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(54) **A HEADER-TANK ASSEMBLY**

(57) The object of the invention is, among others, a header- tank assembly (30) comprising: a header (40) comprising slots (41) to receive tubes, a cover (50) configured to be assembled with the header (40) to form a

channel for a fluid, a baffle (60) protruding from the header (40) and forming an end wall of the fluid channel at an end of the header (40), characterised in that the baffle (60) is made integrally with the header (40).

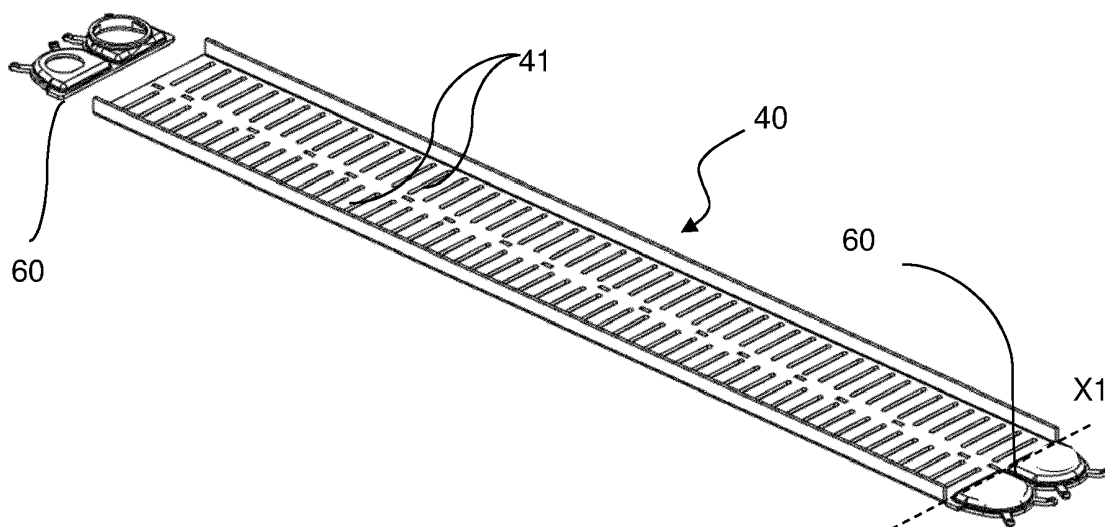


Fig. 5

Description**FIELD OF THE INVENTION**

[0001] The invention relates to a header- tank assembly, in particular to the header- tank assembly for a motor vehicle heat exchanger.

BACKGROUND OF THE INVENTION

[0002] Evaporators look like, and in fact are, similar to radiators, only thicker and smaller in overall size. Like radiators, evaporators consist of a series of internal tubes or flow paths with fins attached to them. Air can pass freely through the fins, just like a radiator. But unlike a radiator, where the internal tubes carry moving engine coolant, the passages in the evaporator carry moving refrigerant.

[0003] In an automotive air conditioning system (further referred to as A/C system), cold, low-pressure liquid refrigerant enters the evaporator. Warm air from the interior of the vehicle passes through the evaporator by action of the blower fan. Since it's a fact of nature that heat always travels from a warmer area to a cooler area, the cooler refrigerant flowing inside the evaporator's absorbs heat from the warm air. At the same time, humidity in the air condenses on the cool evaporator's surface, then eventually drips out of a drain tube to the outside. After the initially warmed refrigerant has completed its path through the evaporator, it moves on to the compressor.

[0004] Known evaporators usually comprise a pair of tubular manifolds located on both ends of the stack of tubes. The manifolds are usually sealed on both ends of the tubular body by, for example, caps which are brazed with the open ends of the manifold. The body comprises slots for receiving the stack of tubes. Alternatively, the manifolds are made of the tank fixed to the header, which comprises slots for receiving tubes. The header and the tank are brazed together forming a channel which is, similarly to tubular manifold, open on both ends. The openings need to be sealed by, for example, caps brazed onto the open ends of the assembly.

[0005] In both aforementioned examples, sealing the open ends of the channel formed by the manifold or the assembly is mandatory in order to provide a fluid-tightness of heat exchanger. This requires very precise and specific tools which would be able to perform a plurality of operations, such as moving the cap towards the opening, positioning the cap in correct location with respect to the opening, providing a fluid-tight connection of the sub-components in the brazing process, and other.

[0006] It would be desired to reduce the number of operations and tools required to form a fluid-tight connection between the sub-components of the heat exchanger. Another aim of the invention is to reduce the time and cost needed for creating at least one unit of the heat exchanger, which would significantly improve feasibility of pro-

duction process.

SUMMARY OF THE INVENTION

[0007] The object of the invention is, among others, a header- tank assembly comprising: a header comprising slots to receive tubes, a cover configured to be assembled with the header to form a channel for a fluid, a baffle protruding from the header and forming an end wall of the fluid channel at an end of the header, characterised in that the baffle is made integrally with the header.

[0008] Preferably, the baffle is connected to the header by the means of a hinge configured to enable the baffle to pivot relatively to the header during the montage of the baffle with the cover.

[0009] Preferably, the hinge protrudes from the header.

[0010] Preferably, the hinge is parallel to a bending line located between the first baffle and the header.

[0011] Preferably, the baffle is perpendicular with respect to the header.

