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## (54) HEAT EXCHANGER FOR VEHICLES

(57) A heat exchanger (10) for vehicles is described, comprising: a first radiating mass (21) having a first side (22) with a mouth (25) for entering a cooling fluid, and a second side (23) with a mouth (27) for exiting the fluid; a second radiating mass (31) having a first side (32) connected to the first collector (24), and a second side (33) connected to a third collector (38); a first tank (35), having a first side (36) connected to a base side (34) of the second radiating mass (31), and a second side (37) connected to the first collector (24), and a third radiating mass (41) having a first side (42) connected to the second collector (26), and a second side (43) connected to a fourth collector (48); and a second tank (45) having a first side (46) connected to a base side (44) of the third radiating mass (41), and a second side (47) connected to the second collector (26).

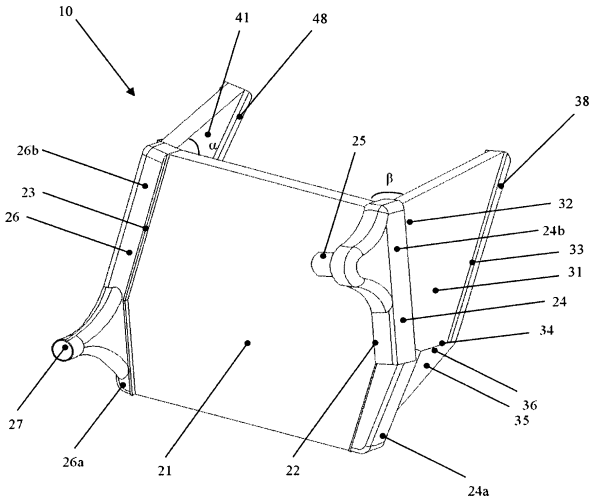


FIG. 1

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## Description

**[0001]** The present invention refers to a heat exchanger for vehicles which can be used for cooling a thermal engine of a vehicle.

**[0002]** In particular, the invention refers to a high-efficiency radiation, which can be used to cool the cooling liquid of the thermal engine of a motorcycle, more in particular of a racing motorcycle.

**[0003]** Heat exchangers for vehicles, for example for motorcycles, are known, generally arranged between the wheel and the engine, which, above all in case of processed motorcycles to participate in speed competitions, must dissipate a high amount of heat to cool the cooling liquid or oil of a thermal engine.

**[0004]** These known heat exchangers, however, are not satisfactory and have the problem of dissipating higher and higher amounts of heat, created by the need of increasing the performances of the vehicle engine, having available reduced spaces to house the heat exchanger in the vehicle.

**[0005]** Object of the present invention is solving the above prior art problems, by providing a heat exchanger, which allows dissipating a high amount of heat while it occupies a reduced space.

**[0006]** The above and other object and advantages of the invention, as will result from the following description, are obtained with a heat exchanger for vehicles as claimed in claim 1. Preferred embodiments and non-trivial variations of the present invention are the subject matter of the dependent claims.

**[0007]** It is intended that all enclosed claims are an integral part of the present description.

**[0008]** It will be immediately obvious that numerous variations and modifications (for example related to shape, sizes, arrangements and parts with equivalent functionalities) can be made to what is described, without departing from the scope of the invention as appears from the enclosed claims.

**[0009]** The present invention will be better described by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 shows a perspective view of a heat exchanger for vehicles according to the present invention;
- Figure 2 shows a perspective view of a heat exchanger for vehicles according to the present invention;
- Figure 3 shows a perspective view of a part of a heat exchanger for vehicles according to the present invention; and
- Figure 4 shows a schematic view of a heat exchanger for vehicles according to the present invention.

**[0010]** With reference to the Figures, the heat exchanger 10 for vehicles of the invention comprises a first radiating mass 21 having a first side 22 connected to a first collector 24 comprising a mouth 25 for entering a cooling fluid, and a second side 23 connected to a second collector 26 comprising a mouth 27 for exiting the cooling fluid; preferably, the first side 22 and the second side 23 are opposite sides of the first radiating mass 21.

