Sept. 9, 1930. C. F. REIS 1,775,600

INDUCTION COIL

Filed April 9, 1928

Fig. 1.

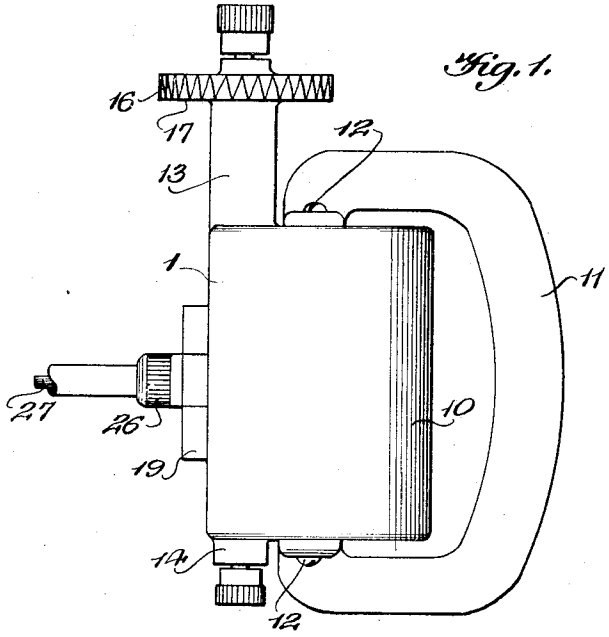
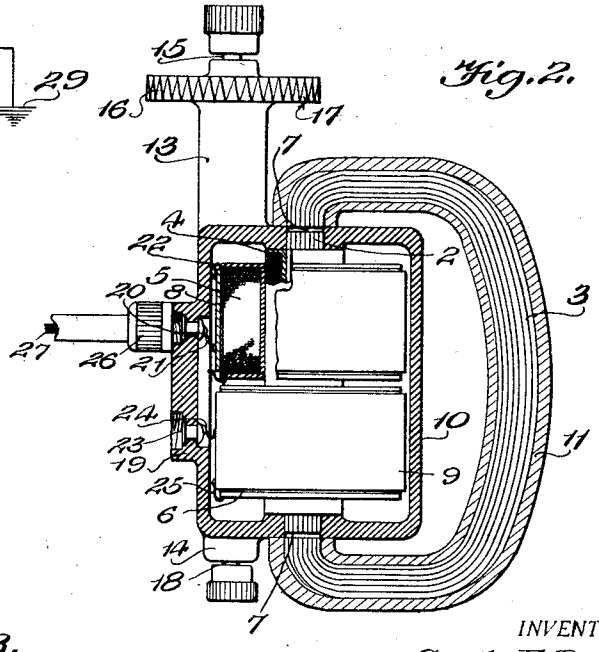


Fig. 2.



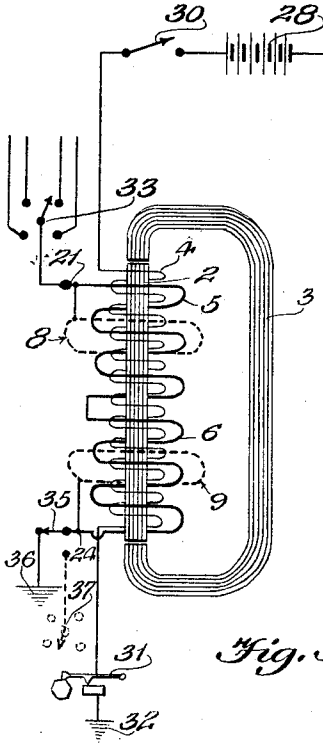


Fig. 3.

INVENTOR.
Curt F. Reis.

BY

Eccleston & Eccleston,
ATTORNEYS.

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UNITED STATES PATENT OFFICE

CURT FREDERICK REIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO EXCEL MAGNETO CO., OF CHICAGO, ILLINOIS

INDUCTION COIL

Application filed April 9, 1928. Serial No. 268,549.

My invention relates to induction coils, and particularly to induction coils adapted for use in automobile ignition systems.

One object of my invention is to provide a compact coil which may be assembled without the use of numerous screws and bolts.

Another object is to construct a coil which may readily be adapted to use in different sized units and in which the inclosing casing is a unit.

Another object is to construct a highly efficient coil which is remarkably free from electrical break-downs.

I will describe one form of induction coil embodying my invention and then point out the novel features in claims.

In the accompanying drawing, Figure 1 is a side view of one form of induction coil embodying my invention.

Figure 2 is a view similar to Figure 1, with parts broken away to show the interior construction.

Figure 3 is a diagrammatic view showing one form of circuit in which my coil may be used.

Referring to Figs. 1 and 2 the reference character 1 is a general designation applied to my coil. This coil is made up of a straight core portion 2 and a curved core portion 3, each composed of many thin strands of fine soft iron wire so as to reduce the reluctance of the magnetic circuit and minimize losses due to hysteresis and eddy currents. The core portion 2 carries a primary winding 4 and two spaced, separately wound secondary windings 5 and 6. Primary 4 closely embraces the core portion 2 and carries the secondaries 5 and 6. The subdivision of the core into many fine wires increases the magnetic induction of the straight core, and the induction is still further increased by the presence of the curved core portion 3. As here shown, the core portions 2 and 3 are separated by small air-gaps 7 which increase the leakage reactance of the windings on core portion 2, and hence increase the time constant of the secondary circuit to prevent too sudden decay of the current in this circuit. This insures that the duration of the peak voltage in the secondary circuit shall be sufficient to ignite the explosive charge in the engine cylinder to which current is being supplied.

