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(54) **Air-conditioner.**

(57) Disclosed is a water cooling type movable air-conditioner for indoor use, which is equipped with a plurality of rollers (10) for moving inside a room and a water cooling chamber (4) for cooling a freon circulating pipe (35). A solenoid-controlled water valve (43) is mounted on the water cooling chamber to automatically control feeding of cold water into the water cooling chamber by means of the operation of a control device (40 to 42) according to water temperature setting, which control device comprises a temperature regulating knob (40) mounted on the outside of the water cooling chamber for temperature setting and a temperature detector (41) set inside the water cooling chamber for measuring water temperature.

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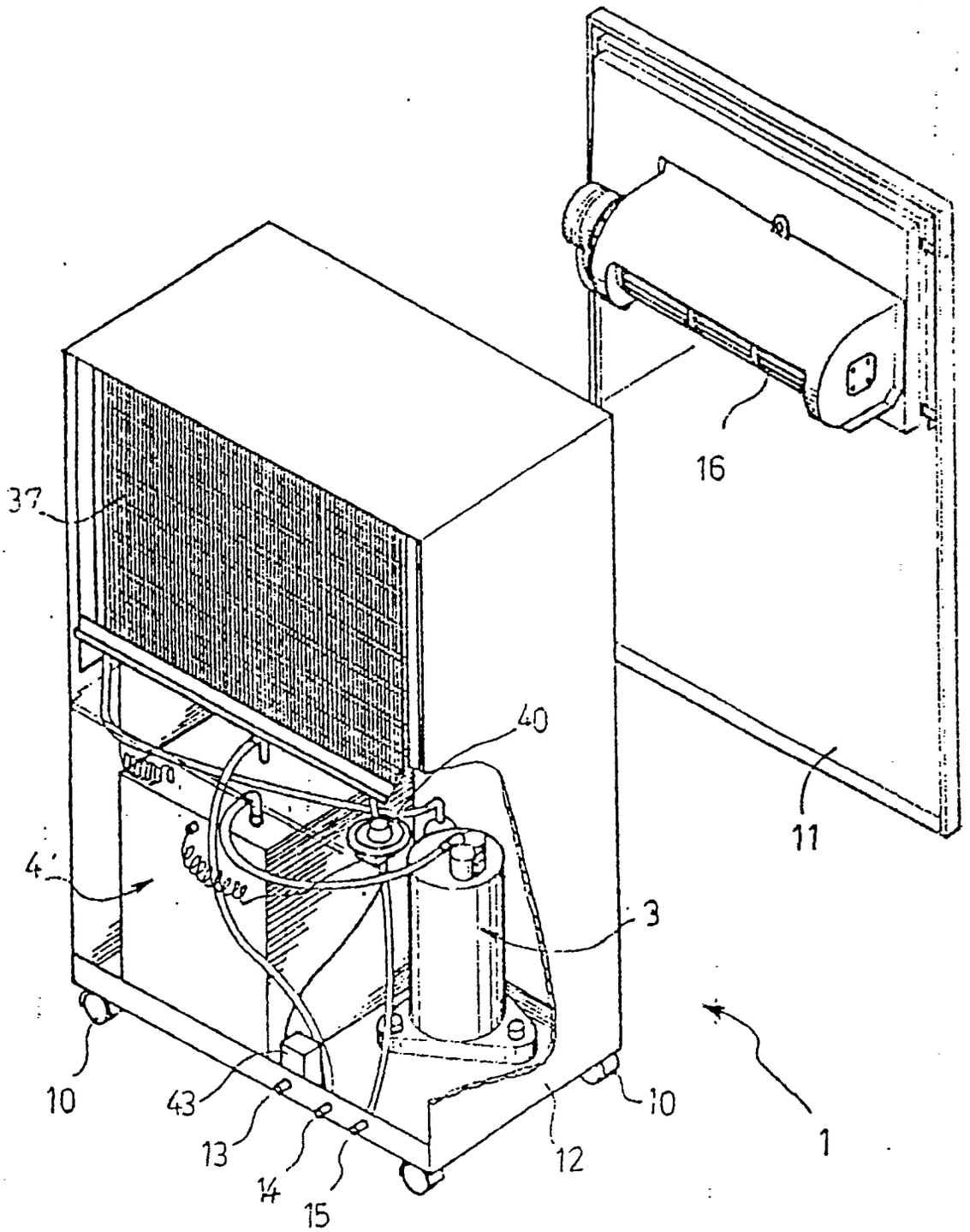


Fig. 2.

