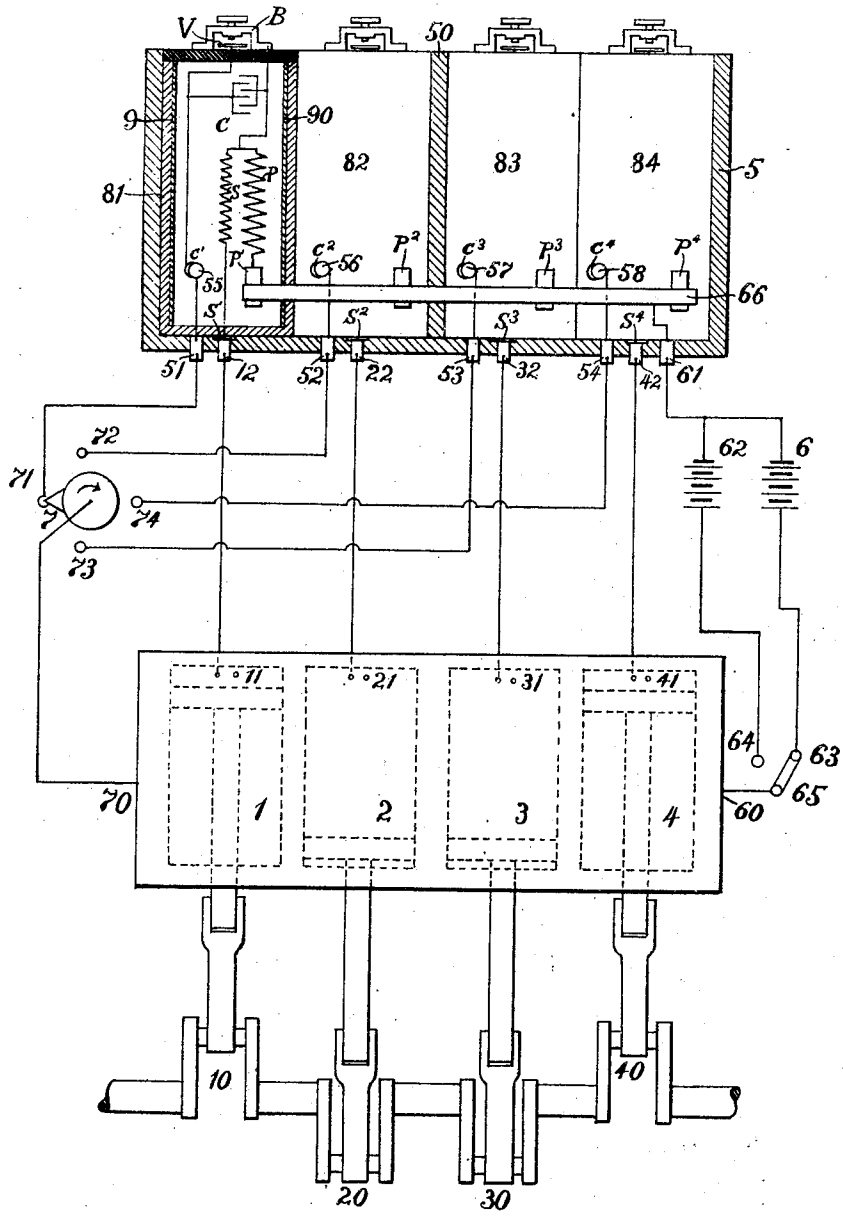
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INDUCTION COIL FOR IGNITION SYSTEMS.

APPLICATION FILED JAN. 25, 1909.

928,204. Patented July 13, 1909.



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INDUCTION-COIL FOR IGNITION SYSTEMS.

No. 928,204. Specification of Letters Patent. Patented July 13, 1909.

Original application filed June 19, 1907, Serial No. 379,782. Divided and this application filed January 25, 1909. Serial No. 474,032.

To all whom it may concern:

Be it known that I, BURTON L. LAWTON, a citizen of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Induction-Coils for Ignition Systems, of which the following is a specification.