**[0011]** The heat exchanger 10 further comprises at least one second radiating mass 31 having a first side 32 connected to the first collector 24, and a second side 33 connected to a third collector 38; preferably, the first side 32 and the second side 33 are opposite sides of the second radiating mass 31.

**[0012]** The heat exchanger 10 further comprises a first tank 35, having a first side 36 connected to a base side 34 of the second radiating mass 31, and a second side 37 connected to a lower portion 24a of the first collector 24; in a preferred way, the lower portion 24a of the first collector 24 is separated from an upper portion 24b of the first collector 24 by means of a separating septum 55, to optimize the flow of the fluid inside the heat exchanger 10 of the invention, as will be explained in detail below.

**[0013]** Preferably, the second radiating mass 31 is arranged transverse to the first radiating mass 21, forming therewith an angle $\alpha$, preferably greater than 90°.

**[0014]** In a preferred way, the heat exchanger 10 for vehicles of the invention comprises deviating wings 56 of the flow associated to the second radiating mass 31, in particular associated to its inlet surface of the air flow, which is oriented towards the traveling direction of the vehicle.

**[0015]** Alternatively, instead of being connected to the first collector 24, the second radiating mass 31 and the first tank 35 can be connected to the second collector 26 comprising the mouth 27 for exiting the cooling fluid.

**[0016]** In a preferred embodiment of the invention, the heat exchanger 10 for vehicles comprises:

- the first radiating mass 21 having the first side 22 connected to the first collector 24 comprising the entry mouth 25 of the cooling fluid, and the second side 23 connected to the second collector 26 comprising the mouth 27 for exiting the cooling fluid;
- the second radiating mass 31 having the first side 32 connected to the first collector 24, and the second side 33 connected to the third collector 38;
- a third radiating mass 41 having a first side 42 connected to the second collector 26, and a second side 43 connected to a fourth collector 48; preferably the first side 42 and the second side 43 are opposite sides of the third radiating mass 41.

**[0017]** The heat exchanger 10 further comprises a second tank 45, having a first side 46 connected to a base side 44 of the third radiating mass 41, and a second side 47 connected to a lower portion 26a of the second collector 26; in a preferred way, the lower portion 26a of the second collector 26 is separated from an upper portion

26b of the second collector 26 by means of a separating septum 55, to optimize the flow of fluid inside the heat exchanger 10 of the invention, as will be explained below in detail.

**[0018]** Preferably, the third radiating mass 41 is arranged transverse to the first radiating mass 21, more preferably symmetrical to the second radiating mass 31, forming with the first radiating mass 21 an angle $\beta$, preferably greater than 90°; more preferably, angle $\beta$ is equal to angle $\alpha$ formed between the second radiating mass 31 and the first radiating mass 21.

**[0019]** In a similar way to the second radiating mass 31, also the third radiating mass 41 comprises deviating wings 56 of the flow associated thereto, in particular associate to its inlet surface of the air flow, which is oriented towards the traveling direction of the vehicle, for example towards the front part of a motorcycle on which the heat exchanger 10 of the invention is assembled, preferably with the wheel inserted in the space included between the second radiating mass 31 and the third radiating mass 41.

**[0020]** Preferably, the first radiating mass 21 comprises a plurality of tubes 12 which extend between the first side 22 and the second side 23 of the first radiating mass 21, said tubes 12 having a first end next to the first side 22, connected to the first collector 24 and a second end, next to the second side 23, connected to the second collector 26.

**[0021]** Preferably, the second radiating mass 31 comprises a plurality of tubes 12 which extend between the first side 32 and the second side 33 of the second radiating mass 31, said tubes 12 having a first end next to the first side 32, connected to the first collector 24, and a second end, next to the second side 33, connected to the third collector 38.

**[0022]** Preferably, the third radiating mass 41 comprises a plurality of tubes 12 which extend between the first side 42 and the second side 43 of the third radiating mass 41, said tubes 12 having a first end next to the first side 42, connected to the second collector 26, and a second end, next to the second side 43, connected to the fourth collector 48.