# AIR-CONDITIONER

The present invention relates to air-conditioners, and more particularly to a water cooling type movable air-conditioner for indoor use.

The air-conditioner of the invention is a device for cooling air, which evaporates freon or other refrigerant in a coil under low pressure so as to absorb heat from outside air, and condenses the evaporated freon into liquid, under high pressure and low temperature, for further circulation.

Three different general types of air-conditioner have been commonly used for cooling the air inside buildings. The first, most common, type is for mounting on a wall or window of a building. The second is a separated type which comprises a compressor and a radiator, which are separately mounted on the outside of a building, and an evaporating condenser, which is installed inside a building, with tubes connected therebetween. The third type is a centralized air-conditioning system.

Disadvantages of the aforesaid different types of conventional air-conditioners are outlined hereinafter.

1. The window mounting type of air-conditioner utilizes air to cool the evaporating condenser, and this consumes much power and produces much noise. It is dangerous to mount an air-conditioner in a wall or window of a building. The installation of an air-conditioner in a wall or window of a building will also detract from the aesthetic appeal of a building, and cause pollution (dripping of water).
2. The centralized air-conditioning system generally utilizes a water cooling tower for cooling the heat, which occupies much space to install and consumes much power to operate. The costs of installation and maintenance are relatively high.
3. In the separated type of air-conditioner, in which condenser, compressor, evaporator and air fan are installed separately, noise is reduced but power consumption is high and it is relatively expensive to install. The installation of the exhaust tube for exhausting hot air again may detract from the appearance of the building. Therefore, few families would like to install this type of air-conditioner.

According to tests, water cooling is much more effective than air cooling for cooling the refrigerant of an air-conditioner. The air-conditioner of the invention is designed to utilize the water cooling method.

According to one aspect of the invention, there is provided a water-cooled movable air-conditioner, comprising:

a housing having a plurality of rollers on the bottom thereof to permit the air-conditioner to be moved and containing a compressor for compressing a refrigerant to circulate through a refrigerant circulating tube;

a control panel mounted on said housing for the operational control;

an air fan mounted within the housing;

a drain tube for discharging water condensed inside said housing;

a water cooling chamber for cooling said refrigerant circulating pipe, the chamber having a cold water inlet and a hot water outlet;

a solenoid-controlled water valve set between said water cooling chamber and said cold water inlet and controlled to close and open by a control device according to water temperature setting, said control device comprising a temperature regulating knob mounted outside the water cooling chamber for temperature setting and a temperature detector set inside said water cooling chamber for measuring water temperature.

According to another aspect of the invention, a movable air-conditioner comprises a housing containing a refrigeration circuit having a first heat exchanger to receive heat from air passed through the housing by a fan, and a second heat exchanger to discharge heat from the circuit, characterised in that the second heat exchanger is water-cooled and is provided with flexible inlet and outlet water hoses for supplying cold water to the second heat exchanger and for removing heated water therefrom.

The present invention provides a water cooled movable air-conditioner, which is practical for use in an enclosed room. Preferably, the air-conditioner utilizes a temperature-controlled water valve to control feeding of cold water and exhausting of hot water, permitting controlled consumption of water and electric power.

The air-conditioner can be conveniently moved within the range of the water pipes connected thereto to cool air in a desired area.

Reference is made to the drawings, in which:

Figure 1 is a front perspective view of a movable indoor air-conditioner according to the present invention;

Figure 2 is a perspective fragmentary back view thereof;

Figure 3 is a schematic drawing, illustrating the operation of the cooling system thereof; and

Figure 4 illustrates an alternative form of cooling system according to the present invention.

Referring first to Figures 1 and 2, a movable indoor air-conditioner in accordance with the present invention comprises a housing 1, a control panel 2, a compressor 3, and a circulating piping and cooling chamber (coil) 4.

The housing 1 defines therein an inner space for mounting the compressor 3 and circulating piping and cooling chamber (coil) 4, and comprises front cover

11 which has a control panel 2 mounted on its front and an air fan 16 mounted on its rear face (Figure 2), a plurality of rollers 10 on the bottom surface thereof, and three water tubes at the rear of the housing, comprising a cold water inlet tube 13, a hot water outlet tube 14 and a drain tube 15.

