

March 18, 1941.

W. A. RAY

2,235,116

AIR CONDITIONING APPARATUS

Filed Nov. 15, 1939

2 Sheets-Sheet 1

Fig. 1

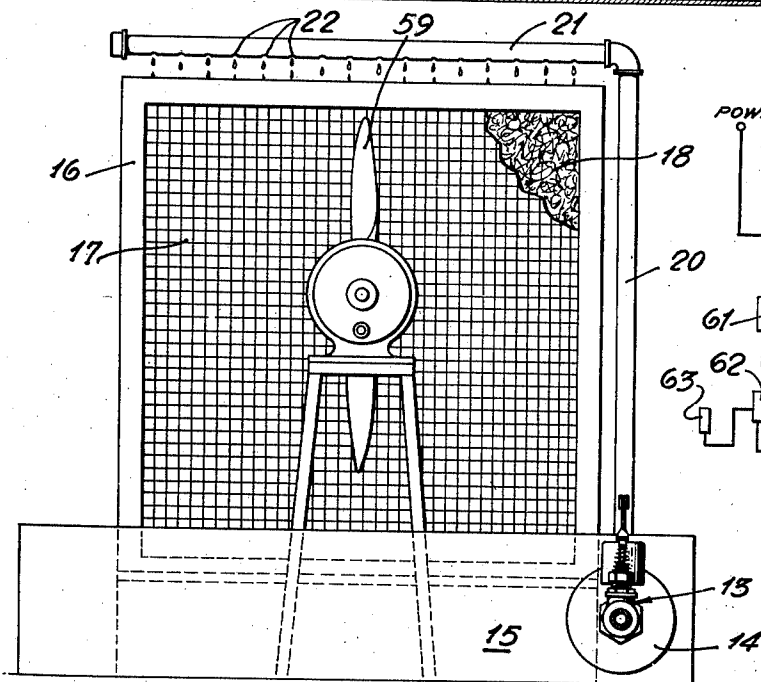
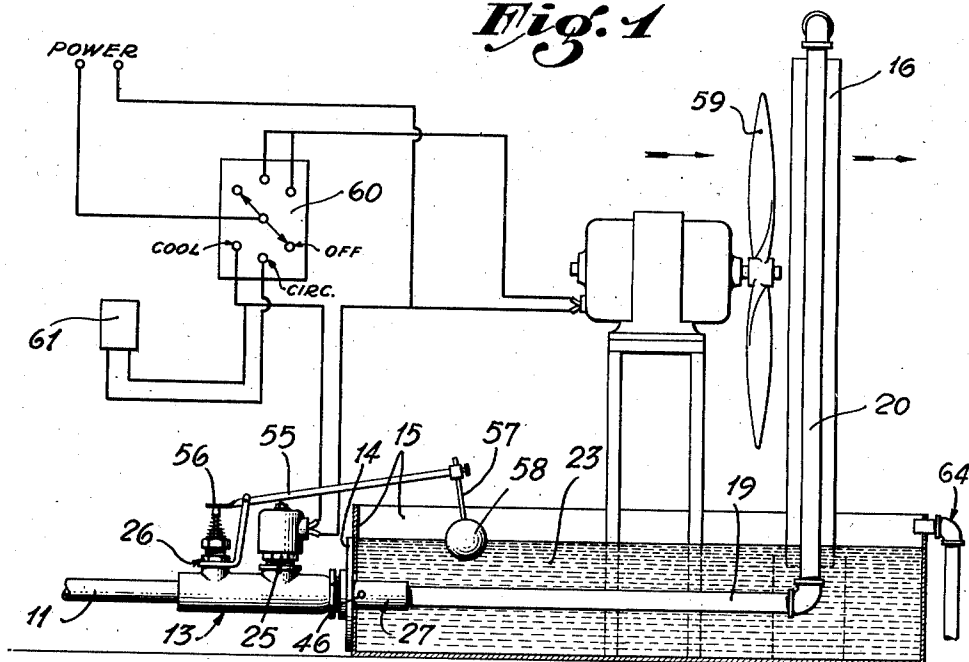
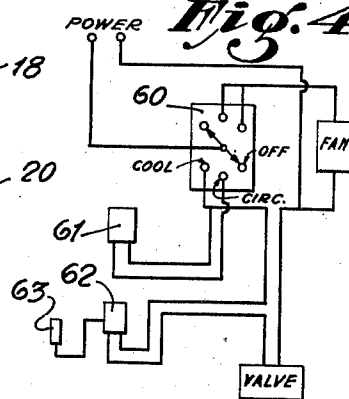


Fig. 2

Fig. 4



Inventor:

WILLIAM A. RAY.

John H. Rouse,
Attorney.

March 18, 1941.