Windings 4, 5 and 6 are suitably insulated from each other and from the core portion 2, but in order to decrease the possibility of electrical break-down due to high voltage discharges puncturing the secondary insulation, coils 5 and 6 are tightly surrounded by metal bands 8 and 9 respectively.

It is necessary to provide an inclosing casing for the coil parts, and a base for supporting them and for this purpose I inclose the core portion 2 including coils 4, 5 and 6 in a cast metal shell 10, preferably of aluminum. This shell 10 closely embraces all of the parts to hold them in rigid assembled position and is suitably arranged to provide a base which serves as a mounting for the entire coil structure. Core portion 3 is likewise inclosed in a cast aluminum shell 11, and the two shells 10 and 11 are secured in assembled relation by any suitable means, here shown as screws 12. Casing 10 not only incloses core portion 2 and the windings 4, 5 and 6 but it carries integral terminal extensions 13 and 14. Passing through the extension 13 is a conducting rod 15 connected to one end of primary 4. Between the terminal 15 and the winding 4 is a regulating resistance 16 carried on the usual porcelain disk. This resistance is normally of small value but when the primary circuit remains continuously closed the increased current in the primary circuit causes this wire to heat up, increases its resistance and thereby limits the primary current to a safe value. The terminal 14 likewise contains a core 18 connected in the primary circuit.

The arrangement of two separate secondary coils 5 and 6 makes it possible to obtain two different arrangements of the secondary circuit as will be pointed out later. As shown in Fig. 2 the shell 10 carries an integral extension 19 provided with two terminal connections 20 and 23. Terminal 20 is connected to metal band 8 by a conducting strip 21 and band 8 is in turn connected to secondary 5 by a strip 22. In similar manner terminal 23 is connected to band 9 by a strip 24, and band

9 is connected to secondary 6 by a strip 25. A plug 26 containing a cable 27 affords means for making a connection to either terminal 20 or 23.

It will now be clear that the primary circuit may be completed by connecting a source of current to terminal extension 13 and one terminal of circuit breaker to extension 14, the other terminal being grounded. This is more clearly shown in Fig. 3. In this figure a battery 28 has one terminal grounded at 29 and the other connected to primary 4 by a switch 30. The other terminal of primary 4 is connected to ground at 32 through a circuit breaker 31. The secondary circuit from the upper terminal of coil 5 passes to a distributor 33 and thence to ground through the spark plugs of the engine, while the lower terminal may be connected to ground 36 or to a second distributor 37 by means of a switch 35. When the switch 35 is in the vertical position two sparks are produced in the secondary circuit through distributors 33 and 37 but when the switch 35 is connected to ground the full voltage of both secondaries 5 and 6 is supplied to distributor 33. It will be understood that the switch 35 may be connected to terminal 23 by a suitable plug while the plug 26 is connected to terminal 20.

My apparatus is not only capable of producing a strong intense spark, but at the same time it is of simple construction and can be assembled without the use of screws other than in fastening the shells 10 and 11. The necessity for drilling is therefore obviated and assembly costs reduced to a minimum. It should be noted that this coil may be made in various sizes by simply changing the size of the magnetic core to correspond to the size of winding employed. The inclosing shells may then be cast in place without any special provision other than a different sized mold.

Although I have herein shown and described only one form of induction coil embodying my invention it will be understood that various changes may be made within the scope of the appended claims without departing from the spirit and scope of my invention.

What I claim is:

1. An induction coil comprising a magnetic core forming a substantially closed magnetic path, made up of a straight portion and a curved portion, a plurality of windings on said straight portion, and a one-piece cast metal shell surounding each of said portions in permanently attached relation thereto, and forming a mounting therefor.

2. An induction coil comprising a substantially closed magnetic circuit, made up of a straight portion and a curved portion separated by air gaps, a plurality of windings on said straight portion and a one-piece cast aluminum shell encasing each of said core portions.

3. An induction coil comprising a straight magnetic core portion of fine wire, a plurality of windings on said core portion, a U-shaped magnetic core portion having its ends in magnetic relation to the ends of said straight portion to form a substantially closed magnetic path, a one-piece shell of cast metal encasing each of said core portions to permanently seal the same, and circuit terminals embedded in one of said shells.

4. An induction coil made up of a straight core portion and a curved core portion forming a single magnetic path, windings in inductive relation to said path, and a one-piece cast metal shell encasing each of said core portions and having an integral metal bracket forming a mounting therefor.

5. An induction coil comprising a straight core portion of fine wire, a plurality of windings on said portion, a curved core arranged to embrace said straight portion but spaced therefrom at each end, a one-piece cast metal shell enclosing each of said core portions, means for detachably securing said shells together and terminals carried by one of said shells.

6. An induction coil comprising a closed magnetic path made up of a straight portion and a curved portion, a plurality of windings in inductive relation to said path, a cast metal shell encasing said straight portion, a similar shell enclosing said curved portion, circuit terminals carried by said housing and connected with said windings, and means for detachably securing said portions in magnetic relation.

7. An induction coil comprising a straight magnetic core portion carrying windings, a cast metal shell surrounding said core portion and carrying integral terminal extensions, a regulating resistance on one of said extensions and connected with one of said windings, a curved magnetic core portion embracing said straight portion and cooperating therewith to form a substantially closed magnetic path, a cast metal shell inclosing said curved core portion, and circuit terminals mounted on one of said shells and connected to certain of said windings.

8. An induction coil comprising a magnetic core of fine wire made up of a straight portion and a curved portion separated by air-gaps, windings on said straight portion, a combined integral enclosing casing and base comprising a metal shell cast around said windings and said core to permanently seal the same, a similar shell surrounding said curved portion, and means for detachably securing said shells together.

CURT FREDERICK REIS.