

Oct. 13, 1925.

I. J. REUTER

1,557,501

IGNITION COIL

Filed July 17, 1923

2 Sheets-Sheet 1

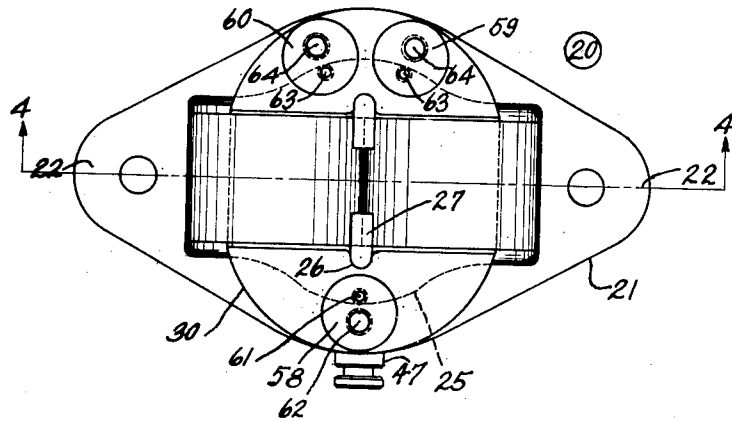


Fig. 1

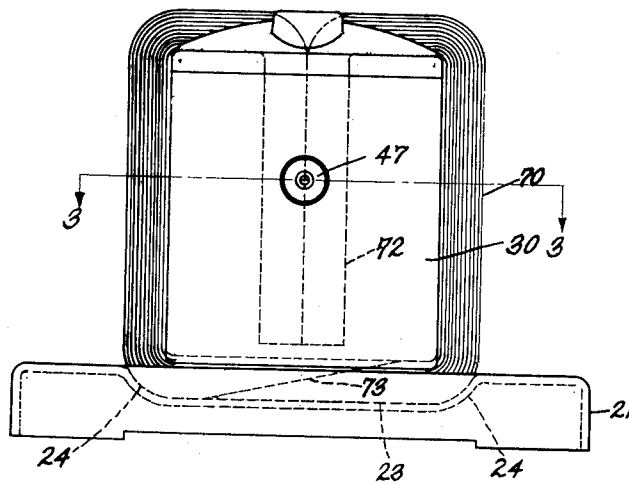


Fig. 2

Witnesses

Clarence Schmieding
J. H. McDonald

Inventor

Irving J. Reuter

By Frederick J. Hardman
His Attorney

Oct. 13, 1925.

