

July 7, 1925.

1,545,429

J. H. HUNT

IGNITION APPARATUS

Filed Jan. 12, 1923

2 Sheets-Sheet 1

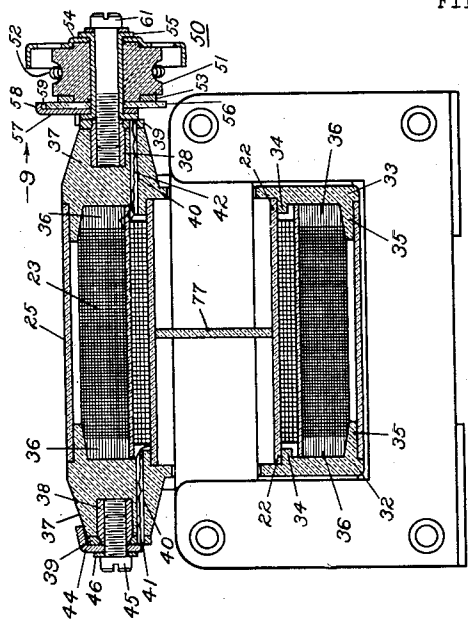


Fig. 1

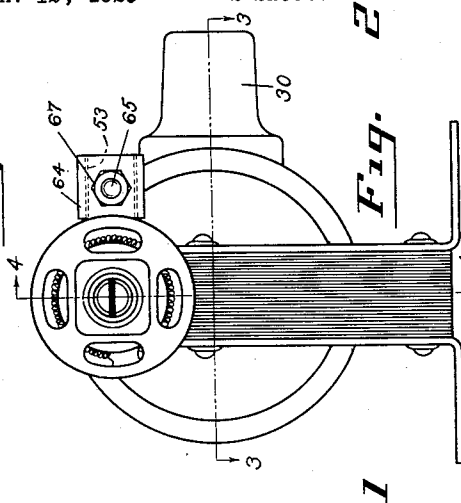


Fig. 2

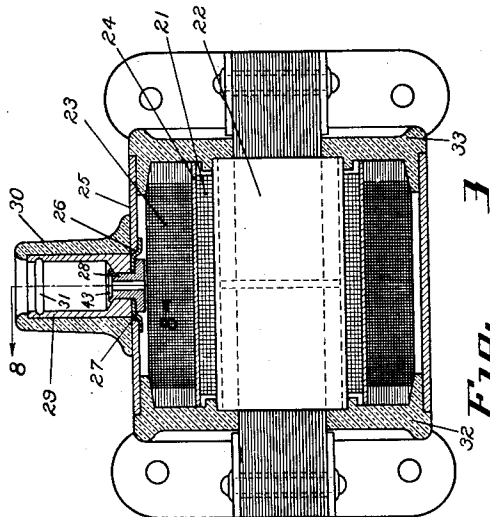


Fig. 3

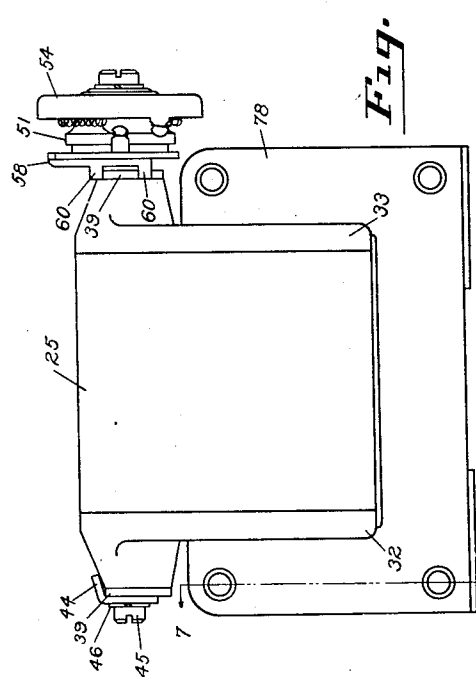


Fig. 4

Witnesses
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IGNITION APPARATUS

