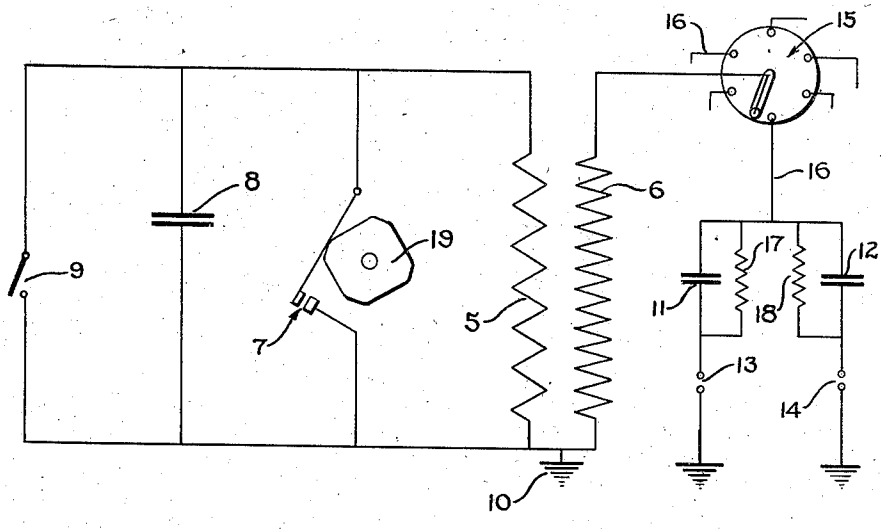
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IGNITION SYSTEM

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IGNITION SYSTEM

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This invention relates to ignition means, and more particularly to an ignition system adapted for use in internal combustion engines or the like.

It has been heretofore proposed to provide dual ignition in internal combustion engine cylinders, or produce two simultaneous sparks for any desired purpose by connecting two condensers in parallel with each other to a single source of electrical energy and connecting each condenser in series with a spark gap. Substantially the full voltage of the source of high tension current may thus be applied to each spark plug gap simultaneously. Such a system is shown in my U. S. Patent No. 2,131,018, dated September 20, 1938. Although the system shown in said patent has proved more satisfactory than prior dual ignition systems, it has been found in practice that the same operates more efficiently under some circumstances than under others because of residual charges which remain on the condensers. In other dual spark systems wherein a single source of high tension current is employed, the arrangement was either that the voltage of the source was divided between the two spark gaps, thus necessitating a voltage source correspondingly higher than the voltage effectively used, or if a parallel arrangement was used the current tended to flow through the gap of least resistance so that if one plug fouled the other plug would not operate.

It is, accordingly, an object of the present invention to provide an improved dual spark ignition system which will operate more efficiently than other systems heretofore provided, particularly when successive sparks across a given set of spark gaps are of the same polarity.

Another object of the invention is to provide a novel dual spark ignition system for internal combustion engines which is efficient and reliable in operation and simple and economical in construction.

A further object is to provide a novel system of the above character which incorporates means whereby the instantaneous intensity and rapidity of discharge through the spark gaps is increased.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims.

In the drawing, which consists of a single figure, one form of ignition system embodying the invention is diagrammatically illustrated.

In the embodiment of the invention illustrated, by way of example, there is a primary winding 5 and a secondary winding 6 of an induction coil, the former of which may be energized with either uni-directional or alternating current by any suitable type of magneto generator (not shown) or other source of electrical current. If desired, a source of uni-directional current, such as a battery, may be employed. Connected in circuit with primary winding 5 in a manner well understood in the art is a circuit breaker 7 of any suitable form, and a condenser 8 is shunted around the breaker mechanism. An ignition or ground switch 9 is also provided in circuit with primary winding 5 for diverting current from the latter to render the system inoperative. The primary circuit is completed through ground as indicated at 10 in the usual manner.

Secondary winding 6 is connected at one to ground, as at 10, and at its other end to a pair of condensers 11 and 12 in parallel, said condensers being connected to ground through a pair of spark gaps 13 and 14, respectively. If the system is used in a multi-cylinder internal combustion engine, secondary winding 6 may be periodically connected to a set of condensers and spark gaps at each cylinder through a suitable distributor 15 and a conductor 16.

