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(71) Applicant: **I.V.A.R. S.P.A.**
25080 Prevalle (BS) (IT)

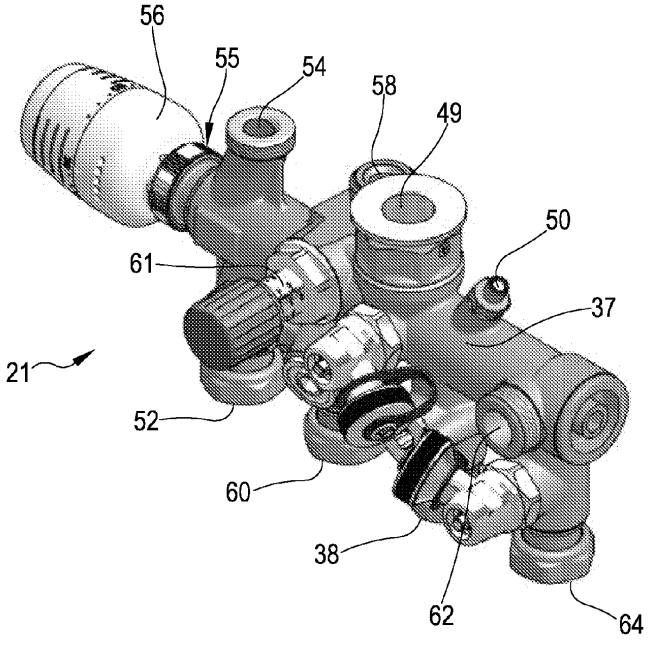
(72) Inventor: **Bertolotti, Umberto**
25080 Prevalle (Brescia) (IT)

(74) Representative: **Galassi, Alessandro**
Ponzellini Gioia e Associati S.R.L.
Via Mascheroni, 31
20145 Milano (IT)

(54) Device for distribution of water for heating

(57) A hydraulic device for distributing water for heating comprising a body (37) in which at least the following are defined: at least a delivery pathway (39) for water for heating and extending from an inlet (38) for the water for heating, destined to be connected to a delivery of a centralised plant (17), to an outlet (49), destined to be connected to a low-temperature heating plant (12b) and/or to a heat exchanger (3) with sanitary water; a first pathway (53) for return water from a low-temperature heating plant (12b) extending from a first inlet (52) for the return water from the low-temperature heating plant (12b) to a first outlet (54) for the return water; a second pathway (63) for the return water extending from a second inlet (62) to a second outlet (64), destined to be connected with a return in the centralised plant (17); and a mixer group (55), arranged between the delivery pathway (39) of the heating water and the first pathway (53), destined to determine a flow of return water to be pre-mixed with the water for heating in the delivery pathway (39) such as to obtain mixed water having an intermediate temperature, suitable for sending into the outlet (49) for water for heating.

FIG.12



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Description

[0001] The present invention relates to a device for selective distribution of water for heating, for example for distributing water for heating to a heat exchanger or from a heat exchanger. The invention is applicable for example in those users known as satellite modules, i.e. in thermo-hydraulic control centres which enable autonomous management of heating and production of sanitary hot water in the presence of centralised system, typically, though not only, in residential or commercial buildings.

[0002] The invention can in any case also be applied in different types of plants with respect to those indicated above. As is known, in user satellite modules, or user satellites, the fluid, in general hot water coming from a boiler of a centralised plant, is sent to the heating plant, or to a heat exchanger by means of which the sanitary water originating from the general water supply is brought to the set temperature, should this be requested by the domestic users.

[0003] It is worthy of note that the demand for sanitary hot water prevails over the function of heating, and that therefore when a user opens a tap in order to obtain hot water, the satellite immediately deviates, via a selector valve, for example a three-way valve, the hot water for heating towards the exchanger with sanitary water, temporarily interrupting the supply to the water for heating. When there is no demand for sanitary hot water, the user satellite closes supply to the exchanger and directs all the heating water in inlet towards the heating plant of the dwelling, if requested.

[0004] Apart from guaranteeing a total autonomy in management of the heat to each single dwelling unit of the building in which the centralised heating system is installed, these user satellites further enable a rapid and precise accounting (water and heat energy) of the resources effectively used by the single user in the user's dwelling.

[0005] These systems thus enable a combination of the advantages of a centralised plant (reduced pollution, high levels of safety and lower costs) with the advantages of an autonomous plant. Indeed, the regulating organs of the user satellite optimise heat consumption and the counters measure the heat effective consumed, thus enabling each user to autonomously regulate the dispensing of heat and to count only his or her own consumption.

[0006] There exist at least three main types of user satellites, according to whether they are configured for sending the water for heating, as well as to the exchanger with the sanitary water, both to a heating plant of the dwelling of the high-temperature type, for example having radiators, and also to a lower-temperature heating plant, for example of the underfloor type, or to both a low-temperature heating plant and a high-temperature heating plant.

[0007] In all three above-described cases, these user satellites can further be provided or not with a recycling plant for the hot sanitary water, thus essentially determining six main types of user satellite. Further, these user satellites can be provided (or not) with further components or accessories, for example for accounting for the heat and the flows of water and for other additional functions.

[0008] These known systems are not without some drawbacks.

[0009] First it is worthy of note that known user satellites exhibit complex structures, in consequence of the numerous connections necessary for supplying all the above-cited functions, with numerous pipes that are interconnected. These systems can therefore be difficult to install, configure and maintain. Further they sometimes have to be specifically made to measure and/or adapted such as to make them conform to the different requirements of the specific users, in consideration of the numerous possible variants.

[0010] Further, these user satellites can be very large because of their numerous connections and the various components they require. For the same reasons they are also rather expensive.

[0011] A further important drawback of the known systems is given by the fact that, as explained herein above, in the absence of a demand for sanitary hot water, the user satellite shuts down, via a three-way valve, supply to the exchanger and directs all the heating water to the heating plant of the dwelling unit, if necessary.

[0012] Consequently, in a case in which the hot sanitary water is not requested for a relatively long period of time, the exchanger cools down and therefore when a user requests hot water, much time is necessary before the hot water reaches the user, given that it is first necessary for the hot water to flow to the exchanger and then to heat the sanitary water.

[0013] To partially obviate this drawback, it is known to mount a heat sensor on user satellites, and in particular on the exchanger, a heat sensor, for example a thermostat, which is able to command opening of the three-way selector valve in order to heat the exchanger, even in the absence of a request for sanitary hot water, when the temperature of the exchanger falls below a predetermined minimum threshold. In this way the exchanger can be pre-heated so that it is maintained above a minimum temperature and thus hot sanitary water is obtained in a shorter time.

[0014] A further solution that has been proposed in order to obviate the above-described drawback comprises a timed programming of the electronic control devices of the user satellite, such as to activate the three-way valve at the predetermined time intervals or according to a predetermined programming such as to heat the exchanger, for example by pre-heating the exchanger before the presumed times of greatest use by the users.

[0015] These solutions also exhibit some drawbacks, as they cause a frequent activation of the selector valve, with a consequent increase in the risk of wear or faulty operation of the selector valve itself, which is a critical component of the system.

[0016] Further, these solutions lead to energy waste, as they tend to over-heat the exchanger to no avail when the valve is sending all the heating water towards the exchanger, and to permit an excessive cooling of the exchanger at other times, with the aim of not activating the selector valve too often. Further, these systems are complex, expensive and not very sturdy.

[0017] The main aim of the present invention is to obviate one or more of the problems encountered in the prior art.

[0018] An aim of the present invention is to provide a device for selective distribution of water for heating which is efficient, rational and effective.

[0019] A further aim of the present invention is to provide a device for selective distribution of water for heating which exhibits a simple, compact and rational structure.

[0020] A further aim of the present invention is to provide a device for selective distribution of water for heating which enables a simplification of the structure of a thermo-hydraulic water control unit in which it is installed, making the structure simple and compact.

[0021] A further aim of the present invention is to provide an apparatus for distribution of water for heating which is compact, with a structure that it simple and easy-to-install and maintain, and/or which incurs contained costs and/or high functioning efficiency.

[0022] A further aim of the present invention is to provide a device for selective distribution of water for heating which enables optimisation of the energy consumption of the heating plant.

[0023] A further aim of the present invention is to provide a device for selective distribution of water for heating which has a long working life and safeguards against malfunctioning of the components of the heating plant.

[0024] A further aim of the present invention is to provide a device for selective distribution of water for heating which is flexible and adaptable to the requirements of the various users.

[0025] It is a further aim of the present invention to provide a device which enables efficient pre-heating of a heat exchanger and which offers a high degree of comfort for users, as well as guaranteeing a rapid supply of hot sanitary water at all times.

[0026] A further aim of the present invention is to make available a device for selective distribution of water for heating which is simple and economical to realise.

[0027] These aims and others besides, which will emerge more fully during the following description, are substantially attained by a device for selective distribution of water for heating according to what is set out in one of more of the accompanying claims, taken alone or in combinations.

[0028] The invention further relates to a thermo-hydraulic apparatus for distribution of water, in accordance with any one of the appended apparatus claims, comprising a second hydraulic device having one or more of the characteristics contained in the present description.

[0029] The invention further relates to a thermo-hydraulic apparatus for distribution of water, in accordance with any one of the appended apparatus claims, further comprising a first hydraulic device having one or more of the characteristics contained in the present description.