W. A. RAY

2,235,116

AIR CONDITIONING APPARATUS

Filed Nov. 15, 1939

2 Sheets-Sheet 2

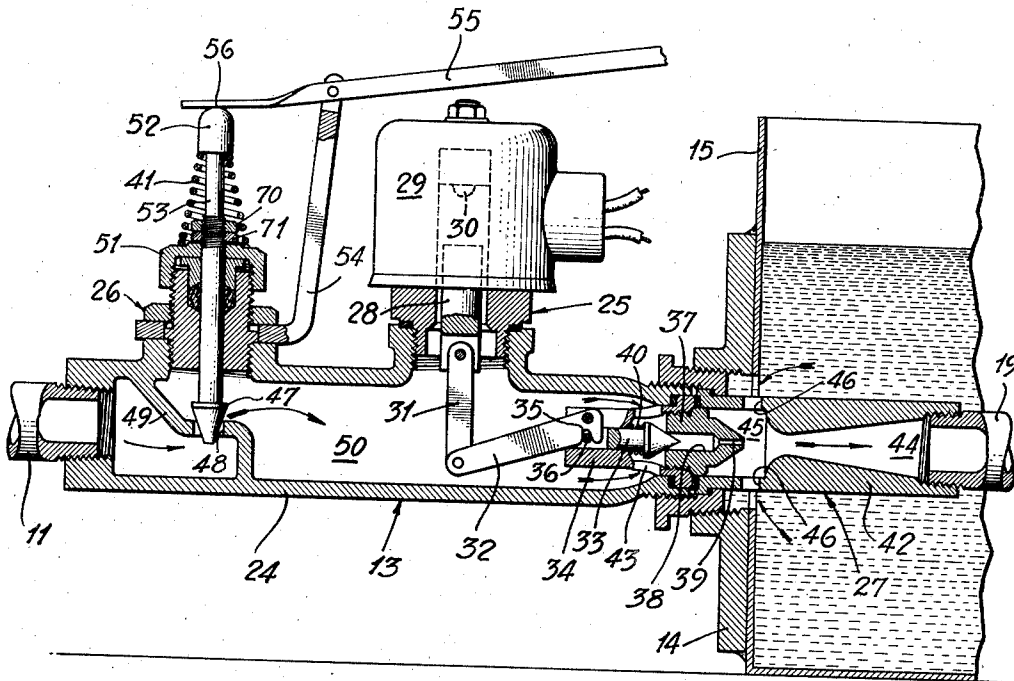


Fig. 3

Inventor:

WILLIAM A. RAY.

311

John H. Rouse,
Attorney.

UNITED STATES PATENT OFFICE

2,235,116

AIR CONDITIONING APPARATUS

William A. Ray, Glendale, Calif.

Application November 15, 1939, Serial No. 304,456

8 Claims. (Cl. 261-25)

My present invention relates to air conditioning apparatus and more particularly to that type of apparatus which is employed in air conditioners commonly known as "Desert coolers."

5 A main object of my invention is the provision of apparatus for filtering, humidifying and cooling air and which includes a frame-like inclosure packed with moisture retaining material through which the air is circulated, 10 means for providing water from a primary supply to the inclosure, and means for recirculating the unevaporated water draining through the inclosure along with the water from the primary supply.

15 A further object of my invention is the provision of means for recirculating water through an air moistening device and which comprises an aspirator operated by water flowing from a primary supply to the device.

20 A still further object resides in the provision of means for regulating the supply of primary and recirculated water to an air moistening device in accordance with the rate of evaporation of the water in the device.

25 Other objects and advantages of the invention will be found in the description, the drawings and the appended claims.

For complete understanding of the invention, reference may be had to the following detailed description and accompanying drawings wherein:

30 Figure 1 is a side elevation of apparatus embodying my invention, partly in section, and a diagram of an electrical control circuit therefor;

Figure 2 is an end elevation of the apparatus 35 shown in Fig. 1;

Figure 3 is an enlarged sectional view of the control valve and aspirator shown in Fig. 1; and

Figure 4 is a diagram of a modified control circuit.

40 In the drawings, the numeral 11 denotes a conduit connecting a valve and aspirator assembly 13 to a conventional, or primary, supply of water under pressure. The assembly 13 is secured by a flange 14 in an opening formed in an end wall of a trough-like reservoir 15. Supported above said reservoir is a frame-like member or inclosure 16 having open upper and lower ends and perforate front and back walls of wire screen 17 and containing a filling of moisture 50 retaining material 18, such as excelsior.

Positioned above said inclosure and connected to the outlet of said valve and aspirator assembly 13 by conduits 19 and 20, is a water distributing pipe 21 having openings 22 through 55 which water can pass to the top of said inclosure

and drain by gravity through the excelsior contained therein into the reservoir 15 where it accumulates, as a secondary supply 23, for recirculation through said inclosure.