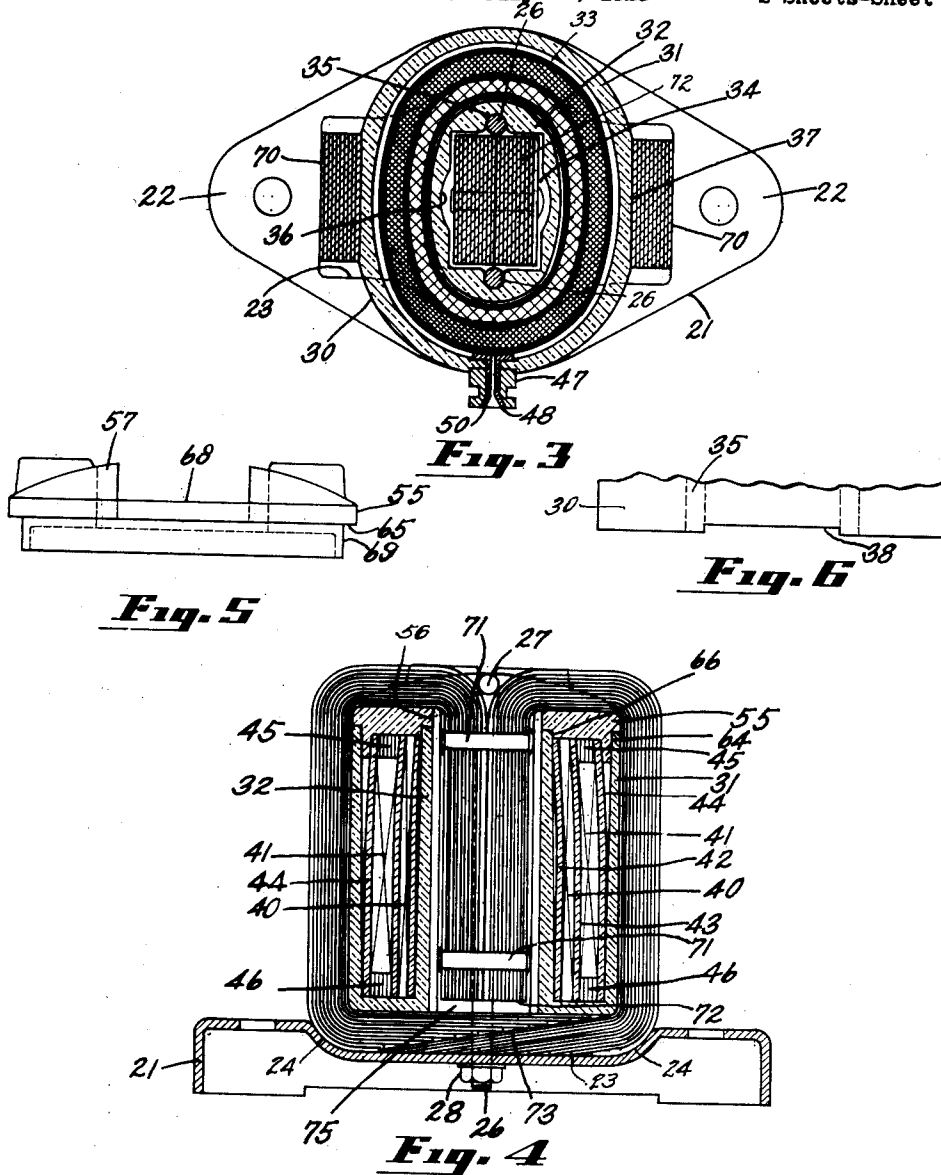
1,557,501

I. J. REUTER

IGNITION COIL

Filed July 17, 1923

2 Sheets-Sheet 2



Witnesses

Clarence Schmieding
J. H. McDonald

Inventor

Irving J. Reuter

By Frederick J. Hardman

His Attorney

Patented Oct. 13, 1925.

1,557,501

UNITED STATES PATENT OFFICE.

IRVING J. REUTER, OF ANDERSON, INDIANA, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF ANDERSON, INDIANA, A CORPORATION OF DELAWARE.

IGNITION COIL.

Application filed July 17, 1923. Serial No. 652,151.

To all whom it may concern:

Be it known that I, IRVING J. REUTER, a citizen of the United States of America, residing at Anderson, county of Madison, State of Indiana, have invented certain new and useful Improvements in Ignition Coils, of which the following is a full, clear, and exact description.

This invention relates to induction coils and particularly to that type of coil used to supply ignition for the engines of motor vehicles and which are subjected to severe vibration.

Among the objects of the present invention is to produce ignition coils at lower cost than heretofore, and to provide for dis-assembling of coils for replacement of parts in a facile manner thereby permitting repairs to be made at relatively low cost.

In order to accomplish these aims, the present invention provides a coil in which the ignition windings are enclosed within a dust and waterproof container composed of insulating material and are removable therefrom. The coil core is adapted to encircle opposite sides of said container with a portion thereof located centrally of said windings, and means are provided for rigidly securing the core and container together, including a base by means of which the coil may be attached to a suitable support.

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 embodiment of the invention is clearly disclosed.

Referring to the drawings:

Fig. 1 is a top plan view of the coil forming the present invention.

