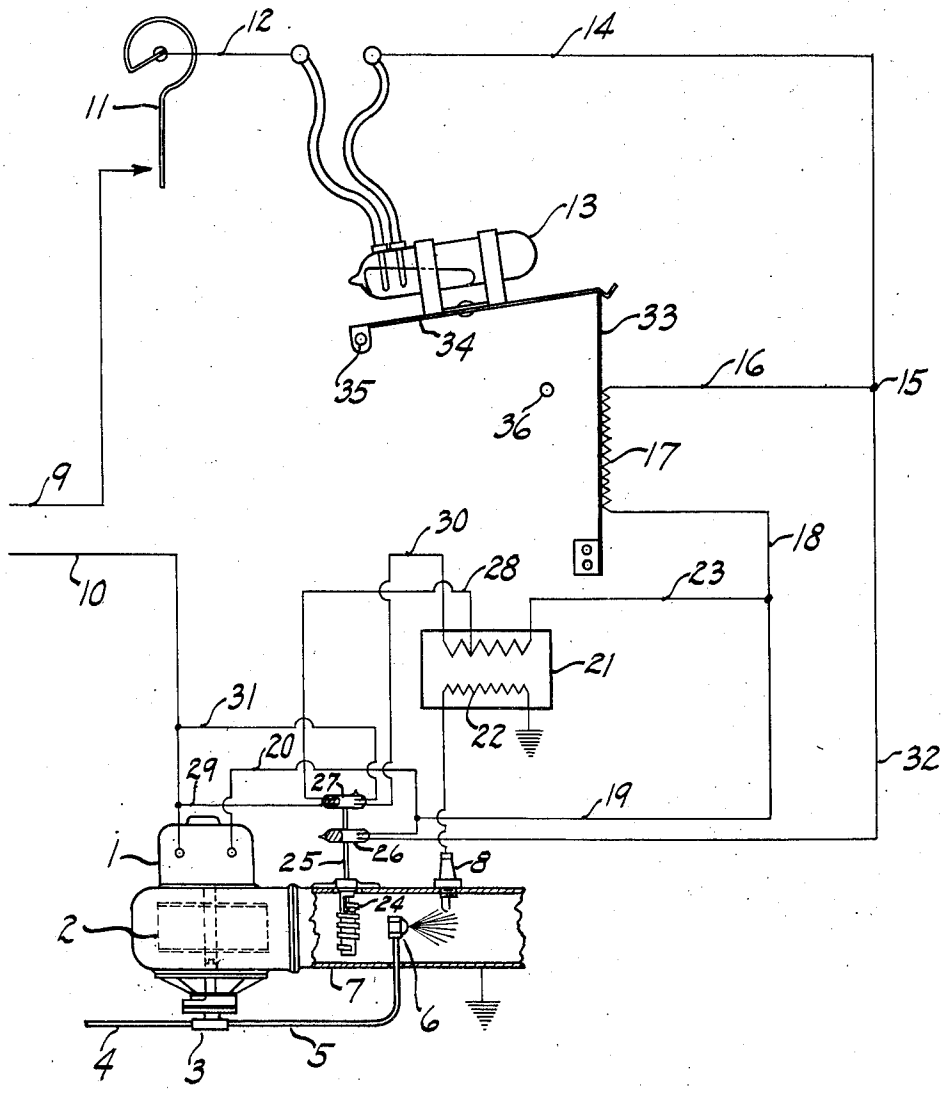
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IGNITION APPARATUS FOR OIL BURNERS

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IGNITION APPARATUS FOR OIL BURNERS

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This invention relates to electric jump spark ignition, commonly used for igniting the oil spray on oil burners.

One of the objects of my invention is to so arrange the jump spark ignition transformer so that when the burner starts up the ignition transformer will supply a very large, hot spark, much above that normally used, and that in a short time after ignition of the oil, the volume of the electric spark will be reduced but will continue to operate as long as the burner is in operation and will be capable of igniting the oil under normal conditions, even when operating at the reduced volume. Another object of my invention is to provide safety means so that in the event that the oil did not ignite, the current to the transformer will be shut off, so that said transformer could not continue operation in its overloaded starting condition.

The invention is illustrated in the accompanying drawing, which is a diagrammatic view of a fuel burning system, having my improved ignition apparatus applied thereto.