[0030] A detailed description is now provided by way of non-limiting example of some preferred embodiments of a device for selectively distributing water for heating to a heat exchanger, in which:

figure 1 is a schematic plan view of a thermo-hydraulic control unit, or a user satellite module, configured for high-temperature heating plants and comprising a device according to an embodiment of the present invention;

figure 2 is a similar view to that of figure 1, relating to a variant of the thermo-hydraulic control unit, configured for a high-temperature plant with a recycling of the sanitary hot water;

figure 2a is a perspective view of the thermo-hydraulic control unit of figure 2;

figure 3 is a similar view to that of figure 1, relating to a variant of the thermo-hydraulic control unit, configured for a low-temperature heating plant;

figure 4 is a similar view to that of figure 1, relating to a variant of the thermo-hydraulic control unit, configured for a low-temperature heating plant and with recycling of hot sanitary water;

figure 5 is a similar view to that of figure 1, relating to a variant of the thermo-hydraulic control unit, configured both for a high-temperature and for a low-temperature heating plant;

figure 6 is a similar view to that of figure 1, relating to a variant of the thermo-hydraulic control unit, configured both for a high-temperature plant and a low-temperature plant and with recycling of the hot sanitary water;

figure 7 is a perspective view of a hydraulic device in accordance with a first embodiment of the present invention; figure 8 is a view in longitudinal section of the device of figure 7;

figure 9 is a view like the one of figure 8 and relating to a use variant of the device;

figure 10 illustrates a perspective view of a first embodiment of a second hydraulic device for distributing water for heating, configured for use in the thermo-hydraulic control units of figures 1 and 2;

figure 11 is a view in longitudinal section of the second device of figure 10;

figure 12 is a perspective view of a second embodiment of a second hydraulic device for distributing water for heating, configured for use in the thermo-hydraulic control units of figures 3 and 4;

figure 13 is a view in longitudinal section of the second device of figure 12;

figure 14 is a perspective view of a variant of the second embodiment of the second hydraulic device for distributing water for heating, configured for use

in the thermo-hydraulic control units of figures 5 and 6;

figure 15 is a view in longitudinal section of the second device of figure 14.

[0031] The figures illustrate, by way of non-limiting example, an example of a thermo-hydraulic control unit, or user satellite, denoted in its entirety by reference number 1.

[0032] The invention is also applicable in heating plants that are different from the one illustrated. The user satellite 1 comprises a first hydraulic device 2 for selective distribution of water for heating to or from a heat exchanger 3. The first hydraulic device 2, illustrated in detail in figures 7-9, comprises at least a first tract 4a of main pathway 4 for the water extending from a firstaccess 5 for the water and at least a selecting zone 6 of the main pathway 4, a second tract 4b of main pathway 4 for the water extending from the selecting zone 6 to a second access 7 operatively connectable to the heat exchanger 3 and a third tract 4c of main pathway 4 for the water extending from the selecting zone 6 to at least a third access 8, distinct from the second access 7 and operatively connectable to a further conduit for the water.

[0033] The first hydraulic device 2 further comprises at least a selector valve 9 mounted at the selecting zone 6 and having a mobile obturator 9a for selectively enabling a passage of water into the first tract 4a and into the second tract 4b or into the first tract 4a and into the third tract 4c.

[0034] The selector valve 9 is a motorised three-way valve. The selector valve 9 is commanded by control and/or command devices 10 of known type such as to give priority to the heat exchanger 3 and thus to a hot sanitary water plant 11, in the presence of a request for hot sanitary water, with respect to the heating plant 12 of the dwelling.

[0035] The first access 5 can define an inlet for the water into the hydraulic device, and in this case the second access 7 and the third access 8 define outlets for the water from the hydraulic device, as illustrated by the arrows included in figure 9. Alternatively, the first access 5 can define an outlet for the water from the hydraulic device, and in this case the second access 7 and the third access 8 define inlets for the water into the hydraulic device, as illustrated by the arrows reported in figure 8.

[0036] The device further comprises at least an additional pathway 13 having a first additional access 13a connected to the first tract 4a of main pathway 4 and a second additional access 13b connected to the second tract 4b of main pathway 4, such as to bypass the selecting zone 6 and the selector valve 9. The additional flow of water in the additional pathway 13, when the passage of water in the additional pathway 13 is enabled, is less than the main water flow between the first tract 4a of main pathway 4 and the second tract 4b of main pathway 4 through the selecting zone 6 when the selector valve 9 enables passage of water between the first tract 4a of main pathway 4 and the second tract 4b of main pathway 4.

[0037] The first hydraulic device 2 further comprises at least a thermostatic element, or thermostat 14, mounted on the additional pathway 13 such as to selectively block the passage of water through the additional pathway 13 in the presence of a water temperature which is above a predetermined temperature in a detection zone in proximity of the thermostat 14, in a direction of and in proximity of the second access 13b of the additional pathway 13 and/or in the direction of the second access 7 of the second tract 4b of main pathway 4, and such as to enable passage of water, in accordance with the additional flow, through the additional pathway 13 in presence of a temperature of the water which is lower than the predetermined temperature in the detection zone.

[0038] The additional flow is predetermined such as to maintain the heat exchanger 3 above a predetermined minimum operating temperature.

[0039] The thermostat 14 is configured such as to define an additional flow suitable for maintaining the heat exchanger 3 above the minimum operating temperature. The thermostat 14 can be regulated or configured appropriately for determining the predetermined temperature such as to enable passage of the additional flow into the additional pathway 13 with the aim of maintaining the heat exchanger 3 above the minimum operating temperature.

[0040] The first tract 4a of main pathway 4, the second tract 4b of main pathway 4 and the third tract 4c of main pathway 4 can be defined internally of a body 15 realised in a single piece, as illustrated in figures 7-9.

[0041] The additional pathway 13 can be defined in the body 15 made in a single piece, as illustrated in figures 7-9. Alternatively, in a variant that is not illustrated, the first tract 4a of main pathway 4 and/or the second tract 4b of main pathway 4 and/or the third tract 4c of main pathway 4 and/or the additional pathway 13 can be defined by a plurality of separate bodies reciprocally mounted such as to define the hydraulic device.

[0042] The hydraulic device can further comprise the heat exchanger 3 connected to the second access 7 of the second tract 4b of main pathway 4. In a case in which the thermostat 14 is mounted on the additional pathway 13, which thermostat 14 enables passage of water only when it perceives a temperature that is lower than a predetermined temperature, the additional flow, when enabled by the thermostat 14, can be any according to the needs of the particular case.

[0043] In a variant that is not illustrated, the additional pathway 13 can be without a thermostat 14 and have a passage defining a constant additional flow suitable for maintaining the minimum operating temperature of the exchanger. In this case the device can further comprise a closing valve mounted on the additional pathway 13 for selectively interrupting the additional flow of water.

[0044] In a further variant, not illustrated, the additional pathway 13 can be without the thermostat 14 but can be

provided with a regulating valve for regulating an additional flow destined to maintain the desired temperature in the exchanger.

[0045] In these variants, in which the passage of water in the additional pathway is generally enabled (and possibly blocked only at certain moments, for example by a closing valve) the constant additional flow of water in the additional pathway 13 is less than 10%, or 5%, or 3%, with respect to the main flow of water through the main pathway 4 for water for heating defined between the first tract and the second tract when the selector valve 9 enables passage of water through the main pathway 4.

[0046] In the above-indicated variant, the additional flow, as mentioned, can be regulated by means of a regulating valve. As can be seen in figures 7-9, the first 4a, the second 4b and the third 4c tract of main pathway 4 and the additional pathway 13 exhibit central longitudinal development axes which lie in a same plane.

[0047] As can be seen in figures 8 and 9, the first hydraulic device 2 can comprise two first accesses 5, 5' for water for heating, both arranged in the first main pathway and displaced with respect to one another, such as to enable interconnection of the first hydraulic device 2 selectively with a first piping or with a second piping that is displaced with respect to the first.

[0048] According to whether the first device is used in one mounting condition or another, one of the two main accesses 5 is closed using a cap 48 and the other first access 5 is connected with a corresponding piping, or vice versa. As can be seen in figure 8, when the device is connected by means of one of the two first accesses 5, a prolongation element 16 is mounted on the body 15, which prolongation element 16 is suitable for enabling mounting on a corresponding piping at an auxiliary access 5a.

[0049] Passing on to a more detailed description, the hydraulic device illustrated in the accompanying figures of the drawings is connected to the exchanger at the second access 7, and is connected, at the first access 5, indirectly to a supply plant of water for heating to the dwelling, such as a centralised plant 17, for example a boiler, and is connected to a heating plant 12 of the dwelling at the third access 8.

[0050] The first hydraulic device 2 is further provided with breather valves 18 of known type, and an electrothermal head 19 (as illustrated in figures 7 and 8) or a thermostat-controllable summer-winter valve 19a (illustrated in the variant of figure 9), positioned between the selector valve 9 and the third access 8, for excluding the heating in the periods of the year in which it is not necessary or when the desired temperature has been reached. As previously mentioned, the first hydraulic device 2 can be connected to the rest of the circuit in various ways and can function in different ways.

[0051] Figures 7 and 8 illustrate the hydraulic device in a perspective view and in longitudinal section, with an indication of the relative heating water flows, in a case in which the second access 7 is connected to the outlet of the heat exchanger 3. In this configuration, the third access 8 is connected to the return from the heating plant 12 of the dwelling and the first access 5 is connected to the outlet from the plant of the dwelling towards the return of the centralised boiler plant, first passing through a counter 20 of known type for measuring the quantity of heating water and thermal energy dispensed to the dwelling.

[0052] In this case the additional pathway 13, when enabled by the thermostat 14 which perceives a temperature of below the predetermined temperature, determines an additional water flow in the additional pathway 13 for the discharge of the return water from the heat exchanger 3 towards the first access 5 and therefore towards the return to the boiler, even in a case in which the selector valve 9 closes the return of the water from the exchanger and enables the return of the water from the heating plant 12 of the dwelling towards the boiler, as illustrated in figure 8.

[0053] The additional flow of water in the additional pathway 13, in outlet from the exchanger, consequently determines an inlet of water into the exchanger. When there is a request for hot sanitary water in the dwelling, the selector valve 9 closes the return of the water from the heating plant 12 and opens the return of the water from the exchanger, determining the main return flow of water for heating towards the boiler.

