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## (54) Cool water dispenser device for refrigerator

(57) Cool water dispenser device for a refrigerator, in particular for a domestic refrigerator, comprising a tank (4) for the accumulation of drinkable water that is housed in a heat insulated casing of the refrigerator, a filter (5) to purify the network water, means for connection to an external watering system of drinkable water, means for the delivery of the cool water (6) contained in said tank (4). Said dispenser device has said filter (5) placed downstream of the tank and it includes a control device comprising valve means (2) that are interposed between the connection of the drinkable water (1) and the tank (4), a meter (3) for the quantity of water that is fed to the tank, an electronic control unit (8) connected with said meter in order to control the closing of said valve means (2) when said quantity of water that comes from the external water network and that supplies the cooled tank reaches a pre-established value.

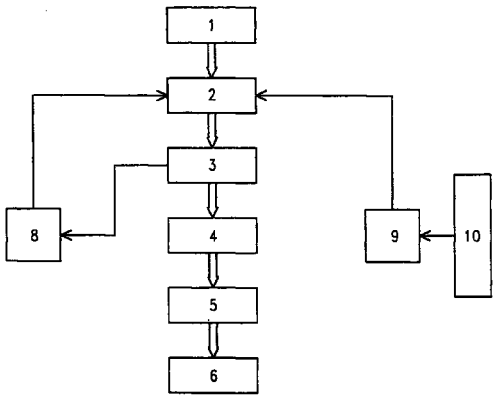


Fig.1

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## Description

**[0001]** The present invention refers to a cool water dispenser device for a refrigerator, particularly for a domestic type appliance.

**[0002]** Domestic refrigerators are known that are internally equipped, with dispensing devices (dispensers") for cool water. Such dispensers provide for the use of a tank, that being adequately connected wit an external water network that is always present in environments where refrigerators are located, allows the accumulation of drinkable water. This tank is situated internally of the heat insulated casing of the refrigerator in a such way as to keep a determined quantity of drinkable water constantly cooled, that is possible to tap through output water delivering means.

**[0003]** However, this device provides for the utilisation, of appropriate internal filters suitable to purify the drinkable water incoming from the water network, from possible organic compounds, from products of the reaction of the chlorine present in the water, from substances released by the piping of the water network. Such filter has a filtration capacity that is determined by the litres of water being treated. After a certain number of litres it is opportune to replace the filter cartridge in order to prevent to lose in effectiveness in the filtering action.

**[0004]** In view of the state of the art herein described, object of the present invention is to realise a dispenser of cool water for a refrigerator, in particular for a domestic refrigerator, that is capable to dispense cooled water without the inconveniences shown by the known dispensers.

**[0005]** According to the present invention, such object is attained by means of a cool water dispenser device for a refrigerator, comprising a tank for the accumulation of drinkable water that is housed in a heat-insulated casing of the refrigerator, means for connection to an external watering system of drinkable water, a filter to purify the network water, means for the delivery of the cool water contained in said tank, said dispenser device being characterised in that said filter is located downstream of the tank and in that it includes a control device comprising valve means that are interposed between the connection of the drinkable water and the tank, a meter of the quantity of water tat is fed to the tank, an electronic control unit tat is connected with said meter in order to control the closing of said valve means when said quantity of water that comes from the external water network and that feeds the cooled tank reaches a pre-established value.

**[0006]** Preferably, said electronic control unit is also suitable to control the closing of said valve means when a pre-established period of time is over.

**[0007]** Owing to the present invention it is possible to provide realise a control of the quantity of water loaded in the dispenser's tanks through time, and it is possible to control the state of deterioration of the filter of the drinkable water due to the quantity of filtered water and possibly also to the utilisation time of the latter, thus allowing its substitution in the opportune moment.

**[0008]** The characteristics and the advantages of the present invention will be made evident by the following detailed description of two embodiments thereof, that are illustrated as a non limiting example in the enclosed drawing, in which:

Figure 1 represents a block diagram of the control device according to a first embodiment;
Figure 2 represents a layout of the control device according to a second embodiment;
Figure 3 represents the block diagram of the operation of the control device more in detail.

