(19) Europäisches Patentamt
European Patent Office
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(11) **EP 1 970 659 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.09.2008 Bulletin 2008/38

(51) Int Cl.:
F28D 1/053 *(2006.01)* ***F28F 1/12*** *(2006.01)*

(21) Application number: **08003953.0**

(22) Date of filing: **04.03.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **05.03.2007 IT MI20070440**

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(54) Radiator for heating a room

(57) The radiator for heating a room comprises a plurality of heating elements connected to a delivery header and a return header for the circulation of a carrier fluid, and fins for optimising the convective heat exchange with the room, the fins exhibiting wet inside surfaces whereon the carrier fluid circulates.

FIG1a

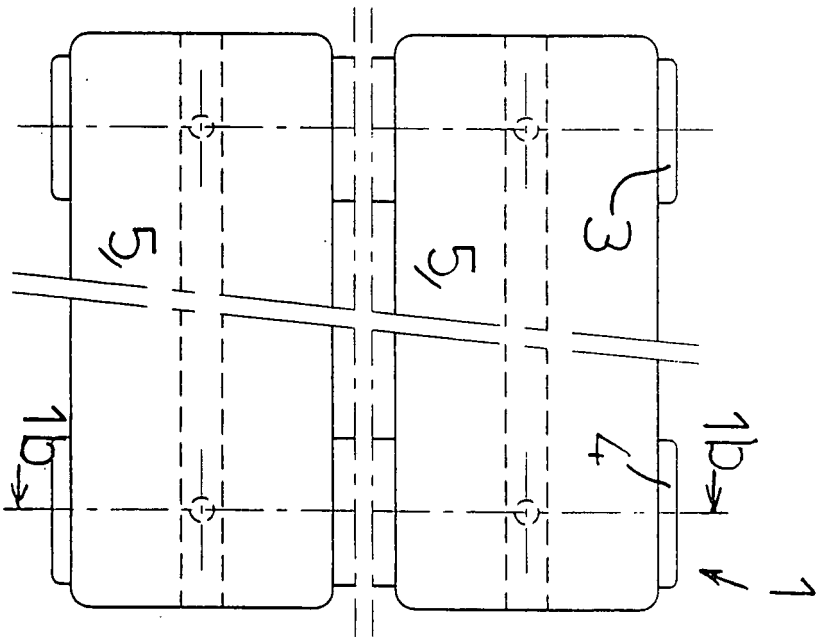

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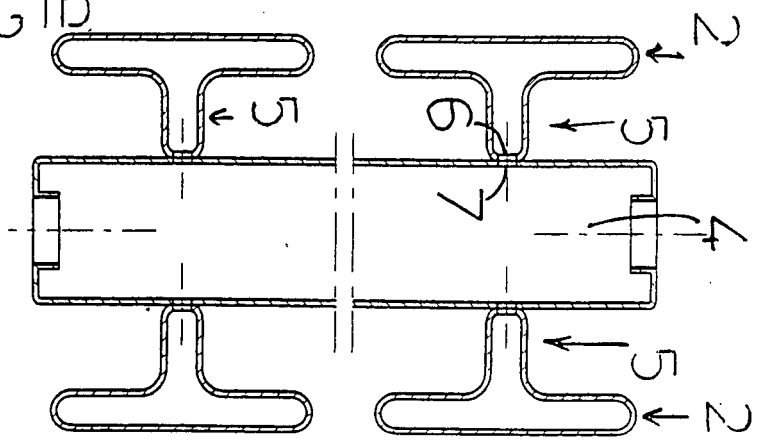
FIG1b



Description

[0001] The present invention relates to a radiator for heating a room, in particular but not necessarily for living use, of the type comprising a plurality of heating elements (tubular or stamped plate) connected to a delivery header and a return header for the circulation of a carrier fluid, and fins for optimising the convective heat exchange with the room. In the prior art, such fins are provided with dry convective surfaces generally obtained from "frets" of stamped plate welded to the heating elements, made of metal as well. The limit of the prior art consists in that if on the one end, that is, the welding one, such fins have almost the same temperature, by contact, on the wet metal, on the other one, that is, towards the opposite end, by the effect of heat transmission especially on walls thins like these ones, the temperature is considerably and progressively lower. It is clear that the limits wet exchange surface affects the heat exchange by irradiation. Moreover, the temperature gradient that sets along the fins negatively affects also the heat exchange by natural convection, limiting the "chimney effect". The technical task of the present invention therefore is to provide a radiator for heating a room which should allow eliminating the aforementioned technical disadvantages of the prior art.

[0002] Within the scope of this technical task, an object of the invention is to provide a radiator for heating a room which should optimise the heat exchange both by irradiation and by natural convection.