[0054] Figure 9 illustrates the first hydraulic device 2, with the relative flows of water for heating, in a variant in which the second access 7 is connected to the inlet of the heat exchanger 3. In this configuration, the third access 8 is connected to the delivery towards the heating plant of the dwelling and the first access 5 is connected to the inlet to the plant of the dwelling by the water for heating in arrival from the centralised boiler plant. In this case the additional pathway 13, when the thermostat 14 is enabled, which perceives a temperature of below the predetermined temperature, determines an additional flow of water into the additional pathway 13 for supply of water towards the heat exchanger 3 from the first access 5 towards the second access 7, even in a case in which the selector valve 9 closes the water delivery towards the exchanger and enables the delivery of water into the heating plant of the dwelling, as illustrated in figure 9.

[0055] When there is a request for hot sanitary water in the dwelling, the selector valve 9 closes the delivery of the water towards the heating plant and opens the water delivery towards the exchanger, determining the main flow of water. In any case the thermostat 14 on the additional pathway 13, or by-pass, enables the exchanger to be kept sufficiently warm at all times such as always to guarantee a rapid supply of hot sanitary water at the moment when it is requested by a user in the dwelling.

[0056] Figures 1-6 illustrate in its entirety a thermohydraulic apparatus for water distribution which comprises the first hydraulic device 2, as described above, and the heat exchanger 3 between the sanitary water and the water for heating, the exchanger having an inlet 71 and

an outlet 72 for sanitary water, operatively connectable to a hydraulic plant for sanitary water 11, and having an inlet and an outlet for the heating water (arranged opposite to those for the sanitary water, i.e. with the inlet of one in place of the outlet of the other, such as to determine a flow in an opposite direction in the respective conduits internally of the heater 3), the second access 7 of the hydraulic device being operatively connected to the inlet (in the high-temperature versions in figures 1 and 2) or to the outlet for the water for heating of the exchanger (in the low-temperature versions and in the versions for both low and high temperature water of figures 3-6).

[0057] In the figures the inlet and outlet of the exchanger 3 for the water for heating are arranged below the outlet 72 and the inlet 71 of the exchanger 3 for the sanitary water, and therefore are not visible in the plan views of figures 1-6.

[0058] The thermo-hydraulic apparatus illustrated in figures will now be described in greater detail. The thermo-hydraulic apparatus or user satellite module 1 enables distribution of a flow of water for heating in arrival from the centralised boiler plant 17 towards the heating plant of the dwelling and towards the hydraulic sanitary water plant 1 of the dwelling.

[0059] The satellite module 1 can take on various configurations and be adapted to different types of plant, illustrated in figures from 1 to 6, using the same essential components and some different components or components configured differently as illustrated herein below.

[0060] The satellite module 1 comprises, in all the illustrated configurations, a first hydraulic device 2 (of the type described herein above), a second hydraulic device 21, a heat exchanger 3 between the water for heating and the hot sanitary water, and a plurality of connections which connect the satellite module 1 with the hydraulic plants external of the satellite module 1.

[0061] In all the configurations the satellite module 1 comprises two connections, an inlet 22 and an outlet 23, with the centralised boiler plant 17, in which water for heating circulates. The satellite module 1 further comprises, in all configurations, two outlet connections for hot water 24 and cold water 25 towards a hydraulic plant for the sanitary hot water of the dwelling and a further inlet connection 26 of cold water into the satellite module 1 from the general water supply. The satellite module 1 further comprises, according to versions, an inlet connection 27 and an outlet connection 28 of the water for heating towards a high-temperature heating plant 12a and/or an inlet connection 29 and an outlet connection 30 of the water for heating towards a low-temperature heating plant 12b.

[0062] The satellite module 1 further comprises electric and electronic devices 10, 31 of known type, for supplying and commanding the various components of the satellite module 1, comprising for example the restart electronic equipment 31 of the counters, the command device of the selector valve 9 and other components, etc.

[0063] The satellite module 1 is housed in a containing frame 32, conformed as a case, for example made of sheet metal. The containing frame is provided with insulating panels, for example made of foam polypropylene. Significantly, the first hydraulic device 2, described in detail herein above, substantially exhibits the same structure for all the variants of the satellite module 1, while the second hydraulic device 21 exhibits a first structure, essential in the two versions for high-temperature plants (figures 1 and 2) while it exhibits a second more complex and substantially unvaried structure in the remaining versions for low-temperature plant (figures 3, 4) or for both high and low temperatures (figures 5, 6), with a sole variant in the last case.

[0064] The first hydraulic device 2 is used with the flows indicated in the variant of figure 8 in the two versions for high-temperature plants 12a, while it is used with the flows indicated in the variant of figure 9 in the remaining versions for low-temperature plants, or both high- and low-temperature plants (figures 3-6).

[0065] The satellite module 1 illustrated in figure 1 is configured for distribution of the water for heating to a high-temperature heating plant, for example a plant with radiators, and therefore comprises the two inlet 27 and outlet 28 connections with the high-temperature heating plant 12a.

[0066] The satellite module 1 illustrated in figure 2 is a variant of the module 1 of figure 1, in which the satellite module 1 further comprises a recycling circuit 33 of the hot sanitary water, an additional inlet connection 35 of the recycling water and a relative recycling pump 34 of the hot sanitary water, of known type and therefore not described in detail.

[0067] The first structure of the second hydraulic device 21, for the two variants of the satellite module 1 for high temperature, is illustrated in the two figures 10 and 11. The second hydraulic device 21 comprises a body 37 in which an inlet 38 is defined, corresponding to the connection 22 for the water in arrival from the centralised boiler plant, and a delivery pathway 39 which takes the water for heating towards a first outlet 40 connected to the heat exchanger 3 and towards a second outlet 41, corresponding to the connection 28, towards the high-temperature heating plant 12a.

[0068] The water sent to the exchanger and the high-temperature heating plant 12a then returns to the first hydraulic device 2 respective into the second access 7 and the third access 8, as illustrated herein above.

[0069] A holder 42 is arranged along the delivery pathway for balancing the plant. The body 37 further comprises a return pathway 43 for the water for heating, having an inlet 44 of the return water from the heating plant 12 of the dwelling and from the exchanger, and an outlet 45, corresponding to the connection 23, towards the centralised boiler plant 17. As can be seen in figures 10 and 11, the inlets 38, 44 and the outlets 40, 41 and 45 for the water of the second hydraulic device exhibit central longitudinal axes lying in a same plane, and all parallel to one another, apart from the outlet 40 which exhibits an

axis that is perpendicular to the other axes.

[0070] In particular, the return water from the heating plant 12 of the dwelling and from the exchanger 3 arrives from the first access 5 of the first hydraulic device 2, in the variant of figure 8. An overpressure valve 46 is arranged between the delivery pathway and the return pathway such as to by-pass the satellite module 1 and return the heating water in inlet from the centralised plant 17 towards the plant in a case in which there is an increase in pressure in the satellite module 1. As previously mentioned, the water follows the above-indicated flows in the second thermo-regulator device in the variant of figure 8 of the first hydraulic device 2.

[0071] The second hydraulic device 21 can be realised by a body 37 in a single piece, or by means of two reciprocally-mounted bodies, for example by hot-pressing brass.

[0072] The satellite module 1 of figure 3 is configured for connection to a low-temperature heating plant 12b, for example a floor plant, and therefore comprises the inlet connection 29 and outlet connection 30 with the plant 12b. In this configuration, as will be more fully explained in detail herein below, the satellite module 1 is provided with a three-way mixer valve which enables pre-mixing of the high-temperature water for heating in inlet from the centralised boiler plant with a part of the return water from the low-temperature heating circuit in order to obtain a flow of mixed water having an appropriate temperature in inlet towards the low-temperature heating plant 12b. The satellite module 1 can comprise a thermostatic head with a remote sensor, in order to enable a fixed-point regulation, or an axial servo-motor and a climate control box in order to achieve a modulating regulation.

[0073] The satellite module 1 is further provided in this case with a booster pump 47, for example a variable-flow pump, for pushing the mixed water towards the low-temperature heating plant 12b. The satellite module 1 illustrated in figure 4 is a variant of the one in figure 3, in which the satellite module 1 further comprises a recycling circuit 33 of the hot sanitary water, an inlet connection 35 and a recycling pump 34 of the hot sanitary water. The satellite module 1 in the version of figure 5 is configured for connection with both a low-temperature heating plant 12b and a high-temperature heating plant 12a, and thus comprises four relative connections 27, 28, 29, 30 with the plants.

[0074] The satellite module 1 further comprises the relative components already described herein above in relation to figures 1 and 3. The satellite module 1 illustrated in figure 6 is a variant of the one in figure 5, in which the satellite module 1 further comprises a recycling circuit 33 of the sanitary hot water, a connection 35 and a relative recycling pump 34 of the hot sanitary water.

[0075] The second embodiment of the second hydraulic device 21, configured for the two variants of the satellite module 1 predisposed for low-temperature heating, is illustrated in figures 12 and 13.

[0076] The second device comprises a body 37 in which an inlet 38 is defined for the water in arrival from the centralised boiler plant, corresponding to the connection 22, and a delivery pathway 39 which brings the water for heating towards a first outlet 49 connected with the booster pump 47 which transmit the water for heating to the first access 5' of the first device, in accordance with the variant of figure 9, for sending to the exchanger in a case in which there is a request for sanitary hot water and thus the selector valve 9 is consequently activated, or for sending to the low-temperature heating plant 12b in the opposite case in which the selector valve 9 is activated in the corresponding position. A probe 50 for the counter 20 and a balancing valve 51 or choke are arranged in the delivery pathway.

[0077] The body 37 of the second device further comprises a first inlet 52 for the return water from the low-temperature heating plant 12b, corresponding to the connection 29, a first pathway 53 for the return water from the low-temperature heating plant 12b, and a first outlet 54 for the water towards a counter 20. A recycling opening 57 is present between the delivery pathway of the water for heating and the first pathway 53 for the return water from the low-temperature heating plant 12b, at which recycling opening 57 a mixer group 55 is mounted, which enables establishing a flow of return water to be pre-mixed with the water for heating in the delivery pathway 39 such as to obtain mixed water having an intermediate temperature appropriate for sending to the low-temperature plant 12b.

