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(54) **INSULATED LIQUID SUPPLY UNIT**

(57) The invention relates to a liquid supply unit for in active state to supply a user with liquid and in passive state to screen access to liquid supply, wherein the liquid supply unit comprises a liquid inlet configured to receive liquid from an external liquid supply, a liquid outlet configured to release the supplied liquid, and a liquid conduit configured to direct the liquid from the liquid inlet to the liquid outlet, wherein the liquid supply unit in passive state encloses at least the liquid conduit and wherein at least a portion of the liquid conduit can be withdrawn from the liquid supply unit, so that said part is not enclosed by the liquid supply unit when the liquid supply unit is in active state and wherein the liquid supply unit further comprises thermal insulation.

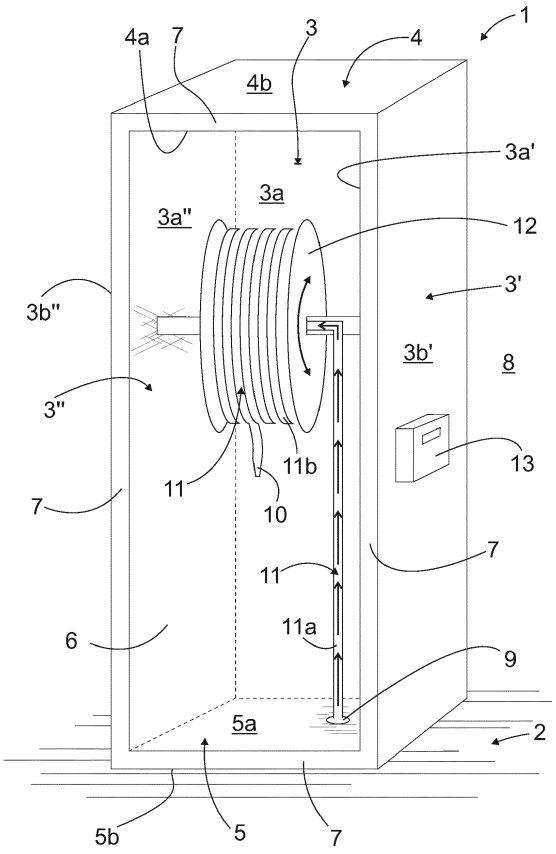

Fig. 1

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Description

[0001] This invention relates to a liquid supply unit for supplying a user with liquid in an active state and shielding against access to liquid supply in a passive state which liquid supply unit comprises:

- a liquid inlet configured to receive liquid from an external liquid supply,
- a liquid outlet configured to release the supplied liquid, and
- a liquid conduit configured to direct the liquid from the liquid inlet to the liquid outlet,
- which liquid supply unit encloses at least the liquid conduit in the passive state, and
- wherein at least part of the liquid conduit can be pulled away from the liquid supply unit so that said part is not enclosed by the liquid supply unit when the liquid supply unit is in the active state,
- and which liquid supply unit further comprises thermal insulation.

[0002] In all cases where a vehicle/a machine/a moving equipment is used in connection with the execution of manual work, there is a likelihood of the vehicle/the machine/the moving equipment afterwards need a cleaning and possibly a loading of liquid, for example of water if water is used in connection with the work. For example, the vehicles and machines can be used for renovation and maintenance/cleaning of public areas in urban areas and in agriculture.

[0003] The cleaning and loading of liquid can advantageously take place at dedicated outdoor cleaning stations, such as on municipal washrooms, so all the necessary items such as water supply, laundry supplies, adapters, etc. are located in the same place. Maintenance and monitoring of cleaning and loading of liquid can also be optimized as everything is gathered at selected cleaning stations instead of being distributed in a large number of locations.

[0004] Cleaning stations located in areas exposed to frost temperatures during periods of the year are, however, at risk that all or part of their water-/liquid-conducting pipes, hoses, containers and joints are freezing so that they cannot be used and may be even exposed to frost damages.

[0005] Furthermore, cleaning stations that are not continuously monitored are at risk of being subjected to abuse in the form of, for example, vandalism and/or excessive use.

[0006] There is therefore a need for a liquid supply unit whose function is not affected by frost temperatures and which eliminates the risk of misuse.

[0007] In accordance with the invention, there is provided a liquid supply unit for supplying a user with liquid in an active state and shielding against access to liquid supply in a passive state, wherein the liquid supply unit comprises:

- a liquid inlet configured to receive liquid from an external liquid supply,
- a liquid outlet configured to release the supplied liquid, and
- a liquid conduit configured to direct the liquid from the liquid inlet to the liquid outlet,
- wherein the liquid supply unit in passive state encloses at least the liquid conduit, and
- wherein at least part of the liquid conduit can be pulled away from the liquid supply unit so that said part is not enclosed by the liquid supply unit when the liquid supply unit is in active state, and
- where the liquid supply unit further comprises thermal insulation.

[0008] According to the invention the term active state should be understood as being a state in which a user can access one or more of the liquid supply unit elements, such as to the liquid conduit, and can manipulate the liquid supply unit, such as pulling the liquid conduit away from the liquid supply unit and turning on/ turning off the supply of liquid.

[0009] According to the invention the term passive state should be understood as being a state in which a user cannot access one or more of the liquid supply unit elements, such as to the liquid conduit, and cannot manipulate the liquid supply unit, such as pulling the liquid conduit away from the liquid supply unit and turning on/ turning off the supply of liquid.

[0010] The liquid supply unit comprises thermal insulation. The use of thermal insulation has the advantage that the internal volume of the liquid supply unit can thereby be isolated from temperature fluctuations in the environment, which in the worst case can result in damage to the individual elements of the liquid supply unit such as joints, pipes, valves, etc., due to thermal expansion and compression of the mentioned elements and/or liquid present in the liquid supply unit. Thus, the internal volume of the liquid supply unit is also insulated if the ambient temperature drops below the freezing point of the liquid being supplied to the liquid supply unit, which otherwise can result in clogging or frost cracking. In the event that the liquid is water, the freezing point will be 0 °C.

[0011] In passive state, the liquid supply can enclose at least the liquid conduit. The liquid conduit can contain stagnant liquid after the liquid supply unit has been in active state and provided a liquid to a user. As the liquid supply includes thermal insulation, it prevents the liquid in the liquid conduit from freezing, which can lead to frost cracking of the liquid conduit.

[0012] In an embodiment, the outer wall of the liquid supply unit can comprise thermal insulation. Thus, all the elements enclosed by the outer wall of the liquid supply unit can be thermally isolated from the environment.

[0013] In an embodiment, the thermal insulation can comprise a sandwich structure. The thermal insulation can therefore consist of a thermally insulating material that is enclosed by a material that is suitable for main-

taining the structure of the thermal insulation. In the embodiment, where the outer wall of the liquid supply unit can comprise thermal insulation, the thermal insulation can therefore consist of a thermal insulating material arranged between an outer and an inner surface of the liquid supply unit walls, such as metal, plastic or plastic sheets. For example, the plates can have a thickness of 1.5 mm and be galvanized whole plates.

[0014] The thermally insulating material can consist of, for example, flamingo plates, granules, mineral wool, cell glass, polystyrene, or PUR. Flamingo plates (for example, 40 mm thick) is an advantage as it provides good insulation, is easy to work with and is affordable.

[0015] In an embodiment, the liquid supply unit can in passive state enclose the liquid inlet, liquid outlet and/or the liquid conduit.

[0016] The risk of damage to or clogging of the liquid inlet, liquid outlet and/or liquid conduit due to thermal expansion or compression of the liquid inlet, liquid outlet and/or the liquid conduit or due to the supplied liquid freezing due to temperature fluctuation in the environment can thus be eliminated.

[0017] In an embodiment, the liquid supply unit may further comprise a heating element.

[0018] The heating element can thereby supply heat to the liquid supply unit such that the inner volume of the liquid supply unit can be more isolated from a very low temperature of the environment, such as if the environment is exposed to hard frost (e.g. -5 °C, -10 °C, -20 °C, -30 °C, etc.), which otherwise makes it difficult to avoid a low temperature in the inner volume of the liquid supply unit. The heating element may, for example, be 350 W.