**[0023]** Preferably, the tubes 12 are arranged substantially horizontal and extend between two opposite sides of the radiating masses 21, 31, 41 and the first and second collector 24, 26 are arranged transverse to the tubes 12; in a preferred way, the tubes 12 are connected to cooling wings of a known type, for example arranged between the tubes, and are connected to a frame, comprising horizontal and transverse plates next to the sides which delimit the radiating masses 21, 31, 41.

**[0024]** Preferably, the deviating wings 56 of the flow are connected to the frame next to the second and the third radiating mass 31, 41.

**[0025]** A vehicle according to the invention, for example a motorcycle, comprises the heat exchanger 10 of the invention assembled arranged between the wheel and the thermal engine, in a preferred way with the second and the third radiating mass 31, 41 arranged laterally to the wheel.

**[0026]** The operation of a preferred embodiment of the heat exchanger 10 for vehicles according to the present invention will now be described; in particular, the flow of cooling fluid inside it, shown in Figure 4, will be described.

**[0027]** The cooling fluid, after having entered the heat exchanger 10 through the entry mouth 25, passes into the first collector 24, in particular in its upper portion 24b, where it is divided into two parts: a first part of the flow, for example about half the flow, enters into the first radiating mass 21, and a second part of the flow, for example the second half, enters into the second radiating mass 31 and from this into the third collector 38.

**[0028]** The first part of the flow then passes from the first radiating mass 21 to the second collector 26, in particular to its upper portion 26b, and from this to the third radiating mass 41 and then into the fourth collector 48.

**[0029]** The second part of the flow then passes from the third collector 38 to the first tank 35 and from this it returns into the first collector 24, in particular in its lower portion 24a, and from this into the first radiating mass 21, in particular at its lower portion 21a, to enter then into the second collector 26, in particular in its lower portion 26a; from the lower portion 26a of the second collector 26, finally, the second part of the flow exits from the outlet mouth 27.

**[0030]** Finally, the first part of the flow passes from the fourth collector 48 to the second tank 45 and from this it returns into the second collector 26, in particular in its lower portion 26a, to exit from the outlet mouth 27.

**[0031]** Surprisingly, it has been measured on prototypes that the heat exchanger 10 for vehicles of the invention improves the performances, with respect to a standard heat exchanger (radiator), decreasing the temperature of the cooling fluid by 15°C, taking into account that usually in this field it is deemed an optimum result to be able to obtain a fluid temperature decrease of 5°C with modifications to the heat exchanger.

## Claims

**1.** Heat exchanger (10) for vehicles comprising:

- a first radiating mass (21) having a first side (22) connected to a first collector (24) comprising a mouth (25) for entering a cooling fluid, and a second side (23) connected to a second collector (26) comprising a mouth (27) for exiting the cooling fluid,
- at least one second radiating mass (31) having a first side (32) connected to the first collector (24), and a second side (33) connected to a third collector (38),
- moreover, a first tank (35), having a first side (36) connected to a base side (34) of the second radiating mass (31), and a second side (37) con-

nected to the first collector (24),
- a third radiating mass (41) having a first side (42) connected to the second collector (26), and a second side (43) connected to a fourth collector (48),
- a second tank (45) having a first side (46) connected to a base side (44) of the third radiating mass (41), and a second side (47) connected to the second collector (26);

wherein the second side (37) of the first tank (35) is connected to a lower portion (24a) of the first collector (24) which is separated from an upper portion (24b) of the first collector (24) by means of a separating septum (55) to optimize the flow of the fluid; and
the second side (47) of the second tank (45) is connected to a lower portion (26a) of the second collector (26) which is separated from an upper portion (26b) of the second collector (26) by means of a separating septum (55), to optimize the flow of fluid.

**2.** Heat exchanger (10) for vehicles according to claim 1, **characterized in that** the second radiating mass (31) and the first tank (35), instead of being connected to the first collector (24), are connected to the second collector (26) comprising the mouth (27) for exiting the cooling fluid.

**3.** Heat exchanger (10) for vehicles according to any one of the previous claims, **characterized in that** the second radiating mass (31) and/or the third radiating mass (41) is arranged transverse to the first radiating mass (21).

