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BURNER CONTROL SYSTEM

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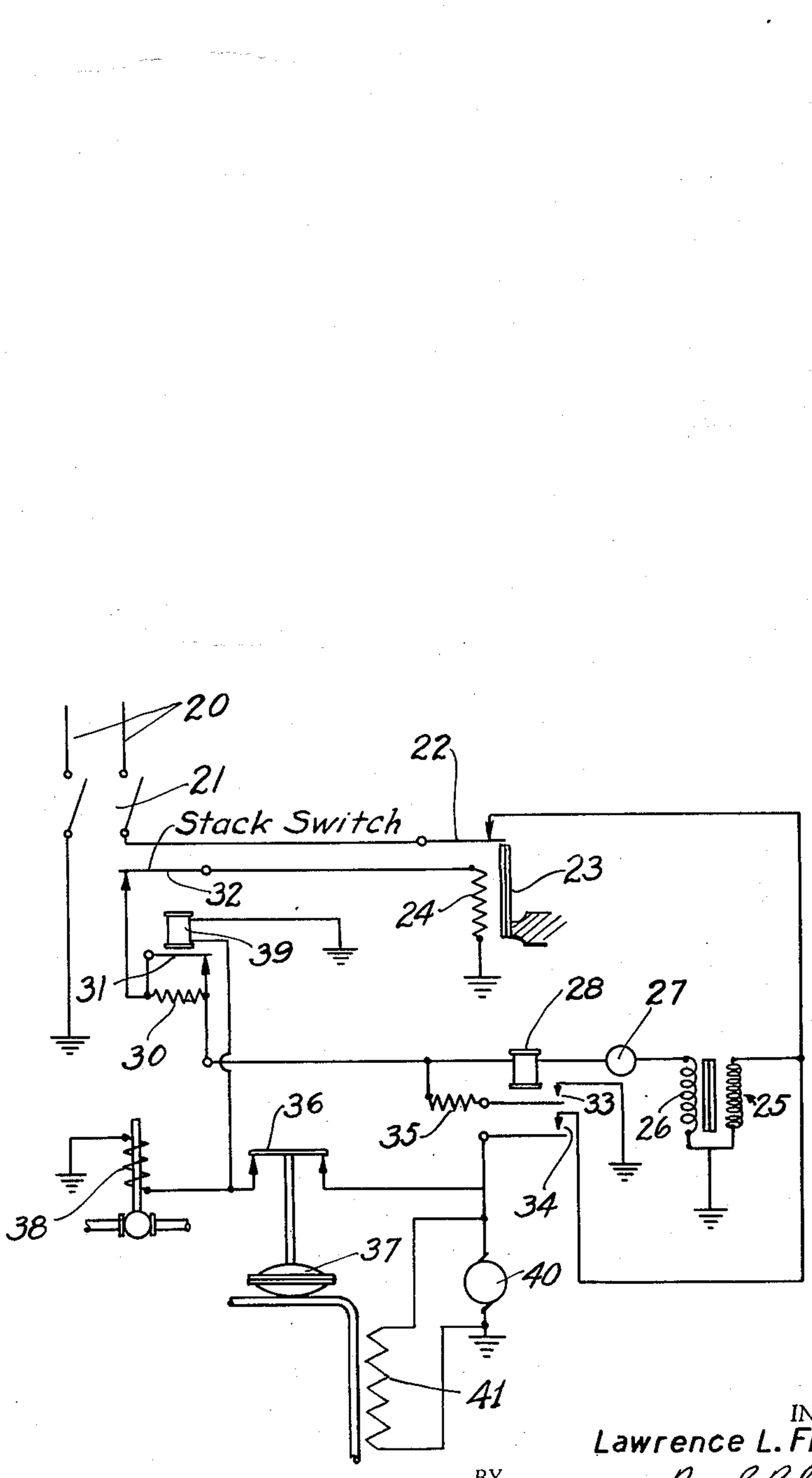


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## BURNER CONTROL SYSTEM

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5 Claims. (Cl. 158—28)

This application is a continuation-in-part of my co-pending application Serial Number 664,306, filed April 4, 1933, now Patent No. 2,158,359, for Viscosity regulated fluid fuel control means.

The present invention relates to electric control systems for fluid fuel burners. In particular this invention relates to an electric control system for low grade, or viscous, oil burners.

It is an object of the present invention to provide means for immobilizing the control system if the burner is not properly functioning after definite periods of time after certain operations.

It is another object of the invention to provide means for immobilizing a control system after a period of time if the temperature of a fluid is not of the proper order at the end of that time.