[0019] The heating element can also be used to maintain a constant temperature in the inner volume of the liquid supply unit, in the case of large fluctuations in ambient temperature, by varying heat supply from the heating element as the ambient temperature changes. This can be done by increasing the heat supply as the ambient temperature drops and by reducing the heat supply as the ambient temperature rises.

[0020] The heating element can be placed at the vertically lowest part of the liquid supply unit, whereby the heat from the heating element is distributed better in the liquid supply unit.

[0021] In one embodiment, the liquid supply unit may comprise a temperature probe/sensor. The temperature probe/sensor can be placed vertically over the heating element and can be placed in the vertical upper part of the liquid supply unit (e.g. 1 m above the heating element). The temperature probe/-sensor can be connected to the heating element so that the heat supply from the heating element can be controlled depending on the temperature as the temperature probe/sensor measures.

[0022] In an embodiment, the thermal insulation may at least partially enclose the heating element.

[0023] This adds a large part, or all of the heat released from the heating element to the inner volume of the liquid supply unit.

[0024] In an embodiment, the liquid supply unit can further comprise a rotatable drum for storing the liquid conduit, wherein the rotatable drum can be suitable for automatic rolling up of the liquid conduit.

[0025] By storing the liquid conduit on a rotatable drum, a storage process is provided which is easy to use as the liquid conduit is rolled on and off the drum by simply rotating the drum and avoiding the liquid conduit being filtered together so that it cannot be pulled away from the liquid supply unit. In addition, a drum provides a space-saving storage.

[0026] By providing a rotatable drum that can be suitable to automatically rolling up the liquid conduit, it prevents a user from not pulling the liquid conduit back into the liquid supply unit (rolled up liquid conduit) after use. This reduces the risk of the liquid conduit being accidentally destroyed after use, for example, by driving a vehicle over it.

[0027] The temperature probe/sensor can be placed in connection with the rotatable drum on which the liquid conduit is mounted to ensure that the liquid conduit is kept above a given minimum temperature and thus not exposed to frost degrees.

[0028] In an embodiment, the liquid supply unit can further comprise at least one pump which can be in liquid communication with the liquid inlet and liquid outlet of the liquid supply unit.

[0029] The pump can be connected to the liquid conduit so that the pump can affect the liquid flowing from the liquid inlet to the liquid outlet via the pump. The pump can also be connected to the liquid conduit via a bypass liquid line, so that the liquid can either flow through the pump or bypass the pump.

[0030] The pump can be able to affect the pressure and/or flow rate of the liquid in the liquid conduit and of the liquid released through the liquid outlet. The pump can be arranged downstream of the liquid inlet and upstream of at least the part of the liquid conduit that is suitable for being withdrawn from the liquid supply unit.

[0031] The at least one pump can be a high-pressure pump (e.g. a piston pump) or a low-pressure pump (e.g. a centrifugal pump) suitable for directing a liquid.

[0032] In an embodiment, the at least one pump can be suitable for increasing the pressure and flow rate of the liquid from the liquid inlet to the liquid outlet when the liquid supply unit is in active state.

[0033] This allows the user to receive a flow of liquid with increased pressure and increased flow rate if desired, which can be advantageous if the liquid is to be used to clean e.g. a vehicle, for example to remove dirt and dirt and reduce the cleaning time which results in a reduced water consumption. Additionally, an increased pressure and an increased flow rate can be an advantage if the user is to fill liquid in e.g. a liquid container on a sweeper, as the filling time is thereby reduced. Overall, there will be reduced liquid consumption, which is good for the environment and reduces costs.

[0034] Using a regular 3/4 or 1 inch hose with a water

pressure of 1-2 bar pressure (spray length of about 2-3 meters) for cleaning a vehicle will give a high water consumption before all dirt has been wiped away, compared to if the liquid supply unit includes a pump (e.g. centrifugal pump), where water pressure increases with up to 5 to 8 bars of pressure (spray length up to 6 to 7 meters), which provides a quick cleaning (about half of time consumption) and less water consumption (about 1/3 of water consumption, which is environmentally friendly).

[0035] In an embodiment, the liquid supply unit can comprise an electronic pump regulator. The electronic pump regulator can stop/disconnect the pump (low pressure pump or high-pressure pump) if the liquid supply has been disconnected so that the pump avoids running without liquid (dry driving). In the case where the liquid outlet is provided with a spraying device for controlling the release of liquid, such as a gun handle/ spray lever, the electronic pump controller can control start and stop of the pump depending on whether the sprayer is activated (for example, the pistol pressure trigger is pushed in).

[0036] In an embodiment, the liquid supply unit can comprise two or more pumps in which the one pump can be suitable for increasing the pressure and flow rate of the liquid to a higher level than the other pump.

[0037] Hereby a need for pressure and flow rate of different sizes can be met. If there is a need for a relatively small increase in pressure and flow rate (e.g. maximum 10 bar), the second pump may be used, and the second pump can be of a type that has the best efficiency at the desired pressure and flow rate range. However, if there is a need for a relatively large increase in pressure and flow rate (e.g. maximum 140 bar), the first pump can be used, and the first pump can be of a type that has the best efficiency in the desired pressure and flow rate range. This allows the liquid supply unit to vary the pressure and flow rate of the liquid with the greatest possible efficiency.

[0038] The two or more pumps can be part of the same circuit/liquid conduit so that the pumps can be changed according to the need. Alternatively, the two or more pumps can be part of each circuit/liquid conduit and connected to each liquid outlet so that liquids of different pressures and flow rates can be released simultaneously.

[0039] In an embodiment, the liquid supply unit may further comprise a control unit for controlling the active and passive state of the liquid supply unit.

[0040] This allows the liquid supply unit to be controlled in whole or in part from one unit, which simplifies the control. In addition, some or all of the functions of the liquid supply unit can be controlled automatically, and logging/data collection/registration can be done by the user of the liquid supply unit, which can be used in connection with service and abuse, for example. Thus, there can be intermittently reading of liquid and/or energy consumption, such as annually or quarterly. The reading can relate to the liquid supply unit as a whole or per user/vehicle. Reading and registration per user/vehicle can be done by each user, for example, to enter a code or load an access card to the control unit before the liquid supply unit can be used. Access to the use of the liquid supply unit can thus be carried out, for example, by a key piece. This enables external actors to use the liquid supply unit and their consumption can be registered so that the owner of the liquid supply unit can collect payment for the external consumer's consumption.

[0041] The control unit can include a Programmable Logic Controller (PLC), and the user can, for example, interact with the control unit via a control panel.

[0042] In an embodiment, the control unit can control the function of the heating element. The control unit can therefore regulate the temperature within the liquid supply unit by controlling the heat output from the heating element, for example, in combination with measuring the temperature within the inner volume of the liquid supply unit with a temperature probe/sensor. This allows the control unit to keep the temperature within the internal volume of the liquid supply unit at a constant level within a given range or above a given temperature.

In an embodiment, the liquid supply unit can comprise a flowmeter and/or a solenoid valve. In an embodiment, the control unit can control the released volume of liquid using the flowmeter and solenoid valve. This can be because the flowmeter and solenoid valve are connected to the liquid conduit, whereby the flowmeter measures the amount of liquid flowing through the liquid conduit and the solenoid valve interrupts the liquid flow in the liquid conduit when the desired amount of liquid has passed the flowmeter. This ensures that the user does not forget to interrupt liquid flow, which can result in a large amount of liquid spillage. In addition, the user can set the controller to release exactly the volume of liquid required to fill a given liquid container, so the user does not need to check if the container is filled. For example, a user can replenish water on water tanks on sweep/suction machines, etc. by the user entering/specifying via a control panel (e.g. display) on the control unit the desired amount of fluid, after which the control unit controls that the desired amount of liquid is released.

[0043] In an embodiment, the control unit can interrupt the release of liquid. For example, the interruption can be set to come into force after a given time interval or a given amount of liquid.

[0044] In an embodiment, the control unit can control the pressure and flow rate of the liquid. The control unit can therefore adjust the pressure and flow rate of the liquid according to the needs of the user, for example, if there is a need for a high pressure for cleaning or a lower pressure for filling a liquid container.

[0045] In an embodiment, the liquid may comprise water.

[0046] In the event that the user is in need of water only for filling a water container, the liquid can therefore exclusively comprise water. In the event that the user is to clean a machine or vehicle and advantageously an

additive such as soap can be used, the liquid can thus comprise water and the additive. For example, the additive can be supplied to the liquid conduit downstream of the pump via a container containing the additive and an injector where the flow rate and/or volume of the additive can be controlled by the control unit.