[0012] Preferably, the baffle is made of the same material as the header, for instance in aluminum.

[0013] Preferably, the assembly comprises two baffles forming respectively two end walls of the fluid channel located respectively at two opposite ends of the header.

[0014] Preferably, wherein both baffles are connected to the header via respective hinges.

[0015] Preferably, at least one baffle has an opening to form an inlet or an outlet for the channel.

[0016] Preferably, one baffle is configured to close an end of the fluid channel.

[0017] Preferably, the header comprises two rows of openings for tubes insertion and the assembly has two covers each for one the rows forming two fluid channels.

[0018] Preferably, the header- tank assembly comprises two pairs of baffles, each pair for a cover, the baffles of a pair are configured to be located at the opposite ends of the cover.

[0019] Preferably, two pairs of baffles are assembled with covers and the header to form two channels for the fluid.

[0020] Preferably, the header- tank assembly comprises at least one distribution device located between the baffles.

[0021] Preferably, the baffles comprise at least one locking protrusion configured to immobilize the tank with respect to the header in an outward direction.

[0022] Preferably, the header comprises two parallel rows of slots for receiving tubes.

[0023] Preferably, the header comprises at least one sidewall protruding in perpendicular with respect to the general plane of the header.

[0024] Preferably, the cover is essentially U-shaped.

[0025] Preferably, the cover comprises projections located on at least one terminal portion forming a U-shape, the projections being configured to be introduced into corresponding cavities of the header.

[0026] Preferably, the cover comprises a plurality of U-shaped ribs arcading in series from one end of the cover to the other end thereof.

[0027] Preferably, a heat exchanger comprises at least one header-tank assembly.

BRIEF DESCRIPTION OF DRAWINGS

[0028] Examples of the invention will be apparent from and described in detail with reference to the accompanying drawings, in which:

Fig. 1 shows a schematic view of the heat exchanger comprising single stack of tubes.

Fig. 2 shows a perspective view of header- tank assembly comprising two stacks of tubes.

Fig. 3 shows a perspective view of the first example of the header in the pre- assembly mode.

Fig. 4 shows a perspective view of the first example of the header in the assembled mode.

Fig. 5 shows a perspective view of the second example of the header in the pre-assembly mode.

Fig. 6 shows a perspective view of the second example of the header in the assembled mode.

Fig. 7 shows a perspective view of the third example of the header in the pre- assembly mode.

DETAILED DESCRIPTION OF EMBODIMENTS

[0029] The invention refers to an assembly of mainly two sub-components: a tank and a header. The assembly may be used in particular in an evaporator for motor vehicles. The main sub-components of the evaporator are depicted by Fig. 1 and briefly described by further paragraphs.

[0030] Fig. 1 shows the perspective view of a heat exchanger 1 comprising main sub-components, i.e. plurality of tubes 2 comprising open ends, and a header- tank assemblies 30 located on each side of the open ends of the tubes 2. The header- tank assemblies 30 may comprise minor differences, depending on what role does each one of them play for the heat exchanger 1.

[0031] The heat exchanger 1 enables the heat exchange between two fluids, wherein one fluid (e.g. refrigerant) is encapsulated and circulates within the heat exchanger 1 and the other (e.g. air) flows across the sub-components of the heat exchanger 1.

[0032] The tubes 2 may be in form of elongated, flattened channels stacked between two header- tank assemblies 30, wherein all tubes 2 are oriented in the same direction, so that the fluid (e.g. air) may flow through the stack. The tubes 2 may provide a fluidal communication

between the header- tank assemblies 30. The tubes 2 actively participate in the heat transfer process, so the flattened shape of the tubes 2 not only enables the fluid to flow through the stack, but also increases the heat transfer surface. However, the specific dimensions of the tubes 2 should be calculated respecting the characteristics of other sub-components.

[0033] In order to further facilitate the heat transfer process, the tubes 2 may be interlaced with so-called fins. Fins may be in a form of corrugated sheet of material of relatively high thermal conductivity, e.g. aluminum. The corrugations form ridges which may be in contact with the surface of two adjacent tubes 2. Usually, the fins are initially squeezed to increase the number of possible corrugations and then brazed to the surface of the tubes 2, so that the fins are immobilized with respect to the tubes 2. Depending on the operational mode of the heat exchanger 1, the fins along with the tubes 2 may receive the heat from the fluid e.g. refrigerant circulating through the tubes 2 in order to facilitate cooling it down. This phenomena may be used in heat exchange devices such as radiators or condensers.

[0034] Alternatively, the fins and the tubes 2 receive the heat from the other fluid, e.g. hot air, in order to receive the heat therefrom, so that the other fluid, e.g. hot air, is cooled down. This phenomena may be used in heat exchange devices such as evaporators.

[0035] The tubes 2 may be formed, for example, in the process of extrusion. This process enables to create the tubes 2 comprising one, or many channels within the single tube 2. Alternatively, the tubes 2 may be made of out of single, folded sheet of metal.

[0036] Fig. 1 further shows the heat exchanger 1 comprising two the header- tank assemblies 30, wherein each of the assemblies comprises a single channel for the fluid. This allows to arrange the fluid flow in several ways.

[0037] The first arrangement may include one header- tank assembly 30 comprising an inlet configured to deliver the fluid thereto. The fluid fills completely the channel formed by the header- tank assembly 30 and it is directed into the tubes 2. The tubes 2 are fluidly connected with the other header- tank assembly 30 which comprise an outlet configured to collect the fluid therefrom. Based on the flow pattern, such arrangement of flow may be called I-flow.

