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(54) **Hollow monolithic header unit for heating systems**

(57) "A hollow enbloc header unit (100) having a plurality of connectors designed to be hydraulically connected to a heating system (10). The hollow enbloc header unit (100) is in the form of plate made of a single piece, and comprises a by-pass branch (200) as a whole substantially Z-shaped, in such a way that at least a portion thereof (103) faces a pipe (108) belonging to a cold-water return branch (250) (or else a hot-water delivery branch (250)), which is also as a whole substantially Z-shaped. In addition, the by-pass branch (200) and the cold-water return branch (250) (or else the hot-water delivery branch (250)) cross one another in a point (P)."

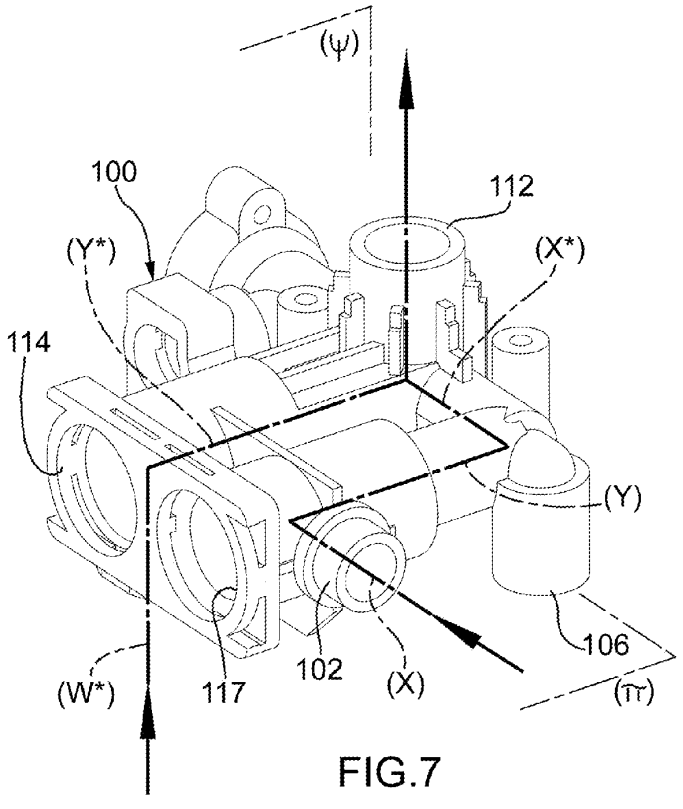

FIG.7

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Description

[0001] The present invention relates to a hollow enbloc header unit for heating systems.

[0002] In particular, the present invention finds advantageous though non-exclusive application in heating systems that use bi-thermal wall-mounted boilers (i.e., combined boilers for heating and for production of domestic hot water), to which the ensuing description will make explicit reference without this implying any loss of generality.

[0003] It is known that wall-mounted boilers for autonomous heating systems have become progressively smaller household appliances that are mass produced and have increasingly contained prices.

[0004] Consequently, the search for markedly integrated low-cost components stimulates the study of new inventions that reduce the overall number of the monofunctional components used in favour of the use of a few multifunctional assemblies characterized by small overall dimensions, high integration of functions, and a rational arrangement of the components designed to render all the operations of ordinary maintenance of the product convenient.

[0005] To produce a multifunction hydraulic unit that uses largely commercially available components but that at the same time meets the requirements of reduction of the overall dimensions, it has consequently become necessary to rethink the classic configuration of the header unit as a "cluster of pipes and connections" in a more sophisticated configuration that can be defined as hollow enbloc, in the form of "technical plate (or base)", designed to contain all the pipes and connections with the heating system, with the aim of obtaining maximum reduction of the overall dimensions and maximum simplicity of maintenance-regulation.

[0006] The aim of the present invention is consequently to provide a hollow enbloc header unit to be installed in a heating system, in particular on the return piping of the heating system, that will be easy and economically advantageous to produce.

[0007] Consequently, according to the present invention, a hollow enbloc header unit for heating systems is provided according to what is claimed in Claim 1 or in any one of the claims that depend directly or indirectly upon Claim 1.

[0008] For a better understanding of the present invention, a preferred embodiment is now described, purely by way of nonlimiting example and with reference to the attached drawings, wherein:

- Figure 1 illustrates a hydraulic scheme of a heating system that uses a wall-mounted boiler of the bi-thermal type in which a hollow enbloc header unit provided according to the teachings of the present invention is used;
- Figure 2 shows, in axonometric view, the hollow enbloc header unit provided according to the present invention; it may be noted that in this figure the hollow enbloc header unit is shown in association with hydraulic components belonging to the heating system;
- Figure 3 shows an exploded view of the hollow enbloc header unit of Figure 2 with the hydraulic components associated thereto;
- Figure 4 is a front view of the hollow enbloc header unit and of the hydraulic components represented in Figure 2;
- Figure 5 shows a cross section A-A taken on the front view of Figure 4;
- Figure 6 illustrates, in axonometric view and in accordance with a first viewpoint, the hollow enbloc header unit, forming the main subject of the present invention, isolated from the rest of the components;
- Figure 7 shows, in axonometric view and in accordance with a

[0009] second viewpoint, the hollow enbloc header unit illustrated, in particular, in Figure 6;

- Figure 8 illustrates a front view of the hollow enbloc header unit;
- Figure 9 shows a cross section B-B of the hollow enbloc header unit taken on the front view of Figure 8; and
- Figure 10 illustrates a cross section C-C of the hollow enbloc header unit taken on the front view of Figure 8.

[0010] In Figure 1, designated as a whole by 10 is a heating system, of a known type, comprising a combined wall-mounted boiler 50 of the bi-thermal type.

[0011] The wall-mounted boiler 50, having a containment guard 50A, in turn comprises a hollow enbloc header unit 100 built according to the present invention.

[0012] The heating system 10 moreover envisages the presence of at least one radiator 51 and at least one point 52 for drawing off domestic hot water.

[0013] In a known way, the radiator 51 is supplied with incoming hot water by means of a pipe 53, whilst the cold water leaving the radiator 51 returns to the wall-mounted boiler 50 through a pipe 54.