[0047] In one embodiment, the liquid supply unit can be stationary mounted by a stationary liquid supply.

[0048] In an embodiment, the fluid supply unit can comprise a liquid heater.

[0049] As mentioned above, the liquid supply unit can be used to clean a machine or vehicle in a cold climate. In cold climate during periods of freezing, salt is often spread on roads to minimize the presence of ice, which results in the formation of saline dirt on the machine or vehicle. In addition, the liquid supply unit can also be used to clean a machine or vehicle for dirt and dirt regardless of the climate.

[0050] It is therefore an advantage to clean the machine or the vehicle with heated liquid (such as heated water) as it improves the ability to dissolve the dirt and salt on the machine or vehicle better and faster. The liquid heater can therefore be suitable for heating the liquid before leaving the liquid supply unit via the liquid outlet.

[0051] The liquid heater can be suitable for heating liquid flowing through a low-pressure pump (said second pump) and/or a high-pressure pump (said first pump). The liquid heater can thus be suitable for heating liquid flowing through the low-pressure pump (e.g. maximum pressure of 10 bar) to e.g. 60 °C and suitable for heating liquid flowing through the high-pressure pump (e.g. maximum pressure 140 bar) to e.g. 130 °C.

[0052] The liquid heater can be located inside the liquid supply unit (i.e. behind the outside of the liquid supply unit) or located in a separate housing near the liquid supply unit.

[0053] The liquid heater can comprise an oil-fired unit. For example, the oil-fired unit can be fired with heating oil, petroleum, etc.

[0054] The structure and function of the liquid supply unit will be described below, referring to the embodiments shown in the figures.

Fig. 1 shows an embodiment of the liquid supply unit as viewed in perspective where the front wall is omitted.

Fig. 2 shows an embodiment of the liquid supply unit in perspective.

Fig. 3 shows an embodiment of the liquid supply unit comprising a pump set in perspective where the front wall is omitted.

Fig. 4 shows an embodiment of the liquid supply unit comprising two pumps viewed in perspective where the front wall is omitted.

Fig. 5 shows an embodiment of a liquid supply unit in exploded view.

Fig. 6 shows an embodiment of a cross section of liquid supply unit viewed from above.

Fig. 7a and Fig. 7b show an embodiment of a liquid heater.

[0055] Fig. 1 shows an embodiment of the liquid supply unit 1 in perspective, with the front wall omitted so that the interior of the liquid supply unit 1 can be seen.

[0056] The liquid supply unit 1 can be located stationary on an outdoor foundation 2 which can comprise an external liquid supply (not shown). However, it is anticipated that the liquid supply unit 1 can be portable so that it can be transported to the place where the liquid supply to the user is to take place.

[0057] In the embodiment shown in Fig. 1, the liquid supply unit 1 is shown to have a box-shaped exterior and the outer surface of the liquid supply unit 1 can be referred to as a housing (e.g. about 500 mm x 700 mm x 1700 mm). Other configurations of the outer surface of the liquid supply unit 1, such as cubic, multi-sided, etc. are also possible. The outer walls of the liquid supply unit 1 can comprise a rear wall 3, two side walls 3', 3", a front wall 3'" (not shown), an upper wall 4 and a lower wall 5. The walls 3, 3', 3", 3"', 4, 5 of the liquid supply unit 1 defines an inner volume 6 of the liquid supply unit 1.

[0058] The walls 3, 3', 3", 3", 4, 5 of the liquid supply unit 1 can each comprise an inner 3a, 3a', 3a", 3a"', 4a, 5a and an outer surface 3b, 3b' 3b", 3b"', 4b, 5b enclosing a thermal insulating material 7 e.g. in the form of a sandwich structure such that the thermal insulating material 7 is shielded from environmental influences such as moisture and impurities. The liquid supply unit 1 can therefore thermally isolate the inner volume 6 from temperature variations in the environment 8.

[0059] In Fig. 1, it is shown that the liquid supply unit 1 comprises a liquid inlet 9 configured to receive liquid from an external liquid supply (not shown) and a liquid outlet 10 configured to release the supplied liquid. For example, the external liquid supply can be a water-works, rainwater reservoir or lake. The liquid inlet 9 can comprise a liquid filter so that impurities do not enter the liquid supply unit 1, which can be relevant, for example, if the external liquid supply is a rainwater reservoir or a lake. A non-return valve and, for example, a ball valve can be mounted at the liquid inlet 9, so that backflow of liquid is prevented and that supply of liquid can be interrupted, for example by service. A liquid conduit 11 is configured to direct the liquid from the liquid inlet 9 to the liquid outlet 10 shown at the liquid flow arrows. The liquid conduit 11 is shown in the embodiment shown in Fig. 1 illustratively comprising a first portion 11 a running vertically from the liquid inlet 9 up to another part 11 b of the liquid conduit 11 which can be mounted on a rotatable drum 12 (e.g. 200 or 280 mm wide and 500 mm diameter) to storage

of the liquid conduit 1 and which other part 11 b of the liquid conduit 11 ends in the liquid outlet 10.

[0060] The rotatable drum 12 can be suitable to rotate when the user pulls in the liquid outlet 10 and/or pulls in said second part 11 b of the liquid conduit 11 until the entire second part 11 b of the liquid conduit 11 is disassembled from the rotatable drum 12.

[0061] The rotatable drum 12 can be suitable for automatically rolling up the liquid conduit 11 by the use of spring and thus rotating the opposite direction so that the second part 11 b of the liquid conduit 11 is mounted on the rotatable drum 12 again as soon as the user releases the liquid conduit 1 or at least does not provide any traction on the liquid conduit 11.

[0062] The liquid supply unit 1 can therefore in passive state enclose at least the liquid conduit 11 and when the liquid supply unit 1 is in active state, at least said second part 11 b of the liquid conduit 11 can be withdrawn from the liquid supply unit 1 so that the other part 11 b is not enclosed by the liquid supply unit 1.

[0063] The liquid supply unit 1 can comprise a control unit 13, whereby the liquid supply unit 1 can be controlled in whole or in part from one unit, which simplifies the control. In addition, some or all of the functions of the liquid supply unit can be controlled automatically, and logging/data collection/registration can be done by the use of the liquid supply unit, which can be used in connection with service and monitoring, for example.

[0064] The control unit can include a Programmable Logic Controller (PLC), and the user can, for example, interact with the controller 13 via a control panel on the controller 13 or through a network connection.

[0065] The control unit 13 can be configured to control a number of functions that can be integrated into the liquid supply unit 1 such as controlling the temperature of the inner volume 6, the released volume of liquid, interrupting the release of liquid, and/or control the pressure and flow rate of the liquid.

[0066] Fig. 2 shows an embodiment of the liquid supply unit 1 in perspective. For similar technical elements as shown in Fig. 1, similar reference numbers are used.

[0067] In Fig. 2, the front wall 3"' is mounted on the liquid supply unit 1 so that the walls 3, 3', 3", 3"', 4, 5 of the liquid supply unit 1 enclose the inner volume 6 of the liquid supply unit 1.

[0068] In the embodiment shown in Fig. 2, the liquid supply unit 1 is illustrated to comprise two openings in the front wall 3'" which gives the user at least partial access to the inner volume 6 of the liquid supply unit 1.

[0069] The first opening 14 can provide the user with different types of spraying devices that can be mounted on the liquid outlet 10 of the liquid conduit 11.

[0070] The second opening 15 can allow the user access to the liquid outlet 10 and the second part 11 b of the liquid conduit 11 so that the user can withdraw the liquid outlet 10 and at least a portion of the liquid conduit 11 away from the inner volume 6 of the liquid supply unit 1 as illustrated in Fig. 2. A spraying tool 16 is illustrated as being mounted on the liquid outlet 10.

[0071] Fig. 3 shows an embodiment of the liquid supply unit 1 comprising a perspective view of a pump 17 in which the front wall 3'" is omitted so that the inner volume 6 of the liquid supply unit 1 is visible. For similar technical elements as shown in the foregoing Figs., similar reference numbers are used.

[0072] In Fig. 3, it is illustrated that the liquid supply unit 1 can further comprise at least one pump 17 and/or a heating element 18.

