May 19, 1925. 1,538,213

R. W. RANDALL

CUT-OUT SWITCH.

Original Filed Sept. 30, 1920

FIG. 1

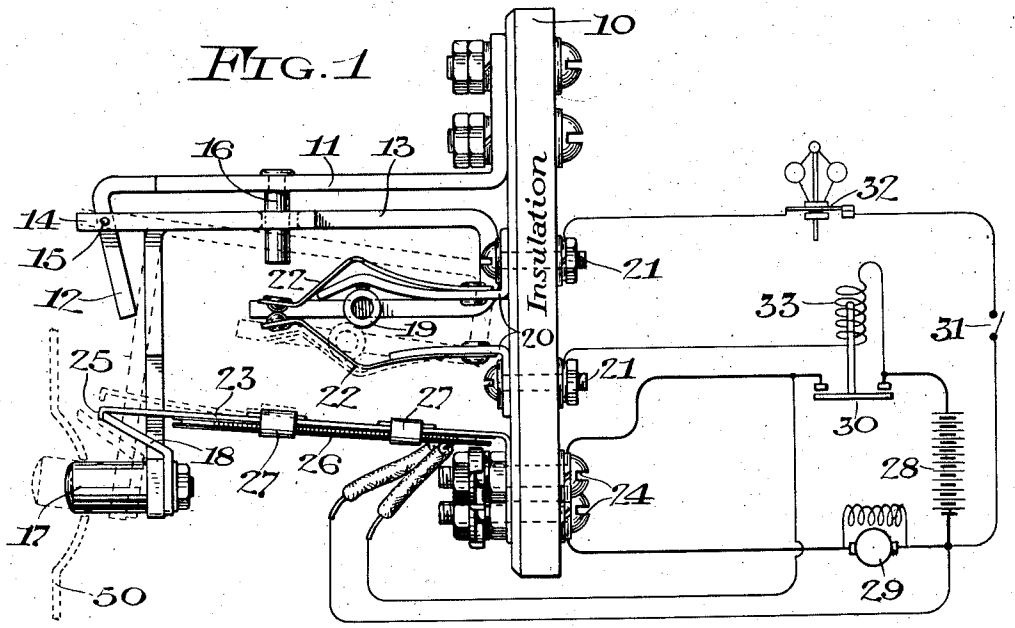


FIG. 2

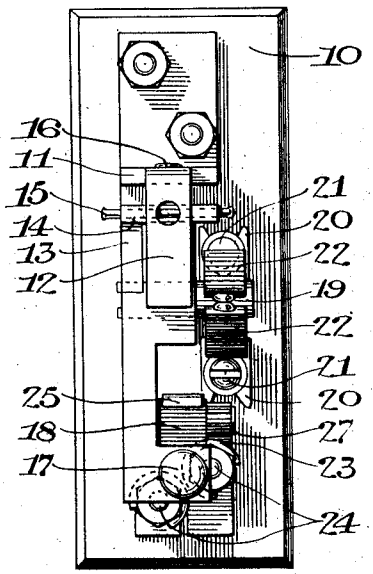


FIG. 3

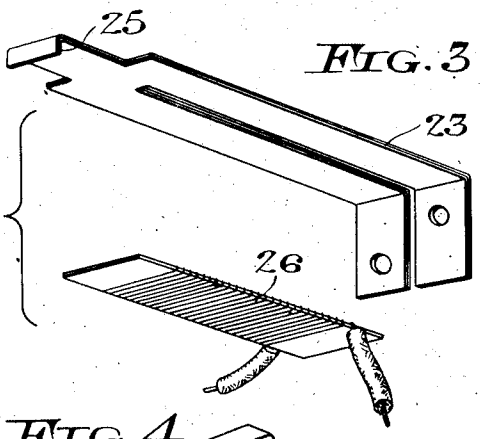
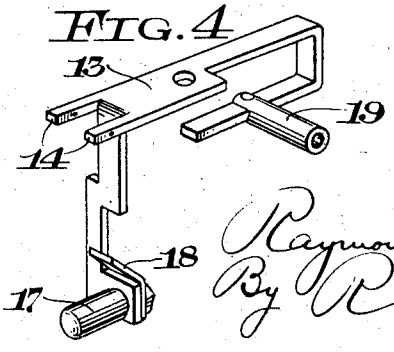


FIG. 4



WITNESSES

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UNITED STATES PATENT OFFICE.

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CUT-OUT SWITCH.

Original application filed September 30, 1920, Serial No. 413,782. Divided and this application filed April 7, 1922. Serial No. 550,470.

