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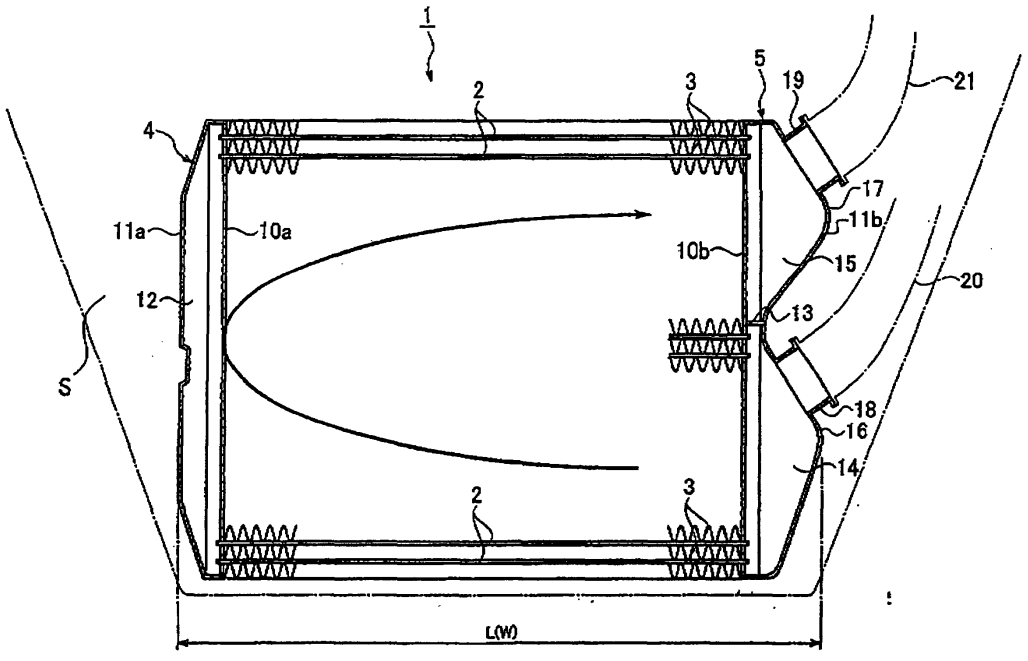
(54) Heat exchanger

(57) A heat exchanger including a tube unit in which a plurality of tubes (2) which are disposed in a stacked state, a one side header tank part (4) which is provided at one end side of the tube unit and in which a returning tank chamber (12) is formed, an other side header tank part (5) which is provided at other end side of the tube unit and in which an inlet tank chamber (14) and an outlet tank chamber (15) are formed, an inlet pipe connecting part (18) and an outlet pipe connecting part (19) which are provided on the other side header tank part (5), inclined sections (16) and (17) configured to incline to a longitudinal direction of the tubes (2) being provided at two locations on the other side header tank part (5), the inlet pipe connecting part (18) and the outlet pipe connecting part (19) being provided on the inclined sections (16) and (17), respectively.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a heat exchanger disposed in a limited space in a vehicle such as an automobile.

Description of Related Art

[0002] A conventional heat exchanger of this kind is disclosed in, for example, Japanese Patent Land-Open No.5-34090.

[0003] As shown in FIG.2, the heat exchanger 100 includes a tube unit in which a plurality of tubes 101 are disposed in a stacked state, a plurality of fins 102 which are disposed between adjacent tubes, a one side header tank part 103 which is provided at one end side of the tube unit and in which a returning tank chamber 103a is formed, an other side header tank part 104 which is provided at other end side of the tube unit and in which an inlet tank chamber 104a and an outlet tank chamber 104b are formed, an inlet pipe connecting part 105 provided on the other side header tank part 104 and configured to guide hot water to the inlet tank chamber 104a, and an outlet pipe connecting part 106 provided on the other side header tank part 104 and configured to discharge cooling water from the outlet tank chamber 104b.

[0004] An inlet pipe 107 and an outlet pipe 108 which are connected to a water jacket (not shown) of an engine are connected to the inlet pipe connecting part 105 and the outlet pipe connecting part 106, respectively.

