I. W. BROEGGER.

IGNITION SYSTEM.

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Fig. 1

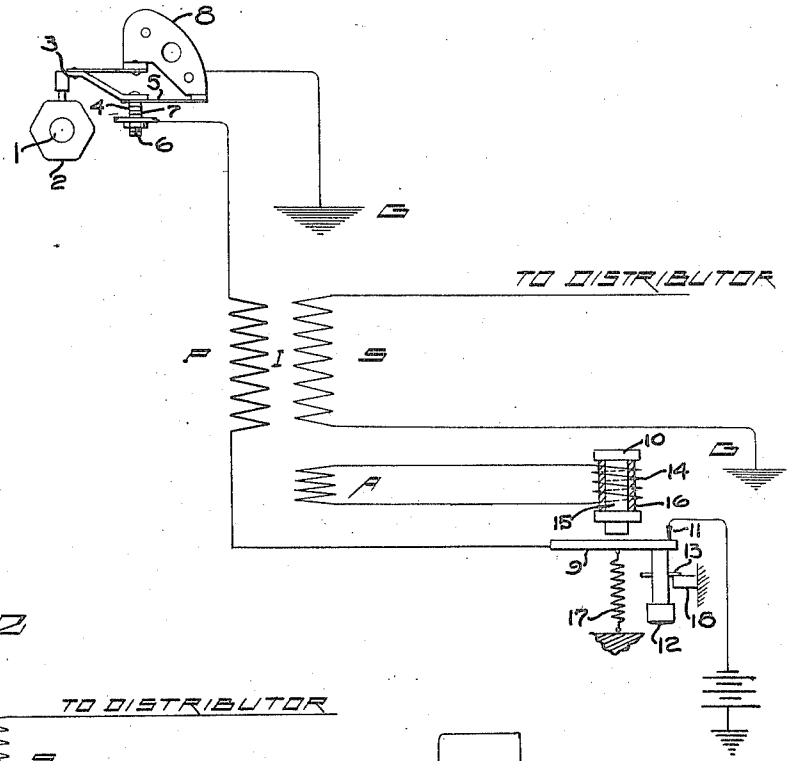
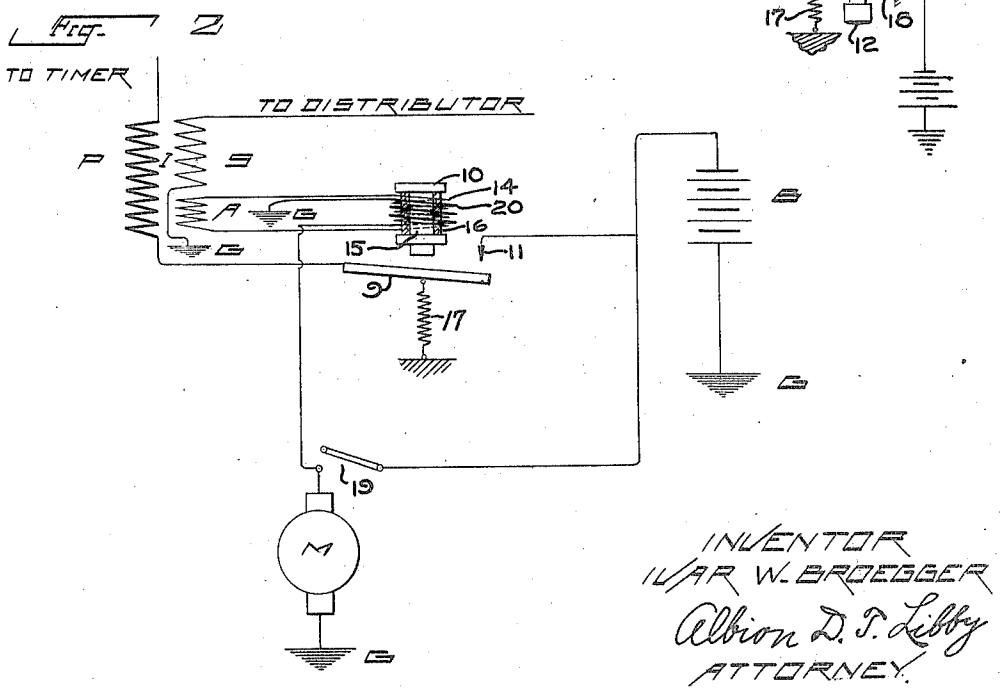


Fig. 2



INVENTOR
IVAR W. BROEGGER
Albion D. T. Libby
ATTORNEY.

UNITED STATES PATENT OFFICE.

IVAR W. BROEGGER, OF NEWARK, NEW JERSEY, ASSIGNOR TO SPLITDORF ELECTRICAL COMPANY, OF NEWARK, NEW JERSEY.

IGNITION SYSTEM.

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To all whom it may concern:

Be it known that I, IVAR W. BROEGGER, a subject of the King of Norway, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Ignition Systems, of which the following is a specification.