[0003] The technical task, as well as these and other objects, according to the present invention are achieved by making a radiator for heating a room according to claim 1. An important aspect of the invention consists exactly in making a radiator wherein the traditional "dry" fine are replaced by "wet" fins wherein the carrier fluid, the same used to heat the radiator itself, circulates. These fins may be obtained from "closed" variedly shaped tubular profiles, from "open" variedly shaped section bar elements, or by sheet moulding/drawing. Such fins may be located inside and/or behind (wall side) one or more radiator walls, whether it is tubular or of stamped plate, but also at the front (that is, on the exposed side of the radiator).

[0004] It is clear that the dimensions being equal, besides considerably increasing the wet exchange surface, which as known expresses the best conditions for heat exchange by irradiation, the fins themselves are provided with a higher, as well as even, surface temperature, as this is determined by the direct contact with the carrier fluid. Such higher surface temperature is more noticeable and advantageous when the carrier fluid temperature is lower, the reason why such application is particularly suitable for radiators that are installed on "low temperature" heating systems.

[0005] The above is to the advantage also of a better natural convection, maximising the optimisation of the "chimney effect".

[0006] Such fins may be applied to the heating elements or be shaped therewith.

[0007] Of course such fins may be applied to plate or tubular radiator models, whether the heating elements of the latter are arranged vertically or horizontally relative to the natural vertical arrangement thereof.

[0008] Further features of the present invention are further defined in the following claims.

[0009] Further features and advantages of the invention will appear more clearly from the description of a preferred but non-exclusive embodiment of the radiator for heating a room according to the finding, illustrated by way of a non-limiting example in the annexed drawings, wherein:

figure 1a shows a front view of a radiator according to a first preferred embodiment of the invention, wherein the fins are shaped with the tubular heating elements;
figure 1b shows a section of the radiator of figure 1a along line 1b-1b;
figure 2a shows a front view of a radiator according to a second preferred embodiment of the invention, wherein the fins are shaped with the tubular heating elements;
figure 2b shows a section of the radiator of figure 2a along line 2b-2b;
figure 3a shows a front view of a radiator according to a third preferred embodiment of the invention, wherein the fins are applied to the tubular heating elements;
figure :3b shows a section of the radiator of figure 3a along line 3b-3b;
figure 4a shows a front view of a radiator according to a fourth preferred embodiment of the invention, wherein the fins are applied to the tubular heating elements;
figure 4b shows a section of the radiator of figure 4a along line 4b-4b;
figure 5a shows a front view of a radiator according to a fifth preferred embodiment of the invention, wherein the fine are applied to the tubular heating elements;
figure 5b shows a section of the radiator of figure 5a along line 5b-5b;
figure 6a shows a front view of a radiator according to a sixth preferred embodiment of the invention, wherein the fins are applied to the tubular heating elements;
figure 6b shows a section of the radiator of figure 6a along line 6b-6b.

[0010] In the following description, equivalent parts of the different preferred embodiments of the invention will be indicated with the same numeral reference.

[0011] With reference to the above figures, there is shown a radiator for heating a room, in a building particularly but not necessarily for living use, globally indicated with reference numeral 1.

[0012] Radiator 1 comprises a plurality of heating ele-

ments 2 connected to a delivery header 3 and a return header 4 for the circulation of a carrier fluid.

[0013] Advantageously, radiator 1 comprises fins 5 for optimising the heat exchange with the room, exhibiting wet inside surfaces wherein said carrier fluid circulates.

[0014] Fins 5 are channel-shaped for delimiting, alone and/or in cooperation with the heating elements 2, flowing channels for the carrier fluid internally, and for air externally.

[0015] Fins 5 therefore are in fluid communication with the heating elements 2 in turn in fluid communication, as said, with the delivery header 3 and the return header 4.

[0016] With reference to figures 1a and 1b, a heating element 2 and a fin 5 are shaped in a single "T" tubular profile with closed section and closed ends. More precisely, there are four "T" tubular profiles connecting the delivery header 3 to the return header 4, whereof two are arranged at a front wall of radiator 1 and two are arranged at a back wall of radiator 1. The "T" tubular profiles, in the portion defining the base of fin 5, are welded to the delivery 3 and return 4 headers they are in fluid communication with, thanks to overlapped holes 6 and 7 provided in the mating zone thereof.