As shown in Figure 1, the control panel 2 is mounted on the front of the cover 11 of the housing 1 and comprises an adjustable exhaust hole 21, a thermostat 22 for constant temperature control, a step-control switch 23 for high-low fan control, a timer 24 and an ON/OFF switch 25.

Referring to Figures 2 and 3, the compressor 3 is mounted inside the housing 1 to compress liquid freon refrigerant from a copper tube for circulation, permitting the compressed freon to pass through a lower pressure tube 32, an evaporating coil 33, a contraction tube 34, a condensing coil 35, and a return tube 36 to return the freon to the compressor 3 for the next circulation. The power source 31 for the compressor 3 is connected with a delay switch and a relay for safety control.

Cold water is introduced to the cooling chamber 4 through the lower cold water inlet tube 13 to constantly cool down the condensing coil 35, and hot water is exhausted from the cooling chamber 4 through the higher hot water outlet tube 14. A temperature regulating knob 40 is mounted outside the cooling chamber 4 to measure water temperature and a solenoid-operated water valve 43 is connected to the regulating knob 40 via conductor 42 to control the passage way of the cold water inlet tube 13 into the cooling chamber 4.

Figure 4 illustrates an alternative form of the present invention, in which a cooling coil 4 is used instead of the cooling chamber of the foregoing embodiment, with the other parts and structure remaining unchanged.

During operation, freon is turned into vapour while passing through the evaporating coil 33, absorbing heat from the outside air. Thus, the air temperature outside the evaporating coil 33 drops immediately and the gas temperature inside the evaporating coil 33 increases drastically. While passing through the contraction tube 34, the pressure of the evaporated freon is relatively increased so that it can be quickly condensed while passing through the condensing coil 35 inside the cooling chamber (coil) 4. As soon as the temperature of the water inside the cooling chamber (coil) 4, which is detected by the temperature detector 41, reaches a pre-determined range set through the temperature regulating knob 40, the temperature regulating knob 40 immediately turns on the solenoid-controlled water valve 43 via the conductor 42, permitting cold water to fill in the cooling chamber (coil) 4 and simultaneously force the hot water to exhaust out of the cooling chamber (coil) 4 through the hot water outlet tube 14. As soon as the temperature of the water inside the cooling chamber (coil) 4 is detected within a pre-determined range, the solenoid-controlled water valve 43 is automatically turned off to block up the cold water inlet tube 13.

The cold water inlet tube 13 is connected to a water tap to induce tap water for the cooling process, so that the air-conditioner of the present invention can be used inside a room or an enclosed area. The frequency of water supply is determined in the most economic way. When the temperature regulating knob 40 is set at a lower level, it requires a higher frequency of water supply so as to reduce power consumption, achieve better cooling effect and higher rating of the operation of the compressor 3. When the temperature regulating knob 40 is set at a higher level, it consumes much more power and achieves relatively low performance of cooling effect but requires low frequency of water supply. Even at low performance level, the cooling effect of the present invention is still better than that of the conventional air cooling method. Since the housing 1 is equipped with rollers 10 and water tubes 13, 14 and 15, it can be freely moved within an area defined by the length of the water tubes 13, 145 and 15, so that cooling air can be directly blown toward desired location. Further, the hot water from the hot water outlet tube 14 which is a by-product of the air-conditioner of the present invention is clean and can be utilized for bathing and washing.

As described above, the present invention provides a water cooling type movable air-conditioner for use indoors, which has a simple structure, is inexpensive to manufacture and install and economic in use, and can be conveniently moved inside a room to a desired area.

It is to be understood that the drawings are designed for purposes of illustration only and are not intended as a definition of the limits and scope of the invention disclosed.

## Claims

1. A water-cooled movable air-conditioner, comprising:

a housing (1) having a plurality of rollers (10) on the bottom thereof to permit the air-conditioner to be moved and containing a compressor (3) for compressing a refrigerant to circulate through a refrigerant circulating tube (32 to 36);

a control panel (2) mounted on said housing (1) for operational control;

an air fan (16) mounted within the housing;

a drain tube (15) for discharging water condensed inside said housing;

a water cooling chamber (4) for cooling said refrigerant circulating pipe, the chamber having a cold water inlet (13) and a hot water outlet

(14);

a solenoid-controlled water valve (43) set between said water cooling chamber and said cold water inlet and controlled to close and open by a control device (40 to 42) according to water temperature setting, said control device comprising a temperature regulating knob (40) mounted outside the water cooling chamber (4) for temperature setting and a temperature detector (41) set inside said water cooling chamber for measuring water temperature.

