(19) Europäisches Patentamt
European Patent Office
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(11) **EP 1 995 546 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.11.2008 Bulletin 2008/48

(51) Int Cl.:
F28F 9/18 *(2006.01)* ***F28D 1/053*** *(2006.01)*

(21) Application number: **07425325.3**

(22) Date of filing: **25.05.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

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(54) **Method of producing a radiator, and radiator produced by such a method**

(57) The multicolumn radiator (1) is defined by two heads (2), each having a hollow body (4) from which originate a number of pipes (5), and by a number of columns (3), each connected at one end to a respective pipe (5) of a first head (2), and at the opposite end to a respective pipe (5) of a second head (2). And the method includes a first step of forming an inner recess defining a socket (8) on the ends (6) of the pipes (5), and an outer recess defining a plug (7) on the free ends of the columns (3), or vice versa; a second step of fitting the columns (3) to the respective pipes (5) by inserting the plug (7) inside the corresponding socket (8); and a third step of connecting the column (3) to the respective pipe (5) at the join between the two.

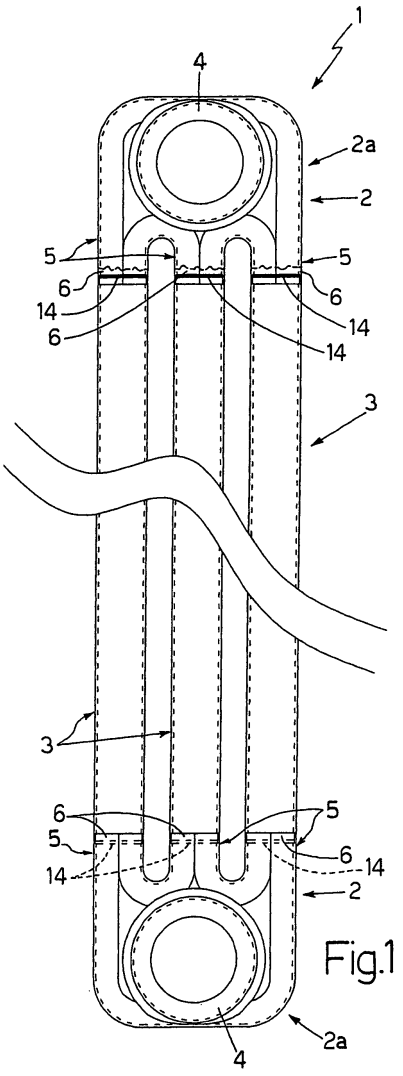

Fig.1

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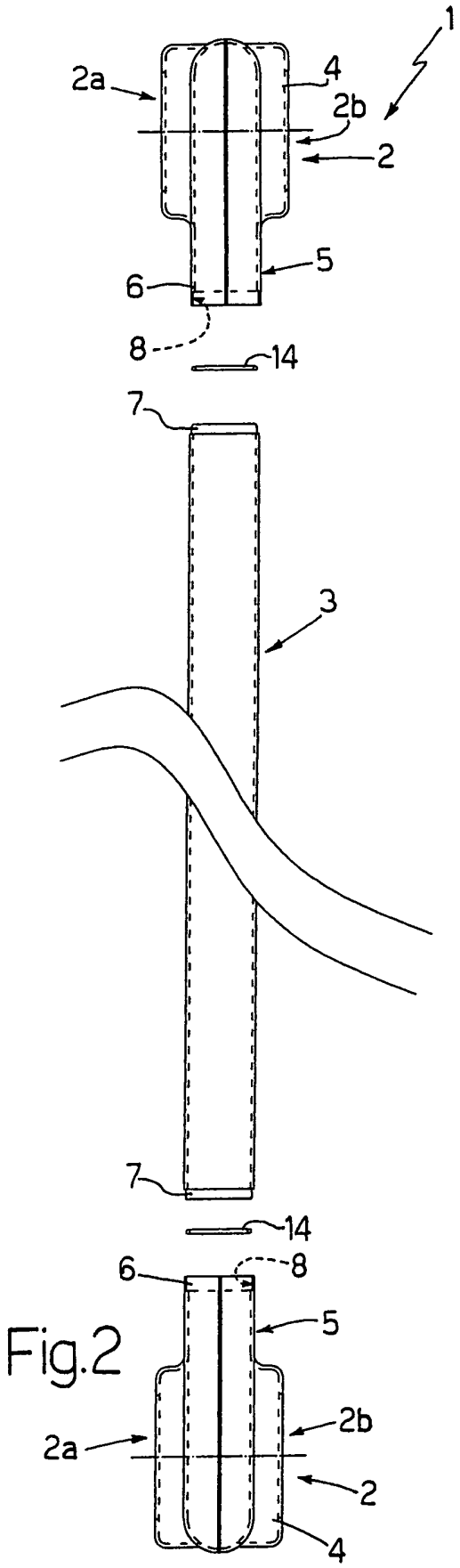

Fig.2

Description

[0001] The present invention relates to a method of producing a multicolumn radiator.

[0002] The present invention also relates to a multicolumn radiator produced using such a method.

