V. G. APPLE.

ELECTRICAL EQUIPMENT FOR INTERNAL COMBUSTION ENGINES.

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1,132,297.

Patented Mar. 16, 1915.

Fig. 1.

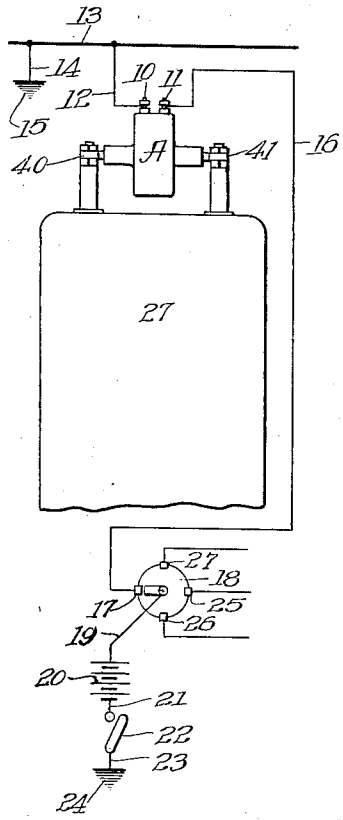


Fig. 2.

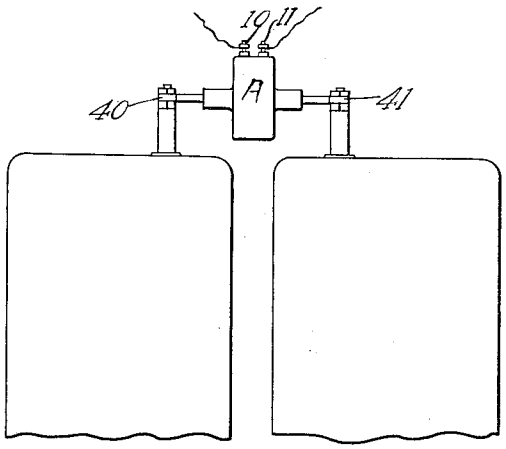
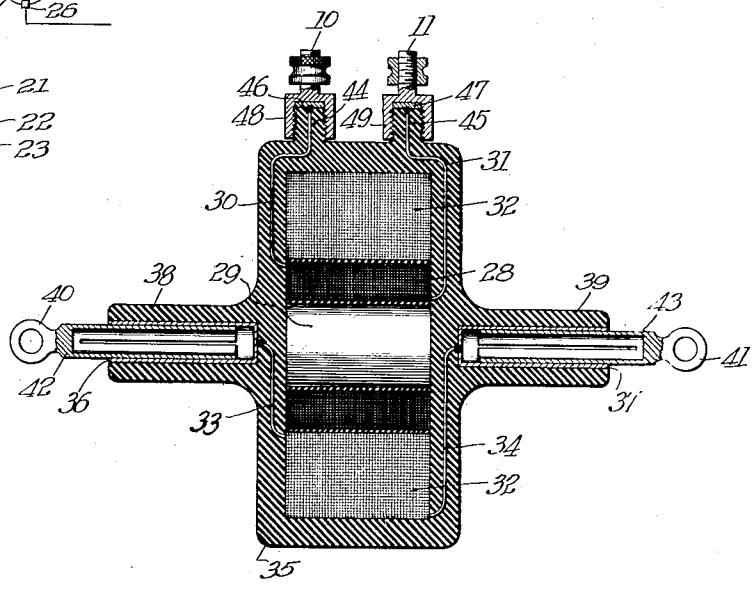


Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO, ASSIGNOR TO THE APPLE ELECTRIC COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO.

ELECTRICAL EQUIPMENT FOR INTERNAL-COMBUSTION ENGINES.

1,132,297. Specification of Letters Patent. Patented Mar. 16, 1915.

Original application filed September 9, 1912, Serial No. 719,360. Divided and this application filed November 17, 1913. Serial No. 801,349.

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Electrical Equipments for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in electrical equipments for internal combustion engines, and particularly to that part of the apparatus which provides the charge-igniting spark.

One of the objects of my invention is the provision of an induction device bodily carried on the spark plug, or otherwise supported in close proximity to the engine so as to minimize the length of the secondary circuit.