[0078] The mixer group 55 comprises a thermostatic head 56 which regulates the flow of "cold" return water to be mixed with the "hot" heating water coming from the boiler for obtaining the mixed water.

[0079] Note that in a case in which there is a request for sanitary hot water, the selector valve 9 of the first device closes the delivery towards the low-temperature heating plant 12b, thus also interrupting the flow of return water from the plant towards the mixer group, and thus the water aspirated from the booster pump and forced from the delivery pathway into the second device towards the first device, and thus into the exchanger, is not mixed but is high-temperature water coming from the boiler. When the selector valve 9 sends the water to the low-temperature heating plant 12b, there is a premixing of the water in the second hydraulic device 21 and thus the first device receives mixed water having a medium temperature.

[0080] The second hydraulic device 21 further comprises an inlet 58 for the mixed water coming from the third access 8 of the first device, a pathway 59 for the mixed water and an outlet 60 of the mixed water, corresponding to the connection 30 towards the low-temperature heating plant 12b.

[0081] As can be seen in figure 12, the inlet 58 is out-of-axis with the outlet 60 and the pathway 59 for the mixed water partially develops about the connection opening 57 between the delivery pathway 39 and the first pathway 53.

[0082] The second hydraulic device 21 further comprises a by-pass valve 61 or overpressure valve at the pathway 59 for the mixed water. The body 37 of the second hydraulic device 21 further comprises a second inlet 62 for the return water from the low-temperature heating plant 12b and from the exchanger through the counter 20, a second pathway 63 for the return water and a second outlet 64, corresponding to the connection 23 for the water towards the return into the centralised boiler plant 17.

[0083] A hydraulic balancer 65 with a check valve of known type is located between the delivery pathway and the second pathway for the return water; this allows direct discharge of the water in inlet from the centralised plant 17 towards the outlet towards the plant in which a minimum necessary pressure is generated in the delivery pathway for overcoming the small resistance of a spring of the check valve.

[0084] A variant of the second embodiment of the second hydraulic device 21, configured for use in the two versions (figures 5 and 6) of the satellite module 1 predisposed for both high-temperature and low-temperature heating, is illustrated in figures 14 and 15.

[0085] In this case the structure of the second hydraulic device 21 is similar to what has been set out for the version of figures 12 and 13, but the second hydraulic device 21 further comprises an obturator 66 which connects the delivery pathway of the water for heating with an additional outlet 67 for the water for heating, from which high-temperature water is sent to the inlet of a heating plant for temperature-temperature water, situated at the connection 28.

[0086] In this case, the second device is lacking the hydraulic balancer 65 with a check valve, as described above. Also with the second embodiment, in the two described variants, the second hydraulic device 21 can be realised by a single-piece body 37, or by several bodies reciprocally mounted. In any case, the satellite module 1 can further comprise a sensor 68, for example a thermostat mounted on the exchanger, which commands the opening of the three-way selector valve 9 for pre-heating the exchanger when the temperature thereof falls below a minimum operating temperature, even in the absence of a request for hot sanitary water.

[0087] As can be seen in the figure, in both variants of the second embodiment of the second hydraulic device, the delivery pathway 39, the first pathway 53 for the return water, the second pathway 63 for the return water and the pathway 59 for the mixed water exhibit central longitudinal development axes lying in a same plane.

[0088] Further, the inlet 38 for the water for heating, the first inlet 52 for the return water, the second outlet 64 for the return water and the outlet 60 for the mixed water are arranged at a same side of the body 37 and exhibit central longitudinal axes that are coplanar and substantially reciprocally parallel. These axes lie in a same plane in which the central longitudinal axes of the outlet 49 for the water for heating and the first outlet 54 for the return water lie. Alternatively the electronic command devices 10 of the satellite module 1 can be programmed such as to command the activation of the selector valve 9 such as to pre-heat the exchanger at regular intervals or in predetermined time periods or daily times for allowing hot sanitary water 1 to be obtained during a contained time in these periods.

[0089] The satellite module 1 further comprises further hydraulic connections, some of which are illustrated in the appended figures of the drawings, of known type and therefore not further described in detail in the present description, and can further comprise further components, also of known type (for example further thermostatic heads, water quantity counters and heat energy counters, further electric and/or electronic command devices of the various circuit components, restarting electronic devices of the counter, electric sensors, probes, flow-meters 69, load/discharge taps, breather valves, overpressure valves (or differential by-passes), hydraulic balancers with check valves, thermostat valves, restart pumps, plant balancing chokes, water volumetric meters 70, ball check valves, etc) and which are therefore not illustrated in detail in the present description.

[0090] The device of the invention is susceptible to numerous variants, all falling within the scope of the innovative concepts contained in the present application. The present invention allows one or more of the following advantages to be obtained.

[0091] Firstly, the invention enables one or more of the drawbacks encountered in the prior art to be obviated.

[0092] The invention further enables distribution of the water for heating in a way which is efficient, rational and effective.

[0093] A device according to the invention exhibits a simple, compact and rational structure.

[0094] The invention further enables the structure of a thermo-hydraulic control box in which it is installed to be simplified, making the structure simple and compact.

[0095] An apparatus for the distribution of water for heating of the invention is compact, with a simple structure that is easy to install and maintain, and further has contained costs and a high level of functioning efficiency.

[0096] Further, the invention enables efficient pre-heating, with water for heating, of a heat exchanger for sanitary water.

[0097] The invention further provides a high level of user comfort and guarantees rapid availability of hot sanitary water at any moment.

[0098] The invention further enables a reduction in energy consumption of the heating plant.

[0099] The invention affords a longer working life of the plant components, reducing the risk of faults and maintenance and repair.

[0100] Further, a device according to the invention is very flexible and adaptable for the requirements of different users.

[0101] The invention is also simple and economical to realise.

Claims

1. A hydraulic device for distributing water for heating comprising a body (37) in which at least the following are defined:

   a delivery pathway (39) for water for heating and extending from an inlet (38) for the water for heating, destined to be connected to a delivery of a centralised plant (17), to an outlet (49) for the water for heating destined to be connected to a low-temperature heating plant (12b) and/or to a heat exchanger (3) with sanitary water;
   a first pathway (53) for return water from a low-temperature heating plant (12b) extending from a first inlet (52) for the return water from the low-temperature heating plant (12b) to a first outlet (54) for the return water;
   a second pathway (63) for the return water extending from a second inlet (62) for return water to a second outlet (64) for the return water, destined to be connected with a return in the centralised plant (17);
   and further comprising a mixer group (55), arranged between the delivery pathway (39) of the water for heating and the first pathway (53) for the return water from the low-temperature heating plant (12b), destined to determine a flow of return water to be pre-mixed with the water for heating in the delivery pathway (39) such as to obtain mixed water having an intermediate temperature, suitable for sending to the outlet (49) for water for heating.

2. The device of claim 1, wherein a hydraulic balancer (65) with a check valve is arranged between the delivery pathway (39) and the second pathway (63) for the return water, which hydraulic balancer (65) with a check valve is for directly discharging the water for heating in inlet from the centralised plant (17) towards the outlet (64) to the centralised plant (17), in a case in which, in the delivery pathway, a minimum pressure is generated which is necessary to overcome a small resistance of a spring of the check valve and/or wherein the device further comprises an obturator (66) connecting the delivery pathway (39) of the water for heating with an additional outlet (67) for the water for heating, destined to be connected to a high-temperature heating plant (12a) for water.

3. The device of claims 1 or 2, wherein the body (37) further comprises a pathway (59) for mixed water extending from an inlet (58) for the mixed water to an outlet (60) for the mixed water towards the low-temperature heating plant (12b) and/or wherein the device further comprises a by-pass or overpressure valve (61) mounted at the pathway (59) for the mixed water and/or wherein, in the delivery pathway (39), a probe (50) for a counter (20) and/or a balancing valve (51) are arranged.

4. The device of any one of the preceding claims, wherein the mixer group (55) comprises a recycling opening (57) between the first pathway (53) for the return water and the delivery pathway (39) and a thermostatic head (56) mounted at the recycling opening (57) and suitable for regulating a flow of return water to be mixed with the water for heating originating from the centralised plant (17) for obtaining mixed water.

5. The device of any one of the preceding claims, wherein the delivery pathway (39), the first pathway (53) for return water and the second pathway (63) for return water are defined internally of the body (37) realised in a single piece and/or wherein the pathway (59) for mixed water is also defined in the body (37) realised in a single piece and/or wherein the body (37) is realised in a single piece by hot-pressing and/or by hot-pressing in brass.

6. The device of any one of the preceding claims, wherein the delivery pathway (39) and/or the first pathway (53) for return water and/or the second pathway (63) for return water and/or the pathway (59) for mixed water are defined by a plurality of separate bodies that are reciprocally mounted such as to define the body (37) of the hydraulic device and/or wherein each of the bodies is realised in a single piece by means of hot-pressing and/or by means of hot-pressing in brass.

7. The device of any one of the preceding claims, wherein at least the delivery pathway (39) and/or the first pathway (53) for return water from a low-temperature heating plant (12b) and/or the second pathway (63) for return water and/or the pathway (59) for mixed water exhibit central axes of longitudinal development lying in a same plane.

8. The device of any one of the preceding claims, wherein at least the inlet (38) for the heating water, the first inlet (52) for the return water, the second outlet (64) or the return water and the outlet (60) for the mixed water are arranged at a same side of the body (37) and/or exhibit central longitudinal axes that are coplanar and substantially parallel to one another and/or wherein the outlet (49) for the heating water and/or the additional outlet (67) for the heating water and/or the first outlet (54) for the return water exhibit central longitudinal axes lying in a same plane with respect to the central longitudinal axes of the inlet (38) for the water for heating, the first inlet (52) for the return water, the second outlet (64) for the return water and the outlet (60) for the mixed water.

