March 4, 1924. 1,485,580

J. G. ZIMMERMAN

THERMOSTATIC CIRCUIT BREAKER

Filed Nov. 17, 1919

Fig. 1

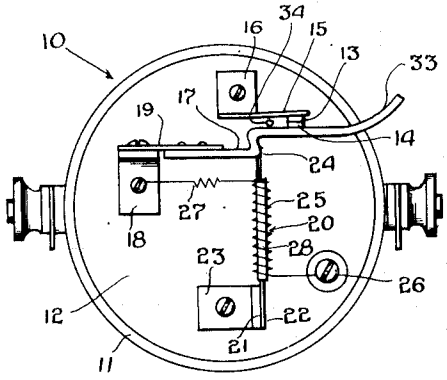


Fig. 2

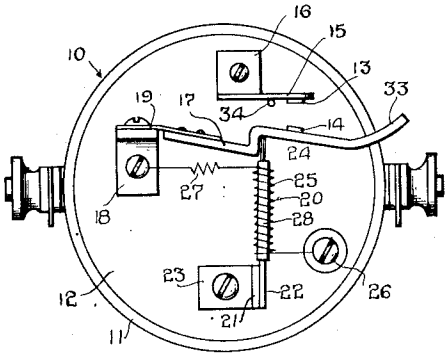


Fig. 3

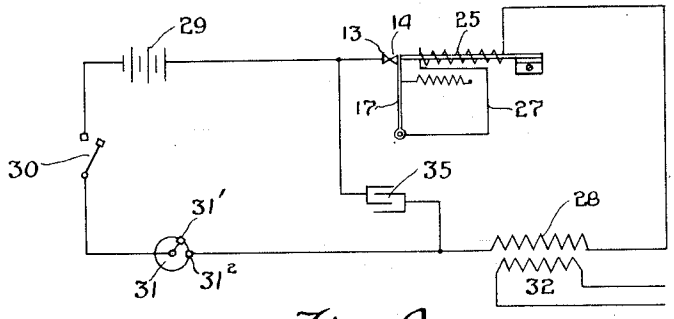
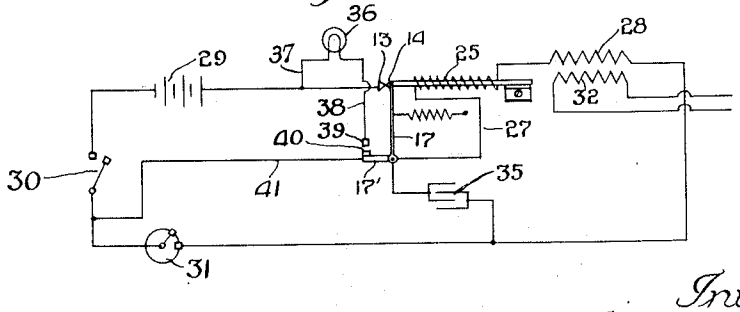


Fig. 4



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UNITED STATES PATENT OFFICE.

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THERMOSTATIC CIRCUIT BREAKER.

Application filed November 17, 1919. Serial No. 338,494.

To all whom it may concern:

Be it known that I, JAMES GARFIELD ZIMMERMAN, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Thermostatic Circuit Breakers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to thermostatic circuit breakers.

The usual form of ignition systems for internal combustion engines includes a timing mechanism operated by the engine to effect an intermittent interruption in the primary circuit of an induction coil in order to induce sufficient voltage in the secondary circuit to produce the igniting spark. The engine not infrequently stops in such position as to leave the primary circuit closed. This not only causes a drain upon the batteries but frequently results in the burning out of the induction coil. Numerous schemes have been adopted for preventing injury to the induction coil when such condition occurs.

The general aim of the present invention is to provide an improved means for this purpose which will function satisfactorily under all working conditions.

This is accomplished by automatically effecting a break in the primary circuit within a certain time interval after the circuit has been closed by the timing mechanism or from any other cause. The provision of such time interval permits the temporary closure of the circuit during ordinary running conditions and during such time as is necessary for starting the engine.