It is a further object of the present invention to provide means for immobilizing a control circuit after a long period of time if the temperature or viscosity of a fluid is not of the proper order at the end of that long period of time, and to provide means for immobilizing the circuit after a short period of time after the fluid has reached a proper temperature or viscosity if combustion is not taking place at the end of that short period of time.

It is a further object of the present invention to provide a control system for a fluid fuel burner in which there is a time delay between the initiation of the preliminary operation and the time at which proper fuel will be available at a particular location, which control system will allow preliminary operation for a set length of time or until the proper fuel is available and will then immobilize the control system if proper combustion does not take place within a pre-determined period of time.

Another object of the present invention is the provision in a fluid fuel burner of a control which will be responsive to the fuel's attaining a desired temperature to initiate a period of time during which combustion must take place or the system will be immobilized.

Another object of the present invention is the provision in a fluid fuel burner of means for circulating fuel for a certain period either of time or until a proper temperature of the fuel is obtained, and then initiating a time period for combustion after which time period if proper combustion has not taken place the system will be immobilized.

These objects and such others as will be apparent from the hereinafter disclosure are attained by means of a device such as shown in my co-pending application Serial No. 664,306, filed April 4, 1933, for Viscosity regulated fluid fuel control means, and by means of other devices hereinafter disclosed.

The device disclosed in my co-pending application comprises means associated with a fuel piping system which will not operate until a proper temperature of the fuel has been obtained and which upon operation will pre-set another device for immobilizing the system if combustion does not take place within a pre-determined time.

As a continuation-in-part, applicant provides a temperature control switch in the main power supply circuit which will operate after the current has flowed to the heater element thereof for a short pre-determined period of time; he provides in series with said heater element a resistance which will increase the time required for the operation of said temperature control switch; and he provides means for shunting out said resistance when fuel is delivered to the combustion chamber. Thus there are provided two controllable time periods, a long period during which fuel may be conditioned, and a short period during which proper combustion must take place. If either the fuel is not properly conditioned for passage to the combustion chamber or if proper combustion does not take place, the control circuit will be immobilized by the disconnection of the power.

In the accompanying drawing:

The figure is a wiring diagram showing a form of my invention. In this diagram power is supplied to the system through the wires **20**. A switch **21** is provided between the power source and the control system. The diagram has been simplified by grounding one side of the switch and all the return wires. The hot side of the circuit passes through a power, or thermo-responsive switch **22**. This switch is actuated by bi-metallic element **23**, which is heated by a resistance **24**. Connected to the out-put side of the switch **22** is a transformer **25**. The transformer **25** provides a source of low voltage for control purposes. The circuit from the low voltage side **26** of the transformer **25** passes through a temperature responsive switch **27**, and through a relay **28**. The low voltage circuit continues to the resistance **30**, which resistance may be shunted out by a relay operated switch **31**. The circuit continues through a stack switch **32**, and through the heater resistance **24** to ground. The heater resistance **24** is adjacent to the bi-metallic element **23**. Upon heating of the resistance **24** and the element **23**, and a pre-determined movement of the bi-metallic element, the switch **22**

will be opened. The switch is so constructed that it must be reset by hand and so that the time required for its operation may be manually adjusted.

Actuated by the relay 28 are two switches 33 and 34. The switch 33 is connected to the output side of the relay 28 through a resistance 35. The relay operated switch 34 is connected to deliver current to an oil temperature responsive control switch 36 operated by a thermostat 37. In series with the switch 36 are a solenoid 38 and a relay 39. The solenoid 38 actuates a valve which controls delivery of fuel to a combustion chamber. The relay 39 operates switch 31 to place the resistance 30 in series with heater resistance 24. The input side of the switch 34 is connected to the output side of the thermo-responsive switch 22. Also connected to the output side of the switch 34 is the fan and pump motor 40.

The construction and operation of the device is such that if upon closure of the main switch 21, the temperature responsive switch 27 is closed, the relay 28 will operate, and current will initially flow through the switch 31 in shunt with the resistance 30, through the stack switch 32, the heater resistance 24, and to ground. Operation of the relay 28 closes the switches 33 and 34. Closure of the switch 34 supplies power to the motor 40 and if the temperature of the fuel is low, current will pass through the switch 36, the solenoid 38 and the relay 39, and to grounds. Passage of power through the solenoid 38 prevents delivery of fuel to the combustion chamber. Passage of power through the relay 39 actuates the switch 31 and places the resistance 30 in series with the heater resistance 24. Placing of resistance 30 in series with resistance 24 will materially reduce the amount of current through the heater resistance 24 and consequently the heating effect thereof. This will increase the period of time required to open the thermo-responsive switch 22. If the circuit through the resistances 30 and 24 is not broken, the switch 22 will open in a pre-determined period of time and immobilize the entire system. As soon as the temperature of the fuel is satisfactory the thermostat 37 will operate to open the switch 36. Opening of the switch 36 will cause deenergization of the solenoid 38 and permit delivery of fuel to the combustion chamber. Also, opening of the switch 36 will cause deenergization of the relay 39 permitting the switch 31 to close and shunt out the resistance 30. Shunting out of the resistance 30 increases the current to and the heating rate of the resistance 24. Then if combustion does not take place promptly and properly in order to actuate the stack switch 32 and open the heater circuit, the system will be immobilized through opening of the switch 22. If the stack switch 32 opens properly in response to the heat of combustion, the relay 28 will continue operative through the resistance 35, the contact 33, and to ground.

