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(54) **HEAT EXCHANGER FOR A HEATING, VENTILATION AND/OR AIR-CONDITIONING SYSTEM OF A VEHICLE**

(57) The present invention concerns a heat exchanger for a heating, ventilation and/or air-conditioning system of a vehicle, the heat exchanger being adapted to operate a heat exchange between a refrigerant fluid and an air flow, the heat exchanger comprising at least one heat exchange area wherein the heat exchange is performed and at least two headers (210), a first header (210) being arranged at a first side of the heat exchange area, a second header being arranged at a second side of the heat exchange area opposed to the first side with respect to a direction of circulation of the refrigerant fluid in the heat exchange area, at least the first header (210) comprising one collecting plate (211) and one cover (212) which divides the first header (210) into one admission chamber (213) adapted to distribute the refrigerant fluid in the heat exchange area and one exit chamber (214) adapted to collect the refrigerant fluid that leaves the heat exchange area, at least one distribution device (230) being arranged in the admission chamber (213), said distribution device (230) extending all along a longitudinal dimension of the admission chamber (213).

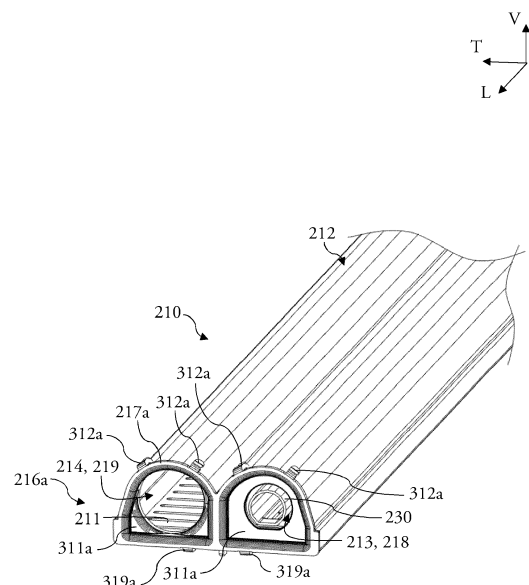


FIG. 3

Description

[0001] The present invention relates to the domain of the heating, ventilation and/or air-conditioning systems adapted to be received in vehicles. More precisely, the invention relates to heat exchanger which are part of such heating, ventilation and/or air-conditioning systems.

[0002] Vehicles comprise, traditionally, at least one thermal treatment system adapted to thermally treat the propulsion system of the vehicle and/or the passenger compartment of such vehicle. Such thermal treatment system usually comprises at least one refrigerant circuit which comprises at least one first heat exchanger adapted to operate a heat exchange between the refrigerant and an air flow and one second heat exchanger adapted to operate another heat exchange between the refrigerant and another airflow. The second heat exchanger can for instance be received in a heating, ventilation and/or air-conditioning system which is adapted to send the second airflow in a passenger compartment of the vehicle, once that the heat exchange in the second heat exchanger has been performed, in order to thermally treat such passenger compartment.

[0003] The heat exchangers currently used in such thermal treatment system are not as efficient as they could be. Especially, their current structures tend toward causing important load losses of the refrigerant fluid which result in a reduction of the global efficiency of the concerned heat exchanger and, as a consequence, of the thermal treatment system comprising such heat exchanger.

[0004] The present invention aims to solve at least this issue by providing a heat exchanger in which the refrigerant fluid is more evenly distributed in the heat exchanger, thus reducing the load losses and improving the heat exchange operated between this refrigerant fluid and the air flow.

[0005] An object of the invention concerns a heat exchanger for a thermal treatment system of a vehicle, the heat exchanger being adapted to operate a heat exchange between a refrigerant fluid and an air flow, the heat exchanger comprising at least one heat exchange area wherein the heat exchange is performed and at least two headers, a first header being arranged at a first side of the heat exchange area, a second header being arranged at a second side of the heat exchange area opposed to the first side with respect to a direction of circulation of the refrigerant fluid in the heat exchange area, at least the first header comprising one collecting plate and one cover which divides the first header into one admission chamber adapted to distribute the refrigerant fluid in the heat exchange area and one exit chamber adapted to collect the refrigerant fluid that leaves the heat exchange area, at least one distribution device being arranged in the admission chamber, said distribution device extending all along a longitudinal dimension of the admission chamber. We here mean by "longitudinal dimension of the admission chamber" a dimension meas-

ured along a main extension axis of this admission chamber. The distribution device is adapted to distribute, evenly, the refrigerant fluid which enters the admission chamber all across the heat exchange area of the heat exchanger, thus improving the efficiency of the heat exchange performed within such heat exchange area.

[0006] According to an embodiment of the invention, the distribution device can comprise at least one perforated pipe comprising a plurality of holes. According to an aspect of this embodiment, the perforated pipe is advantageously arranged in such a way that the holes face the collecting plate of the first header. According to the invention, the collecting plate forms the part of the first header which is arranged at the interface between the heat exchanger area and the chambers formed in the first header. Advantageously, the invention thus uses gravity to ensure the even distribution of the refrigerant fluid in the heat exchange area.

[0007] According to an aspect of the invention, at least one through-cavity is arranged in the collecting plate of the first header, this at least one through-cavity being adapted to receive a tooth formed on the cover of the first header. Advantageously, a plurality of through-cavities is formed in the collecting plate of the first header, each of these through-cavities being adapted to receive one tooth formed on the cover of the first header. As detailed later, the cooperation between the teeth and the corresponding through-cavities is used in a pre-assembly process.

[0008] According to another aspect of the invention, the cover of the first header comprises at least one first part defining the admission chamber and at least one second part defining the exit chamber, the first part and the second part sharing at least one partition which contributes to define both the admission chamber and the exit chamber, the tooth adapted to be received in the at least one through-cavity being arranged on the partition of the cover. Especially, the at least one tooth is arranged on a free-end of said partition, which faces the collecting plate of the first header. Advantageously, a plurality of teeth can be formed in the cover's partition.

[0009] According to the invention, the first header extends between a first end and a second end, the first end being formed by a first closing wall and the second end being formed by a second closing wall, the first closing wall comprising at least a first orifice which comes out on the admission chamber and at least a second orifice which comes out on the exit chamber. Advantageously, the second closing wall can comprise at least one centring element adapted to centre the distribution device in the admission chamber. Such centring element therefore also contributes to ensure the even distribution of the refrigerant fluid in the heat exchange area.