[0003] Multicolumn radiators comprise two opposite heads connected by a number of columns. Each head comprises a hollow central body, from which a number of pipes originate, one for each column, and is formed in two flash-welded parts.

[0004] The method currently used to produce multicolumn radiators of the above type comprises the steps of:

pressing the two parts of the head;
flash welding the two parts to form the head;
cutting the columns to the desired length;
placing the ends of the columns at the ends of the corresponding pipes of the head; and
flash welding the ends of the columns to the respective ends of the head pipes.

[0005] The above method of producing multicolumn radiators has several drawbacks.

[0006] In particular, flash welding the head is expensive in terms of electric power consumption of the welding machines; involves high-cost finishing operations to remove weld marks; produces dust which must be removed by special regulation equipment; and involves high-cost maintenance of the equipment and machinery employed. As for the end product, i.e. the multicolumn radiator, even using the most sophisticated techniques, it is not always possible to obtain columns of exactly the same length, which poses problems when welding the columns to the head, and increases the number of rejects caused by columns of other than the predetermined length.

[0007] It is an object of the present invention to provide a method of producing a multicolumn radiator, designed to eliminate the aforementioned drawbacks.

[0008] It is a further object of the present invention to provide a multicolumn radiator produced using such a method.

[0009] According to the present invention, there is provided a method of producing a multicolumn radiator defined by two metal heads, each having a hollow central body from which originate a number of pipes, and by a number of metal columns, each connected at one end to a respective said pipe of a first said head, and at the opposite end to a respective said pipe of a second said head; the method being characterized by comprising:

a first step of forming an inner recess defining a socket on the ends of said pipes, and an outer recess defining a plug on the free ends of said columns, or vice versa;
a second step of fitting said columns to the respective said pipes by inserting said plug inside the corresponding said socket; and
a third step of connecting said column to the respective said pipe at the join between the two.

[0010] According to the present invention, there is also provided a multicolumn radiator defined by two metal heads, each having a hollow central body from which originate a number of pipes, and by a number of metal columns, each connected at one end to a respective said pipe of a first said head, and at the opposite end to a respective said pipe of a second said head; the radiator being characterized in that an inner recess defining a socket is formed on the ends of said pipes, and an outer recess defining a plug is formed on the free ends of said columns, or vice versa; said columns being fitted to the respective said pipes by inserting said plug inside the corresponding said socket.

[0011] A preferred embodiment of the present invention will be described with reference to the accompanying drawings, in which:

Figure 1 shows a side view of a multicolumn radiator in accordance with the teachings of the present invention;
Figure 2 shows an exploded front view of the multicolumn radiator in Figure 1;
Figures 3, 4 and 5 show side, front, and underside views, respectively, of a first component part of the multicolumn radiator in Figure 1;
Figures 6 and 7 show front and underside views, respectively, of a head of the Figure 1 multicolumn radiator at a first manufacturing stage;
Figures 8 and 9 show front and underside views, respectively, of the Figure 6 head at a second manufacturing stage;
Figures 10, 11 and 12 show side, front, and underside views, respectively, of the Figure 6 head at a third manufacturing stage;
Figure 13 shows a front view of a second component part of the multicolumn radiator in Figure 1.

[0012] Number 1 in Figures 1 and 2 indicates a multicolumn radiator comprising two (respectively, top and bottom) heads 2 made of metal, preferably steel; and a number of parallel vertical columns 3 hydraulically connecting heads 2 and also made of metal, preferably steel.

[0013] With reference to Figures 3 to 7, head 2 comprises a hollow central body 4 from which originate a number of pipes 5 (in the example embodiment shown, three pipes: two lateral and one central), the free ends 6 of which are parallel to one another for connection to corresponding free ends of columns 3. As shown in Figures 1, 2, 10, 11 and 12, the free ends 6 of pipes 5 have a reduction in inside diameter to define a recess or socket 8, and an annular shoulder 11 between socket 8 and the rest of pipe 5. As shown in Figures 1, 2 and 13, column 3 is cylindrical, and its free end has a portion 7 whose outside diameter is reduced to define a plug, and an outer annular shoulder 12 between portion 7 and the rest of

column 3. Portion 7 of each column 3 is inserted inside corresponding socket 8, so that the free edge of portion 7 rests on shoulder 11, and the free edge of pipe 5 rests on shoulder 12; for which purpose, portion 7 is the same length as socket 8.

[0014] As shown in Figures 3 to 7, head 2 is formed in two parts 2a, 2b welded to each other.

[0015] The method of producing multicolumn radiator 1 comprises:

a first step of forming, preferably stamping, the two parts 2a, 2b defining head 2;
a second step of joining the two parts 2a, 2b facing and in contact with each other, by means of a number of electric weld spots 13, as shown in Figures 6 and 7;
a third step of laser welding the two parts 2a, 2b to each other along all the contacting edges, as shown in Figures 8 and 9, to form head 2;
a fourth step of forming, e.g. turning, sockets 8 and, hence, shoulders 11 (Figures 10 and 12) on ends 6 of pipes 5;
a fifth step of cutting columns 3 from a pipe not shown;
a sixth step of forming, e.g. turning, portions 7 and, hence, shoulders 12 (Figure 13) on both the free ends of columns 3;
a seventh step of inserting portions 7 of the columns inside respective sockets 8 of pipes 5, so that the free edge of portion 7 rests on shoulder 11, and the free edge of pipe 5 rests on shoulder 12, as shown successively in Figures 2 and 1; and
and eighth step of welding column 3 to respective pipe 5 at the join between the two.