2. A movable air-conditioner comprising a housing (1) containing a refrigeration circuit (32 to 36) having a first heat exchanger (33) to receive heat from air passed through the housing by a fan (16), and a second heat exchanger (4, 35) to discharge heat from the circuit, characterised in that the second heat exchanger (4, 35) is water-cooled and is provided with flexible inlet (13) and outlet (14) water hoses for supplying cold water to the second heat exchanger and for removing heated water therefrom.

3. A movable air-conditioner according to Claim 2, wherein the second heat exchanger (4, 35) is provided with an inlet valve (43) to which the inlet hose (13) is connected, and control means (40, 41, 42) for controlling the opening of the inlet valve according to the temperature of the water in said heat exchanger.

4. A movable air-conditioner according to Claim 3, wherein said control means (40, 41, 42) comprise a temperature sensor (41) adjacent to the water outlet hose (14) and a solenoid to actuate the inlet valve (43) according to the output of the sensor.

5. A movable air-conditioner according to Claim 4, wherein the control means (40, 41, 42) comprise a temperature adjusting means (40) whereby the response of the solenoid to the output of the sensor may be varied.

6. A movable air-conditioner according to any of Claims 2 to 5, wherein the housing is provided with wheels or rollers (10) to facilitate movement thereof.

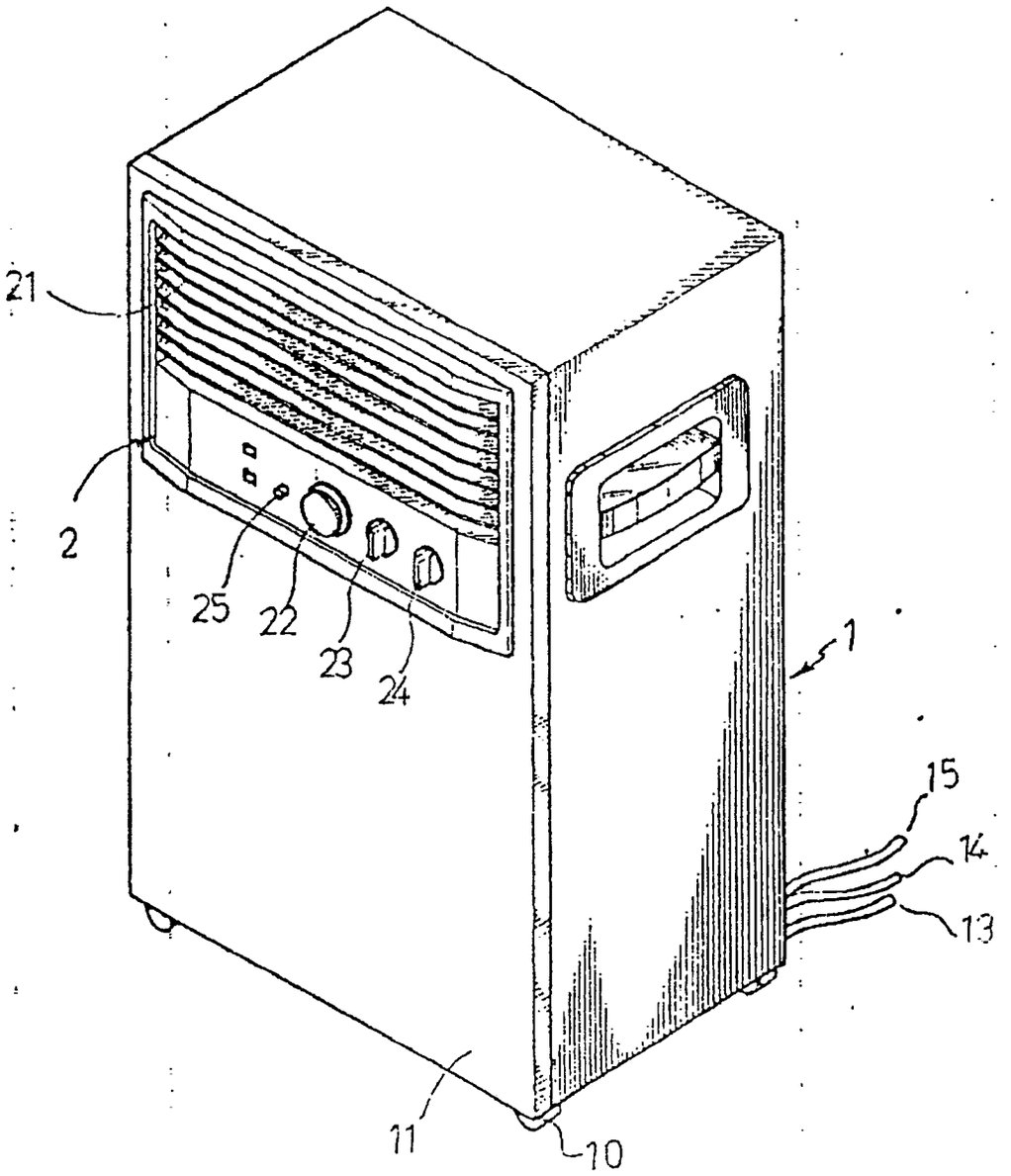


Fig. 1.