[0010] Optionally, the first closing wall and/or the second closing wall can comprise at least one elastic tab adapted to maintain the position of the cover. We here mean by "elastic tab" a tab adapted to return to its original position after having been mechanically deformed. As

earlier mentioned, the cover can be pre-assembled with the collecting plate thanks to the cooperation between the teeth carried by the cover and the through-cavities formed on the collecting plate. While positioning this cover on the collecting plate, the at least one elastic tab is moved away. Once the cover positioned, the elastic tab returns to its original position and it rests against said cover, thus maintaining its position. Optionally, the first closing wall and/or the second closing wall can comprise at least one elastic strip adapted to maintain the position of the collecting plate. Such elastic strip is for instance arranged on a free-end of the concerned closing wall which faces the heat exchange area and rests against a bottom of the collecting plate, that is to say a part of this collecting plate which faces the heat exchange area. To put it another way, once the first header is assembled, the collecting plate and the cover cooperates thanks to the teeth and the through-cavities earlier described while the at least one elastic tab and the at least one elastic strip carried by the first and/or the second closing wall(s) maintain the positions, respectively, of the cover and of the collecting plate.

[0011] According to an aspect of the invention, the second header comprises at least one collecting plate and one lid which divides the second header into one collecting chamber adapted to collect the refrigerant fluid that leaves the heat exchange area and one distributing chamber adapted to distribute the refrigerant fluid in the heat exchange area, and at least one passage of refrigerant fluid is arranged between the collecting chamber and the distributing chamber. To put it another way, the refrigerant fluid that exits a first portion of the heat exchange area reaches the collecting chamber from which it flows to the distributing chamber which is adapted to distribute such refrigerant fluid in a second portion of said heat exchange area. Advantageously, those two chambers thus ensure that the first portion of the heat exchange area is always full of refrigerant fluid.

[0012] According to an aspect of the invention, the lid comprises at least one first portion which defines, at least partially, the collecting chamber and at least one second portion which defines, at least partially, the distributing chamber, the first portion et the second portion sharing at least one wall which contributes to define both the collecting chamber and the distributing chamber, at least on passage of refrigerant fluid being formed in the wall. Advantageously, a plurality of passages can be arranged in the wall.

[0013] According to the invention, the heat exchange area comprises a plurality of tubes and a plurality of fins, each fin being arranged between two adjacent tubes and each tube extends between the first header and the second header. For instance, the tubes can be stacked along two parallel directions, defining a first row of tubes and a second row of tubes, the tubes of the first row extending between the admission chamber of the first header and the collecting chamber of the second header and the tubes of the second row extending between the distrib-

uting chamber of the second header and the exit chamber of the first header. In other words, the collecting chamber of the second header is adapted to collect the refrigerant fluid that exits the first row of tubes while the distributing chamber of said second header is adapted to distribute refrigerant fluid in the second row of tubes. According to an embodiment of the invention, one passage of refrigerant fluid can be arranged every two tubes.

[0014] As a result, it is understood that the refrigerant fluid first enters the admission chamber of the first header, and especially the distributing device arranged in this admission chamber. This distribution device is configured to distribute, evenly, the refrigerant fluid in the tubes of the first row of tubes of the heat exchange area, wherein a heat exchange is performed between the refrigerant fluid and the air flow. The refrigerant fluid that exits this first row of tubes then reaches the collecting chamber of the second header. Thanks to the at least one passage of refrigerant fluid arranged in the second header, the refrigerant fluid accumulated in the collecting chamber then reaches the distributing chamber from which it is sent in the tubes of the second row of tubes of the heat exchange area wherein the refrigerant fluid keeps exchanging heat with the air flow. Finally, the refrigerant fluid exits the second row of tubes and reaches the exit chamber of the first header from which it can then exit the heat exchanger. In other words, it is understood that the refrigerant fluid circulates in the heat exchange area following a U-shaped direction of circulation, a first branch of this U-shape being formed by the first row of tubes, a second branch of this U-shape being formed by the second row of tubes and a base of this U-shape being formed by the second header.

[0015] According to an embodiment of the invention, one passage of refrigerant fluid is arranged every two tubes.

[0016] Advantageously, at least the collecting plate of the first header can comprise at least one series of slots, each adapted to receive at least one of the tubes forming the heat exchange area. Optionally, the collecting plate of the first header can comprise two rows of slots, a first row of slots being adapted to receive the tubes of the first row of tubes and a second row of slots being adapted to receive the tubes of the second row of tubes. According to an embodiment of the invention, the collecting plate of the second header is structurally identical to the collecting plate of the first header.

[0017] The invention also concerns a heating, ventilation and/or air-conditioning system for a vehicle, comprising at least one heat exchanger as mentioned above.

[0018] Other details, features and advantages of the invention are to be described in the detailed description of the invention given hereunder in relation with different views of the invention illustrated on the following figures:

[Fig. 1] is a schematic representation of a thermal treatment system comprising at least one heat exchanger according to the invention ;

[Fig. 2] is a perspective view of the heat exchanger according to the invention ;

[Fig. 3] is a perspective view of a first half of a first header of the heat exchanger according to the invention ;

[Fig. 4] is a perspective view of a second half of the first header illustrated on figure 3 ;

[Fig. 5] is a perspective view of the first header of the heat exchanger of the invention illustrated deprived of its cover ;

[Fig. 6] is a perspective view of the cover of the first header of the heat exchanger of the invention ;

[Fig. 7] is a perspective view of a second header of the heat exchanger of the invention represented without its lid.

[0019] In the following specification, the orientations given are related to the orientation of a heat exchanger 200 according to the invention. On the figures, an L, V, T coordinate system is illustrated in which a longitudinal direction is parallel to a longitudinal axis L, a vertical direction is parallel to a vertical axis V and a transversal direction is parallel to a transversal axis T. According to the examples given, the longitudinal axis L is perpendicular to both the vertical axis V and to the transversal axis T, the vertical axis V is perpendicular to both the longitudinal axis L and to the transversal axis T and the transversal axis T is perpendicular to both the longitudinal axis L and to the vertical axis V. For instance, once the heat exchanger 200 of the invention is implemented in a vehicle, the vertical axis V corresponds to a direction perpendicular to the road on which such vehicle is adapted to run.

[0020] Figure 1 illustrates, schematically, a thermal treatment system 100 according to the invention. As shown, such thermal treatment system 100 comprises at least one refrigerant fluid circuit 110 which comprises at least one heat exchanger 200 according to the invention, at least one circulation device 111 adapted to circulate the refrigerant fluid and at least one condenser 112. According to the illustrated example, the refrigerant fluid RF that circulates in the refrigerant fluid circuit 110 is adapted to carry and to exchange heat by changing its state. For instance, the refrigerant fluid RF can be chosen among 1234YF, R134a or CO₂.

