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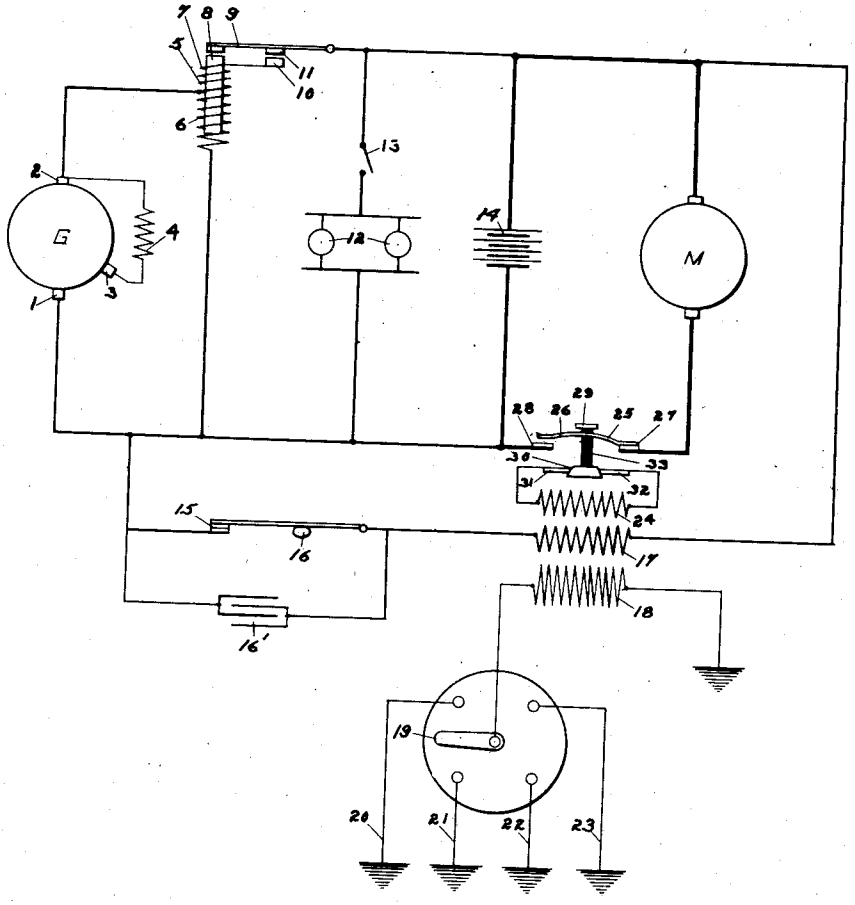
STARTING AND IGNITION SYSTEM FOR INTERNAL COMBUSTION ENGINES.

FILED MAR. 16, 1918.



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Patented Jan. 2, 1923.

1,440,528

UNITED STATES PATENT OFFICE.

ALVIN E. BUCHENBERG, OF TOLEDO, OHIO.

STARTING AND IGNITION SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

Application filed March 16, 1918. Serial No. 222,862.

To all whom it may concern:

Be it known that I, ALVIN E. BUCHENBERG, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Starting and Ignition Systems for Internal-Combustion Engines, of which I declare the following to be a full, clear, and exact description.

This invention relates to starting and ignition systems for internal combustion engines.

An object of my invention is to provide in connection with such systems where the same battery supplies current for both starting and ignition, means for partially, if not fully, preventing loss in effectiveness of the ignition apparatus due to the heavy demand upon the battery in starting the engine.

Another object is to combine an arrangement performing the above named function, with an ignition system which is normally self regulating for wide variations in engine speed.

Further objects will definitely appear from the detailed description to follow.

I accomplish the objects of this invention by the arrangements described in the following specifications.

An arrangement constituting a preferred embodiment of my invention is illustrated in the accompanying drawing, forming a part of this specification in which the various elements are diagrammatically indicated.

When an electric motor is employed for the purpose of starting an internal combustion engine, and its source of supply is the storage battery, and where the ignition system is also connected to the storage battery, the large quantity of current required for the starting operation causes an abnormally low potential across the terminals of the ignition coil, resulting in a weak and inefficient spark in the secondary circuit. In cold weather, this difficulty is further enhanced through the fact that the storage battery is cold, thereby having less voltage than ordinary, and also that the vapor fuel of the engine is condensed more or less by the cold engine cylinders. These particular difficulties are in a great measure overcome by the use of my invention which I will now describe.

I employ a generator G, which may be of any ordinary construction, but which is here shown as of the third brush type, employing main brushes 1 and 2, the so-called third brush 3 and shunt field 4. Current generated passes to the load circuits through an automatic cut-out 5, comprising a shunt coil 6, series coil 7, core 8, armature 9, and contacts 10 and 11. The generator is adapted to supply current for the lamps 12, through a switch 13, and also to charge the storage battery 14.

