July 1, 1941. L. O. SELBY 2,247,858

OIL BURNER

Filed March 4, 1939

Fig. 1.

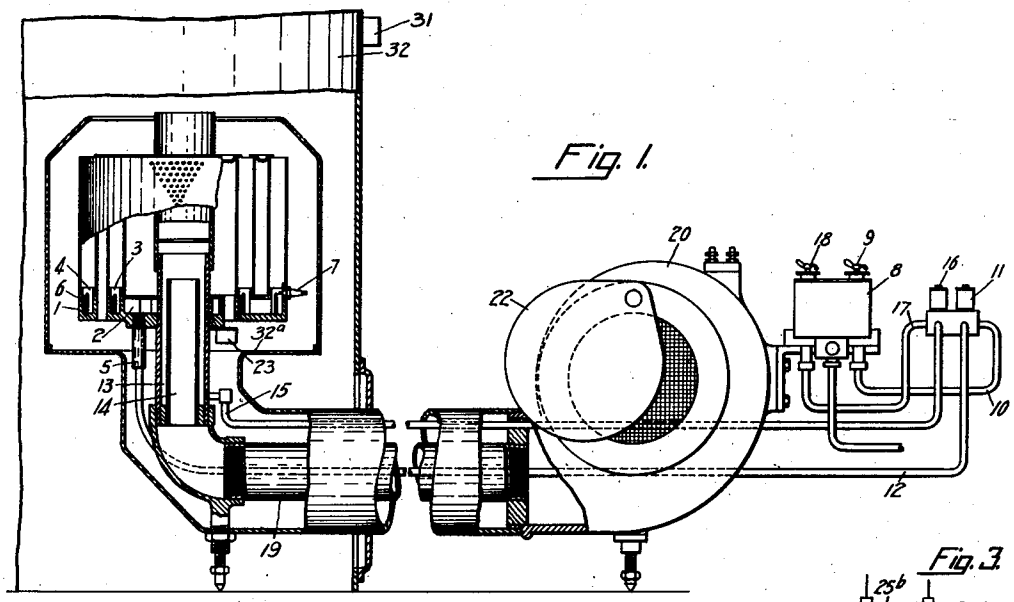


Fig. 3.

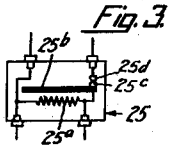


Fig. 2.

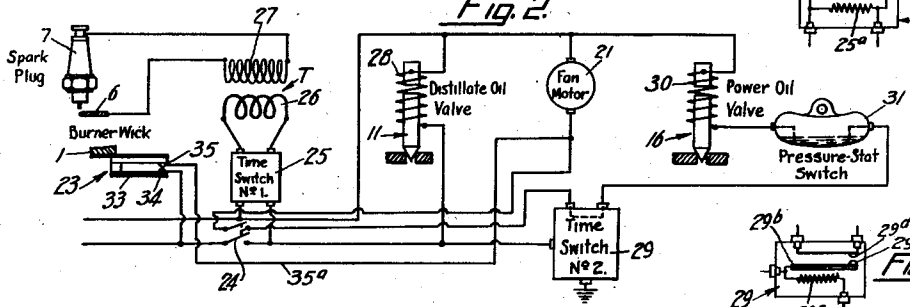
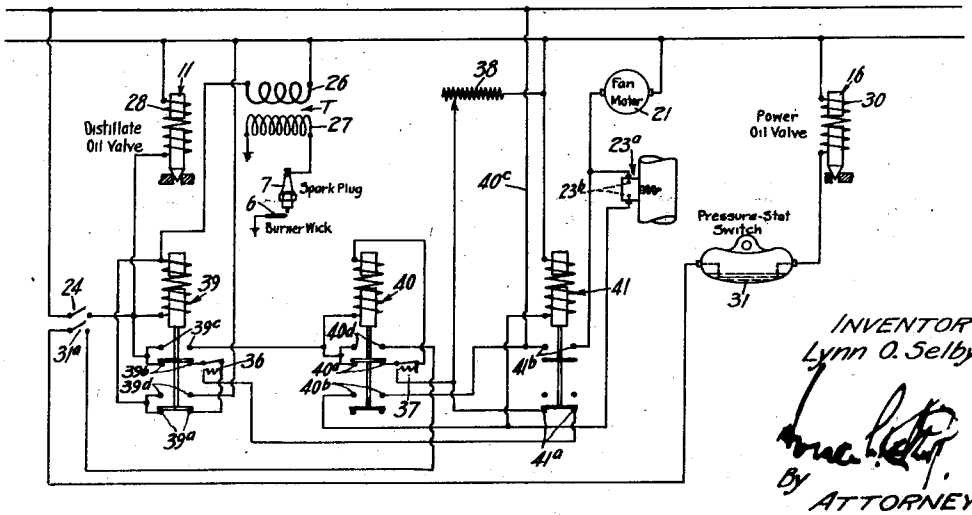


