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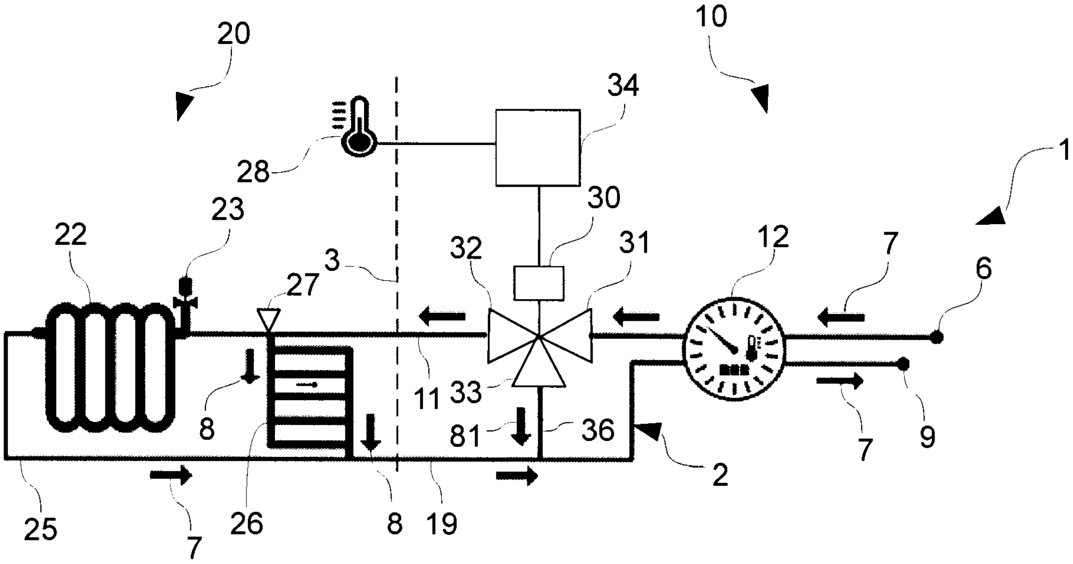
(54) HEATING AND/OR COOLING SYSTEM HAVING REGULATED FLUID FLOW TO A ZONE, AND AN ARRANGEMENT THEREOF

(57) The present invention refers to a heating and/or cooling system (1) having regulated fluid flow to a zone (20). The system (1) includes a conduit (2) for fluid flow. Along the flow direction, the conduit has an entry part (11) outside the zone (20), then a zone part (25) present in the zone (20), and an exit part (19) outside the zone (20). At the entry part (11), a three-way valve (30) is placed. One output port (32) of the three-way valve (30) leads the fluid to the zone (20), however other output port (33) leads the fluid to flow to the exit part (19) from the entry part (11) of the system conduit (1) bypassing the zone (20). Either all or a part of the fluid may be subjected to the bypassing of the zone (20) by using the three-way valve (30). The three-way valve (30) is controlled by zone temperature and/or by a user input.

FIG 2



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Description

[0001] The invention refers to a heating and/or cooling system having regulated fluid flow with respect to a zone according to claim 1, and a central heating and/or cooling arrangement having regulated fluid flow with respect to a zone according to claim 11.

Background of the Invention

[0002] In central heating and/or cooling arrangements, which may form a part of the HVAC (Heating, Ventilation and Air Conditioning) systems, generally a central heating and/or cooling unit, such a boiler or a furnace is used to heat a conditioning fluid, which then is circulated through a conduit to different fluidly connected units installed in zones that are to be heated or cooled by the central heating and/or cooling arrangement, for example to rooms of an apartment, offices, commercial buildings, and so on and so forth. The conditioning fluid, also referred simply to as the fluid, may be, but not limited to water, air, steam etc. The fluid is conditioned before being sent to the zone that is to be heated and/or to be cooled. For example for the purpose of heating the zone, the conditioning of the fluid is performed by heating the fluid in a central heating unit. For example in water based heating and/or cooling arrangements, water is heated in a boiler, i.e. the central heating unit, by using natural gas, wood, coal, fuel oil, and/or electricity, and is then pumped through a central conduit or pipe to an outside of the different zones, for example the apartments, that are to be heated and/or to be cooled. The conditioned fluid, i.e. the hot water in the present example, is then directed from the outside of the zone into the zone to be heated and/or to be cooled via sub-conduits or pipes. Within the zone are located one or more heat exchangers, i.e. a unit or a device for transferring heat from one medium to another, and the heated water flows through the one or more heat exchangers to perform the heating and/or the cooling of the zone. The fluid after being circulated though the zone, i.e. through the heat exchangers in the zone, is returned to the central conduit and subsequently flows back to the central heating and/or cooling unit. The fluid is then reconditioned, i.e. for the present example the water received by the heating unit is reheated and subsequently is pumped back into the central conduit and therefrom to the zones.

[0003] The aforementioned conventional fluid circulation system of a zone such as an apartment in a multi-apartment building, having central heating and/or cooling has several drawbacks such as impossibility of regulating the heating and/or cooling fluid flow of each apartment, independently and from outside of the apartment, i.e. the zone, due to the system's design requirement of having continuous circulation on some of the heat exchangers, generally heated towel rails in the apartment, to guarantee overall circulation of the fluid in the central conduit of the heating and/or the cooling arrangement. Thus although most of the heat exchangers are provided with individually operable control valves, thermostatically or manually, that regulate fluid flow though that heat exchanger, some of the heat exchangers function as continuous-flow channels or modules, and are devoid of valve controls to limit the fluid flow in such continuous-flow channels or heat exchangers. This results in loss of energy caused by overheating or over-cooling of the zone resulting from the continuous unregulated fluid flow through the continuous flow heat exchangers. If such continuous flow heat exchangers or modules are removed from the arrangement, any subsequent flow control on the other heat exchangers, i.e. the heat exchangers with the valve controls, within the zone, i.e. within the apartment, may cause pressure instabilities, complete or partial flow restriction, and possible over-pressures on the central circulation.