In order to get good results from a battery ignition system for internal combustion engines the primary winding of the induction coil is usually made of relatively low resistance in order to help compensate for the mechanical lag of the circuit breaker and the electrical lag of the coil. Also in order to give the coil a chance to "build up" the time of contact is made as large as possible, that is to say, the cam which operates the circuit breaker or current interrupter is usually constructed with "flats" as long as possible. With the parts constructed as above the engine will stop a majority of the time in such a position that the circuit breaker contacts will be closed, under which condition a heavy current will flow through the primary of the induction coil and if the ignition switch is not thrown to open position the coil is very apt to be destroyed.

It is the object of my invention to provide a battery ignition system in which this trouble is overcome.

Another object is to provide an ignition system which is very simple in its construction and hence one that is cheap to manufacture.

Other and further objects will be apparent, to one skilled in the art, after a study of the specification in connection with the drawing attached thereto.

In the drawing Figure 1 illustrates diagrammatically one form of my ignition system, while Fig. 2 illustrates a modification of Fig. 1.

Referring particularly to the two figures of the drawing, wherein like numbers refer to corresponding parts, 1 is an engine operated drive shaft carrying a cam 2 that is adapted to operate a movable member 3. A contact 4 is carried on the arm 5 of movable member 3 while a relatively stationary contact screw 6 carries a contact 7 adapted to coöperate with contact 4. Movable member 3 is attached to bracket 8, which in common practice is connected to the framework or ground G. The contact 7 is connected to primary P of the induction coil I. The other end of the primary P is connected to a movable member 9 of relay 10. The contact 11, adapted to coöperate with the movable member 9, is connected to battery B, the opposite end of which is grounded. The secondary S, of the induction coil, has one terminal grounded and the other terminal is adapted to be taken to a distributer for distributing the current impulses to the spark gaps of the engine cylinders. The distributer is not shown or described herein as its functions are old and well known. An auxiliary winding A constitutes a part of the induction coil I, said winding A being influenced by the primary P for a purpose which will hereinafter be described. The terminals of the winding A are connected to the winding 14 of relay 10. In some cases the core 15 of relay 10 may have a comparatively low resistance short circuited winding 16 thereon. In practice, when so used, I prefer to use a heavy copper tube over the core 15. The current set up in the winding A by the induction coil I, due to the action of the primary P thereon when the battery current passes through the breaker contacts 4 and 7 during its operation by the engine, flows through the winding 14 of relay 10, causing the relay to hold the movable member or armature 9, which is, as is usual in slow acting relays, of considerable inertia, in circuit closing relationship with contact 11 against retractile member 17, used for the purpose of pulling the armature 9 away from the contact 11 when the engine becomes stationary.

It is the usual practice to drive the cam 2 at one half crank shaft speed, so that when the car is being operated at very low speed on direct drive the impulses per second, through the primary P of the induction coil I, are relatively low and if an ordinary relay were used in place of the one shown the connection between the armature 9 and contact 11 would become interrupted and would cause misses in, or interrupt the ignition circuits entirely. The use of the copper shell 16 on the relay 10 serves to make the operation of the armature very sluggish, due to the induced current in the heavy short circuited winding acting to maintain the flux in the core 15 for an appreciable time, after the current impulses take place through the winding 14, hence the special relay 10 serves to maintain the armature 9 and contact 11 in circuit closing position. In order to close

the primary circuit for starting the engine I have shown in Fig. 1 a special switch arm 12 carrying a pin 13 which engages detent 18 for the purpose of holding the movable member 9 against contact 11. While I have shown the parts in closed position it will be understood that after the engine has been started the switch arm 12 is to be returned manually or automatically to its normal position leaving the armature 9 free to be drawn away from the contact 11 by retractile member 17 when the engine stops. The switch arm 12 may also be used for drawing the armature 9 from the stop 11 for the purpose of opening the battery circuit to the primary of the induction coil for shutting down the engine. The exact details relating to these switching features form no part of my invention and will not be further referred to, however, if desired the armature 9 may be drawn to closed position against the contact 11 by means of an additional winding 20 placed on the relay 10, current being applied to the winding 20 by means of a special switch or the switch 19 which is used for applying current to the starting motor M may be utilized, all as shown in Fig. 2, reference to which will readily show that while the starting motor is cranking the engine, current also flows from battery B through the winding 20 closing the battery circuit through the primary P of the induction coil I, automatically and as soon as the engine begins to rotate under the influence of the starting motor M or under its own power the impulses from the primary P will act on the winding 14 as previously described to hold the relay 10 in circuit closing position so that the battery circuit to the induction coil will be held closed after the starting motor has been stopped by releasing switch 19.

It will also be observed that after the starting motor is stopped by the opening of the switch 19 the winding 20 of relay 10 is closed from ground G through the starting motor to the same ground G. It being understood that wherever ground is shown it indicates the framework of the apparatus or car on which it is placed. Inasmuch as the armature of the starting motor is of extremely low resistance the effect is a second short circuited winding on the relay 10 which assists the copper shell 16 to make the relay 10 slow in its action of releasing the armature 9. The relay 10 can be made very small and inexpensive and it will thus be seen that I have provided a very simple way of taking care of the trouble hereinbefore referred to. The exact construction of the relay 10, switching means, or induction coil I, or the circuit breaker operated by the engine may be varied over a wide range and I therefore do not wish to be limited to any particular form of each.

