A heat exchanger transfers heat between a first fluid and a second fluid. The heat exchanger comprises a stack of plates comprising a last plate and a penultimate plate jointly delimiting an end chamber. The last plate is provided with at least one inlet for the second fluid and one outlet for the second fluid. The stack of plates defines an inlet passage for the second fluid and an outlet passage for the second fluid. The end chamber houses a channeling means comprising an inlet circulation canal for channeling the second fluid between the inlet for the second fluid and the inlet passage for the second fluid, and an outlet circulation canal for channeling the second fluid between the outlet for the second fluid and the outlet passage for the second fluid.
FLUID/FLUID HEAT EXCHANGER

[0001] The invention is in the field of heating, ventilation and/or air-conditioning systems fitted to motor vehicles. The subject of the invention is a heat exchanger incorporated into an air-conditioning loop and/or into a secondary loop of such a heating, ventilation and/or air-conditioning system. Another subject of the invention is an air-conditioning loop equipped with such a heat exchanger.

[0002] A heat exchanger comprises a core bundle of tubes which is made up of a stack of first tubes for the circulation of a first fluid. Between two adjacent first tubes there is formed a passage for the circulation of a second fluid.

[0003] Such a heat exchanger is provided with inlet and outlet orifices for the first fluid so that the first fluid can circulate through the heat exchanger. In addition, the heat exchanger is also provided with inlet and outlet orifices for the second fluid so that the second fluid can circulate through the heat exchanger.

[0004] It is known practice to use such a heat exchanger to allow an exchange of heat between a refrigerant in two different thermodynamic states. It is also known practice to use such a heat exchanger for exchanging heat between a refrigerant and/or a coolant and/or an air flow.

[0005] More particularly, the inlet and outlet orifices for the first fluid and for the second fluid are arranged on an end face of the heat exchanger. They are generally arranged near respective corners of the end face. Such a heat exchanger is notably known from document FR 2 891 615.

[0006] Arranged in this way, the inlet and outlet for one and the same fluid are spaced apart. It is therefore necessary to fit a manifold assembly so that the heat exchanger can be connected to the air-conditioning loop and/or to the secondary loop of the heating, ventilation and/or air-conditioning system. This increases the overall size and detracts from the compactness of the heating, ventilation and/or air-conditioning system.

[0007] In addition, in order to improve the heat-transfer efficiency of the heat exchanger, it is necessary to increase the surface areas for exchange between the first fluid and the second fluid. This notably entails the heat exchanger having specially tailored dimensions. As a result, heat exchangers of the prior art have inlet and outlet orifices for one and the same fluid which are spaced apart by a sizeable distance.

[0008] Such positioning of the inlet and outlet orifices for the fluids places restrictions on how the heat exchanger can be incorporated into an air-conditioning system fitted to a motor vehicle, particularly into an air-conditioning loop through which a refrigerant, such as those known by the designations R744, R134a or the like, circulates, or into a secondary loop through which a coolant, such as a mixture of water and glycol or the like, circulates.

[0009] More particularly, connecting such a heat exchanger into the air-conditioning loop and/or into the secondary loop often requires manifolds of complex configuration which introduce pressure drops.

[0010] In addition, connecting an additional component to the heat exchanger proves difficult. In particular, such an additional component, particularly an expansion member or the like, has inlet and outlet orifices with reduced center-distances between them. It is therefore necessary to define a complicated path for the manifold pipes in order to connect the inlet and outlet orifices of the heat exchanger with the inlet and outlet orifices of the additional component. The alternative is the need to use an additional connecting piece. All of these solutions increase the costs of manufacture, the size and the weight of a heating, ventilation and/or air-conditioning system.

[0011] It is an object of the present invention to propose a heat exchanger that can perform efficient transfer of heat between a first fluid and a second fluid, the heat exchanger offering ways of connection to an air-conditioning loop and/or to a secondary loop of a heating, ventilation and/or air-conditioning system with which a motor vehicle is fitted which are simple, easy, flexible and optimized in order notably to allow the connection of an additional component that has a relatively arbitrary distance between centers.

[0012] Such a heat exchanger for transferring heat between a first fluid and a second fluid comprises a stack of plates comprising a last plate and a penultimate plate jointly delimiting an end chamber, the last plate being provided with at least one inlet for the second fluid and one outlet for the second fluid, the stack of plates defining an inlet passage for the second fluid and an outlet passage for the second fluid.