[0004] Therefore there exists a need for a technique to regulate fluid flow with respect to one or more zones with reduced or no dependency on the aforementioned continuous flow heat exchangers. Such a technique may mainly be applicable to the buildings with central HVAC systems. Furthermore, such a technique may be used for any kind of energy distribution or collection central system and can provide local regulation, with respect to the zones that are intended to be heated and/or cooled by the central heating and/or cooling arrangement, of the fluid flow circulation and consequently control and increased efficiency of the energy consumption.

Object of the Invention

[0005] It is therefore an object of the present invention is to provide a technique, particularly a heating and/or cooling system for regulated fluid flow to a zone that is intended to be heated and/or cooled by the system, and a central heating and/or cooling arrangement thereof.

Summary of the Invention

[0006] The above mentioned objective is achieved by a heating and/or cooling system having regulated fluid flow with respect to a zone according to claim 1 of the present technique, as presented. This forms a first aspect of the present technique. The heating and/or cooling system, hereinafter also referred to as the system, includes a system conduit, a heat exchanger, a three-way valve, and a valve control unit. In the system a fluid is used to heat and/or cool the zone.

[0007] The system conduit provides flow space or channel for flow of the fluid. The system conduit receives the fluid via an inlet of the system conduit, for example from a central circulation. The fluid before being received by the system conduit is conditioned i.e. the fluid is heated or cooled and consequently is ready or prepared for performing heat exchange in the zone, generally by convention via the heat exchanger with an ambient fluid or ambient air of the zone. The fluid is usually conditioned by a heating and/or cooling unit forming a part of the central circulation, besides a central conduit for flow of the fluid within the central circulation. The fluid is released from the system conduit, for example returned to the central circulation, via an output of the system conduit after heat exchange is performed by the fluid, i.e. after the conditioned fluid has circulated through the zone. The system conduit thus has three parts, as viewed along a flow direction of the fluid within the system conduit - an entry part positioned outside the zone which brings the fluid from the inlet of the system conduit to the zone, a zone part positioned inside the zone for circulating the fluid through the zone, and an exit part positioned outside the zone that brings the fluid from the zone to the outlet of the system conduit. In other words, the zone part of the system conduit is positioned inside the zone and in-between the entry part and the exit part of the system conduit.

[0008] The heat exchanger is fluidly inserted in or connected to the zone part of the system conduit and is positioned inside the zone, meaning thereby that the conditioned fluid entering the zone part of the system conduit flows into the heat exchanger, heats or cools a surface that then performs convention based heating or cooling of the zone, and flows back into the zone part of the system conduit and therefrom to the exit part of the system conduit. An example of heat exchanger is a radiator that is used in apartment rooms to heat and/or cool the zone i.e. the apartment room in the present example, by performing heat exchange with the ambient air of the room.

[0009] The three-way valve, also known as the three-port valve or the 3-way valve, is positioned at the entry part of the system conduit, i.e. outside the zone. The 3-way valve has an inlet port and two outlet ports. The inlet port receives the fluid from the entry part of the system conduit, one of the outlet ports, also referred to as a normal port, by action of the 3-way valve, release the fluid so received into the system conduit such that the fluid flows into the zone part of the system conduit, and the other outlet port i.e. a cross-flow output port, by action of the 3-way valve releases the fluid so received into the exit part of the system conduit such that the fluid flows towards the outlet of the system conduit without flowing through the zone or into the zone part of the system conduit or through the heat exchanger positioned inside the zone.

[0010] The valve control unit controls the 3-way valve to direct all the fluid received by the inlet port either into the normal output port or into the cross-flow output port of the three-way valve. Alternatively, the valve control unit controls the 3-way valve to direct a part of the fluid received by the inlet port into the normal output port and remaining of the fluid into the cross-flow output port of the three-way valve. The valve control unit decides on the amount of fluid to flow through the different output ports i.e. the normal output port and/or the cross-flow output port by using user input or by using temperature input indicative of an existing temperature of the zone as compared to a desired temperature of the zone.

[0011] Thus, in the aforementioned system of the present technique requirement of having a continuous flow heat exchanger or channel is at least partially obviated, especially when the fluid flow through other heat exchangers of the system are partially or completely restricted contrary to as was required in the conventional systems. Furthermore, the present technique provides for energy saving, as compared to the conventional arrangements/systems because fluid is not required to flow through the continuous flow heat exchangers even when conditioning, i.e. heating or cooling, of the zone is undesired and thus at least partially obviating unnecessary heating and/or cooling of the zone. Furthermore, a user of the zone, for example an apartment dweller, may divert the fluid, using the cross-flow output port of the 3-way valve, back to the central conduit, if so desired, and thus the fluid is required to flow over shorter distance before returning to the central heating and/or cooling unit, and thus pumping of the fluid requires lesser energy and lesser load is experienced by any pump aiding the fluid circulation, and consequently results into longer life for such pump.

[0012] In an embodiment of the system, the system includes a cross-flow channel. The cross-flow channel is positioned outside the zone and in between the cross-flow output port of the three-way valve and the exit part of the system conduit such that the fluid released into the cross-flow output port flows into the exit part of the system conduit via the cross-flow channel. This provides a flexibility in the arrangement of the system conduit and positioning of the 3-way valve.