[0038] Next arrangement may include one header- tank assembly 30 comprising both inlet and outlet, so it is configured to deliver and collect the fluid from the heat exchanger 1. In order to arrange the fluid flow, the header- tank assemblies 30 may comprise e.g. baffles. The fluid fills partially the channel formed by one header- tank assembly 30 and it is directed into the portion of tubes 2. The tubes 2 are fluidly connected with the other header- tank assembly 30 which may also comprise baffles. The fluid is directed through the channel formed in the other header- tank assembly 30 into the other portion of tubes 2, so that the fluid is reversed. Based on the flow pattern, such arrangement of flow may be called U-flow.

[0039] In the last, but not least arrangement of fluid flow, the heat exchanger 1 may comprise the header-tank assemblies 30 wherein each one of them comprises at least two channels for the fluid. In this arrangement, one header- tank assembly 30 comprises inlet fluidly connected to one of its channels and the outlet fluidly connected with the other channel, and the other header- tank assembly 30 is configured to and the outlet the fluid fills all channels completely, yet the U-turn is formed between the adjacent channels thereof. The heat exchanger 1 comprising upper-mentioned flow arrangement may be used as evaporator for A/C loop. The exemplary arrangement of such header- tank assembly 30 and its sub- components is shown in Figs. 2-7.

[0040] Fig. 2 shows a perspective view of the standalone header- tank assembly 30 comprising two channels for the fluid. The header- tank assembly 30 may comprise, inter alia, a cover 50 which may form one or more than one channels for the fluid. The cover 50 may be in a form of one or more half-cylindrical portions, depending on the desired number of channels to be formed. Further, the cover 50 may be a unitary element or several elements which are connected to each other in such way, to ensure a fluid- tight connection (e.g. by brazing).

[0041] As shown in Fig. 2 the first channel may be formed by one part of the cover 50, wherein the first channel is responsible for delivering fluid to the tubes which are fluidly connected with the header 40. The second channel may be formed by other part of the cover 50, wherein the second channel may be responsible for collecting the fluid from the tubes which are fluidly connected with the header 40. In such embodiment, an inlet 71 which is usually responsible for delivering the fluid from the loop to the heat exchanger 1 may be fluidly connected with the first channel, and an outlet 72 which is usually responsible for collecting the fluid from the heat exchanger 1 may be fluidly connected with the second channel. As further shown in Fig. 2, the inlet 71 and/or the outlet 72 may be fixed to the same baffle 60, however, other deployment of these sub-components is also envisaged, depending on the flow arrangement through the heat exchanger 1.

[0042] The cover 50 is essentially U-shaped and it may comprise projections located on at least one terminal portion forming U-shape. The cover 50 may further comprises a plurality of U-shaped ribs arcading in series from one end of the cover 50 to the other, in order to increase robustness of the tank 50.

[0043] The header 40 may comprise cavities adapted to partially receive the cover 50, wherein the cavities are arranged alternately and in two parallel series between the two rows of slots 41. The projections located on the tank 50 may be configured to be introduced into corresponding cavities of the header 40.

[0044] Figs. 3 and 4 show the perspective view of standalone header 40 which is the sub-component of header-tank assembly 30 described in preceding paragraphs. The header 40 shown in Fig.3 is depicted in pre- assembly mode, i.e. the header 40 is ready to receive the cover 50 and tubes 2 and the baffles 60 are configured in the pre-assembly mode.

bly mode, i.e. the header 40 is ready to receive the cover 50 and tubes 2 and the baffles 60 are configured in the pre-assembly mode.

[0045] The header 40 comprises a plurality of openings adapted to receive tubes 2 which are further referred to as slots 41. The slots 41 may comprise collars to facilitate forming fluid- tight connection with the tubes 2 by increasing the contact area between these sub-components, wherein the shape of the opening of the slot 41 may correspond to the shape of the received tube 2. The slots 41 may be arranged in two parallel rows, as shown in Fig. 3. This enables receiving two stacks of tubes 2 into the same header 40. As shown in Fig. 1, other applications comprising only one row of slots 41 configured to receive one stack of tubes 2 are also envisaged.

[0046] The header 40 may further comprise at least one sidewall extending along the longer side thereof. Preferably, the header 40 may comprise a pair of sidewalls extending along both sides of the header 40. Two sidewalls are substantially parallel with respect to each other and perpendicular to the portion of the header 40 which comprises the slots 41. The sidewalls are formed by bending or stamping of the excessive material located on the longer sides of the header 40 and they are configured to receive the cover 50 in order to form a fluid tight connection between an inner face of the sidewall and an outer face of the cover 50.

[0047] The header 40 may comprise at least one baffle 60 protruding therefrom. In other words, the baffle 60 is made integrally with the header 40. This means that both baffle 60 and the header 40 are made of the same piece of material which is advantageous in terms of reducing production. The header 40 comprises two longer sides and two shorter sides, wherein the baffle 60 may protrude from either of these sides.

