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ELECTRICAL SPARK IGNITION MEANS FOR BURNERS

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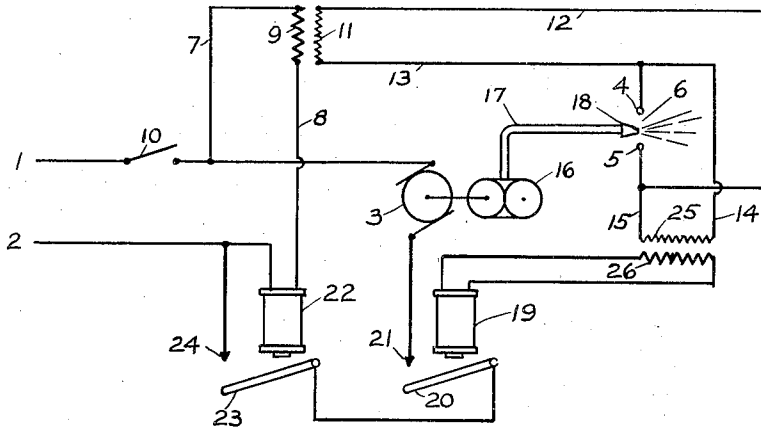


Fig. I

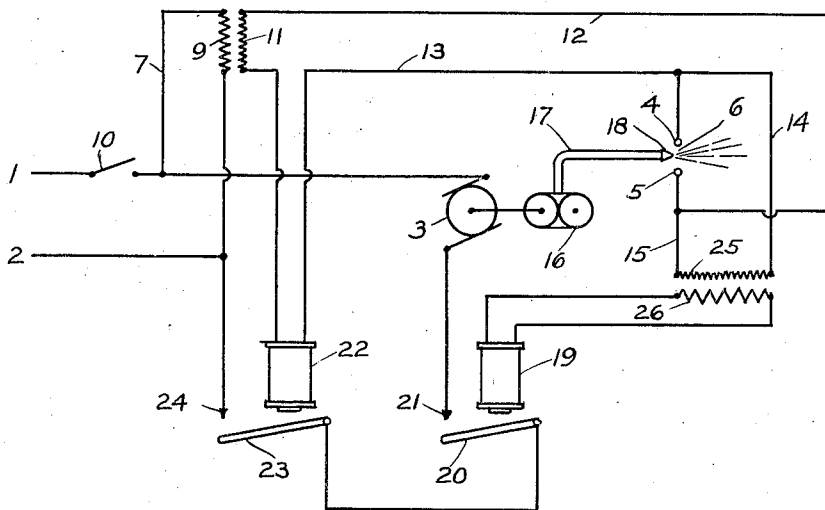


Fig. II.

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ELECTRICAL SPARK IGNITION MEANS FOR BURNERS.

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Our invention relates to safety ignition means for oil burners similar to the arrangement disclosed in our co-pending application Serial No. 120,855, and pertains particularly to an improvement in the circuit whereby an electrical spark of suitable intensity must be present in order to permit operation of the burner.

This circuit embodies a relay in series with one of the coils of the ignition spark transformer, whereby an open circuit or even an insufficient flow of current in either the primary or secondary circuit will prevent operation of the burner. It also embodies means whereby a short circuit or partial short circuit of the spark gap will prevent operation of the burner.

One of the objects of our invention is to provide a combination of apparatus requiring less minute adjustment than the arrangements illustrated in our co-pending application.

Other objects will hereinafter appear.

The nature and scope of our invention are more thoroughly explained in the following description taken in connection with the accompanying drawings forming part of this specification, in which:

Fig. I is a diagram of our spark control circuit in which a relay is placed in series with the primary of the ignition transformer, and a second transformer and relay are actuated by the secondary circuit of the ignition transformer.

Fig. II is a similar circuit with the first relay in series with the secondary of the ignition transformer.

Similar numerals refer to similar parts in all of the figures, in which:

1 and 2 are alternating current power leads, 3 is a motor, 4 and 5 are electrodes separated by spark-gap 6. 7 is a wire connecting one side of ignition transformer primary coil 9 to lead 1 when switch 10 is closed. 8 in Fig. I, connects the other side of primary coil 9 in series with relay coil 22 which is in turn connected to lead 2. Switch 10 represents either a manually operated switch or any type of thermostat or automatic switch for closing and opening the circuit.

In the arrangements shown, the air and oil pump 16 is driven by motor 3 and discharges a combustible mixture of oil and air through

conduit 17 and nozzle 18 into the firebox of the furnace.

The ignition transformer secondary coil 11 is connected by means of wires 12 and 13 to said electrodes 4 and 5. 14 and 15 are wires connecting the primary 25 of a second transformer in parallel with the secondary 11 of the ignition transformer. The secondary 26 of the second transformer is connected in parallel with relay coil 19. 20 is the armature actuated by relay-coil 19, and 21 is the point with which 20 contacts to connect one side of motor 3 with the armature 23 of relay coil 22. Armature 23 in turn connects with contact point 24 which is in turn connected with power-lead 2.