Fig. 2 is a front 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. 1.

Fig. 5 is a side view of the cup cover.

Fig. 6 is a fragmentary side view of the base portion of the coil cup.

The coil 20 comprises a base 21, provided with apertured ears 22 through which screws may pass for securing the base to any suitable support. Base 21 is provided with a substantially rectangular centrally disposed depression, 23, provided with 55 dish surfaces 24 and side grooves 25. Coil

cup or container 30, composed of insulating material such as bakelite, is molded in the form of an annulus, having outer wall 31 and inner wall 32 concentrically related and providing a deep annular groove 33. The cross section of this groove is wedge shaped as provided by the natural draft in the mold, being wider at the top than at the bottom. The inner wall 32 provides a substantially rectangular central opening 34, including grooves 35 and 36. The outer wall 31 is provided with diametrically opposite flat surfaces 37, and a groove 38 extends across the base of the cup 30, cooperating with the surfaces 37 to form a continuous flat surface around the cup.

Previously formed primary and secondary windings 40 and 41 respectively, wound on paper tubes 42 and 43 respectively, the secondary winding 41 being wrapped with insulation 44, are placed within the groove 33. The layers of secondary turns are not as wide as the layers of paper which insulate them, therefore, there will be, at the side edges of the secondary coil, portions of paper at 45 and 46 extending beyond the ends of the layers of secondary turns. These spaces between the layers of paper forming these portions are filled with a non-conducting fluid such as bakelite varnish. High tension or outside terminal 47 of secondary winding 41 is secured in place by a hollow rivet 48 which passes through outer wall 31 of the cup 30. A pig tail connection is brought out from the secondary winding and led through the rivet 48 and secured thereto by dropping solder into the recess 50.

Cup cover 55 is provided with a central aperture 56 corresponding to aperture 34 in cup 30 and including grooves 57. The cover 55 is also made of non-conducting material such as bakelite, which is moulded around metal inserts 58, 59 and 60. Insert 58 is provided with a hole 61 through which the inside end of secondary winding 41 is brought and soldered down. Screw hole 62 is provided for attachment of a terminal screw. Inserts 59 and 60 are provided with holes 63 through which the opposite ends of the primary winding 40 are brought and soldered down. Screw holes 64 are provided for attachment of suitable terminals. Cover 55 is provided with a flange 69 adapted to fit within the wall 31,

and providing a shoulder 65 which rests on top of the wall 31. Cover 55 is provided with a recess 66 within which the upper end of wall 32 snugly fits. The cover 55 tends to seal the cup and the flange 69 wedges the upper side edges of the windings 40 and 41 at the top over against the wall 32 to rigidly secure the windings within the cup. The annular groove 33 being wedged shaped in cross section, operates to wedge the lower side edges of the windings 40 and 41 slightly together to hold the windings tightly in place. It is therefore apparent that the windings are rigidly supported in the cup by reason of the wedging by the cup cover flange 69 at the upper side edges of the coils, and by the wedging of the annular groove 33 at the bottom side edges of the coils.

A groove 68 extends across the top of the cover 55, and together with groove 38 in the bottom of the cup 30 and the flat surfaces 37 on opposite sides thereof, form a continuous flat surface entirely around the windings.

Core 70 is composed of identical laminations of flexible sheet iron, the ends thereof being secured together by rivets 71 to form a substantially rigid portion 72. This portion 72 is loosely received by apertures 56 and 34 of cover 55 and cup 30 respectively. The loose ends of these laminations are divided into two substantially equal groups and are parted and bent down over the outside of cover 55 and around the outer sides of cup 30, the ends of the left hand group, as viewed in Fig. 4, contacting with the inner lamination of the right hand group adjacent the base of cup 30, as shown at 73, and the ends of the right hand group contacting with the base 21, so that each lamination encircles the windings 40 and 41. Thus the core 70 rests in the groove 68 in cover 55, and in the depression 23 formed in base 21, and fits within the groove 38 formed in the base of cup 30. Bolts 26, provided with hooked ends 27 engaging the laminations intermediate said groups adjacent the aperture 56 in cover 55, pass through grooves 57 in cover 55 and grooves 35 in cup 30, through suitable holes in base 21 and are held in place by nuts 28. An air gap 75 is provided between the lower end of portion 72 and the meeting ends of the laminations adjacent the base of cup 30.