**[0009]** With reference to Figure 1, there is shown a block diagram of the hydraulic circuit according to a first embodiment of the dispenser according to the invention. The water 1 deriving from an external water network feeds a tank 4 through a solenoid valve 2 and, downstream of the same, there is a litre-counter 3. Said litre-counter 3 can either be a separate device from the solenoid valve 2, or it can be integrated therein. The tank for the accumulation of the water 4 is inserted in a heat insulated and refrigerated casing located inside the refrigerator, so as to refrigerate the drinkable water of the external water network. The solenoid valve 2 that allows the flow of the network water 1 into the tank is essentially made up of a mechanical valve whose closing and opening operation is controlled by the switch 9 located on the door 10 of the refrigerator, in normal conditions of operation. The closing of the solenoid valve 2 can be controlled also by a electronic control device 8 in particular cases of operation. The litre-counter is a device for the reading of the flow of the water and is usually made up of an electromechanical apparatus that allows to obtain a certain number of digital pulses for each litre of water that goes through the solenoid valve 1. It can be realised by different implementations.

**[0010]** A first type of litre-counter device provides the use of an electrodynamic circuit in which a mechanical revolving mean, made up of paddles, is connected with a magnet and with a reed reading element. By turning, the magnet determines the opening and the closing of the reed contact. The contact closing and opening actions are monitored by the electronic control device 8. A variation of this type of device provides for the use of different elements as paddles for the mechanical revolving mean, some of which the possibility is given to reflect a bright signal, adequately produced, so that it is possible to excite a photo-detector element (a photodiode or a phototransistor) that produces measurable pulses.

**[0011]** A second type of litre-counter device provides for the use of a piezoelectric sensor that is sensitive to the pressure variations. A body introduced in the

path of the water and adequately modelled in order to create loops therein creates vortexes and therefore sudden pressure changes that can be detected by the piezoelectric sensor. The mechanical vibrations are transduced into measurable electric pulses.

**[0012]** According to the invention, a filter 5 suitable to purify the drinkable water deriving from the external water network is located upstream of the refrigerant tank 4 in order to treat only the water that is used immediately. It is generally manufactured with a material tat allows to eliminate possible organic compounds, products of the reaction of the chlorine present in the water and substances released by the piping of the water network in the common use water.

**[0013]** The switch 9 of the dispensers is advantageously situated on the door 10 of the refrigerator appliance and controls the opening and closing operation of the solenoid valve 2, in such a way as to allow the inflow of new network water in the tank 4, in order to replace the water previously tapped.

**[0014]** Downstream of the filter 5 a dispenser 6 for the delivery of cool water is provided.

**[0015]** In Figure 3 the action of the control device 8 is shown more in detail. It is known that the filter 5 deteriorates for quantity of filtered water and for time of utilisation. By reading the water flow, the litre-counter 3 provides a certain number of pulses to the control device for each litre of water that flows in the dispenser. Such control device consists essentially of a microprocessor data acquisition circuit 80, that it is possible to set so that it controls the closing of the solenoid valve 2 upon the attainment of the number of wanted litres, and therefore stops the water feed to the dispensers. Since the filter 5 also deteriorates with the time of utilisation, it is possible and preferable to set a timer in the control device, in order to cause it to close the solenoid valve 2, thus stopping the delivery of water even after a desired period of time.

**[0016]** The microprocessor 80 is connected with a file memory 11, that is used to store the readings of the litre-counter 3 and possibly the value of the timer, in the case of sudden or lasting lack of supply voltage of the electronic control device.

**[0017]** In addition an user interface device 14 is connected with the microprocessor 80. In this way the user can reset the count of the litres of water that go through the tank 4 and reactivate the delivery. The attainment of the quantity of water being set can be signalled through an acoustic or optical signaller.