[0013] More particularly, the end chamber houses a channeling means comprising an inlet circulation canal for channeling the second fluid between the inlet for the second fluid and the inlet passage for the second fluid, and an outlet circulation canal for channeling the second fluid between the outlet for the second fluid and the outlet passage for the second fluid.

[0014] According to a first embodiment, the channeling means consists of at least one boss formed on the last plate and/or the penultimate plate of the stack of plates.

[0015] According to a second embodiment, the channeling means consists of an insert housed in the end chamber. According to an alternative, the insert is formed of at least one blade. Advantageously, the blade comprises a base wall and a contour which are connected to one another by a lateral wall.

[0016] For preference, the base wall is in contact with the penultimate plate of the stack of plates and the contour is in contact with the last plate of the stack of plates. Thus, the inlet circulation canal and the outlet circulation canal for the second fluid are delimited by the insert and the last plate.

[0017] According to another alternative, the insert is formed by two blades joined together. With this arrangement, the base wall of one of the blades is in contact with the penultimate plate of the stack of plates, the base wall of the other of the blades is in contact with the last plate of the stack of plates and the respective contours of the blades is in contact with one another.

[0018] In particular, according to the various embodiment alternatives, the insert is made up of two separate distribution compartments. Advantageously, the two distribution compartments are identical.

[0019] Further, the insert consists of a distribution device, formed as a single piece, comprising two distribution chambers. For preference, the two distribution chambers are arranged with local symmetry with respect to one another.

[0020] In addition, according to the present invention, the inlet circulation canal and the outlet circulation canal for the second fluid are orthogonal to the inlet passage for the second fluid and to the outlet passage for the second fluid.

[0021] Moreover, the inlet for the second fluid and the outlet for the second fluid are arranged in a central zone of the last plate of the stack of plates.

[0022] An air-conditioning loop according to the present invention comprises a heat exchanger as defined hereinabove. To that end, the air-conditioning loop comprises a connecting
element comprising an intake opening and a discharge opening for the second fluid and a major axis passing through the centers of the intake opening and of the discharge opening. In addition, the major axis forms an angle of between 0° and 90° with a first median axis of the last plate of the stack of plates.

Further features and advantages of the invention will become apparent from studying the following description with reference to the attached figures, which are given by way of nonlimiting examples, and which may serve to supplement the understanding of the present invention and the explanation of how it is embodied but also, as appropriate, contribute to defining it, and in which:

FIGS. 1 and 2 are schematic views of heating, ventilation and/or air-conditioning systems incorporating a heat exchanger according to the present invention.

FIG. 3 is a perspective view of a heat exchanger according to the present invention.

FIG. 4 is a partially exploded view of the heat exchanger of FIG. 3.

FIG. 5 is an exploded view of the heat exchanger of FIGS. 3 and 4.

FIGS. 6 and 7 are partial schematic views of respective embodiment variants of the heat exchanger depicted in FIG. 3.

FIGS. 8a and 8b are schematic views of two embodiments of an insert according to the present invention.

FIGS. 9a to 9c are schematic views of a last plate of the heat exchanger according to respective variants regarding integration into an air-conditioning loop according to the present invention.

FIGS. 1 and 2 are schematic views of a heating, ventilation and/or air-conditioning system 1 incorporating a heat exchanger according to the present invention. The heating, ventilation and/or air-conditioning system 1 shown in FIGS. 1 and 2 is designed to be fitted to a motor vehicle in order to alter the aerothermal parameters of an interior air flow 8 intended to be distributed inside a motor vehicle interior.

To that end, the heating, ventilation and/or air-conditioning system 1 comprises an air-conditioning loop 2 through which there circulates a refrigerant, such as one of the refrigerants known by the designation R744, R134a or the like.

The air-conditioning loop 2 comprises a compressor 3, able to compress the refrigerant, a first heat exchanger 4, notably an air/refrigerant heat exchanger 4, able to operate as a condenser 4 and through which a flow of external air passes, an expansion member 5, able to expand the refrigerant, and an accumulator 6, able to create a refrigerant storage zone and prevent refrigerant in the liquid state from being admitted to the compressor 3.