In Fig. II relay coil 22 is connected in series with secondary coil 11 of the ignition transformer.

The operation of our electrical ignition circuit is as follows:

The power current is always presumed to be on leads 1 and 2.

When the control switch 10 is closed (see Fig. I) relay coil 22 and primary coil 9 of the ignition transformer are energized. This latter energizes the high-tension secondary coil 11 producing a voltage of say 10,000 volts which normally causes a spark to jump across the spark-gap 6 between the electrodes 4 and 5.

When the proper spark is passing between the electrodes there exists a potential difference between wires 12 and 13, and relay-coil 19 is energized by said potential difference acting through the second transformer coils 25 and 26. Relay-coil 19 is so wound as to lift armature 20 to contact with point 21 when thus energized. Relay coil 22, being energized by the flow of current through the primary 9 of the ignition transformer, raises armature 23 to contact with point 24.

Since the switch mechanisms of both relays are in series with motor 3, the latter is connected across the main power leads 1 and 2 only when both relays are simultaneously energized.

If electrodes 4 and 5 should be pulled apart so that a suitable current could not jump across gap 6, the amount of current passing through the coils 11 and 9 of the ignition transformer would be reduced to such an extent that relay magnet 22 would drop arma-

ture 23 and thereby break the circuit to motor 3.

If on the other hand, carbon should build up on electrodes 4 and 5 and the secondary circuit thereby, or for any other reason, should become partially or wholly short-circuited, then the amount of current flowing through the primary coil 25, would be reduced, secondary coil 26 would receive less energy, and consequently relay coil 19 would release armature 20 and thereby break the motor circuit at point 21. Thus, relay coil 19 will open the motor circuit in case of a short in the ignition circuit, and relay coil 22 will break the motor circuit if the ignition circuit is open.

In the arrangement shown in Fig. II, where relay coil 22 is connected in series with the secondary instead of with the primary of the ignition transformer, the operation is identical with that described for Fig. I, since lack of current flow in the ignition circuit will obviously cause relay coil 22 to release the armature 23 and thereby break the motor circuit.

The arrangement of a special relay in series with the primary or the secondary of the ignition transformer constitutes an important feature of our invention.

Transformer coils 25 and 26, and relay 19 constitute only one of the means we have in mind for preventing operation of the motor when an insufficient spark is produced across electrodes 5 and 6. For instance, a vacuum or gas-filled tube can be connected suitably to operate from the potential existing across the gap, and when thus energized can be made to serve relay 19 the same as is now done by transformer coils 25 and 26; or the tube can be made to act as a relay to replace relay 19.

Having described our invention, what we claim and desire to secure by Letters Patent is:

1. In a burner ignition control device, a power circuit, a transformer having its primary connected to the power circuit, a pair of spaced electrodes forming a spark gap for igniting the burner, said electrodes being connected to the secondary of the transformer, a relay switch having its coil in series with the transformer for opening the power circuit when the electrode circuit is too widely opened, a second transformer with one coil shunted across the electrodes and means controlled by said second transformer for open-

ing the power circuit when the electrodes are short circuited.

2. In a burner ignition control device, a power circuit, an ignition transformer having its primary connected to the power circuit, a pair of spaced electrodes forming a spark gap for igniting the burner, said electrodes being connected to the secondary of the transformer, a second transformer having one coil in parallel with the electrodes so as to be energized when a spark is present at the gap and de-energized when the electrodes are short-circuited, and means actuated by the second transformer for opening the power circuit when the electrodes are short-circuited.

3. In an electrical circuit for burners, a power circuit, a fuel-supply motor, a relay switch having a coil and contactors, the motor and contactors being in series in the power circuit, a transformer having its primary shunted around the motor and contactors, a pair of spaced electrodes forming a spark-gap, said electrodes being connected to the secondary circuit of the transformer, the coil of the switch being in series with the transformer so as to open the contactors when the predetermined minimum current flows through the secondary circuit, a second transformer having its primary shunted across the electrodes and a relay switch having its contactors in series in the power circuit and having its coil connected to the secondary of the second transformer so as to open said contactors when the second transformer is de-energized by a short circuit of the electrodes.

4. In an electrical circuit for burners, a power circuit, a fuel-supply motor, a pair of relay switches having coils and contactors in series with the motor in the power circuit, an ignition transformer connected to the power circuit, a pair of electrodes forming a spark-gap in the secondary circuit of the transformer, the coil of one of the switches being in series with the transformer so as to open the motor circuit when a predetermined minimum current flows through the transformer, a second transformer having its primary in parallel with the electrodes and its secondary connected to the second coil so as to de-energize the second coil when the electrodes are short circuited.

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