May 26, 1959 H. J. MARTIN 2,888,006

FURNACE HUMIDIFIER SYSTEM

Filed May 23, 1956

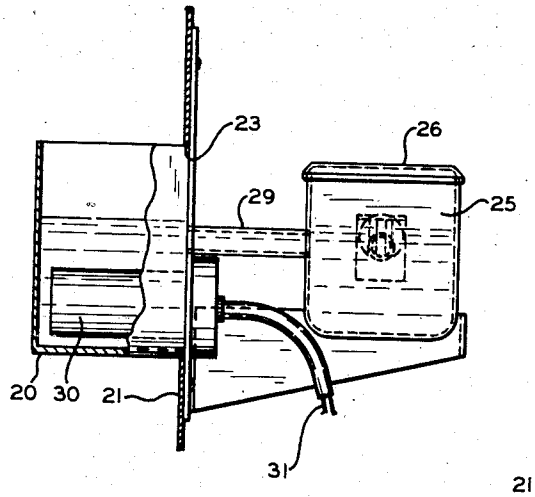

FIG. 1

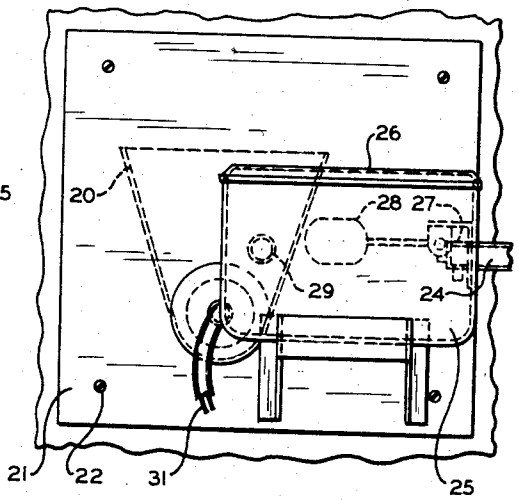

FIG. 2

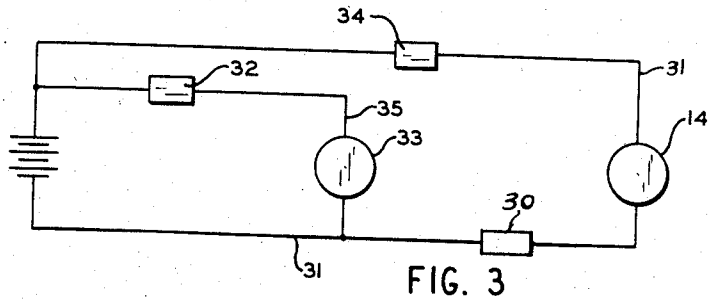

FIG. 3

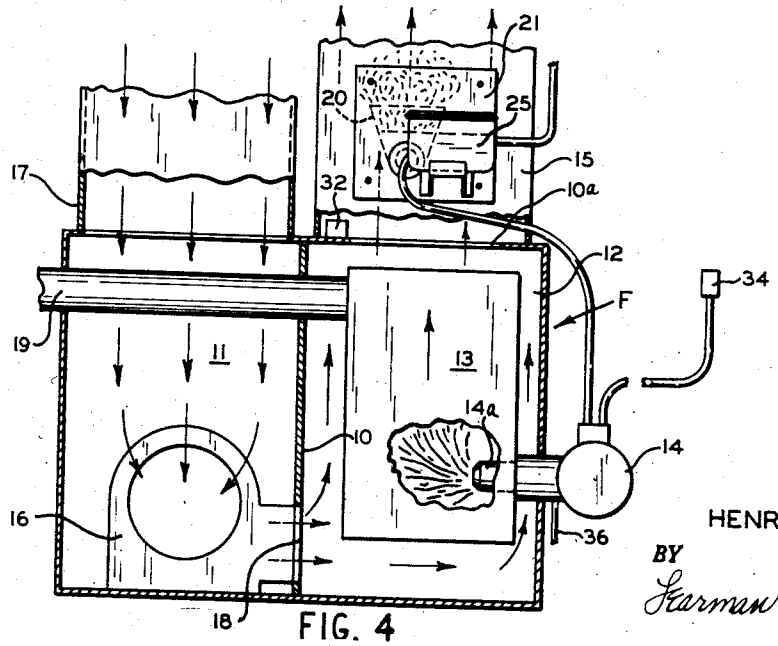

FIG. 4

INVENTOR.
HENRY J. MARTIN

BY
Fearman & Fearman

ATTORNEYS

United States Patent Office 2,888,006
Patented May 26, 1959

2,888,006

FURNACE HUMIDIFIER SYSTEM

Henry J. Martin, Saginaw, Mich.