[0016] Welding at the eighth step may be performed in various ways, or as shown in Figure 1, i.e. by means of a copper alloy ring 14 fitted to portion 7 before this is inserted inside socket 8. Next, the whole multicolumn radiator 1 is placed inside a furnace at a temperature of close to 1100 °C to melt ring 14 and so braze portion 7 to socket 8.

[0017] The many advantages of the present invention will be clear from the above description.

[0018] In particular, a method is provided in which head 2 is laser welded, which is cleaner and cheaper than flash welding, and involves no finish work. Columns 3 can be furnace-brazed to head 2, which is also cleaner, cheaper, and involves no finish work. The plug and socket joint between columns 3 and pipes 5 provides for more effective welding of the columns to the pipes, by not being a butt weld, as in currently marketed radiators. Welding of columns 3 to pipes 5 is in no way compromised, even if columns 3 are not cut exactly to the right size. And finally, the method described may be automated, thus reducing the manufacturing cost of multicolumn radiator 1.

Claims

1. A method of producing a multicolumn radiator (1) defined by two metal heads (2), each having a hollow central body (4) from which originate a number of pipes (5), and by a number of metal columns (3), each connected at one end to a respective said pipe (5) of a first said head (2), and at the opposite end to a respective said pipe (5) of a second said head (2); the method being **characterized by** comprising:

   a first step of forming an inner recess defining a socket (8) on the ends (6) of said pipes (5), and an outer recess defining a plug (7) on the free ends of said columns (3), or vice versa;
   a second step of fitting said columns (3) to the respective said pipes (5) by inserting said plug (7) inside the corresponding said socket (8); and
   a third step of connecting said column (3) to the respective said pipe (5) at the join between the two.

2. A method as claimed in Claim 1, **characterized in that**, at said third step, said column (3) is connected to the respective said pipe (5) by welding.

3. A method as claimed in Claim 2, **characterized in that**, at said third step, said column (3) is connected to the respective said pipe (5) by brazing, by inserting a preferably copper-based ring (14) between said plug and said socket (7, 8), and inserting said radiator (1) inside a brazing furnace.

4. A method as claimed in any one of the foregoing Claims, **characterized in that** said socket (8) is formed at said ends (6) of said pipes (5), and said plug (7) is formed at said free ends of said columns (3).

5. A method as claimed in any one of the foregoing Claims, **characterized in that** said socket (8) is substantially the same length as said plug (7).

6. A method as claimed in at least one of the foregoing Claims, **characterized by** comprising, before said first step, a step of forming, preferably stamping, two parts (2a, 2b) eventually defining said head (2), and a step in which said two parts (2a, 2b) are placed facing and in contact with each other, and are welded to form said head (2).

7. A method as claimed in Claim 6, **characterized in that**, at said step of welding said two parts (2a, 2b), said two parts (2a, 2b) are first joined by weld spots (13) and then laser welded along all the contacting edges of said two parts (2a, 2b).

8. A multicolumn radiator defined by two metal heads

(2), each having a hollow central body (4) from which originate a number of pipes (5), and by a number of metal columns (3), each connected at one end to a respective said pipe (5) of a first said head (2), and at the opposite end to a respective said pipe (5) of a second said head (2); the radiator being **characterized in that** an inner recess defining a socket (8) is formed on the ends (6) of said pipes (5), and an outer recess defining a plug (7) is formed on the free ends of said columns (3), or vice versa; said columns (3) being fitted to the respective said pipes (5) by inserting said plug (7) inside the corresponding said socket (8).

9. A radiator as claimed in Claim 8, **characterized in that** said column (3) is connected to the respective said pipe (5) by welding.

10. A radiator as claimed in Claim 9, **characterized in that** said column (3) is connected to the respective said pipe (5) by brazing, by inserting a preferably copper-based ring (14) between said plug and said socket (7, 8), and inserting said radiator (1) inside a brazing furnace.

11. A radiator as claimed in any one of Claims 8 to 10, **characterized in that** said socket (8) is formed at said ends (6) of said pipes (5), and said plug (7) is formed at said free ends of said columns (3).

12. A radiator as claimed in Claim 11, **characterized in that** said socket (8) is substantially the same length as said plug (7).

13. A radiator as claimed in any one of Claims 8 to 12, **characterized in that** said two parts (2a, 2b) are laser welded to each other.