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2 Sheets-Sheet 2

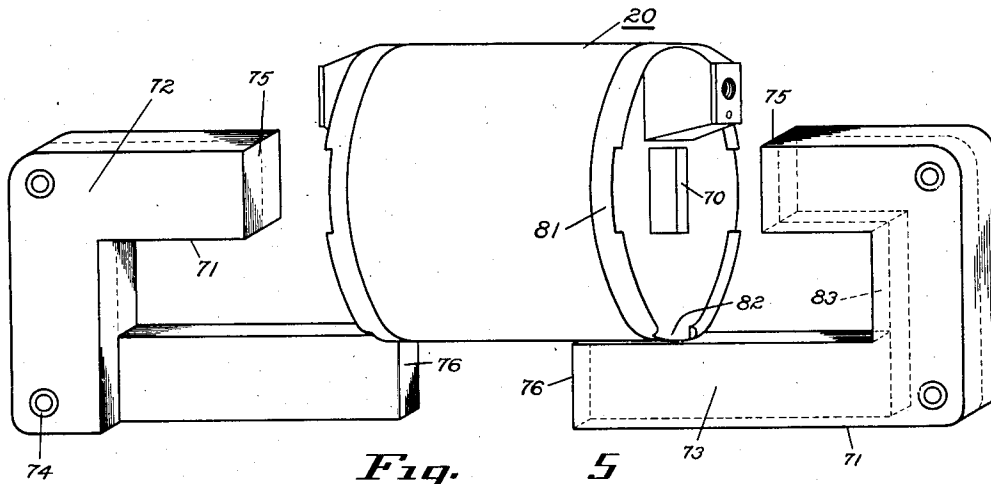


Fig. 5

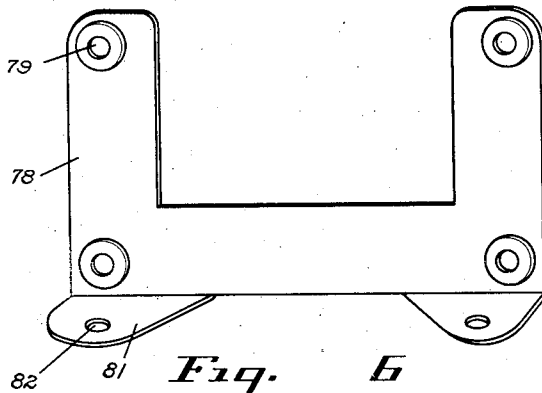


Fig. 6

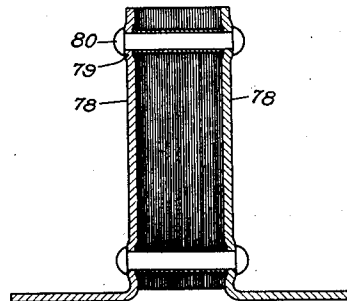


Fig. 7

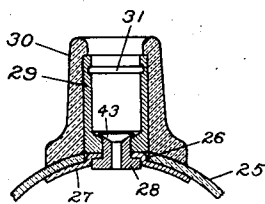


Fig. 8

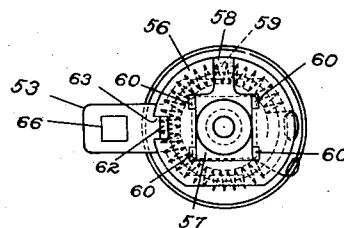


Fig. 9

Witnesses

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UNITED STATES PATENT OFFICE.

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IGNITION APPARATUS.

Application filed January 12, 1923. Serial No. 612,323.

To all whom it may concern:

Be it known that I, JOHN H. HUNT, a citizen of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Ignition Apparatus, of which the following is a full, clear, and exact description.

This invention relates to induction coils and particularly to the type of induction coil used with ignition apparatus for automobiles.

One object of the invention is to provide improvements in an ignition coil having a core which encircles the winding and provides an air gap preferably within the winding. Such a coil is generally known as the C-type because the core may be considered C-shaped. However, the present invention is not to be limited to a C-shaped core.

More particularly it is an object of the invention to provide for the mounting of the windings in a moisture proof closure which can be completely assembled as a unit independent of the core. The windings of the ignition coil are preferably enclosed within a moisture proof container which supports the terminals of the windings for making connections with other parts of the ignition apparatus.

A further object is to provide a core preferably of the C-type or other type which provides an air gap within the windings, and which may be easily assembled with the coil structure mounted thereon, the core providing a support for the coils which is sufficiently rigid so that the possibility of damage to the windings due to vibration is minimized.

Preferably the core is formed by securing together a plurality of groups of core laminations or core sections. In this connection it is an object of the invention to provide means for securing the core sections together with the coil assembly mounted thereon, said means serving as a support bracket for the ignition coil.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly shown:

In the drawings:

Fig. 1 is a side elevation of the present invention. 55

Fig. 2 is an end view thereof.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2. 60

Fig. 5 shows the coil assembly and core sections in disassembled relation.

Fig. 6 is a perspective view of one of the coil brackets. 65

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 1.

Fig. 8 is a fragmentary sectional view taken on the line 8—8 of Fig. 3.

