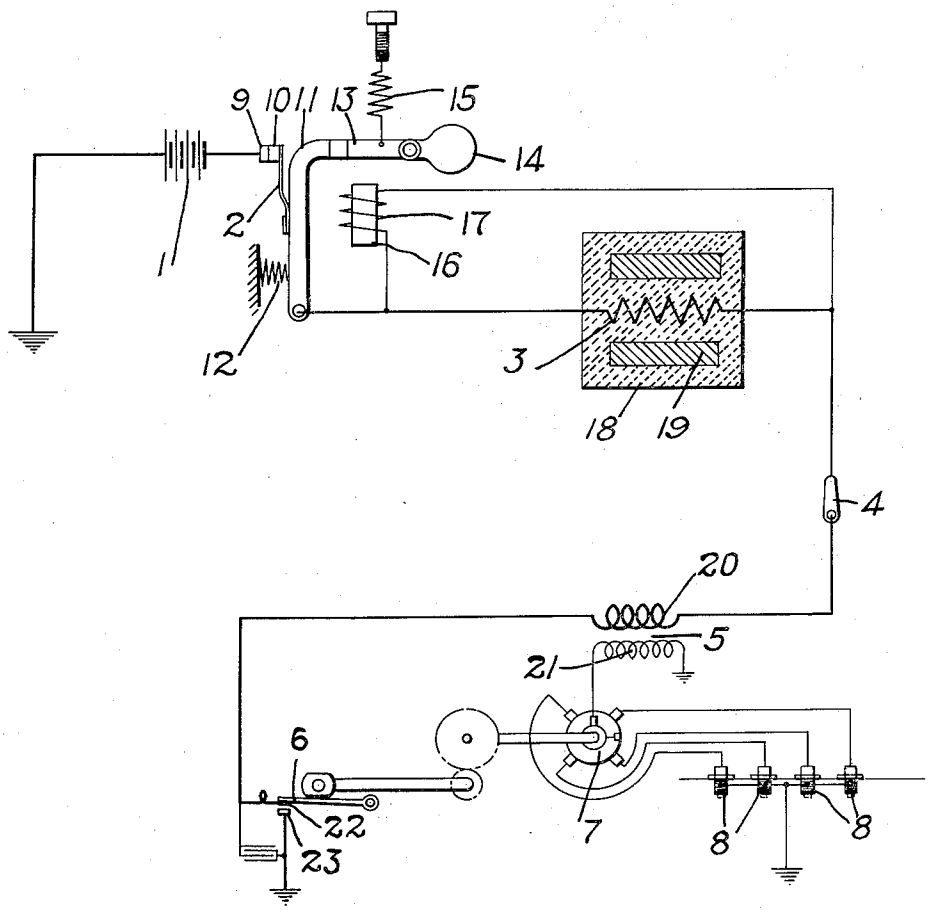
H. V. S. TAYLOR.

IGNITION SYSTEM.

APPLICATION FILED JAN. 5, 1916.

1,327,790. Patented Jan. 13, 1920.



WITNESSES:

R. J. Cadge.

J. R. Langley.

INVENTOR

Horace V. S. Taylor.

BY

Wesley & Clark

ATTORNEY

UNITED STATES PATENT OFFICE.

HORACE V. S. TAYLOR, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

IGNITION SYSTEM.

1,327,790. Specification of Letters Patent. Patented Jan. 13, 1920.

Application filed January 5, 1916. Serial No. 70,421.

To all whom it may concern:

Be it known that I, HORACE V. S. TAYLOR, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Ignition Systems, of which the following is a specification.

My invention relates to ignition systems and particularly to controlling means therefor.

My invention has for its object to provide a simple and efficient means for automatically opening the primary circuit of an ignition system when current traverses said circuit continuously for a predetermined period.

In the operation of ignition systems for internal combustion engines, it may occur that the ignition system comes to rest in such position that the usual interrupter is in its closed position to complete the primary circuit. Should the operator neglect to open the ignition circuit by means of the usual manually operable switch or to remove the switch plug, current flows from the storage battery through the primary circuit of the ignition system and the energy of the battery is wasted. In case the ignition circuit is closed for a considerable period of time, the battery may be wholly discharged.