Other more specific objects are to provide a thermostatic circuit breaker which will open with a quick action and thus avoid burning of the contact points; to provide a circuit breaker for this purpose which will require a manual manipulation to reclose the circuit; and to provide a circuit breaker of this character so constructed as to be conveniently reset.

Other objects and advantages will hereinafter appear.

An embodiment of the present invention is illustrated in the accompanying drawings.

The views of the drawings are as follows:

Figure 1 is an elevation of one form of the invention applied to the end of an induction coil of standard type.

Figure 2 is a view similar to Figure 1 showing the parts in a different position.

Figure 3 is a diagrammatic view illustrating the application of the present invention to an ignition system.

Figure 4 is a diagrammatic view illustrating the application of the invention to an ignition system of somewhat different form.

The embodiment of the invention illustrated in the drawings includes a thermally controlled and preferably spring actuated switch for connection in series with an induction coil and with a source of electric current such, for instance, as a battery. The switch may be mounted upon the coil casing or independently mounted upon the dash panel of an automobile, or, in fact, at any point within convenient reach of the operator. The connections are such that, during a continued closed condition of the circuit, current flowing through the thermostatic control element will, after a definite time interval raise the temperature of the control element to such a degree as to effect a release of the switch to open the circuit. The circuit preferably remains in open condition until closed by manual manipulation of the cut-out switch.

The capacity of the thermostatic control is such that the critical temperature is never reached during the running of the engine or during such period of time as is necessary to start the engine.

The induction coil 10 shown in Figures 1 and 2 of the drawings is a well known type and includes a primary and secondary coil enclosed in the usual cylindrical insulating casing 11. In the present instance the automatic cut-out switch mechanism is mounted upon a disk or plate 12 of insulating material forming a part of or attached to the casing 11.

The switch mechanism includes a relatively fixed contact 13 and a relatively movable contact 14. The fixed contact is preferably mounted upon a resilient arm 15 carried by a suitable bracket 16 rigidly secured to the plate 12. The movable contact 14 is mounted upon an arm or lever 17, supported by a

bracket 18, rigidly secured to the plate 12. A resilient strap 19 connecting the lever 17 with the supporting bracket 18 tends at all times to press the lever in such direction as to separate the contacts 13 and 14 to open the switch.

Means is provided however for normally holding the switch closed. This means includes a thermostat of any well known or approved type constituting a detent or latch for retaining the switch lever 17 in the closed position against the action of the resilient strap 19 but operable to release the lever to open the switch when the temperature of the thermostat has risen to a predetermined point. In the present instance this thermostat comprises an arm 20 composed of a pair of strips 21 and 22 of dissimilar metals, such as copper and steel rigidly secured together. One end of the arm 20 is mounted upon a bracket 23 rigidly secured to the plate 12. The other end normally engages a shoulder 24 formed on the lever 17 preferably by bending the lever as shown. A suitable resistance coil 25 is wound about the arm 20 and is electrically connected at one end to a suitable terminal 26 and at the other end to an extensible conductor 27. The other end of the conductor 27 is electrically connected with the switch lever 17 through the supporting bracket 18. The resistance coil 25 is well insulated from the thermostatic arm 20 by interposing a sleeve 28 of insulating material therebetween. It will be understood that the arm 15 and bracket 16 are made of a good conducting material so that when the switch is closed current entering through the terminal 26 will flow through the resistance coil 25, conductor 27, switch lever 17, across the switch and to the bracket 16. In practice this circuit is connected in series with the primary windings 28 of the induction coil as is diagrammatically illustrated in Figures 3 and 4.

A diagram of a complete primary circuit of an ignition system is illustrated in Figure 3. This circuit includes a battery 29, a main switch 30, a timing mechanism 31, the primary windings 28 of an induction coil and the thermostatic circuit breaker above described. The secondary windings 32 of the coil are connected to the spark plugs not shown. Should the engine stop with the timer contacts 31′ and 31² closed and the operator fails to open the main switch 30 current will continue to pass through the circuit and through the resistance coil 25 and thus heat the thermostatic arm 20. As the temperature of the arm 20 gradually rises the arm gradually bends until it reaches a position such as indicated in Figure 2, thus releasing the switch lever 17 to permit the switch to quickly open under the action of the resilient strap 19. Thus it will be seen that the circuit is automatically and quickly opened within a certain time interval after the engine has stopped thus avoiding a useless drain upon the battery, and the danger of burning out the coil.