From the above it will be apparent that there has been provided a coil in which the parts are held rigidly in place and are free from the serious effects caused by vibration. As the nuts 28 are drawn up on the bolts 26, the cover 55 will be clamped in place on the cup 30, thus rigidly securing the windings 40 and 41 therein. The meeting ends of the laminations will be forced toward each other by the dished surfaces 24, thus

causing the outside branches of the core to bear against the flat surfaces 37 of the cup and to closely contact with the grooves 68 and 38 in the cover 55 and cup 30 respectively, to hold the core 70 rigidly in place. The meeting ends of the laminations will be compressed between the base of cup 30 and the base 21, forming a close contact between the laminations of both groups, thus reducing the reluctance thereof.

The coil may be readily disassembled for inspection or replacement of parts, merely by removing the nuts 28 and withdrawing the bolts 26. The meeting ends of the core 70 may then be sprung outwardly so as to clear the sides of the cup 30, and when the core 70 is lifted upwardly, as viewed in Fig. 4, the portion 72 will be withdrawn from the cup 30 and cover 55 through apertures 34 and 56 respectively. The terminal connections of the primary and secondary windings may then be unsoldered and the cover 55 lifted off the cup 30. The windings 40 and 41 may then be readily lifted out of the cup 30.

It should be understood that the degree to which the side edges of the windings are wedged over at the top by the cover 55 is somewhat exaggerated in order to more clearly illustrate this feature of the present invention.

While the form of apparatus herein shown and described constitutes a preferred form of embodiment of the invention, 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. In an ignition coil, the combination with a cup formed of insulating material provided with a centrally disposed coaxial aperture; of ignition windings within said cup; a cover for said cup having a complementary aperture; a mounting base provided with a depression; a laminated core including a base portion adapted to fit within said depression and having a depending stem portion passing through said apertures; and means passing through said apertures, engaging said core and connected with said base, for clamping said core against the base and for holding said cup and cover in position with respect to the base.

2. In an ignition coil, the combination with a cup composed of insulating material, provided with an upstanding hollow inner sleeve integral with the base of said cup and providing an aperture in said base; of a cover for said cup having a complementary aperture; ignition windings located in the cup around said sleeve; a supporting base having a central depression; a laminated core having a depending stem portion extending into said sleeve and supported by the cover and having branch portions bent

around the outside of the cup and terminating within the depression; and means passing through the sleeve engaging the core and connected with the base for holding the parts together.

3. In an ignition coil, the combination with a cup in the form of an annulus, providing a deep annular groove surrounded by inside and outside walls concentrically related, said inner wall providing a substantially rectangular aperture; of ignition windings located in said groove; a cover for said cup provided with a corresponding aperture; a base having a depression; a core comprising flexible laminations and having a substantially rigid portion loosely received by said apertures and branch portions bent around opposite sides of the cup and terminating within the depression; and means passing through said apertures engaging the core and having connection with the base for rigidly holding the parts together.

4. In an ignition coil, the combination with a cup in the form of an annulus, providing a deep annular groove of wedge shaped cross section being wider at the top than at the bottom surrounded by inside and outside walls concentrically related, said inner wall providing a substantially rectangular aperture; of ignition windings located in said groove, the side edges of said windings being wedged into the bottom of said cup; a base having a central depression; a cover for said cup provided with a corresponding aperture and having a flange fitting within and resting on the outer wall of said cup and wedging the side edges of the windings at the top against the inner wall, and provided with a recess within which the top of said inner wall snugly fits; a core composed of flexible laminations having a substantially rigid portion loosely received by said apertures and branch portions bent around opposite sides of the cup and terminating within the depression; and means passing through said apertures engaging the core and having connection with the base for rigidly holding the parts in position.