Application May 23, 1956, Serial No. 586,703
5 Claims. (Cl. 126—113)

This invention relates to furnace humidifier systems and more particularly to a system which furnishes an adequate supply of water vapor for introduction into the air being warmed in the furnace at the time the furnace fan is energized to blow the air through the hot air ducts.

The desirability of introducing moisture into warm air heating ducts is well known. Not only is it more healthful from the standpoint that the mucous membranes will tend to remain more germ resistant if there is a sufficient amount of moisture in the air, but also less heat will be required when there is an adequate humidity content to keep human beings comfortably warm and considerable fuel can be conserved in this way.

Presently, water reservoirs or tanks are provided in conventional furnaces to introduce water vapor into the heated air being circulated; however, very little or no evaporation of the water in the reservoir takes place until the bonnet of the furnace heats up considerably. In present furnace systems the burner control element or heating control element is electrically connected to a thermostatic switch in the space to be heated and, when the switch calls for heat, the control element is energized, and the burner commences to heat the air within the bonnet of the furnace. At some later time when there is an appreciable amount of hot air in the furnace bonnet, the blower fan is energized and the heated air is circulated through the house until the desired temperature level is restored, whence the thermostatic switch deenergizes both the burner control element and the fan. The difficulty with present systems is that very little evaporation takes place until the air is heated considerably above the temperature at which the fan is energized. When the fan is energized to blow the heated air through the system, the bonnet has not heated sufficiently to cause any material degree of vaporization. Usually the space to be heated has been restored to its former temperature level and the burner control and fan have been deenergized before any substantial vaporization takes place. Consequently, very little vapor is introduced into any of the air being circulated.

One of the prime objects of this invention is to provide a furnace system in which the water reservoir within the furnace is provided with a heating element which is energized simultaneously with the control element of the heating systems so that by the time the fan is energized, the water in the reservoir is boiling and steam is introduced into the warm air in the bonnet throughout the time the fan is operating.

A further object of the invention is to provide a furnace system with a vaporizer of novel design which can be very rapidly and conveniently electrically connected to the furnace burner control element or the like to operate in synchronism therewith.

A further object of the invention is to provide va-

porizing means of simple and economical design which can be economically manufactured and very simply installed in existing furnace systems with very little modification thereof.

A further object of the invention is to provide a vaporizer unit which can be used in all present day systems in which a thermostatic switch automatically controls the heating plant. With other objects in view, the present invention consists in the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing, and more particularly pointed out in the appended claims, it being understood that equivalent changes may be made in the various elements which comprise the invention without departing from the spirit thereof, or the scope of the claims.

In the drawings:

Figure 1 is a partly sectional, side elevational view showing the vaporizer unit mounted in position on a furnace wall.

Fig. 2 is a front elevational view thereof.

Fig. 3 is a schematic view illustrating the electrical circuits which control the system.

Fig. 4 is a sectional, side elevational view showing the unit installed in operating position in a conventional furnace, and illustrating furnace elements which operate in conjunction therewith.

Referring now more particularly to the accompanying drawings, a letter F in Fig. 4 generally indicates a furnace of known design which is partitioned as at **10** to form compartments **11** and **12**. Supported within the heating compartment **12** is a burner casing **13** having a burner **14a** therein which is operated by a burner controlling element (motor) **14**. In the particular furnace which I have shown for illustrative purposes only, a hot air bonnet or duct **15** is provided above the chamber **12** and the air from chamber **12** passes into the bonnet **15** through an opening **10a** in the top wall of the furnace. The blower fan **16** is provided in the lower end of the compartment **11**, and cold air returning by gravity from a cold air duct **17** is blown by the fan **16** into the burner compartment **12** through an opening **18** in the partition **10**. The stack **19** of the burner extends horizontally out through the compartment **11** and serves to preheat the returning cold air in the usual manner.