Fig. 4.

Fig. 5.



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OIL BURNER

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Application March 4, 1939, Serial No. 259,881

17 Claims. (Cl. 158—28)

My invention relates to oil burners.

It has among its objects to provide an improved control mechanism for combined burners of the type including a preheating and maintaining burner, herein called the distillate burner, and a main burner, herein called the power burner, preheated and maintained hot by the distillate burner ready for starting and operation at any time whereby an entirely automatic control of both of these burners is made possible. Further objects of my invention are to provide such control mechanism including an improved automatic starting mechanism for the distillate burner, and improved automatic controlling mechanism for the power burner including improved controlling mechanism for the fan motor thereof when the power burner is shut down, these mechanisms being so connected and cooperating as to be under the control of a single control member. Still further objects of my invention are to provide such improved controlling mechanism including improved time control mechanism operating in such manner as to insure successful automatic starting and automatic operation, while insuring satisfactory control of both burners and enabling the power burner to be shut down without smoking. These and other objects and advantages of my improvements will, however, hereinafter more fully appear.

In the accompanying drawing, I have shown for purposes of illustration two embodiments which my invention may assume in practice.

In the drawing—

Figure 1 is a side elevation, partially in section, of a combined distillate and power burner adapted for use with my improvements;

Fig. 2 is a wiring diagram of one form of controlling mechanism therefor;

Fig. 3 is a detail of the ignition controlling time switch;

Fig. 4 is a like detail view of the power burner fan and valve controlling time switch, and

Fig. 5 is a wiring diagram of a modified form of controlling mechanism.

In the illustrative construction shown in Figures 1 and 2, I have shown my improved controlling mechanism applied to a combined distillate and power burner of the type described and claimed in my copending application Serial No. 156,989, filed August 2, 1937, improved control means, hereinafter described, being provided whereby automatic operation and control of both the distillate burner and power burner is made possible.

Referring first to the distillate burner, the same is of the general construction disclosed in my application mentioned, including a burner base 1 having a vaporizing chamber 2 connected in a usual manner to oil grooves 3 and 4 equipped with usual wicks 6, while the vaporizing chamber is provided with a usual carbon leg 5. Herein, however, an electric spark plug 7 is provided to ignite the outer wick. Further, the fuel supply from a constant level float chamber 8 has its maximum flow controlled by a metering valve 9 and is connected by a pipe 10 to a normally closed solenoid valve 11 which controls the flow through a pipe 12 connected to the carbon leg 5. Also, improved controlling mechanism, hereinafter described, controls both the operation of the spark plug 7 and the solenoid valve 11.

Referring to the power burner, the same also, as heretofore, includes a vaporizing chamber 13 disposed coaxially within the vaporizing chamber 2 of the distillate burner, and an air supply pipe 14 delivering axially through the vaporizing chamber. The oil supply 15 to the vaporizing chamber 13 also is controlled by a solenoid valve 16 which, in turn, controls the flow through a pipe 17 from the constant level float valve chamber 8; the maximum flow being controlled by a metering valve 18, while the air is supplied to the air tube 14 through a conduit 19 from a blower 20 operated by a suitable electric motor 21 and having an adjustable air shutter 22. Here attention is, however, directed to the fact that improved thermostatic control means 23 are provided to control the operation of the fan motor 21, and cooperate with improved controlling mechanism also provided for controlling the solenoid valve 16 and this fan motor, as hereinafter brought out.