[0014] Once again with reference to Figure 1, designated by 55 is a pipe for supply of domestic hot water to the offtake point 52, and designated by 56 is a pipe for the cold water coming from the mains (not shown).

[0015] The cold water at inlet from the pipe 56 connected up with the mains serves to supply the offtake point 52 (after it has been heated), and/or to top up the heating system 10.

[0016] Within the containment guard 50A there is a burner 60 supplied with a fuel gas (LPG, methane, etc.) by means of a gas-supply pipe 61.

[0017] In a known way, arranged above the burner 60 is a bi-thermal heat exchanger 65, which has the purpose of heating simultaneously both the domestic water for supplying the offtake point 52 and the water of the circuit for heating the environments, which comprises the radi-

ator 51.

[0018] As has been said, the water coming from the mains enters the boiler 50 through the pipe 56, passes into the heat exchanger 65, and exits from the boiler 50 as hot water through the pipe 55. However, before reaching the heat exchanger 65 the cold water passes through a flow switch 57 that gives precedence to the domestic water, said flow switch being hydraulically connected through a topping-up pipe to the hollow enbloc header unit 100.

[0019] Completing the wall-mounted boiler 50 are the following elements:

- an expansion vessel 58;
- a pump 59, which sends the water for heating environments into circulation causing it to flow through the bi-thermal heat exchanger 65;
- a safety solenoid valve 70 in the gas-supply pipe 61 for opening and closing the passage of gas towards the burner 60;
- a low pressure switch 71 for preventing operation of the boiler 50 when a pre-set value of the pressure of the water in the heating system 10 has not been reached; and
- a pressure gauge 72 for displaying the pressure of the water in the system.

[0020] The hollow enbloc header unit 100 forming the specific subject of the present invention is illustrated in greater detail with reference to Figures 2 to 10 and comprises the following elements:

- a connector 102, symmetrically arranged about an axis (X);
- a pipe 103 for housing a differential by-pass valve for by-passing heating (see below); the pipe 103 is set symmetrically about an axis (Y) perpendicular to the axis (X) and terminates with a connector 117 (Figure 6);
- a pipe 108, connected to which is a safety valve (see below); the pipe 108 is set symmetrically about an axis (Y*) parallel to the axis (Y) and terminates with a connector 114 (Figure 6);
- a transverse pipe 110 for connection between the pipes 103 and 108, which are in turn parallel to one another; the pipe 110 is set symmetrically about an axis (X*), parallel to the axis (X), and perpendicular to the axes (Y), (Y*); in addition, the pipe 110 terminates with a connector 111 (see below);
- a connector 112 set symmetrically about an axis (W); it should moreover be noted that the connector 112 divides the aforesaid pipe 110 into two portions 110A, 110B;
- a connector 113 set symmetrically about an axis (W*) parallel to the axis (W); in addition, the connector 113 gives out into the aforesaid pipe 108; the connector 113 has the purpose of connecting hydraulically the entire hollow enbloc header unit 100 with the pipe 54 for return of the cold water from the heat exchanger 65 (see also Figure 1);
- a connector 115 set symmetrically about an axis (Y**) parallel to the axes (Y), (Y*); the connector 115 has the purpose of connecting hydraulically the entire hollow enbloc header unit 100 with the pipe 56 for the cold domestic water coming from the mains, through the flow switch 57, with function of topping-up of the system;
- a connector 106 (with axis (W**)) provided with a tap 107 for discharging the system; the axis (W**) is perpendicular to the plane (II) ; and
- a connector 118 set symmetrically about an axis (W***) provided with a tap 116 for charging the system; the axis (W***) is perpendicular to the plane (II) (Figure 5).

[0021] It is to be noted that the ensemble of the connector 102 (with axis (X)), the pipe 103 (with axis (Y)), and the portion 110A (with axis (X*)) of the pipe 110 (with axis (X*)) constitutes a by-pass branch 200 designed to guarantee a minimum flowrate of recirculation of water through the heat exchanger 65 of the boiler 50.

[0022] The by-pass branch 200 is substantially Z-shaped in such a way that at least a portion thereof, constituted in this case by the pipe 103 (with axis (Y)), will be as close as possible to the pipe 108 (with axis (Y*)) thus reducing the overall dimensions of the hollow enbloc main body 100 (see below). It should likewise be noted that the by-pass branch 200 is completely integrated in the hollow enbloc main body 100.

[0023] In addition, the axes (X), (X*), (Y), (Y*), (Y**) all substantially lie in one and the same plane (Π).

[0024] The ensemble of the connector 113 (with axis (W*)), the pipe 108 (with axis (Y*)), and the connector 112 (with axis (W)) constitutes a cold-water return branch 250, which is also completely integrated in the hollow enbloc main body 100. Also the cold-water branch 250 has a Z configuration.

[0025] In addition, the axes (Y*), (W) and (W*) all substantially lie in one and the same plane (Ψ) perpendicular to the aforesaid plane (Π) . In fact, the planes (Π) and (Ψ) intersect in a straight line coinciding with the axis (Y*).

[0026] In addition, the by-pass branch 200 and the cold-water return branch 250, which both have a Z configuration, intersect in a point (P) belonging simultaneously to the planes (Π) and (Ψ) and to the axes (X*) and (Y*) .

[0027] In an alternative embodiment of the present invention (not illustrated) the branch 250 is a hot-water delivery branch.

[0028] In summary, the hollow enbloc header unit 100 comprises the following elements:

- the by-pass branch 200;
- the cold-water return branch 250;
- the connector 114;
- a portion 110B of a pipe 110, said portion 110B being

provided with a connector 111;
- the connector 113;
- the connector 115;
- the connector 106;
- the connector 117; and
- the connector 118.

[0029] In this way, a hollow enbloc header unit 100 is obtained that is extremely compact and hence occupies a very small space in the three dimensions, i.e., length (L1), width (L2) (Figure 9), and height (H) (Figure 10).

[0030] It should be noted that the desired compactness of the hollow enbloc header unit 100 is represented above all by the fact that, as has been said previously, the by-pass branch 200 and the cold-water return branch 250 both have a Z configuration and intersect in the point (P) belonging simultaneously to the planes (Π) and (Ψ) and to the axes (X*) and (Y*) .