This application is a division from my application Serial Number 379,732 filed June 19, 1907, Patent No. 911,414, dated Feb. 2, 1909. That patent relates to a multiple cylinder internal combustion motor ignition system and this present application relates to the induction coil apparatus to be used in such a system. In high tension ignition systems of this character it is desirable to provide primary and secondary windings to correspond with the igniters in the cylinders. I prefer to supply all the primary windings from a common source such as a battery of dry cells and to provide an individual vibrator for each primary. The secondary of each coil is preferably wound on the same core with its primary. A circuit closer brings the primaries successively into circuit. The vibrators then act so as to interrupt the circuits rapidly and induce momentary currents in the corresponding secondaries sufficient for ignition. Four cycle motors have one ignition and working stroke of each piston once in two complete revolutions of the main shaft. A four cylinder engine, therefore, has one ignition at each half revolution of the main shaft. There is, therefore, at the moment of ignition in one cylinder, some other cylinder with a full charge of air and fuel, but uncompressed. This charge is inflammable and sometimes is untimely ignited, especially when the mixture is rich.

For convenience in manufacture, shipping, handling, installing, operating, testing, adjusting and repairing it is very desirable to mount all the coils in close proximity in a single case. This however has given rise to a difficulty known variously as "back firing", or "cross firing". Where the apparatus is used on a motor vehicle the trouble is called "bucking" and is annoying and sometimes very dangerous. The trouble is manifested by the cylinders firing out of order or sequence and is due I believe to magnetic and static induction between the primaries and secondaries of the coils.

It is my object to prevent such trouble and to insure a perfectly regular and orderly action. I accomplish the desired result in a very simple and inexpensive manner for instance by inserting one or more plates or sheets of suitable material preferably metal such as soft iron between the adjacent coils so as to prevent any interference between the primaries and secondaries of adjacent coils. The design or shape of these shielding plates is unimportant but they preferably form an open circuit around the coils.

The drawing shows a section of casing with four units, one of which is in section, and all are arranged in a diagram with a four cylinder four cycle motor.

The cylinders 1, 2, 3 and 4 are provided with the usual valves and pistons connected to cranks 10, 20, 30 and 40. The igniters 11, 21, 31 and 41 have one terminal of each grounded on the engine frame and the other terminals connected to the terminals 12, 22, 32 and 42 in the bottom of the casing 5. The casing preferably has a center partition 50 which strengthens it and divides it into two compartments. The battery or source of current 6 is grounded at 60 on the engine frame and connected to terminal 61 in the casing. It is often desirable and, in fact, customary, to provide an additional battery such as 62 and a switch with the contact 63 and 64 and switch arm 65, so that either battery may be thrown into or out of circuit readily.

A circuit closer or switch is provided, which is driven at a rate proportioned to the speed of the motor, as is customary, and which has a revoluble member 7, grounded at 70 on the engine frame. The contacts 71, 72, 73 and 74 are connected to the terminals 51, 52, 53 and 54 in the casing. Each of the coil boxes 81, 82, 83 and 84 is preferably independently removable from the casing and contains a primary winding P, a secondary winding S and a condenser C, the latter being bridged or shunted across the vibrator terminals B and V. The primaries have terminals P′, P^2, P^3, and P^4 on the exterior of the boxes which engage the contact strip 66 in the casing, which is connected to battery terminal 61. The secondaries have terminals S′, S^2, S^3 and S^4 on the bottom of the boxes engaging the terminals 12, 22, 32 and 42 which are connected to the igniters. The

other terminals of the coil windings in each box are connected to the bridge B. The armatures, such as V, are connected to terminals C', C^2, C^3 and C^4 on the exterior of the boxes which engage the contacts 55, 56, 57 and 58 in the casing which are connected to the terminals 51, 52, 53 and 54.