Fig. 9 is a view of the ignition resistance unit when disassembled from the coil, this view being taken in the direction of arrow 9 of Fig. 4. 70

In the drawings, 20 designates the coil assembly which comprises a primary winding 21 wound about a non-conducting tube 22 and a secondary winding 23 wound about a non-conducting tube 24. These windings are separately applied to their respective tubes and the internal diameter of the tube 24 is great enough so that it will easily slip over the primary windings 21. 75

A tube 25 forming a part of the coil housing is provided with an aperture 26 for receiving a dished washer 27 which is secured by a hollow rivet 28 to metal insert 29 which has been previously moulded into a non-conducting terminal socket member 30 preferably of bakelite or other moulded insulating material. The insert 29 provides a socket for receiving the end of an insulated stranded cable for conducting high tension current to the distributing apparatus of the ignition system. The socket 29 is provided with a groove 31 for receiving a wire split ring surrounding the insulation of the cable as clearly shown in the patent to O. F. Conklin, 1,372,065. The coil housing also includes coil end covers 32 and 33 each having an annular flange 34, the internal diameter of which is such as to fit closely over the outside of the tube 22 supporting the primary winding 21. The end covers 32 and 33 each have an annular flange 35 the external diameter of which is such that the end cover may fit tightly within the tube or bar- 85 90 95 100 105

rel 25. The internal surfaces of the flanges 35 are conical in shape so as to contact with the margins of the paper insulation layers 36 of the secondary winding 23 and crowd these layers together so as to hold the secondary winding 23 securely in place and to assist in preventing moisture getting in between the insulating layers of the secondary winding. The primary winding 21 is formed preferably of enameled wire wound upon core 22, after which the primary is baked to eliminate moisture. The secondary winding 23 also preferably of enameled wire wound upon a core 24, is dipped in a suitable insulating material, varnished and then baked. The primary winding is inserted into the hollow core of the secondary winding.

Each end cover 32 and 33 is provided with a boss 37 supporting a threaded insert 38 preferably moulded in place. To each insert 38 there is riveted a conducting plate 39 and a small hole 40 extends through the plate 39 and the boss 37 into the interior of the coil housing. It is apparent that the tubes 22 and 25 and the end covers 32 and 33 provide a housing for the coil windings. The joints between these members are sealed by a suitable cement so as to provide moisture proof enclosure.

One terminal lead 41 of the primary winding is brought out through the hole 40 in the end cover 32 and connected with one of the plates 39. The other terminal of the primary and the inside of the secondary are brought out through the other hole 40 as indicated at 42, and are both attached by soldering to the other plate 39. The outside terminal of the secondary winding is brought out through the hollow rivet 28 and is soldered thereto as indicated at 43.

To attach a wire to the left hand block 39 there is provided a terminal clip 44, a screw 45 and a lock washer 46. The right hand insert 38 and plate 39 may be secured directly to a wire in the same manner. However, if an ignition resistance unit is employed, this unit is attached directly to the insert 38 and an ignition circuit wire is attached to the ignition resistance unit.

This unit designated as a whole by numeral 50 includes a non-conducting spool 51 carrying a resistance wire 52 having its terminals connected respectively with a terminal bracket 53 and with a cover disc 54. A hollow rivet 55 secures together the spool 51, the terminal bracket 53, the cover 54, a non-conducting washer 56 and a plate 57. Plate 57 is provided with an ear 58 bent over and fitting within a notch 59 provided in the non-conducting washer 56. Plate 58 is provided with ears 60 extending toward the end cover 33 and spaced apart so as to fit around the terminal plate 39 carried by said end cover. A screw 61 passing through

the hollow rivet 55 secures the resistance unit assembly 50 to the insert 38 and unit 50 is prevented from turning on the screw 61 because the ears 60 extend along the sides of the plate 39. The resistance terminal bracket 53 is prevented from turning with respect to the plate 57 by virtue of a lug 62 engaging a notch 63 provided in the non-conducting washer 56. The resistance terminal bracket 53 carries a terminal clip 64 and a terminal bolt 65 having a square shoulder under the head thereof which fits within the square opening 66 provided in the bracket 53. A nut 67 cooperates with the bolt 65. The solder which is used to attach the coil terminals to the plates 39 will fill up the holes 40 in the end covers 32 and 33 thereby preventing access of moisture and foreign matter to the interior of the coil housing through holes 40.