9. A thermo-hydraulic apparatus for distribution of water, **characterised in that** it comprises a second hydraulic device (21) for selective distribution of water for heating in accordance with any one of the preceding claims and comprises at least:

a centralised plat (17) for supplying water for heating operatively connected to the inlet for water for heating;
a low-temperature heating plant (12b) connected directly or
indirectly to the outlet (60) for water for heating and to the first inlet (52) for return water from the low-temperature heating plant (12b);
a heat exchanger (3) between the sanitary water and the water for heating operatively connected, directly or indirectly, to the outlet (49) for water for heating and to the second inlet (62) for return water;
a booster pump (47) operatively interposed between the outlet (49) for the water for heating and the exchanger (3) and the low-temperature heating plant (12b).

10. The apparatus of the preceding claim, further comprising a first hydraulic device (2) for distribution of water for heating, comprising:

a body (15) internally exhibiting at least a first tract (4a) of main pathway (4) for water for heating extending from a first access (5) for the water and at least a selecting zone (6) of the main pathway (4), the first access (5) for the water being operatively connected to the outlet (49) for the water for heating of the second hydraulic device (21); a second tract (4b) of main pathway (4) for the water extending from the selector zone (6) to a second access (7) operatively connected to the heat exchanger (3); and a third tract (4c) of main pathway (4) for the water extending from the selecting zone (6) to at least a third access (8) distinct from the second access (7) and operatively connected to the low-temperature heating plant (12b); and
at least a selector valve (9) mounted on the body (15) at the selecting zone (6) for selectively commanding a passage of water into the first tract (4a) and into the second tract (4b) or into the first tract (4a) and into the third tract (4c).

11. The apparatus of the preceding claim, wherein the outlet (49) for the water for heating is operatively connected to the booster pump (47) which transmits the water for heating to the first access (5) of the first hydraulic device (2), for sending to the exchanger (3) in a case in which hot sanitary water is requested and a selector valve (9) is consequently activated, or for sending to the low-temperature heating plant (12b) in an opposite case in which a selector valve (9) is activated into the corresponding position and/or wherein the apparatus further comprises at least an additional pathway (13) having a first additional access (13a) connected to the first tract (4a) of main pathway (4) and a second additional access (13b) connected to the second tract (4b) of main pathway (4), such as to by-pass the selecting zone (6) and the selector valve (9).

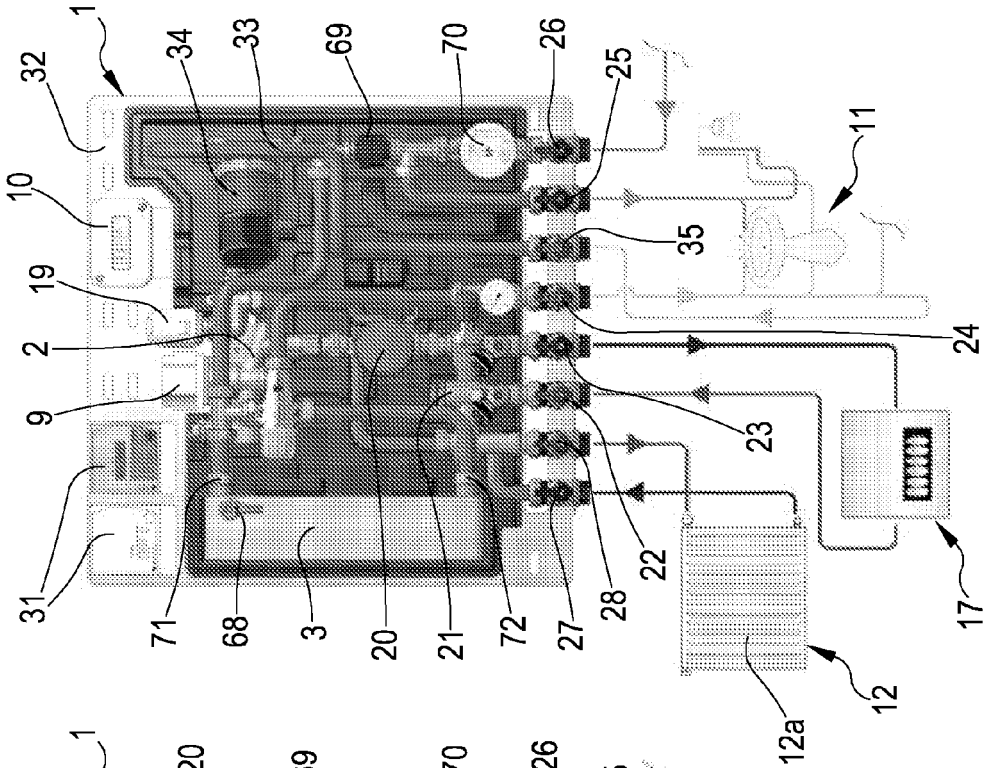
12. The apparatus of claim 10 or 11, further comprising at least a thermostat (14) mounted on the additional pathway (13) such as to selectively block a water passage through the additional pathway (13) in a presence of a water temperature which is higher than a predetermined temperature in a detection zone in proximity of the thermostat (14), in a direction of the second access (13b) of the additional pathway (13) and/or of the second access (7) of the second tract (4b) of main pathway (4), and in order to enable the passage of water, with the additional flow through the additional pathway (13) in a presence of a water temperature that is lower than the predetermined temperature in the detection zone.

13. The apparatus of claims 11 or 12, wherein the additional flow is predetermined such as to maintain the heat exchanger (3) above a minimum operating temperature and/or wherein the thermostat (14) is configured such as to define an additional flow suitable for maintaining the heat exchanger (3) above the minimum operating temperature and/or wherein the additional pathway (13) enables passage of an additional flow of water that is lower than a main flow of water between the first tract (4a) of main pathway (4) and the second tract (4b) of main pathway (4) through the selecting zone (6), the main flow being defined when the selector valve (9) enables passage of water between the first tract (4a) of main pathway (4) and the second tract (4b) of main pathway (4) and/or wherein the apparatus further comprises a regulating valve for regulating the additional flow and/or a closing valve mounted on the additional pathway (13) such as to selectively interrupt the additional flow of water.

14. The apparatus of any one of claims from 10 to 13, wherein the first tract (4a), the second tract (4b) and the third tract (4c) of main pathway (4) are defined internally of a body (15) realised in a single piece and/or wherein the additional pathway (13) is defined in the body (15) realised in a single piece and/or by means of hot-pressing and/or by means of hot-pressing in brass.

15. The apparatus of any one of claims from 9 to 14, further comprising a counter (20) operatively interposed between the first outlet (54) for return water

from a low-temperature heating plant (12b) and the second inlet (62) for return water, the exchanger (8) being operatively connected between the first outlet (54) for return water and the counter (20).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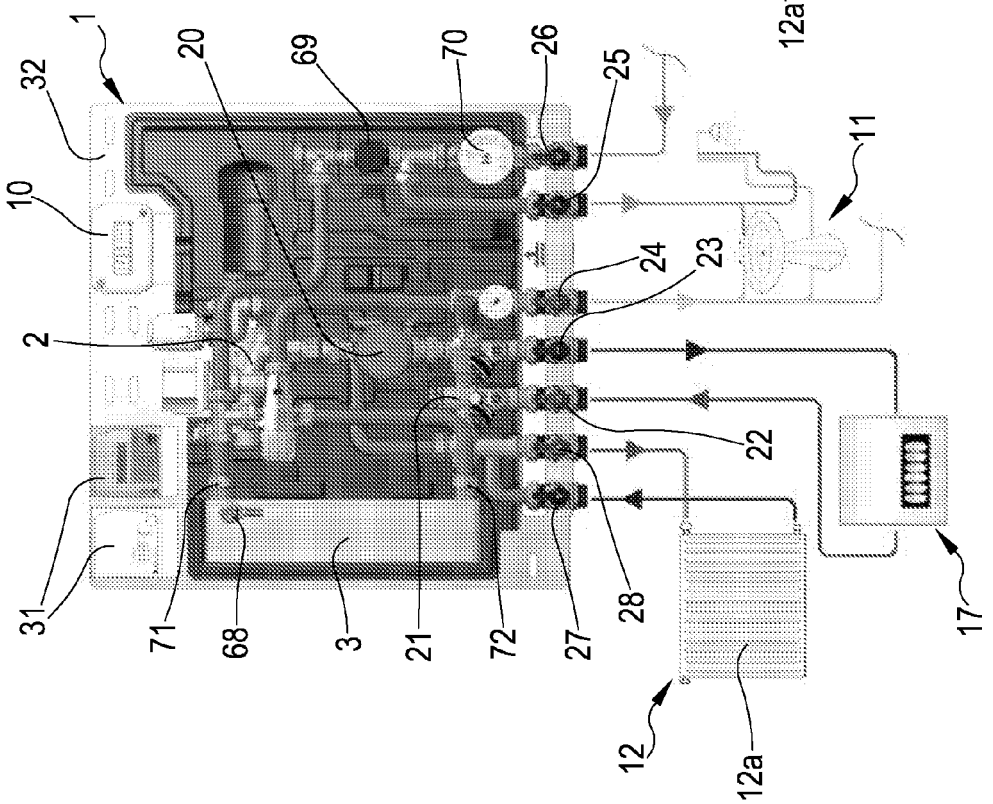
12a
12