Other and further objects of my invention will become apparent to those skilled in the art from a consideration of the following description when taken in conjunction with the drawings forming a part thereof, wherein—

Figure 1 diagrammatically shows the wiring of my apparatus, together with one of the induction coils, supported by and operating two spark plugs in one cylinder of a gas engine. Fig. 2 illustrates my improved induction device as carried by the spark plugs of two adjoining cylinders, and Fig. 3 is a longitudinal, vertical, sectional view through the induction apparatus shown in Figs. 1 and 2.

In Fig. 1 of the drawings, I have illustrated my improved induction device mounted upon and simultaneously operating two spark plugs inserted in the head of one cylinder of an internal combustion engine. The body of the device is indicated by the letter A, carrying at its periphery the two primary terminals 10 and 11, the one of which is connected through the wire 12 with a bus bar 13 which in turn is connected by the wire 14 to ground at 15. The other primary terminal 11 is connected by the wire 16 with one of the terminals 17 of a commutating device 18, the opposite lead 19 of which is connected to one terminal of the battery 20. The other terminal of the battery 20 connects through the wire 21 to one point of the switch 22, the other point of which is connected by the wire 23 to ground at 24.

Whereas the device may be used with an internal combustion engine having any number of cylinders, I have in the drawings indicated a commutating device having four terminals 17, 25, 26 and 27. The terminal 17 is connected with the induction device A carried by a cylinder 27 and the other terminals 27, 25, and 26 are connected with similar induction devices mounted upon three other cylinders not shown in the drawings. The bus bar 13 forms the opposite connection for each of the induction devices mounted on the other cylinders.

The primary coil 28 of the induction device is wound upon a central core 29 and is provided with terminal wires 30 and 31. The secondary coil 32 is wound over the primary coil and its terminal wires 33 and 34 are connected to terminals of a particular form. The coils and core referred to are then inclosed in a body of insulating material 35, such as "bakelite" or the like, which is applied in a mastic state and subsequently baked until it becomes hardened and sufficiently strong to support the coils. The secondary terminal wires 33 and 34 are embedded in the insulating material and are connected to the metallic cups 36 and 37 respectively that are held in place in laterally projecting hubs 38 and 39 respectively. Connecting terminals 40 and 41 are provided for connections with spark plugs and are adapted for adjustment to accommodate the distance that the spark plugs may be separated. To this end, split tubes 42 and 43 have frictional telescopic movement within the respective fixed cups 36 and 37 to which the secondary coil is connected. The terminals 40 and 41 may be separated to a variable degree by moving the tubes 42 and 43 in and out of the respective cups. The primary terminals 30 and 31 are likewise embedded in the body of insulating material 35 and pass through screw threaded projections 44 and 45 respectively. These terminals are secured to metallic disks 46 and 47 as by solder, or otherwise, screw threaded terminal cups 48 and 49 being then screwed over the threaded projections until they make electrical contact with the respective terminal disks. Each of the cups carry screw connections, as 10 and 11, respectively.

which serve as the primary terminals of the spark coil.

The entire elimination of the secondary wiring, by directly attaching the secondary terminals of the induction coils to the spark plugs removes one fruitful source of trouble, such as causing ignition in the wrong cylinder, superinduced by the inductive effect of one set of secondary connecting wires upon another neighboring set. The static discharge due to the condenser effect of these highly insulated wires is not present when the secondary coil is directly connected to the spark plugs. Mechanical vibration, which so often is a disturbing factor by causing breakage of such wires, is no longer to be feared.

While I have found it convenient to support the spark coils directly upon the spark plugs, it is obvious that they may be otherwise supported upon the engine cylinders, or they may be partly supported by the plugs, and partly by other means.

In Fig. 2 I have shown my improved induction device carried by and operating two spark plugs positioned in two neighboring cylinders, as in some ignition systems for a multiple cylinder internal combustion engine a spark is simultaneously produced in two adjoining cylinders, the one being at the proper point in its cycle for explosion to take place, and the other spark taking place in a dead gas for the purpose of cleaning the terminals.

The invention as illustrated and described in this application forms a part of that already described in my co-pending application, for improvements in electrical equipments for internal combustion engines filed September 9th, 1912 and serially numbered 719,360, of which this forms a division.

What I claim is:—

1. A spark coil having a primary and a secondary winding and terminals for the secondary winding adjustable to varying distances of separation and adapted to support the coil structure.

2. A spark coil having primary and secondary windings, a homogeneous insulating body inclosing said windings, and provided with hub-like projections therefrom, and telescoping laterally adjustable coil supporting terminals for the secondary winding within said projections.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

VINCENT G. APPLE.

In the presence of—
FORÉE BAIN,
MARY F. ALLEN.