Each end cover is provided centrally thereof with a rectangular aperture 70 for receiving the laminated core sections or sub-assemblies which will now be described. The core comprises two sections 71 each section including a plurality of L-shaped laminations 72 and a plurality of J-shaped laminations 73 which are assembled together by means of hollow rivets 74. There are substantially the same number of J-shaped and L-shaped laminations in each core section. When these laminations are assembled together the core section will have a branch portion 75 which is substantially square in cross section and a branch portion 76 which is oblong in cross section with the short dimension equal to one half of the long dimensions of the cross section.

In other words the separately formed core units are made so that the portions which are to extend within the windings are complete in cross sectional dimensions, while the portions which are to extend along the outside of the windings are built up to partly complete in cross sectional dimensions. These latter portions are arranged to overlap and thus form, when overlapping, a core portion of the desired cross section.

When the core sections 71 are assembled together, each branch portion 75 of a core section is moved through a rectangular opening 70 and into the space within the tube 22. The adjacent ends of the branches 75 are spaced by a non-conducting disc 77. The core sections are fastened together to form a single C-shaped core by means of bracket 78 provided with holes 79 which are in alignment with the holes in the hollow rivets 74. The metal of the bracket 78 is deformed around the hole 79 in order to provide for the riveted over end of the hollow rivet end 74. This structure is fastened together permanently by means of the solid rivets 80 as shown clearly in Fig. 7. Each bracket 78 is provided with ears 81 which

are apertured at 82 for receiving screws or the like by means of which the coil may be mounted on a suitable support. The coil assembly is prevented from rotation with respect to the core since the rectangular openings 70 are provided to receive the rectangular portions of the core which enter within the coil windings. Each end bell includes an annular bead or flange 81 which is notched at 82 to receive a portion of the core 83 extending along side the end of the coil assembly.

The following are some of the advantages which result from this construction: The cost of material for the housing is reduced because only the windings are enclosed. The windings and enclosure therefor is a complete unit easily separated from the core and brackets, so that if the windings become defective they can be replaced without throwing away the core. The housing for the windings supports them sufficiently without requiring a wax filling to protect the windings from injury due to vibration. The type of core with air gap inside the windings and external iron circuit allows the use of coil near magnetizable bodies without substantial loss due to lines of force straying from the coil towards said bodies. This is possible because the point where the magnetic flux enters the air is remote from magnetizable bodies away outside the coil. This type of core also improves the efficiency of the coil for the amount of copper wire used in the windings. It is therefore possible to construct a coil for engine ignition work with less copper wire than in the conventional coil with only a central core.

The coil assembly can be supported upon the core assembly in three positions, namely, in the position shown in Fig. 2, or with the socket 30 on top, or with the socket 30 extending toward the left from the tube 25 (as viewed in Fig. 2).

While the form of embodiment of the invention as herein shown and described, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim is as follows:

1. An induction coil comprising; a coil assembly including primary and secondary windings and a sealed housing therefor, said housing having an opening through the central portion thereof; and an iron core formed independently of said housing and extending within said opening in said hous-

ing and around the outside thereof forming a substantially complete iron path for the magnetic flux of said windings, and means whereby said iron core may be assembled in its proper position upon the coil assembly without opening the sealed housing.

2. A coil assembly for an ignition coil comprising concentrically arranged primary and secondary windings each wound on a non-conducting tube; and a moisture proof housing for said windings including the tube for the inside winding, a tube surrounding said windings and two end covers cooperating with both of said housing tubes.

3. A coil assembly for an ignition coil, comprising concentrically arranged primary and secondary windings each wound on a non-conducting tube; and a moisture proof housing for said windings including the tube for the inside winding, a tube surrounding said windings, and two end covers each having two annular flanges cooperating respectively with both of said housing tubes.

4. A coil assembly for an ignition coil, comprising concentrically arranged primary and secondary windings with the secondary outside the primary, each winding being wound on a non-conducting tube; and a moisture proof housing for said windings including the tube for primary winding, a tube surrounding said windings, and two end covers each having an annular flange in contact with the primary winding tube and an annular flange fitting snugly within the outside tube and binding against the insulation of the secondary coil whereby to secure the secondary winding in position.

5. In an induction coil, the combination with coil windings, of a moisture proof housing enclosing and rigidly supporting said windings; an independently formed core supporting the housing; and a bracket for supporting the core.

6. In an induction coil, the combination with a core assembly which serves as a support for the coil assembly, of a coil assembly including windings and housing therefor and carrying terminals for said windings, said coil assembly being adapted to be mounted upon the core in any of a plurality of positions to permit convenient location of the coil terminals.

In testimony whereof I hereto affix my signature.

JOHN H. HUNT.

Witnesses:

WM. P. PASCO,
ELMER E. FREED.