Referring to the controlling mechanism shown in Figure 2, attention is first directed to the automatic controlling mechanism for the spark plug 7. Herein a manual switch 24 is provided in one side of the line and a suitable time switch 25 is provided controlled by this switch 24. This time switch may be of any suitable type, but I have shown the same, for simplicity, of the thermostatic type including a heating coil 25*a* and a normally closed thermostatic switch element 25*b* carrying a contact 25*c* and adapted, after a predetermined heating period, as, for example, three to five minutes, to move said contact to disengage a contact 25*d* controlling current flow through a primary coil 26 of a transformer T having a secondary coil 27 connected to the spark plug 7. Thus, when the switch 24 is closed, current will flow from the line through the

switch 24 and the transformer T to energize the spark plug 7, and a spark will thus continue to be transmitted to the outer wick 6 until after the expiration of the desired time limit, when the thermostatic element 25b is opened, thereby interrupting operation of the spark plug circuit. At the same time that the time switch 25 is started by throwing the switch 24, it will also be observed that an actuating coil 28 for the solenoid valve 11 of the distillate burner is energized in such manner as to open this valve and thereby establish normal operating oil flow to the distillate burner.

Referring to the control mechanism for the power burner, the closing of the switch 24 also sets a suitable time switch 29 in operation which controls the operation of the solenoid valve 16 of the power burner and of the fan motor 21 for the latter. The time switch 29 illustrated herein (Fig. 4) is of the same general construction as time switch 25 save that it is of the type having its contacts normally open, and that it is adapted to provide a longer time interval. Herein, a movable contact 29a is carried by a bimetallic element 29b which is heated by a heating element 29c of high resistance or suitably heat insulated, and this contact 29a is adapted to engage a stationary contact 29d, after a predetermined heating interval, herein 15 or 20 minutes, the time necessary for the distillate burner to bring the oil in the vaporizing chamber 13 of the power burner up to such a temperature as to vaporize the same and maintain combustion when this vapor is mixed with the air passing through the tube 14. Herein, the fan motor 21 and actuating coil 30 for the solenoid valve 16 of the power burner are connected in parallel, a suitable pressurestat switch 31 responsive to the pressure in the boiler 32 also controlling the circuit to the actuating coil 30. Herein, it will also be noted that a thermostatic switch generally indicated at 23, is also mounted on the burner base 1, herein inside of a suitable burner enclosing casing 32a, and adapted to control the circuit of the fan motor 21. As shown, (Fig. 2) this switch includes a bimetallic strip 33 responsive to changes in temperature of the burner base 1 and carrying a contact 34 connected to one side of the line and adapted to cooperate with a contact 35 connected in a conductor 35a in a secondary fan motor circuit for energizing the fan motor from the line after its circuit through time switch 29 has been interrupted by opening of switch 24. Herein, this bimetallic element 33 is adapted to be maintained in circuit closing position while both the distillate and power burners are in operation, but is adapted to break the circuit through the contacts 34, 35, a suitable time after the power burner has been shut down, here, for example, ten to fifteen minutes.

