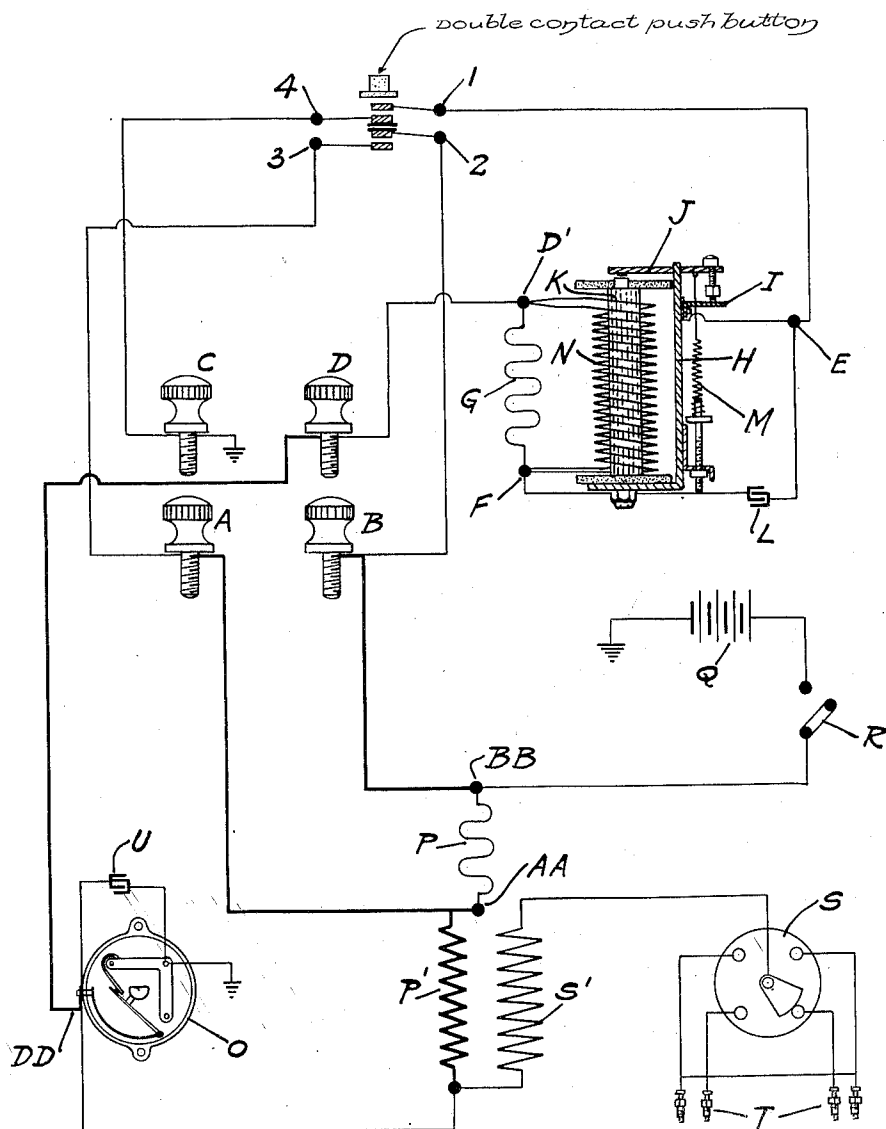


May 26, 1925.

1,539,261

C. M. LINDSAY
AUXILIARY IGNITION CIRCUIT

Filed Nov. 15, 1923



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AUXILIARY IGNITION CIRCUIT.

Application filed November 15, 1923. Serial No. 674,997.

To all whom it may concern:

Be it known that I, CHARLES M. LINDSAY, a citizen of the United States, residing at Washington, District of Columbia, have invented new and useful Improvements in Auxiliary Ignition Circuits, of which the following is a specification.

This invention relates to improvements in auxiliary ignition circuits and more particularly to the circuits to be used with the ignition systems of gas engines and the like.

One of the objects of the present invention is to provide what may be termed a booster of simple and practical construction which may be inexpensively manufactured, assembled and installed.

A further object is to provide an apparatus of the above character adapted to cause a series of rapid interruptions in the primary circuit during the period the breaker mechanism is open thereby to give a hot intense spark available for ignition purposes.

A further object is to provide a mechanism of the above character adapted to eliminate pre-ignition and back firing.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the accompanying sheet of drawings wherein is shown one of various possible embodiments of the invention.

Referring now to this drawing in detail, the auxiliary circuit is shown as applied to a simple ignition system in order that this application may be more apparent. The circuit has four main terminals marked A, B, C and D connected by heavy lines which show the external wiring of the booster circuit. The lighter lines leading from these four main terminals designate the internal wiring of the booster circuit. As the booster circuit is only required for starting internal combustion engines, it is controlled by a double contact push button, the terminals of which are designated by the numbers 1, 2, 3, 4.

On pushing the double contact push button the booster circuit is connected to the ignition system. On release of the push button the parts are restored to normal position and the ignition system to normal operating position.