In said drawing, the numeral 1 indicates an electric motor which is adapted to drive the blower wheel 2 and the fuel pump 3. Fuel is sucked through the pipe 4 from a tank, not shown. The numeral 5 indicates the fuel delivery pipe which runs to the spray nozzle 6, which nozzle is adapted to spray the fuel under pressure so that it is finely atomized. Air from the blower wheel 2 is conducted to the fuel spray through the pipe 7, where the air and fuel are mixed. Ignition of the oil spray is accomplished by the electric spark plug 8. The burning oil flame may be projected into any type of furnace, not shown. The numerals 9 and 10 indicate the main electric power wires; the wire 9 connecting with the room thermostat 11, which thermostat controls the operation of the motor 1 according to the temperature in the room where the thermostat is located. The wire 12 connects to one terminal of the mercury safety switch 13, which switch is normally closed. The wire 14 connects to the other terminal of the mercury switch 13 and runs to the junction point 15. When the burner is first started by the closing of the contacts on the room thermostat 11, the current to the electric motor 1 is through the wire 9, through thermostat 11, through the contacts of the safety switch 13, through wire 14, through the junction point 15, through wire 16, through heat coil 17, through wire 18, through wire 19, through wire 20, through motor 1 and back to wire 10, thereby completing the circuit to the motor. The numeral 21 indicates an ignition transformer. The secondary winding 22 connects to the spark plug 8. It is common practice to use an ignition transformer on oil burners and to have said transformer in continuous operation as long as the oil burner is operating, because it has been found that at times there is a momentary stoppage of the oil, due to water in the oil, or dirt in the screen, whereby, if the spark only operated for a few seconds when the burner was started and was then cut off, there would be an explosion, in the event of momentary stoppage of the oil, that would not occur with the continuous operating transformer. The full winding on the primary of the transformer 21 will produce the normal operating spark in the secondary commonly used on oil burners, which spark is hot enough to ignite the oil under normal operating conditions. I have found that by tapping into the primary so as to cut out about 25% of its winding, I can, by certain switch arrangements which will be later described, greatly increase the output of the transformer during the starting period of the burner, and then, after ignition, reduce the transformer to normal operation. By this arrangement I get a very large, hot spark for a short period during the starting up of the burner, which insures more prompt ignition under adverse conditions, such as extremely cold weather, and operating on low gravity oil. Current to the primary coil of the transformer is taken through the wire 23. The numeral 24 indicates a piece of thermostatic metal which is located near the oil spray so as to get heat from the ignited oil, and said thermostatic metal is adapted, when heated, to rotate the shaft 25 through a small arc. Mounted on the shaft 25 are two mercury switches 26 and 27. The mercury in

these switches is shown in the position it assumes when the burner is not in operation. When the burner starts up, the current to the primary of the ignition transformer will go through the wire 23, through the wire 28, through the left hand contacts of the mercury tube 27, and through the wire 29 to the wire 10, thereby completing the primary circuit of the ignition transformer, whereby a certain number of turns on the primary of the transformer are cut out, and by this arrangement, the transformer will give an abnormal voltage and a very hot spark. As soon, however, as ignition of the oil occurs, the thermostat 24 will immediately operate so that the mercury in tube 27 will close the right hand contacts and open the left hand contacts and then the primary current to the transformer will be through the wire 23, through the wire 30, through the right hand contacts of the mercury switch 27, and through the wire 31 to the wire 10, thereby reducing the transformer to normal operation and this transformer will continue normal operation during the entire running period of the burner, and when running normal, the spark is great enough to re-ignite the spray should there be a momentary stoppage, as before described. Should the transformer 21 run continuously with the abnormal high voltage in current, said transformer would overheat and would use a great deal more current than would be necessary. As the change of operation of the transformer 21 from abnormal to normal is brought about by action of heat on the thermostat 24, I provide a safety cut off switch which will cut the current off of the transformer 21 while it is operating in the abnormal condition in the event that the oil should fail to ignite. As has been before stated, when the motor 1 starts up, the current goes through the heat coil 17, but as soon as the fire lights, the thermostat 24 will operate the mercury switch 26 so as to close the right hand contacts of said switch, and by this action, the heat coil 17 will be shunted out of the circuit, as the current to the motor 1 will then go from the point 15 through the wire 32, through the contacts of the mercury switch 26, and through the wire 20 to the motor 1. Should the fuel fail to ignite, the thermostat 24 will not operate the mercury tubes 26 and 27, and under this condition, the current will continue to flow through the heat coil 17, and in about two minutes time, the heat from the coil 17 will cause the thermostatic strip 33 to move to the right and release the mercury switch 13 so that it will drop and open the contacts of said mercury switch, thereby shutting off the current to the transformer 21 and motor 1, so that said transformer cannot continue operation in its overloaded condition. The mercury tube 13 is mounted on the member 34, which member is pivoted at 35, so that when the thermostatic strip 33 moves to the right, it will permit the member 34 to drop and cause the mercury in switch 13 to flow to the right hand side of said mercury tube, thereby opening the circuit to the transformer 21. The numeral 36 indicates a stop pin which is adapted to stop the member 34 after it has been released by the thermostatic strip 33.