[0017] With reference to figures 2a and 2b, a heating element 2 and two fins 5 are shaped in a single dual "T" (TT) tubular profile with closed section and closed ends. More precisely, there are four dual "T" tubular profiles connecting the delivery header 3 to the return header 4, whereof two are arranged at a front wall of radiator 1 and two are arranged at a back wall of radiator 1. Dual "T" tubular profiles, in the portion defining the base of fin 5, are welded to the delivery 3 and return 4 headers they are in fluid communication with, thanks to the overlapped holes 6 and 7 provided in the mating zone thereof. With reference to figures 3a and 3b, two heating elements 2 are provided at a front wall of radiator 1 and two heating elements 2 at a back wall of radiator 1. Fins 5 are comprised of "C" tubular profiles with closed section and open ends. A first series of fins 5 is applied bridge-wise between the front surface of the two front heating elements 2, a second series of fins 5 is applied bridge-wise between the front surface of the two back heating elements 2 in the space comprised between the two front heating elements 2 and the two back heating elements 2, and a third series of fins 5 is applied bridge-wise between the back surface of the two back heating elements 2, To ensure fluid communication between each fin 5 and the heating elements 2 connected thereby, each open end of each fin 5 is inserted through the wall thickness of the corresponding heating element 2 with which it exhibits an intersection portion. The heating elements 2 at the bases thereof are welded to the delivery 3 and return 4 headers they are in fluid communication with, thanks to the overlapped holes 6 and 7 provided in the mating zone thereof. With reference to figures 4a and 4b, two heating elements 2 are provided at a front wall of radiator 1. Fins 5 are comprised of "C" tubular profiles with closed section and open ends. A first series of two fins 5 is applied to the back surface of one of the two heating elements 2, whereas a second series of two fins 5 is applied to the back surface of the other heating element 2. To ensure fluid communication between each fin 5 and the heating element 2 it is applied to, each open end 8 of each fin 5 is inserted through the wall thickness of the heating element 2 with which it exhibits an intersection portion. End 8 of fin 5 lies on an oblique plane relative to the longitudinal axis 9 of the fin itself. A portion of edge 10 of base 8 of fin 5 is juxtaposed to a portion of edge 11 of the opening of the heating element 2 wherein fin 5 is inserted so that a seating surface is created for the passage of the carrier fluid from the heating element 2 to fin 5. In this way, the opposite side of base 8 acts as deflector for the fluid from element 2 to fin 5. The heating elements 2 at the bases thereof are welded to the delivery 3 and return 4 headers they are in fluid communication with, thanks to the overlapped holes 6 and 7 provided in the mating zone thereof. With reference to figures 5a and 5b, two heating elements 2 are provided at a front wall of radiator 1. Fins 5 are comprised of "W" tubular profiles with closed section and closed ends. A first fin 5 is applied to the back surface of one of the two heating elements 2, whereas a second fin 5 is applied to the back surface of the other heating element 2. Each fin 5 is welded to the corresponding heating element 2 it is in fluid communication with, thanks to overlapped holes 12 and 13 provided in the mating zone thereof. Each heating element 2 is welded to the delivery 3 and return 4 headers it is in fluid communication with, thanks to overlapped holes 6 and 7 provided in the mating zone thereof.

[0018] With reference to figures 6a and 6b, two heating elements 2 are provided at a front wall of radiator 1. Fins 5 are comprised of open section bars. A first fin 5 is applied to the back surface of one of the two heating elements 2, whereas a second fin 5 is applied to the back surface of the other heating element 2. Each fin 5 is welded to the corresponding heating element 2. Between the inner surface of each fin 5 and the outer surface of the corresponding heating element 2 there is delimited a flowing chamber for the carrier fluid, but limited by the two sub-chambers 14a and 14b that remain empty to ensure smaller contents of carrier fluid and to allow the air flow. Except for the two empty sub-chambers 14a and 14b, fin 5 is in fluid communication with the corresponding heating element 2 through holes 15a and 15b obtained through the thickness of the wall portion of the heating element 2. Each heating element 2 is welded to the delivery 3 and return 4 headers it is in fluid communication with, thanks to overlapped holes 6 and 7 provided in the mating zone thereof. More in general, fins 5, in any particular embodiment of the invention, may be arranged at a back wall of the radiator (as shown, for example, in the embodiments of figure 4a, 5a, 6a) and/or at an inner wall of the radiator (as shown, for example, in the embodiment of figure 3a, 3b) and/or also at a front wall of said radiator (as shown, for example, in the embodiment of figure 3b).

[0019] Fin 5 may be comprised in general of a tubular

profile with circular or polygonal closed section having open or closed ends, or of a channel-shaped profile with open section cooperates with the heating element 2 or the heating elements 2 it is associated to for defining flowing channels for the carrier fluid.

[0020] The operation of radiator according to the invention clearly appears from what described and illustrated: the circulation of the carrier fluid that sets in the radiator besides the heating elements 2 also impinges the inner surfaces of the fins 5 that are in fluid communication with the heating elements, thus bringing all the advantages mentioned above.

[0021] Several changes and variations can be made to the radiator thus conceived, all falling within the scope of the inventive concept; moreover, all details can be replaced with technically equivalent elements.