In the position shown in the drawing, the primary circuit may be traced from battery 6 to terminal 61, contact strip 66, contact P', primary winding P, bridge B, vibrator V, contacts C' and 55, terminal 51, contact 71, circuit closer 7, ground 70 to 60 switch 65, contact 63 to the battery. The secondary circuit may be traced from the secondary winding S, terminals S' and 12, igniter 11, through engine frame to ground 70 circuit closer 7, contact 71, terminal 51, contacts 55 and C', armature V and bridge B back to the secondary. The charge in cylinder 1 is thus ignited. It is customary to fire the cylinders in the order of 1, 2, 4 and 3 and the circuits as shown are so ordered, the circuit closer rotating to the right, so as to successively complete the circuits through the coil boxes 81, 82, 84 and 83. It is obvious that contacts 72 and 74 might be interchanged so that the order of firing would be 1, 4, 2 and 3, the valves being properly set.

Sometimes the charge in cylinder 2 which, as shown and described, is supposed to follow cylinder 1 at 180°, although uncompressed is ignited at the same time as cylinder 1. I have been able to prevent this by eliminating or reducing the induction effect of the coils in box 81 on the coils in box 82 by means of a soft iron plate or shield placed between the coils. Preferably I place a plate or sheet such as 9 and 90 on each side of each coil within the box which is customarily of wood. There is then no danger of the cross induction, no matter what the position or arrangement of the boxes in the casing. The same difficulty of "back" or "cross firing" is encountered in four cycle engines of more than four cylinders and may be avoided by the use of my invention; so also in engines of the two cycle type and two or more cylinders, the "cross-firing" may be avoided by inductively insulating the coils for the different cylinders by one or more shields as described. I wish it clearly understood that I consider my invention in its broad sense to cover the use of any suitable material preventing cross-induction and untimely firing. Experiment with a system may show that the "cross firing" occurs only in one cylinder, in which case it will be only necessary to shield the coil for that cylinder on the side from which the trouble comes.

What I claim is:

1. Induction apparatus for an ignition system comprising, a plurality of adjacent coils, each consisting of normally open circuit primary and secondary windings and a shield to prevent induction between the adjacent secondary windings.

2. Induction apparatus comprising a plurality of coils, each consisting of primary and secondary windings, a vibrator for each primary and a metallic member between the coils, forming a local magnetic shield for each secondary.

3. Induction apparatus comprising a plurality of coils arranged in close proximity to one another and each having normally open circuit primary and secondary windings and adapted to be brought into operation in a predetermined sequence and means for preventing the induction of currents in one secondary by the influence of an immediately adjacent secondary.

4. Induction apparatus for ignition systems comprising a plurality of coils having normally open circuit primary and secondary windings, and an iron plate between adjacent coils to prevent troublesome interference.

5. Induction apparatus for ignition systems comprising a plurality of coils and an open circuit shield between adjacent coils to prevent interference.

6. Induction apparatus for ignition systems comprising a plurality of coils and a shield between adjacent coils and projecting above and below the ends thereof to prevent cross induction.

7. Induction apparatus comprising, a casing, a plurality of independently removable coil units mounted therein and a shield to prevent interference between adjacent units.

8. Induction apparatus comprising a casing, a partition dividing said casing into two compartments a plurality of coil units in each compartment and a shield to prevent interference between the units in a compartment.

9. Induction apparatus comprising a casing, a plurality of coil units removably mounted therein and each consisting of a box, primary and secondary windings and a shield on at least one side thereof inside said box to prevent interference.

10. Induction apparatus for ignition systems comprising, a plurality of coils and one or more sheets of iron between adjacent coils leaving at least one side of each coil exposed.

11. Induction apparatus comprising a plurality of coil units each having shields on its opposite sides to prevent interference and leaving at least one side exposed.

12. An induction coil for ignition systems comprising primary and secondary windings, and a sheet of iron on one side thereof leaving at least one other side exposed.

13. An induction coil for ignition systems comprising, primary and secondary

windings and shields on two sides of said coil only to prevent interference.

14. An induction coil for ignition systems comprising, a vibrator, primary and secondary windings and a shield on one side thereof to prevent interference and leaving at least one side exposed.

15. An induction coil for an ignition system comprising, primary and secondary windings, a vibrator, a condenser shunted across the vibrator contacts and an open circuit shield arranged on at least one side thereof to prevent interference.

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