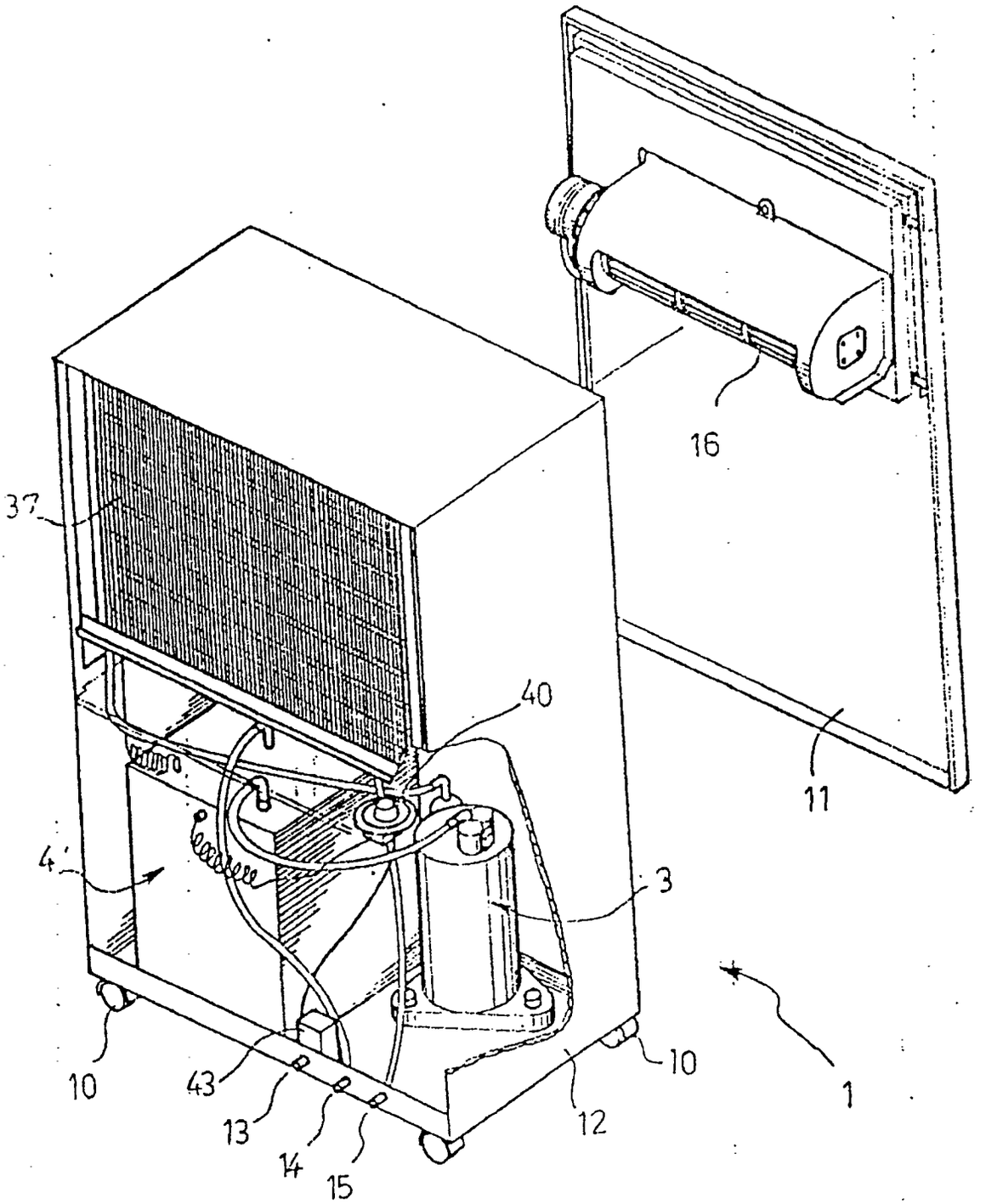


Fig. 2.