[0005] In the above-mentioned structure, the hot water entered the inlet tank chamber 104a through the inlet pipe is introduced in the returning tank chamber 103a passing through the tubes 101 communicating with the inlet side tank chamber 104a, thereafter introduced in the outlet tank chamber 104b passing through the tubes 101 communicating with the outlet tank chamber 104b, and discharged through the outlet pipe from the outlet tank chamber 104. Air around an outer periphery of each of the tubes is heat-exchanged by the hot water passing through the tubes 101, thereby the air is heated.

[0006] Here, it is required that if the heat exchanger 100 is installed in the automobile, the heat exchanger 100 is disposed in a limited in-car space in the automobile. If the in-car space S has a trapezoidal shape, the heat exchanger is disposed as shown in FIG.3.

[0007] However, in the above-mentioned conventional heat exchanger 100, because the inlet pipe 107 and the outlet pipe 108 must be disposed in a significantly projected state from a side surface of the heat exchanger 100, only a heat exchanger having a smaller width W than a length L of the trapezoidal in-car space S can be merely disposed. Accordingly, there is a problem that heat exchange efficiency of the in-car space S is reduced.

SUMMARY OF THE INVENTION

[0008] Therefore, an object of the present invention is to provide a heat exchanger capable of accomplishing increased heat exchange efficiency of an in-car space of the heat exchanger in a vehicle, having, in particular, a trapezoidal shape.

[0009] To accomplish the above object, a heat exchanger according to one embodiment of the present invention includes a tube unit in which a plurality of tubes are disposed in a stacked state, a one side header tank part which is provided at one end side of the tube unit and in which a returning tank chamber is formed, an other side header tank part which is provided at other end side of the tube unit and in which an inlet tank chamber and an outlet tank chamber are disposed adjacently in a stacked direction of the tubes, an inlet pipe connecting part provided on the other side header tank part and configured to guide a fluid from an outside into the inlet tank chamber, and an outlet pipe connecting part provided on the other side header tank part and configured to eject the fluid to an outside of the outlet tank chamber.

[0010] Inclined sections configured to incline to a longitudinal direction of the tubes are provided at two locations on the other side header tank part, and the inlet pipe connecting part and the outlet pipe connecting part are provided on the inclined sections, respectively.

[0011] If the number of the tubes which communicate with the inlet tank chamber and are outward flow paths is B1 and the number of the tubes which communicate with the outlet tank chamber and are homeward flow paths is B2, a relation between B1 and B2 is set to be B1 > B2.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG.1 is a sectional view showing a mounted state of a heat exchanger according to one embodiment of the present invention.

FIG.2 is a sectional view of a conventional heat exchanger.

FIG.3 is a sectional view showing a mounted state of the conventional heat exchanger.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Preferred embodiments pf the present invention will be explained in detail with reference to the accompanying drawings.

[0014] FIG.1 illustrates a mounted state of a heat exchanger according to one embodiment of the present invention.

[0015] As shown in FIG.1, a trapezoidal in-car space S having a width which gradually narrows as going from an upper portion to a lower portion of the space is pro-

vided in a vehicle, for example, automobile. A heat exchanger 1 for a vehicle's air heating is provided in the in-car space S. In this embodiment, the heat exchanger 1 is used for the vehicle's air heating, but is not limited to this heating, and any other heat exchanger may be used.

[0016] The heat exchanger 1 includes a tube unit in which a plurality of tubes 2 are disposed in an upwardly and downwardly stacked state, a plurality of fines 3 which are disposed between adjacent tubes 2, respectively, and a pair of header tank parts or one side header tank part 4 and other side tank part 5 which are disposed at both ends of the tube unit, respectively. The one and other side header tank parts 4 and 5, the tubes 2 and the fines 3 are made of a material having high heat conductivity, for example, aluminum.

[0017] Any fluid passes through the tubes 2 to perform heat exchange. In this embodiment, the fluid is water.

[0018] The one side header tank part 4 and the other side header tank part 5 include respectively header plates 10a and 10b in which ends of the tubes 2 are inserted, and header covers 11a and 11b disposed to cover the header plates 10a and 10b. A returning tank chamber 12 is formed in the one side header tank part 4 between the header plate 10a and the header cover 11a. All the tubes 2 are communicated with the returning tank chamber 12.

[0019] An inlet tank chamber 14 and an outlet tank chamber 15 are formed in the other side header tank part 5 by parting a space between the header plate 10b and the header cover 11b by means of a partition 13. In this embodiment, the inlet tank chamber 14 and the outlet tank chamber 15 are disposed adjacently in a stacked direction of the tubes 2. More specifically, the inlet tank chamber 14 is disposed in a lower position of the tube unit and the outlet tank chamber 15 is disposed in an upper position of the tube unit, respectively.