[0073] The pump 17 can be arranged downstream of the liquid inlet 9 and upstream of the second part 11 b of the liquid conduit 11, and/or pump 17 can be arranged upstream of the liquid outlet 10.

[0074] In the embodiment shown in Fig. 3, the pump 17 is illustrated as being arranged in the first portion 11 a of the liquid conduit 11 so that the liquid flows from the liquid inlet 9 through the pump 17 and further to the liquid outlet 10.

[0075] The pump 17 can be suitable for increasing the pressure and flow rate of the liquid from the liquid inlet 9 to the liquid outlet 10 when the liquid supply unit 1 is in active state. It is anticipated that the liquid supply unit 1 can comprise a bypass conduit so that the liquid can bypass the pump 17 if it is not desired that the pump 17 will affect the pressure and the flow rate of the liquid.

[0076] The pump 17 can be a high pressure or a low-pressure pump depending on the need. If there is a need for a relatively small increase in pressure/the flow rate of the liquid (e.g. maximum 10 bar and a maximum of 16 to 100 L/min), a pump of one type that has the best efficiency at the desired pressure and flow rate range, such as a centrifugal pump, can be used. If, on the other hand, there is a need for a relatively large increase in pressure/flow rate of the liquid (e.g. maximum 140 bar and maximum 11 L/min), a pump of a type that has the best efficiency at the desired pressure and flow rate range can be used. In the case of a high-pressure pump, a filter must be installed upstream of the pump to protect the pump from impurities, e.g. particles.

[0077] As illustrated in Fig. 3, the heating element 18 can be arranged near the vertical lower position of the liquid supply unit 1 so that heat released from the heating element distributes better in the inner volume 6 of the liquid supply unit 1.

[0078] In one embodiment, the liquid supply unit 1 can further comprise a thermostat or other temperature sensor so that the heater 18 can be controlled to release heat so that the temperature of the inner volume 6 of the liquid supply unit 1 is maintained at a constant temperature over a given temperature or within a given temperature range.

[0079] Fig. 4 shows an embodiment of the liquid supply unit 1 (e.g. about approximately 1200 mm x 1000 mm x 1700 mm) comprising two pumps viewed in perspective where the front wall 3'" is omitted. For similar technical elements as shown in the foregoing Figs., similar reference numbers are used.

[0080] In the embodiment shown in Fig. 4, the liquid supply unit 1 is illustrated as comprising the elements of Fig. 3, i.e. liquid inlet 9, liquid outlet 10, liquid line 11, rotatable drum 12, pump 17, etc. The liquid supply unit 1 is illustrated to further comprise a liquid inlet 9', liquid outlet 10', liquid conduit 11', rotatable drum 12' and pump 17'.

[0081] One pump 17' can be suitable for increasing the pressure and flow rate of the liquid to a higher level than the second pump 17, whereby the user can use the liquid outlet 10, 10' and the liquid conduit 11, 11' connected to the pump 17, 17' that is best suited for the purpose. One pump 17' can be a high-pressure pump with a suitable liquid line 11' (e.g. 3/4 inches) and the second pump 17 can be a low-pressure pump with a suitable liquid line 11 (e.g. 3/8 inches with steel inserts).

[0082] In the embodiment shown in Fig. 4, it is illustrated that the two pumps 17, 17' can be connected to each of their separate circuits from the liquid inlet 9,9' to the liquid outlet 10, 10', whereby two users will be able to use each of their liquid conduits 11, 11'. As also explained earlier, the two pumps 17,17' can be part of the same circuit/liquid conduit so that the pumps 17, 17' can be changed according to the need. Thus, it is possible that the liquid supply unit 1 has only one liquid inlet 9,9' distributed to two liquid conduits 11, 11', the two liquid conduits 11, 11' each comprising a pump 17, 17' and a liquid outlet 10, 10' so that the liquid conduits 11, 11' downstream of the pumps 17, 17' and the liquid outlets 10, 10' can be configured to best be used for that pressure/flow rate, as pumps 17,17' work within.

[0083] The liquid supply unit 1 is shown to comprise only one chamber in the inner volume 6, i.e. that there is no division/separation between, for example, the two pumps 17, 17' and liquid conduits 11, 11'. It is therefore also illustrated that the liquid supply unit 1 comprises one heating element 18. However, it is possible that the liquid supply unit 1 can comprise a partition/separation and two or more heating elements 18 in the inner volume 6, if advantageous, for example, due to different optimal operating temperatures of the pumps 17, 17'.

[0084] The liquid can be water. In the event that the user has to clean a machine or a vehicle, and an additive such as soap can be used advantageously, however, the liquid can comprise water and the additive. For example, the additive can be supplied to the liquid conduit 11, 11' or the pump 17, 17' via a container 19 containing the additive, wherein the flow rate/the volume of the additive, for example, can be controlled by the control unit 13. In Fig. 4, it is illustrated that the additive is added to the liquid conduit 11' connected to one pump 17'. However, it is anticipated that a container 19 may also or alternatively be added to the liquid conduit 11 connected to the second pump 17.

[0085] As also described for Figs. 1-3, the control unit 13 can be suitable for controlling the active and passive state of the liquid supply unit 1, such as controlling the temperature in the inner volume 6, controlling the released volume of liquid from each of the pumps 17, 17', controlling a disruption of the release of liquid, and/or control the pressure and flow rate of the liquid.

[0086] The liquid supply unit 1 can be provided with a door mounted in front thereby shielding the front wall 3" of the liquid supply unit 1. The door can thus ensure that only authorized users can access the control unit 13 and thus use the liquid supply unit 1.

[0087] Fig. 5 shows an embodiment of a liquid supply unit 1 in exploded view.

[0088] For similar technical elements as shown in the foregoing Figs., similar reference numbers are used.

[0089] It is shown in Fig. 5 that the walls 3, 3', 3", 3"', 4, 5 of the liquid supply unit 1 can comprise an inner 3a, 3a', 3a", 3a"', 4a, 5a and an outer surface 3b, 3b', 3b", 3b"', 4b, 5b enclosing a thermal insulating material 7 e.g. in the form of a sandwich structure such that the thermally insulating material 7 is shielded from environmental influences such as moisture and impurities. A rotatable drum 12 suitable for holding the liquid conduit 11 (not shown) is located in the inner volume 6 of the liquid supply unit 1.

[0090] The front wall 3'" (which can be a door) can have the aforementioned second outlet 15 which allows the user to withdraw the liquid outlet 10 and at least a portion of the liquid conduit 11 away from the inner volume 6 of the liquid supply unit 1. The front wall 3" can further comprise a hinge 20 around which the front wall 3'" can be rotated and locking elements 21 (e.g. rotatable) so as to be able to access the inner volume 6 of the unit 1 if one has the means for unlocking the front wall 3"'.

[0091] In Fig. 5, in the inner volume 6 of the liquid supply unit 1 there is further shown a drip tray 22 which can collect liquid wasted from the rotatable drum 12, a traverse pump member 23, a traverse hose member 24, fittings 25 for the traverse members 23, 24 and a heat cover 26 for covering the heater 18.

[0092] Fig. 6 shows an embodiment of a cross-section of liquid supply unit 1 seen from above.

[0093] For similar technical elements as shown in the foregoing Figs., similar reference numbers are used.

[0094] In Fig. 6, it is shown that the front wall 3'" (door) of the liquid supply unit 1 is closed to the surroundings 8. Therefore, a user has access only to the liquid conduit 11 via said second output 15. It can be seen that the front wall 3'" can further comprise a hinge 20 around which the front wall 3'" can be rotated and locking elements so that the inner volume 6 of the device 1 can be accessed if one has the means to unlock the door 3"'.

[0095] Fig. 7a and Fig. 7b shows an embodiment of a liquid heater 27.

[0096] In Fig. 7a and 7b, it is shown that the liquid heater 27 can comprise a separate housing which can be located near the liquid supply unit 1. The outer walls of the liquid heater 27 can comprise a rear wall 28, two side walls 28', 28", a front wall 28"', an upper wall 29 and a lower wall 30. The walls 28, 28', 28", 28"', 29, 30 of the liquid heater 27 define an inner volume 31 of the liquid

heater 27. It is envisaged that said walls 28, 28', 28", 28"' 29, 30 can include a thermal insulating material.

