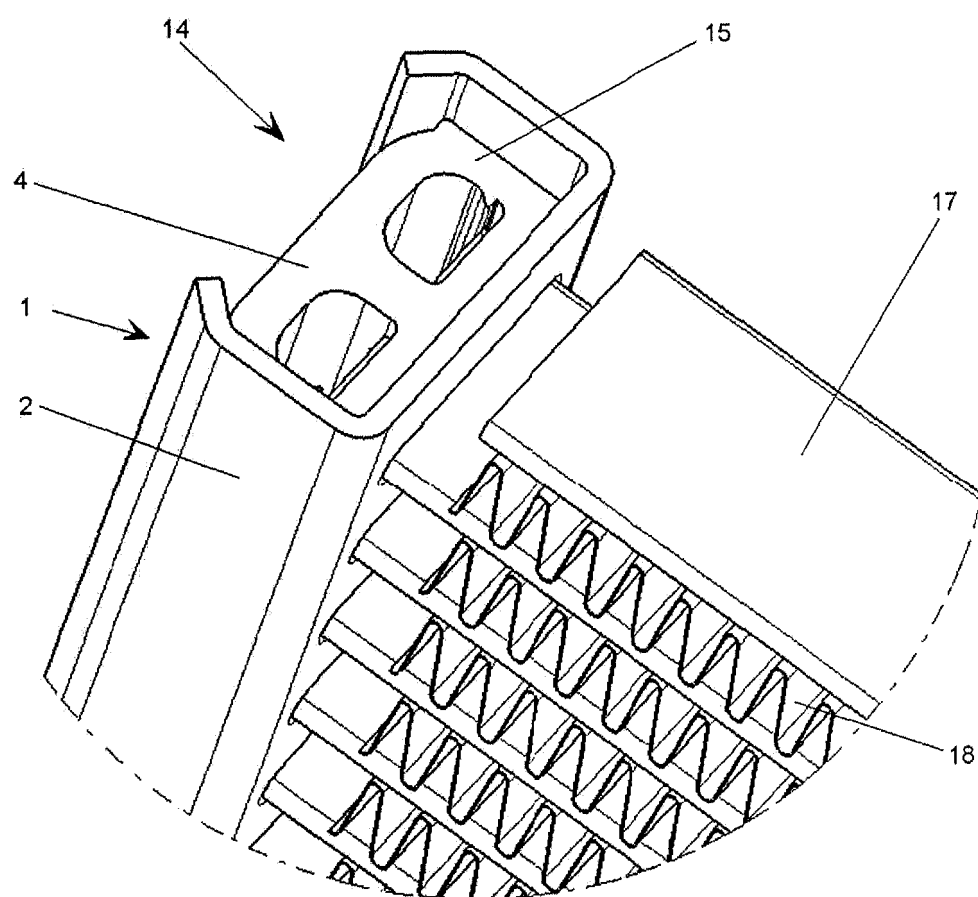


Fig. 2

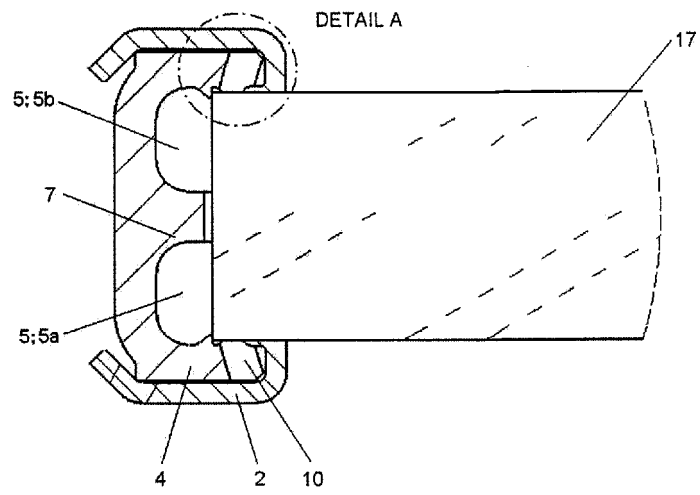


Fig. 3

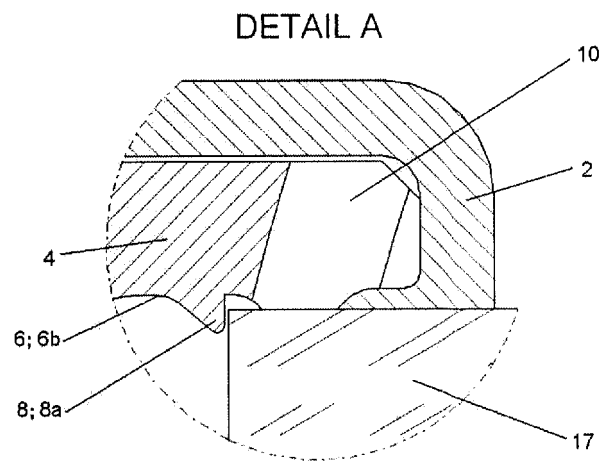


Fig. 4

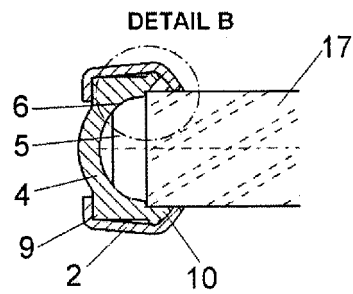


FIG. 5

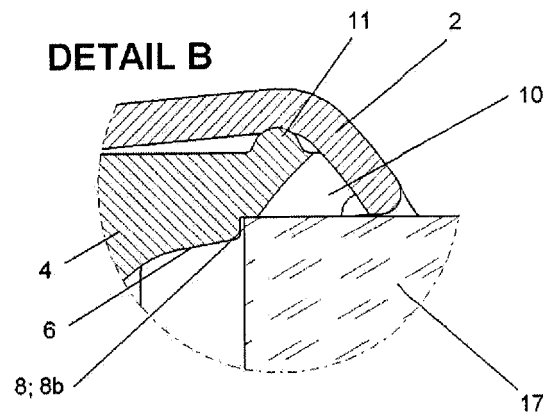


FIG. 6

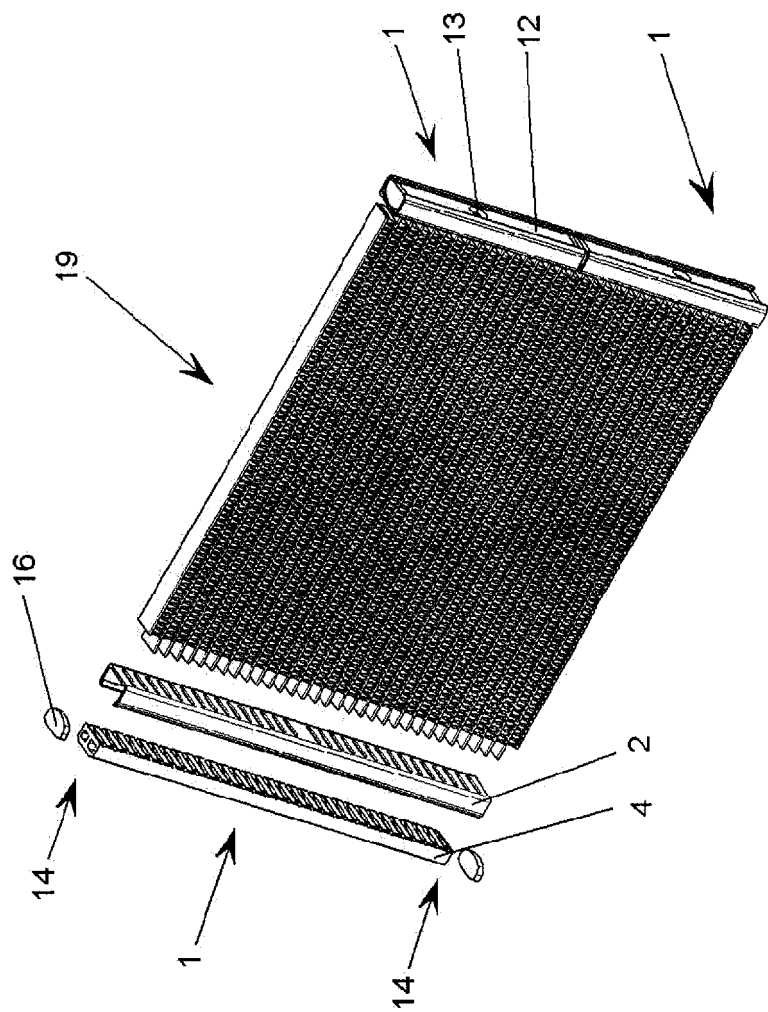


Fig. 7

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- US 20030155109 A1 [0002]
- US 6564863 B1 [0002]
- EP 0586037 A1 [0002]
- WO 2004048875 A1 [0002]
- US 5246066 A [0002]
- US 2003085030 A1 [0002]
- WO 2005121683 A1 [0002]
- WO 2005121683 A [0002]