[0020] The inlet tank chamber 14 are communicated with a group of tubes disposed in the lower position of the tube unit and the outer tank chamber 15 are communicated with a group of tubes disposed in the upper position of the tube unit.

[0021] The partition 13 is disposed in a position such that if the number of the tubes 2 which communicate with the inlet tank chamber 14 and are outward flow paths is B1 and the number of the tubes 2 which communicate with the outlet tank chamber 15 and are homeward flow paths is B2, a relation between B1 and B2 is set to be B1 > B2. Meanwhile, in this embodiment, the paths of all the tubes 2 are set to be the same width in a passing direction of supplied wind of the heat exchanger (vertical direction to page space in FIG.1).

[0022] The header cover 11b of the other side header tank part 5 has inclined sections 16 and 17 provided on two mountain portions which are formed on the header cover 11b. An inlet pipe connecting part 18 is provided on the inclined section 16, and an outlet pipe connecting part 19 is provided on the inclined section 17.

[0023] Here, in this embodiment, the inclined sections 16 and 17 are set to incline in a similar direction or parallel and with a generally similar angle to each other. However, the inclined sections are not limited to these arrangements.

[0024] The inlet pipe connecting part 18 is communicated with the inlet tank chamber 14 and connected to one end of an inlet pipe 20. The other end of the inlet pipe 20 is connected to a water jacket (not shown) of an engine so that hot water heated by the engine is supplied through the inlet pipe 20 to the inlet tank chamber 14. The outlet pipe connecting part 19 is communicated with the outlet tank chamber 15 and connected to one end of an outlet pipe 21. The other end of the outlet pipe 21 is connected to the water jacket (not shown) of the engine so that cooling water cooled by the heat exchanger 1 is discharged through the outlet pipe 21 to exterior of the heat exchanger 1.

[0025] In the structure as mentioned above, the hot water entered the inlet tank chamber 14 through the inlet pipe 20 passes through the tubes 2 communicating with the inlet tank chamber 14 and is introduced in the returning tank chamber 12, thereafter, passes through the tubes 2 communicating with the returning tank chamber 12 and the outlet tank chamber 15 and is introduced in the outlet tank chamber 15, and is discharged from the outlet tank chamber 15 through the outlet pipe 21 to the exterior.

[0026] In this case, heat exchange is executed between the hot water passing in the tubes 2 and air which is an outer heat exchanging medium passing around an outer periphery of each of the tubes 2, thereby the air is heated to contribute to heating in a vehicle interior.

[0027] In the above-mentioned heat exchanger 1, because the inlet pipe 20 and the outlet pipe 21 can be disposed so that the pipes are not significantly projected from a side surface of the heat exchanger 1 by providing them on the inclined sections 16 and 17, a heat exchanger having a generally similar width W to a length L, for example, a maximum depth of the trapezoidal in-car space S can be provided, consequently, it is possible to accomplish high heat exchange efficiency in the in-car space S.

[0028] In the above-mentioned embodiment, if the number of the tubes which communicate with the inlet tank chamber and are outward flow paths is B1 and the number of the tubes which communicate with the outlet tank chamber and are homeward flow paths is B2, because a relation between B1 and B2 is set to be B1> B2, the hot water having a large temperature difference from circumferential air flows in each of the outward tubes 2, on the contrary, the cooling water having a less temperature difference from the circumferential air flows in each of the homeward tubes 2, thereby the hot water having high heat exchange efficiency has a slow flow speed, and the cooling water having low heat exchange efficiency has a rapid flow speed.

[0029] Consequently, it is possible to accomplish heat exchange efficiency higher than a case where water

flows through each of outward and homeward paths at the same speed.

[0030] In the above-mentioned embodiment, the inlet tank chamber 14 is disposed in the lower position of the heat exchanger and the outlet tank chamber 15 is disposed in the upper position of the heat exchanger, if air generated in the water passing through each of the tubes 2 is guided to the outlet tank chamber 15 together with the cooling water, because the air is smoothly guided to the outlet pipe 21 through the outlet pipe connecting part 19 without accumulating at an upper side of the outlet tank chamber 15, the ejection of the air can be efficiently accomplished.