[0031] Furthermore, the hollow enbloc header unit 100 is normally made of a single piece, for example, with a single operation of die-casting or else pressure injection moulding.

[0032] The main characteristic of the hollow enbloc header unit 100 described above regards its geometrical conformation which can be equated with an extremely compact technical plate (or base), designed to contain, according to parallel-perpendicular axes, all the pipes and connectors for connection with the pipes and with the safety and control devices of the heating system 10.

[0033] It should be noted that, in this context, when we say that the hollow enbloc header unit 100 has a geometrical conformation that can be equated with that of a technical plate (or base), we mean that the aforesaid height (H) is much smaller both than the length (L1) and than the width (L2).

[0034] Forming part of the heating system 10 are also the following elements, hydraulically connected to the aforesaid hollow enbloc header unit 100:

- a header 102A for hydraulic connection between the pipe 102 and the delivery pipe 53 (see also Figure 1) of the heating system 10;
- a differential by-pass valve 104 for by-passing heating inserted in the pipe 103; as is known, the differential by-pass valve 104 is pre-calibrated, and has the purpose, if need be, of guaranteeing a minimum flowrate of recirculation of water through the heat exchanger 65 of the boiler 50 even when a thermostatic radiator valve 51A (Figure 1) applied at inlet to the radiator 51 blocks circulation because the demand for heat by the environment in which the radiator 51 itself is situated has terminated.

[0035] Located in the connector 117 is a normally open tap 105; as is known, the tap 105 can be closed, in effect performing the function of bypass of the radiator system only if there are not envisaged thermostatic radiator valves or zone valves for blocking the flow circulating when the environment no longer requires heat;

- a safety valve 109 (normally at 3 bar) (Figure 1) inserted in the connector 114;
- the expansion vessel 58, a connector of which is inserted in the connector 111;
- the pump 59, the intake of which is hydraulically connected to the connector 112;- a tap 116 for charging the heating system 10, inserted in the connector 118; and
- the tap 107 for discharging the heating system 10, hydraulically associated to the connector 106.

[0036] As has been said, the main advantage of the hollow enbloc header unit described above is that it has a geometrical shape that can be equated to that of a technical plate (or base) designed to contain, according to parallel-perpendicular axes, all the pipes and connections with the safety and control devices of the heating system.

Claims

1. A hollow enbloc header unit (100) having a plurality of connectors designed to be hydraulically connected to a heating system (10);
said unit (100) being **characterized in that** it is substantially in the form of plate made of a single piece and comprises:

   - a by-pass branch (200) shaped as a whole substantially like a Z in such a way that at least a portion (103) thereof faces a pipe (108) belonging to a cold-water return branch (250), or else a hot-water delivery branch (250), which is also as a whole substantially Z-shaped.

2. The unit (100) as claimed to Claim 1, **characterized in that** said by-pass branch (200) lies in a plane (Π) , and **in that** said cold-water return branch (250), or else said hot-water delivery branch (250), lies in a plane (Ψ); said planes (Π) and (Ψ) being perpendicular to one another.

3. The unit (100) as claimed in Claim 2, **characterized in that** at least one axis ((X), (X*), (Y)) of at least one portion (102, 103, 110A) of said by-pass branch (200), and at least one axis (Y*) of at least one portion (108) of the cold-water return branch (250), or else of the hot-water delivery branch (250), lie in one and the same plane (Π).

4. The unit (100) as claimed in Claim 3, **characterized in that** said by-pass branch (200), and said cold-water return branch (250), or else said hot-water delivery branch (250), cross one another in a point (P).

5. The unit (100) as claimed in Claim 4, **characterized in that** the point (P) is simultaneously in the planes (Π) and (Ψ).

6. The unit (100) as claimed in any one of the preceding claims, **characterized in that** said by-pass branch (200), designed to guarantee a minimum flowrate of recirculation of water through a heat exchanger (65) of a boiler (50) of the heating system (10), comprises a connector (102) (with axis (X)), a pipe (103) (with axis (Y)) , and a portion (110A) (with axis (X*)) of a pipe (110) (with axis (X*)).

7. The unit (100) as claimed in any one of the preceding claims, **characterized in that** said cold-water return branch (250), or else said hot-water delivery branch (250), comprises a connector (113) (with axis (W*)), a pipe (108) (with axis (Y*)), and a connector (112) (with axis (W)).

8. The unit (100), as claimed in any one of the preceding claims, **characterized in that** it further comprises:

- a part (10B) of a pipe (110) (with axis (X*)), said part terminating with a connector (111);
- a connector (115) (with axis (Y**) parallel to the axes (Y), (Y*));
- a connector (106) (with axis (W**)) provided with a tap (107) for discharging the heating system (10); and
- a connector (118) (with axis (W***)) provided with a tap (116) for charging the heating system (10).

9. The unit (100) as claimed in Claim 8, **characterized in that** it can be hydraulically connected to at least one of the following components:

- a header (102A) for hydraulic connection with a delivery pipe (53) of the heating system (10);
- a differential by-pass valve (104);
- a safety valve (109);
- an expansion vessel (58);
- a pump (59);
- a tap (116) for charging the heating system (10); and
- a tap (107) for discharging the heating system (10).