FIG.2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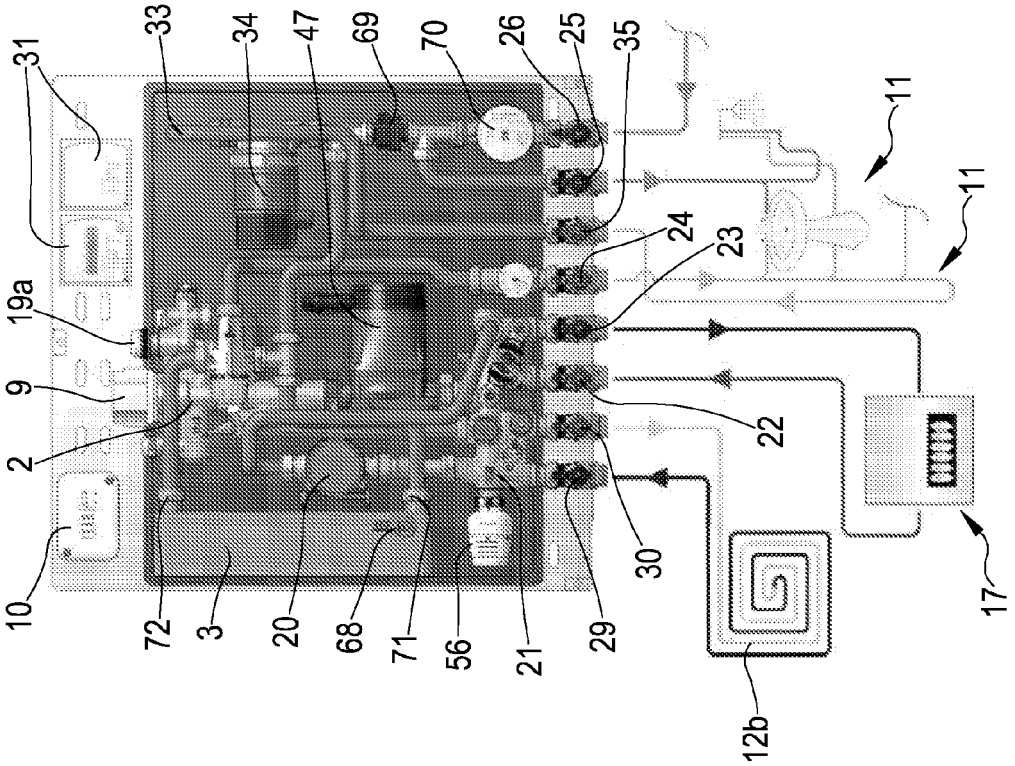
12a

FIG.1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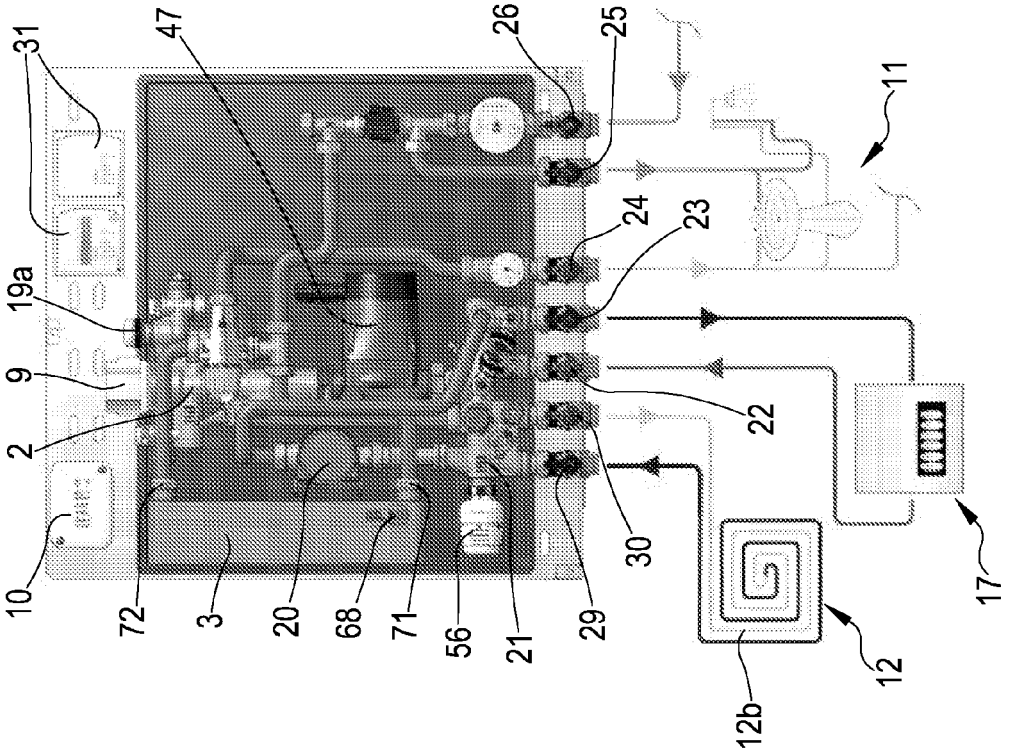
12b

FIG.4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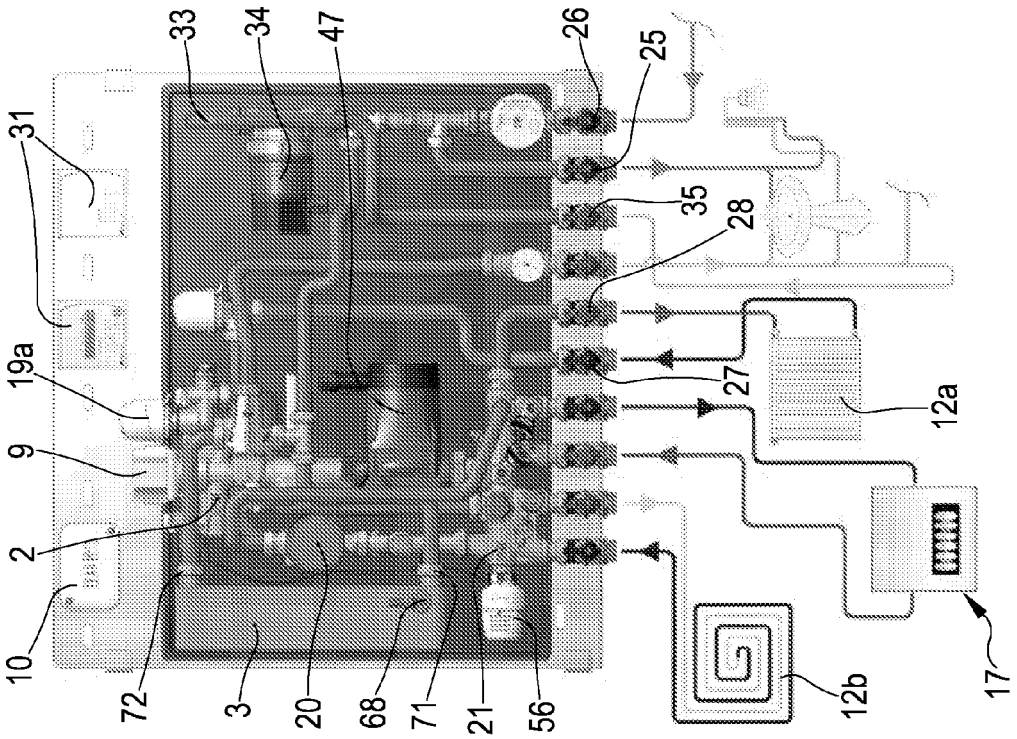
12b

FIG.3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12b
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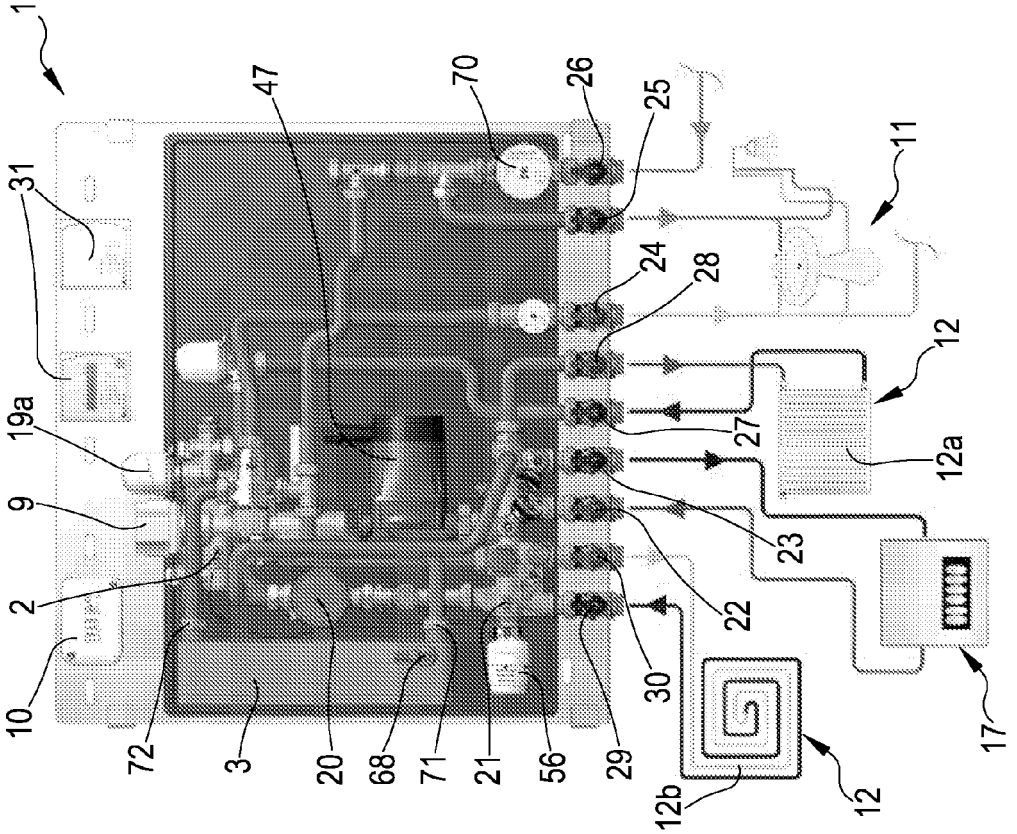
FIG.6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12b
12
17