[0097] Inside the inner volume 31 of the liquid heater 27, the heating unit 32 of the liquid heater 27 can be located, such as an oil-fired unit 32 or the like. For example, an oil-fired unit 32 can be fired with fuel oil, petroleum or the like as fuel. Fuel can be supplied to the liquid heater 27 via a filler bracket 33 to a fuel tank 34. An oil bracket 35 can show the oil level in the fuel container 34. A drip tray 36 for inter alia collecting waste of fuel can be located at the bottom of the liquid heater 27 and a chimney 37 of the heating unit 32 can be located at and pass through the upper wall 29 of the liquid heater 27. Finally, the liquid heater 27 can comprise a frame 38 for carrying the heating unit 32, a heater (not shown) for heating the inner volume 31 of the liquid heater 27 so as not to be exposed to too low temperatures (such as freezing degrees) and a heat seal 39.

[0098] The liquid heater 27 can therefore be suitable for heating the liquid before leaving the liquid supply unit 1 via the liquid outlet 10,10' which can be used to clean a machine or vehicle in a cold climate where there is salt on the roads during periods of freezing to minimize the formation of ice, resulting in the formation of saline dirt on the machine or vehicle. It is therefore an advantage to clean the machine or the vehicle with heated liquid (such as heated water) as it improves the ability to dissolve the dirt and salt on the machine or vehicle better and faster.

[0099] The liquid heater 27 can be suitable for heating liquid flowing through a low-pressure pump (said second pump 17) and/or a high-pressure pump (said one pump 17'). The liquid heater 27 can thus be suitable for heating liquid flowing through the low-pressure pump (e.g. maximum 10 bar) to e.g. 60 °C and suitable for heating liquid flowing through the high-pressure pump (e.g. maximum 140 bar) to e.g. 130 °C.

Claims

1. A liquid supply unit for supplying a user with liquid in an active state and shielding against access to liquid supply in a passive state, wherein the liquid supply unit comprises:

- a liquid inlet configured to receive liquid from an external liquid supply,
- a liquid outlet configured to release the supplied liquid, and
- a liquid conduit configured to direct the liquid from the liquid inlet to the liquid outlet,
- wherein the liquid supply unit in passive state encloses at least the liquid conduit, and
- where at least part of the liquid conduit can be pulled away from the liquid supply unit so that said part is not enclosed by the liquid supply unit when the liquid supply unit is in active state,

characterized in that

- the liquid supply unit further comprises thermal insulation.

2. The liquid supply unit according to claim 1, wherein the liquid supply unit in passive state encloses the liquid inlet, the liquid outlet and/or the liquid conduit.

3. A liquid supply unit according to claims 1-2, wherein the liquid supply unit further comprises a heating element.

4. The liquid supply unit according to claim 3, wherein the thermal insulation at least partially encloses the heating element.

5. A liquid supply unit according to any one of the preceding claims, wherein the liquid supply unit further comprises a rotatable drum for storing the liquid conduit, wherein the rotatable drum is suitable for automatic rolling up of the liquid conduit.

6. A liquid supply unit according to any one of the preceding claims, wherein the liquid supply unit further comprises at least one pump that is in liquid communication with the liquid inlet and the liquid outlet of the liquid supply unit.

7. The liquid supply unit according to claim 6, wherein the at least one pump is suitable for increasing the pressure and flow rate of the liquid from the liquid inlet to the liquid outlet when the liquid supply unit is in active state.

8. A liquid supply unit according to any one of the preceding claims, wherein the fluid supply unit comprises two or more pumps in which the one pump is suitable for increasing the pressure and flow rate of the liquid to a higher level than the second pump.

9. A liquid supply unit according to any one of the preceding claims, wherein the liquid supply unit further comprises a control unit for controlling the active and passive state of the liquid supply unit.

10. A liquid supply unit according to any one of the preceding claims, wherein the liquid comprises water.

11. A liquid supply unit according to any one of the preceding claims, wherein the liquid supply unit comprises a liquid heater.