FIG. 1 illustrates a first embodiment variant of the heating, ventilation and/or air-conditioning system 1. According to the first embodiment variant, the air-conditioning loop 2 comprises a second heat exchanger 7 able to operate as an evaporator 7, through which the interior air flow 8 passes. On passing through the second heat exchanger 7, the interior air flow 8 is able to be cooled down and/or dehumidified before being diffused within the vehicle interior.

In addition, the air-conditioning loop 2 also comprises an internal heat exchanger 9 designed to allow transfer of heat between the refrigerant present in a high-pressure circulation canal 10 of the internal heat exchanger 9 and the refrigerant present in a low-pressure circulation canal 11 of the internal heat exchanger 9.

The high-pressure circulation canal 10 extends between a high-pressure inlet 12 and a high-pressure outlet 13 of the internal heat exchanger 9. The low-pressure circulation canal 11 extends between a low-pressure inlet 14 and a low-pressure outlet 15 of the internal heat exchanger 9.

Thus, in a direction 16 in which the refrigerant circulates within the air-conditioning loop 2, the refrigerant circulates successively through the compressor 3, the first heat exchanger 4, the high-pressure circulation canal 10 of the internal heat exchanger 9, the expansion member 5, the second heat exchanger 7, the accumulator 6, the low-pressure circulation canal 11 of the internal heat exchanger 9 and the compressor 3.

FIG. 2 illustrates a second embodiment variant of the heating, ventilation and/or air-conditioning system 1. According to the second embodiment variant, the heating, ventilation and/or air-conditioning system 1 comprises a refrigerant/coolant heat exchanger 17 designed to allow a transfer of heat between the refrigerant circulating through the air-conditioning loop 2 and a coolant circulating through a secondary loop 18. The coolant is, for example, made up of a mixture of water and glycol.

To that end, the refrigerant/coolant heat exchanger 17 is arranged in the air-conditioning loop 2 and in the secondary loop 18.

The refrigerant/coolant heat exchanger 17 comprises a refrigerant circulation canal 19 which extends between a refrigerant inlet 20 and a refrigerant outlet 21. The refrigerant/coolant heat exchanger 17 also comprises a coolant circulation canal 22 which extends between a coolant inlet 23 and a coolant outlet 24.

In addition, the secondary loop 18 comprises a pump 25 intended to force the circulation of the coolant, and a third heat exchanger 26, or unit heater 26, through which the interior air flow 8 passes before being distributed to the motor vehicle interior.

Thus, in a direction 27 in which the coolant flows inside the secondary loop 18, the coolant circulates successively through the pump 25, the refrigerant/coolant heat exchanger 17, the coolant circulation canal 22 and then through the third heat exchanger 26 and the pump 25.

Independently, the refrigerant circulates, inside the air-conditioning loop 2 in the direction 16 of circulation of the refrigerant, successively through the compressor 3, the first heat exchanger 4, the expansion member 5, the refrigerant circulation canal 19, the accumulator 6 and the compressor 3.

In other variants which have not been depicted, the refrigerant/coolant heat exchanger 17 can be positioned at other points in the air-conditioning loop 2.

In addition, according to another embodiment which has not been depicted, the heating, ventilation and/or air-conditioning system 1 comprises an internal heat exchanger 9, in a configuration as described in FIG. 1, and a refrigerant/coolant heat exchanger 17, in a configuration as described in FIG. 2.

FIG. 3 is a perspective view of the exchanger of a heat exchanger 110 according to the present invention. The heat exchanger 110 is able indifferently to act as an internal heat exchanger 9, in the configuration illustrated in FIG. 1, or as a refrigerant/coolant heat exchanger 17, in the configuration illustrated in FIG. 2.
In other words, the heat exchanger 100 is able to allow a transfer of heat between a first fluid, such as a low-pressure or high-pressure refrigerant, and a second fluid, such as the low-pressure or high-pressure refrigerant or the coolant.

The heat exchanger 100 comprises a circulation canal for the first fluid 110 which extends between an inlet for the first fluid 111 and an outlet for the first fluid 112. The heat exchanger 100 also comprises a circulation canal for the second fluid 120 which extends between an inlet for the second fluid 121 and an outlet for the second fluid 122.

According to the first embodiment variant of the heating, ventilation and/or air-conditioning system 1 illustrated in FIG. 1, the first fluid consists of the high-pressure refrigerant and the second fluid consists of the low-pressure refrigerant.