Having thus described my invention what I claim is:—

1. In an ignition system the combination of an engine operated circuit breaker, an induction coil having one end of its primary winding connected to an element of said circuit breaker, a relay device having its armature connected to the other end of said primary winding and a contact adapted to coöperate with said relay armature, and means for connecting a source of energy in the primary circuit of said induction coil, said relay being held in running position by current from a winding on said induction coil.

2. In an ignition system the combination of a circuit breaker, an induction coil having its primary connected in circuit with said circuit breaker, an auxiliary winding on said induction coil, a relay device normally holding the primary circuit open, means for closing the primary circuit through an element of the relay device which is then adapted to be held in operative position by current from said auxiliary winding, and a source of current adapted to be connected in circuit with said primary winding by said relay device.

3. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding connected in circuit with said circuit breaker, a source of current, a relay device adapted to connect said source of current in circuit with said primary winding and circuit breaker, and an auxiliary winding on said induction coil connected to said relay device for holding said relay device in operative position.

4. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding adapted to be connected in circuit with said circuit breaker, a source of current, an auxiliary winding on said induction coil, a relay device having a winding thereon adapted to be connected in circuit with said source of current for bringing said relay device into operative position, and a second winding on said relay device adapted to be connected with said auxiliary winding for the purpose of holding said relay device in operative position after said source of current has been removed from said first winding.

5. In an ignition system for internal combustion engines having means for cranking the engine, a circuit breaker operated by the engine, an induction coil having its primary winding adapted to be connected in circuit with said circuit breaker, a source of current, an auxiliary winding on said induction coil, a relay device having a winding adapted to be connected in circuit with said source of current when said cranking means is operated whereby said relay device is put in operative position for including said source

of current in circuit with the primary of said induction coil, a second winding on said relay device adapted to be connected in circuit with said auxiliary winding for the purpose of holding said relay device in operative position after said cranking means has been disconnected from the engine.

6. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding connected in circuit with said circuit breaker, a source of current, a relay device adapted to connect said source of current in circuit with said primary winding and circuit breaker, an auxiliary winding on said induction coil, a winding on said relay device connected to said auxiliary winding, and a short circuited winding on said relay device for maintaining flux in the core of said relay device between current impulses from said auxiliary winding.

7. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding connected in circuit with said circuit breaker, a source of current, a relay device adapted to connect said source of current in circuit with said primary winding and circuit breaker, an auxiliary winding on said relay device connected to said auxiliary winding, and a short circuited winding on said relay device for maintaining flux in the core of said relay device when the current impulses from the auxiliary winding are relatively slow.

8. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding connected in circuit with said circuit breaker, a source of current, a relay device adapted to connect said source of current in circuit with said primary winding and circuit breaker, an auxiliary winding on said induction coil, a winding on said relay device connected to said auxiliary winding, a heavy short circuited winding on said relay device for maintaining flux in the core thereof when the current impulses from the auxiliary winding are slow, and a second winding on said relay device adapted to place the same in operative position.

9. In an ignition system the combination of a circuit breaker, an induction coil having its primary winding connected in circuit with said circuit breaker, a source of current, a relay device adapted to connect said source of current in circuit with said primary winding and circuit breaker, an auxiliary winding on said induction coil, a winding on said relay device connected to said auxiliary winding, a heavy short circuited winding on said relay device for maintaining flux in the core thereof when the current impulses from the auxiliary winding are slow, and a second winding on said relay device adapted to place the same in operative position, said second winding also serving to assist the heavy short circuited winding to maintain flux in the core of the relay device as described.

10. In an ignition system for internal combustion engines having an electric motor for cranking the engine, a circuit breaker operated by the engine, an induction coil having its primary winding adapted to be connected in circuit with the circuit breaker, a source of current and a switch to connect same to the electric motor, a relay having three windings, one short circuited within the relay structure another short circuited through the electric motor but adapted to take current from said source when the starting switch is operated whereby the relay acts to close the source of current through the said primary winding, a winding on the induction coil connected to the third winding of the relay for holding it in operative position, said short circuited winding serving to maintain the flux in the relay core when the current impulses from the induction coil are a minimum.

11. In an ignition system the combination of a circuit breaker, a source of current, an induction coil having primary and secondary windings, means for closing a circuit from the source of current through the said primary winding and circuit breaker and means associated with the induction coil and the first mentioned means for maintaining the primary circuit closed during normal operation of the circuit breaker, said means also acting to open the primary circuit when the circuit ceases operation.

12. In an ignition system, a source of electric current, a main circuit including a current interrupter, and the primary of an induction coil, a relay for controlling circuit connections between the current source and main circuit, said relay in operative position being under the control of the current impulses in the main circuit.

13. In an ignition system for internal combustion engines, a main circuit including the primary of an induction coil and a source of electric current, a relay having a contact in said main circuit, an interrupter adapted to be operated by the engine, means for closing said contact and means controlled by said interrupter for maintaining said contact continually closed while the engine is in operation.

In witness whereof I affix my signature.

IVAR W. BROEGGER.