5. In an ignition coil, the combination with an elliptically shaped cup composed of insulating material provided with a centrally disposed coaxial aperture substantially rectangular in cross section; ignition windings within said cup; a cover for said cup provided with a complementary aperture and provided with a flat groove extending across the top thereof; a flat groove extending across the bottom of said cup, and diametrically opposite flat surfaces located on the outer surface of said cup, all of said flat surfaces cooperating to form a continuous flat bearing surface encircling said cup; a supporting base for said cup having a depression; a core composed of flexible laminations and including a substantially rigid portion loosely

received by said apertures, and branch portions bent around opposite sides of the cup, the ends thereof meeting adjacent the base of said cup and resting within the depression; and means passing through said apertures, engaging the core and having connection with said base for securing the parts rigidly in position and for causing said branch portions of the core to bear against the continuous flat surface.

6. An induction coil comprising: a winding unit having a central opening therein, a laminated iron core inserted within said opening and divided adjacent one end of said opening into two groups of core laminations, said groups of laminations being bent around the outside of said winding unit and their ends bent into substantial contact with one another adjacent the other end of said opening, and means for rigidly holding said contacting ends in position.

7. An induction coil comprising: a winding unit having a central opening therein, a laminated iron core inserted within said opening and divided adjacent one end of said opening into two groups of core laminations, said groups of laminations being bent around the outside of said winding unit and their ends bent into substantial contact with one another adjacent the other end of said opening, and common means for holding said contacting ends in position and for holding the inserted portion of said core within the opening in said winding unit.

8. An induction coil comprising: a winding unit having a central opening therein, a laminated core unit having a portion inserted within said opening, the laminations of said core being divided into two groups adjacent the exit of said opening, said groups being bent around the outside of said winding unit and having their ends brought into substantial contact adjacent the opposite end of said winding unit, a supporting base for said core and winding units, and a common means for holding said contacting ends in position and for holding said core unit upon said base.

9. An induction coil comprising: a winding unit having a central opening therein, a laminated core unit having a portion inserted within said opening, the laminations of said core being divided into two groups adjacent the exit of said opening, said groups being bent around the outside of said winding unit and having their ends brought into substantial contact adjacent the opposite end of said winding unit, a supporting base for said core and winding units, and common means for holding the inserted portion of said core down within the opening in the winding unit and for holding said core rigidly upon said base.

10. An induction coil comprising: a winding unit having a central opening therein,

a laminated core unit having a portion inserted within said opening, the laminations of said core being divided into two groups adjacent the exit of said opening, said groups being bent around the outside of said winding unit and having their ends brought into substantial contact adjacent the opposite end of said winding unit, a supporting base for said core and winding units, and a common clamping means for rigidly clamping the core laminations about the winding unit and for clamping the core unit to said base.

11. An induction coil comprising: a winding unit having a complete protective casing for protecting the windings thereof from dust and water, said casing having a central opening; a core unit separate from said winding unit but having an inner portion inserted within said central opening and an outer portion bent around the outside of

said winding unit to form an encircling iron path about said winding unit.

12. An induction coil comprising: a winding unit having a complete protective casing for protecting the windings thereof from dust and water, said casing having a central opening; a core unit separate from said winding unit but having an inner portion inserted within said central opening and an outer portion bent around the outside of said winding unit to form an encircling iron path about said winding unit, and releasable means for holding said bent core portion in bent position whereby said core unit and winding unit may be easily disassembled by releasing said releasable means and bending back said bent core portion.

In testimony whereof I hereto affix my signature.

IRVING J. REUTER.