In that case, the circulation canal for the first fluid 110 consists of the high-pressure circulation canal 10, the inlet for the first fluid 111 corresponding to the high-pressure inlet 12 and the outlet for the first fluid 112 corresponding to the high-pressure outlet 13. Likewise, the circulation canal for the second fluid 120 consists of the low-pressure circulation canal 11, the inlet for the second fluid 121 corresponding to the low-pressure inlet 14 and the outlet for the second fluid 122 corresponding to the low-pressure outlet 15.

In another variant, the first fluid consists of the low-pressure refrigerant and the second fluid consists of the high-pressure refrigerant. The layouts quoted hereinabove are then reversed.

Moreover, according to the second embodiment variant of the heating, ventilation and/or air-conditioning system 1 illustrated in FIG. 2, the first fluid consists of the refrigerant and the second fluid consists of the coolant.

In that case, the circulation canal for the first fluid 110 consists of the refrigerant circulation canal 19, the inlet for the first fluid 111 corresponding to the refrigerant inlet 20 and the outlet for the first fluid 112 corresponding to the refrigerant outlet 21. Likewise, the circulation canal for the second fluid 120 consists of the coolant circulation canal 22, the inlet for the second fluid 121 corresponding to the coolant inlet 23 and the outlet for the second fluid 122 corresponding to the coolant outlet 24.

In another variant, the first fluid consists of the coolant and the second fluid consists of the refrigerant. The layouts mentioned hereinabove are reversed.

The heat exchanger 100 comprises an end face 123 in which the inlet for the first fluid 111, the outlet for the first fluid 112, the inlet for the second fluid 121 and the outlet for the second fluid 122 are arranged. The first fluid and the second fluid enter the heat exchanger 100 and are discharged from the heat exchanger 100 at the end face 123.

According to other embodiment variants that have not been depicted, the end face 123 can be provided only with the inlet for the first fluid 111 and with the outlet for the first fluid 112 or, alternatively, with the inlet for the second fluid 121 and with the outlet for the second fluid 122.

Arranged in this way, the heat exchanger 100 according to the present invention is a heat exchanger comprising a circulation canal for the first fluid 110 and/or a circulation canal for the second fluid 120 which is differently arranged in the shape of an "T", a "U" or any other arrangement, considering that the heat exchanger 100 according to the present invention comprises both an inlet and an outlet for at least one and the same fluid on the end face 123.

The example depicted, the heat exchanger 100 is of parallelepipedal overall shape. However, the heat exchanger 100 can adopt other shapes.

The heat exchanger 100 is preferably a plate-type heat exchanger made up mainly of a stack of plates 124. In the embodiment, the plates 124 are substantially planar and rectangular in shape and have a depth P, in a first direction, and a width L, in a second direction. Advantageously, the first direction is perpendicular to the second direction. The plates 124 additionally have parts of different depths, notably obtained by pressing.

FIGS. 4 and 5 respectively are a partially exploded view and an exploded view of the heat exchanger 110 of FIG. 3. The heat exchanger 110 consists of a stack of plates 124.

Two contiguous plates 124 are joined together via their peripheral edge 125 to form the circulation tubes for the first fluid and for the second fluid.

By stacking several tubes formed of two plates 124 joined together, the first circulation chamber 126a for the first fluid and a second circulation chamber 126b for the second fluid are defined, like those depicted in FIG. 5. Arranged in this way, the heat exchanger 100 comprises a plurality of first circulation chambers for the first fluid 126a and a plurality of second circulation chambers for the second fluid 126b, which are formed in alternation with one another.

Such an alternating arrangement of the first circulation chambers for the first fluid 126a and the second circulation chambers for the second fluid 126b makes it possible to optimize the transfer of heat between the first fluid and the second fluid.

One of the plates 124 of the heat exchanger 100, referred to as the last plate 124, comprises the end face 123. In addition, the heat exchanger 100 comprises an end chamber 126c delimited by the last plate 124 and a penultimate plate 124 of the stack of plates 124 that make up the heat exchanger 100. The penultimate plate 124 is contiguous with the last plate 124.

The end chamber 126c is indifferently either a first circulation chamber 126a for the first fluid or a second circulation chamber 126b for the second fluid, according to various different ways of embodying the heat exchanger 100. In the example illustrated, the end chamber 126c is a second circulation chamber 126b for the second fluid.