**4.** Heat exchanger (10) for vehicles according to claim 3, **characterized in that** the second radiating mass (31) and/or the third radiating mass (41) each form with the first radiating mass (21) an angle ($\alpha$, $\beta$) greater than 90°.

**5.** Heat exchanger (10) for vehicles according to claim 4, **characterized in that** the third radiating mass (41) is arranged symmetrical to the second radiating mass (31), forming with the first radiating mass (21) an angle ($\beta$) equal to the angle ($\alpha$) formed between the second radiating mass (31) and the first radiating mass (21).

**6.** Heat exchanger (10) for vehicles according to any one of the previous claims, **characterized in that** it comprises deviating wings (56) of the flow associated to an inlet surface of the air flow of the second radiating mass (31) and/or of the third radiating mass (41), which is oriented towards the traveling direction of the vehicle.

**7.** Vehicle comprising a heat exchanger (10) according to any one of the previous claims, assembled arranged between a wheel and a thermal engine, with the second and/or the third radiating mass (31, 41) arranged laterally to the wheel.

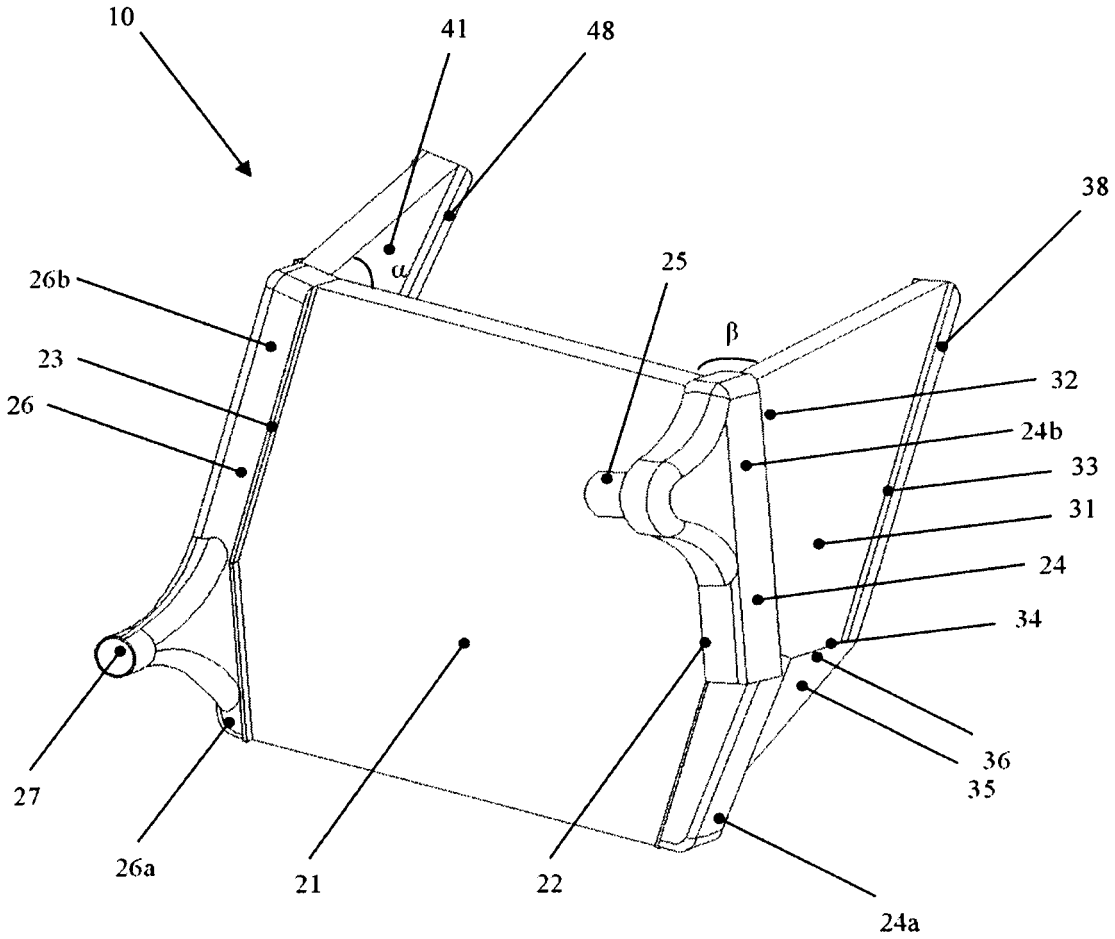


FIG. 1

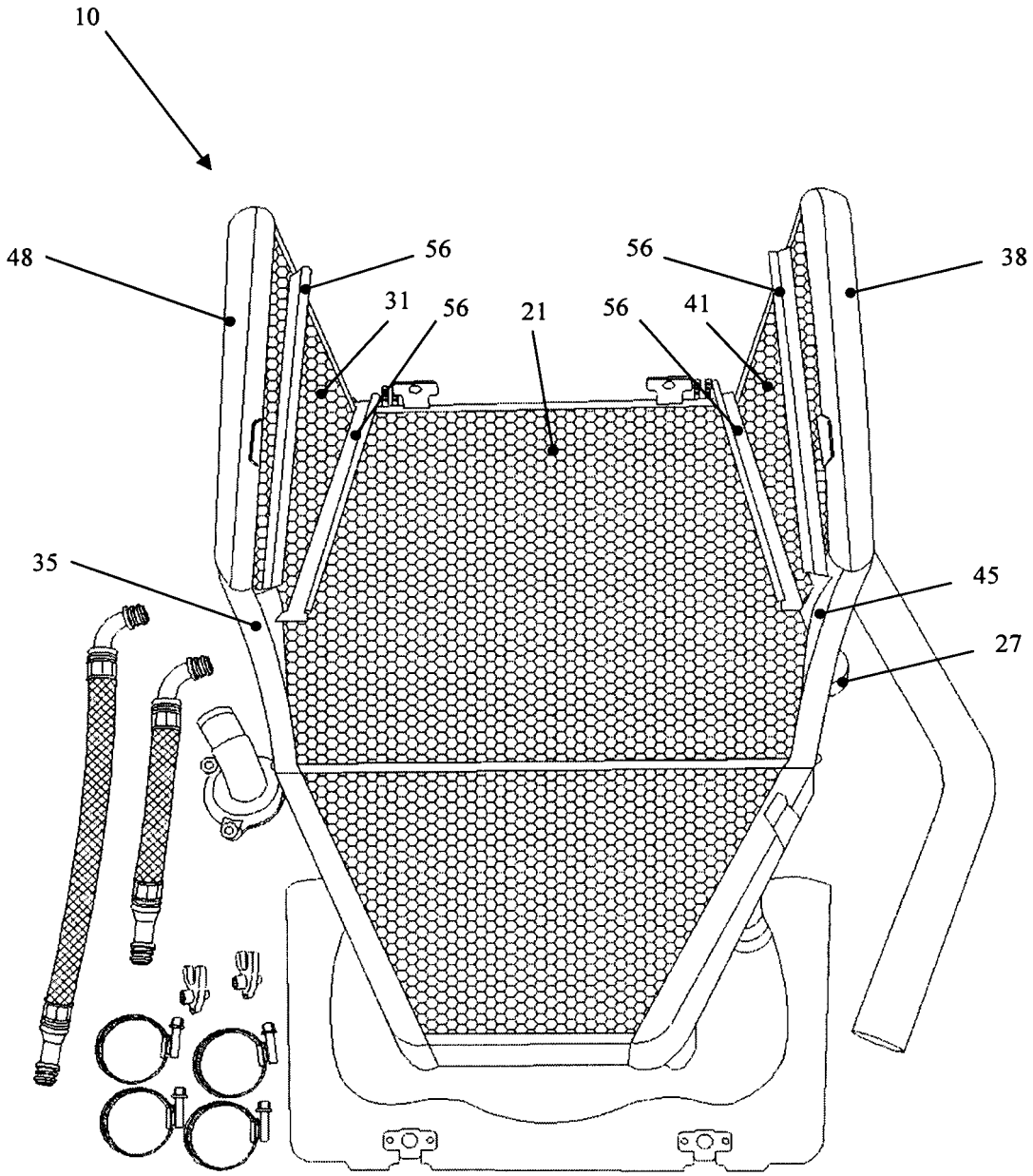


FIG. 2

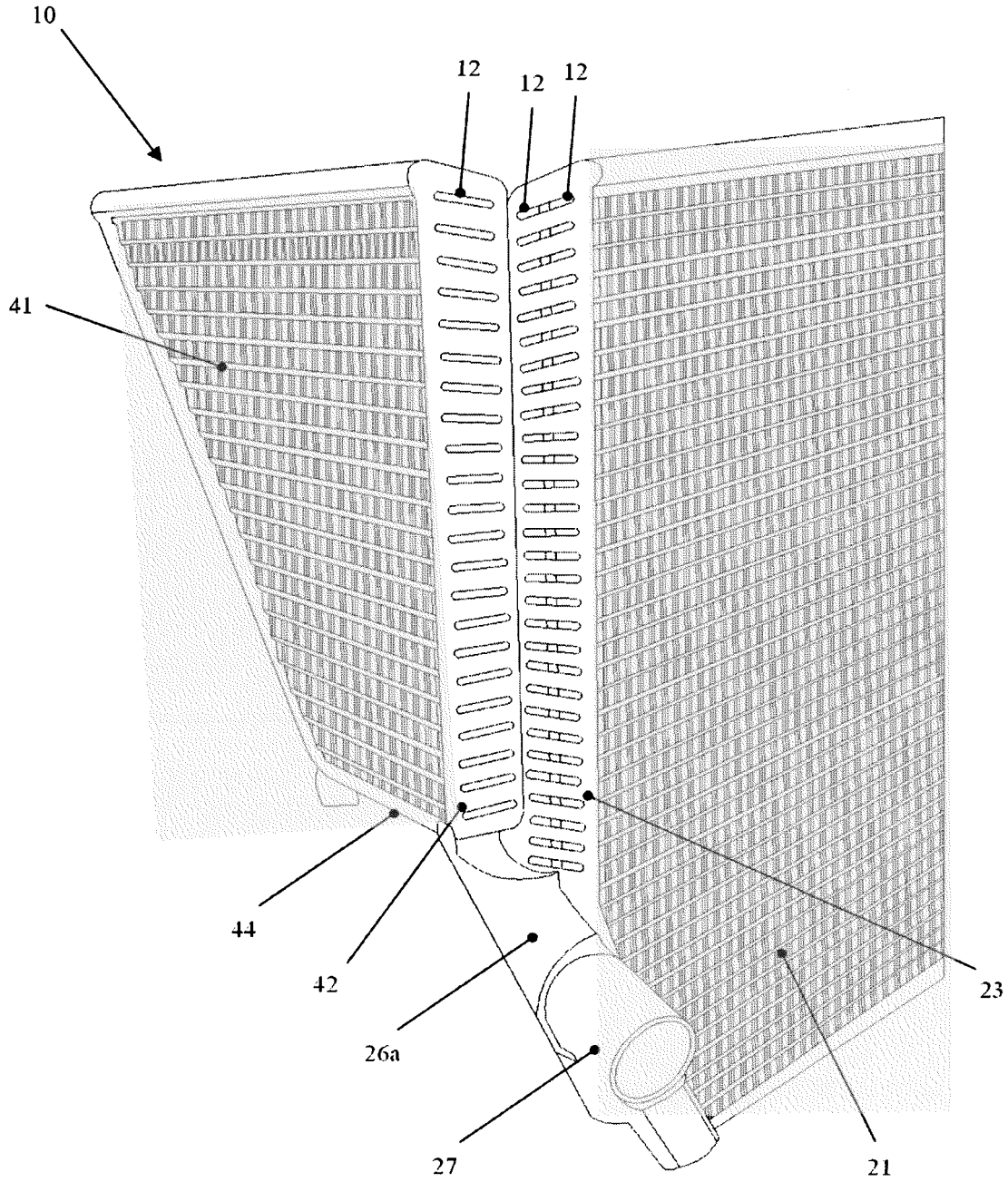


FIG. 3

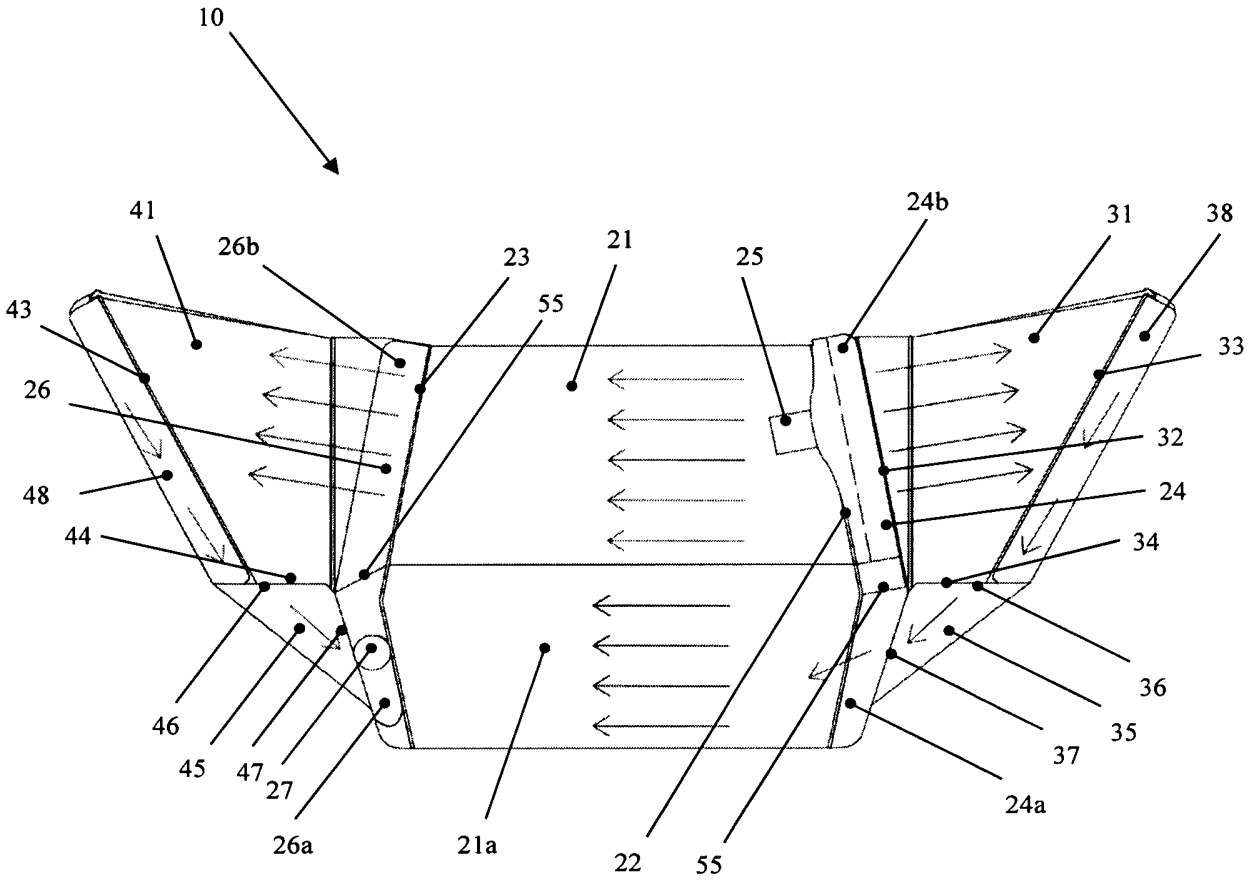
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FIG. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 18 00 0712

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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TECHNICAL FIELDS SEARCHED (IPC)

F28D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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| Munich | 11 January 2019 | Bain, David |

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