

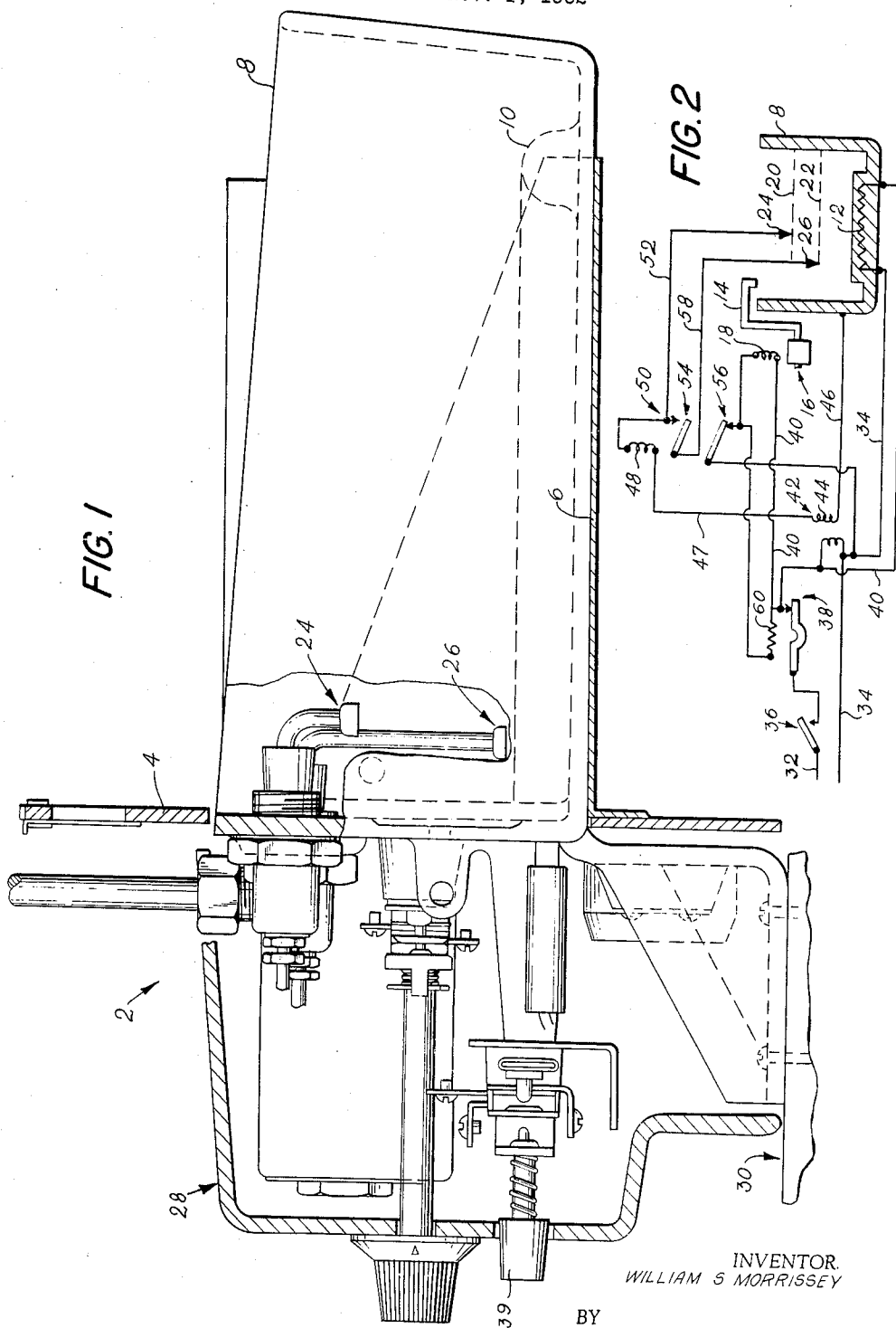
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3,209,125

HUMIDIFIER

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3,209,125 HUMIDIFIER

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This invention relates to humidifiers, and more in particular to controlling the operation of humidifiers of the type used in domestic heating systems.

An object of this invention is to provide trouble-free control of the water level in humidifiers. A further object is to provide improved control of the electrical circuits in humidifiers of the type where water is supplied through a solenoid valve and the water is evaporated by the use of electric resistance heating. A further object is to provide for the above with a construction which is sturdy, dependable, relatively simple, and readily accessible for service. These and other objects will be in part obvious and in part pointed out below.

