March 8, 1932. A. H. SPITZENBERGER ET AL 1,848,440

TEMPERATURE CONTROL APPARATUS

Filed April 12, 1930

Fig. 1.

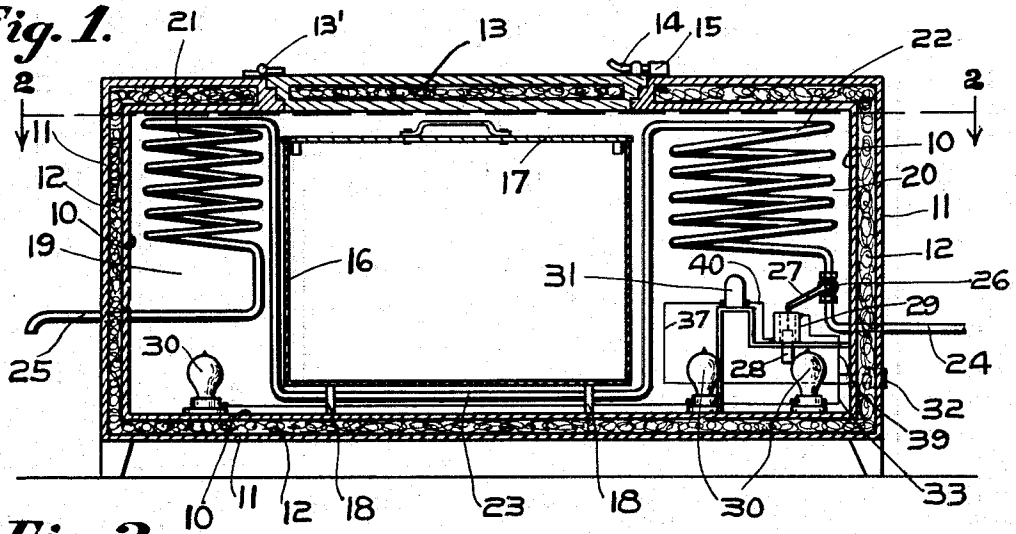


Fig. 2.

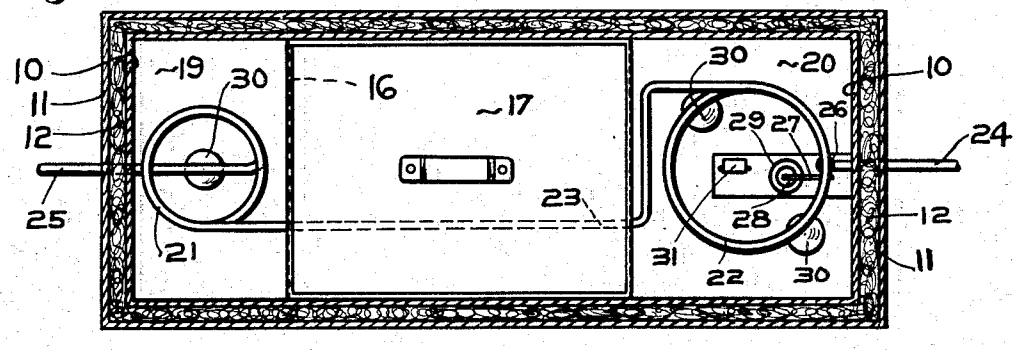
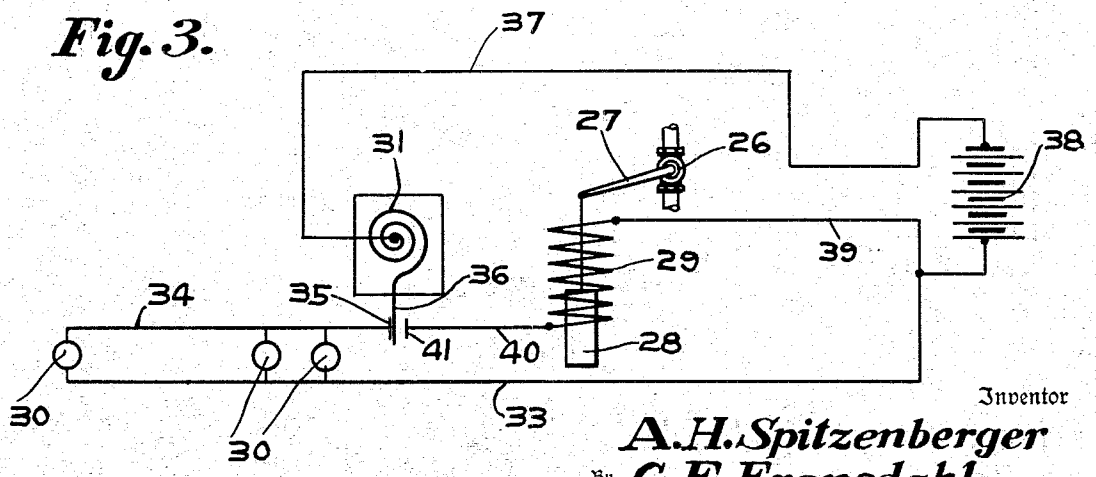