FIG.5

FIG.2a

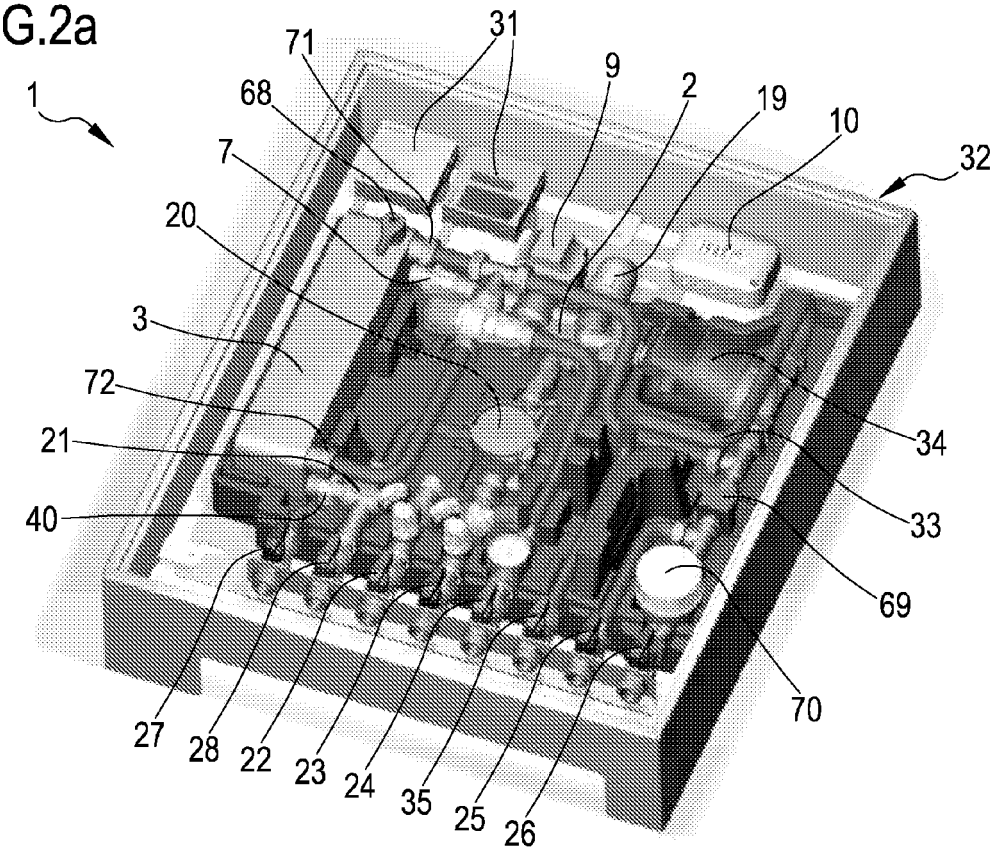
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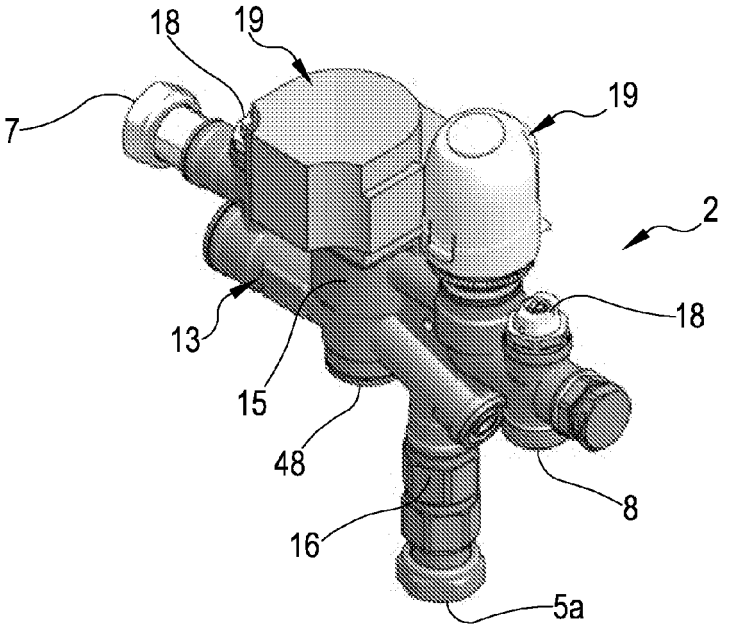
FIG.7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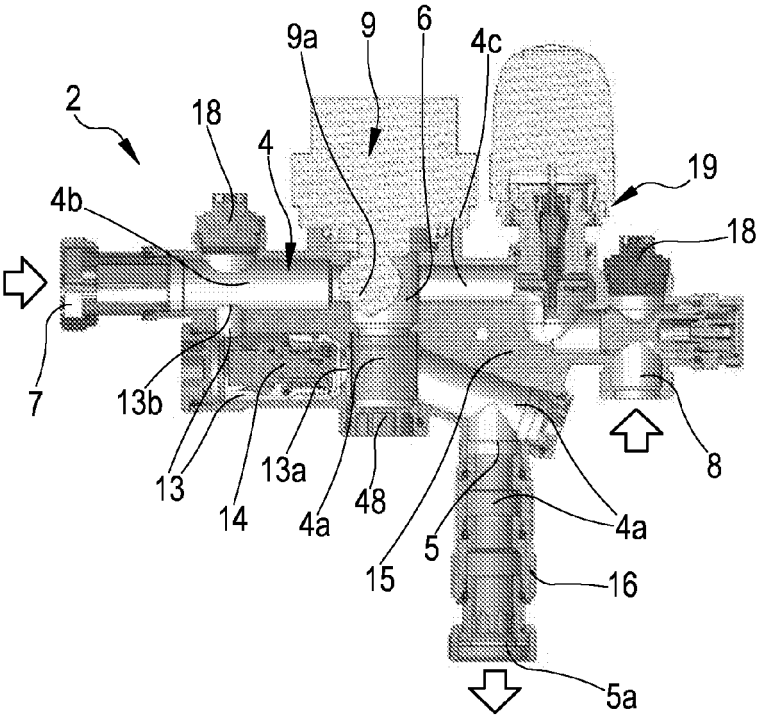
16
5a

FIG.8


9a
9
6
4c
2
18
4
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4b
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7
13b
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13a
14
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48
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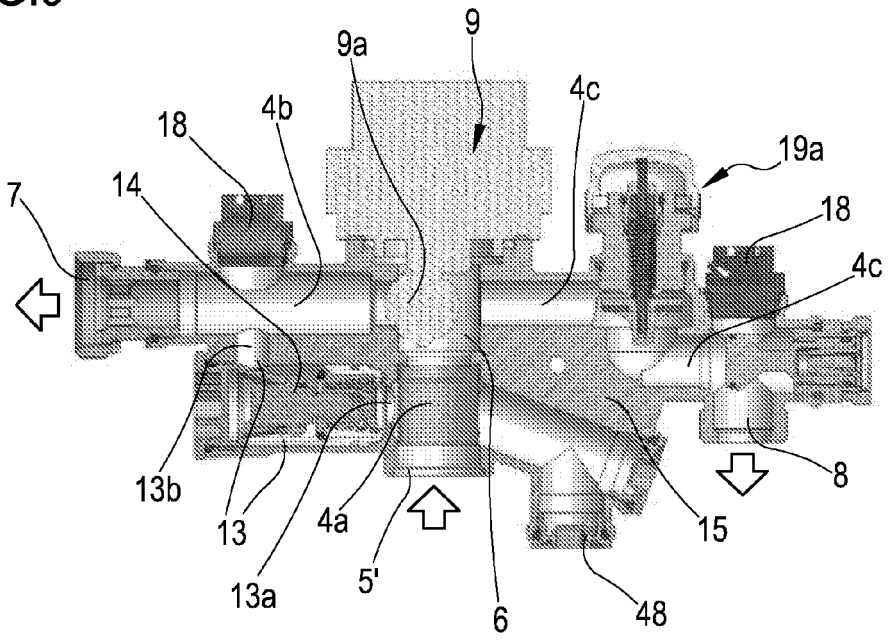
16
5a

FIG.9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4c
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FIG.10