The present invention advantageously proposes that the end chamber 126c should house at least one channeling means 127, notably an insert 127, able to channel the second fluid, firstly, from the inlet for the second fluid 121 toward a circulation inlet passage 130 for the second fluid which is formed in the set of plates 124 and secondly from a circulation outlet passage 131 for the second fluid, formed in the set of plates 124, toward the outlet for the second fluid 122.

In particular, the channeling means 127, notably the insert 127, comprises an inlet circulation canal 128a for channeling the second fluid between the inlet for the second fluid 121 and the second circulation inlet passage 130 for the second fluid and an inlet circulation canal 128b for channeling the second fluid between the outlet for the second fluid 122 and the circulation outlet passage 131 for the second fluid.

In other words, in the example illustrated, the end chamber 126c houses the two circulation canals 128a and 128b for the second fluid.

By virtue of the insert 127, the inlet for the second fluid 121 and the outlet for the second fluid 122 can be formed in any relatively arbitrary zone on the end face 123 of the heat.
exchanger 100. The inlet for the second fluid 121 and the outlet for the second fluid 122 may notably be arranged in a central zone 129 of the last plate 124 of the stack of plates 124.

[0070] The central zone 129 is defined as a zone on the external face 123 of the last plate 124 arranged on either side of a first median axis x, in the first direction, and a second median axis y, in the second direction, of the last plate 124. In particular, the central zone 129 represents less than 30% of the depth D and/or of the width L of the last plate 124.

[0071] The presence of the inlet circulation canal 128a and of the outlet circulation canal 128b for the second fluid inside the end chamber 126 offers a great deal of flexibility regarding the positioning of the inlet for the second fluid 121 and the outlet for the second fluid 122 through the last plate 124.

[0072] Thus the inlet circulation canal 128a for the second fluid connects the inlet for the second fluid 121 to the inlet circulation passage 130 for the second fluid which extends through all of the plates 124 except for the last plate 124. The inlet circulation passage 130 for the second fluid connects together the second circulation chambers 126b for the second fluid. Likewise, the outlet circulation canal 128b for the second fluid connects the outlet circulation passage 131 for the second fluid, which extends through all of the plates 124 except for the last plate 124, to the outlet for the second fluid 122. The outlet circulation passage 131 for the second fluid connects together the second circulation chambers 126b for the second fluid.

[0073] For preference, the inlet circulation canal 128a for the second fluid is orthogonal to the inlet circulation passage 130 for the second fluid and the outlet circulation canal 128b for the second fluid is orthogonal to the outlet circulation passage 131 for the second fluid.

[0074] Alternatively, according to another embodiment, the insert 127 is housed in the end chamber 126c through which the first fluid circulates, the insert 127 channeling the second fluid. Thus, the insert 127 comprises the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid, which are arranged in the end chamber 126c allowing circulation of the first fluid.

[0075] According to an embodiment illustrated in FIG. 5, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are produced in the form of an additional component consisting of the insert 127. Thus, in order to form the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid, the insert 127 is positioned in the end chamber 126c between the last plate 124 and the penultimate plate 124 of the stack of plates 124 that make up the heat exchanger 100.

[0076] Alternatively, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are produced from at least one boss formed on the last plate 124 and/or the penultimate plate 124 of the stack of plates 124.

[0077] FIGS. 6 and 7 are partial schematic views of respective embodiment variants of the heat exchanger 100 according to the present invention. In a first alternative embodiment illustrated in FIG. 6, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are produced by the insert 127 housed inside the end chamber 126c between the last plate 124 and the penultimate plate 124 of the stack of plates 124 that make up the heat exchanger 100. According to the example of FIG. 6, the insert 127 is formed of a single blade 132.

[0078] The blade 132 is made from a strip, for example a metal strip, that has been pressed. The blade 132 comprises a base wall 132a and a contour 132b. The base wall 132a and the contour 132b are joined together by a lateral wall 132c.

[0079] In order to define the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid, the base wall 132a is in contact with the penultimate plate 124 of the stack of plates 124 and the contour 132b is in contact with the last plate 124 of the stack of plates 124.

[0080] The insert 127 is assembled with the last plate 124 and the penultimate plate 124 of the stack of plates 124, preferably by brazing or the like.

[0081] Thus, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are delimited by the insert 127 and the last plate 124.