I provide an arrangement which operates automatically to open the primary circuit of an ignition system when current traverses the circuit continuously for a predetermined period. It is well known that during the normal operation of an ignition mechanism, only a small current is required at intervals of very short duration. The heating effects upon resistors or other devices in circuit are therefore slight, as compared with those resulting from a continuous flow of current.

An automatc cutout, which is biased to the open position, is retained in its closed position by a trigger mechanism which constitutes the armature of an electromagnet. A shunt circuit for the coil of the electromagnet comprises a ballast resistor which is provided with means for storing heat. During the normal operation of the system, the resistor, which is composed of material having a positive temperature coefficient, has a low resistance value and substantially no current traverses the coil of the electromagnet. When current traverses the resistor continuously, the temperature of the resistor rises and its resistance is increased. Current is accordingly caused to traverse the coil of the electromagnet, and the latter operates to attract the armature and release the switch for opening the ignition circuit.

The details of my invention will be described in connection with the accompanying drawing, in which the single figure is a diagrammatic view of circuits and apparatus embodying my invention.

An ignition system comprises a battery 1, which may be a storage battery or may consists of a number of dry cells, an automatic cutout 2, and a ballast resistor 3 for normally limiting the current traversing the primary circuit. The system comprises, also, a manually operable switch 4, an induction coil 5, an interrupter 6, which is in circuit with the primary winding of the induction coil, and a distributer 7 that is connected in circuit with the secondary winding of the induction coil. The usual spark plugs 8 of an internal combustion engine are respectively connected to the terminals of the distributer 7.

The automatic cutout 2 comprises a stationary contact member 9 and a movable contact member 10 that is carried by a pivotally mounted arm 11. A spring 12 tends to maintain the arm 11 in such position as to separate the contact members 9 and 10. The arm 11 is retained in its illustrated position by a pivotally mounted trigger member 13 that is provided with a counterweight 14. A spring 15 normally maintains the trigger member 13 in its illustrated position to engage the arm 11. An electromagnet for controlling the trigger member 13 comprises a core member 16 and a coil 17.

The ballast resistor 3 may be of tungsten or other suitable material having a positive temperature coefficient. A heat-storage device which surrounds the resistance element comprises a mass of heat-insulating material 18 in which is embedded a heat-storage member 19 which may be, for example, an iron ring.

The manually operable switch 4 may be the usual switch that is mounted upon the dash board of an automobile. The induction coil 5, which may be of the usual transformer type, comprises a primary winding 20 and a secondary winding 21. The interrupter 6 and the distributer 7 may be oper-

atively connected in any suitable manner to the shaft of an internal combustion engine (not shown).

It may be assumed that the various parts occupy their respective illustrated positions and that the interrupter 6 and the distributer 7 are actuated by any suitable driving means. When the contact members of the interrupter 6 are in engagement, current traverses a circuit extending from the battery 1 through contact members 9 and 10, arm 11, resistor 3, switch 4, primary coil 20 of induction coil 5, and contact members 22 and 23 of the interrupter 6 to ground and thence to the other terminal of the battery.

When the interrupter contact members 22 and 23 are separated, the opening of the primary circuit induces a high-tension discharge in the secondary circuit which comprises the secondary coil 21, the distributer 7, and the spark plug 8 that is at that instant connected to the movable member of the distributer. Substantially no current will traverse the electromagnet coil 17 because its resistance is high relatively to that of the resistor 3, under normal operating conditions. The coil 17 is therefore shunted by a circuit of comparatively low resistance.

Should the engine stop for any cause whatever and the ignition mechanism come to rest in such position that the interrupter contact members 22 and 23 are in engagement, current will traverse the primary circuit above traced. The current traversing the ballast resistor 3 causes the temperature of the latter to rise relatively slowly because of the heat that is being stored in the heat storage member 19. As the temperature of the resistor rises, its resistance increases, and, if the resistor be properly designed, its resistance may increase to a value 10 or 20 times the value obtaining under normal temperature conditions.