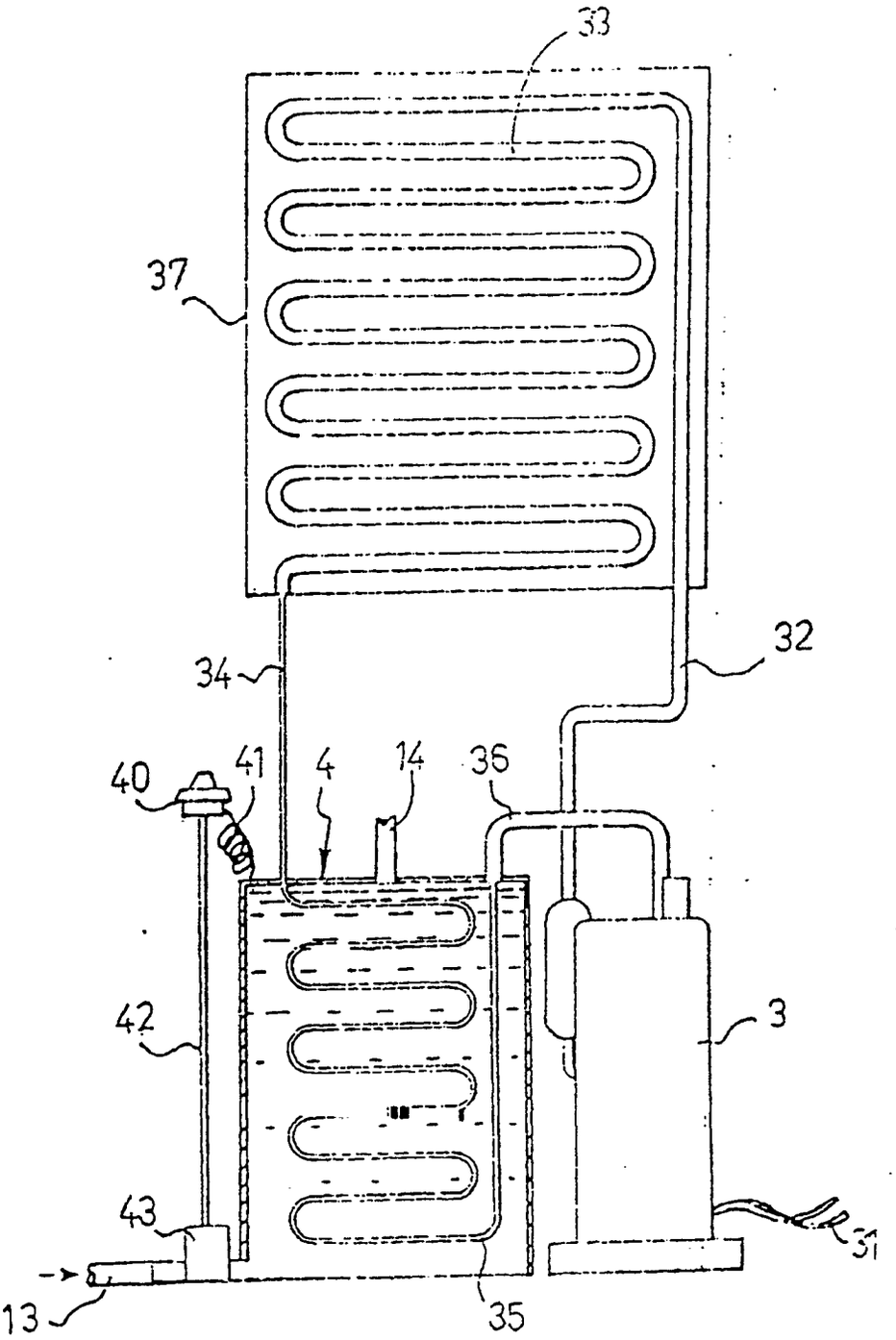


Fig. 3.