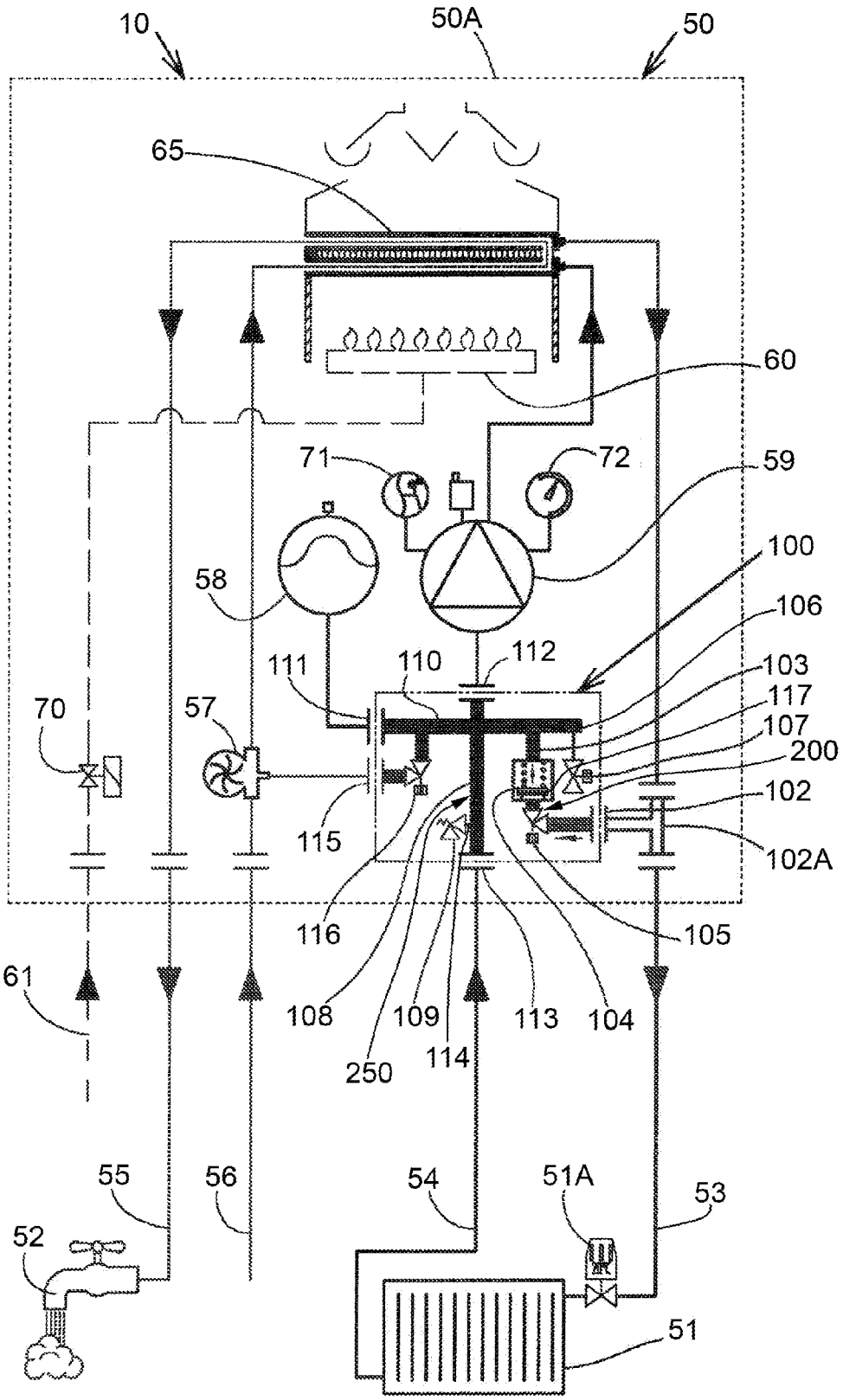
10
50A
50
65
60
71
72
59
58
100
106
111
110
112
103
117
70
57
107
200
102
115
102A
116
105
61
108
109
113
104
250
114
55
56
54
51A
53
52
51