[0082] In an embodiment alternative illustrated in FIG. 7, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are produced by the insert 127 housed inside the end chamber 126c between the last plate 124 and the penultimate plate 124 of the stack of plates 124 that make up the heat exchanger 100. According to the example of FIG. 7, the insert 127 is formed by a joining together of two blades 133.

[0083] Each blade 133 is made from a strip, for example a metal strip, that has been pressed. In addition, each blade 133 comprises a base wall 133a and a contour 133b which are joined together by a lateral wall 133c.

[0084] In order to define the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid, the two blades 133 are joined together in such a way that their respective contours 133b are in contact with one another. In addition, the base wall 133a of one of the blades 133 is in contact with the penultimate plate 124 of the stack of plates 124 whereas the base wall 133a of the other of the blades 133 is in contact with the last plate 124 of the stack of plates 124.

[0085] The insert 127 is assembled with the last plate 124 and the penultimate plate 124 of the stack of plates 124, preferably by brazing or the like.

[0086] Thus, the inlet circulation canal 128a and the outlet circulation canal 128b for the second fluid are delimited by the insert 127, in an interior space lying between the two blades 133.

[0087] In addition, in order to ensure communication between the inside of the insert 127 and the inlet for the second fluid 121 and the outlet for the second fluid 122, the blade 133 in contact with the last plate 124 has circulation openings 134 corresponding respectively with the inlet for the second fluid 121 and the outlet for the second fluid 122.

[0088] According to this embodiment, each blade 133 is formed of a strip, for example a metal strip, which is assembled, notably by brazing or the like, with the last plate 124 and the penultimate plate 124.

[0089] Reference is now made to FIGS. 8a and 8b which are schematic views of two embodiments of the insert 127 according to the present invention.

[0090] According to a first embodiment variant shown in FIG. 8a, the insert 127 consists of two separate distribution compartments 135a and 135b. Advantageously, the two distribution compartments 135a and 135b are identical. In the example shown in FIG. 8a, the two distribution compartments 135a and 135b are arranged with local symmetry relative to one another. As a result, the two distribution compartments 135a and 135b respectively define the inlet circulation canal 128a and the outlet circulation canal 128b.

[0091] According to a second embodiment variant shown in FIG. 8b, the insert 127 consists of a distribution device 136.
made up of a single piece, comprising two distribution chambers 136a and 136b. Advantageously, the two distribution chambers 136a and 136b are identical. According to the example shown in FIG. 8b, the two distribution chambers 136a and 136b are arranged with local symmetry relative to one another.

In addition, the walls that make up the insert 127 advantageously respectively extend in the first direction and the second direction as shown in FIG. 8a. Alternatively, at least one of the walls that make up the insert 127 may make an angle with the first direction and/or the second direction, as shown in FIG. 8b. Such special arrangements allow the inlet for the second fluid 121 and the outlet for the second fluid 122 to be located in an optimal configuration.

FIGS. 9a to 9c are schematic views of the last plate 24 of the heat exchanger 100 in respective variant forms of integration into the air-conditioning loop 2 of the air-conditioning system 1.

More specifically, in FIGS. 9a to 9c, the last plate 24 is provided with a connecting element 140 allowing the heat exchanger 100 to be connected to the other components of the air-conditioning loop 2 and/or of the secondary loop 18 of the air-conditioning system 1.

In particular, the connecting element 140 is the expansion member 5 of the air-conditioning loop 2 or any other component that forms part of the air-conditioning loop 2 and/or of the secondary loop 18.

The connecting element 140 comprises an intake opening 141 and a discharge opening 142 for the second fluid, which openings are respectively in fluidic communication with the inlet for the second fluid 121 and the outlet for the second fluid 122.

The connecting element 140 has a major axis A passing through the centers of the intake opening 141 and of the discharge opening 142.

According to the various variant forms of integration of FIGS. 9a to 9c, the connecting element 140 is positioned in such a way that the major axis A forms a given angle with the first median axis x, of between 0° and 90°, for example of the order of 45°.

More specifically, in FIG. 9a, the angle is equal to 0°. In FIG. 9b, the angle is equal to 90° and in FIG. 9c, the angle is equal to 45°.

Quite clearly the invention is not restricted to the embodiments described hereinabove and provided solely by way of example. It encompasses various modifications, alternative forms and other variants that a person skilled in the art might conceive of within the scope of the present invention and notably all combinations of the various embodiments described hereinabove.

