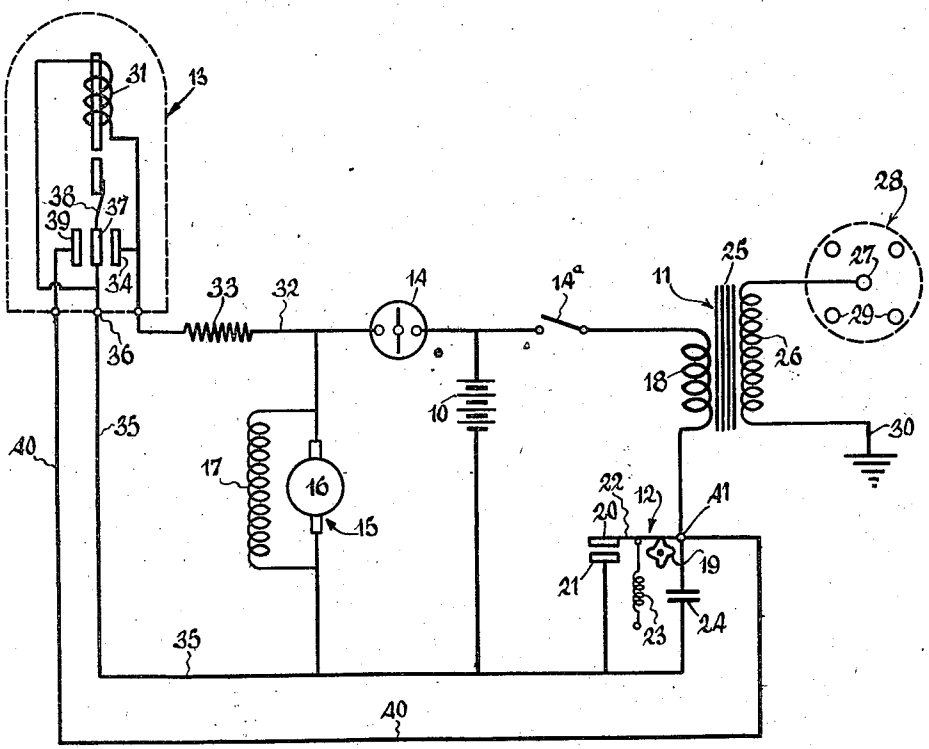
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IGNITION SYSTEM

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IGNITION SYSTEM

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This invention relates to ignition systems and is particularly concerned with systems for use with internal combustion engines in which positive ignition is ensured despite unfavorable temperature or atmospheric conditions.

More particularly the invention has to do with ignition systems in which a shower of sparks is produced within the cylinder of the engine at a predetermined time when the compression stroke is completed.

An object of the invention is to provide a simple ignition system of this nature which is economical of manufacture and efficient in operation.

A further object is to provide a system of the nature indicated in which full voltage on the primary of the ignition transformer is ensured.

A further object is to provide an ignition device and circuit which utilizes standard and easily available equipment. A common type of vibrator for automobile radio receivers may be effectively utilized in accordance with the principles of the invention.

A further object is to provide a simplified ignition circuit by which the make and break contacts of the ignition system merely short circuit the interrupting circuit of the vibrator at times during which it is not desired to have it rapidly interrupt the primary circuit of the ignition transformer.

A further object is to provide a starting device and circuit which is automatically operable on closing the starting switch and which operates only so long as the starter switch is closed.

The novel features that I consider characteristic of my invention are set forth in the appended claims; the invention itself, however, both as to its organization and its method of operation together with additional objects and advantages thereof will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawing in which the figure represents diagrammatically an illustrative ignition circuit.

In the embodiment shown on the accompanying drawing the simplified circuit of the invention comprises a source of electromotive force such as battery 10, an ignition transformer 11, a mechanical make and break device 12, vibrator 13, starting switch 14 and an ignition switch 14a. The starting motor 15, consisting of armature 16 and field coils 17, is in parallel with the battery 10, as are also primary coil 18 of the ignition transformer and vibrator coil 31 of the vibrator device 13. The advantage of this type of circuit will be apparent as the description proceeds.

The make and break device may be of the usual type in which a cam 19, operating from a cam or other shaft of the engine moves a contact 20 in and out of engagement with contact 21. Movable contact 20 is, as is customary, mounted on an arm 22 normally held downwardly by spring 23. Rotation of cam 19, which in the present instance has four operating points for use with a four cylinder engine, makes and breaks the circuit comprising contacts 20 and 21 as will be readily understood to persons skilled in the art. A capacitance 24 is placed across the contacts as shown.