To all whom it may concern:

Be it known that I, RAYMOND W. RANDALL, a citizen of the United States, and resident of Toledo, in the county of Lucas and State of Ohio, have invented new and useful Improvements in Cut-Out Switches, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to thermostatic switches and particularly to switches of this type designed for the protection of automatic gasoline engine operated power and lighting plants in the event of the closing of the motor starting circuit and a failure of the motor to start the engine within a reasonable time.

In power and lighting plants of this type depending on a circuit established by the closing of a lamp socket switch or the local switch for any current consuming device, a failure of the starting motor to start the gas engine in operation to supply the demand for current may cause the motor battery to become depleted if the cause for the failure is not attended to promptly. The present invention provides a cut-out switch to open the motor circuit a short time after it is established if in the meantime it has not been effective for starting the gas engine in operation so as to have been opened by other automatic means.

With the above and other objects in view the invention consists in a thermostatic cut-out switch as herein claimed and all equivalents.

This application constitutes a division of the application filed by me September 30, 1920 for thermostatic cut-out switches, Serial No. 413,782.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in different views:

Fig. 1 is a side view of a thermostatic cut-out switch constructed in accordance with this invention and showing in diagram possible connections for its use in an automatic lighting and power plant;

Fig. 2 is an end view thereof;

Fig. 3 is a perspective view of the members constituting the thermostat elements, said members being separated, and,

Fig. 4 is a perspective view of the drop frame.

In these drawings 10 indicates an insulating base to which a bracket 11 is bolted or otherwise rigidly secured. The bracket preferably consists of a piece of strap metal bent to stand out from the base and having a reduced end 12 bent downwardly, as shown. A drop frame 13, also preferably consisting of a piece of bent strap metal, is fulcrumed to the downwardly bent reduced end 12 of the bracket 11 by having arms 14 cut from its downwardly bent front portion before bending same and allowed to remain horizontal in prolongation of its upper horizontal portion so that said arms 14 embrace the downwardly bent reduced end 12 with a fulcrum pin 15 passed therethrough and through the end 12. A drop frame is thus pivotally mounted on the bracket and is capable of a swinging movement, being guided by a guide pin 16 riveted to the bracket 11 and passing through an opening in the upper horizontal portion of the drop frame.

On the front downwardly extending end of the drop frame 13 is secured a button 17, preferably of insulating material, and preferably mounted on the same screw stud with it is a latch plate 18 bent so that its end extends forwardly and upwardly through an opening cut in the drop frame. The other end of the drop frame is reduced and bent forwardly with a laterally extending arm 19 secured thereto, said arm preferably consisting of a tube of insulating material slotted to receive the drop frame and riveted thereto.

A pair of contact supports 20, secured to the base 10 by bolts forming binding posts 21, have riveted to them spring contacts 22 which are normally in engagement with each other. One of the contact supports 20 is long enough to be engaged by the arm 19 and thereby constitutes a stop for limiting the movement of the drop frame in one direction. The other, however, permits the arm to engage the lower contact 22 so as to separate the contacts when the drop frame swings in the other direction against the end 12 of the bracket.

A thermostat element 23 which consists of a bifurcated strip of bimetallic thermostat material, with its two ends secured to the base 10 by bolts forming binding posts 24, is bent out from the base and its reduced end is bent downwardly to form a hook 25

for engaging the edge of the latch plate 18 for holding the drop frame in its raised position, shown in full lines. This thermostat element is adapted to have an electric current pass through it and offers a resistance thereto such that it is caused to be heated thereby. The material of which the thermostat element is made is arranged so that the characteristic warping incident to such heating will lift its hooked end 25, and in order to increase this action an additional heating element 26, consisting of a coil of resistance wire wound about a sheet of insulation, is attached to the under side of the thermostat element by means of metal clips 27, sheets of insulation, such as mica, being interposed between the metal parts to prevent short circuit. This heating element 26 may be connected directly across the starting motor battery so as to be controlled by the starting motor switch and thereby receive current at the same time as the thermostat element 23.

The diagram in Fig. 1 represents a possible circuit arrangement in which the thermostatic switch of this invention may be used. A heavy line motor circuit includes a battery 28, a starting motor 29 for the gas engine which drives the generator of a lighting system or the like, not shown, the thermostat element 23 and a motor starting switch 30. The auxiliary heating element circuit includes the battery 28, said heating element 26 and the switch 30. The control circuit includes battery 28, a switch 31, which may be a hand switch or an automatic switch, an automatic switch 32, which is preferably a governor controlled switch or other switch operated to open the control circuit when the gas engine is properly functioning, the switch contacts 22 and the solenoid 33 of the motor starting switch 30.