FIG.1

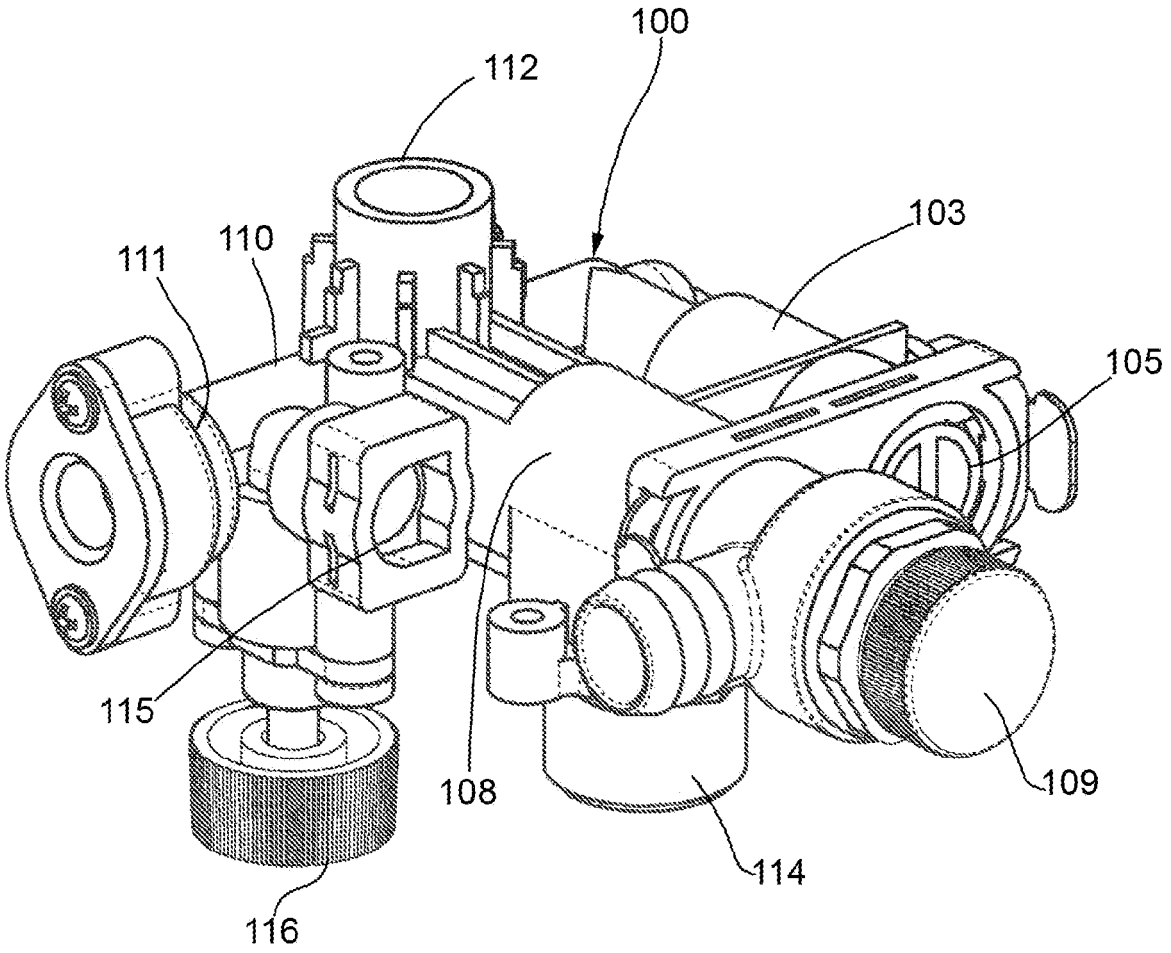

FIG.2

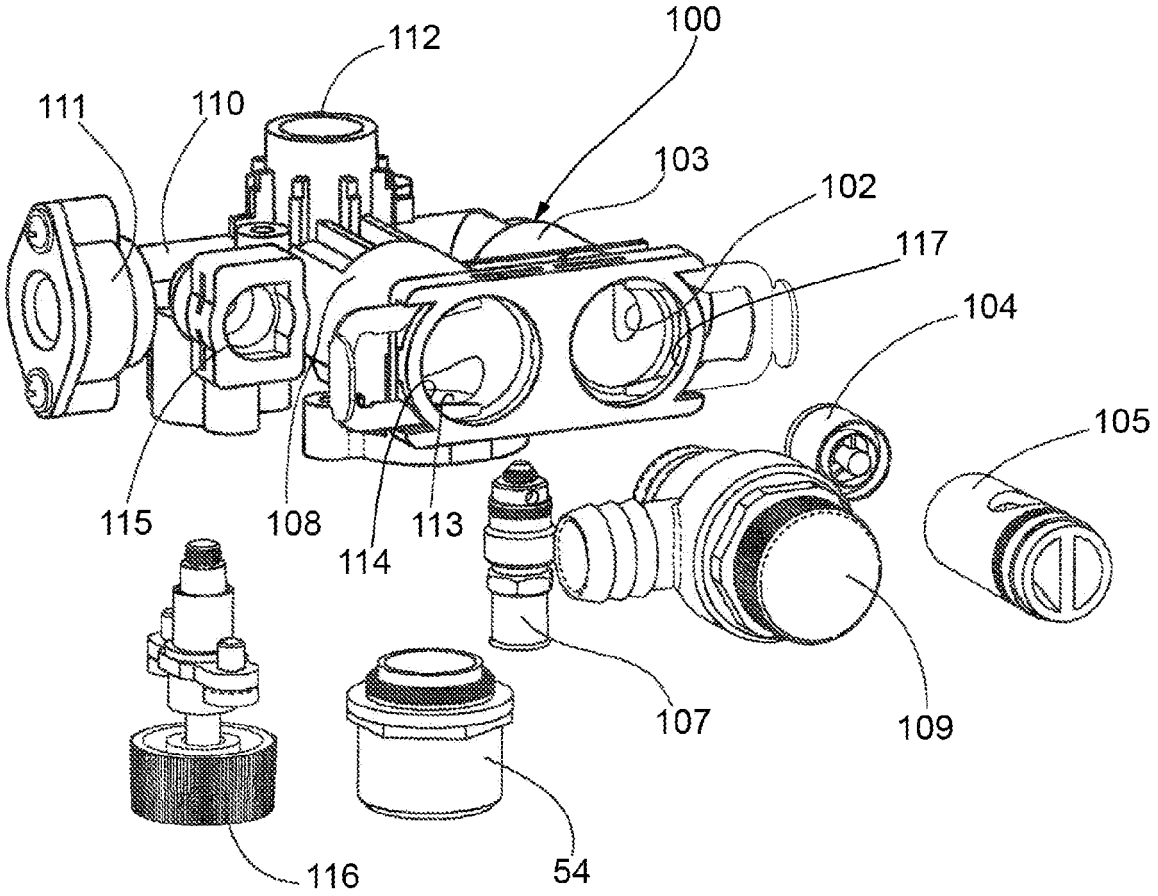
112
100
111
110
103
102
117
104
105
115
108
113
114
107
109
116
54