Fig. 3.



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UNITED STATES PATENT OFFICE

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TEMPERATURE CONTROL APPARATUS

Application filed April 12, 1930. Serial No. 443,691.

The present invention relates to a temperature controlled cabinet, and more particularly for a cabinet for use in laboratories, hospitals, creameries and the like, where it is desired to maintain cultures at a predetermined constant temperature, and which is adapted for various other uses wherein a chamber at a predetermined temperature is desirable.

An object of the present invention is to provide a relatively small compact cabinet of this character which has effective means operable upon relatively slight variations in temperature for either positively raising the temperature in the chamber or for positively lowering the temperature therein so as to maintain the temperature evenly and constantly at the desired degree.

A further object of the present invention is to provide a cabinet of this character with a removable container so constructed and arranged within the cabinet as to admit of the free circulation of air about the container and which is so constructed that it may be readily used not only in hospitals and laboratories, but also in creameries for testing milk and cream.

Another object of the present invention is to provide a cabinet of this character which is relatively light and compact in construction, which may be economically manufactured, which may be operated by electricity and connected to the ordinary cord socket and to any suitable source of water supply, and to provide a device which is highly efficient and will remain in constant operation without any attention or adjustment.

The invention also aims to provide a device of this character which may be inexpensively operated, and wherein the usual electric heating lamp may be employed for raising the temperature and wherein a body of water is controlled for lowering the temperature, the lighting of the lamps and the flow of the water being directly controlled from a thermostat of simple and standard construction suitably located in the device.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views.

Figure 1 is a longitudinal vertical section taken through a temperature controlled apparatus constructed according to the present invention, the electric wiring being shown somewhat diagrammatically.

Figure 2 is a horizontal section taken substantially on the line 2—2 of Figure 1 through the upper end of the device immediately below the top thereof and with the cover of the inner receptacle removed, and

Figure 3 is a diagrammatic view of the electric circuit diagram employed.

Referring now to the drawings, the cabinet or body portion of the device may be of any suitable configuration, and in the present instance is shown as of elongated rectangular construction. The cabinet is constructed of spaced inner and outer walls 10 and 11 with an intermediate filling of heat non-conducting material 12. A removable cover 13, similarly constructed, is fitted in rabbeted seats in the top of the cabinet and may be provided at one end with hinges 13′ and at its other end with a latch handle 14 adapted to engage a keeper 15 on the cabinet for binding the cover 13 in place.

From Figure 1 it will be noted that the cover 13 is located nearer one end of the cabinet than at the other, and that immediately positioned beneath the cover 13 is a removable receptacle 16 having a cover 17 which may be removed from the receptacle 16 after the cover 13 has been opened so as to gain access to the receptacle 16 without entirely removing the same from the cabinet. The receptacle 16 is closed on all sides but open at its top and is provided on its bottom with depending legs or spacers 18 which are adapted to seat upon the bottom of the cabinet and space the receptacle 16 thereabove for free passage of air in circulation across the bottom of the receptacle 16.