As the arm 20 cools it tends to regain its normal straight position but the shoulder 24 on the lever 17 prevents such action until the switch has been again closed by some other means. Such means may be in the form of a finger piece 33 on the switch lever extending within easy reach of the operator. When the finger piece 33 has been moved to close the switch the arm 20 snaps back to its normal latching position.

The resiliency of the arm 15 effects a quick separation of the switch contacts in a manner which will now be described. The movable contact 14, in closing, presses the fixed contact 13 slightly backwardly against the action of the arm 15. As the lever 17 is released and the switch starts to open the arm 15 first causes the fixed contact to follow the movable contact until the arm 15 has reached its normal position of rest or until it has engaged a suitable stop 34 provided for this purpose. At this time the slight following movement of the fixed contact is abruptly arrested and the separation of the contacts occurs. Thus the separation occurs during the full speed movement of the lever 17 rather than at the time the movement of the lever is accelerating from zero to full speed.

The switch mechanism above described may be enclosed in a casing of any desired character so that the temperature of the thermostatic element will not be materially effected by outside influence.

In the diagram of Figure 3 a condenser 35 is shown connected across the battery, main switch and timing mechanism in order to reduce the arcing which might occur either at the main switch or timing mechanism. By connecting the condenser across the thermostatic switch as well as the main switch and timing mechanism, as shown in Figure 4, arcing at the thermostatic switch contacts may also be avoided.

Means may be provided for indicating the condition of the thermostatic switch. This may be in the form of an audible signal such as a buzzer, or a light may be used. In the present instance a lamp 36 is employed. One lead 37 from the lamp is electrically connected to one side of the battery while the other lead 38 is connected to a fixed contact 39. The switch lever 17 is provided with an insulating extension 17′ carrying a movable contact 40 for engaging the fixed lamp contact 39 when the lever 17 moves to open position. The movable contact 40 is connected to the other side of the battery through a lead 41 and the main switch 30. Thus it will be seen that so long as the thermostatic switch is closed the lamp circuit

is open but as the lever 17 moves to the right to open the thermostatic switch, the insulating extension 17′ moves contact 40 against contact 39 to complete the lamp circuit and light the lamp.

Although the invention has been described in connection with an ignition system as a means for protecting an induction coil and battery it will be understood that it may be used in various other relations as a protective device for other electrical apparatus.

It is clear that the resistance coil for the thermostatic element need not necessarily be connected in series with the apparatus to be protected since the apparatus would function in the same manner if the resistance were connected in parallel therewith.

Various other changes may be made in the embodiment of the invention hereinabove specifically described without departing from or sacrificing any of the advantages of the invention defined in the following claims.

I claim:

1. The combination of a switch having fixed and movable contacts, a movable member for actuating said movable contact, means for moving said member to open the switch, a thermostatic arm for engaging said member to normally hold said switch closed, a resistance element normally in circuit with the switch, for varying the temperature of said arm to release the same and permit said switch to open, and a shoulder on said member to prevent the return of said holding arm to normal position until said switch is closed.

2. In combination, a mounting base, a spring arm on said base having a relatively fixed contact, a thermostatic arm attached to the base and extending toward said spring arm, an arm having an offset portion and a contact cooperable with said first contact, said arm extending between said first contact and said thermostatic arm and being adapted to be held with the contacts in electrical engagement by end-wise engagement of said thermostatic arm therewith, said thermostatic arm being adapted to be flexed from endwise engagement with said contact carrying arm into the offset portion thereof to permit opening of the switch, said contact carrying arm projecting to provide a finger piece for closing the switch.

In witness whereof I hereunto subscribe my name this 28th day of October, 1919.

JAMES GARFIELD ZIMMERMAN.