[0022] In the practice, the materials used as well as the sizes, can be whatever, according to the technical requirements and to the

prior art.

Claims

1. Radiator for heating a room of the type comprising a plurality of heating elements connected to a delivery header and a return header for the circulation of a carrier fluid, and fins for optimising the convective heat exchange with said room, **characterised in that** said fins exhibit inside surfaces wetted by said carrier fluid.

2. Radiator for heating a room according to claim 1, **characterised in that** said fins are channel-shaped for delimiting, alone and/or in cooperation with said heating elements, flowing channels for said carrier fluid internally, and for air externally.

3. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is arranged at a back wall of said radiator.

4. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is arranged at an inner wall of said radiator.

5. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is arranged at a front wall of said radiator.

6. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is comprised of a tubular profile with closed section and closed ends.

7. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is comprised of a tubular profile element with closed section and open ends.

8. Radiator for heating a room according to one or more of the previous claims, **characterised in that** said tubular profile is of steel.

9. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is comprised of a profile with open section.

10. Radiator for heating a room according to one or more of the previous claims, **characterised in that** said open section profile is a drawn and/or moulded sheet.

11. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is applied to at least one of said heating elements.

12. Radiator for heating a room according to one or more of the previous claims, **characterised in that** at least one of said fins is shaped with at least one of said heating elements.