The valve and aspirator assembly 13, shown in 5 detail in Fig. 3, comprises a casing 24 provided with valve means, electrically operable to open or closed positions, and generally indicated by the numeral 25, regulating valve means, generally indicated at 26, for controlling the pressure 10 of the water passing to valve 25, and aspirating means, generally indicated at 27, and operated by water flow through said casing.

The valve means 25 comprises a plunger 28, 15 operable by a solenoid device 29 to raised position in contact with stop button 30, and operatively connected by links 31 and 32 to a valve member 33, which is slidable in a supporting member 34 secured in the outlet of said casing. The link 32 is pivotally supported on said mem- 20 ber 34 and has a notch 35 cooperating with a pin 36 provided on the stem of said valve member. This valve operator is the subject of Patent No. 2,052,246, granted to me on August 25, 1936.

A valve port member 37, having a port 38 and 25 a restricted outlet orifice 39, is threadedly received in the member 34. A spring 40 normally biases the valve member to close the port and the plunger 28 to lowered position.

Aspirating means is provided by a Venturi tube 30 member 42 cooperating with the orifice 39. When the valve member 33 is in open position, water flows through openings 43 in member 34, valve port 38, orifice 39 and passageway 44, creating a partial vacuum in chamber 45 and drawing 3 water from the reservoir 15 through the openings 46 formed in member 42 and transmitting it along with the water from the orifice 39.

The pressure regulating valve means 26 comprises a valve member 47, cooperable with a port 40 48 provided in a partition 49 separating the inlet of the assembly from the central chamber 50, and biased toward open position by a spring 41 compressed between a valve cap 51 and a head 52 provided on the upper end portion of valve stem 53. Supported by the casing 24 is a bracket 54 to the upper end portion of which is pivotally secured an arm 55 having a twisted end portion 56 normally in abutting relation with the valve stem head 52. Adjustably secured to the other end portion of said arm, by a rod 57, is a float 58.

The throttling or regulating valve 26 is not intended to completely shut-off the supply of water and accordingly a portion of the stem 53 is provided with threads with which an adjusting

nut 71 and a lock nut 70 cooperate. The nut 71, by engagement with the cap 51, limits the movement of the valve member 47 toward closed position.

5 Means for circulating air through the inclosure 16 is provided by an electrically driven fan 59. Connections for a source of power for the operation of said fan and the valve 25 are indicated by the legend. A manually operated switch 60, 10 having "Off," "Circulate" and "Cool" positions, controls the operation of the air conditioning apparatus. In the "Off" position of said switch, power supply to the fan and to the valve 25 is interrupted, with resultant stoppage of both water 15 and air circulation.

In the "Circulate" position, under normal conditions the fan only is energized and dry air is forced through the filtering medium in the inclosure.

20 In the "Cool" position of the switch, both the fan and the valve are connected in parallel to the power and consequently the valve 25 opens, permitting water to flow to the inclosure 16 through which it drains by gravity into the reservoir and from which it is recirculated through 25 the inclosure by the aspirator along with water from the primary supply.

The level of the water in the reservoir is normally maintained within relatively narrow limits 30 by the float-operated pressure-regulating valve 26 which regulates the supply of primary and recirculated water to the inclosure in response to change in the level of the water caused by variation of evaporation rate in the inclosure. A 35 relatively small flow of primary water through the aspirator suffices for recirculation of a large amount of water from the reservoir and so normally substantially all of the primary water is consumed by evaporation. Variation in the amount of primary water supplied is effected by 40 variation in the pressure of the water at the orifice 39 produced by the float-operated valve. If the humidity of the atmosphere becomes relatively high, reduced evaporation from the inclosure may permit the reservoir to fill and accordingly an overflow drain 64 is provided. 45

In cool weather, circulation only of dry air is normally required for comfort. However, to guard against excessive dryness of the air then 50 circulated by the apparatus, a humidostat 61 may be connected to one terminal wire of the valve solenoid 29 and to the "Circulate" contact of the switch; the switch, in its "Circulate" position, thus connecting the valve to the power in series with the humidostat. In response to an 55 abnormally dry condition of the air, the humidostat closes a switch to complete this circuit, with the result that the valve 25 is opened, permitting water to pass through the inclosure to humidify the air circulating therethrough. It will be noted that, in the "Cool" position of the switch, the valve is open continuously and is not under the control of the humidostat.