It will also be noted that the receptacle 16 is of less height than the interior height of the cabinet so that there is an air space be-

tween the top of the cabinet and the cover 17. The receptacle 16 extends transversely substantially the entire width of the interior of the cabinet so that the side walls of the receptacle 16 engage the opposite inner faces of the cabinet for holding the receptacle in proper position and for preventing the circulation of air around the opposite sides of the receptacle and to thus insure the circulation of air across the bottom and top of the receptacle and against the exposed ends thereof, and insure the circulation of air in substantially vertical planes rather than the spreading of the air horizontally.

The particular location of the receptacle 16 toward one end of the cabinet provides a small chamber 19 at one end of the cabinet and a larger chamber 20 at the other end of the cabinet. In the upper portion of the small chamber 19 is located a relatively small coil 21, and similarly located in the large chamber 20 is a relatively large coil 22. The coils 21 and 22 are connected in series by a pipe 23 which is looped downwardly and across the under side of the receptacle 16, as shown in Figures 1 and 2.

The large coil 22 is provided at its lower end with an inlet pipe 24 extending through the side of the cabinet and adapted for connection with any suitable source of water supply. The lower end of the small coil 21 is provided with a discharge pipe 25 which extends through the opposite end of the cabinet and leads to any suitable point of discharge. The admission of water through the inlet pipe 24 is controlled by a valve 26 located in the pipe 24, the valve 26 having an operating arm 27 which is connected to the core 28 of a solenoid 29.

The water which passes through the coils 21 and 22 is adapted to cool the interior of the cabinet, and for the purpose of raising the temperature in the cabinet a plurality of heating electric lamps 30 are employed. Preferably, one of the heating lamps is located in the small chamber 19 beneath the coil 21 while in the large chamber 20 two of the lamps are located, the same being disposed in the lower end of the chamber and preferably one toward each side of the cabinet and beneath the coil 22. A thermostat 31 is also located, preferably in the large chamber 20, beneath the coil 22 for controlling the illumination of the lamps 30 and the operation of the solenoid 29 for alternately lighting the lamps to heat the chamber or open the valve 26 to admit a cooling fluid through the coil to lower the temperature in the chamber, according to the condition prevailing therein.

Any suitable wiring arrangement may be resorted to for carrying out the purpose of this invention, and Figure 3 shows the present preferred arrangement of the wiring. The wiring is contained in the cabinet as diagrammatically shown in Figure 1 and may be connected to a plug socket 32 located in the end of the cabinet, or in any other convenient location adapted to receive the prongs of a plug of the usual electric cord for supplying current to the circuit.

In Figure 3 one side of the lamp 30 is connected to a wire 33 leading directly to the plug 32, shown in Figure 1. The other side of the lamp 30 is connected to a short wire 34 which terminates in a contact 35 at the thermostat 31 and is adapted to be engaged by the arm 36 of the thermostat for closing a circuit through the lamps 30, the circuit passing through the thermostat 31 and through the wire 37 which leads to the other side of the plug 32, shown in Figure 1. The wires 33 and 37, to the plug 32, are connected to any suitable source of electric energy, indicated by the battery 38 in Figure 3.

Branched from the wire 33 near the plug 32 is a branch wire 39 which leads to one end of the coil of the solenoid 29, and the solenoid is provided at the other end of its coil with a short wire 40 which leads to a fixed contact 41 arranged opposite to the fixed contact 35 and adapted at times for engagement with the thermostat arm 36.

In operation, a culture or the like is placed in the receptacle 16, the cover 17 fitted down tightly on the receptacle 16, and the upper cover 13 of the cabinet is securely clamped and sealed in the top. The cabinet is connected to a suitable source of electric supply and also water supply and preferably has been brought up to a desired temperature before the culture or the like is placed in the receptacle 16.