FIG.3

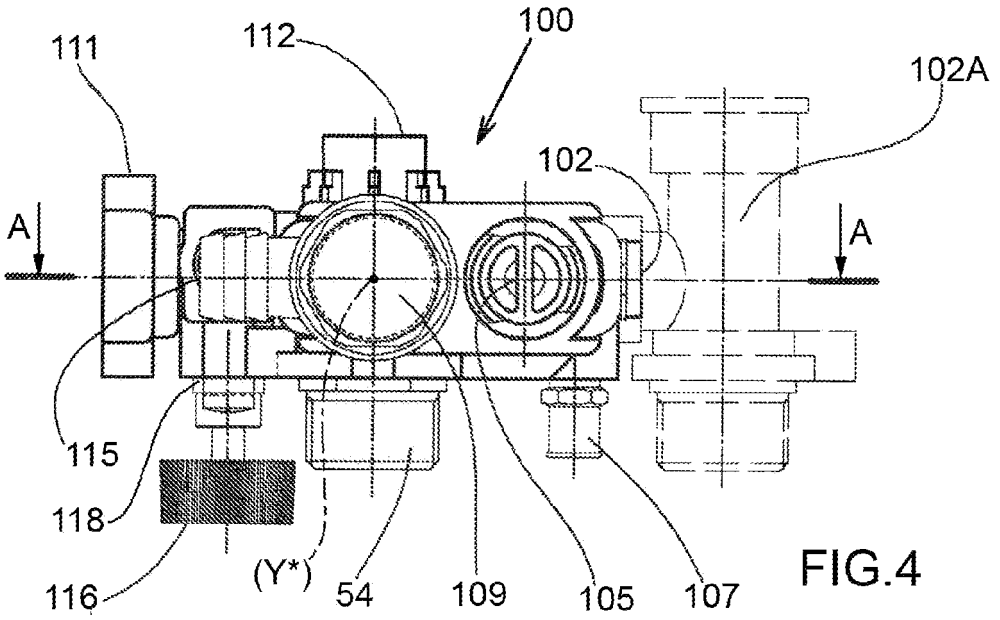

FIG.4

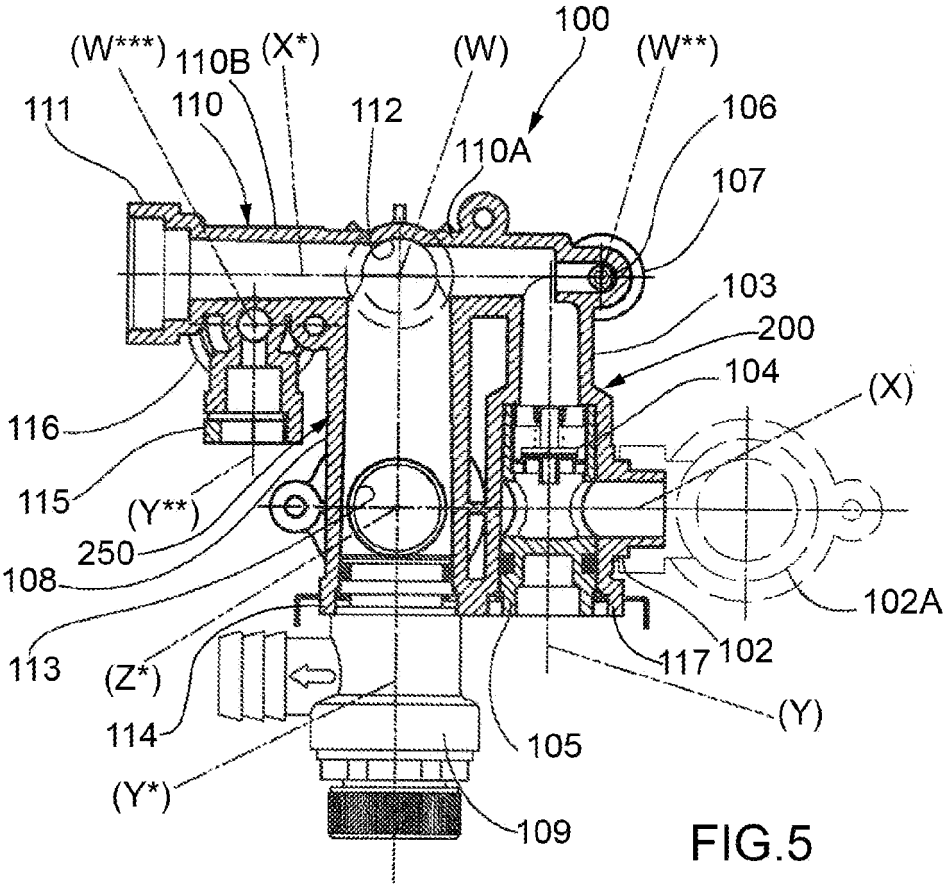

FIG.5

SECT.A-A

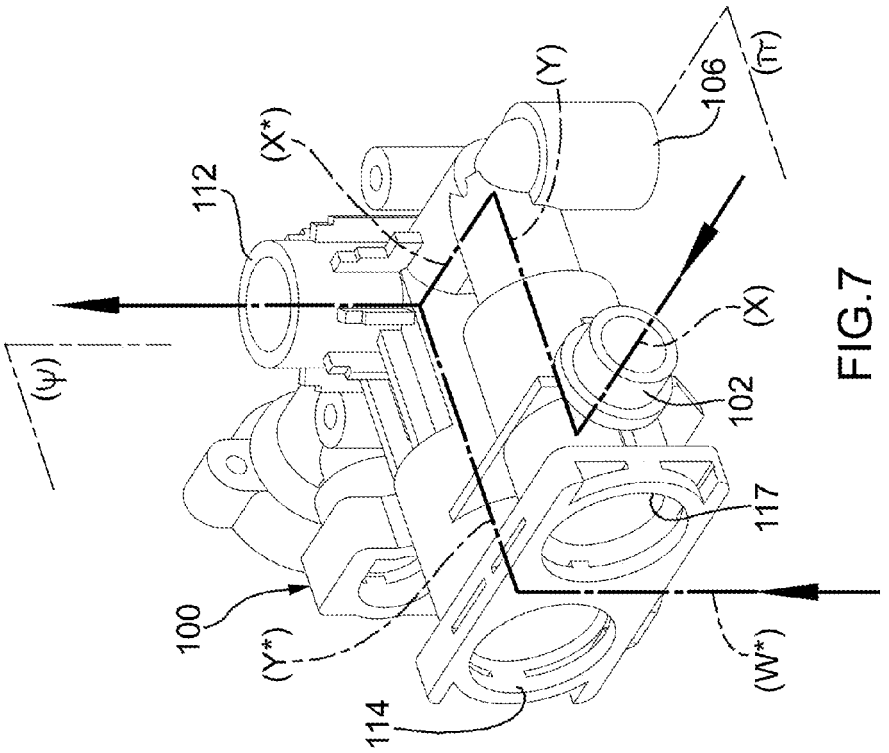
(Y)
106
(π)
(X*)
112
(X)
(ψ)
102
117
100
(Y*)
(W*)
114