On the pressing of the double contact push button, the circuits 1 and 4, and 2 and 3 are closed but no electrical connection exists between the terminals 1 and 2 or 3 and 4, the

parts being illustrated as indicated by the heavy lines.

Starting from any convenient source of electricity such as the battery Q, one terminal of which is ground, the electric current flows through a switch R when closed to and through resistance coil P to a primary winding P¹ of a suitable induction coil thence to a mechanically operated primary circuit interrupter O at the terminal DD, thence through the contact points of the interrupter to the ground as indicated.

Shunted around the contact points of the interrupter is a condenser U as usually provided in such circuits. When the primary circuit is opened by the interrupter O, a high tension current is induced in the secondary winding S¹ of the induction coil which is transmitted to and through the distributor and rotor S to the spark plugs T producing a single spark for each interruption of the primary circuit by the interrupter O.

At the usual slow cranking speed of an internal combustion engine, the single interruption is so sluggish that the inductive action of the coil is less pronounced and only a weak spark, if any is produced at all, which accounts for the difficulty experienced in starting internal combustion engines in cold weather.

When the primary circuit is opened by the interrupter contacts and during the entire period the interrupter contacts are open a continual flow of sparks is produced at the spark plugs of a frequency and temperature sufficient to ignite a raw or poorly mixed charge of fuel.

It should be noted that the booster only functions when the primary circuit interrupter contacts are open, which, in the type of ignition system described, is during the ignition and combustion period of each cycle of the engine's operation. This causes the sparks produced to be correctly timed or synchronized with the engine and eliminates the need for the special interrupters or distributors required in other systems producing continuous nonsynchronous sparks.

When the double contact push button is pressed and the switch R closed the electric current flows from the battery Q through the switch to terminal BB of a resistance coil P where it divides with part of the current taking the path of less resistance

through the heavy line to the main booster terminal B. This is connected to the double push button contact 2 thence, on closing of the push button to the terminal 3 which is
 5 connected to main booster terminal A. The current then flows to the terminal AA adjacent the resistance coil P providing a shunt circuit around the resistance coil P of low resistance and permitting the full
 10 force of the battery Q to be used for starting. From the terminal AA the electric current flows through the primary winding of the induction coil P¹ to the terminal DD of the interrupter. If the interrupter con-
 15 tacts are closed the current flows through the contacts to the ground and no action takes place. Assuming, however, that these contacts are open then the current flows from the interrupter terminal DD through the
 20 heavy line to the main booster terminal D and the internal wiring to the point D¹ where the current divides, part passing through accumulative electro-magnetic vi-
 25 brator windings N to a terminal F, the other part of the current passing through the non-inductive low resistance shunt G to terminal F.

From this terminal F the current flows to and through the iron case K of the wind-
 30 ings N, frame H and vibrating member J to the vibrator contacts, one of which, I, is connected through the winding N which magnetizes the core K. The contacts I cause the electro-magnetic field of the core
 35 K to collapse thereby permitting a tension spring M to draw the vibrating member J back to its original position and close the contacts I.

This completes a cycle of operation of the
 40 vibrator, which cycle occurs between five and six hundred times per second. Connected to the frame H and the insulated contact point I is a condenser L to protect the contact points I and assist during the period of its
 45 discharge in the rapid collapse of the electro-magnetic field, thereby accelerating the movement of the vibrating member J. An adjusting screw is provided to vary the ten-
 50 sion of the spring M as shown when tuning the vibrator to the required pitch. The electric current after passing through the vi-
 55 brator goes from the insulated contact point I through the terminal E to the terminal 1 of the double contact push button thence through the push button contacts to termi-
 60 nal 4 and to the main booster terminal C which is grounded.

In order for the booster circuit to op-
 60 erate satisfactorily it is preferable that the total resistance of the circuit be low and the speed of the vibrator high.

The improved booster circuit herein shown with the two magnetic windings on the
 65 core and a low resistance, non-inductive shunt G in parallel with the windings N

permits the use of a lighter tension spring M and consequently gives higher speed of the vibrating member J and likewise less energy to operate.

It will thus be seen that the present in- 70
 vention provides a reliable and efficient auxiliary circuit particularly adapted for use with ignition systems of gas engines and the like.

Without further analysis, the foregoing 75
 will so fully reveal the gist of this invention that others can by applying current knowledge readily adapt it for various ap-
 plications without omitting certain features that, from the standpoint of the prior art, 80
 fairly constitute essential characteristics of the generic or specific aspects of this inven-
 tion, and, therefore, such adaptations should and are intended to be comprehended with-
 85 in the meaning and range of equivalency of the following claims.