[0013] In another embodiment of the system, the system includes a temperature sensor. The temperature sensor, for example a thermometer, determines a temperature of the zone. In a related embodiment, the valve control unit controls the 3-way valve at least partially based on the temperature of the zone as determined by the temperature sensor. The temperature sensor may be connected to the valve control unit either via a wired connection or via a wireless connection. Thus a user is not required to regulate the 3-way valve based on experience, rule or decision. The amount of fluid provided to the zone via the normal output port of the 3-way valve and/or the amount of fluid provided to the exit part of the system conduit via the cross-flow output port is determined or decided based either completely or partially on the temperature of the zone as determined by the temperature sensor. Thus the system may be automated and does not require an external decision making or manual interference to decide the amounts of fluid that should flow into the zone and into the cross-flow output port.

[0014] In a further embodiment of the system, the system includes a calorimeter. The calorimeter determines an amount of energy provided to the zone, for example by measuring an amount of calories emitted to or drawn from the central circulation. This data can be used for calculating a cost of the energy provided and used by the zone. This data may also be used for controlling the 3-way valve via the valve control unit where it is desirable to regulate or restrict the amount of fluid provided to the zone based on the amount of energy already or previously used by the zone.

[0015] In another embodiment of the system, the three-way valve is motorized. Thus a need for a user to regulate or move the valve manually is obviated. The motorized 3-way valve is controlled electronically by the valve control unit based on different parameters such as a temperature of the zone and/or a user input, thereby achieving the automated system.

[0016] In a preferred embodiment of the system, the system includes a cross-flow module and a flow valve. The cross-flow module is positioned inside the zone and is configured to direct the fluid flow such that at least a part of the fluid flows towards the exit part of the system conduit without flowing through the heat exchanger. The flow valve controls an amount of the fluid that forms the part of the fluid that flows towards the exit part of the system conduit without flowing through the heat exchanger. Thus a controlled cross-flow is provided within the zone.

[0017] In another embodiment of the system, the valve control unit controls the three-way valve at least partially based on a user input. Thus, the amount of fluid provided to the zone via the normal output port of the 3-way valve and/or the amount of fluid provided to the exit part of the system conduit via the cross-flow output port is determined or is decided based either completely or partially on the user input. The user input may be indicative of a user's desire and/or indicative of a rule regarding regulation of fluid flow into the zone. In a related embodiment of the system, the valve control unit receives wirelessly a command indicative of the user input. Thus, the 3-way valve is controllable by the user remotely.

[0018] The aforementioned object is also achieved by a central heating and/or cooling arrangement according to claim 11 of the present technique, which presents a second aspect of the present technique. The central heating and/or cooling arrangement has regulated fluid flow with respect to one or more zones that are supposed to be heated and/or cooled by the central heating and/or cooling arrangement of the present technique. The central heating and/or cooling arrangement, hereinafter also referred to as the arrangement, includes a central circulation and one or more of the systems as aforementioned in accordance with the first aspect of the present technique. The central circulation has a central conduit for flow of a fluid for heating and/or cooling of the one or more zones, a central circulation pump for moving the fluid within the central conduit, and a heating and/or cooling unit for thermally conditioning the fluid before the fluid is circulated through the zone. In the arrangement, a number of the systems is equal to or corresponds to a number of the zones that are to be heated or to be cooled, i.e. in other words each zone has its own system for heating and/or cooling the zone. The system includes a system conduit having an inlet and an outlet, as aforementioned in accordance with the first aspect of the present technique. The inlet and the outlet of the system conduit of the system are fluidly connected to the central conduit. The arrangement of the present technique has same advantages as aforementioned with respect to the first aspect of the present technique.

[0019] In an embodiment of the arrangement, the arrangement includes at least two systems. Each of the systems heats and/or cools a different zone. The zone is for example a room such as a conference hall, a storage room, etc., or an apartment having one or more rooms. The zones, i.e. the rooms or the apartments are located at a same floor level of a building having these rooms and/or the apartments. Thus fluid flow to different zones, i.e. apartments or rooms, of the building that are located on the same floor but are distinct from each other, for example apartments owned or resided by different individuals, may be regulated.

[0020] In another embodiment of the arrangement, the arrangement includes at least two systems. Each of the systems heats and/or cools a different zone. The zone is for example a room such as a conference hall, a storage room, etc., or an apartment having one or more rooms. The zones, i.e. the rooms or the apartments are located at different floor levels of a building having these rooms and/or the apartments. Thus fluid flow to different zones, i.e. apartments or rooms, of the building that are located on different floors, for example an apartment owned or resided by an individual on the first floor and another one by another individual on the second floor of the building, may be regulated.

[0021] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the system and the arrangement according to the invention, which match at least essentially with respect to their function can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0022] The invention is just exemplarily described with respect to the attached figures in the following.

Brief Description of the Drawings

[0023]

Fig. 1 schematically represents a conventional heating and/or cooling system according to the prior art;

Fig. 2 schematically represents a heating and/or cooling system of the present invention; and

Fig. 3 schematically presents a central heating and/or cooling arrangement of the present invention.

Detailed Description of the Drawings

[0024] It may be noted that in the present disclosure, the terms 'first', 'second', etc. are used herein only to facilitate discussion and carry no particular temporal or chronological significance unless otherwise indicated.

[0025] The basic idea of the present technique is to provide on demand or if so desired heat exchanging fluid, or the conditioning fluid, flow to a zone, for example an apartment. The demand or desire may arise for example based on thermal condition of the zone that may be determined by using a temperature sensor inside the zone; and letting the fluid circulate inside the zone only if needed, i.e. if desired or demanded, and otherwise bypassing the fluid back to a central circulation without circulating the fluid through the zone.