In the drawings:

FIGURE 1 is a sectional view of one embodiment of the invention; and

FIGURE 2 is a schematic representation of the electrical circuit of FIGURE 1.

Referring to FIGURE 1, a humidifier 2 is mounted as a "plug-in" to the wall 4 of a furnace and is supported upon the furnace wall by a shelf 6. Humidifier 2 has a tank 8 with a ridge 10 on its bottom wall which encloses a resistance heater element 12 (see also FIGURE 2). Water is supplied to tank 8 through a tube 14 under the control of a solenoid valve 16 having a solenoid 18. As will be explained more fully below, the water level in tank 8 is maintained between an upper level 20 and a lower level 22. These water levels 20 and 22 are sensed by a pair of electrical probes 24 and 26, respectively, each of which is an electrical contact with an enlarged lower end. The components of the electrical supply and control system are enclosed in a casing 28 and a lower box 30. However, these components are known in the art and are represented schematically in FIGURE 2, and the details of construction of the various components are not essential to an understanding of the invention.

Referring to FIGURE 2, electrical power is supplied through a pair of lines 32 and 34. Line 32 is connected through a manual switch 36 and a normally closed thermostat time-delay switch 38 to a line 40. When switches 36 and 38 are closed power is supplied through lines 34 and 40 to heater element 12 and to the primary winding of a transformer 42. The secondary winding 44 of transformer 42 is connected through a line 46 to the wall of tank 8 and, therefore, to the water within the tank. The other side of winding 44 is connected through a line 47 to the winding 48 of a relay 50, the other side of winding 48 being connected through a line 52 to the upper water level probe 24. Relay 50 has a normally open switch 54 and a normally closed switch 56. Switch 54 has its fixed contact connected to line 52, and its armature is connected through a line 58 to the lower water level probe 26. Switch 56 has its armature connected to line 34, and has its fixed contact connected to one side of the solenoid 18 of valve 16 and also to the heater element 60 of switch 38.

In discussing the operation, it is assumed first that switch 38 is closed and that solenoid 18 is de-energized so that switch 54 is open and switch 56 is closed. With this condition, switch 56 connects heater element 60 and solenoid 18 across lines 34 and 40 so that these components are energized. The energization of solenoid 18 opens valve 16 so as to supply water in tank 8. The

energization of heater element 60 starts a timing cycle by virtue of heating the thermal-responsive element of switch 38 so that switch 38 opens automatically after a pre-determined time. This disconnects line 40 from line 32 and de-energizes solenoid 18 so as to close valve 16 and cut off the supply of water to tank 8. However, the time characteristic of switch 38 is such that, during normal operation, the level of water in tank 8 rises to the upper level 20 prior to the opening of switch 38. When the water reaches level 20, probe 24 is contacted by the water and this completes a circuit from the secondary winding 44 through line 46, the wall of tank 8, the water in tank 8, probe 24, and line 52 to the relay solenoid 48, the other side of which is connected through line 47 to winding 44. This energizes solenoid 48 so as to lift the armatures of the relay, closing switch 54 and opening switch 56. The lifting of switch 56 de-energizes solenoid 18 and heater element 60 so that valve 16 is closed and the supplying of water to tank 8 is stopped. The de-energizing of heater element 60 stops the timing operation of switch 38 so that switch components cool and are in condition for another timing operation of switch 38 when tank 8 requires filling again. However, switch 38 acts as a safety device to prevent flooding which might otherwise result from solenoid 18 remaining energized for a period longer than that required to fill tank 8, or due to malfunctioning of relay 50 or other cause.

When water level in tank 8 reaches the upper probe 24 so as to energize solenoid 48, as discussed above, the closing of switch 54 completes an interlock circuit from line 52 through line 58 and the lower probe 26 to the water in the tank. Hence, when the evaporation of water from the tank causes the water level to drop, this interlock circuit keeps solenoid 48 energized until the water drops below the lower level 22. At this level the water no longer contacts probe 26 and, therefore, the interlock circuit is broken and solenoid 48 is de-energized. The armatures of relay 50 drop so as to re-close switch 56 and re-open switch 54. The closing of switch 56 energizes solenoid 18 which starts the flow of water to tank 8 and also energizes the heater element 60 of switch 38, all as discussed above. In the meantime, however, the components of switch 38 have cooled so that a new timing cycle is started as discussed above. However, when switch 38 is opened, it does not close until plunger 39 is pushed. This cuts off the electrical current to the entire system and prevents damage, for example, if the water supply should fail.