**[0018]** During the normal use of the apparatus, it is also possible to visualise the instantaneous water consumption on a display 13, that can consists of a numerical device or of an analog hand indicator or only of a light led.

**[0019]** In Figure 2 there is shown a second embodiment of the dispenser in which the use of a second solenoid valve 12 is provided, that is placed downstream of the tank 4, that controls the delivery of cool water. The opening and closing of said solenoid valve are also controlled by the switch 9, in normal conditions of operation. In addition the closing of said solenoid valve can be controlled by the control device 8, when it is necessary to change the filter.

## Claims

1. Cool water dispenser device for a refrigerator, in particular for a domestic refrigerator, comprising a tank (4) for the accumulation of drinkable water tat is housed in a heat insulated casing of the refrigerator, a filter (5) to purify the network water, means for connection to an external watering system of drinkable water, means for the delivery of the cool water (6) contained in said tank (4), said dispenser device being characterised in tat said filter (5) is placed downstream of the tank and in tat it includes a control device comprising valve means (2) tat are interposed between the connection of the drinkable water (1) and the tank (4), a meter (3) for the quantity of water that is fed to the tank, an electronic control unit (8) that is connected with said meter in order to control the closing of said valve means (2) when said quantity of water that comes from the external water network and that feeds the cooled tank reaches a pre-established value.

2. Dispenser device according to claim 1, characterized in that said valve means (2) comprises a solenoid valve tat controls the inflow of the water from the network (1) to the tank (4).

3. Dispenser device according to claim 2, characterized in that it comprises a switch (9) that, in normal conditions, controls the opening and closing operation of the solenoid valve (2).

4. Dispenser device according to claim 3, characterized in that the switch (9) controls the opening/closing operation of the first solenoid valve (2) upon the opening/closing operation of the door (10) of the refrigerator.

5. Dispenser device according to claim 3 or 4, characterized in that said valve means comprise a second solenoid valve (12) downstream of the tank (4), that controls the delivery of the cool water and whose opening and closing are controlled by the switch (9), in normal conditions of use, while its closing can be controlled by the control device (8), in case the substitution of the filter (5) becomes necessary.

6. Dispenser device according to any one of the previous claims, characterized in that said meter (3) of the quantity of water consists of an electromechanical apparatus that provides pulses according to the quantity of water (1), in litres, that goes through the

solenoid valve (2).

**7.** Dispenser device according to claim 6, characterized in that said electronic control unit (8) consists of a microprocessor data acquisition circuit (80) that, by receiving the data from the meter (3), controls the closing of the solenoid valve (2) when the quantity of established litres has been reached or when a period of pre-established time has elapsed, so that the substitution of the filter (5) that deteriorates because of the quantity of drinkable filtered water or because of the time of utilisation becomes possible.

**8.** Dispenser device according to claim 7, characterized in that said electronic control unit (8) comprises a file memory unit (11) to store the readings in case of lack of supply voltage.

**9.** Dispenser device according to claim 8, characterized in that said electronic control unit (8) is connected with a device (13), that can consists of a numerical display or of an analog hand indicator or just of a light led, that allows to visualise the instantaneous consumption of cool water (6).

**10.** Dispenser according to claim 8, characterized in that said electronic control unit (8) is connected with an user interfacing device (14), that allows to reset the count of the litres of water that go through the refrigerant tank and to restart its delivery, the attainment of the set quantity of water being signalled through an acoustic or optical signaller.

**11.** Refrigerator, particularly for domestic use, comprising a refrigerated heat insulated casing, characterized in that it comprises a water dispenser device according to any one of the previous claims.