In the operation of the burners equipped with my improved control mechanism, it will be evident that it is only necessary for the operator to close the switch 24 to start both burners in operation. When this switch is closed, the primary 26 of the transformer is energized in such manner as to cause operation of the spark plug 7. At the same time, the actuating coil 28 of the solenoid valve 11 of the distillate burner is opened to supply oil from the constant level float chamber 8 to that burner. The spark plug 7 will continue to operate and ignite the outer wick 6, the flow of current to the spark plug being interrupted after the predetermined time interval by the opening of the contact 25c of the time switch 25. In the meantime, the current supplied to the time switch 29 will set the time switch 29 in operation in such manner that this time switch, after a predetermined time, herein 15 to 20 minutes, will close the circuits to the fan motor 21, pressurestat switch 31, and actuating coil 30 of the solenoid valve 16 of the power burner. These circuits are only energized when the distillate burner has brought the vaporizing parts of the power burner to such temperature as to generate sufficient vapor to maintain combustion when the vapor is mixed with the air supplied through the tube 14. The thermostatic switch 23 also remains open during the operation of the distillate burner and until the power burner has sufficiently heated the bimetallic element of this switch to cause it to close. At any time during the operation of the burners, should the pressure generated in the boiler 32 be excessive, the pressurestat switch 31 will operate to interrupt the flow through the actuating coil 30 of the solenoid valve 16 of the power burner, and thereby permit this valve to close and stop the power burner. Further, this switch 31 will also automatically reestablish this circuit and thereby start the power burner when the pressure in the boiler 32 returns to normal, both this starting and stopping of the power burner being independent of the delay imposed by the time switch 29, since this switch 29 continues to hold its contacts 29a, 29d closed. Whenever the power burner is shut down by the switch 31, however, it will be observed that the fan motor 21 remains in operation so that no smoking occurs, the circuit of this fan motor being maintained through the time switch 29 irrespective of whether or not the power burner is shut down by switch 31 sufficiently long to cause the burner base thermostatic time switch 23 to open. Here it will be understood that the heat of the distillate burner alone is not sufficient to keep the switch 23 closed, this switch thus being responsive to starting and stopping of the power burner and functioning, first, to maintain the operation of the fan while the power burner might smoke for lack of air, and then, to shut down the fan. Thus when the main switch 24 is opened, to shut down both burners, this fan motor 21 will also continue to operate for such a predetermined time after this switch is thrown as determined by the time switch 23, the latter switch remaining closed until the burner base is cooled sufficiently to cause this switch to open.

In Figure 5, I have illustrated a modified form of controlling mechanism. In this control mechanism, wherein the corresponding operating parts of the burner mechanisms are indicated by the same numbers as used in Figure 2, it will be observed that, after coil 36 has timed the spark and the other 37 has timed the power burner oil valve and fan motor for the desired long heating period, instead of two time switches having their heating coils constantly in circuit, as herefore, heating coil 36 is cut out, while heating coil 37 is switched into a circuit including in series therewith the winding of relay 40 and a variable resistance 38, thus greatly reducing the current passing through heating coil 37. Further, it will be observed that in this construction magnetic relays 39 and 40 are used, of which the relay 39 controls the circuit through the coil 36, while the relay 40 controls the circuit of the heating coil 37. Further, an additional magnetic relay 41 is provided to control the inter-

ruption of the fan motor circuit. Of these magnetic relays, the relay **39**, through contacts **39***a* and **39***b*, also controls the spark and heater coil **36**, and through contacts **39***c*, the time delayed picking up of relays **40** and **41**, while contacts **39***d* control the holding coil circuit for relay **39**. Contacts **40***a* control the circuit to resistance **38** and heating coil **37** with a twenty minute delay for the operation of relays **40**, **41**, while contacts **40***b* control the normal circuit of the fan motor **21** and the energization of the coil of relay **41** from a supplementary line connection **40***c*, and contacts **40***d* control the circuit to the pressurestat switch **31** and the actuating coil **30** of oil valve **16**. Further, contacts **41***a* of relay **41** control the heating circuit for heating coil **36** of relay **39**, while contacts **41***b* control a fan motor circuit which remains closed after the relay **40** has dropped upon opening of the switch **24**. Here, however, it will be noted that a bimetallic stack switch **23***a*, responsive to the stack heat of the power burner to close its contacts **23***b*, is so connected in the circuit of the holding coil of relay **41** as to cause this relay to drop when, a predetermined time after the power burner is shut down, the switch **23***a* opens its circuit, as heretofore described; the auxiliary circuit of the fan motor being broken at contacts **41***b* as this relay **41** drops. A manual switch **31***a* is also provided in the circuit for coil **30** of solenoid valve **16** for the power burner, permitting the power burner to be shut down without maintaining steam pressure in the boiler. It will be understood, moreover, that when this switch **31***a* is open, the power burner is ready for instant resumption of operation upon closing the switch, just as in the case when this circuit is opened by pressurestat switch **31**, as above described.

Here it will be understood that I also contemplate the location of the switch **23**, shown in Figures 1 and 2, in the stack or elsewhere, rather than adjacent the burner base, so long as the same is responsive to the temperature of the power burner. Also, it will be understood that with the control mechanism shown in Figure 5, a switch **23** may be used on the burner base if desired, in lieu of a stack switch.