[0048] Fig. 3 shows in particular two baffles 60 protruding from both shorter sides of the header 40. Depending on the location of the baffle 60 and its desired function, one baffle 60 may play the same or different role than the other. For example, one baffle 60 may provide a fluidal communication with the loop, and the other one may provide an end wall of the fluid channel at an end of the header 40, as shown in Fig. 3. The baffle 60 adapted to provide a fluidal communication with the loop may comprise openings to receive inlet 71 and/or outlet 72 connection spigots or other components which are able to provide a fluid-tight communication between the loop and the header-tank assembly 30.

[0049] Referring to previous paragraphs, the baffles 60 shown in Fig. 3 are configured in the pre- assembly mode, i.e. they are aligned substantially in parallel with respect to the portion of the header 40 which comprises slots 41. The boundary portion of the header 40 may comprise a bending line (X1) located between the baffle 60 and the header 40. The bending line (X1) determines where the structural deformation of the header 40 and the baffle 60 will occur, when the header 40 is transformed from the pre-assembly mode to assembly mode.

[0050] From the process point of view, the transformation from the pre-assembly mode to assembly mode may be carried in at least two ways. One of the methods may comprise a first action which is aligning the cover 50 with the header 40, second action which is bending the baffle 60 along the bending line (X1), third action which is immobilizing the cover 50 with respect to the header 40 by the means of bending protrusions located on the baffle 60, and fourth action which forming the header- tank assembly 30 by providing a fluid- tight connection between all sub-components, for example by brazing one to another. If one of the baffles 60 is not made integrally with the header 40 it must be placed before the third action, so that the fourth action could be performed for both baffles 60.

[0051] Alternatively, in a second method the second action may be taken before the first action, so that the cover 50 is placed in a space delimited by at least one baffle 60 being already bent to assembly mode and the sidewall of the header 40. Such order of actions may facilitate proper placement of cover 50 onto the header 40 in order to form the header- tank assembly 30.

[0052] Fig. 4 shows the header 40 in the assembly mode, wherein the components such as inlet and outlet 71, 72 spigots, covers 50, and tubes have been omitted for the sake of clarity.

[0053] Fig. 4, similarly to Fig. 3, shows the header 40 comprising two baffles 60 made integrally therewith. The baffles 60 are bent along the bending lines (X1), so that they are aligned substantially perpendicularly with respect to portion of the header 40 which comprises the slots 41. Both bending lines (X1) are located on the shorter sides of the header 40, yet they do not cross the sidewalls thereof. In particular, the bending lines (X1) are adjacent to respective pairs of terminal ends of the sidewalls.

[0054] The baffle 60 may be connected to the header 40 by the means of a hinge 61 configured to enable the baffle 60 to pivot relatively to the header 40 during the montage of the baffle 60 with the cover 50. The term "hinge" should be understood as the portion of the header 40 which is intentionally deformed by e.g. bending, in order to form a structure that will change relative position of the baffle 60 with respect to the header 40 while still providing a fluid- tight connection. The hinge 61 allows the baffle 60 to pivot relatively to the header 40 along the bending line (X1).

[0055] Figs. 5 and 6 show another embodiment of the header- tank assembly 30, wherein the header 40 comprises only one baffle 60 made integrally with the header 40 and the other baffle 60 as a separate sub-component which is configured to be connected with the header 40 and the cover 50 in order to close the channels for the fluid on one end of the header- tank assembly 30.

[0056] Fig. 7 shows the header- tank assembly 30, wherein the header 40 comprises two baffles 60 made integrally with the header 40. In contrast to the embodiments shown in Figs 1-6, the hinge 61 shown in Fig. 7 is

located on one of the sidewalls of the header 40. In particular, both hinges 61 are located between one sidewall of the header 40 and respective baffles 60.

[0057] Alternatively, one hinge 61 may be located on one sidewall of the header 40 and the other hinge 61 may be located on the opposite sidewall of the header 40. The hinge(s) 61 may pivot along the bending line(s) (X1) which may be coplanar with respective sidewalls of the header 40.

[0058] The feature of the hinge 61 located on at least one sidewall of the header 40 allows to reduce the pressure required to bend the baffle 60 relatively to the header 40 in order to form the header- tank assembly 40.

[0059] The variations of the embodiments depicted by Figs 1-7 are allowed. For example, one hinge 61 may be made integral with the sidewall of the header 40 and the other may be made integral with the shorter side thereof. Alternatively, one hinge 61 may be made integral with the sidewall of the header 40 and the other hinge 61 be non-integral with the header 40.

[0060] Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of drawings, the disclosure, and the appended claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to the advantage.

Claims

1. A header- tank assembly (30) comprising:

- a header (40) comprising slots (41) to receive tubes,
- a cover (50) configured to be assembled with the header (40) to form a channel for a fluid,
- a baffle (60) protruding from the header (40) and forming an end wall of the fluid channel at an end of the header (40),

characterised in that

the baffle (60) is made integrally with the header (40).

2. The header- tank assembly (30) according to claim 1, wherein the baffle (60) is connected to the header (40) by the means of a hinge (61) configured to enable the baffle (60) to pivot relatively to the header (40) during the montage of the baffle (60) with the cover (50).
3. The header- tank assembly (30) according to any of the preceding claims, wherein the hinge (40) protrudes from the header (40).
4. The header- tank assembly (30) according to claim 3, wherein the hinge (40) is parallel to a bending line

(X1) located between the first baffle (60) and the header (40). bly (30).