[0026] For better understanding of the present technique, it may be helpful to understand a conventional heating and/or cooling system. Such a conventional heating and/or cooling system 101, hereinafter also referred to as the conventional system 101 is schematically represented in Fig. 1.

[0027] The conventional system 101 according to the prior art includes a system conduit 2, at least one heat exchanger 22, a two-way valve 15, and a continuous flow heat exchanger or channel herein referred to as the continuous flow module 24. In the conventional system 101, a fluid is used to heat and/or cool a zone 20, which may be an apartment or a room or any enclosed space that required thermal conditioning i.e. heating and/or cooling.

[0028] The system conduit 2 is a pipe or channel that provides flow space or flow path for flow of the fluid. The system conduit 2 receives the fluid via an inlet 6 of the system conduit, for example from a central circulation (not show in Fig. 1). The fluid before being received by the system conduit 2 is conditioned i.e. the fluid is heated or cooled and consequently is ready to perform heat exchange when circulating within the zone 20, generally by convention via the heat exchanger 22 with an ambient air within the zone 20. The fluid is usually conditioned by a heating and/or cooling unit (not shown in Fig 1), for example a boiler, forming a part of the central circulation, besides a central conduit (not shown in Fig 1) for flow of the fluid within the central circulation. The fluid is released from the system conduit 2, for example returned to the central circulation, via an output 9 of the system conduit 2 after the exchange of heat is performed by the fluid, i.e. after the conditioned fluid has circulated through the zone 20. The system conduit 2 has three parts, as viewed along a flow direction 7 of the fluid within the system conduit 2 - an entry part 11 positioned at an outside 10 of the zone 20 and which brings the fluid from the inlet 6 of the system conduit 2 to the zone 20, a zone part 25 positioned inside the zone 20 for circulating the fluid through the zone 20, and an exit part 19 positioned at the outside 10 of the zone 20 and that brings the fluid from the zone 20 to the outlet 9 of the system conduit 2. In Fig. 1 a dotted line 3 represents the outside 10 of the zone 20 and the zone 20. As aforementioned, the zone 20 may be an apartment or a room in a building having multiple rooms or apartments, and the outside 10 of the zone 20 will then be any space or area present outside of the apartment or the room.

[0029] Integrated in the fluid flow within the entry part 11 of the system conduit 2 is the two-way valve 15. The two-way valve 15, hereinafter also referred to as the valve 15, has an inlet port 14 which receives the fluid from the entry part 11 of the system conduit 2 and an exit port 16 through which the fluid may be released into the entry part 11 of the system conduit 2 if the valve 15 is in open position. When the valve 15 is closed no fluid flows into the system conduit 2.

[0030] After entering the zone part 25 of the system conduit 2, the fluid flows to the one or more heat exchangers 22. Each of the heat exchanger 22 is fluidly inserted in or is connected to the zone part 25 of the system conduit 2 and is positioned inside the zone 20, for example the heat exchanger 22 may be a radiator mounted on a wall inside an apartment room i.e. inside the zone 20. The conditioned fluid entering the zone part 25 of the system conduit 2 flows into the heat exchanger 22, heats or cools a surface (not shown) of the heat exchanger 22 that in turn performs convention based heating or cooling of the zone 20, and flows back into the zone part 25 of the system conduit 2 and therefrom continues to flow to the exit part 19 of the system conduit 2. Associated with the heat exchanger 22 is a flow control 23 of the heat exchanger 22, for example a manually operated or thermostatically controlled valve 23. The flow control 23 limits or restricts an amount of fluid that can circulate though the heat exchanger 22 and thus controls the heating and/or cooling caused by the heat exchanger 22.

[0031] At times when the flow control 23 of the one or more heat exchangers 22 are completely closed, so as to completely restricting fluid flow though the heat exchanger 22, or when the fluid flow is partially restricted, the fluid then flows through the continuous-flow module 24 in a direction 8 and therefrom to the exit part 19 of the system conduit 2.

[0032] The conventional system 1 also includes a calorimeter 12 inserted in the system conduit 2 which measures an amount of energy exchange of the fluid after being circulated through the zone 20. The heat exchangers 22, the flow controls 23, the continuous-flow modules 24, the calorimeter 12 and the two-way valve 15 are well known and extensively used in central heating and cooling systems and thus not explained herein in further details for sake of brevity.

[0033] Referring now to Fig 2, a heating and/or cooling system 1 of the present invention is presented. The heating and/or cooling system 1, hereinafter also referred to as the system 1, includes all the components of the conventional system 1 as explained in reference to Fig 1, for example the system conduit 2 with the inlet 6 and the outlet 9 and having the entry part 11, the zone part 25 and the exit part 19, as aforementioned, and the heat exchanger 22 along with the flow control 23. The system 1 also optionally includes the calorimeter 12. However, the system 1 does not include the two-way valve 15 as explained with reference to Fig 1. Instead, the system 1 includes a three-way valve 30, also referred to as the three-port valve 30 or the 3-way valve 30 or the 3-port valve 30. The system 1 also includes a valve control unit 34 that controls the three-way valve 30.