As a result of my improved construction, it is made possible to confine the necessary action of the operator to opening and closing the main switch, all other operations incident to starting the two burners and to the control of the power burner during the time that this switch is closed, being performed automatically by my improved mechanism. Thus, all necessity for separately operating an ignition circuit is eliminated, at the same time that this circuit is maintained closed only for a sufficient time to insure lighting of the wick. Further, the valves for the two burners are successively opened in the desired sequence, while both the valve for the power burner and the fan for the latter are so controlled by the time switch, pressurestat switch, and the switch on the burner base, as satisfactorily to meet the varying requirements of the device in operation.

While I have in this application specifically described two embodiments which my invention may assume in practice, it will be understood that these forms of the same are chosen for purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

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

1. In combination, a pair of oil burners having oil supplies and one burner preheating the other, valves controlling said oil supplies, a manually operable control member, ignition mechanism for said preheating burner controlled by operation of said member, and mechanism likewise controlled by said member for automatically opening the valve of said preheating burner and subsequently disabling said ignition mechanism and opening the valve of the preheated burner after a preheating operation while maintaining the valve of said preheating burner open to maintain said preheated burner constantly preheated ready for immediate starting.

2. In combination, a pair of oil burners having oil supplies and one burner preheating the other, valves controlling said oil supplies, a manually operable control member, ignition mechanism for said preheating burner including time control means controlled by operation of said member, starting mechanism for said burners likewise controlled by operation of said member including means for opening the preheating burner valve upon operation of said ignition mechanism and having time control means for opening said preheated burner valve following a predetermined preheating operation while maintaining the valve of said preheating burner open to maintain said preheated burner constantly preheated ready for immediate starting, and mechanism for starting and stopping said preheated burner in accordance with demands for heat while continuing to maintain the valve of said preheating burner open to maintain said preheated burner constantly preheated ready for starting.

3. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, means for starting and shutting down said burners, and means effective only upon the shutting down of said preheated burner and operating only when the preheating burner is also shut down for maintaining said fan motor in operation for a time interval after said starting and shutting down means has been moved to shutting down position.

4. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, mechanism for starting and stopping said burners including means for starting and stopping said preheated burner while maintaining said preheating burner in operation, and burner temperature responsive means inoperative to stop the fan while said mechanism is in starting position and operative to break the circuit of said fan motor after a time interval following the movement of said mechanism to stopping position.

5. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, mechanism for starting and stopping said burners including means for starting and stopping said preheated burner while maintaining the preheating burner and fan motor in operation, and burner temperature responsive means controlling the circuit of said fan motor and open during operation of said preheating burner only and closed during operation of said preheated burner and opening said fan motor circuit after a time interval following the movement of said mechanism to stopping position.

6. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, means for starting and stopping said burners, a time delay switch controlled thereby and controlling the starting of said fan motor, and burner temperature responsive means for effecting stopping of said fan motor after a time interval following the movement of said starting and stopping means to stopping position.

7. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, separate oil supplies for said burners, electromagnetically operated valves controlling said oil supplies, means for starting and stopping said burners, a time delay switch controlled thereby and controlling the starting of said motor and the opening of the valve for said preheated burner, means for stopping said preheated burner while maintaining said preheating burner and fan motor in operation, and means responsive to heat generated by said preheated burner for stopping said fan motor after a time interval following the movement of said first mentioned means to stopping position.

8. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, means for starting and stopping said burners, a time delay switch controlled thereby and controlling said motor, and means not responsive to the operating temperature of said preheating burner alone and responsive to heat generated by said preheated burner for stopping said fan motor after a time interval following movement of said first mentioned means to stopping position.

9. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, means for stopping and starting said preheated burner while maintaining said preheating burner in operation including a time delay switch controlling said motor, means for starting and stopping the preheating burner, a switch controlling the operation of said time delay switch, and temperature responsive means controlled by the heat generated by said preheated burner for stopping said fan motor a time interval after said preheating burner is stopped and said switch is opened.