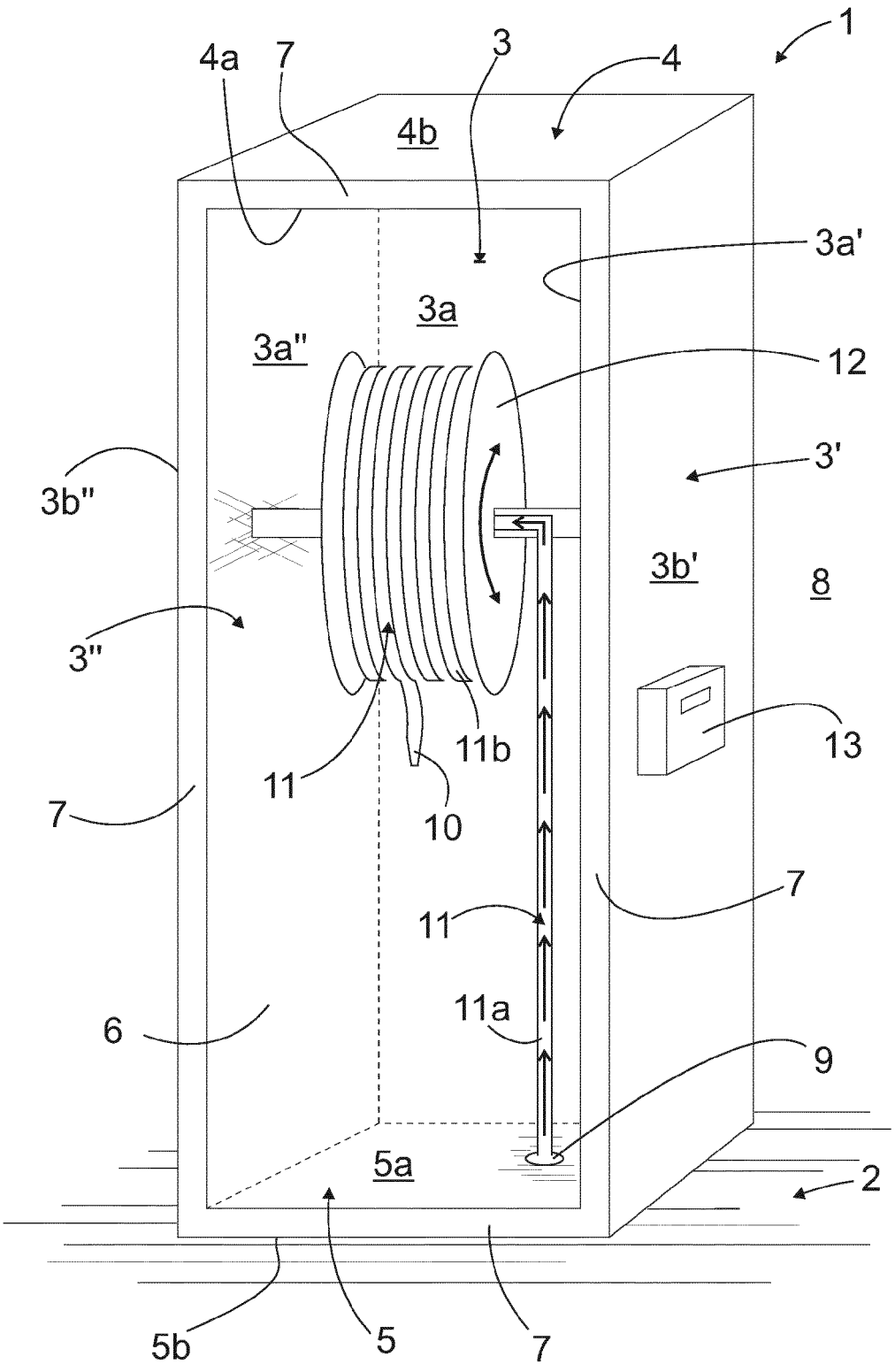


Fig. 1

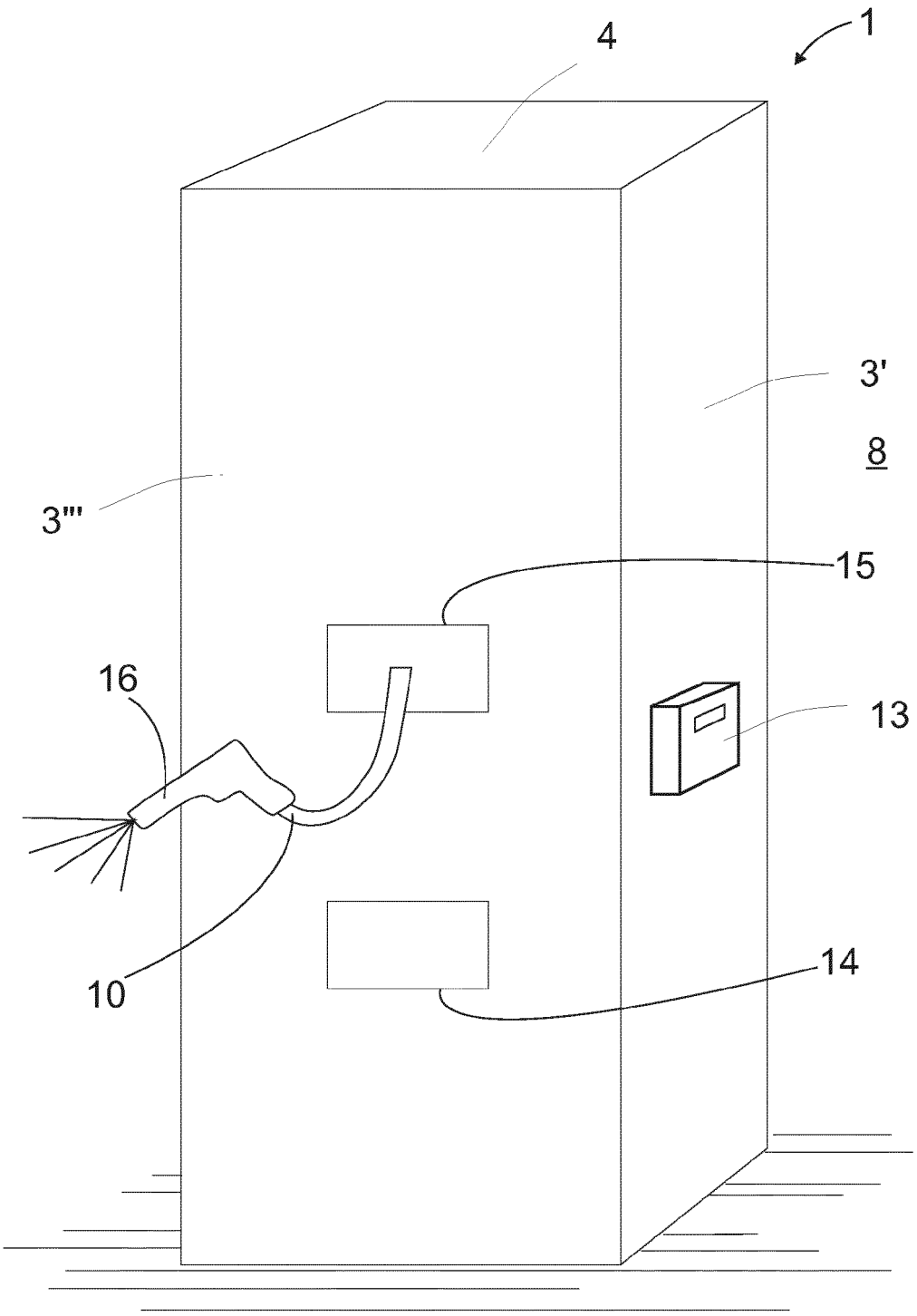


Fig. 2

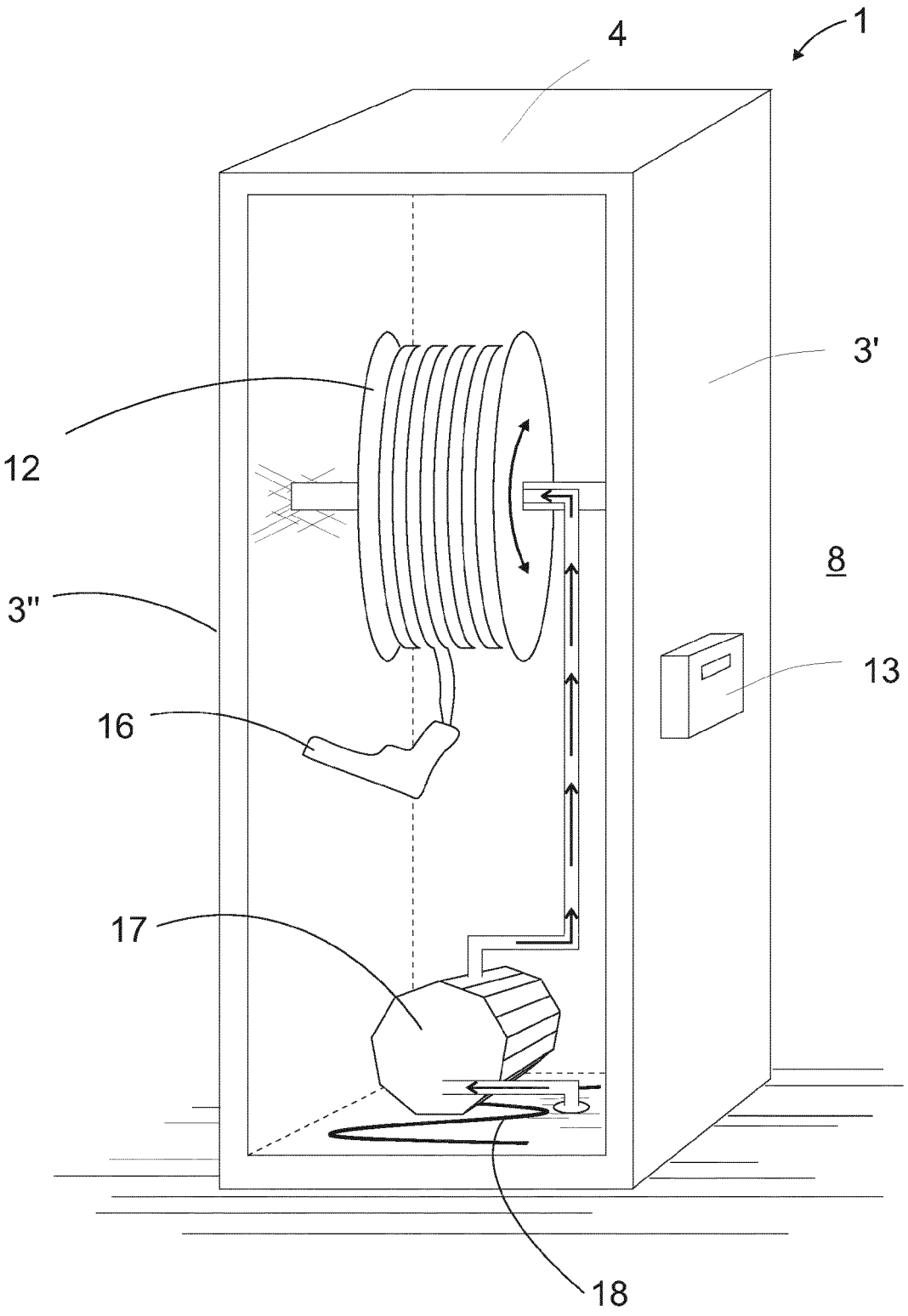


Fig. 3

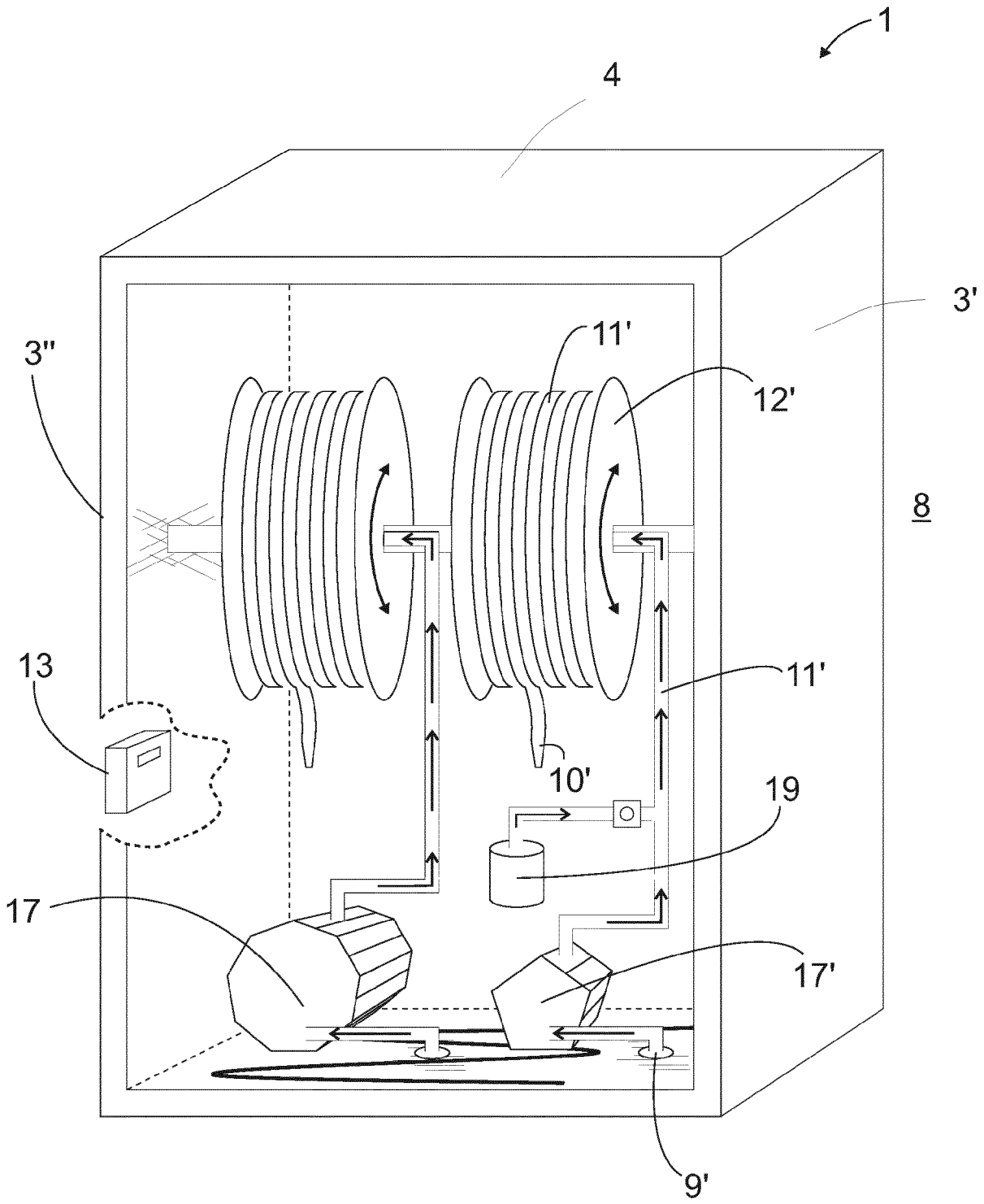