Mounted on the wall of the bonnet **15** is my vaporizer unit which comprises a reservoir **20** secured fast on a plate **21** which may be mounted by means of screws **22** on an outer wall of the bonnet. An opening **23** may be provided in the wall of the bonnet to receive the reservoir **20** which, it will be observed, is open at its upper end. The reservoir is continually replenished with water from a water supply pipe **24** which leads in the usual manner into a float chamber **25**. Within the float chamber **25**, which is closed by cover **26** to prevent evaporation of its contents, a conventional float valve **27** is provided to normally close the pipe **24**. Since this valve **27** is of common design and is to be found on various furnaces it is only necessary to mention that, when the ball member **28** falls due to a drop in liquid in the chamber **25**, the valve **27** permits liquid to enter chamber **25** through the pipe **24**, and when the liquid level is restored in chamber **25**, valve **27** closes off the supply pipe **24**. The pipe **29** connects the float chamber **25** with the reservoir **20** and it will be obvious that the liquid level in reservoir **20** is maintained at the proper level by virtue of the association of the float chamber **25** therewith. Within the reservoir **20** is an energizing element for the vaporizer constituting a heating cartridge **30** of conventional enclosed resistance wire

design which is electrically connected by wires 31 to the burner motor 14. When the cartridge 30 heats the liquid in reservoir 20 to cause it to boil, the vaporizer is energized to release vapor. The circuit for there various elements is shown in Fig. 3, and it will be seen that the cartridge 30 is in series with the house thermostatic switch 34 which operates the motor 14 of the burner 14a in circuit 31 which is parallel to circuit 35 which includes the fan thermostatic switch 32 and the motor 33 of the blower fan 16.

In operation, when the house thermostatic switch 34, which normally holds line 31 open determines that the space to be heated is falling below the desired temperature level, its contacts close and it makes the circuit to the burner motor 14 and the cartridge heater 30. Accordingly, the burner motor causes the burner to heat the air in compartment 12. At the same time the cartridge heater 30 is energized and it begins to heat the water in reservoir 20. When the fan thermostatic switch 32, which is located in the compartment 12, and normally holds line 35 open determines that the air in compartment 12 has been heated sufficiently so that it exceeds the temperature of the air in the space to be heated its contacts close and make the circuit to the fan motor 33. When the blower fan motor 33 is energized, the heated air is circulated through the hot air system into the space to be heated. Cold air ducts in the space to be heated, of course, return the cooler air through the duct system 17 to the compartment 11. By the time the blower fan 16 is energized the water in reservoir 20 is boiling and steam is given off into the air proceeding from the burner compartment 12 up into the bonnet 15. By the time the heat level in the space to be heated has been restored and the house thermostatic switch has broken circuit 31 and deenergized the burner motor 14 and the cartridge heater 30 a considerable amount of vapor has been introduced into the air being circulated. Some vapor continues to be introduced, of course, until the fan temperature responsive switch 32 deenergizes the fan 33 even though cartridge heater 30 is deenergized. No electrical energy is expended, however, in heating the reservoir after the temperature of the space to be heated is restored.

In the embodiment of the invention which is illustrated, the numeral 14 indicates the motor for operating the burner. The system chosen for purposes of illustration only is a gun type oil furnace. However, it is to be understood, that the term "control element," which in this illustrated embodiment of the invention is the burner motor, is broad enough to include other controllers in other furnace systems. For instance, in a pot type oil furnace, the controlling element is the carburator which has a solenoid motor. In a stoker-fired coal furnace, the controlling element is the stoker motor, and because the stoker motor runs for only a very short time averaging perhaps a minute and a half, a delayed action relay may be connected to the cartridge heater so that the cartridge heater 30 is energized a predetermined time interval, after the stoker motor is put into operation. In a gas furnace having a solenoid valve unit controlling the admission of gas to a burner, the controlling element would be the solenoid operated valve. Accordingly, while I have illustrated only the one particular system of the several which are currently on the market, it is to be understood that the term "controlling element" is broad enough to define the controlling element or the like which is employed with other systems. The controlling element in any system for purposes of this application may be defined as the element which is at rest or substantially so, or in a position preventing substantial flow of a fuel or heat carrying body, when the temperature in the space to be heated is at the desired level, and is energized by the room temperature responsive switch when the temperature falls below this level to permit the application of heat, or additional heat, to the air in the furnace. This element is normally deenergized by the room thermostatic switch or returned to initial position when the temperature level is restored.

