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AUTOMATICALLY CONTROLLED WATER CIRCULATING SYSTEM

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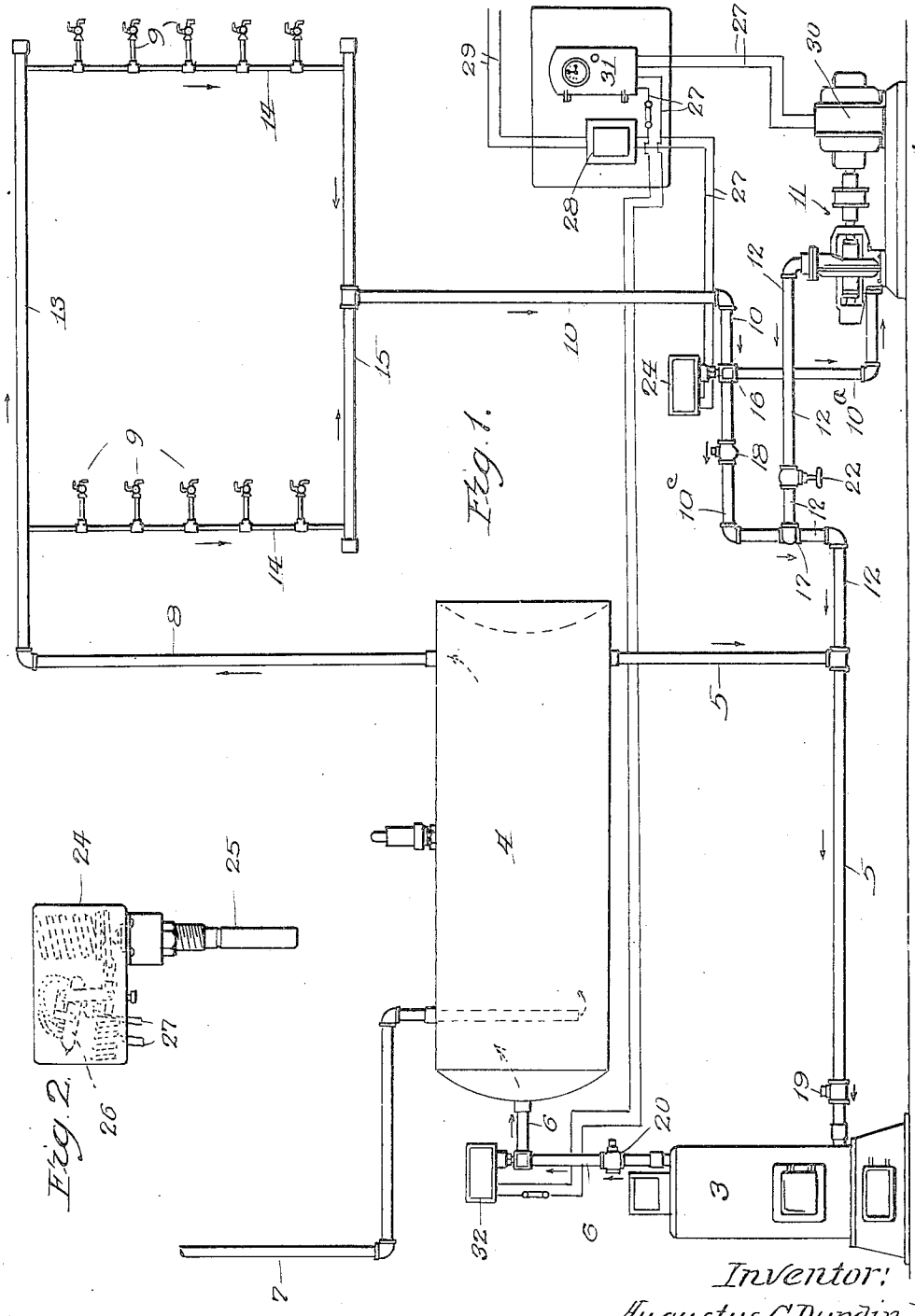


Fig. 1.

Fig. 2.

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AUTOMATICALLY-CONTROLLED WATER-CIRCULATING SYSTEM

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This invention relates to water circulating systems. It is well known that in large buildings, where a great many hot water faucets or other outlets are employed, the hot water in the pipes cools when not circulating properly, and therefore a hot water circulating pump is used to circulate the water through the system, whereby hot water may be constantly supplied at any faucet or other outlet. During intervals it is unnecessary for the pump to operate, and in order to economize, the pump is shut down so long as the water in the pipes remains hot. This, however, requires the services of an attendant, and frequently the pump is not started until the water has become cold, with the result that often it takes considerable time before hot water again reaches the faucets or other outlets.