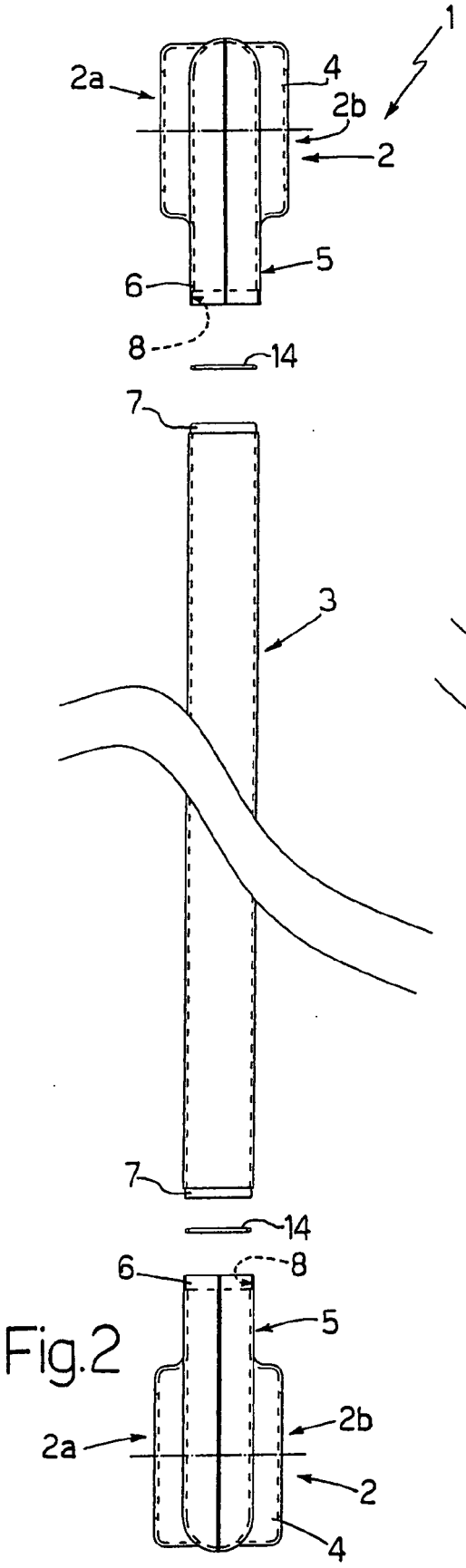
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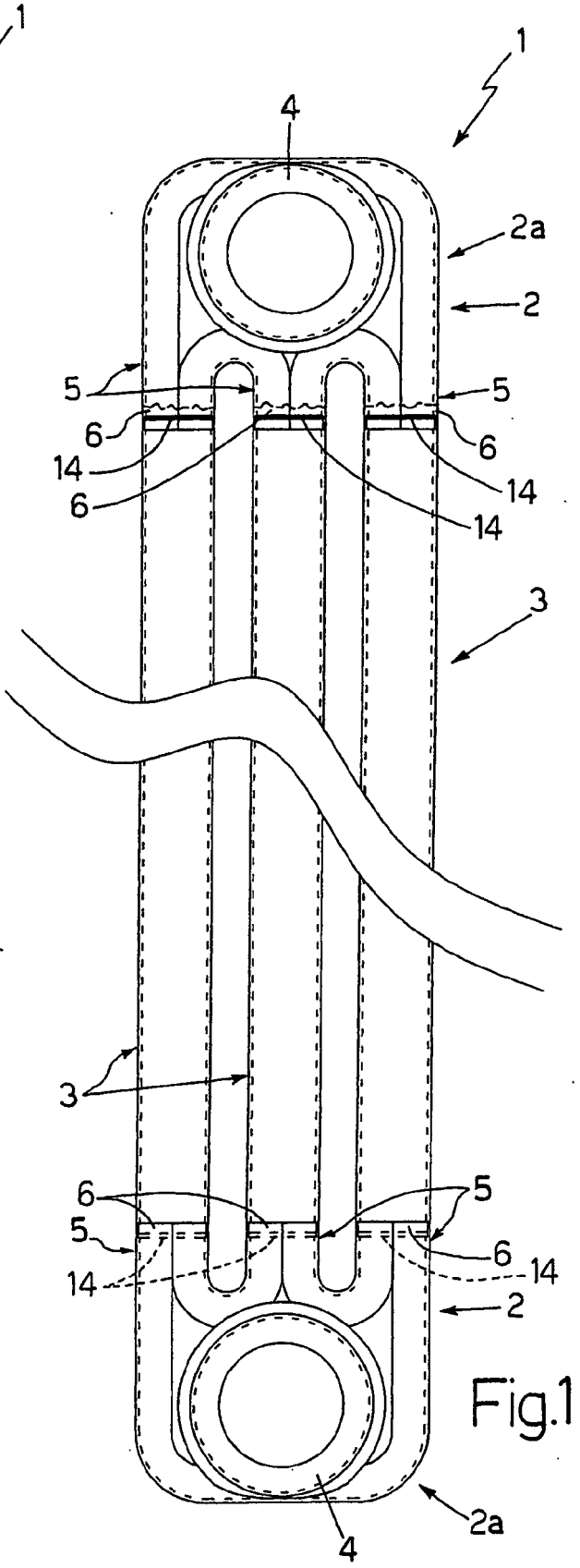
Fig.2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2a