It is to be understood that the drawings and descriptive matter are in all cases to be interpreted as merely illustrative of the principles of the invention rather than as limiting the same in any way since it is contemplated that various changes may be made in the various elements to achieve like results without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In a furnace system, a furnace housing including a duct leading to a space to be heated, heating means for heating the air in said housing, a source of heat energy supply which said heating means transforms into heat leading to said heating means, an electrical circuit, means in said circuit controlling the operation of said heating means, a temperature responsive switch in said circuit in the space to be heated actuating the controlling means when the switch determines that the temperature in the space is below the desired level, a liquid-containing vaporizer in communication with the air in said housing, a normally deenergized heating element in said vaporizer, connected in said circuit to be energized when said controlling means is actuated, and means energized only after an interval during which the heating means heats the air and the heating element vaporizes the liquid in the vaporizer for circulating air through said housing and duct.

2. In a furnace system, a furnace housing including a duct leading to a space to be heated, heating means for warming the air in said housing, an electrical circuit including a source of power, means in said circuit controlling the operation of said heating means, a temperature responsive switch in the circuit with said controlling means normally holding the circuit open but actuatable when the temperature in the space to be heated drops to close the circuit to the controlling means, a liquid-containing vaporizer in communication with the air in said housing, a normally deenergized resistance heating element in said vaporizer connected in said circuit, fan means for circulating air through said housing, a circuit for said fan means connected to the source of power, and a switch connected to said fan means energizing said fan means after an interval during which the heating means heats the air and the heating element vaporizes the liquid in the vaporizer.

3. In a furnace system, a furnace housing including a duct system leading therefrom to a space to be heated and returning therefrom to the housing, heating means for warming the air in said housing, an electrical circuit including a source of power, means in said circuit controlling the operation of said heating means, a thermostatic switch in the space to be heated and connected in said circuit in series with said controlling means, said switch normally holding the circuit open but actuatable when the temperature in the said space drops to close the circuit to the controlling means, a liquid reservoir communicating with the furnace housing and the air therein, a normally deenergized heating element immersed in the liquid in the reservoir connected in the circuit in series with the controlling means and heating means, a fan in said housing for forcing air therethrough and through said duct system, said fan having a motor connected in the circuit parallel to the controlling means and heating element, and a thermostatic switch responsive to the temperature of the air in the furnace housing connected to said fan motor to energize the same after the temperature of the air in the furnace has been raised a predetermined amount by the heating means.

4. In a furnace system; a furnace circulatory system including a housing and a duct system leading therefrom to a space to be heated and returning to the housing; a heating unit for warming the air in said housing; an electric circuit connected to a source of electrical power; means controlling the operation of said heating unit and

connected in said circuit; a temperature responsive switch located in the space to be heated and connected in said circuit to actuate said controlling means when the temperature in the space to be heated falls below a certain predetermined level and the switch responds thereto; a liquid containing vaporizer communicating with the circulatory system and the air therein; a resistance element incorporated with said vaporizer and connected in said circuit and energized when said thermostatic switch actuates said controlling means to raise the temperature of the air in the housing; a fan for circulating the air in said housing through the circulatory system; and means for holding said fan out of operation for a time interval after said resistance element has been energized.

5. In a furnace system; a furnace housing including a duct leading to a space to be heated; heating means for warming the air in said housing; an electrical circuit connected to a source of power; means in said circuit controlling the operation of said heating means; a temperature responsive switch in said circuit and in the space to

be heated actuating the controlling means when the switch determines that the temperature in the space is below the desired level; a vaporizer in communication with the air in said housing energizable to release vapor into the air in said housing; an electrically controlled energizing element controlling said vaporizer connected in circuit with said switch to be energized when said controlling means is actuated; means for circulating the air in said housing through the circulatory system; and means for holding said circulating means out of operation for a time interval after said controlling means has been energized.

References Cited in the file of this patent

UNITED STATES PATENTS

1,674,337	Klees et al.	June 19, 1928
2,232,347	Stuart	Feb. 18, 1941
2,347,490	Legeman	Apr. 25, 1944
2,804,870	Chelini	Sept. 3, 1957