This construction is effective to immobilize the system in a short time after initiation of the cycle if at the time of initiation the switch 36 is open due to the fuel being in the proper condition. This is due to the large amount of current delivered to the heater 24 if the resistance 30 is not in series therewith. Such would not be the actuation of the device if the resistance 30 were lumped with the resistance 24, and the resistance 30 could not be shunted out.

It will be understood that deenergization of the solenoid 38 and operation of the valve associated therewith, or of the valve 10 in Fig. 1, will not only deliver fuel to a combustion chamber but will initiate combustion, as a suitable fuel igniting device is provided for the fuel when delivered to the combustion chamber.

Having thus described my invention, I claim:

1. A fluid fuel burner control system, comprising: a fuel burner; a fuel heater; a motor and pump for circulating fuel through said burner and said heater; a thermostatic switch having a temperature responsive actuating element heated by means of an electrical resistance; actuation of said switch stopping said motor; means for simultaneously starting the operation of said motor, and for causing a current to flow through said resistance which will effect operation of said switch at the end of a predetermined time period; and means responsive to the temperature of the fuel for preventing or allowing the initial delivery of fuel from said burner to a combustion chamber and for decreasing the current flow through said resistance if said means does not allow fuel to be delivered, to affect the length of said time period and to permit circulation by said motor and heating by said heater of said fuel before delivery.

2. A liquid fuel burner control system, comprising: a fuel burner; a fuel heater; an electric motor and a pump for circulating fuel through said burner and said heater; an electrically actuated time switch connected in series with said motor; means for simultaneously starting the operation of said motor and the running of a predetermined time period to the operation of said switch; and means responsive to the temperature of the fuel for preventing or allowing the initiation of a trial period of fuel feeding from said burner to a combustion chamber during which ignition normally occurs, and for increasing the time period to the operation of said switch if said last means does not allow fuel to be fed to the combustion chamber, to permit circulation by said motor and pump, and heating by said heater of said fuel before delivery.

3. A liquid fuel burner control system, comprising: a fuel heater; a fuel burner; means for circulating fuel through said heater and said burner; a timing device capable of stopping said means for circulating; means for simultaneously starting the operation of said means for circulating and the running of a predetermined time period to the operation of said device to stop said means for circulating; and means responsive to the temperature of the fuel for preventing or allowing the initiation of a trial period of fuel feeding from said burner to a combustion chamber during which ignition normally occurs, and for increasing the time period to the operation of said device to stop said means for circulating if said means responsive to the temperature of the fuel does not allow fuel to be fed to the combustion chamber, to permit circulation by said means for circulating and heating by said heater of said fuel before delivery.

4. A liquid fuel burner control system, comprising: a fuel burner; a fuel heater; means for circulating fuel through said burner and said heater; a timing device capable of stopping said means for circulating; means for simultaneously starting the operation of said means for circulating and the running of a predetermined time period to the operation of said device to stop said means for circulating; means respon-

sive to the temperature of the fuel for preventing or allowing the initiation of a trial period of fuel feeding from said burner to a combustion chamber during which ignition normally occurs, and for increasing the time period to the operation of said device to stop said means for circulating if said means responsive to the temperature of the fuel does not allow fuel to be fed to the combustion chamber, to permit circulation by said means for circulating and heating by said heater of said fuel before delivery; and means for inactivating said timing device if proper ignition occurs.

5. A liquid fuel burner control system, comprising: a fuel burner; a fuel heater; an electric motor and a pump for circulating fuel through said burner and said heater; a time switch connected in the circuit of said motor; a switch for simultaneously starting said motor and the running of a predetermined time period to the operation of said time switch to stop said motor; means responsive to the temperature of the fuel for preventing or allowing the initiation of a trial period of fuel feeding from said burner to a combustion chamber during which ignition normally occurs, and for increasing the time period to the operation of said switch to stop said motor if said means responsive to the temperature of the fuel does not allow fuel to be fed to the combustion chamber, to permit circulation by said motor and heating by said heater of said fuel before delivery to the combustion chamber; and means for inactivating said time switch if proper ignition occurs.

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