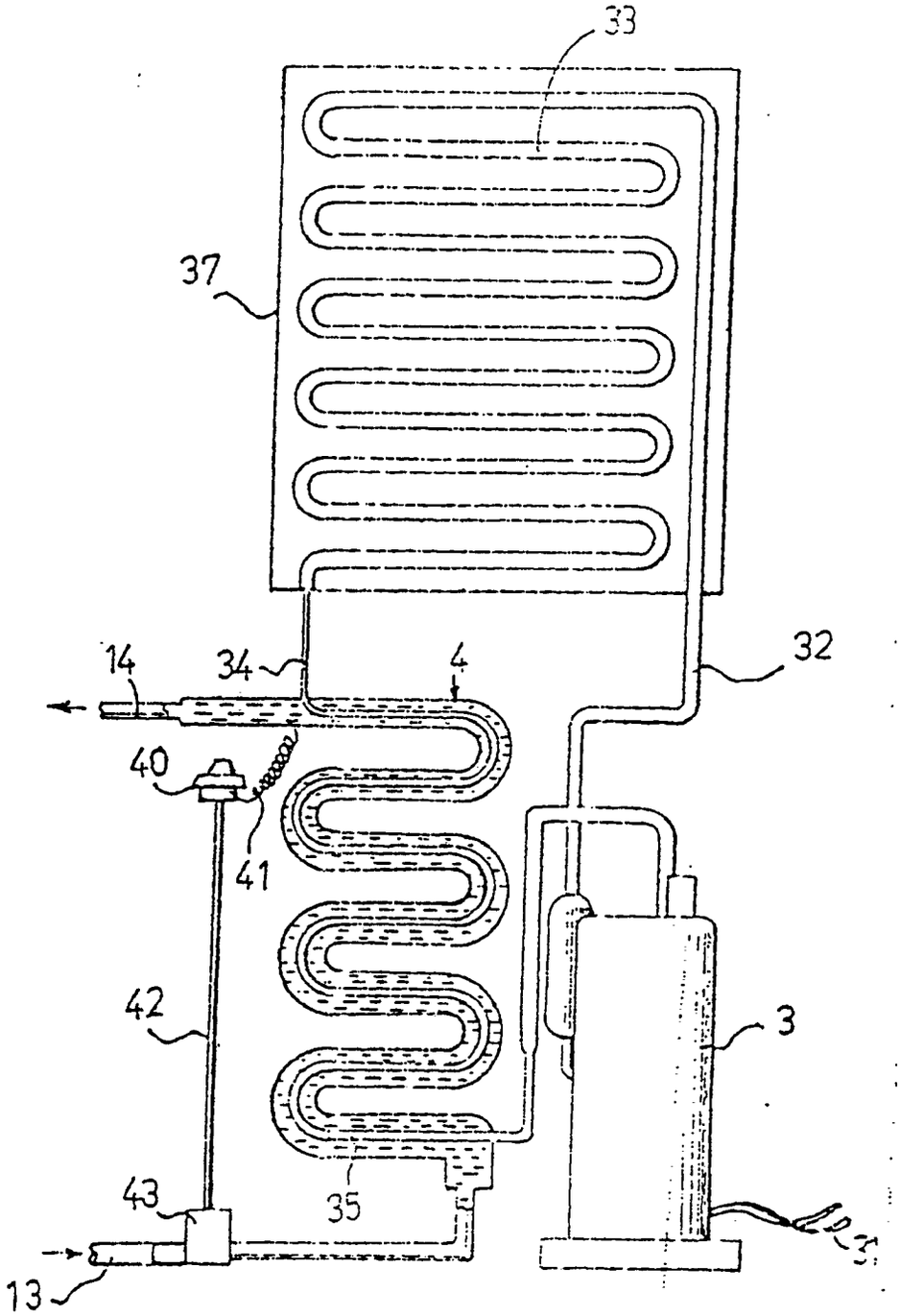


Fig. 4.