From the above description, it will be seen that I have provided, in a conventional continuous operating ignition transformer of standard size, a means of having an abnormally hot spark for a short period during the starting time of the burner, and then, after ignition has occurred, I provide for switching the transformer to normal operation, and I further provide a safety means for cutting the current off of the transformer in the event ignition of the oil fails to occur.

I claim:—

1. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, a wire arranged to be connected to the primary of the transformer so as to cut out a portion of the primary winding and thereby cause the transformer to produce an abnormally hot spark, an automatic device for connecting and disconnecting said wire, thus permitting the transformer to operate at an abnormally high output during the starting period of the burner and restoring the transformer to normal operation in a short period of time after the burner is started.

2. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, said transformer being arranged and adapted to operate selectively with a high and low ratio between its primary and secondary, and automatic means for connecting said transformer to operate with a higher ratio during the starting period of the burner and with a lower ratio after the operation of the burner for a short period of time.

3. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, a wire arranged to be connected to the primary of the transformer so as to cut out a portion of the primary winding and thereby cause the transformer to produce an abnormally hot spark, an automatic device for connecting and disconnecting said wire, thus permitting the transformer to operate at an abnormally high output during the starting period of the burner and restoring the transformer to normal operation in a short period of time after the burner is started, and automatic means for breaking the circuit to the

primary of the transformer in the event of combustion failure.

4. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, a wire arranged to be connected to the primary of the transformer so as to cut out a portion of the primary winding and thereby cause the transformer to produce an abnormally hot spark, an automatic device responsive to the heat from the burner for connecting and disconnecting said wire, thus permitting the transformer to operate at an abnormally high output during the starting period of the burner and restoring the transformer to normal operation in a short period after the burner is started.

5. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, a wire arranged to be connected to the primary of the transformer so as to cut out a portion of the primary winding and thereby cause the transformer to produce an abnormally hot spark, an automatic device responsive to the heat from the burner for connecting and disconnecting said wire, thus permitting the transformer to operate at an abnormally high output during the starting period of the burner and restoring the transformer to normal operation in a short period of time after the burner is started, and automatic means responsive to combustion conditions for causing the circuit to the primary of the transformer to be broken in the event of combustion failure.

6. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, a wire connected to the primary of the transformer adapted to cut out a portion of the primary winding and thereby cause the transformer to produce an abnormally hot spark, and an automatic switch responsive to the heat from the burner located in circuit with said wire, said switch being arranged and adapted to remain closed when the burner is not operating and to open in a short period of time after ignition occurs.

7. In combination, an oil burner, an igniter, a transformer therefor adapted to supply a continuous jump spark during the operating period of the burner for igniting the oil, said transformer being arranged and adapted to operate selectively with a high and low ratio between its primary and secondary, and means including a thermostat operated by the heat from the burner for connecting said transformer to operate with the higher ratio during the starting period of the burner and with the lower ratio after the operation of the burner for a short period of time.

8. In combination, an oil burner, a spark plug, means adapted to supply selectively a current of high potential and a current of low potential to the spark plug for igniting the fuel, a switch adapted to selectively connect said supply means to the spark plug, a thermostat actuated by the heat from the burner, and means for connecting said thermostat to said switch.

9. In combination, an oil burner, a spark plug, means adapted to supply selectively a current of high potential and a current of low potential to the spark plug for igniting the fuel, a switch adapted to selectively connect said supply means to the spark plug, a thermostat actuated by the heat from the burner, means for connecting said thermostat to said switch, and means controlled by said thermostat adapted to disconnect said current supply means in the event of combustion failure.

10. In an oil burner, a motor for said oil burner, a main electric circuit connected to said motor, a transformer having its primary arranged for connection to said circuit, and being arranged and adapted to operate selectively with a high and low ratio between its primary and secondary, automatic means including a thermostat actuated by the heat from the burner for connecting said transformer to operate with the higher ratio during the starting period of the burner and with the lower ratio after the operation of the burner for a short period of time, a heating element in the main circuit, a second thermostat operated by said heating element, a switch controlled by the second thermostat to open the main circuit, and a shunt controlled by the first thermostat to cut out the heating element.

In testimony whereof I have hereunto set my hand.

LEWIS L. SCOTT.