Fig.1

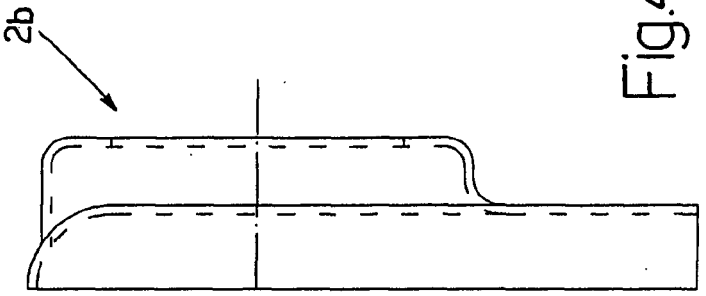


Fig.4

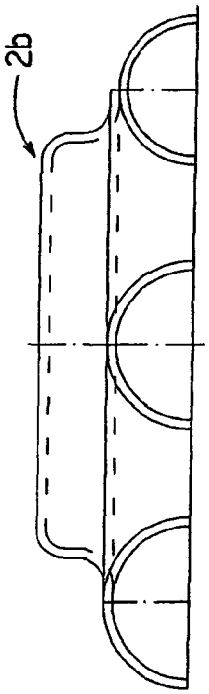


Fig.5

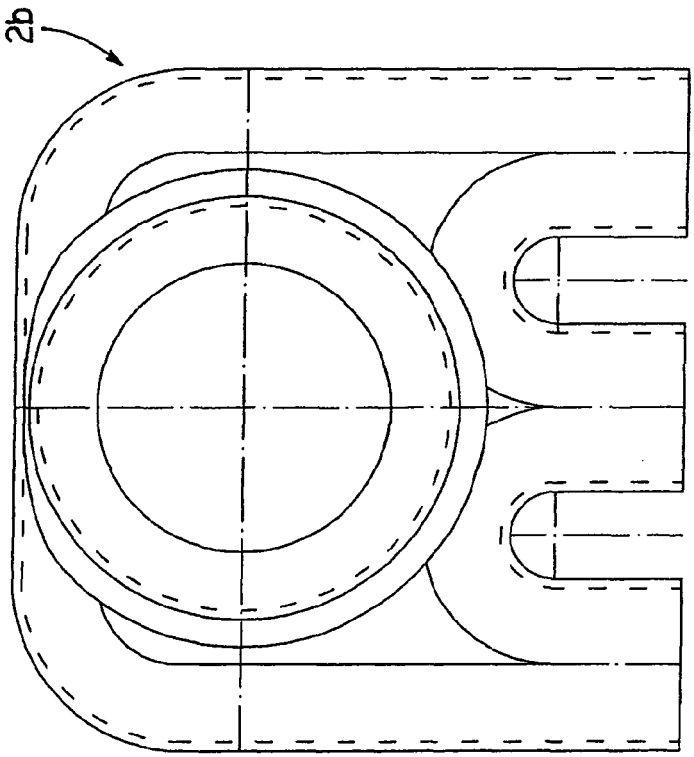