FIG.7

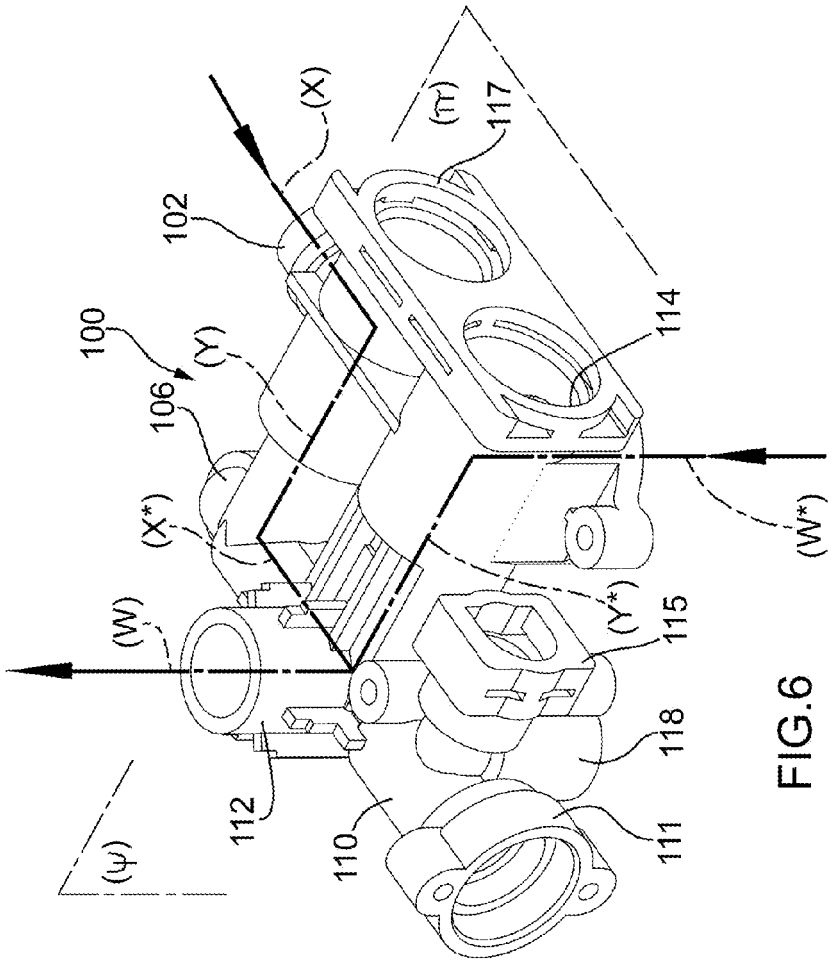
(X)
(π)
117
102
114
100
(Y)
106
(W*)
(X*)
(Y*)
(W)
115
118
112
110
111
(ψ)

FIG.6

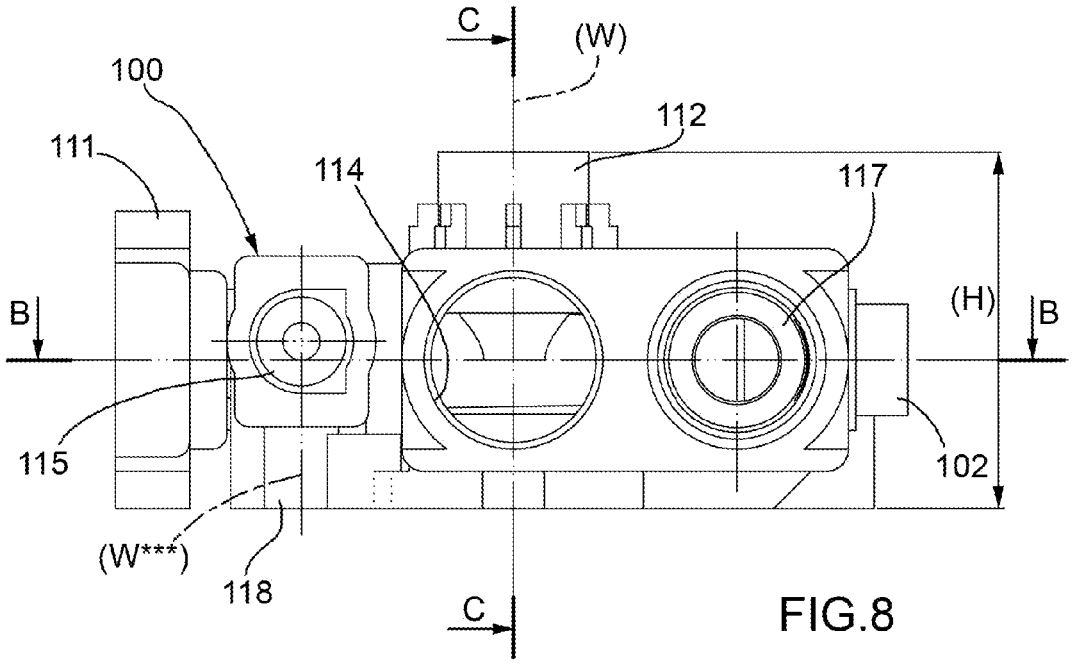
C
(W)
100
112
111
114
117
B
(H)
B
115
102
(W***)
118
C