It is thus seen that the water level is maintained within the desired limits at all times and the safety features of the circuit prevent damage or inconvenience due to malfunction of the equipment. Transformer 42 acts as an isolation transformer and it also provides the desired voltage to operate the electrical probes 24 and 26 circuits. Hence, the other components may be at another voltage, for example, the standard voltage of the house current. The device is free of the operational difficulties which are encountered frequently with humidifiers having float-type controls, and the components including the probes will withstand temperatures and other conditions to which they are subjected even under abnormal conditions.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A humidifier comprising, a tank which is to be positioned within a hot air chamber with one side wall at one side of the chamber, mounting plate means for support-

ing said tank in cantilever fashion within the hot air chamber, an electrical tank heating element operatively associated with said tank, means constituting a supply of water to said tank and including a water supply pipe and a solenoid valve which is normally closed and which has a valve 5 energized to open the valve, a lower electrical probe mounted upon said tank and positioned therein at a minimum desired level of water in the tank, an upper electrical probe mounted upon said tank and positioned therein at the maximum desired level of water 10 in the tank, a relay having an energizing solenoid and a normally-closed switch which is closed to energize said solenoid valve and which is opened to de-energize said solenoid valve, said relay also having a normally-open switch which is closed by the energization of said energizing solenoid, means constituting a source of electricity and 15 providing an electrical circuit from one side of said source of electricity through the water in said tank to said probes and also providing an electrical connection between said upper probe and one side of said energizing solenoid and 20 from the other side of said energizing solenoid to the other side of said source whereby said energizing solenoid is energized by the contacting of the water with said upper probe, said normally-open switch having one side connected to said lower probe and having its other side connected to said upper probe whereby said normally-open 25 switch constitutes an interlock circuit to hold said energizing solenoid of said relay energized after the water level drops from said upper probe and until the water level drops from said lower probe, an electrical circuit connecting said valve solenoid in series with said normally-closed switch and thence to a pair of electrical supply lines of the source of electricity, said electrical circuit further including a normally-closed electrical timing switch assembly formed by a bimetallic strip which moves to a closed-switch position when at ambient temperatures and which moves to an open-switch position at a predetermined elevated temperature, said bimetallic strip having the characteristic that it does not move to its closed-switch position because of a reduction in its temperature below 30 said predetermined elevated temperature, means to move said bimetallic strip from its open-switch position to its closed-switch position, a control heater element connected

in parallel with said valve solenoid and positioned adjacent said bimetallic strip to heat the same simultaneously with the energization of said valve solenoid, said electrical circuit further including means connecting said electrical tank heating element to electrical supply lines of the source of electricity, said timing switch assembly and said control heater element being so related that said bimetallic strip is heated to said predetermined elevated temperature only when said control heater element has been energized for a predetermined period of time whereby said bimetallic strip remains in its closed-switch position during normal operation and moves to its open-switch position only under abnormal conditions which cause said control heater element to be energized for an excessive 15 period of time.

2. A humidifier as described in claim 1 wherein said mounting plate means is of the "plug-in type" and includes a shelf which is mounted upon the wall of the hot air chamber and supports said tank.

3. A humidifier as described in claim 1 wherein said tank heating element is a resistance heater imbedded in the bottom wall of said tank, and wherein said means constituting a source of electricity and providing an electrical circuit to said probes includes a transformer having a secondary winding connected in series circuit with said probes. 25

References Cited by the Examiner

UNITED STATES PATENTS

30	1,820,981	9/31	Le Fever	137—392
	2,103,904	12/37	Hill	236—44
	2,634,746	4/53	Newton	137—400
	2,804,870	9/57	Chelini	219—362 X
	2,810,381	10/57	Knight	219—272 X
35	2,883,511	4/59	Gooldy	219—272 X
	2,888,006	5/59	Martin.	

FOREIGN PATENTS

40	769,538	6/34	France.
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