After the occurrence of a spark or discharge across a given pair of spark plug gaps in the above-described system, a residual charge remains on the condensers 11 and 12 associated with said gaps. If successive sparks across a given set of gaps are of opposite polarity, this residual charge does not materially affect the operation of the system. However, when successive sparks across the same gaps are of like polarity, the residual charge which remains on the condensers effects a reduction of the potential drop between the spark gap electrodes when the next impulse is applied, thereby necessitating a higher applied voltage to break down the resistance of the gaps.

In order to obviate the above disadvantage, which results from the residual charge on the condensers, novel means are provided for dissipating each residual charge before the occurrence of the succeeding impulse. Said means, in the form shown, is constituted by resistors 17 and 18 connected in shunt with condensers 11 and 12, respectively. The values of resistances 17 and 18 will depend upon the particular system in which

the same are used, but in an average internal combustion engine ignition system a resistance of one megohm for each resistance is suitable. For most successful operation, the values of the resistances should be just high enough to dissipate the residual charges on the condensers between successive impulses and may be readily determined by test. In various systems, resistances ranging from ½ megohm to 5 megohms may be found suitable. When the residual charges, or a major part of each of such charges, on the condensers 11 and 12 are dissipated by resistances 17 and 18, the operating characteristics of the system are considerably improved.

In the operation of the system shown, a low tension current is caused to flow from a suitable source through the circuit comprising primary winding 5 and circuit breaker 7 when the latter is in closed position. When the current in the primary winding reaches a predetermined maximum, breaker 7 may be opened by rotatable cam 19. A high tension voltage is thereby induced in secondary winding 6, which becomes a source of high tension current, the voltage being sufficiently high to break down the resistance of spark plug gaps 13 and 14 so that current flows across said gaps, thereby creating sparks and at the same time charging condensers 11 and 12. Substantially the full voltage induced in the secondary winding is thus applied to both spark gaps while the total energy of the source is divided between the gaps. The charged condensers then discharge back across the gaps, producing a second set of sparks until the charges on the condensers fall below that necessary to overcome the resistance of the gaps. The remainder of the charges on the condensers or residual charges are then dissipated by resistances 17 and 18 so that they will not affect the potential difference between the spark gap electrodes when the next impulse from secondary winding 6 occurs.

There is thus provided a novel dual ignition system wherein a proper division of the energy delivered by a single source of energy, such as the secondary winding of an ignition coil, is obtained when both spark plugs or gaps are in good condition, and wherein the discharge across one gap of a given pair is not detrimentally affected by fouling of the other gap. An ignition system is also provided wherein the detrimental effect of residual charges on condensers connected in series with the spark gaps is eliminated in a simple and effective manner.

Although only a single form of the invention has been shown and described in detail, it will be understood that other forms are possible and that various changes may be made in the details and arrangement of the parts without departing from the spirit and scope of the invention. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. In a dual ignition system for internal combustion engines or the like, a single source of high tension current, a pair of spark gaps, and means for applying substantially the full voltage of said source to each of said gaps while dividing the energy from said source between said gaps, said last-named means including a condenser in series with each of said gaps and resistor means shunting said condensers.

2. In a dual ignition system for internal combustion engines or the like, a source of high tension current, a pair of spark gaps, a common conductor for said gaps from said source, and means including an electrostatic condenser connecting each of said gaps to the common high tension conductor and resistor means connected in shunt with said condensers.

3. In a dual ignition system for internal combustion engines or the like, a source of high tension current, a pair of spark gaps, a common conductor for said gaps from said source, and means including twin electrostatic condensers connecting said gaps in parallel with each other to said common conductor and resistance means connected in shunt with said condensers.

4. In a dual ignition system for internal combustion engines or the like, a source of high tension current, a plurality of spark gaps, a common conductor for said gaps from said source, and means including a condenser connecting each of said gaps to said conductor and a resistance connected in shunt with each of said condensers.

5. In a dual ignition system for internal combustion engines or the like, a source of high tension current, a plurality of spark gaps connected in parallel to said source, a condenser connected in series with each of said spark gaps, and a resistance connected in shunt with each of said condensers.

LLOYD H. SCOTT.