13. Radiator for heating a room as described and claimed.

FIG1a

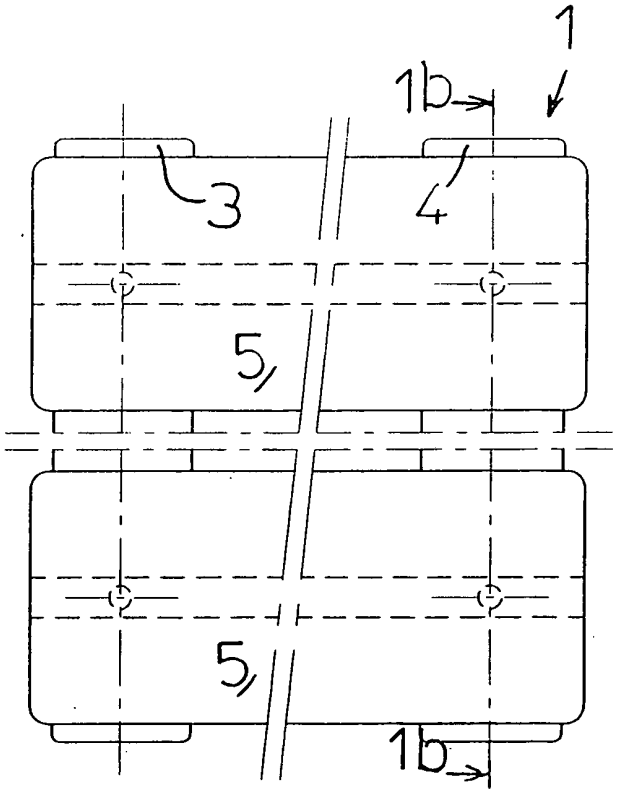


FIG1b

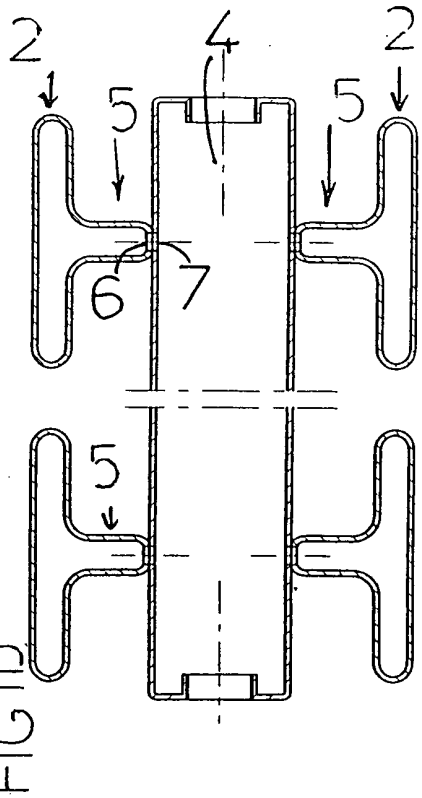


FIG2a

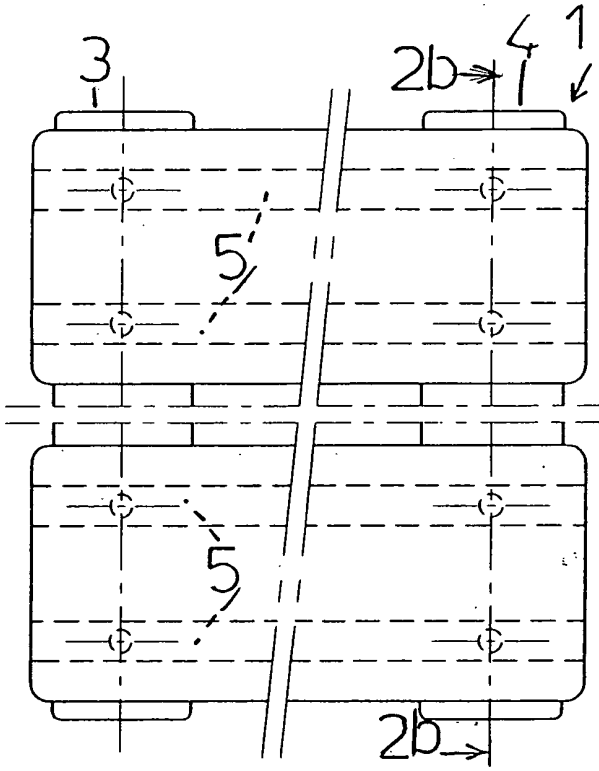
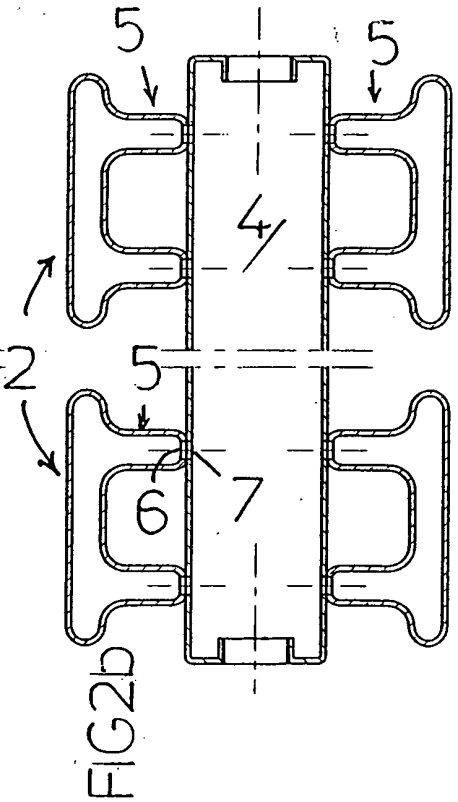