Fig.3

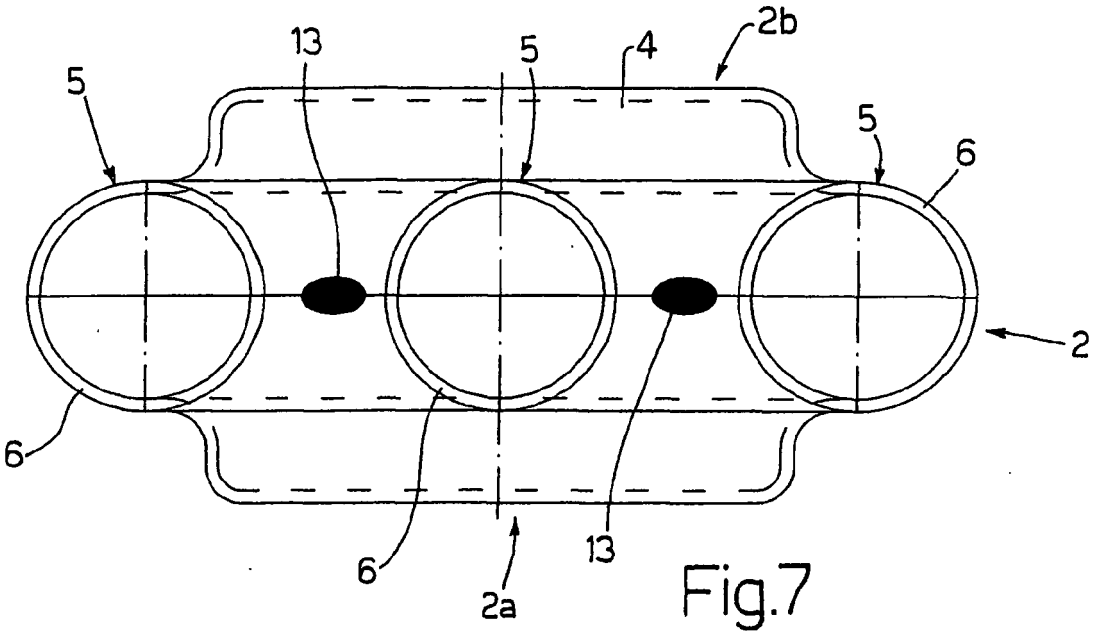


Fig.7

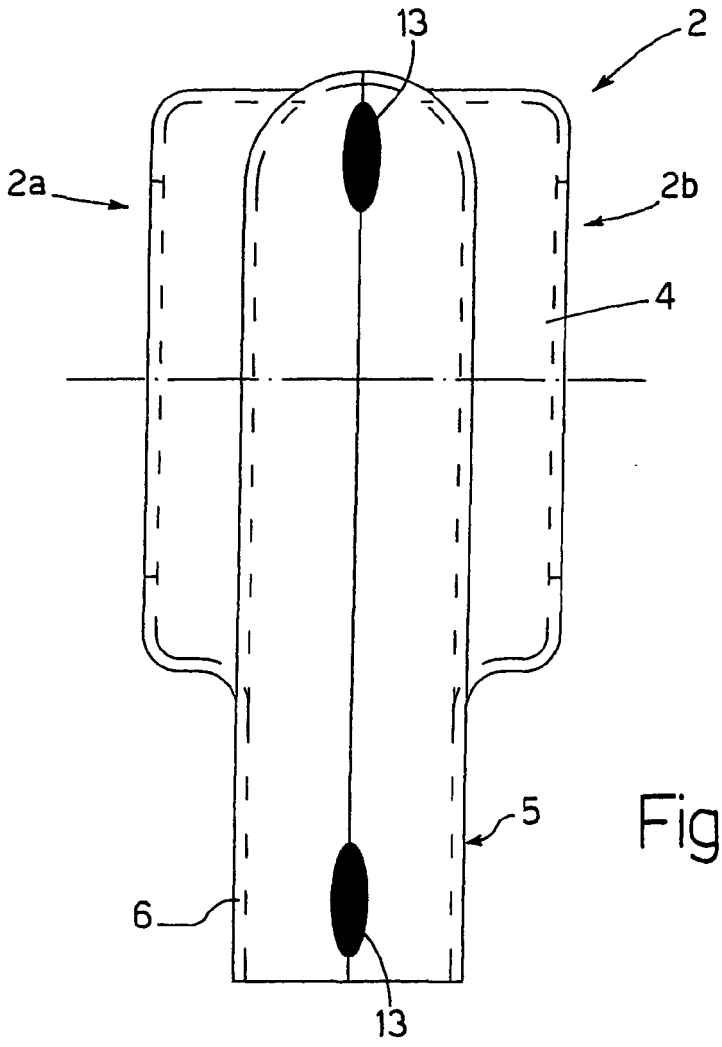


Fig.6