[0021] As a result, the circulation device 111 adapted to circulate the refrigerant fluid is a compression device and the refrigerant fluid circuit 110 also comprises at least one expansion device 113. The compression device 111 is adapted to compress the refrigerant fluid RF before it reaches the condenser 112. Within the condenser 112, the refrigerant fluid RF is adapted to exchange heat with an air flow which crosses the condenser 112 in order to

cool and liquefy the refrigerant fluid passing through such condenser 112. In other words, the refrigerant fluid is adapted to give calories to the air flow which crosses said condenser 112. The refrigerant fluid RF thus exits the condenser 112 in a liquid state and goes through the expansion device 113 in which its pressure is reduced. The cooled liquid refrigerant fluid RF then reaches the heat exchanger 200 in which a heat exchange between the refrigerant fluid RF and another air flow AF is performed. As a result, the refrigerant fluid's temperature raises until the refrigerant fluid evaporates. To put it another way, the heat exchanger 200 of the invention is an evaporator with respect to the refrigerant fluid RF. For instance, the heat exchanger 200 of the invention can be arranged in a heating, ventilation and air-conditioning system 300 and the airflow AF with which the heat exchange is performed in the heat exchanger 200 can be sent to a passenger compartment of the vehicle in order to thermally treat this passenger compartment. The refrigerant fluid RF exits the heat exchanger 200 in a gaseous state and then reaches again the compression device 111 to start a new thermodynamic cycle.

[0022] According to another embodiment not illustrated here, the heat exchanger 200 according to the invention can be used as a condenser with respect to the refrigerant fluid while the condenser can be used as an evaporator, depending on the thermal needs of the vehicle, and especially in the passenger compartment.

[0023] Figure 2 is a perspective view of the heat exchanger 200 according to the invention. This heat exchanger 200 comprises at least one heat exchange area 201 through which the refrigerant fluid is adapted to circulate. The heat exchanger 200 also comprises at least one first header 210 and one second header 220 distributed on two opposed sides of the heat exchange area 201, those sides being opposed along a main direction of circulation of the refrigerant fluid along the heat exchange area 201. According to the illustrated embodiment, the refrigerant fluid circulates parallel to the vertical axis V.

[0024] The first header 210 comprises at least one collecting plate 211 and at least one cover 212 which defines at least two compartments in the first header 210 : one admission chamber 213 adapted to distribute the refrigerant fluid through the heat exchange area 201 and one exit chamber 214 adapted to collect the refrigerant fluid that leaves the heat exchange area 201 once the heat exchange has been performed. Thus, the admission chamber 213 and the exit chamber 214 are both adapted to be hydraulically connected to the refrigerant fluid circuit earlier describes thanks to hydraulic connectors 215. As described hereunder, at least one distribution device is received in the admission chamber 213, such distribution device being adapted to distribute the refrigerant fluid in the heat exchange area 201.

[0025] The second header 220 comprises at least one collecting plate 221 and at least one lid 222 which divides the second header 220 into at least one collecting cham-

ber 223 and one distributing chamber 224. At least one passage of refrigerant fluid is arranged between the collecting chamber 223 and the distributing chamber 224, such passage of refrigerant fluid being adapted to allow the circulation of refrigerant fluid between the collecting chamber 223 and the distributing chamber 224. The functions of those chambers 223, 224 are detailed hereafter.

[0026] The heat exchange area 201 is more particularly formed by a plurality of tubes 202 aligned one after the other along a direction parallel to the longitudinal axis L and by a plurality of fins - not shown on figure 2 -, each of the fins being arranged between two adjacent tubes 202. As illustrated, each tube 202 extends between the first header 210 and the second header 220. According to the illustrated embodiment, the tubes 202 are distributed along two rows, the tubes 202 of a first row 203 extending between the admission chamber 213 of the first header 210 and the collecting chamber 223 of the second header 220 and the tubes 202 of a second row 204 extending between the exit chamber 214 of the first header 210 and the distributing chamber 224 of the second header 220. According to a non-illustrated embodiment, the heat exchange area can comprise only a unique row of tubes, each tube thus comprising a wall which divides it into two conduits, a first conduit extending between the admission chamber of the first header and the collecting chamber of the second header and a second conduit extending between the exit chamber of the first header and the distributing chamber of the second header.

[0027] The refrigerant fluid enters the heat exchanger 200 through the hydraulic connector 215 connected to the admission chamber 213 of the first header 210. Especially, the refrigerant fluid reaches the distribution device which is arranged in this admission chamber 213 and which is adapted to distribute the refrigerant fluid in the heat exchange area 201, and particularly, in the tubes 201 forming the first row 203 of tubes 202. Along its circulation in the tubes 202 of the first row 203, the refrigerant fluid exchanges heat with the airflow which enters the heat exchanger 200, and then reaches the collecting chamber 223 of the second header 220. As a result, the refrigerant fluid circulating in the collecting chamber 223 is warmer than the refrigerant fluid circulating in the admission chamber 213. As mentioned above, at least one passage is arranged between the collecting chamber 223 and the distributing chamber 224 of the second header 220. The refrigerant fluid circulating in the collecting chamber 223 thus reaches the distributing chamber 224 from which it is distributed in the tubes 202 forming the second row 204. Along this second row 204 of tubes 202, the refrigerant fluid keeps exchanging heat with the air flow and therefore reaches the exit chamber 214 of the first header 210 in a gaseous state. The gaseous refrigerant fluid finally exits the heat exchanger 200 through the hydraulic connector 215 connected to the exit chamber 214 and start a new thermodynamic cycle as described with reference to figure 1.

[0028] With reference to figures 3 to 6 we are now going to detail the structure and the function of the first header 210. Figure 3 is a perspective view of a first half of the first header 210, figure 4 is a perspective view of a second half of this first header 210, figure 5 is a partial view, in perspective, of the first header 210 illustrated without its cover 212 and figure 6 is a perspective view of the cover 212 of the first header 210.

[0029] As illustrated, the first header 210 mostly extends parallel to the longitudinal axis L, between a first end 216a - shown on figure 3 - and a second end 216b - shown on figure 4. Especially, the first end 216a is formed by a first closing wall 217a shown on figure 3 and the second end 216b is formed by a second closing wall 217b shown on figure 4.

[0030] As represented on figure 3, at least two orifices 218, 219 are formed in the first closing wall 217a, a first orifice 218 coming out on the admission chamber 213 and a second orifice 219 coming out on the exit chamber 214. As understandable from figure 2, the first orifice 218 is adapted to receive a first hydraulic connector 215 and the second orifice 219 is adapted to receive a second hydraulic connector 215, both those hydraulic connectors 215 being adapted to be connected to the refrigerant fluid circuit earlier described. More precisely, the first hydraulic connector is adapted to be connected to the distribution device 230 received in the admission chamber 213.

[0031] As represented on figure 4, at least one centring element 310 is formed on the second closing wall 217b, and especially on a part of this second closing wall 217b which contributes to define the admission chamber 213. As illustrated on figure 5, this centring element 310 is adapted to receive, and to centre, the distributing device 230. According to the embodiment illustrated on figure 3, two centring elements 310 are formed on the second closing wall 217b, one centring element 310 being arranged in order to face one of the chambers 213, 214 of the first header 210. This arrangement permits to use the same second closing wall 217b, regardless the position of the respective chambers 213, 214 of the first header 210.

[0032] The closing walls 217a, 217b also respectively comprise at least one flat portion 311a, 311b at least partially received in the concerned chamber 213, 214. Those flat portions 311a, 311b are configured to ensure the sealing of said chambers 213, 214.