[0034] The three-way valve 30, as shown in Fig 2, is positioned at the entry part 11 of the system conduit 2, i.e. outside 10 the zone 20. The 3-way valve 30 has an inlet port 31 and two outlet ports 32, 33. The inlet port 31 receives the fluid from the entry part 11 of the system conduit 2, one of the outlet ports 32, also referred to as a normal outlet port 32, by action of the 3-way valve 30, release the fluid so received into the system conduit 2 such that the fluid flows into the zone part 25 of the system conduit 2, and the other outlet port 33 i.e. a cross-flow output port 33, by action of the 3-way valve 30 releases the fluid so received into the exit part 19 of the system conduit 2 such that the fluid flows towards the outlet 9 of the system conduit 2 without flowing through the zone 20 or into the zone part 25 of the system conduit 2 or through the heat exchanger 22 positioned inside the zone 20. The three-way valve 30 is motorized, that is the three-way valve 30 can be electronically controlled without requiring any manual intervention. Such motorized three-way valves 30, their intrinsic working principle and techniques for electronically controlling such three-way valves 30 is well known in the filed of hydrodynamics and thus not explained herein in details for sake of brevity.

[0035] The valve control unit 34 controls the 3-way valve 30 to direct all the fluid received by the inlet port 31 either into the normal output port 32 or into the cross-flow output port 33 of the three-way valve 30. Alternatively, the valve control unit 34 controls the 3-way valve 30 to direct a part of the fluid received by the inlet port 31 into the normal output port 32 and remaining of the fluid into the cross-flow output port 33 of the three-way valve 30. The valve control unit 34 decides on the amount of fluid to flow through the different output ports 32, 33 i.e. the normal output port 32 and/or the cross-flow output port 33 by using a user input and/or by using a temperature input indicative of an existing temperature within the zone 20 as compared to a desired temperature of the zone 20. The temperature within the zone 20 may be measured by a temperature sensor 28, positioned within the zone 20, and which may then transmit a signal indicative of the temperature reading to the valve control unit 30, either by a wired connection, as shown in Fig. 2 or wirelessly for example by using blue tooth communication protocol.

[0036] Thus, the valve control unit 30 controls the three-way valve 30 such that the fluid, after being received by the 3-way valve 30 via the input port 31, is allowed to flow into the zone 20, i.e. the apartment 20, via the normal output port 32 of the motorized 3-way valve 30, only if so needed or desired. However, when it is not needed or desired to circulate the fluid into the zone 20, the zone 20 is bypassed for the fluid flow by directly circulating the fluid back to the system conduit 2 via the output port 33 i.e. via the cross-flow output port 33. The valve control unit 34 is responsible for the control of liquid flow, i.e. for amounts that flow to the zone 20 and that bypass the zone 20, and this control may be based on user inputs such as a preset timetable, a preset temperature value, or a direct control command from the user delivered to the valve control unit 34 via a wired or wireless reception at the valve control unit 34. The valve control unit 34 may also be programmed such that it guarantees heating or cooling of the zone 20 at a lowest obligatory level which may be according to the local and national regulations or by choice of the user.

[0037] A diameter of the cross-flow output port 33 of the 3-way valve 30 may be defined according to a capacity of a circulation pump (not shown in Fig 2) and the maximum pressure level that the system 1 can operate at, for example when all the flow control 23 associated with every heat exchanger 22 in the zone 20 is closed, and thus all the fluid entering the inlet 6 of the system conduit 2 is being made, by the valve control unit 34, to flow through the cross-flow output port 33 of the three-way valve 30 of the system 1. The cross-flow output port 33 may be connected to a cross-flow channel 36. The cross-flow channel 3 is a conduit or pipe or flow path and is positioned outside the zone 20 and in-between the cross-flow output port 33 of the three-way valve 30 and the exit part 19 of the system conduit 2. The fluid that flows into the cross-flow output port 33 of the three-way valve 30 enters the cross-flow channel 36 and then flows into the exit part 19 of the system conduit 2, and subsequently flows out of the outlet 9 of the system conduit 2.

[0038] As shown in Fig 2, the system 1 may also include a cross-flow module 26, which is similar in construction, positioning and function as the continuous flow heat exchanger 24 but, contrary to the continuous flow heat exchanger 24, the cross-flow module 26 includes or is associated with a flow valve 27. The cross-flow module 26, i.e. the cross-flow heat exchanger 26, is positioned inside the zone 20 such that it directs the fluid flow to an effect that at least a part of the fluid flows towards the exit part 19 of the system conduit 2 without flowing through the one or more other heat exchangers 22. The flow valve 27 controls an amount of the fluid that forms the part of the fluid i.e. the amount of the fluid that flows towards the exit part 19 of the system conduit 2 without flowing through the one or more other heat exchangers 22.

[0039] Now referring to Fig 3, a central heating and/or cooling arrangement 100 is presented schematically. The central heating and/or cooling arrangement 100, hereinafter also referred to as the arrangement 100, has regulated fluid flow with respect to one or more zones 20 that are supposed to be heated and/or cooled by the arrangement 100. Fig 3 shows two such zones demarcated by a dotted line 50.

[0040] The arrangement 100, includes a central circulation 90 and one or more of the systems 1. In the Fig 3, two such systems 1 have been depicted schematically. The systems 1 of the Fig 3 are same as the system 1 described herein-above with reference to Fig 2.

[0041] The central circulation 90 has a central conduit 92 though which the fluid for heating and/or cooling of the one or more zones 20 flows, a central circulation pump 93 for moving the fluid within the central conduit 92, and a heating and/or cooling unit 94 for thermally conditioning the fluid before the fluid is circulated through the zones 20. In the arrangement 100, a number of the systems 1 is equal to or corresponds to a number of the zones 20 that are to be heated or to be cooled, i.e. in other words each zone 20 has its own system 1 for heating and/or cooling the zone 1, as explained herein-above in reference to Fig 2. As shown in Fig 3 in combination with Fig 2, the inlet 6 and the outlet 9 of the system conduit 2 of the system 1 are fluidly connected to the central conduit 92, and more particularly to a feed part 95 of the central conduit 92 and to a return part 96 of the central conduit 92, respectively. The feed part 92 of the central conduit 92 is the part of the central conduit 92 that carries, or though which flows, the fluid from the central heating and/or cooling unit 94, hereinafter also referred to as the unit 94, after being conditioned i.e. after being heated or cooled. The fluid flow direction in the feed part 95 of the central conduit 92 is indicated by arrows marked with reference numeral 97. The return part 96 of the central conduit 92 is the part of the central conduit 92 that carries, or though which flows, the fluid towards the unit 94 for being conditioned i.e. for being heated or cooled. The fluid flow direction in the return part 96 of the central conduit 92 is indicated by arrows marked with reference numeral 98. The overall circulation of the fluid in the central conduit 92 and in the systems 1 fluidly connected to the central conduit 92 is performed or driven by the central circulation pump 93.