[0031] Meanwhile, in the above-mentioned embodiment, although the heat exchanger 1 is installed in the trapezoidal in-car space S in the vehicle, the present invention can also be applied to a case where the heat exchanger is installed in any trapezoidal in-car space other than the vehicle.

[0032] Although the preferred embodiments of the present invention have been mentioned, it should be noted that the present invention is not limited to these embodiments, various modifications and changes can be made to the embodiments.

Claims

1. A heat exchanger, comprising:

a tube unit in which a plurality of tubes (2) are disposed in a stacked state;
a one side header tank part (4) which is provided at one end side of the tube unit and in which a returning tank chamber (12) is formed;
an other side header tank part (5) which is provided at other end side of the tube unit and in which an inlet tank chamber (14) and an outlet tank chamber (15) are disposed adjacently in a stacked direction of the tubes (2);
an inlet pipe connecting part (18) provided on the other side header tank part (5) and configured to guide fluid from an outside into the inlet tank chamber (14); and
an outlet pipe connecting part (19) provided on the other side header tank part (5) and configured to discharge the fluid to an outside of the outlet tank chamber (15),

wherein inclined sections (16, 17) configured to incline to a longitudinal direction of the tubes (2) are provided at two locations on the other side header tank part (5),
wherein the inlet pipe connecting part (18) and the outlet pipe connecting part are (19) provided on the inclined sections (16, 17), respectively.

2. The heat exchanger according to claim 1, wherein the inclined sections (16, 17)are inclined in a similar direction to each other.

3. The heat exchanger according to claim 1, wherein the inclined sections (16, 17) are inclined at a substantially similar angle to each other.

4. The heat exchanger according to claim 1, wherein if the number of the tubes (2) which communicate with the inlet tank chamber (14) and are outward flow paths is B1 and the number of the tubes (2) which communicate with the outlet tank chamber (15) and are homeward flow paths is B2, a relation between B1 and B2 is set to be B1 > B2.