[0033] In order to maintain the cover 212 in position, the closing walls 217a, 217b comprise, respectively, at least one elastic tab 312a, 312b. We here mean by "elastic tab" a tab configured to return to its original position after being subjected to a mechanical deformation. Thus, those elastic tabs 312a, 312b are moved away in order to position the cover 212 and then rest against said cover 212, therefore maintaining it in the desired position. According to the illustrated embodiment, each closing wall 217a, 217b comprises at least four of these elastic tabs 312a, 312b, two of them being arranged on the admission

chamber's side and the other two on the exit chamber's side.

[0034] Additionally, the closing walls 217a, 217b comprise at least one elastic strip 319a, 319b adapted to rest against the collecting plate 211, and especially against a bottom of this collecting plate 211, that is to say against a part of this collecting plate 211 which faces the second header. According to the illustrated embodiment, each of the closing wall 217a, 217b comprises two of these elastic strips 319a, 319b, one arranged on the admission chamber's side and the other on the exit chamber's side.

[0035] As illustrated on figure 5, the distribution device 230 extends all along a longitudinal dimension of the admission chamber, that is to say that this distribution device 230 extends between the first closing wall 217a and the second closing wall 217b. Especially, a first longitudinal end 231 of the distribution device 230 is received, at least partially, in the first orifice 218 and a second longitudinal end 232 of this distribution device 230 is received in one of the centring elements 310 of the second closing wall 217b. According to the illustrated embodiment, the distribution device 230 is in the form of a perforated pipe 233, that is to say a pipe 233 in which holes 234 are formed. Those holes 234 form the part of the distribution device 230 through which the refrigerant fluid exit said distribution device 230 in order to reach the tubes forming the heat exchange area. As such, they are advantageously arranged in a portion of the pipe 233 which faces the collecting plate 211.

[0036] In order to ensure the correct positioning of those holes 234, and more generally of the pipe 233 in which those holes 234 are formed, at least the first longitudinal end 231 of the perforated pipe 233 comprises a flat part 235. This flat part 235 thus permits to position the pipe 233 with the correct orientation and, also, permits to maintain the position of such pipe 233 before brazing it to the closing walls 217a, 217b. To put it another way, this flat part 235 has at least a function of pre-assembly but also plays the role of a poka-yoke, that is to say that it avoids mistakes that could occur during the assembly.

[0037] The collecting plate 211 contributes to define both the admission chamber and the exit chamber of the first header. As earlier mentioned, the heat exchange area comprises at least two rows of tubes which each extend between the first header and the second header. Especially, each of the tubes is hydraulically connected to the first header and to the second header. In order to allow this hydraulic connection, several slots 313 are formed in the collecting plate 211, each of those slots 313 being adapted to receive one of the tubes. Obviously, as there are two rows of tubes forming the heat exchange area, there are two rows 313a, 313b of slots 313 formed in the collecting plate 211. Between those rows 313a, 313b, we note that a series of through-cavities 314 are formed. Those through-cavities 314 are adapted to receive corresponding teeth arranged on the cover.

[0038] Those teeth are for instance illustrated on figure 6 which is a perspective view of the cover 212 represent-

ed alone. This cover 212 thus presents at least one first part 315 and at least one second part 316 which have identical shapes. Especially, those parts 315, 316 each present a U-shaped cross-section, the first part 315 participating in defining the admission chamber and the second part 316 participating in defining the exit chamber. As shown, the first part 315 and the second part 316 of this cover 212 share at least one partition 317 which aims to actually divide the first header into the admission chamber and the exit chamber. Advantageously, the teeth 318 adapted to be received in the through-cavities arranged in the collecting plate are formed on this shared partition 317. Those teeth 318 are more particularly formed on a free-end of this partition 317 turned toward the collecting plate. It is understood that the shape of the cover 212 described here is only an example of a way to execute the invention but does not restrict this invention and that other shapes could be chosen without departing from the scope of the invention.

[0039] According to the illustrated embodiment, the cover 212 is made as a single piece, that is to say to it is not possible to separate the first part 315 and the second part 316 without damaging at least one of them. Of course, the first part 315 and the second part 316 could be realized separately and then assembled by any known way, for instance glued to each other, within the scope of the invention.

[0040] Now referring to figure 7, we are going to describe the second header 220. Figure 7 is a perspective view of this second header 220 represented without its collecting plate. The collecting plate of the second header 220 is structurally identical to the collecting plate of the first header and the description given of this first header's collecting plate above thus applies mutatis mutandis to said second header's collecting plate.

[0041] The global shape of this second header 220 is extremely similar to the shape of the first header 210 and the following specification will only focus on the differences between those headers 210, 220.

[0042] The second header 220 comprises at least two closing walls 225a, 225b which form the longitudinal ends 226, 227 of the second header 220 are identical. Those closing walls 225a, 225b are identical to the second closing wall of the first header. In other words, both of these closing wall comprise the centring elements 226a, 226b. As the chambers of the second header 220 does not receive anything but the refrigerant fluid, it is understood that those centring elements 226a, 226b are only realized to reduce the manufacturing global cost.

[0043] As previously described, the second header 220 comprises the lid 222 which divides this second header 220 into the collecting chamber 223 and the distributing chamber 224. Especially, the lid 222 comprises at least a first portion 228 which defines the collecting chamber 223 and a second portion 229 which defines the distributing chamber 224. The first portion 228 and the second portion 229 share a wall 320 on which teeth 321 are arranged, said teeth being adapted to be re-

ceived in through-cavities formed on the collecting plate, as previously described with reference to the cover and the collecting plate of the first header. Additionally the at least one passage 322 thanks to which the collecting chamber 223 and the distributing chamber 224 communicate is arranged in the wall 320. According to the illustrated embodiment, a plurality of passages 322 are arranged in the wall 320. For instance, one passage 322 can be arranged every two tubes.

[0044] According to the illustrated embodiment, the lid 222 is made of one piece, that is to say that the first portion 228, the second portion 229 and the wall 320 cannot be separated without damaging at least one of them. Alternately, the first part and the second part can be realised independently and then fixed to one another, for instance with glue. According to this alternative, the wall is thus formed by the two portions of the first and second part which are reunited.

[0045] The present invention therefore provides a heat exchanger adapted to be received in a heating, ventilation and/or air-conditioning system of a vehicle, such heat exchanger providing an optimized heat exchange thanks to the distributing device and the U-shape circulation of the refrigerant fluid in the heat exchange area of said heat exchanger.

[0046] However, the invention cannot be limited to the means and configurations described and illustrated herein, and it also extends to any equivalent means or configurations and to any technically operative combination of such means. In particular, the shape and arrangement of the headers and of the distribution device can be modified insofar as they fulfil the functionalities described in the present document.