[0042] Within the central conduit 92 are placed or integrated, generally at a topmost position with respect to a level of the central pump 93 or the central heating and/or cooling unit 94, blind caps with bleeding key 91 which provides bleeding of any air that may be present inside the central conduit 92 or that may enter the central conduit 92.

[0043] In the arrangement 100, the diameter of the cross-flow output port 33 of the 3-way valve 30 may further be defined according to capacity of the central circulation pump 93 and the maximum pressure level that the arrangement 100 can operate at, for example when all the 3-way valves 30 in the arrangement 100 are in full bypass mode i.e. none of the zones 20 need any fluid flow to into them.

[0044] In an embodiment of the arrangement 100, the arrangement 100 includes at least two systems 1. The zone 20 is for example a room such as a conference hall, a storage room, etc., or an apartment having one or more rooms, that are located at a same floor level of a building having these rooms and/or the apartments. Additionally, the arrangement 100 may include at least one more system 1 corresponding to another zone 20 that is located at a different floor level of the building having these rooms and/or the apartments. Alternatively, in another embodiment of the arrangement 100, the arrangement 100 includes at least two systems 1. The zone 20 is for example a room such as a conference hall, a storage room, etc., or an apartment having one or more rooms, that are located at different floor levels of a building having these rooms and/or the apartments. Additionally, the arrangement 100 may include at least one more system 1 corresponding to another zone 20 that is located at a same floor level as one of the earlier floor levels of the building having these rooms and/or the apartments.

[0045] Thus, the present invention refers to a heating and/or cooling system 1 having regulated fluid flow to a zone 20. The system 1 includes a conduit 2 for fluid flow. Along the flow direction, the conduit has an entry part 11 outside the zone 20, then a zone part 25 present in the zone 20, and an exit part 19 outside the zone 20. At the entry part 11, a three-way valve 30 is placed. One output port 32 of the three-way valve 30 leads the fluid to the zone 20, however other output port 33 leads the fluid to flow to the exit part 19 from the entry part 11 of the system conduit 2 bypassing the zone 20. Either all or a part of the fluid may be subjected to the bypassing of the zone 20 by using the three-way valve 30. The three-way valve 30 is controlled by zone temperature and/or by a user input.

List of reference numbers

[0046]

1	heating and/or cooling system
2	system conduit
3	dotted line schematically demarcating the zone and the outside of the zone
6	inlet of the system conduit
7	flow direction in the system conduit
8	cross-flow in the zone
9	outlet of the system conduit
10	outside of the zone
11	entry part of the system conduit
12	calorimeter
14	inlet port of the 2-way valve
15	2-way valve
16	outlet port of the 2-way valve
19	exit part of the system conduit
20	zone
22	heat exchanger
23	flow control of the heat exchanger
24	continuous flow module
25	part of the system conduit inside the zone
26	cross-flow module
27	flow valve for the cross-flow module
28	zone thermometer

30 3-way valve
31 inlet port of the 3-way valve
32 outlet port of the 3-way valve
33 cross-flow outlet port of the 3-way valve
34 valve control unit
36 cross-flow channel
50 dotted line showing zone divisions
90 central circulation
91 ends of the central conduit
92 central heating and/or cooling unit
93 central conduit
94 central circulation pump
95 feed part of the central conduit
96 return part of the central conduit
97 direction of fluid flow in the feed part of the central conduit
98 direction of fluid flow in the return part of the central conduit
100 central heating and/or cooling arrangement
101 conventional central heating and/or cooling system

Claims

1. Heating and/or cooling system (1) having regulated fluid flow with respect to a zone (20), the system (1) comprising:

- a system conduit (2) for flow of a fluid for heating and/or cooling of the zone (20), the system conduit (2) having an inlet (6) configured to receive the fluid from a central circulation (90), and an outlet (9) configured to release the fluid into the central circulation (90), wherein the system conduit (2) comprises an entry part (11) positioned outside the zone (20), an exit part (19) positioned outside the zone (20), and a zone part (25) positioned inside the zone (20) and in-between the entry part (11) and the exit part (19) of the system conduit (2);
- a heat exchanger (22) configured to heat and/or cool the zone (20) by exchanging heat within the zone (20), wherein the heat exchanger (22) is positioned inside the zone (20) and is fluidly connected to the zone part (25) of the system conduit (2);
- a three-way valve (30) positioned at the entry part (11) of the system conduit (2) and having an inlet port (31) configured to receive the fluid from the entry part (11) of the system conduit (2), an outlet port (32) configured to release the fluid so received into the system conduit (2) such that the fluid flows into the zone part (25) of the system conduit (2), and a cross-flow output port (33) configured to release the fluid so received into the exit part (19) of the system conduit (2) such that the fluid flows towards the outlet (9) of the system conduit (2); and
- a valve control unit (34) configured to control the three-way valve (30) to direct the fluid received by the inlet port (31) into the output port (32) and/or the cross-flow output port (33) of the three-way valve (30).