The principal object of this invention is to provide automatic control means in a hot water circulating system whereby the pump is started automatically whenever the water in the return pipe from the system reaches a predetermined low degree of temperature, whereby hot water may be constantly supplied to the faucets and other outlets, the pump being automatically stopped again whenever the water in the return pipe reaches a predetermined high degree of temperature. Another object is to provide automatic means for preventing the operation of the pump during such hours as it is unnecessary to circulate the hot water and to permit the pump to start again when hot water is again required in the system. Another object is to provide automatic means for preventing the operation of the pump when the hot water heater (which supplies the hot water) is shut down and for automatically permitting the operation of the pump again when the heater is started again.

With these and other objects and advantages in view, this invention consists in a water or other fluid circulating system having automatic control means for starting the water or other fluid circulating pump when the temperature of the water or other fluid in the return pipe reaches a predetermined degree and for stopping the pump when the temperature in the return pipe reaches another predetermined degree. It further consists in a water or other fluid circulating system having an automatically controlled water or other fluid circulating pump, and having automatic control means for permitting operation of the pump during certain hours of the day and preventing the operation thereof at other times. The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawing accompanying this specification, in which:

Fig. 1 is a diagrammatic view, in side elevation, of an automatically controlled hot water system, embodying a simple form of the present invention and Fig. 2 is a detail side elevation of a thermostat device employed in the system.

Referring to said drawing, which illustrates one embodiment of the invention applied to a hot water circulating system, the reference character 3 designates a hot water heater of conventional form, and 4 designates a hot water tank or reservoir connected to the hot water heater by a water pipe 5 and a hot water pipe 6 as is customary. The main water supply pipe as shown at 7 enters the tank 4 and supplies cold water to the same. A hot water supply pipe or riser 8 is connected to the top of the tank or reservoir 4 and supplies hot water to the faucets or other outlets 9 and a water return pipe 10, and branch 10^a connects the faucets with the inlet side of a hot water circulating pump 11. A water return pipe 12 leads from the discharge side of the pump and connects with the water return pipe 5. In some situations the hot water supply pipe or riser 8 runs to the top of the building and connects with a horizontal pipe 13 at the top of the building from which horizontal pipe, vertical hot water pipes 14 extend down to a horizontal water return pipe 15 which is connected to the main return pipe 10. The faucets or other outlets may be connected to the hot water pipes 14 as shown in the drawing. This particular arrangement is not necessary to the invention, broadly considered, as any conven-

tional type of hot water circulating system may be employed containing the hot water supply pipe for the faucets and other outlets and the water return pipe.

The hot water circulating pump 11 preferably comprises an electric motor driven water pump, and a conventional type of motor driven water pump is illustrated in the drawing. The water return pipe 10 is connected to the branch 10^a by fitting 16, and from said fitting leads a water return branch pipe 10^c, which is connected by a fitting 17 to the water pipe 12, which leads from the discharge side of the pump Check valves 18, 19, 20 are interposed in the water return pipes 10^c, 5 and hot water pipe 6, respectively, which check valves open in the direction indicated by the arrows adjacent the check valves. A shut off valve 22 may be interposed in the water return pipe 12 in case it is desired to shut off the pump from the heater for the purpose of repairs on the pump or for other reasons.

A thermostat 24 is connected to one of the water pipes, and preferably to one of the water return pipes of the system and it is here shown as connected to the fitting 16 between the main water return pipe 10 and branch 10^a that leads to the pump. Said thermostat is of the type which employs a well or reservoir 25 for containing a volatile or other expansible fluid, and an electric switch mechanism 26 which opens and closes an electric circuit as a result of the expansion and contraction of the volatile or other expansible fluid in the well or reservoir 25. The thermostat 24 is screwed upon the fitting 16 and the well 25 enters the same and is always surrounded by the water contained in the fitting. From the thermostat 24, lead electric conductors 27 which run to an ordinary switch 28, and thence to the motor 30 of the pump. The switch 28 is connected to the service wires 29. A time switch 31 may be interposed in the circuit to the motor, for controlling the intervals of time during which the motor may be operated, for instance the time switch may be set so as to automatically close the circuit to the motor early in the morning and break the circuit at night, whereby the motor may be started and stopped during certain hours of the day by the thermostat 24, but cannot be started by it after the time switch has broken the circuit to the motor.

In conjunction with the time switch 31 or as an alternative control for governing the intervals of time that the pump may be permitted to operate, a thermostat 32, similar to the thermostat 24, may be connected to the hot water pipe 6 and the electric switch mechanism of the thermostat 32 connected to the conductors 27. The thermostat 32 is set so as to close a break in the circuit to the motor when the temperature of the water at the heater reaches a predetermined high degree and to break the circuit when the temperature of the heater falls to a predetermined low degree.