Claims

1. Heat exchanger (200) for a heating, ventilation and/or air-conditioning system (300) of a vehicle, the heat exchanger (200) being adapted to operate a heat exchange between a refrigerant fluid (RF) and an air flow (AF), the heat exchanger (200) comprising at least one heat exchange area (201) wherein the heat exchange is performed and at least two headers (210, 220), a first header (210) being arranged at a first side of the heat exchange area (201), a second header (220) being arranged at a second side of the heat exchange area (201) opposed to the first side with respect to a direction of circulation of the refrigerant fluid (RF) in the heat exchange area (201), at least the first header (210) comprising one collecting plate (211) and one cover (212) which divides the first header (210) into one admission chamber (213) adapted to distribute the refrigerant fluid (RF) in the heat exchange area (201) and one exit chamber (214) adapted to collect the refrigerant fluid (RF) that leaves the heat exchange area (201), at least one distribution device (230) being arranged in the ad-

mission chamber (213), said distribution device (230) extending all along a longitudinal dimension of the admission chamber (213).

2. Heat exchanger (200) according to the preceding claim, wherein the distribution device (230) comprises at least one perforated pipe (233) comprising a plurality of holes (234).
3. Heat exchanger (200) according to the preceding claim, wherein the perforated pipe (233) is arranged in such a way that the holes (234) face the collecting plate (211) of the first header (210).
4. Heat exchanger (200) according to any of the preceding claims, wherein at least one through-cavity (314) is arranged in the collecting plate (211) of the first header (210) and wherein the at least one through-cavity (314) is adapted to receive a tooth (318) formed on the cover (212) of the first header (210).
5. Heat exchanger (200) according to any of the preceding claims, wherein the cover (212) of the first header (210) comprises at least one first part (315) defining the admission chamber (213) and at least one second part (316) defining the exit chamber (214), the first part (315) and the second part (316) sharing at least one partition (317) which contributes to define both the admission chamber (213) and the exit chamber (214), the tooth (318) adapted to be received in the at least one through-cavity (314) being arranged on the partition (317) of the cover (212).
6. Heat exchanger (200) according to any of the preceding claims, wherein the first header (210) extends between a first end (216a) and a second end (216b), the first end (216a) being formed by a first closing wall (217a) and the second end (216b) being formed by a second closing wall (217b), the first closing wall (217a) comprising at least a first orifice (218) which comes out on the admission chamber (213) and at least a second orifice (219) which comes out on the exit chamber (214).
7. Heat exchanger (200) according to any the preceding claim, wherein the second closing wall (217b) comprises at least one centring element (310) adapted to centre the distribution device (230) in the admission chamber (213).
8. Heat exchanger (200) according to any of claims 6 or 7, wherein the first closing wall (217a) and/or the second closing wall (217a) comprises at least one elastic tab (312a, 312b) adapted to maintain the position of the cover (212).
9. Heat exchange (200) according to any of claims 6

to 8, wherein the first closing wall (217a) and/or the second closing wall (217b) comprises at least one elastic strip (319a, 319b) adapted to maintain the position of the collecting plate (211).

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10. Heat exchanger (200) according to any of the preceding claims, wherein the second header (220) comprises at least one collecting plate (221) and one lid (222) which divides the second header (220) into one collecting chamber (223) adapted to collect the refrigerant fluid (RF) that leaves the heat exchange area (201) and one distributing chamber (224) adapted to distribute the refrigerant fluid (RF) in the heat exchange area (201), and wherein at least one passage (322) of refrigerant fluid (RF) is arranged between the collecting chamber (223) and the distributing chamber (224). 10
11. Heat exchanger (200) according to the preceding claim, wherein the lid (222) comprises at least one first portion (228) which defines, at least partially, the collecting chamber (223) and at least one second portion (229) defining, at least partially, the distributing chamber (224), the first portion (228) et the second portion (229) sharing at least one wall (320) which contributes to define both the collecting chamber (223) and the distributing chamber (224), at least on passage (322) of refrigerant fluid (RF) being formed in the wall (320). 25
12. Heat exchanger (200) according to any of the preceding claims, wherein the heat exchange area (201) comprises a plurality of tubes (202) and a plurality of fins, each fin being arranged between two adjacent tubes (202) and wherein each tube (202) extends between the first header (210) and the second header (220). 30
13. Heat exchanger (200) according to claims 11 and 12, wherein one passage (322) of refrigerant fluid is arranged every two tubes (202). 40
14. Heat exchanger (200) according to claims 10 or 11 in combination with claim 12, wherein the tubes (202) are stacked along two parallel directions, defining a first row (203) of tubes (202) and a second row (204) of tubes (202), the tubes (202) of the first row (203) extending between the admission chamber (213) of the first header (210) and the collecting chamber (223) of the second header (220) and the tubes (202) of the second row (204) extending between the distributing chamber (224) of the second header (220) and the exit chamber (214) of the first header (210). 45
15. Heating, ventilation, and/or air-conditioning system (300) for a vehicle, comprising at least one heat exchanger (200) according to any of the preceding claims. 50