FIG.8

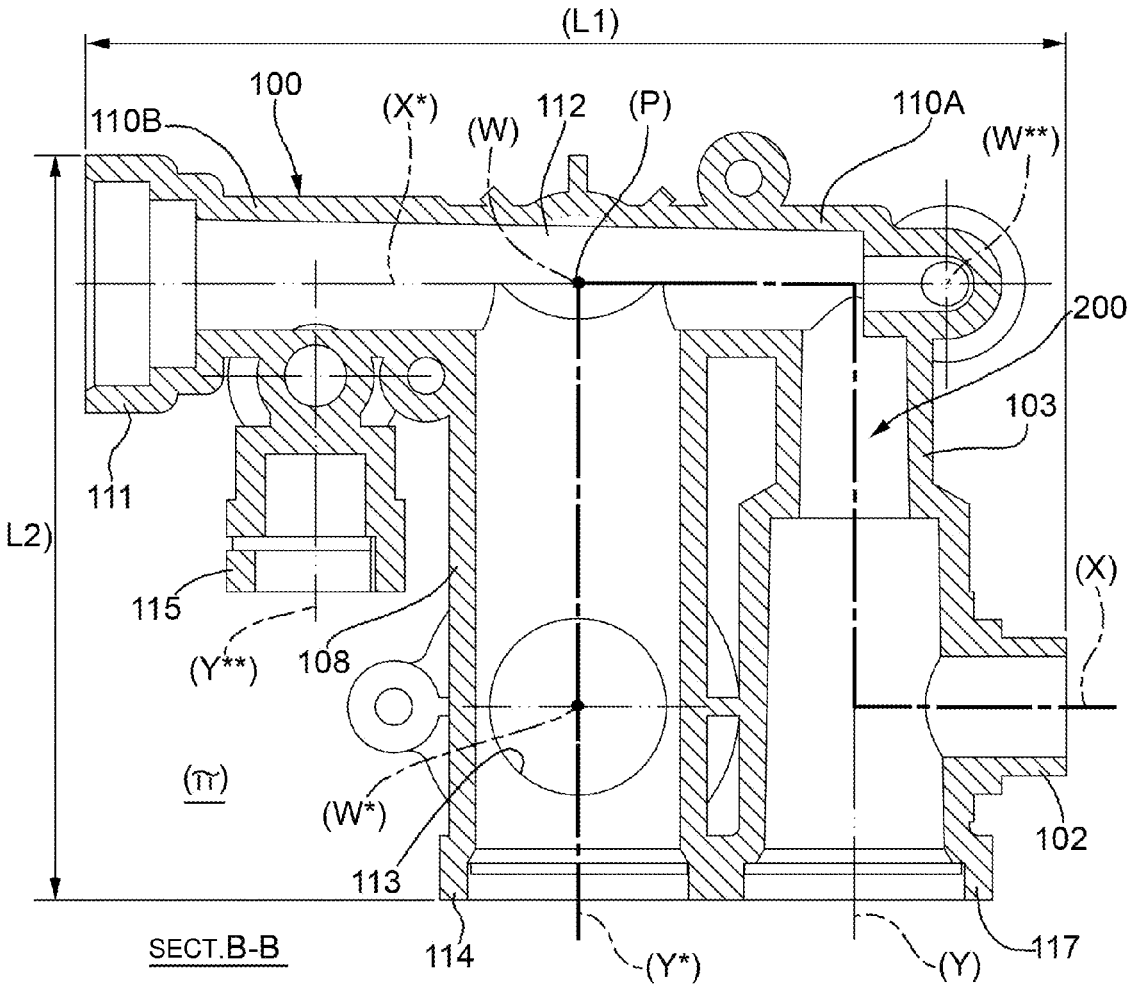
(L1)
100
(X*)
(W)
112
(P)
110A
110B
(W**)
200
103
111
L2)
115
(X)
(Y**)
108
(W*)
102
113
SECT.B-B
114
(Y*)
(Y)
117

FIG.9

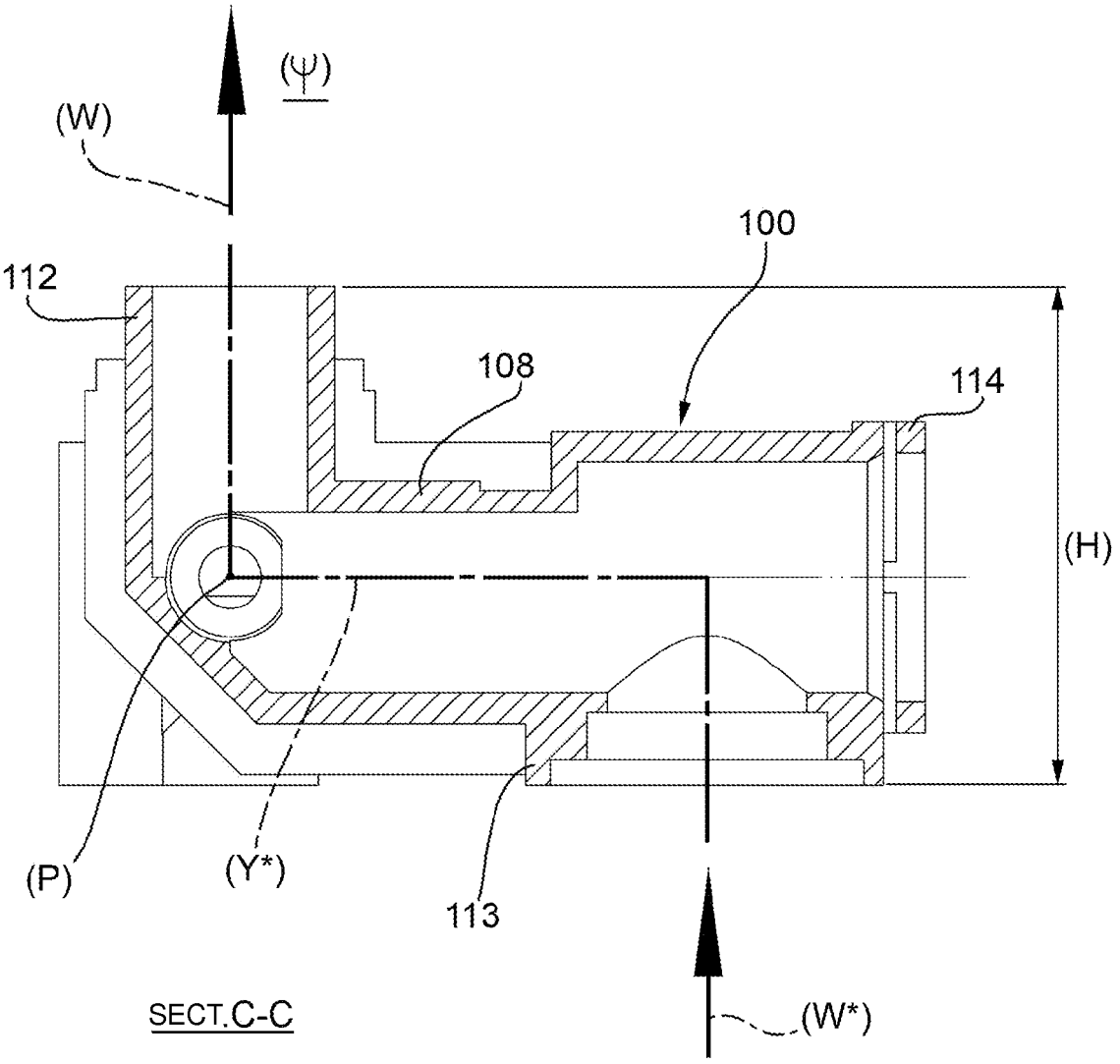

FIG.10