In operation, the thermostat 31 is adjusted or arranged so as to operate at certain predetermined temperatures. When the temperature in the cabinet and receptacle falls below that which is desired, the thermostat 31 contracts and swings the arm 36 into position to engage the fixed contact 35 and close the circuit from the wire 33 through the lamps 30, thermostat 31 and wires 37. The lamps are thus lighted and caused to heat the interior of the cabinet.

When the rising temperature goes beyond the predetermined desired temperature, the thermostat 31 will be operated in an opposite direction and the arm 36 thereof will engage the fixed contact 41, breaking the circuit through the lamps 30 and de-energizing them, and completing the circuit from the wire 39 through the solenoid 29, the wire 40, contact 41 and the thermostat 31 through the wire 37. This energizes the solenoid 29 and causes the core 28 to shift and swing the lever arm 27 for opening the valve 26 and admitting cool water from the water supply to pass through the coils 21 and 22, the cool water reducing the temperature in the chamber. The thermostat 31 will thus alternately engage the contacts 35 and 41 as the temperature in the chamber

rises and falls and will thus alternately light the lamps 30 to raise the temperature and admit cool water to the chamber for lowering the temperature.

By this means, the various deviations in temperature from that desired will be quickly corrected and thus the cultures or other matter which is placed in the receptacle 16 will not be subjected to any appreciable change in temperature throughout a relatively long period of time.

It will be understood that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:—

1. A temperature controlled cabinet, comprising a cabinet body, a receptacle mounted in the body, water coils arranged in the body for lowering the temperature therein by passage of water through the coils, electric heating means disposed in the cabinet for raising the temperature, and thermostatically controlled means arranged in the cabinet connected to the coils and to the heating means for alternately operating the same for raising and lowering the temperatures in the cabinet as they vary from a predetermined desired temperature.

2. A temperature controlled cabinet, comprising a cabinet body, an article receiving receptacle mounted in the cabinet, a cooling coil in the cabinet, heating lamps in the cabinet, a valve controlling the flow of water through the coil for cooling the cabinet, electric means for operating the valve, and a thermostatically controlled device connected to the lamps and to said electric means for alternately operating the same to maintain a predetermined fixed temperature in the cabinet.

3. A temperature controlled cabinet, comprising a cabinet body, a receptacle mounted in the body adapted to receive substances to be maintained at a predetermined fixed temperature, a water coil mounted in the cabinet body, a valve controlling the flow of water through the coil, heating lamps mounted in the body, a circuit closing thermostat mounted in the body and connected in circuit with said lamps, and a solenoid connected to said valve and included in said circuit with the thermostat, said thermostat adapted for operation incident to the rise and fall of temperature in the cabinet body for alternately lighting the lamps to raise the temperature and opening the water valve to admit water to the coil and reduce the temperature.

4. A temperature controlled cabinet, comprising a cabinet body, an article receptacle mounted in the cabinet body, a pair of water coils arranged in opposite ends of the cabinet and connected in series, a valve for controlling the passage of water through said coils to cool the cabinet, a solenoid connected to said valve for opening the same, said solenoid arranged to normally maintain said valve closed by the weight of the core of the solenoid, heating lamps arranged in opposite ends of the cabinet body adapted to raise the temperature therein when lighted, and a thermostat arranged in circuit with said lamps and said solenoid and adapted for operation by changes in temperature to alternately light the lamps and open said valve.

5. A temperature controlled cabinet, comprising a cabinet body, a receptacle mounted between the ends of the body, a water coil connected to a source of water supply and arranged in each end of the cabinet, a valve controlling the supply of water to said coils, a solenoid normally maintaining the valve closed and adapted to open the valve when energized, a plurality of heating lamps arranged in the cabinet body, and a thermostat switch device arranged in circuit with the lamps and the solenoid for alternately lighting the lamps and energizing the solenoid.

In testimony whereof, we affix our signatures.

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