The transformer 11 may be of standard design for use in automobile ignition having a ferrous core 25 and a secondary winding 26 comprising a larger number of turns than has the primary 18 in order to permit a step-up in voltage. One end of the secondary may be connected to the center contact 27 of a distributor 28. The separate outer contacts 29 of the distributor are connected to the insulated terminals on spark plugs of the engine which are of course screwed into the cylinder block and therefore have one of their electrodes grounded to the chassis, or in the case of a stationary engine, connected to ground. The other or low end of the secondary 26 may be connected to ground through lead 30.

As has been indicated the actuating coil 31 of the vibrator is connected in parallel with the motor 15 and battery 10 so that its energization is quite independent of whether or not the circuit through primary 18 is open or closed. It is so connected by conductor 32, in which is inserted series resistance 33 connected to contact 34 at one end thereof and by the conductor 35 connected at 36 to the other end thereof and to the negative side of the power source.

The vibrator 13 may conveniently be of the type used for converting D. C. to A. C. for use with automobile radio receivers, and may comprise a fixed contact 34 connected to one end of coil 31 and a movable contact 37 disposed on a flexibly mounted armature or reed 38 connected to the other end, as shown. The circuit through coil 31 might be termed the actuating circuit of the vibrator. A third contact 39, also fixed, is connected by conductor 40 to terminal 41 connected to the movable contact 20 of the make and break device 12. The circuit from fixed contact 21 through conductor 35, terminal 36, contacts 37 and 39 and conductor 40 to terminal

41 may be termed the interrupting circuit of the vibrator.

In operation the ignition switch is thrown in and starting switch 14 is actuated, thereby applying full battery voltage across motor 15 and primary 18 and instantaneously energizing vibrator actuating circuit including coil 31. If the make and break contacts 20 and 21 are closed, no interrupted voltage is applied to primary 18 since vibrator contacts 37 and 39 are short circuited therethrough. When contacts 20 and 21 are opened, by the movement of the cam 19 connected to the engine, which is now turning over due to the energization of the starting motor the vibrator interrupting circuit effective across terminals 37 and 39 is placed in series with the primary 18, thereby rapidly interrupting the primary circuit and inducing high alternating voltages in the secondary 26, which are applied through the distributor 28 to selected spark plugs thereby producing a shower of sparks within the engine cylinder. When the contacts 20 and 21 again close the vibrator interrupting circuit is again shorted, although the armature 38 continues to oscillate. Since there is no inductance in the vibrator interrupting circuit at this time there is no sparking at the vibrator terminals.

It will be readily understood that the vibrator operates by reason of the continuous making and breaking of contacts 34 and 37. When the coil 31 is initially energized it produces a magnetic flux which draws armature 38 to one side until contact 37 meets contact 34. Thereupon the coil 31 is shorted and the armature 38 is released. Such armature is constructed and mounted so that it will spring back and momentarily make contact between 37 and 39, thereafter springing back again. While it is performing this oscillation the coil 31 is again energized and again draws arm 38 to one side. This cycle is repeated continuously thereby causing a series of rapid interruptions of the circuit through contacts 37 and 39, which are applied to the primary 18 as hereinbefore described.

It will be noted that the coil 31 is in parallel with the motor and primary 18 and at no time does it assume a series relationship with any of these elements. Thus the full battery voltage is always available for the starting motor and for application to the ignition coil.

The resistance 33 is chosen so that it will take up momentary current surges produced when coil 31 is short circuited thereby preventing short circuiting the battery.

In practice the invention may be accomplished by connecting a standard commercial radio vibrator, preferably with a resistance 33 suitably secured thereto, across the terminals of the starting motor of the engine. The terminal connected to contact 39 may then be connected by a suitable conductor 40 to the high side or moving element of the make and break device. This simple connection with and insertion in an ignition system of the type disclosed is an important feature of the invention as it obviates complicated wiring and installation difficulties and provides a cheap and easy way in which the invention may be utilized.

Having thus described my invention, I claim:

1. A starting system for internal combustion engines comprising a source of electromotive force, a primary ignition coil, a vibrator coil and a starting motor all connected in parallel with said source, mechanical means for making and breaking the circuit through said primary ignition coil and vibrator contacts connected across said means said contacts being in circuit with and actuated by said vibrator coil upon energization of said motor.

2. A system for starting internal combustion engines comprising a source of electromotive force, a vibrator coil and a starting motor connected in parallel with each other, a switch for connecting said coil and motor across said source and a primary ignition coil connected across said source, mechanical means for making and breaking the circuit through said primary ignition coil and vibrator contacts connected across said means said contacts being in circuit with and actuated by said vibrator coil, the closing of said switch being effective to energize both the starting motor and the vibrator.

3. In an ignition system for internal combustion engines including a starting motor, a battery and a make and break device, circuit connections therefor, a starting mechanism comprising a three contact radio vibrator the coil of which is connected across said motor so that it is energized when said motor is energized, and a resistance in series with said coil, said vibrator having a pair of contacts connected across said make and break device.

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