5. The header- tank assembly (30) according to any of the preceding claims, wherein the baffle (60) is perpendicular with respect to the header (40). 5
6. The header- tank assembly (30) according to all preceding claims, wherein the baffle (60) is made of the same material as the header (40), for instance in aluminum. 10
7. The header- tank assembly (30) according to any of the preceding claims, wherein the assembly (40) comprises two baffles (60) forming respectively two end walls of the fluid channel located respectively at two opposite ends of the header (40). 15
8. The header- tank assembly (30) according to claim 7, wherein both baffles (60) are connected to the header (40) via respective hinges (61). 20
9. The header- tank assembly (30) according to any of the preceding claims, wherein at least one baffle (60) has an opening to form an inlet (71) or an outlet (72) for the channel. 25
10. The header- tank assembly (30) according to claims 1-8, wherein one baffle (60) is configured to close an end of the fluid channel. 30
11. The header- tank assembly (30) according to any of the preceding claims, wherein the header (40) comprises at least one side wall protruding in perpendicular with respect to the general plane of the header (40), the side wall further comprising notches configured to immobilize at least one side of the cover (50). 35
12. The header- tank assembly (30) according to any of the preceding claims, wherein the header- tank assembly (30) comprises two pairs of baffles (60), each pair for a cover (50), the baffles (60) of a pair being configured to be located on the opposite ends of the cover (50). 40 45
13. The header- tank assembly (30) according to claim 12, wherein two pairs of baffles (60) are assembled with covers (10,11) and the header (40) to form two channels for the fluid. 50
14. The header- tank assembly (30) according to any of the preceding claims, wherein the header (40) comprises at least one distribution device located between the baffles (60). 55
15. A heat exchanger (1) according to all preceding claims, comprising at least one header-tank assem-