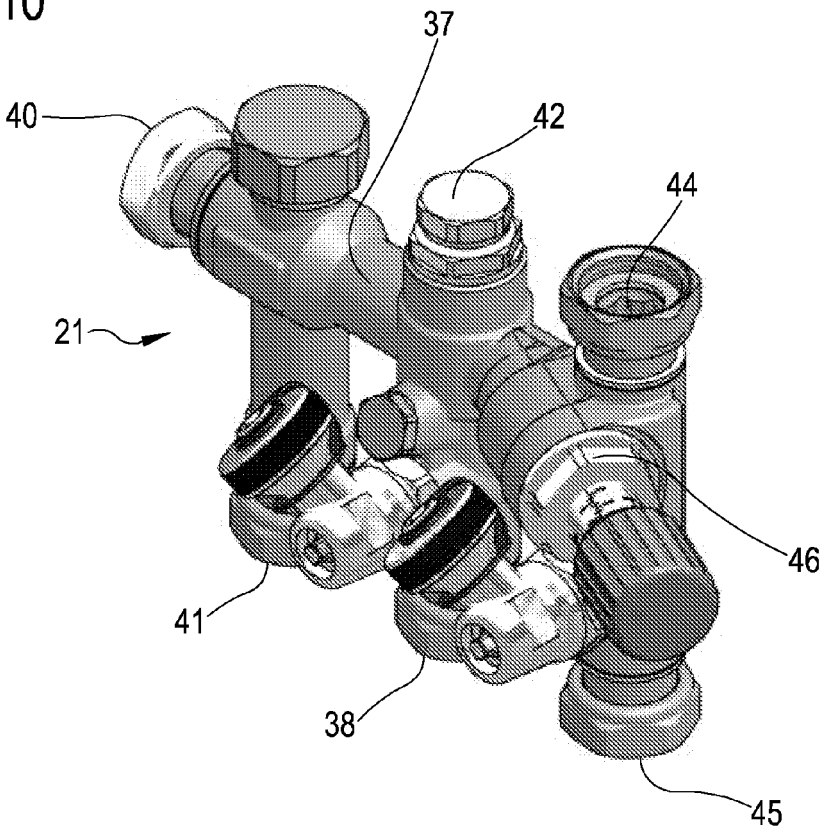

FIG.11

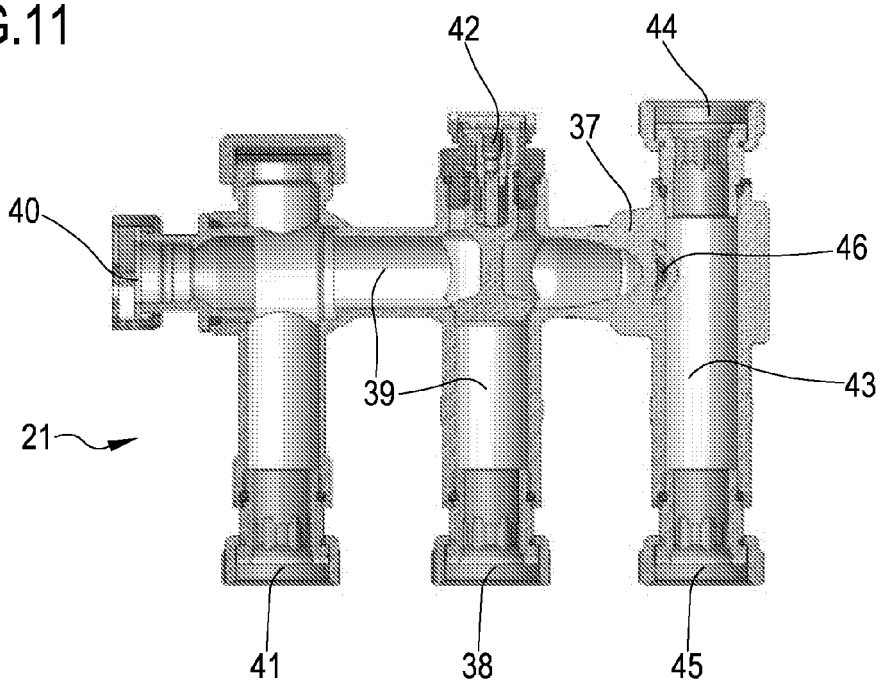

FIG.12

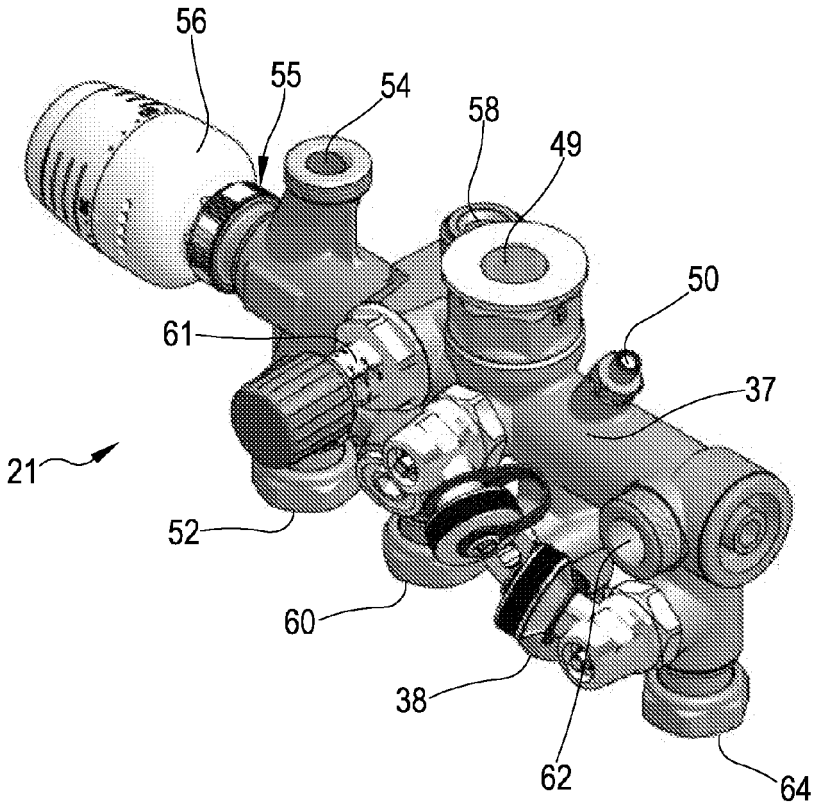
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FIG.13

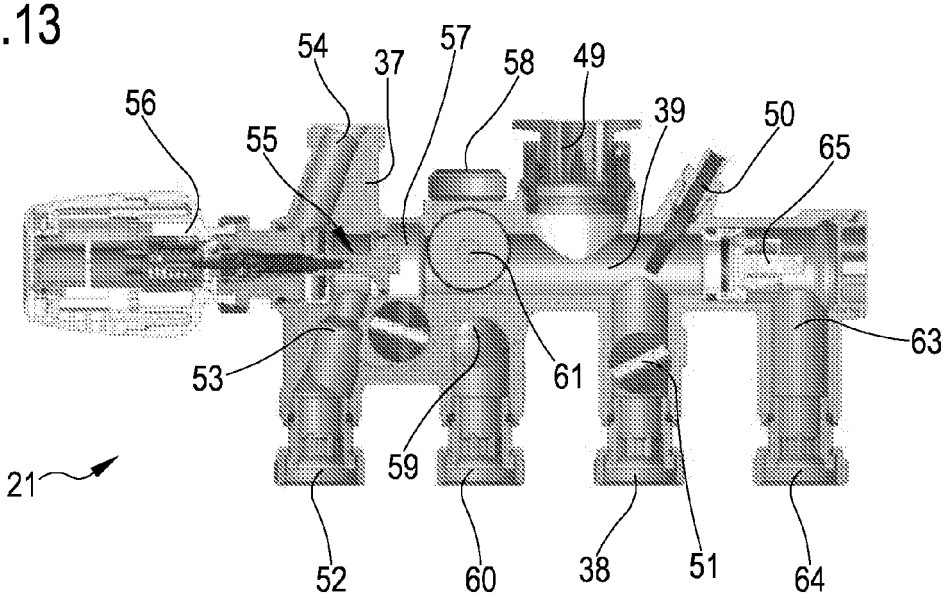
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FIG.14

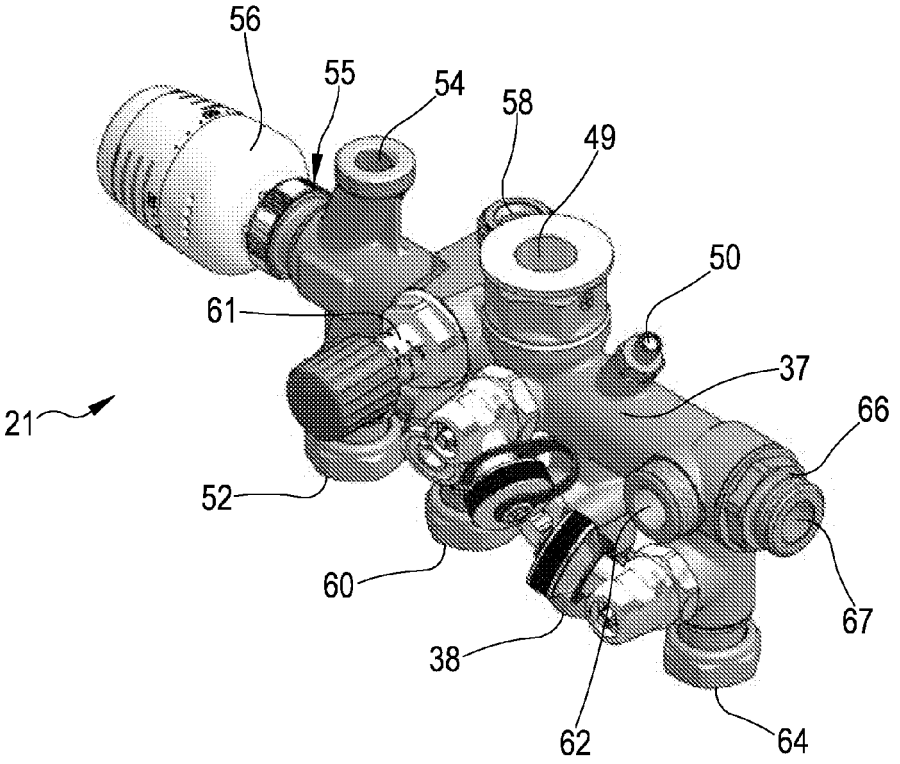
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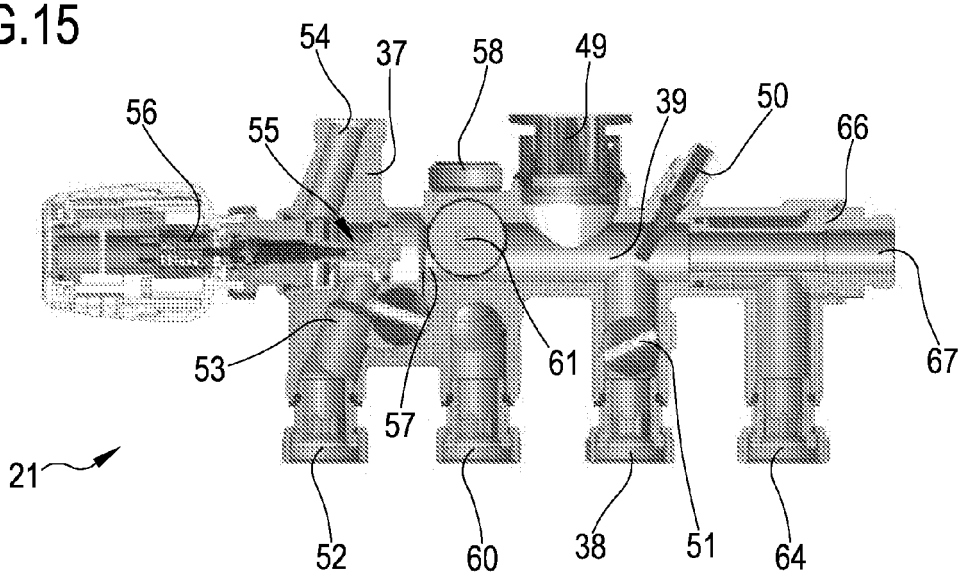
FIG.15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