1. A heat exchanger (100) for transferring heat between a first fluid and a second fluid, the heat exchanger (100) comprising a stack of plates (124) comprising a last plate (124) and a penultimate plate (124) jointly delimiting an end chamber (126) and a last plate (124) having at least one inlet for the second fluid (121) and one outlet for the second fluid (122), and the stack of plates (124) defining an inlet passage for the second fluid (130) and an outlet passage for the second fluid (131), wherein the end chamber (126) houses a channeling means (127) comprising an inlet circulation canal (128a) for channeling the second fluid between the inlet for the second fluid (121) and the inlet passage for the second fluid (130), and an outlet circulation canal (128b) for channeling the second fluid between the outlet for the second fluid (122) and the outlet passage for the second fluid (131).

2. The heat exchanger (100) as claimed in claim 1, wherein the channeling means (127) consists of at least one boss formed on the last plate (124) and/or the penultimate plate (124) of the stack of plates (124).

3. The heat exchanger (100) as claimed in claim 1, wherein the channeling means (127) consists of an insert (127) housed in the end chamber (126).

4. The heat exchanger (100) as claimed in claim 3, wherein the insert (127) is formed of at least one blade (132, 133).

5. The heat exchanger (100) as claimed in claim 4, wherein the blade (132, 133) comprises a base wall (132a, 133a) and a contour (132b, 133b) which are connected to one another by a lateral wall (132c, 133c).

6. The heat exchanger (100) as claimed in claim 5, wherein the base wall (132a) is in contact with the penultimate plate (124) of the stack of plates (124) and wherein the contour (132b) is in contact with the last plate (124) of the stack of plates (124).

7. The heat exchanger (100) as claimed in claim 6, wherein the inlet circulation canal (128a) and the outlet circulation canal (128b) for the second fluid are delimited by the insert (127) and the last plate (124).

8. The heat exchanger (100) as claimed in claim 5, wherein the insert (127) is formed by two blades (133) joined together, the base wall (133a) of one of the blades (133) is in contact with the penultimate plate (124) of the stack of plates (124), the base wall (133a) of the other of the blades (133) is in contact with the last plate (124) of the stack of plates (124), and the respective contours (133b) of the blades (133) are in contact with one another.

9. The heat exchanger (100) as claimed in claim 3, wherein the insert (127) is made up of two separate distribution compartments (135a, 135b).

10. The heat exchanger (100) as claimed in claim 9, wherein the two distribution compartments (135a, 135b) are identical.

11. The heat exchanger (100) as claimed in claim 3, wherein the insert (127) consists of a distribution device (136) comprising two distribution compartments (136a, 136b).

12. The heat exchanger (100) as claimed in claim 11, wherein the two distribution compartments (136a, 136b) are arranged with local symmetry with respect to one another.

13. The heat exchanger (100) as claimed in claim 1, wherein the inlet circulation canal (128a) and the outlet circulation canal (128b) for the second fluid are orthogonal to the inlet passage for the second fluid (130) and to the outlet passage for the second fluid (131).

14. The heat exchanger (100) as claimed in claim 1, wherein the inlet for the second fluid (121) and the outlet for the second fluid (122) are arranged in a central zone (129) of the last plate (124) of the stack of plates (124).

15. An air-conditioning loop (2) and/or secondary loop (18) comprising a heat exchanger (100) as claimed in claim 1.

16. An air-conditioning loop (2) and/or secondary loop (18) as claimed in claim 15, wherein the air-conditioning loop (2) and/or the secondary loop (18) comprises a connecting element (140) comprising an intake opening (141) and a discharge opening (142) for the second fluid and a major axis (A) passing through the centers of the intake opening (141) and of the discharge opening (142), and wherein the major
axis (A) forms an angle of between 0° and 90° with a first median axis of the last plate (124) of the stack of plates (124).

17. The heat exchanger (100) as claimed in claim 7, wherein the insert (127) is made up of two separate distribution compartments (135a, 135b).

18. The heat exchanger (100) as claimed in claim 17, wherein the two distribution compartments (135a, 135b) are identical.

19. The heat exchanger (100) as claimed in claim 7, wherein the insert (127) consists of a distribution device (136) comprising two distribution chambers (136a, 136b).

20. The heat exchanger (100) as claimed in claim 19, wherein the two distribution chambers (136a, 136b) are arranged with local symmetry with respect to one another.