The increased resistance of the resistor 3 causes a corresponding increase in the current traversing the coil 17 of the electromagnet, and, when the latter is energized to a predetermined value, the trigger member 13 is drawn downwardly against the force of the spring 15. The arm 11 is then actuated in a clockwise direction about its point of pivotal support by the spring 12 to separate the contact members 9 and 10 and thereby open the primary circuit.

The ballast resistor 3 and the electromagnet for controlling the trigger member 13 are so arranged that the primary circuit is not interrupted during the normal operation of the ignition system. This action occurs only after current has traversed the primary circuit continuously for a period of sufficient length to materially increase the resistance of the resistor 3.

Under normal operating conditions, the temperature of the heat-storage member 19 is relatively low, and some time is required to heat it to its maximum temperature. The presence of the heat-storage member operates to cause the rise in temperature of the resistor 3 to occur more slowly than would otherwise be the case. The interval between the closing of the primary circuit in the manner above described and the instant when the temperature of the resistor 3 reaches the critical value at which the electromagnet 17 actuates the trigger mechanism, is sufficient to allow the chauffeur to leave his seat and crank the engine before the circuit is opened. If the heat-storage member were omitted, the temperature of the resistor 3 would reach the predetermined value so quickly that the ignition circuit would be opened unnecessarily in many cases.

It will be readily understood that the automatic cutout will operate only in case the engine stops when the interrupter contact terminals are in engagement and the manually operable switch is left in its closed position. Inasmuch as these conditions rarely occur, it will seldom be necessary to reset the trigger mechanism of the cutout. This operation may be accomplished in any suitable manner, as, for example, by manually operable means located on the dash board of the vehicle, or a mechanical connection between the manually operable switch and the trigger mechanism may be provided.

The advantages of a cutout constructed in accordance with my invention are that it will operate as a safety device to prevent the discharge of the battery under exceptional conditions and that a very small amount of current is required for its operation. The only attention required by the mechanism is that necessary in resetting the same after it has operated to open the circuit.

I claim as my invention:

1. In an electrical system, the combination with a circuit comprising a battery and a switch, of means comprising an electromagnet having a winding permanently in circuit with said switch for effecting the opening of said switch and permanently opening said switch when current traverses said circuit continuously for a predetermined period.

2. In an electrical system, the combination with a circuit comprising a battery, a switch and a tripping mechanism for said switch, of electro-responsive means permanently in circuit with said switch for actuating said tripping mechanism to permanently open said circuit when current traverses said circuit continuously for a predetermined period.

3. In an electrical system, the combination with a circuit comprising a battery and

a switch, of means for opening said switch and circuit when current traverses said circuit continuously for a predetermined period, said means comprising a tripping mechanism and electromagnetic controlling means therefor having a coil and a resistor in shunt relation thereto, said coil being energized to a degree dependent upon the length of the period of continuous current flow.

4. In an ignition system, the combination with a circuit comprising a battery and a switch, of means for opening said switch and preventing a further flow of current in said circuit when current traverses said circuit continuously for a predetermined period, said means comprising an electromagnet having a coil and a resistor in shunt relation to said coil.

5. In an ignition system, the combination with a circuit comprising a battery and a switch, of means for opening said switch to prevent a further flow of current in said circuit when current traverses said circuit continuously for a predetermined period, said means comprising an electromagnet having a coil and a shunt circuit for said coil, the resistance of said shunt circuit varying with the period during which current traverses said circuit.

6. In an ignition system, the combination with a circuit comprising a battery and a switch, of means for opening said switch when current traverses said circuit continuously for a predetermined period, said means comprising an electromagnet having a coil and a shunt for said coil including a resistor having a positive temperature coefficient and heat-storage means associated with said resistor.

7. In an ignition system, the combination with a source of current, an ignition device, an interrupting device in circuit with said source and said ignition device, of automatic means for controlling the connections of said devices, said means comprising a switch biased to its open position, tripping mechanism for opening said switch, an electromagnet for controlling said mechanism, and a shunt circuit for the coil of the electromagnet comprising a resistor having heat-storage means associated therewith.

In testimony whereof I have hereunto subscribed my name this 31st day of Dec., 1915.

HORACE V. S. TAYLOR.