2. The system (1) according to claim 1, comprising a cross-flow channel (36) positioned outside the zone (20) and in-between the cross-flow output port (33) of the three-way valve (30) and the exit part (19) of the system conduit (2) such that the fluid released through the cross-flow output port (33) flows into the exit part (19) of the system conduit (2) via the cross-flow channel (36).

3. The system (1) according to claim 1 or 2, further comprising a temperature sensor (28) configured to determine a temperature within the zone (20).

4. The system (1) according to claim 3, wherein the valve control unit (34) is configured to control the three-way valve (30) at least partially based on a temperature of the zone (20) as determined by the temperature sensor (28).

5. The system (1) according to claim 3 or 4, wherein the valve control unit (34) is configured to receive communication from the temperature sensor (28) wirelessly.

6. The system (1) according to any of claims 1 to 5, further comprising a calorimeter (12) configured to determine an amount of energy provided to the zone (20).

7. The system (1) according to any of claims 1 to 6, wherein the three-way valve (30) is motorized.

8. The system (1) according to any of claims 1 to 7, further comprising a cross-flow module (26) and a flow valve (27), wherein the cross-flow module (26) is positioned inside the zone (20) and is configured to direct the fluid flow such that at least a part of the fluid flows towards the exit part (19) of the system conduit (2) without flowing through the heat exchanger (22), and wherein the flow valve (27) is configured to control an amount of the fluid that forms the part of the fluid.

9. The system (1) according to any of claims 1 to 8, wherein the valve control unit (34) is configured to control the three-way valve (30) at least partially based on a user input.

10. The system (1) according to claim 9, wherein the valve control unit (34) is configured to receive wirelessly a command indicative of the user input.

11. Central heating and/or cooling arrangement (100) having regulated fluid flow with respect to one or more zones (20), the arrangement (100) comprising:

- a central circulation (90) having a central conduit (92) for flow of a fluid for heating and/or cooling of the one or more zones (20), a central circulation pump (93) for moving the fluid within the central conduit (92), and a heating and/or cooling unit (94) for thermally conditioning the fluid; and
- one or more heating and/or cooling system (1) according to any of claims 1 to 10, wherein a number of the heating and/or cooling system (1) corresponds to a number of the zones (20), and wherein the inlet (6) and the outlet (9) of the system conduit (2) of the heating and/or cooling system (1) are fluidly connected to the central conduit (92).

12. The arrangement (100) according to claim 11, comprising at least two heating and/or cooling systems (1), and wherein the different heating and/or cooling systems (1) are configured to heat and/or cool different zones (20) located at a same floor level of a building having multiple zones.

13. The arrangement (100) according to claim 11 or 12, comprising at least two heating and/or cooling systems (1), and wherein the different heating and/or cooling systems (1) are configured to heat and/or cool different zones (20) located at different floor levels of a building having multiple zones.

FIG 1 (PRIOR ART)