In the modified control circuit of Fig. 4, a differential thermostat is shown connected in series 65 with the valve. This circuit is in other respects identical with that of Fig. 1. The differential thermostat comprises a circuit-controlling thermostat 62 responsive to indoor temperature, 70 modulated in its action by a device 63 positioned outdoors and responsive to the temperature there, and serves to control the cooling of the air by stopping and starting water flow to the inclosure. This control may be provided as a precaution 75 against the possibility of excessively cooling the

air, or of cooling it too far below the temperature existing outdoors. With the apparatus connected as shown in Fig. 4, when the switch is in "Circulate" position, the humidostat 61 and the thermostat 62 are in series, so that the opening 5 of either one will effect closure of valve 25; and when the switch is in "Cool" position, the thermostat alone controls the valve 25.

It is to be understood that the specific embodiment of my invention which I have shown and described is for the purpose of illustration only and that modifications may be made without departing from the spirit of my invention. My invention, therefore, is to be limited only by the scope of the appended claims.

This application is a continuation-in-part of my co-pending application, Serial No. 249,596, filed January 6, 1939.

I claim as my invention:

1. In an air conditioning system, in combination, an air moistening member, a conduit connecting said member with a primary supply of water, a reservoir for receiving unevaporated water from said member, and aspirating means in said conduit and operated by water flow therethrough for transmitting water from said reservoir to said member along with the water from said primary supply.

2. In an air conditioning system, in combination, an air moistening member, a conduit connecting said member with a primary supply of water, a reservoir for receiving unevaporated water draining from said member, aspirating means in said conduit and operated by water flow therethrough and in communication with said reservoir for transmitting water therefrom to said member along with the water from said primary supply, and means for circulating air with respect to said member.

3. In an air conditioning system, in combination, an air moistening member, a conduit connecting said member with a primary supply of water, a reservoir for receiving unevaporated water draining from said member, aspirating means in said conduit and operated by water flow therethrough and in communication with said reservoir for transmitting water therefrom to said member along with the water from said primary supply, valve means connected in said conduit ahead of said aspirating means and responsive to the level of the water in said reservoir for controlling the pressure of the water supplied to said aspirating means, and means for circulating air with respect to said member.

4. In an air conditioning system, in combination, an air filtering and moistening device comprising a perforate frame-like inclosure containing excelsior or the like, a conduit connecting the top of said inclosure with a primary supply of water, a reservoir for receiving water draining by gravity through said inclosure and through which a portion of said conduit extends, and aspirating means in said portion of said conduit and operated by water flow therethrough for transmitting water from said reservoir to said inclosure along with the water from said primary supply.

5. In an air conditioning system, in combination, an air filtering and moistening device comprising a perforate frame-like inclosure containing excelsior or the like, a conduit connecting the top of said inclosure with a primary supply of water, a reservoir for receiving water draining by gravity through said inclosure and through which a portion of said conduit extends, aspi-

rating means in said portion of said conduit and operated by water flow therethrough for transmitting water from said reservoir to said inclosure along with the water from said primary supply, and means for circulating air through said inclosure.

6. In an air conditioning system, in combination, an air filtering and moistening device comprising a perforate frame-like inclosure containing excelsior or the like, a conduit connecting the top of said inclosure with a primary supply of water, a reservoir for receiving water draining by gravity through said inclosure and through which a portion of said conduit extends, aspirating means in said portion of said conduit and operated by water flow therethrough for transmitting water from said reservoir to said inclosure along with the water from said primary supply, valve means connected in said conduit ahead of said aspirating means and responsive to the level of the water in said reservoir for controlling the pressure of the water supplied to said aspirating means, and means for circulating air through said inclosure.

7. In an air conditioning system, in combination, a trough-like receptacle, a valve casing mounted in a wall of said receptacle and having an inlet and an outlet and means controlling fluid flow therebetween, means connecting said inlet with a primary supply of water, an air filtering and moistening device mounted above said receptacle and comprising a perforate frame-like inclosure containing excelsior or the like through which water can drain by gravity into said re-

ceptacle, a conduit connecting the outlet of said valve casing with the top of said inclosure and having a portion within said receptacle, aspirating means in said portion and operated by water flow therethrough for transmitting water from said receptacle to said inclosure along with the water from said primary supply, and a fan for circulating air through said inclosure.

8. In an air conditioning system, in combination, a trough-like receptacle, a valve casing mounted in a wall of said receptacle and having an inlet and an outlet and means controlling fluid flow therebetween, means connecting said inlet with a primary supply of water, an air filtering and moistening device mounted above said receptacle and comprising a perforate frame-like inclosure containing excelsior or the like through which water can drain by gravity into said receptacle, a conduit connecting the outlet of said valve casing with the top of said inclosure and having a portion within said receptacle, aspirating means in said portion and operated by water flow therethrough for transmitting water from said receptacle to said inclosure along with the water from said primary supply, additional valve means in the inlet of said valve casing, float means responsive to the level of the water in said receptacle and operatively connected to said additional valve means for controlling the pressure of the water flowing through said valve casing and said aspirating means, and a fan for circulating air through said inclosure.

WILLIAM A. RAY.