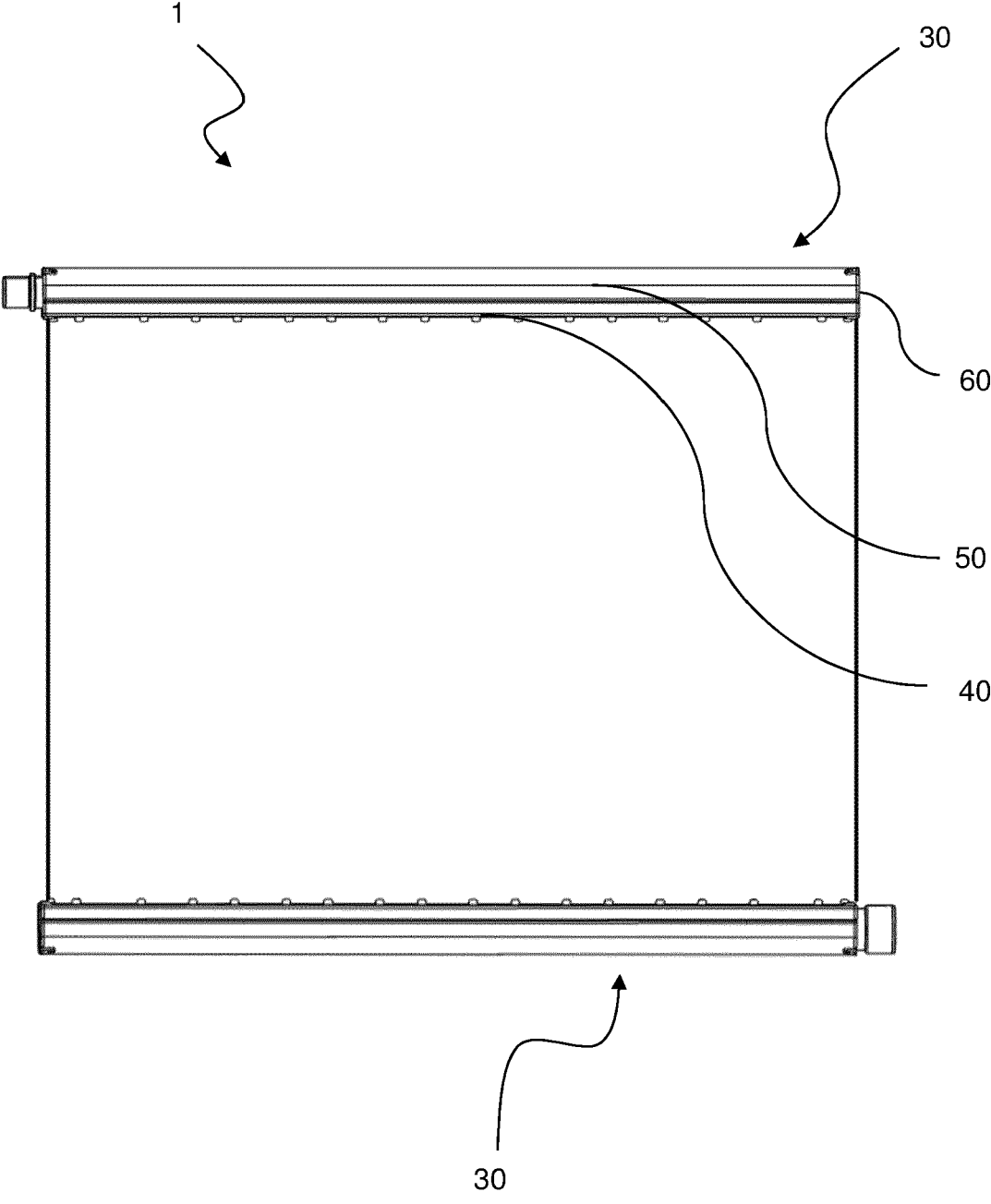


Fig. 1

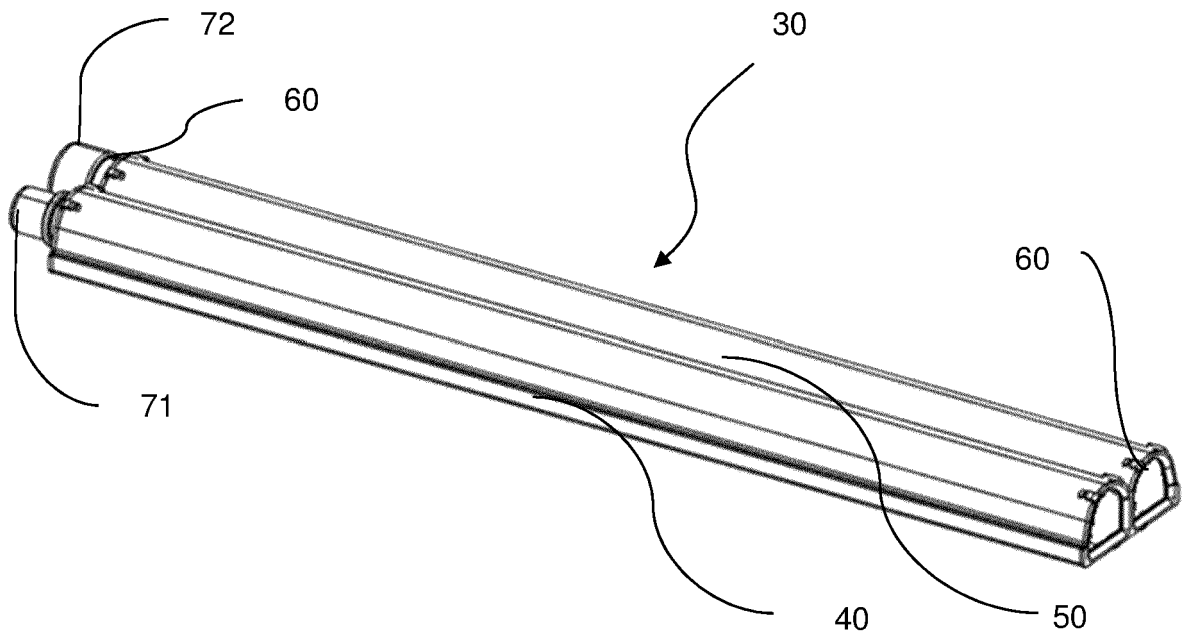


Fig. 2

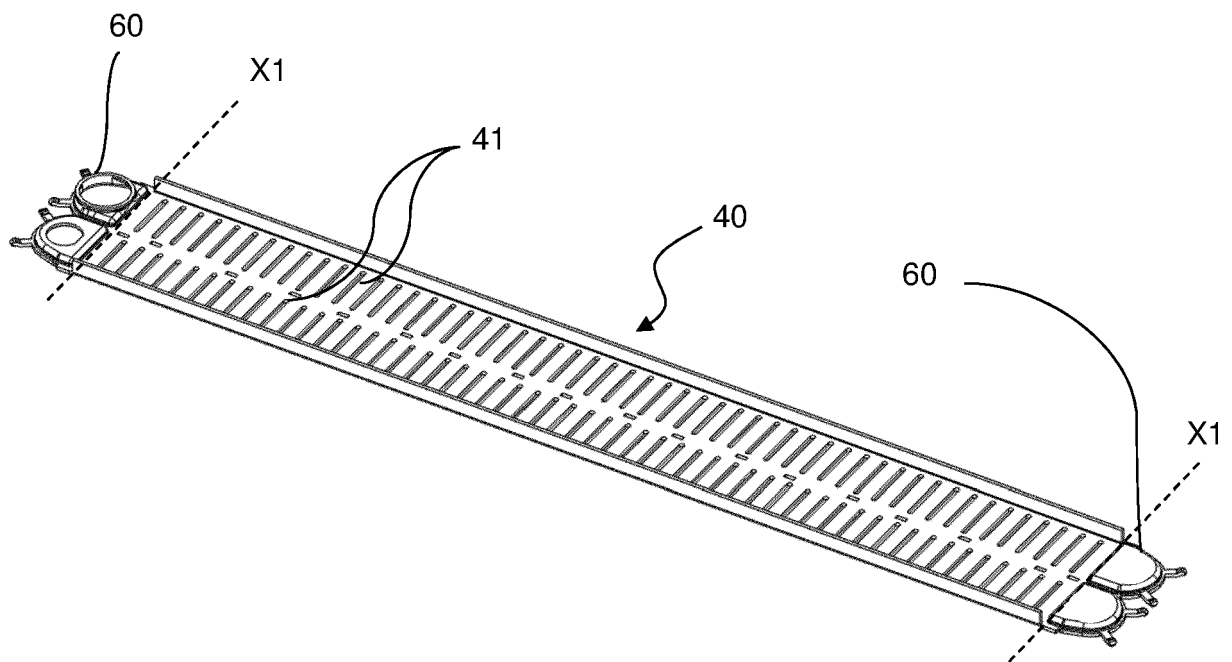


Fig. 3

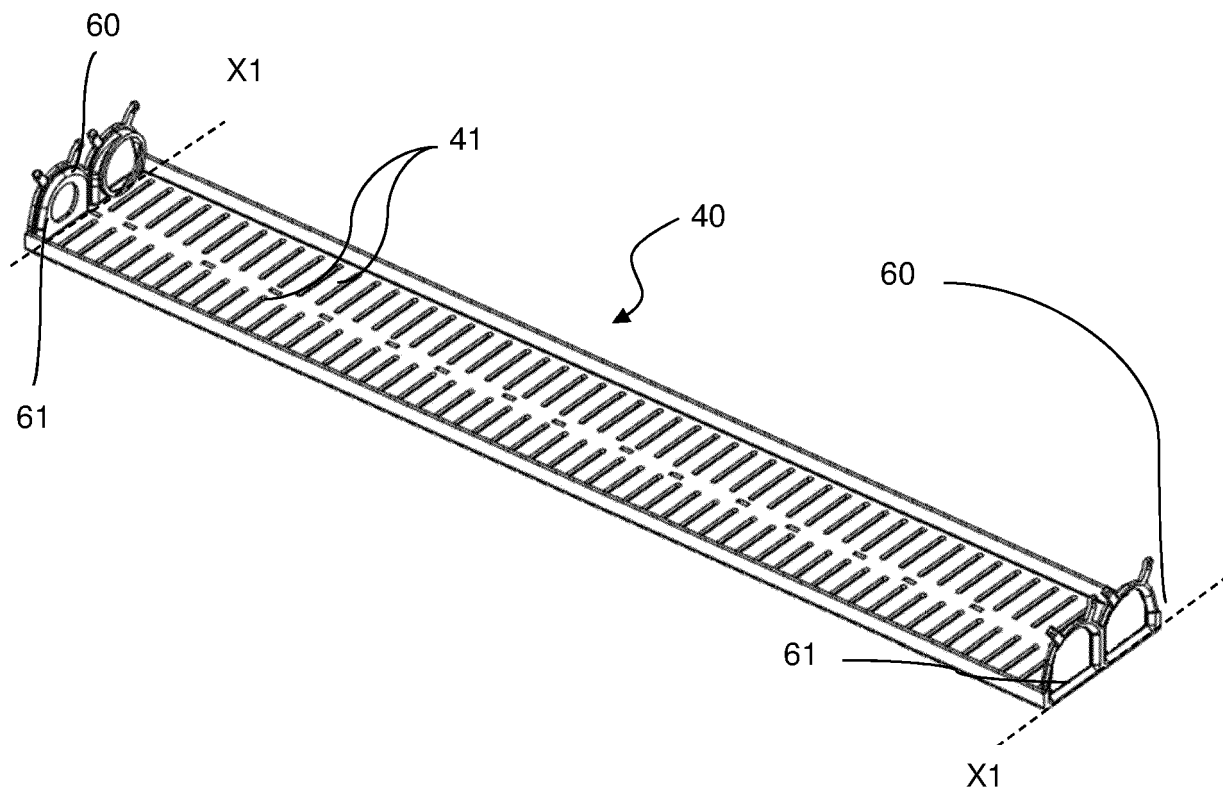


Fig. 4

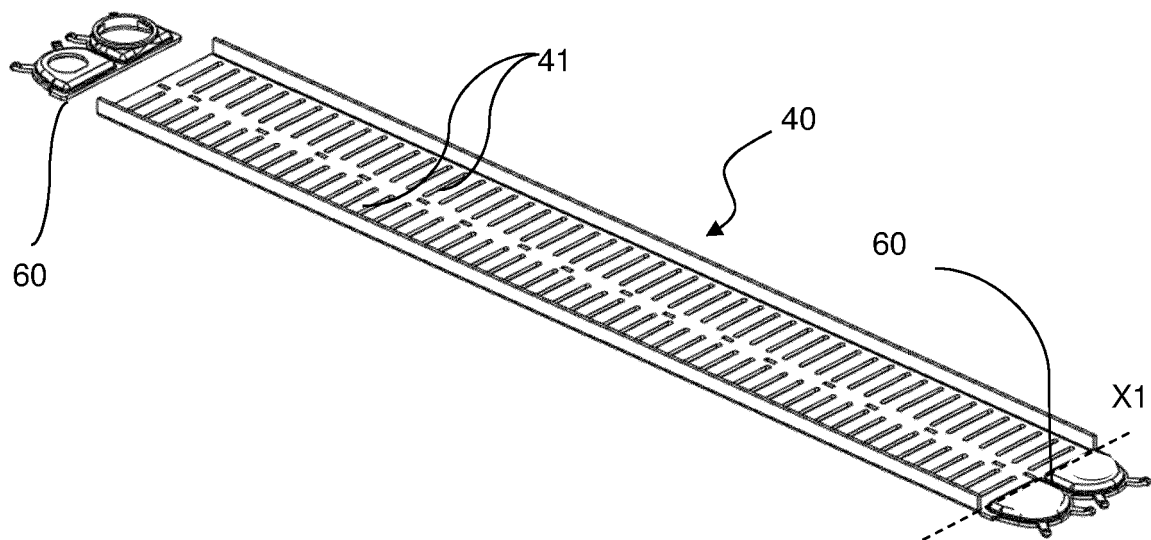