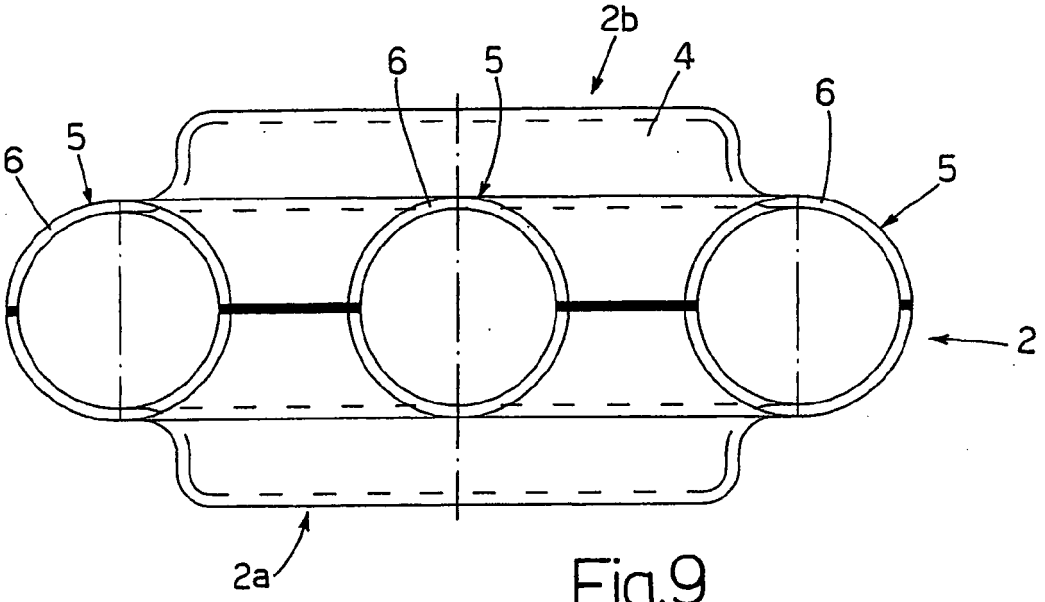


Fig.9

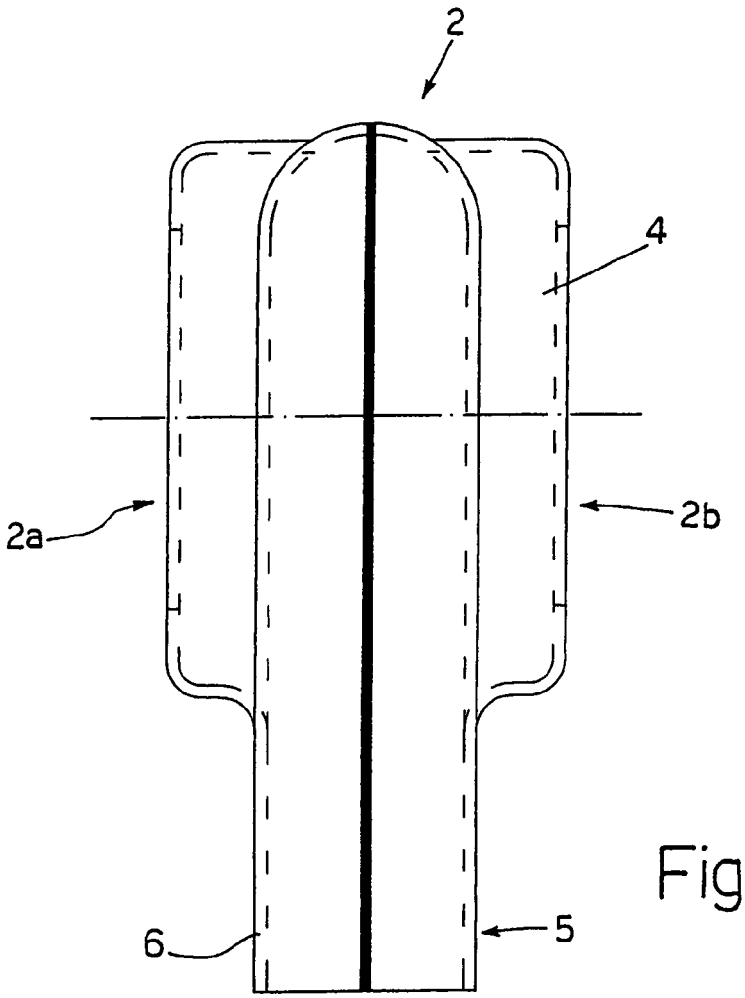
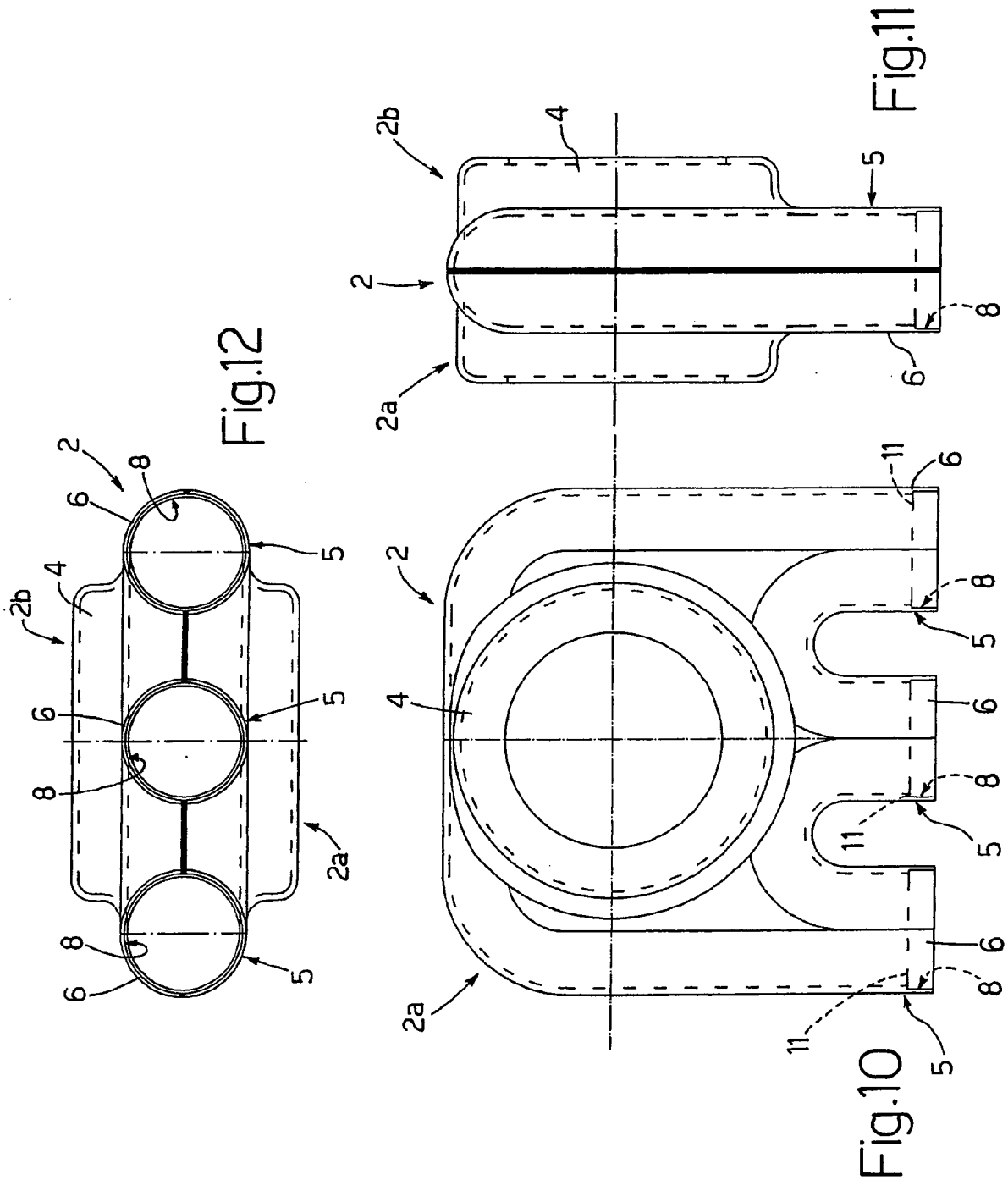