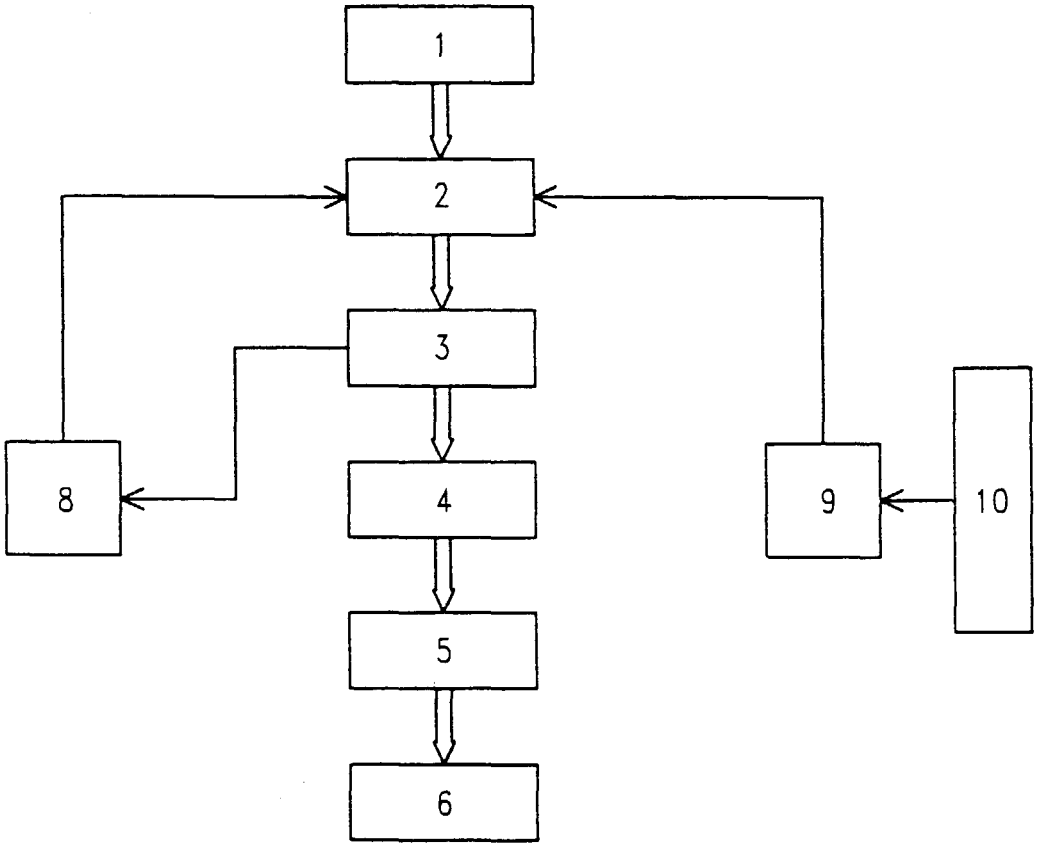
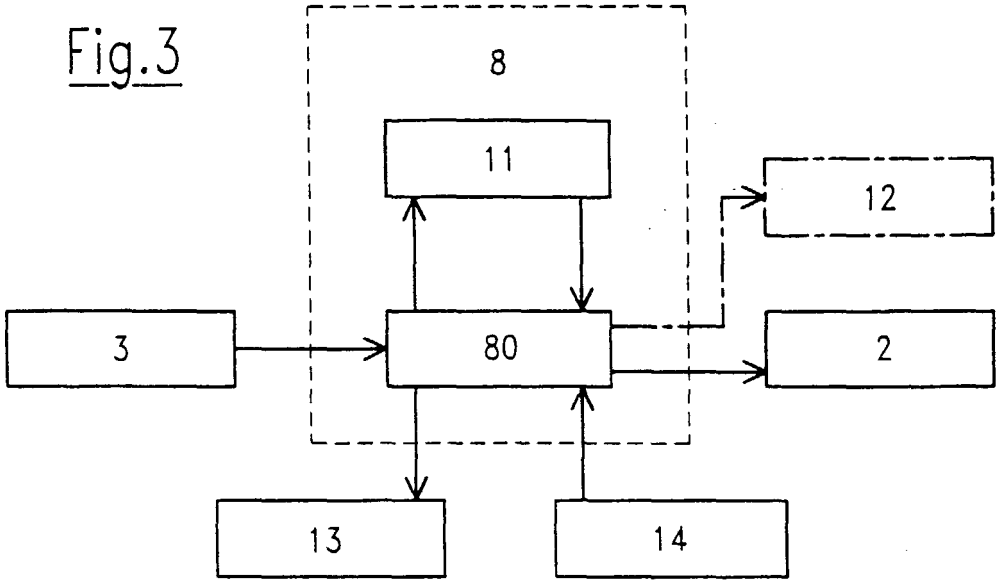