In operation, the closing of the control circuit by means of switch 31 energizes the solenoid 33 to close the motor starting switch 30. This completes the motor starting circuit to operate the motor 29 to start the gas engine and generator in operation, and upon the successful accomplishment of that function the switch 32 opens the control circuit by the action of the governor or other suitable automatic means. Should the switch 32 not be opened within a reasonable time, which would indicate the failure of the gas engine to properly assume its duty of driving the generator to supply the lighting system, for some reason, the heating of the thermostat element 23 by the motor starting current passing through it or by the heating coil 26 beneath it will cause it to rise to the dotted line position and so release the latch plate 18, permitting the drop frame to swing on the fulcrum 15 to the dotted line position thereupon opening contacts 22 by the engagement of the insulating arm 19 with the lower contact 22, and so opening the control circuit. The solenoid 33 will thereupon be de-energized, permitting the motor starting switch to drop and open the motor starting circuit.

The failure of the generator to supply the demand for service will constitute a signal giving notice that the generator plant should be inspected to remedy the cause of the failure, whether it be a lack of fuel or lubricant, failure of ignition, failure of the storage battery, or other cause. When the cause for failure has been remedied and in the meantime the cooling of the thermostat element has permitted it to resume its normal position, the button 17 may be depressed so as to again lift the drop frame and cause the latch plate to engage the hook of the thermostat element and the arm 19 to release the contact 22 to permit it to engage the other and close the control circuit. If the service switch has remained closed during this time, this resetting operation by completing the closing of the control circuit causes the solenoid 33 to become energized to close the motor starting switch to start the motor 29 and set the generating plant in operation. The starting operation will be effected before the thermostat cut-out switch becomes operative, if conditions are normal, and consequently the automatic switch 32 will be opened by the governor or other automatic means as the result of the operation of the generating plant and the motor starting switch will be opened and the thermostat element and heating coil cut out of circuit before they have had a chance to release the drop frame.

In practice the automatic cut-out switch of this invention is enclosed in a casing 50 and only the button 17 thereof is exposed through an opening, as shown.

In order to utilize the comparatively inexpensive commercial bi-metallic thermostat metal it is necessary that the current passing through it should be of considerable strength and consequently the full motor current is passed therethrough. Though the purpose of the switch operated by the thermostat is to open the motor circuit, in order to avoid heavy arcing at the delicate contact points, this switch is not directly in the motor circuit but is in the control circuit including the solenoid 33 of the motor starting switch 30 which is capable of breaking the motor circuit without damage thereby.

In keeping with the provision for obtaining a maximum deflection of the thermal element by passing the strongest current available therethrough is the provision of the supplemental heating element co-operating therewith to augment the heating influence and the deflection thereof and which for best results is connected directly across the terminals of the battery by means of the motor

starting switch. It is to be understood, however, that this supplemental heating element is not essential to the operation of the thermal cut-out switch for the heavy flow of current through the high resistance thermal metal may alone be relied on for the purpose of releasing the switch. The presence of the supplemental heating element affords a convenient means for adjusting and predetermining the time element for the operation of the cut-out switch.

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

1. In a cut-out switch for a gas engine operated electric light and power plant having a starting motor for starting the gas engine, a motor circuit including the starting motor, a solenoid switch controlling the motor circuit, a thermostat element included in the motor circuit and capable of slowly responding to the current flow therethrough, a switch operated by the thermostat element when it responds to the motor starting current, and a control circuit including said switch and the solenoid of the solenoid switch.

2. In a gas engine operated electric light and power plant, a starting motor for starting the gas engine, a motor circuit including the starting motor, a solenoid switch controlling the motor circuit, a thermostat element included in the motor circuit and capable of slowly responding to the current flow therethrough, a switch operated by the thermostat element when it responds to the motor starting current, a control circuit including said switch and the solenoid of the solenoid switch, and a heating coil in a circuit also controlled by the solenoid switch and so disposed with relation to the thermostat element as to heat it.

3. In a gas engine operated electric light and power plant, a starting motor for starting the gas engine, a motor circuit including the starting motor, a solenoid switch controlling the motor circuit, a thermostat element included in the motor circuit and capable of slowly responding to the current flow therethrough, a switch operated by the thermostat element when it responds to the motor starting circuit, a control circuit including said switch and the solenoid of the solenoid switch, and a governor operated switch for opening said control circuit when the starting motor succeeds in starting the gas engine.

In testimony whereof, I affix my signature.

RAYMOND W. RANDALL.