For starting the engine and thereby causing rotation of the generator G, I employ the usual starting motor M, which is in circuit with the storage battery 14. The ignition circuit includes the interrupter contacts 15, the interrupter cam 16, condenser circuit 16′, and a primary coil 17. Adjacent the primary is a secondary coil 18, and connected thereto is a distributor arm 19, by the rotation of which current is distributed to the various spark plug circuits 20, 21, 22 and 23. The other terminal of the secondary is grounded.

I employ a particular type of regulating means for the ignition coil, whereby effective ignition is maintained through wide variations of engine speed. This regulation consists in a choke coil 24, which serves to choke the primary ignition current for all lower engine speeds. The time constant of this choke coil is such, however, that at the higher frequencies of current interruption existing at high engine speeds, the choking effect is greatly diminished in its effect on the primary coil, at the instant of current interruption. Using this choke coil, it becomes possible to design a primary coil for receiving, at high speeds, voltage, which at low speeds would cause serious heating effects, but which effects are prevented by the employment of the choke coil. However, if the choke coil is rendered inoperative at starting, the time will be insufficient to cause deleterious results, and the full battery voltage will be effective to cause a strong ignition current, thereby overcoming condensation effects and other abnormal conditions incident to the starting operation.

To accomplish this result in the choke coil circuit, I employ a special type of starter switch 25 in the starter motor circuit. This switch as indicated, consists of a spring contact strip 26, having one end fixed to a terminal 27, and the other end adapted to be engaged with a second terminal 28, both terminals being in series with the starter circuit. The switch is normally open, but is capable of depression, so as to make contact, by means of the button 29. This button is attached to a convenient point on the starter

switch and extends therethrough to a contact bar 30, which is normally in contact with terminals 31 and 32 in the choke coil circuit. The connecting portion 33, intermediate the starter switch 26 and contact plate 30 is of insulating material, and is of such length, that, when the starter switch is in its normally open position, the contact plate 30 closes the circuit through the choke coil 24.

The operation of the system will now be described. In starting, the button 29 is depressed, thus simultaneously closing the starter circuit and opening the choke coil circuit. Immediately the current will pass from the battery through a motor M, and also an excess current will pass through the primary coil 17. Since the choke coil is inoperative, this will develop exceptionally hot sparks in the spark plugs, and the engine will start up under its own power.

I am aware that this particular arrangement is susceptible of considerable variation without departing from the spirit of my invention, and I therefore desire to claim the same broadly as well as specifically, as indicated by the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In an electric starting and ignition system for internal combustion engines, the combination of an electric starting motor, a storage battery adapted to supply current to said motor, an ignition circuit including a primary coil connected to said storage battery, a normally closed ignition regulator circuit including a regulating coil operatively related to, but independent of, said primary coil and means for opening said regulator circuit when the motor is being operated to start the engine whereby the ampere turns of the primary coil are increased above their normal value during starting.

2. In a starting and ignition system for automobiles, the combination of an electric starting motor; a storage battery adapted to supply current to said motor; a primary ignition coil connected to said battery; an ignition regulating coil operatively related to said primary coil; and means connected to said regulating coil for rendering it inoperative when the starting motor is energized.

3. In a starting and ignition system for automobiles, the combination of an electric starting motor; a storage battery adapted to supply current to said motor; a primary ignition coil connected to said battery; an ignition regulating coil operatively related to said primary coil; and means connected to said regulating coil for rendering it inoperative when the starting motor is energized, and operative when the starting motor is deenergized.

4. In a starting and ignition system for automobiles, the combination of an electric starting motor; a storage battery adapted to supply current to said motor; an ignition circuit including a primary coil connected to said battery; an ignition regulating circuit having a choke coil operatively related to said primary coil; and means for rendering the choke coil ineffective when the starting motor is energized.

5. In a starting and ignition system for automobiles, the combination of an electric starting motor; a storage battery adapted to supply current to said motor; an ignition circuit including a primary coil connected to said battery; an ignition regulating circuit having a choke coil operatively related to said primary coil; and means for simultaneously energizing said starting motor and rendering said choke coil inoperative.

6. In a system of the class described, the combination of a battery and an electric starting motor in circuit therewith, an ignition system connected to said battery including primary and secondary windings, electro-magnetic means associated therewith to normally reduce the effectiveness of said system and means for rendering said first means inoperative when the starting motor is operated.

7. In a system of the class described, the combination of a battery and electric starting motor in circuit therewith, a normally open switch for controlling said circuit, an ignition system connected to said battery including primary and secondary windings, and normally effective means inductively related to said windings and operatively connected with said switch for controlling the ignition circuit whereby the effectiveness of said system is increased when said starting motor is operated.

In testimony whereof, I affix my signature.

ALVIN E. BUCHENBERG.