Fig.1

Fig.3



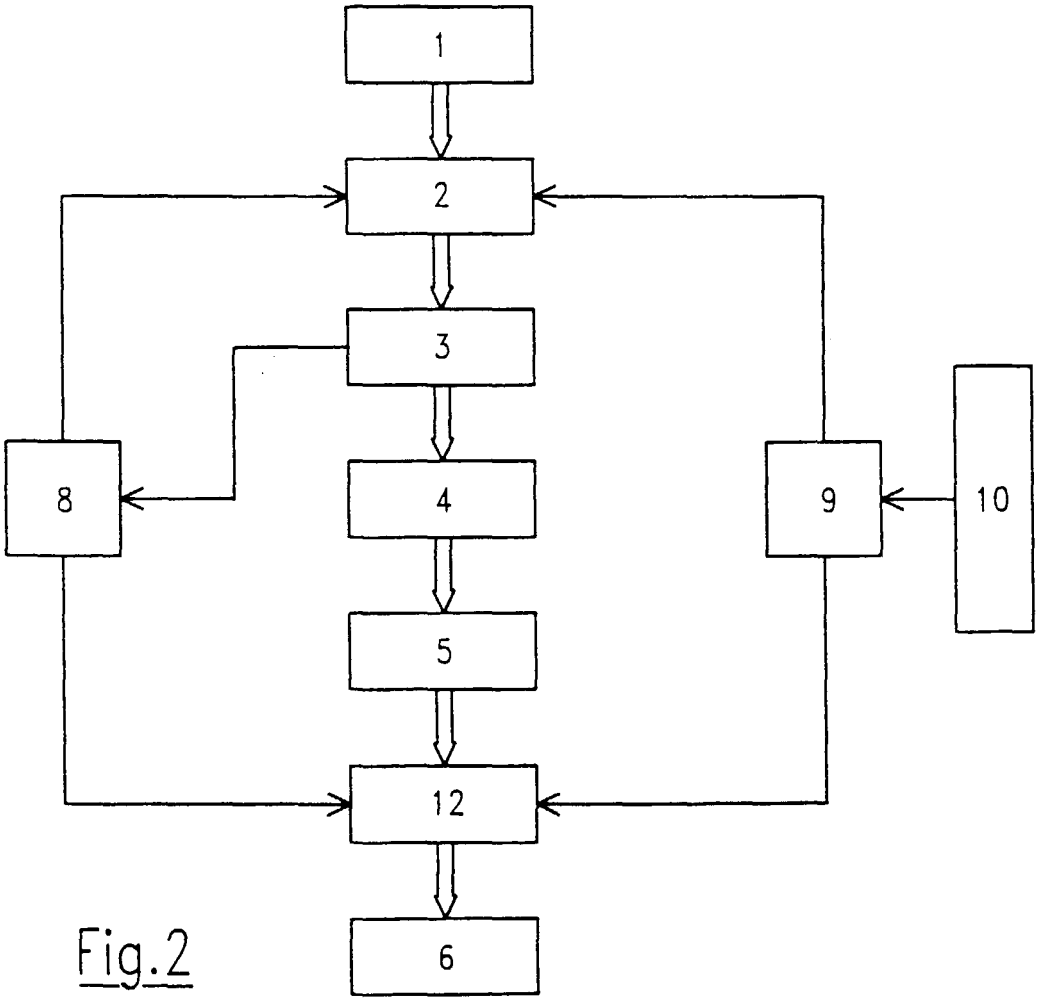




Fig.2