What I claim is:—

1. In a system of the character described, the combination with a normally closed me-
 90 chanically operated primary circuit inter-
 rupter, opened only during the ignition period of each cycle of an engine's operation, a condenser connected in parallel with said
 95 interrupter, a distributor, a battery connected therewith, an induction coil between
 the distributor and the battery and a resistance coil associated with the induction coil, of means for passing a continuous series of
 100 sparks through the distributor and only during the ignition and combustion period of
 each cycle of the engine's operation, said means including a high frequency low re-
 sistance electro-magnetically operated vi-
 105 brator in shunt with the mechanically op-
 erated primary circuit interrupter, said vi-
 brator consisting of a low resistance, inductive winding, a low resistance non-induc-
 tive winding shunted across, or connected
 110 in parallel with the inductive winding, a
 vibrating member connected in series with
 the windings, two contact points, one mounted on the vibrating member, the other nor-
 115 mally stationary, means to adjust the sta-
 tionary contact point, a condenser in shunt
 with the contact points and a double pole
 120 push button, one pole serving to connect the
 stationary contact to ground, the other pole
 of the push button being connected in such
 a manner that it shorts out the resistance
 coil in the primary circuit.

2. In a system of the character described, the combination with a normally closed me-
 125 chanically operated primary circuit inter-
 rupter open only during the ignition period
 of each cycle of an engine's operation, a
 130 condenser connected in parallel, a distribu-
 tor, a battery and the primary circuit of
 an induction coil connected therewith, a
 resistance coil associated with the induction
 coil, and improved means for shorting out 135

said resistance coil and passing a continuous series of sparks through the distributor and only during the ignition and combustion period of each cycle of the engine's operation.

3. In a system of the character described, the combination of a normally closed mechanically operated primary circuit interrupter open only during the ignition period of each cycle of an engine's operation, a condenser connected in parallel with said interrupter, a battery and the primary circuit of an induction coil connected therewith, and a resistance coil associated with the induction coil and semi-automatic means for shorting out said resistance coil, and a distributor connected to the secondary circuit of the induction coil, and a high frequency, low resistance, magnetically operated interrupter connected in parallel with the mechanically operated primary circuit interrupter.

4. In a system of the character described, the combination with a normally closed mechanically operated primary circuit interrupter open only during the ignition period of each cycle of an engine's operation, a condenser connected in parallel with said interrupter, a battery and the primary circuit of an induction coil connected therewith, and a resistance coil associated with the induction coil and semi-automatic means for shorting out said resistance coil, and a distributor connected to the secondary circuit of the induction coil, and means for passing a continuous series of sparks through the distributor and only during the ignition and combustion period of each cycle of the engine's operation, said means including a high frequency, low resistance, electro-magnetic vibrator, having two low resistance cumulative inductive windings connected in parallel, and a low resistance non-inductive winding connected in parallel with the inductive windings.

5. In a system of the character described, the combination with a normally closed mechanically operated primary circuit interrupter open only during the ignition period of each cycle of an engine's operation, a condenser in parallel with said interrupter, a battery and the primary circuit of an induction coil connected therewith, and a resistance coil associated with the induction coil and semi-automatic means for shorting out said resistance coil, and a distributor connected to the secondary circuit of the induction coil, and means for passing a continuous series of sparks through the distributor and only during the ignition and combustion period of each cycle of the engine's operation, said means including a high frequency electro-magnetic vibrator having two low resistance cumulative windings connected in parallel, and a non-inductive low resistance shunt connected in parallel with said vibrator windings.

6. In a system of the character described, the combination with a normally closed mechanically operated primary circuit interrupter opened only during the ignition period of each cycle of an engine's operation, a condenser in parallel with said interrupter, a battery and the primary circuit of an induction coil connected therewith, and a resistance coil associated with the induction coil and semi-automatic means for shorting out said resistance coil, and a distributor connected to the secondary circuit of the induction coil, and means for passing a continuous series of sparks through the distributor and only during the ignition and combustion period of each cycle of the engine's operation, said means including a high frequency electro-magnetic vibrator, having two low resistance cumulative windings connected in parallel, and a non-inductive low resistance shunt connected in parallel with said vibrator windings, and a means for adjusting the period of vibration.

7. In a system of the character described, the combination with a normally closed mechanically operated primary circuit interrupter open only during the ignition period of each cycle of an engine's operation, a condenser in parallel with said interrupter, a battery and the primary circuit of an induction coil connected therewith, and a resistance coil associated with the induction coil, and means for passing a continuous series of sparks through the distributor and only during the ignition and combustion period of each cycle of the engine's operation, said means including a high frequency electro-magnetic vibrator, having two low resistance cumulative windings connected in parallel, and a double pole push button for connecting the vibrator to ground and shorting out the resistance coil.

8. In a system of the character described, in combination, a mechanically operated primary circuit interrupter mechanism and an ignition system whose mechanically operated primary circuit interrupter is normally closed except during the ignition and combustion period of each cycle of the engine's operation, a condenser in parallel with said interrupter, an induction coil, a resistance coil associated therewith, a high frequency low resistance electro-magnetic vibrator connected in parallel with the mechanically operated primary circuit interrupter and a double pole push button for the purpose of connecting the vibrator in circuit by pair of contacts and to short out the resistance coil usually connected in the primary circuit of such an ignition system with the other pair of contacts.

Signed at Washington, District of Columbia, this 4th day of October, 1923.

CHARLES M. LINDSAY.