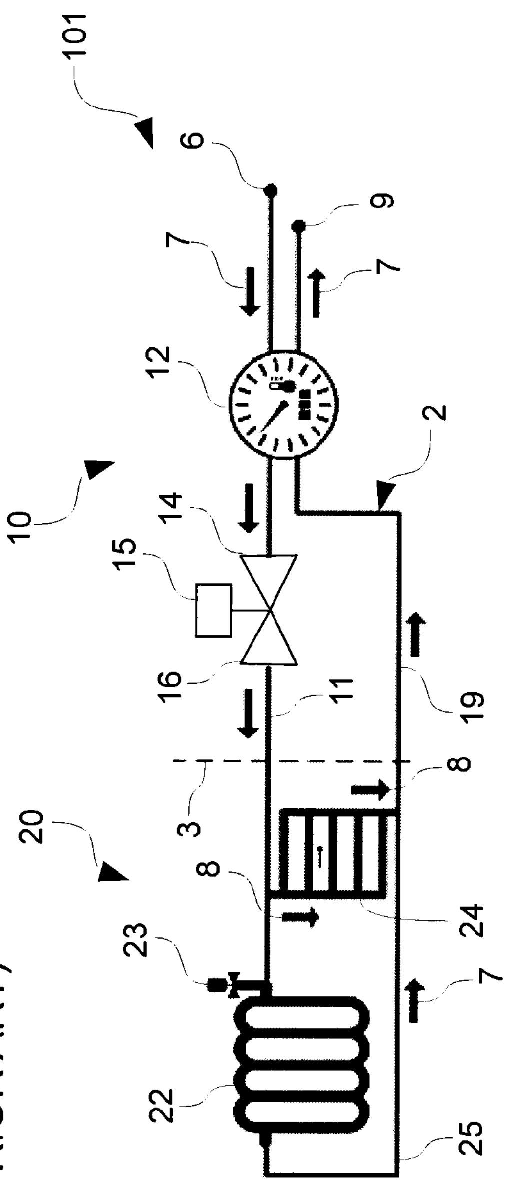


FIG 2

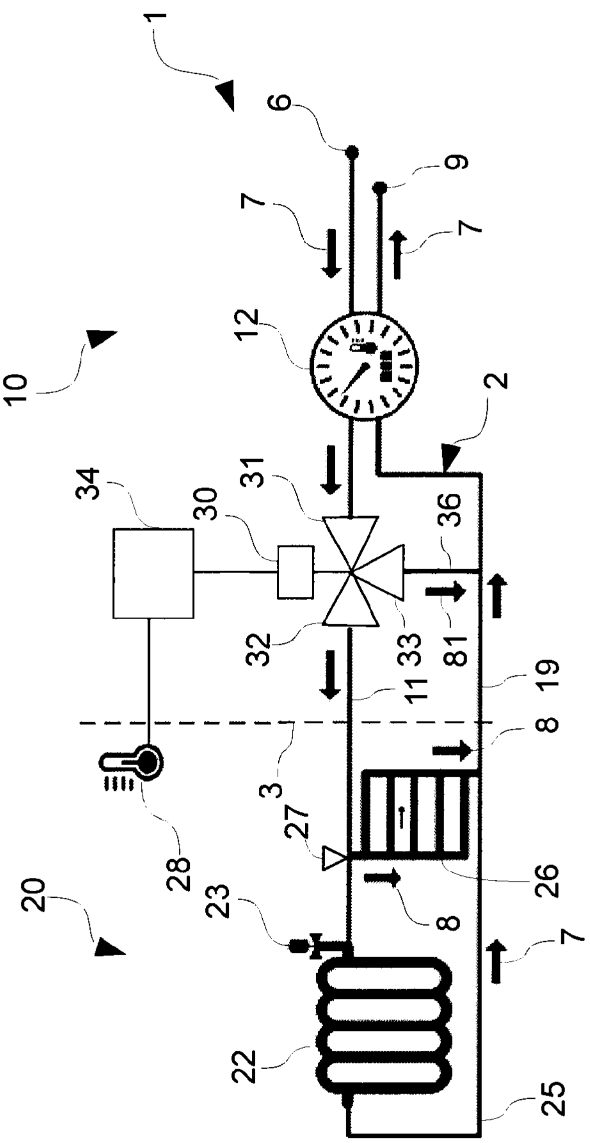
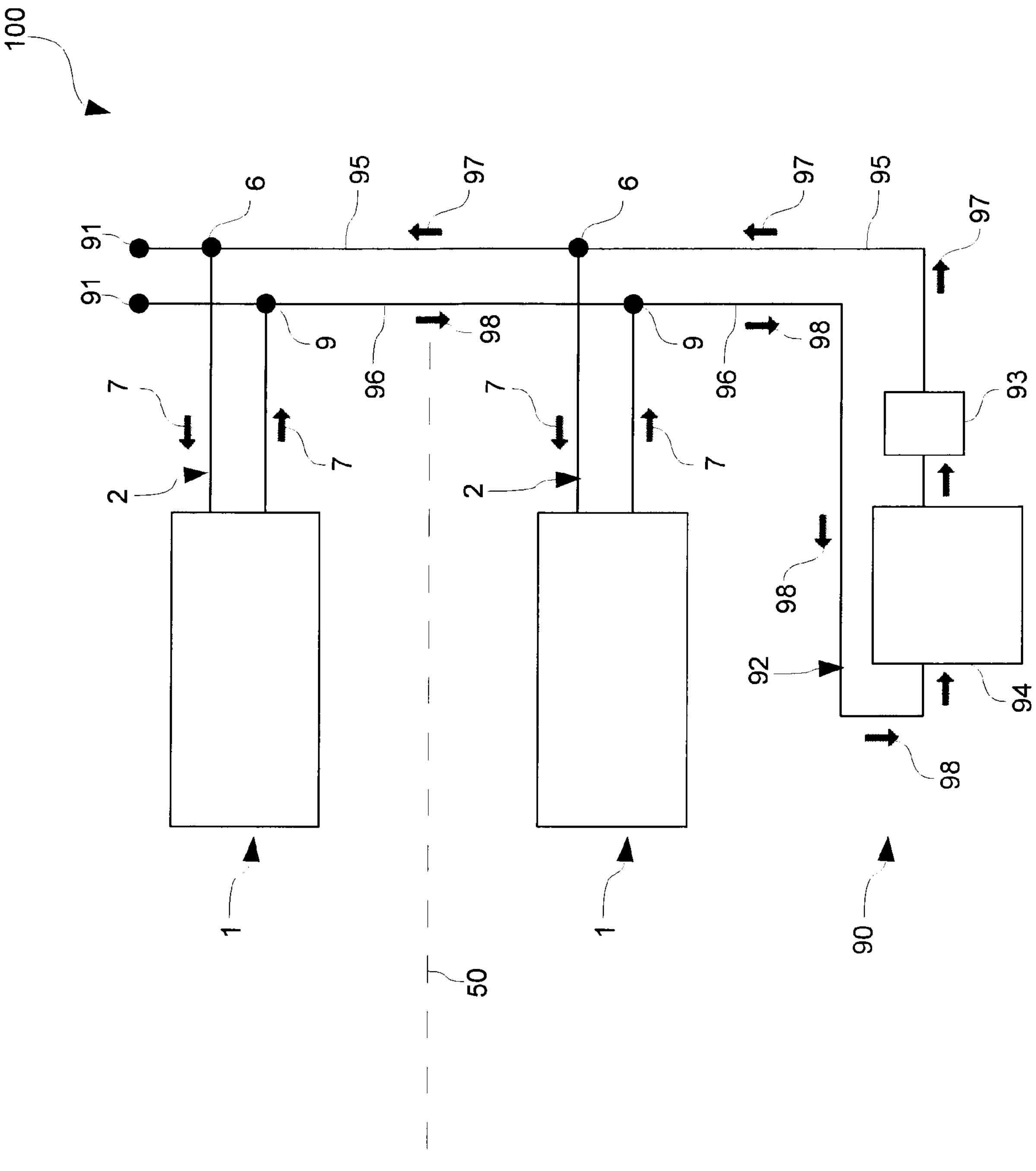


FIG 3



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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 3715

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F24D

The present search report has been drawn up for all claims

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Place of search	Date of completion of the search	Examiner
Munich	13 September 2017	Ast, Gabor

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