It is to be understood that the time switch may be omitted entirely, in which case the circuit is not broken by the time switch. It is also to be understood that the thermostat 32 may be omitted. In such cases the attendant closes the switch 28 at the commencement of a day's operation and opens it at night.

In the operation of the system provided with the time switch 31, but unprovided with the thermostat 32, the hot water heater 3 being started, it supplies hot water to the hot water tank or reservoir 4 through the hot water pipe 6, the cold water returning to the heater through the water return pipe 5. The water in the main return pipe 10 being below a predetermined temperature, the electric switch mechanism of the thermostat 24 remains closed, and assuming that the time switch is closed, the circuit to the pump motor is closed and the pump is started, thereby pumping the cold water from the hot water system and discharging it back through the pipes 12, 5 to the heater 3, consequently the hot water in the tank or reservoir 4 rises and fills the hot water system. When the water in the system has been heated to a predetermined high degree of temperature and the hot water reaches the well 25 of the thermostat 24, and the thermostat is actuated thereby, the electric switch thereof opened, and the circuit to the pump motor broken, whereupon the pump remains idle until the water in the return pipe 10 cools sufficiently to again operate the thermostat 24 and close the switch thereof thereby starting the pump again. In this manner the water is circulated through the hot water system only when the water in the return pipe becomes cool.

When the time switch 31 is used it may be set to close a break in the circuit to the motor during certain hours of the day and to break the circuit during night time or at other intervals as may be desired. So long as the time switch 31 is closed, the thermostat 24 will start the pump motor whenever the water in the return pipe 10 becomes cold, but it cannot start the pump when the time switch 31 is open.

When the thermostat 32 is used without the time switch it closes a break in the circuit to the pump motor, as soon as the water in the pipe 6 becomes hot thereby permitting the thermostat 24 to start the pump whenever the water in the return pipe 10 is cold. When, however, the fire in the heater is shut down and the water in the pipe 6 cools, the switch of the thermostat 32 opens, thereby breaking the circuit to the motor and preventing the thermostat 24 from starting the motor when the water in the return pipe becomes cold.

It will be observed that the time switch 31 and the thermostat 32 serve as automatic

master switches that control the length of time during which the thermostat 24 may start and stop the pump.

From the above it will be seen that the constant supply of hot water (when needed) in the hot water system does not depend upon the care of an attendant, but that hot water will be circulated through the hot water system until hot water reaches the thermostat 24, and that so long as the temperature of the water in the water return pipe 10 exceeds a predetermined degree, the pump will remain idle. In addition to dispensing with the services of an attendant, a hot water circulating system equipped with the present automatic control means, is economical, because the pump is used only when necessary to circulate the water. While the invention has been shown and described in connection with a hot water circulating system, it is quite obvious that its use is not limited to a hot water system, but that it may be employed in fluid circulating systems where changes of temperature take place.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. An automatically controlled fluid circulating system comprising in combination a source of fluid supply, a fluid supply pipe and a fluid return pipe connected therewith, there being fluid outlets connected to said supply pipe, an electric motor operated fluid circulating pump for circulating liquid towards the source only, said return pipe having a direct passage past the pump and the pump having branch pipes connecting its intake and discharge sides with said return pipe, a check valve in said return pipe between its connections with said branch pipes, and a thermostat connected to said return pipe and operated by changes of temperature of the fluid therein, said thermostat being electrically connected with the motor of said pump and operating to start and stop the same.

2. A fluid circulating system comprising in combination a source of fluid supply having a primary circulating system, a fluid supply pipe and a fluid return pipe connected with said source of supply and forming therewith a secondary circulating system, there being fluid outlets connected with said fluid supply pipe, an electric motor operated fluid circulating pump having its suction and discharge ends connected with said fluid return pipe outside of the primary circulating system, said pump operating to circulate fluid from said fluid outlets towards said source of supply, a check valve in said fluid return pipe located between its connections with the pump, and a thermostat connected to said return pipe and operated by changes of temperature of the fluid therein, said thermostat being electrically connected with the motor of said pump and operating to start and stop the same.

3. A hot water circulating system comprising in combination a hot water tank, a hot water heater connected therewith through a primary circulating system, a hot water supply pipe connected with said tank and a return pipe connected with said hot water heater and forming a secondary circulating system, there being hot water outlets connected with said hot water supply pipe, an electric motor operated water circulating pump having its suction and discharge ends connected with said return pipe and outside of said primary circulating system, said pump operating to circulate water from said outlets towards the hot water heater, a check valve in said water return pipe between its connection with the pump, and a thermostat connected to said return pipe and operated by changes of temperature of the water therein, said thermostat being electrically connected with the motor of said pump and operating to start and stop the same.

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