Fig. 5

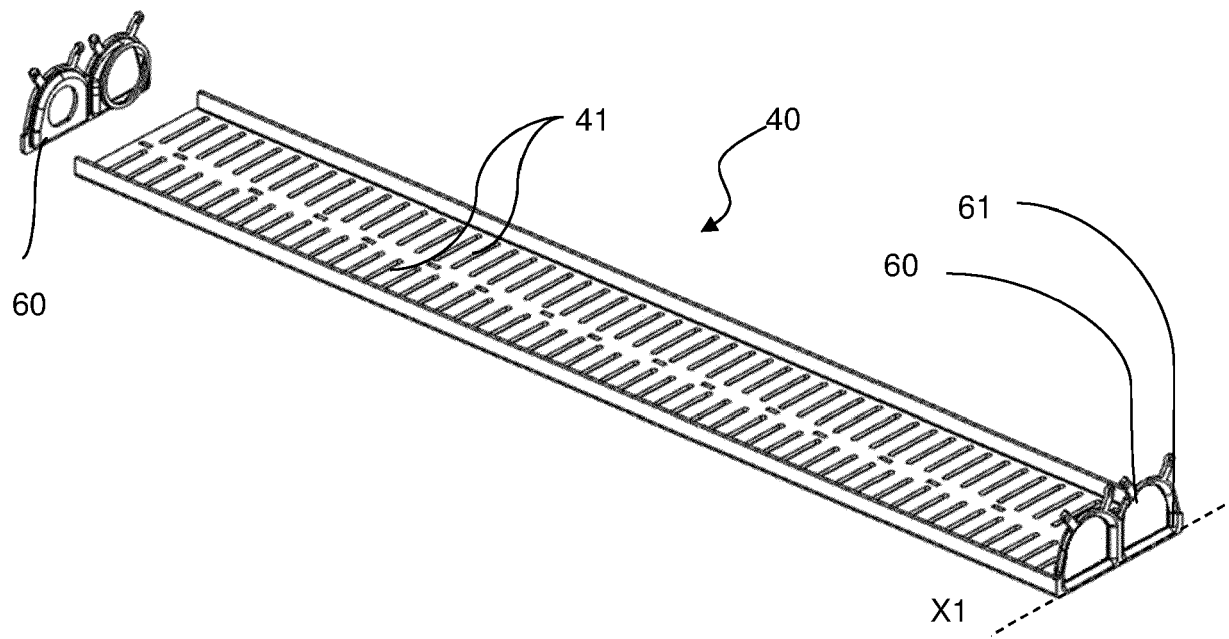


Fig. 6

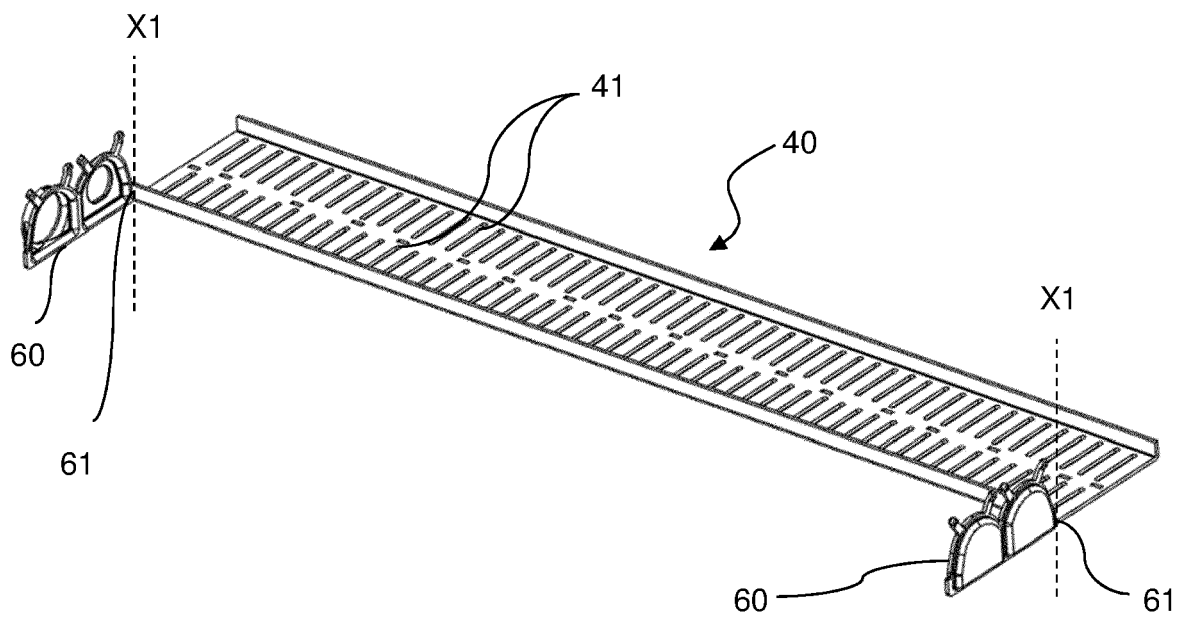


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 20 18 7411

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F28F
Place of search		Date of completion of the search	Examiner
Munich		19 November 2020	Martínez Rico, Celia
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 20 18 7411

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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