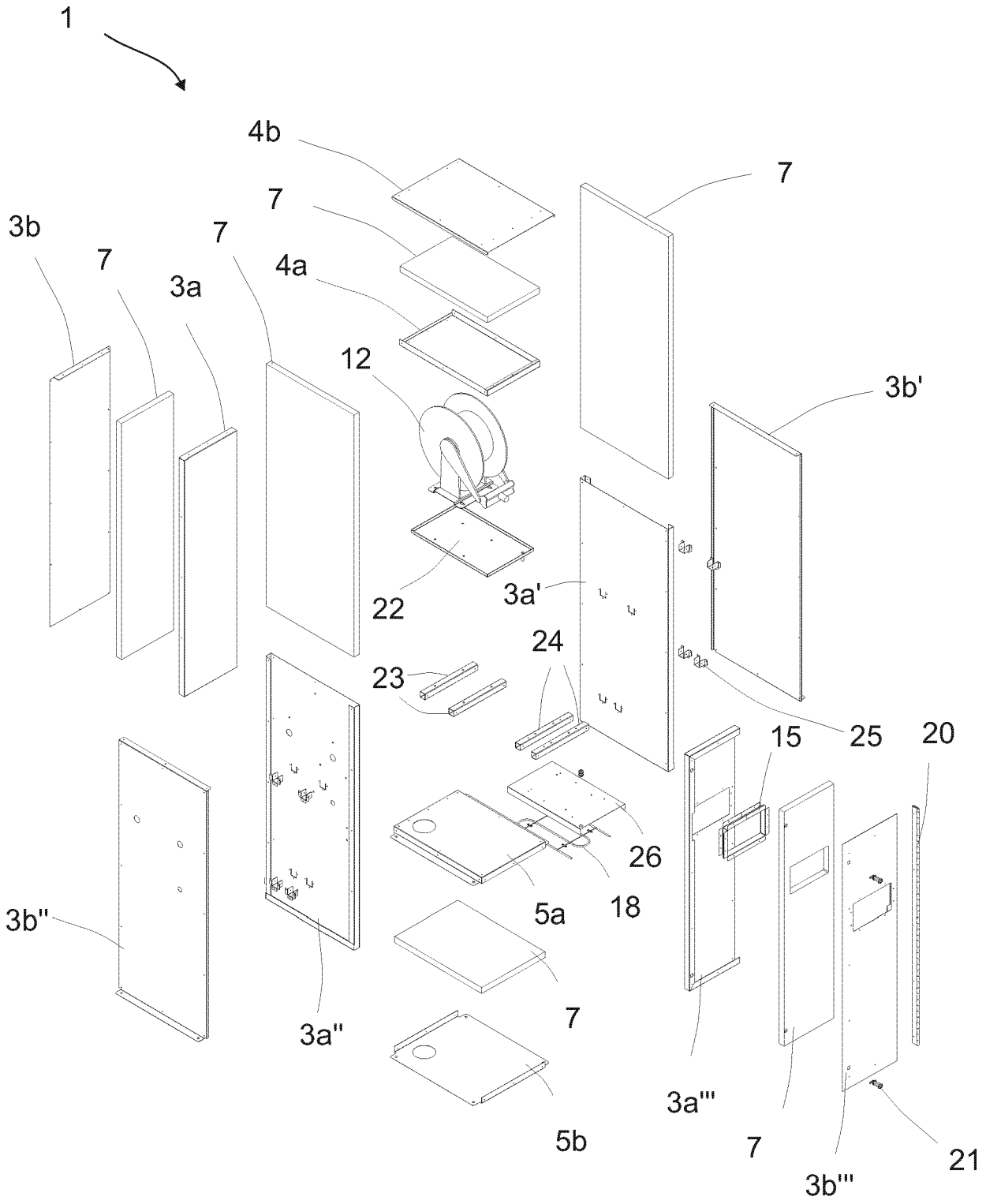


Fig. 4


1
4b
7
7
3b
7
4a
3a
12
3b'
22
3a'
24
23
25
20
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26
18
5a
3b"
7
3a"
3a'''
7
21
5b
3b'''