10. In combination, a pair of oil burners, one preheating the other, and the latter having an air supply including a fan motor, means responsive to the heat generated by both of said burners for shutting down said preheated burner while maintaining said preheating burner and fan motor in operation, means for shutting down both of said burners, and means responsive to the heat generated by said preheated burner for maintaining said fan motor in operation for a time interval after said second mentioned means has been operated to shut down said burners.

11. In combination, a pair of oil burners having oil supplies and one burner preheating the other, air supply means for the preheated burner including a fan motor, mechanism for starting and stopping said preheated burner while maintaining said preheating burner and fan motor in operation, mechanism for starting and shutting down both burners, and thermostatic means adjacent said burners and heated by both burners for maintaining said fan motor in operation following movement of said mechanism into position for shutting down both burners.

12. In combination, a pair of oil burners, one preheating the other and the preheated burner having vaporizing means and air supply means including a fan motor, mechanism for starting and stopping said preheated burner while maintaining said preheating burner and fan motor in operation, means for starting and stopping both of said burners, and means responsive only to the operation of said starting and stopping means for maintaining said fan motor in operation a sufficient time after stopping of said burners to eliminate smoking of fuel in said vaporizing means.

13. In combination, a pair of oil burners having oil supplies and one burner preheating the other and the latter having an air supply including a fan motor, valves controlling said oil supplies, a manually operable control member movable into position to start and stop both burners, ignition mechanism for said preheating burner including time delay control means controlled by operation of said member, mechanism likewise controlled by operation of said member for effecting automatic starting of said burners including means for opening the preheating burner valve upon operation of said ignition mechanism and having time delay control means for opening said preheated burner valve following a predetermined preheating operation, and means responsive to the burner temperature of said preheated burner for continuing the operation of said fan motor for a time interval after said control member has been moved into stopping position.

14. In combination, a pair of oil burners having oil supplies and one burner preheating the other, electromagnetically operated valves controlling said oil supplies, ignition mechanism for the preheating burner, and electric control mechanism for said valves and electric ignition mechanism having a manually operable switch, operating coils for said valves, means for energizing the coil of the preheating burner valve to open the latter upon closure of said switch, electrically operated time delay switch means for cutting out said ignition mechanism, and electrically operated time delay switch means for subsequently energizing the coil of the preheated burner valve to open the latter while maintaining the oil supply to said preheating burner.

15. In combination, a pair of oil burners having oil supplies and one burner preheating the other, electromagnetically operated valves controlling said oil supplies, ignition mechanism for the preheating burner, operating coils for said valves, a manually operable switch for energizing the coil of the preheating burner valve to open the latter upon closure of said switch, and electrically operated time delay switch means including a heating coil and means actuated thereby to open the circuit of said ignition mechanism and a second heating coil and means actuated thereby subsequently to close the circuit of the coil for the preheated burner valve after different time intervals while maintaining the oil supply to said preheating burner.

16. In combination, a pair of oil burners having oil supplies and one burner preheating the other, electromagnetically operated valves controlling said oil supplies, ignition mechanism for the preheating burner, and electric control mechanism for said valves and ignition mechanism having a manually operable switch, operating coils for said valves, means for energizing the

coil of the preheating burner valve to open the latter upon closure of said switch, an electrically operated time delay switch including electric heating means adapted to cut out said ignition mechanism, and a second electrically operated time delay switch including electric heating means adapted to open the preheated burner valve, said time delay switches operating after different time intervals and having electromagnetically operated relays controlling the current flow through said heating means while maintaining the oil supply to said preheating burner.

17. In combination, a pair of oil burners having oil supplies and one burner preheating the other, electromagnetically operated valves controlling said oil supplies, ignition mechanism for the preheating burner, electric control mechanism for said valves and ignition mechanism having a manually operable switch, operating coils for said valves, means for energizing the coil of the preheating burner valve to open the latter upon closure of said switch, an electrically operated time delay switch for cutting out said ignition mechanism, a second electrically operated time delay switch including electric heating means adapted to subsequently energize the coil to open the valve of the preheated burner, air supply means for the preheated burner including a fan motor energized by said control mechanism upon closing the preheated burner valve, and temperature responsive means in circuit with said fan motor and responsive to changes in temperature of the preheated burner for maintaining said motor in operation after opening of said manually operable switch.

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