FIG2b



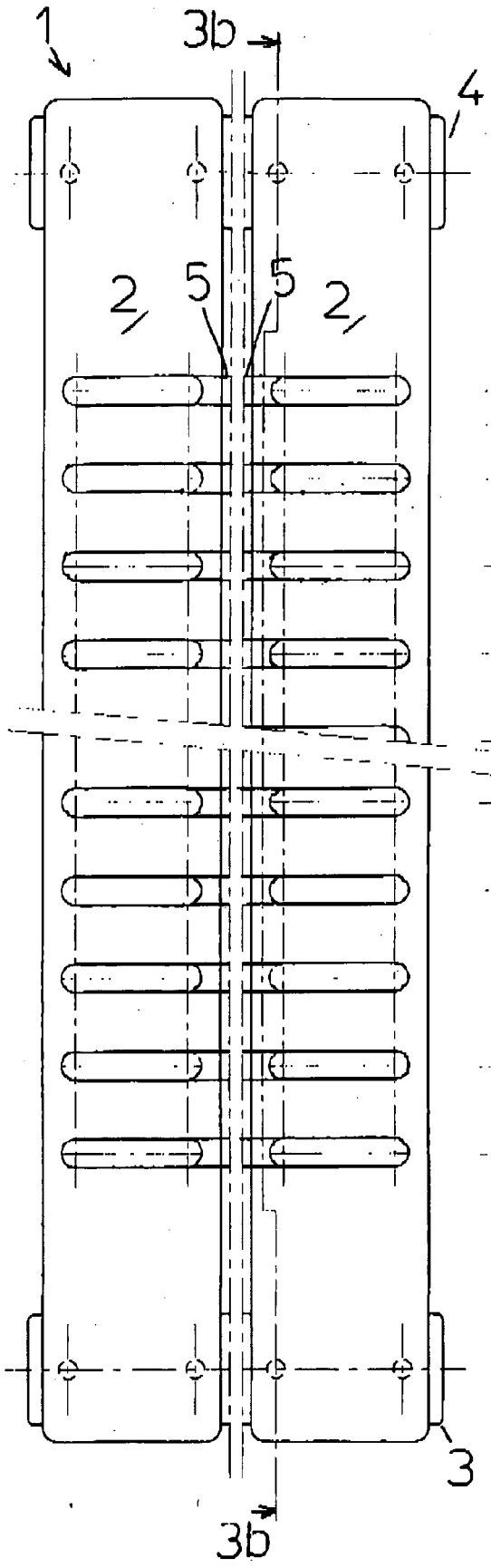


FIG 3a

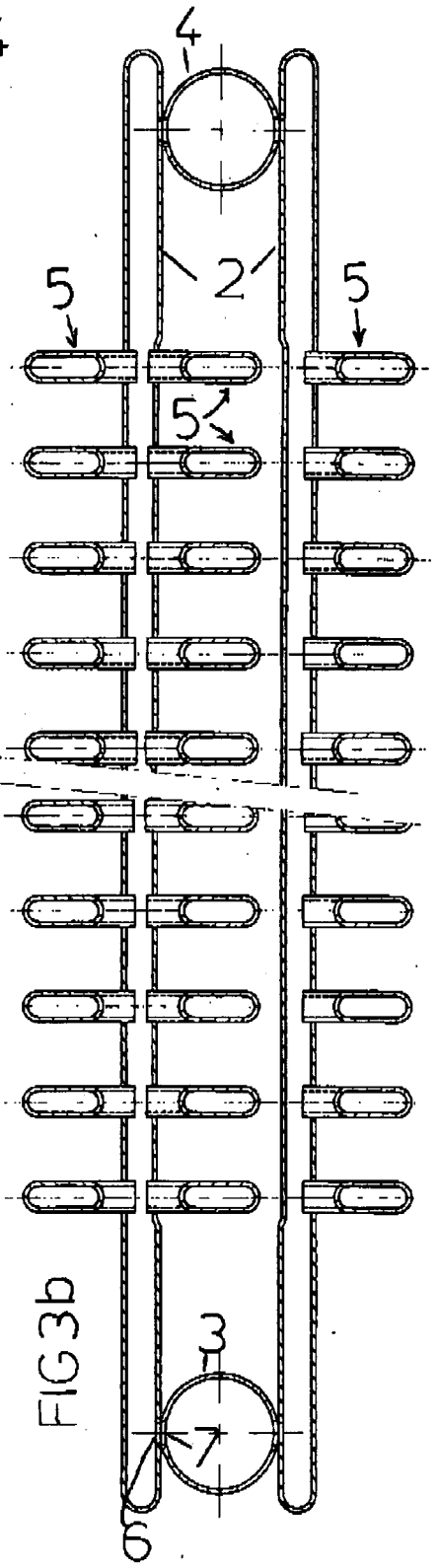


FIG 3b

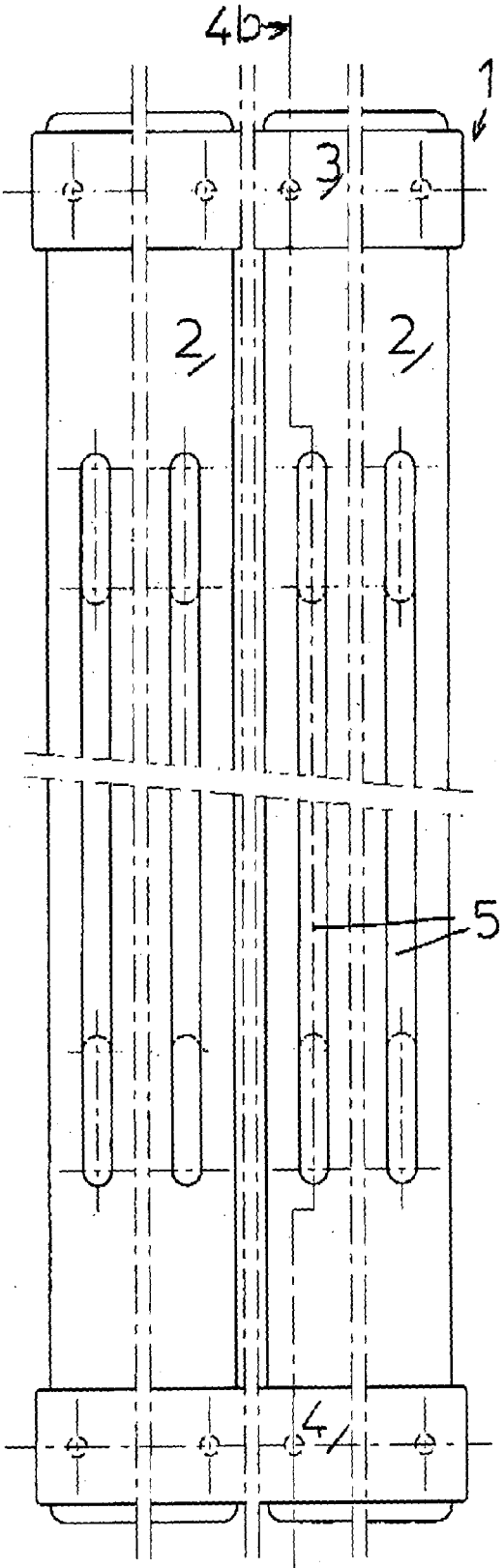


FIG4a

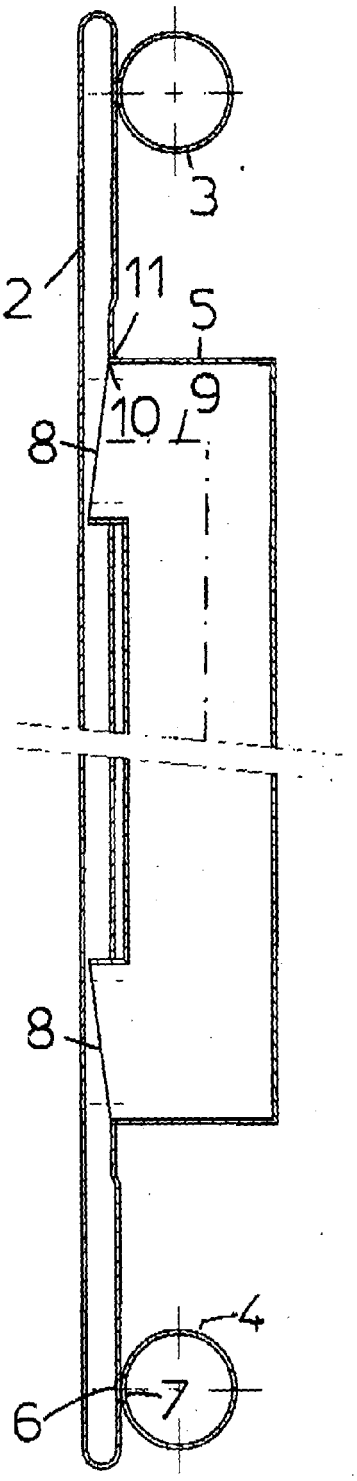