FIG. 1

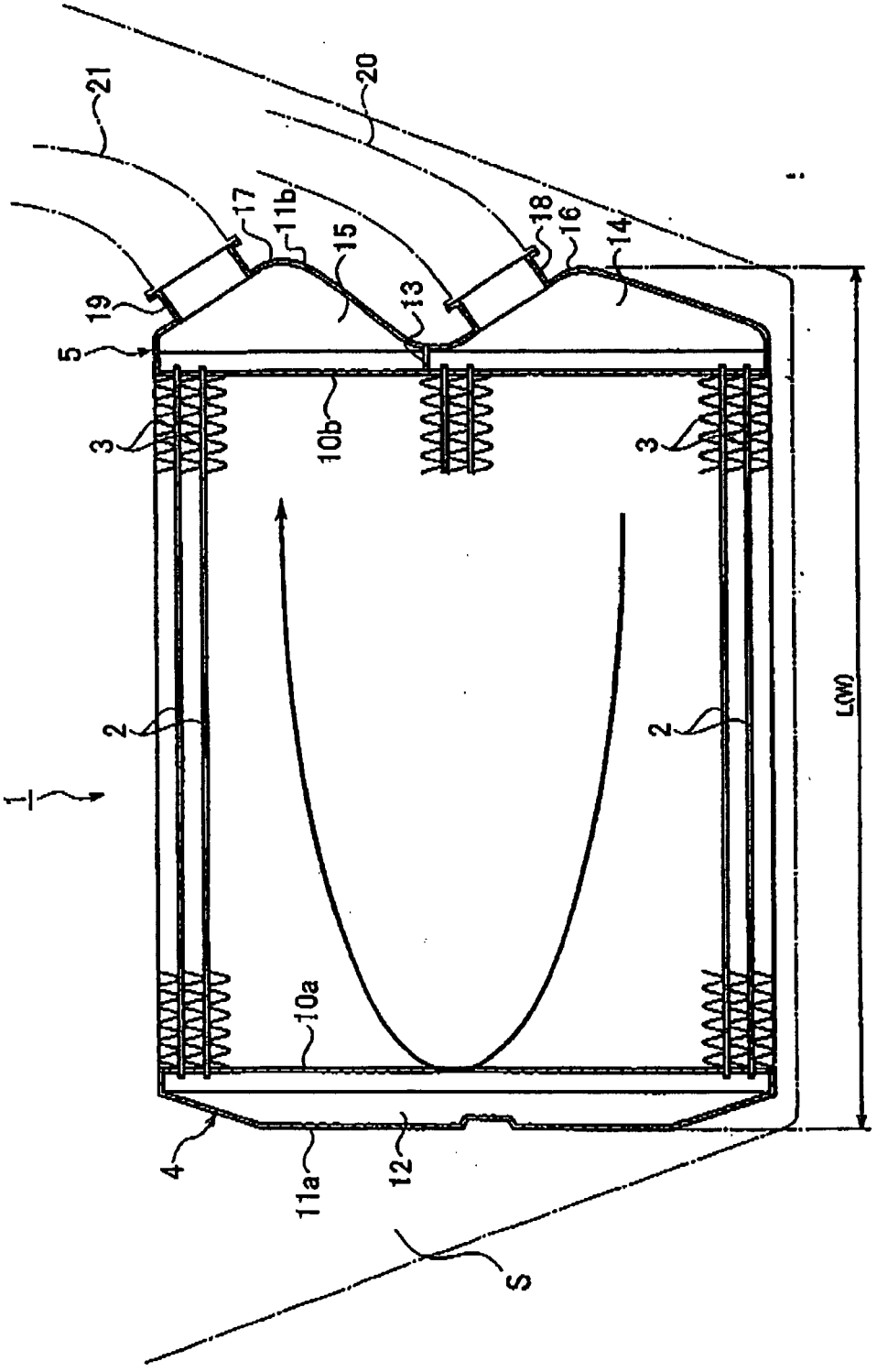


FIG. 2

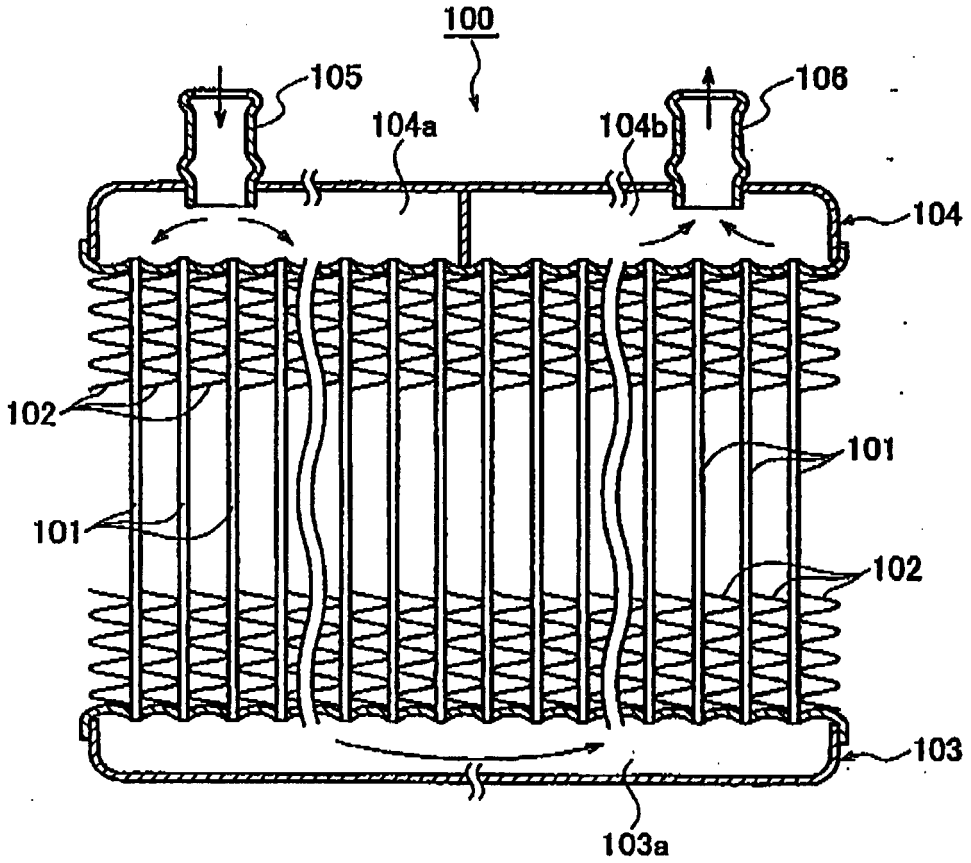
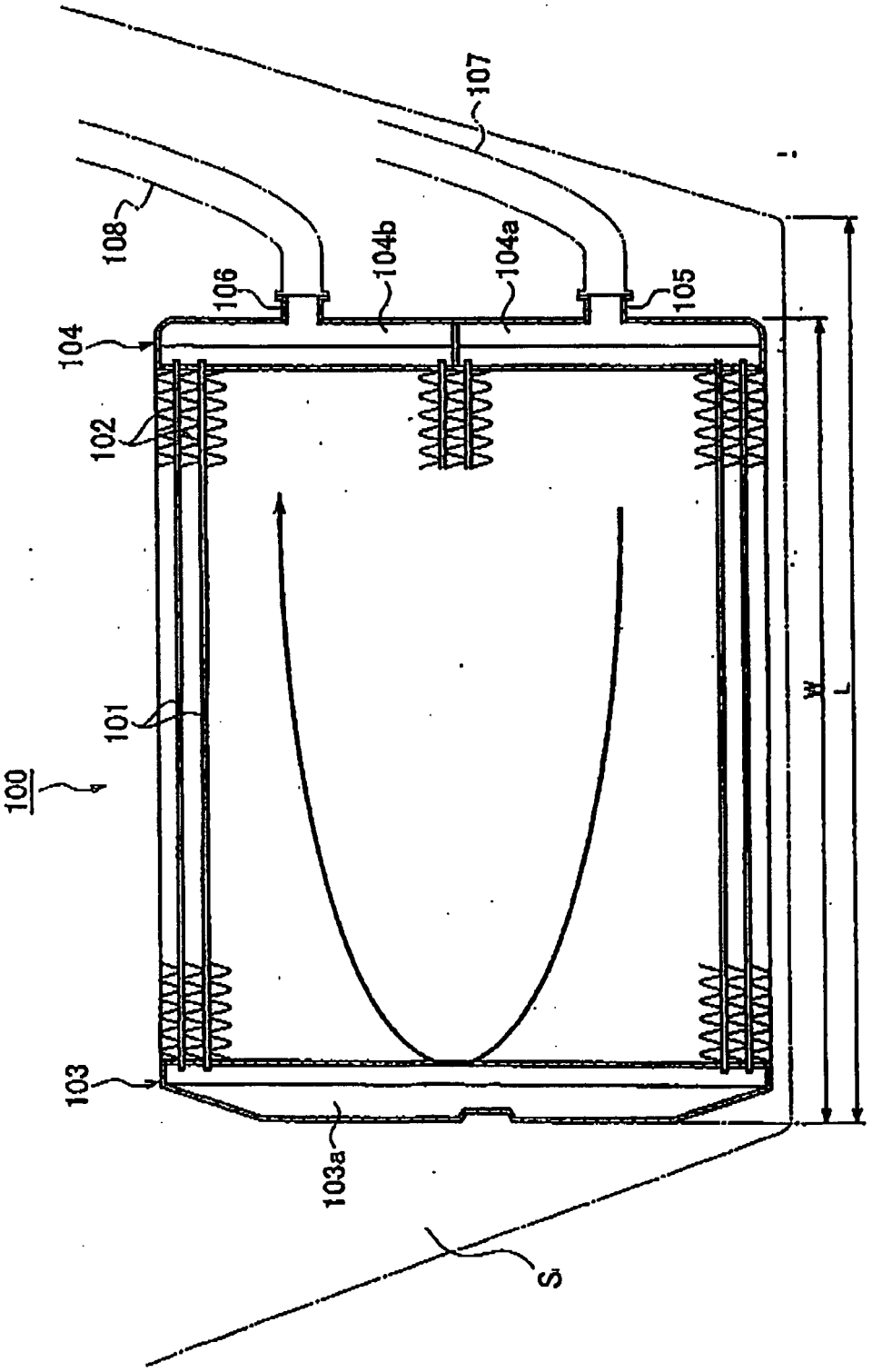


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 06 02 6628

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 03 211398 A (MATSUSHITA ELECTRIC IND CO LTD) 17 September 1991 (1991-09-17) * abstract; figures * -----	1-4	INV. F28F9/04 F28D1/053
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			TECHNICAL FIELDS SEARCHED (IPC) F28F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 April 2007	MELLADO RAMIREZ, J

CATEGORY OF CITED DOCUMENTS

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10-04-2007

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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