Fig. 5

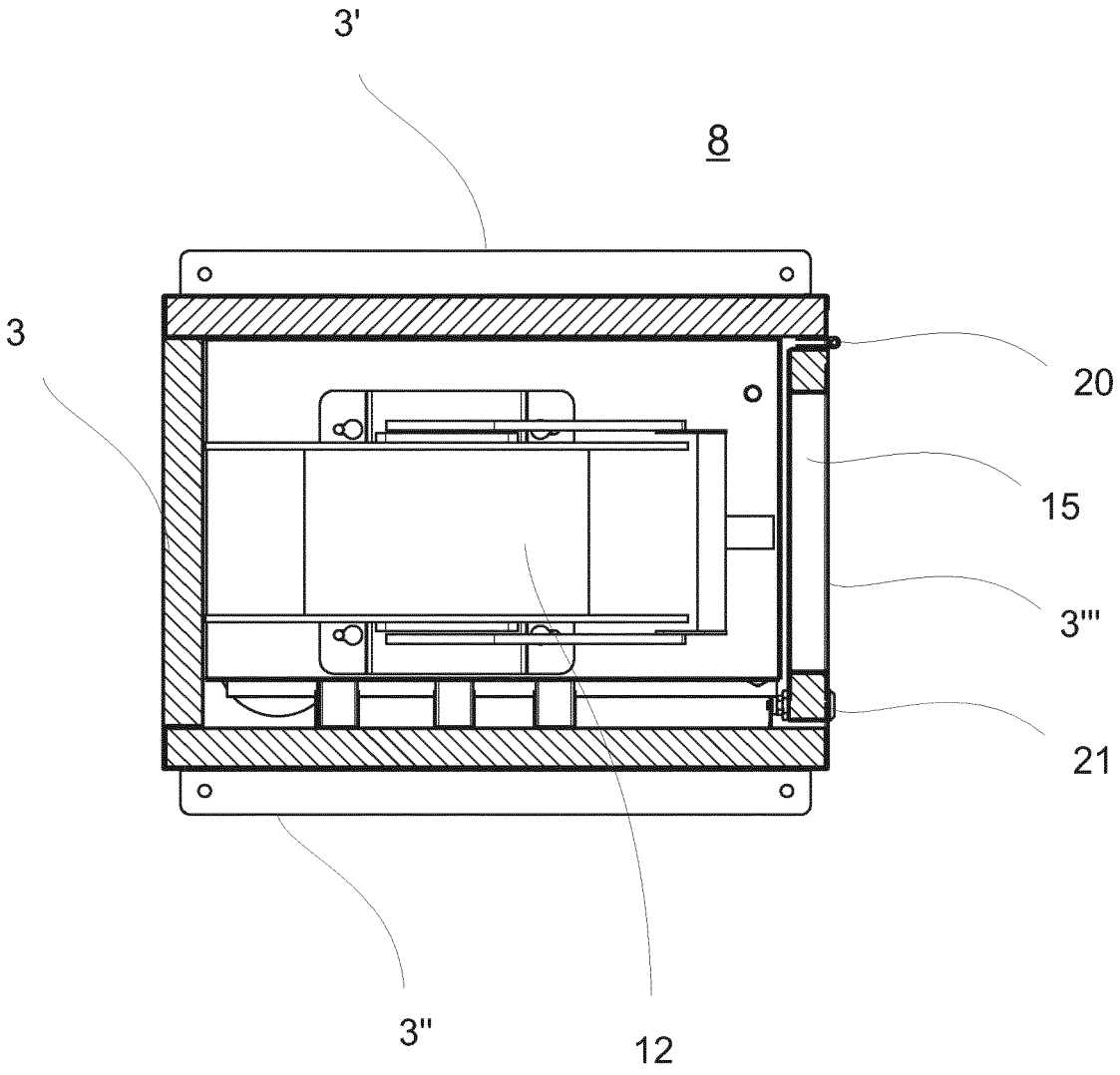

Fig. 6

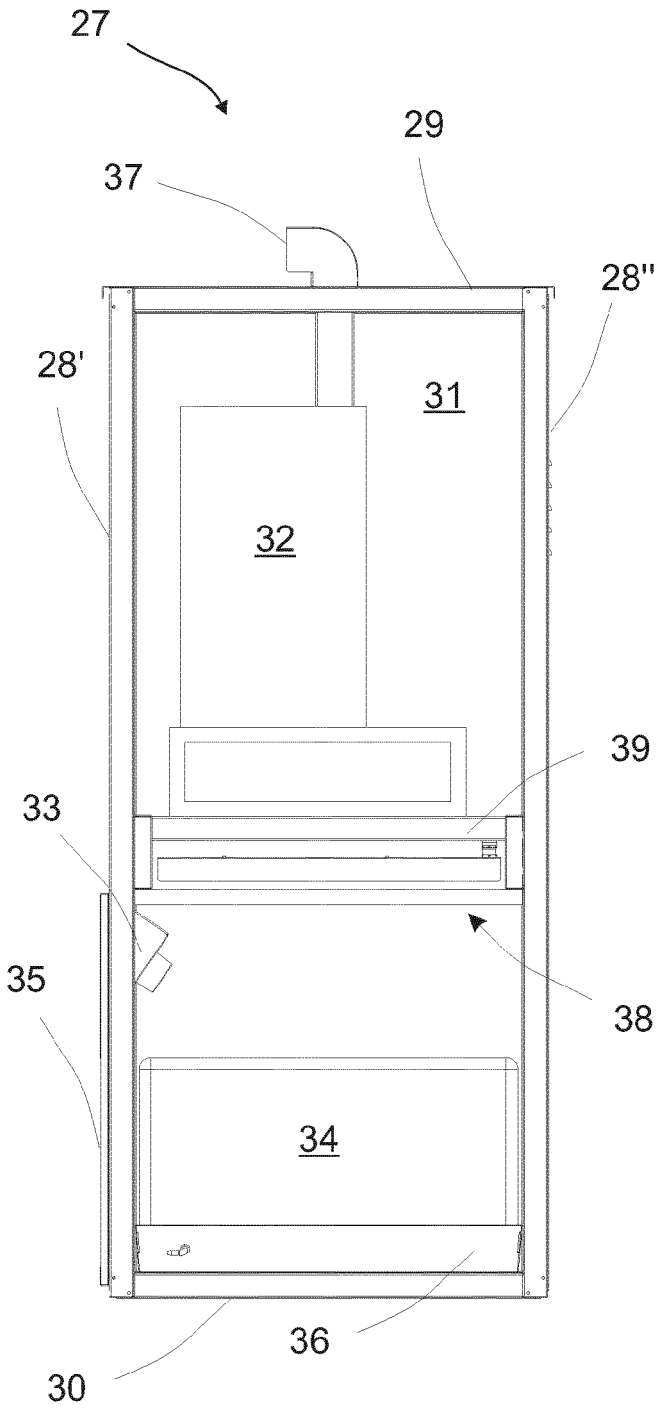

Fig. 7a

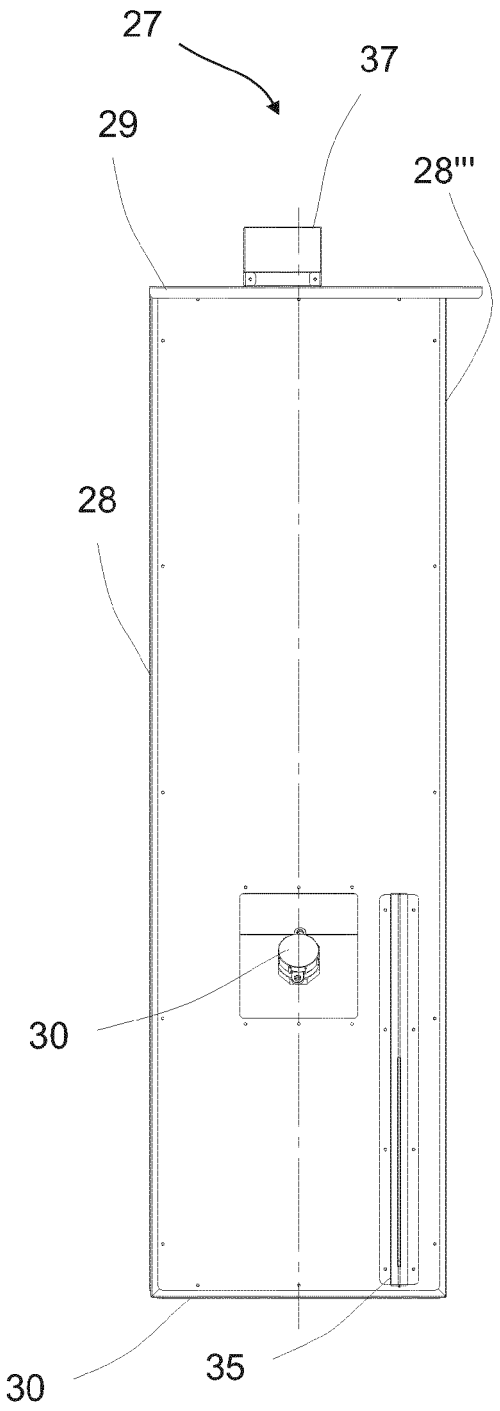

Fig. 7b

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 2524

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2 181 521 A (FRANK READE) 28 November 1939 (1939-11-28) * pages 1, 2; figures 1-5 *	1-5,10, 11 6-9	INV. B60S3/04
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TECHNICAL FIELDS SEARCHED (IPC)

B60S
E03B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 May 2018	Posavec, Daniel

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82