Fig.8


2b
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2a
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Fig.10
Fig.11
Fig.12

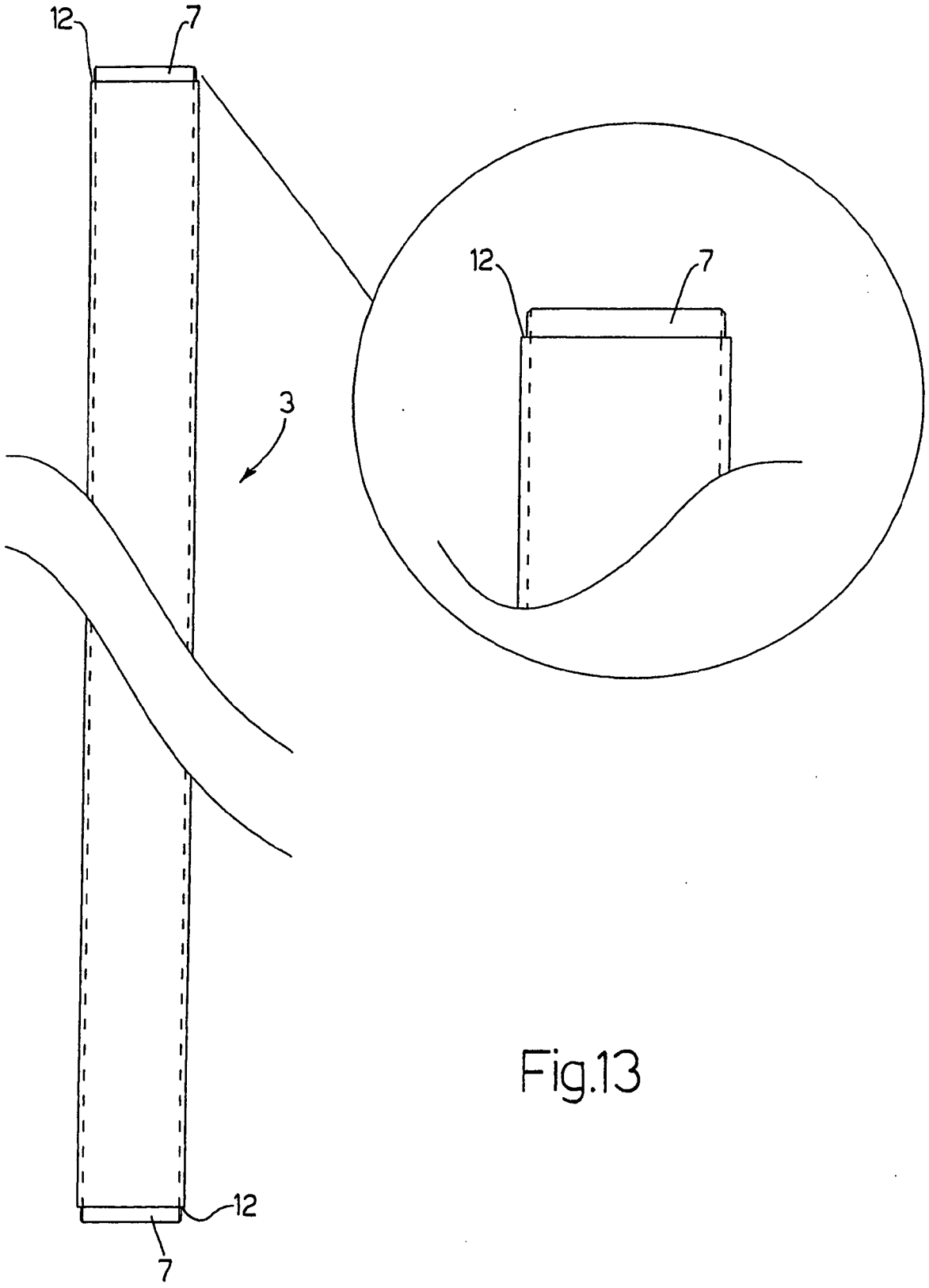

Fig.13

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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5325

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			TECHNICAL FIELDS SEARCHED (IPC) F28D F28F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 September 2007	MELLADO RAMIREZ, J

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