FIG4b

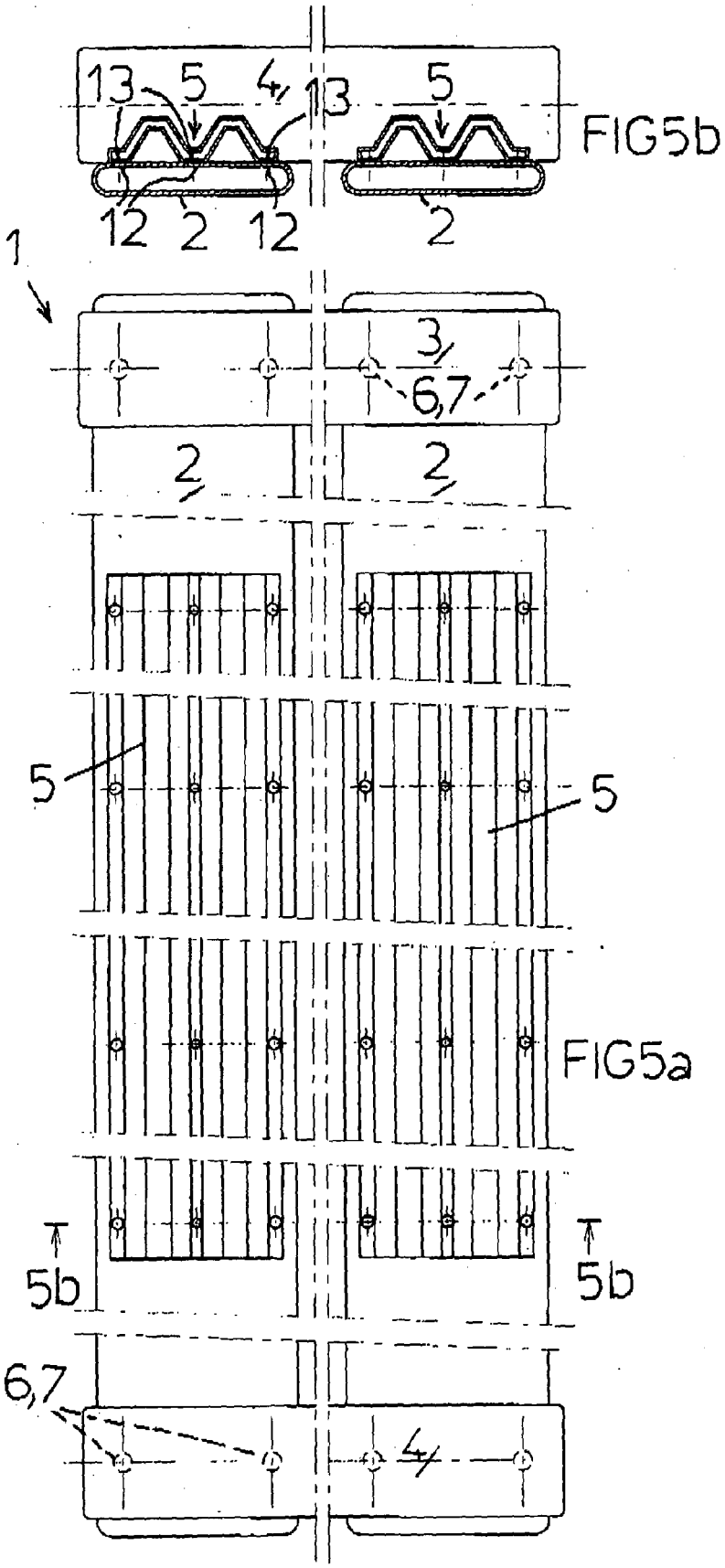


FIG5b

FIG5a

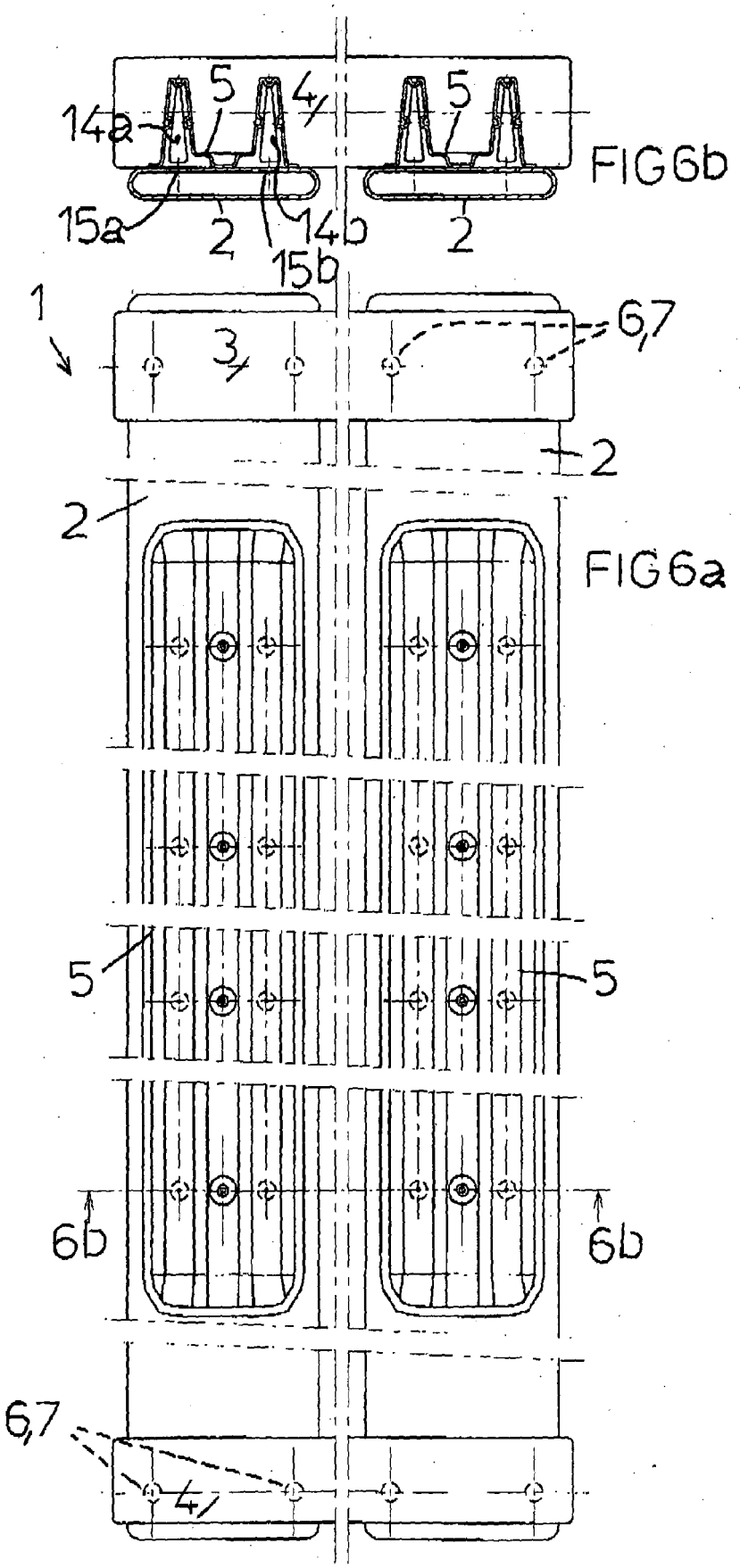


FIG6b

FIG6a

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 00 3953

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 June 2008	Leclaire, Thomas

CATEGORY OF CITED DOCUMENTS

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