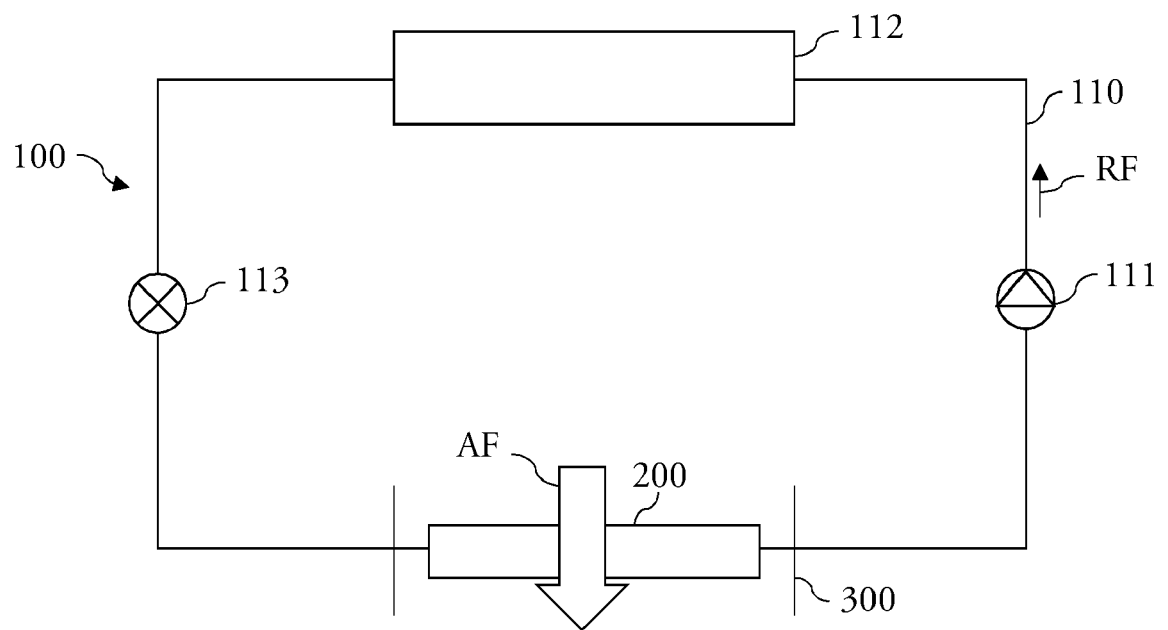


FIG. 1

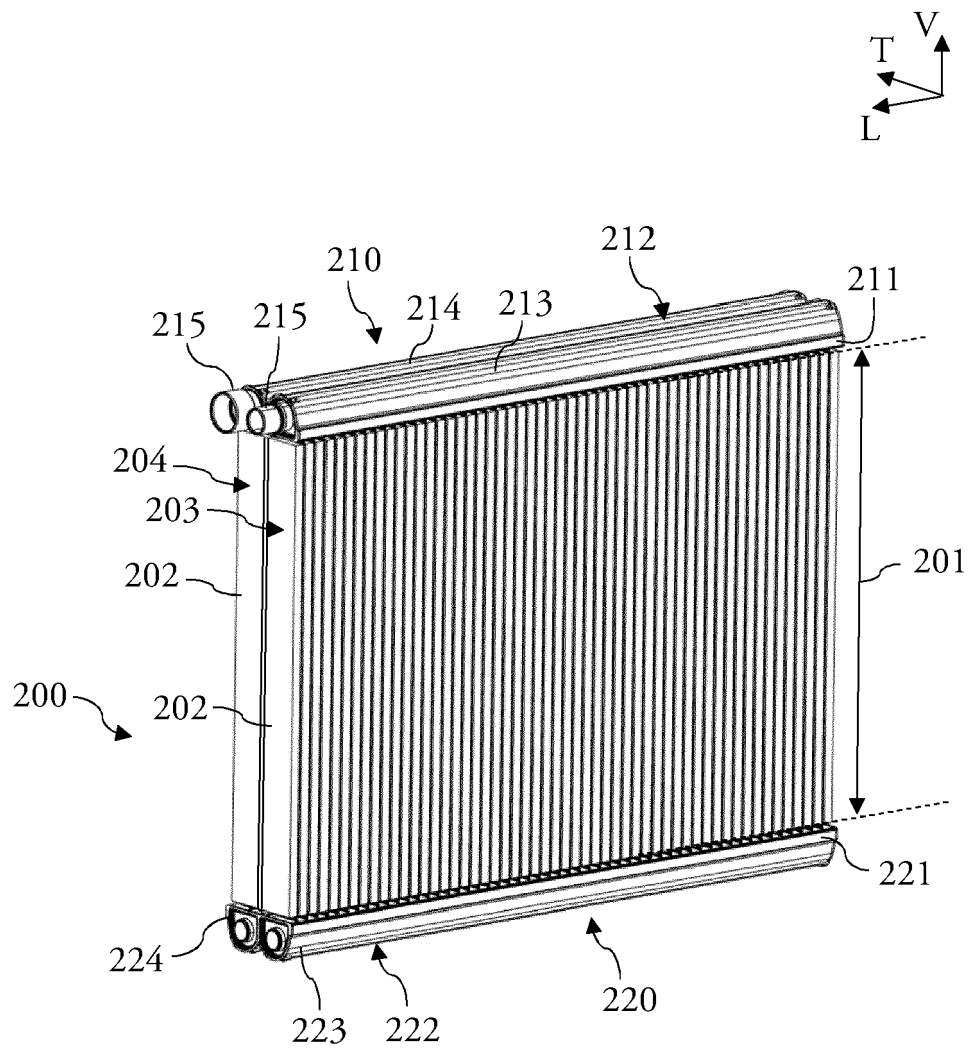


FIG. 2

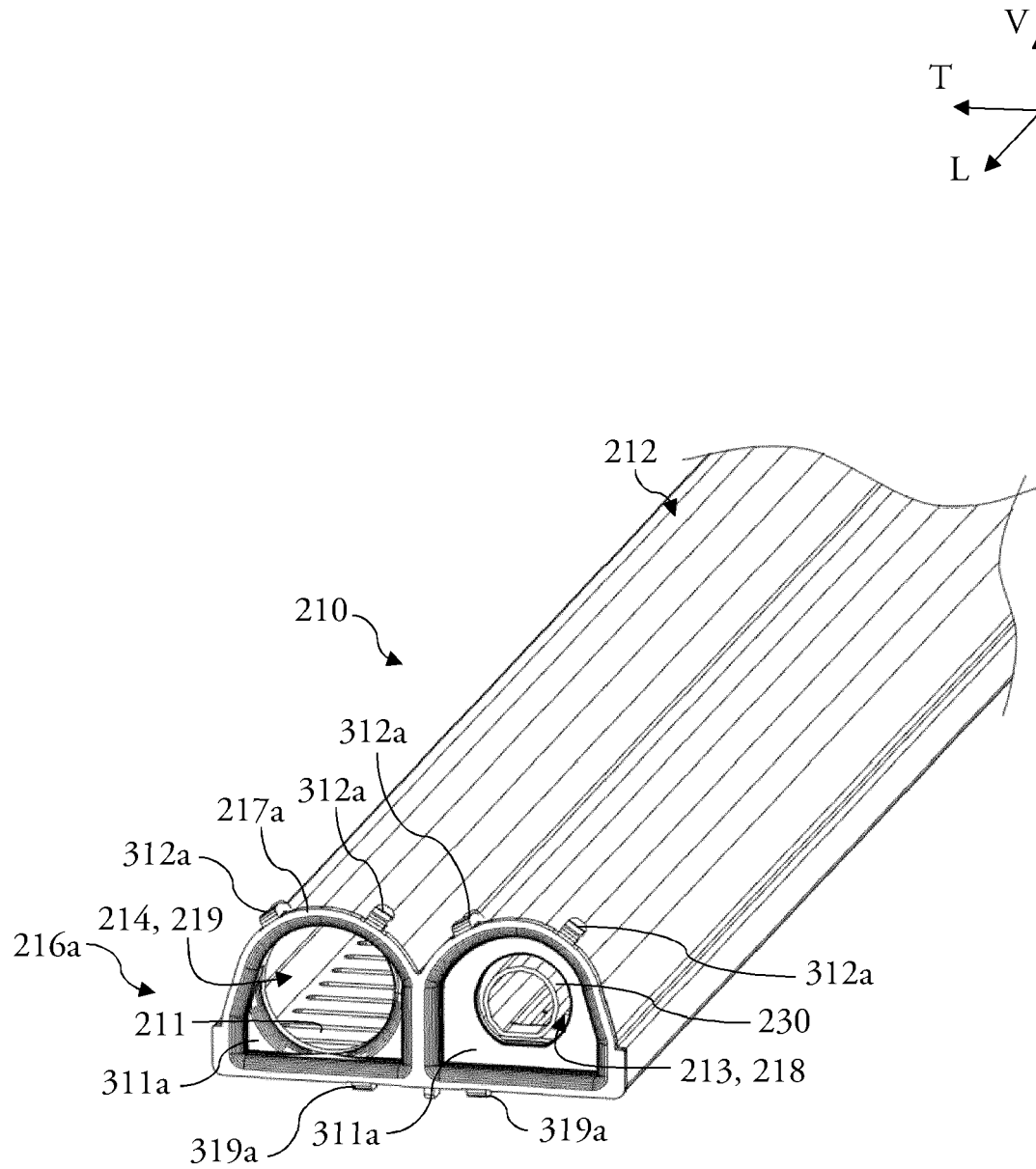


FIG. 3

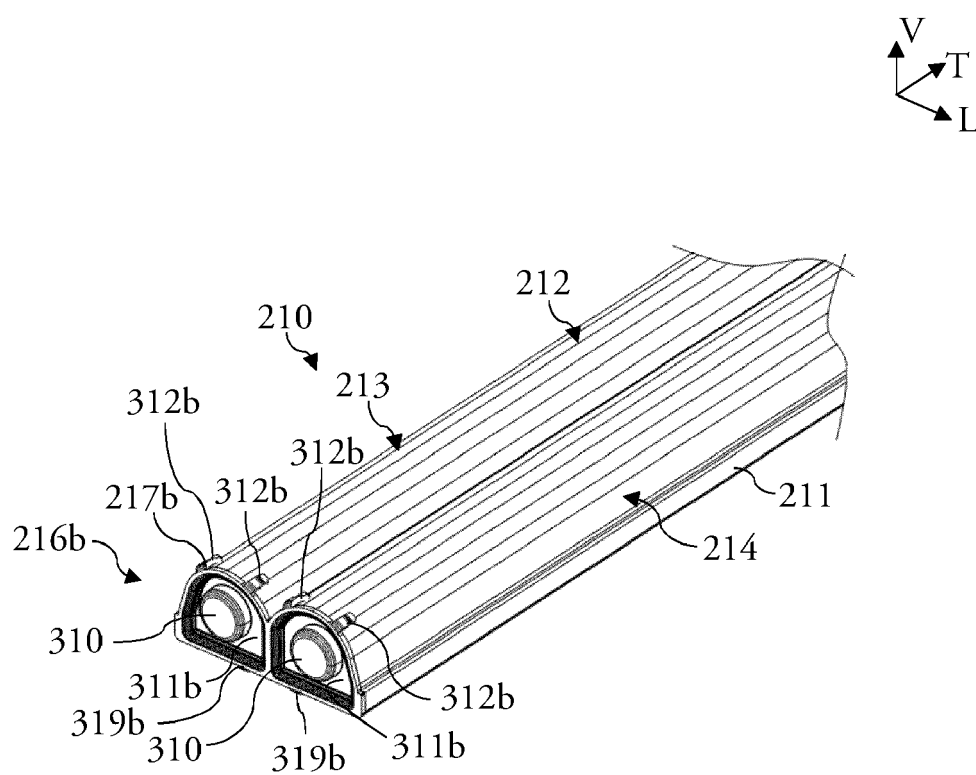


FIG. 4

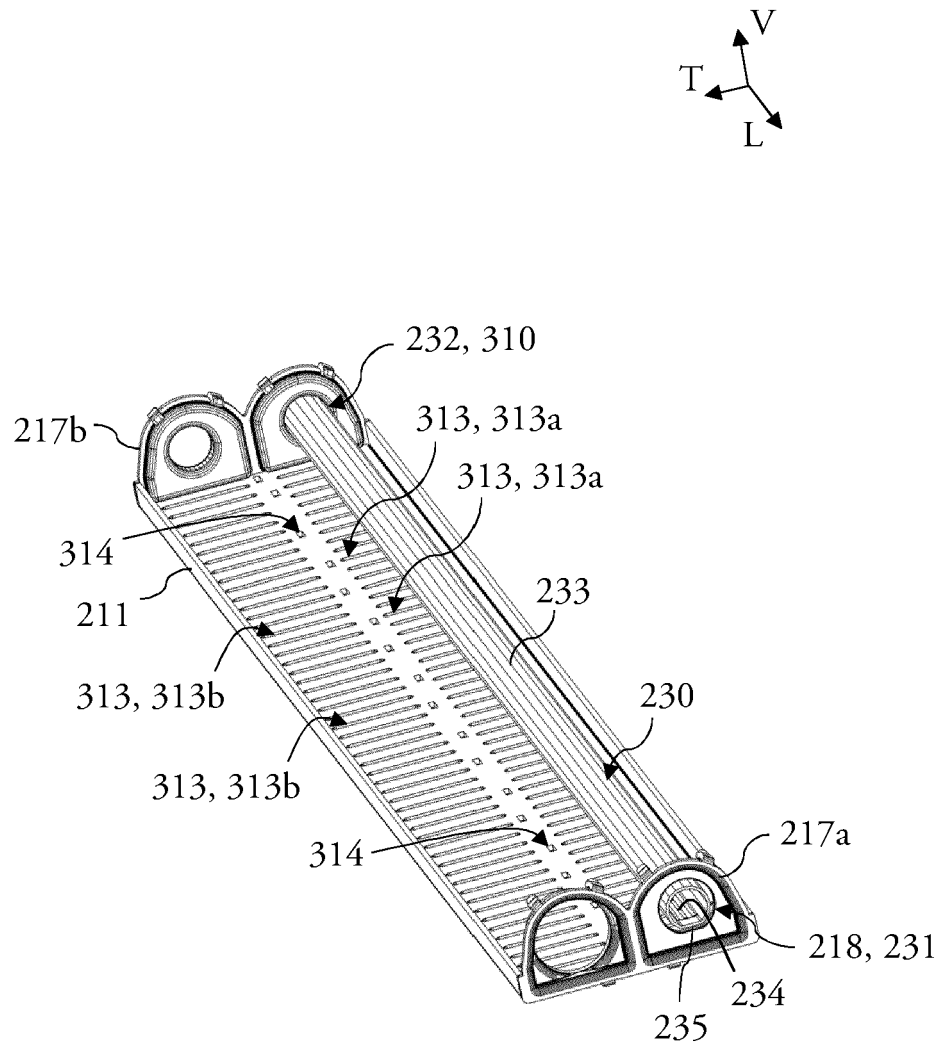


FIG. 5

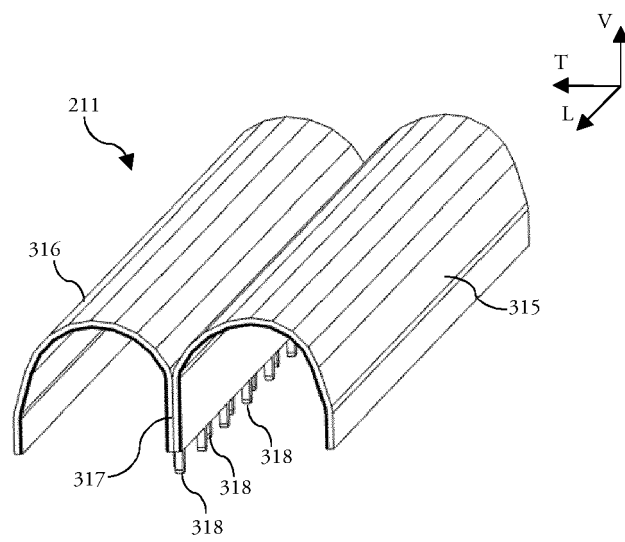


FIG. 6

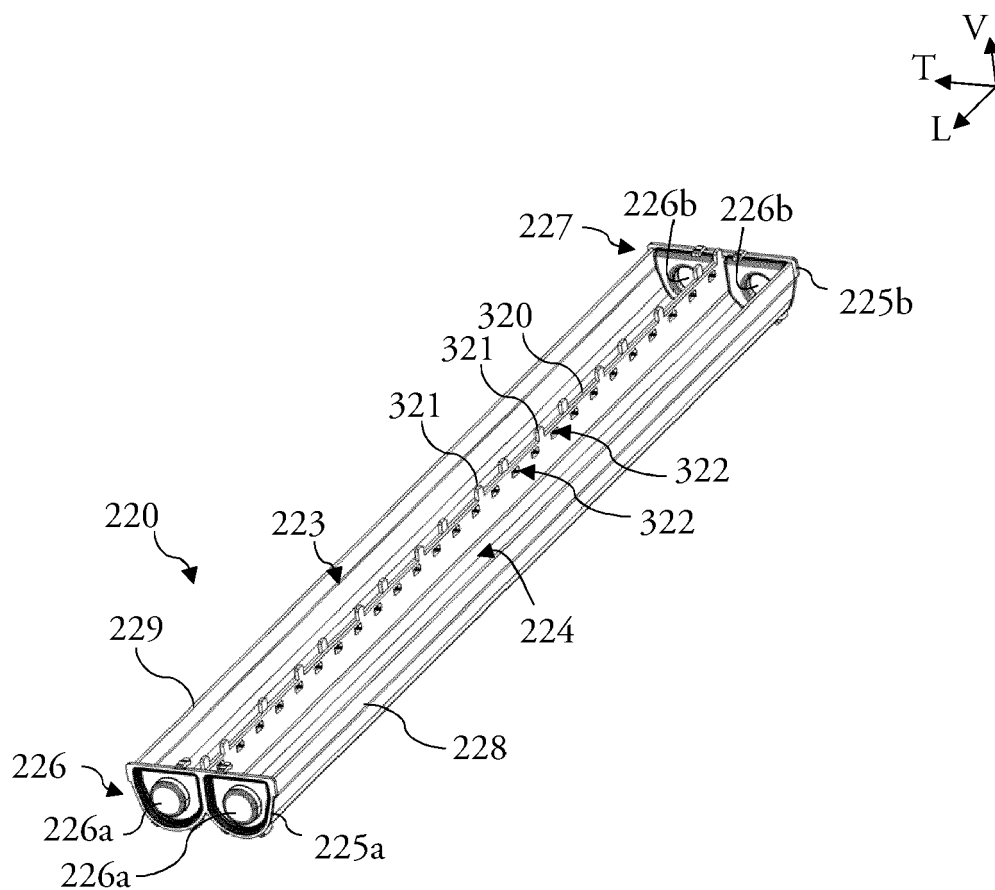
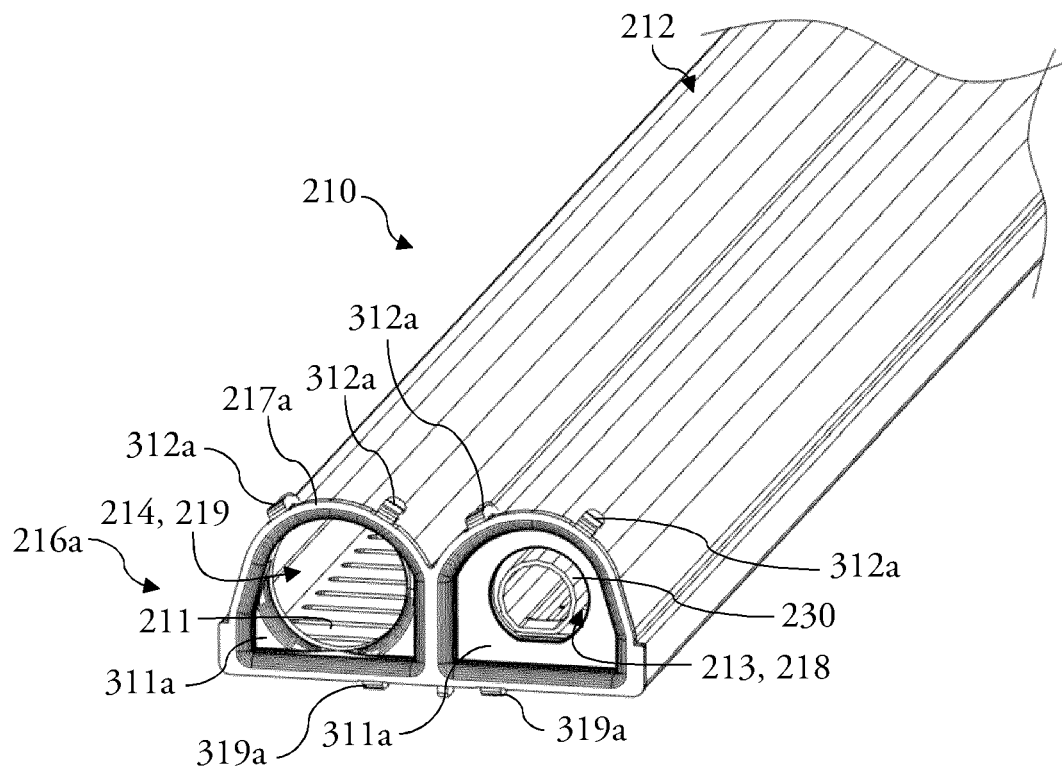
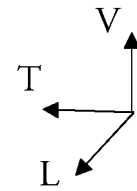


FIG. 7



ABSTRACT



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 18 7399

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 3 089 607 A1 (VALEO SYSTEMES THERMIQUES [FR]) 12 June 2020 (2020-06-12)	1,2,6,7,	INV. F28F9/02
Y	* figure 1 *	14,15 3	
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Y	----- JP 2004 278935 A (CALSONIC KANSEI CORP) 7 October 2004 (2004-10-07) * figures 4-5 *	3	

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		18 November 2020	Martínez Rico, Celia
CATEGORY OF CITED DOCUMENTS		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	
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 20 18 7399

5 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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