June 27, 1950 H. L. HARTZELL 2,512,796

IGNITION COIL

Filed June 13, 1946

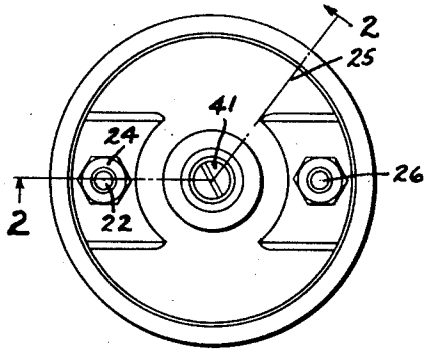


Fig. 1

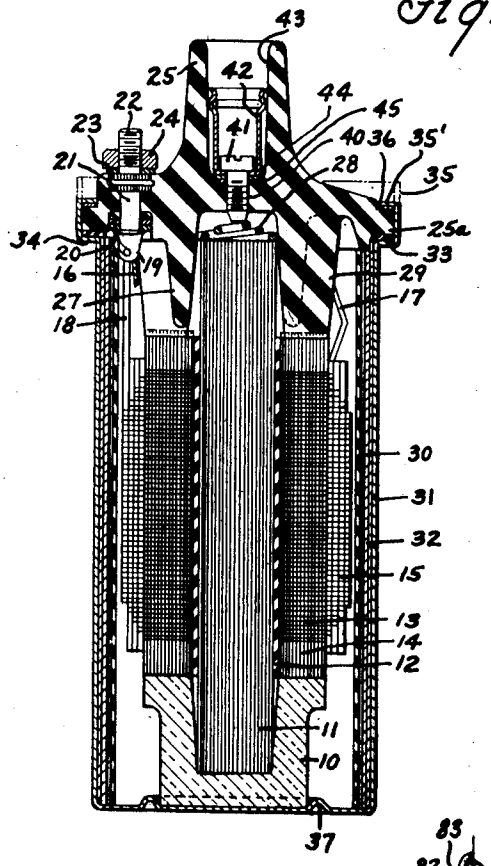


Fig. 2

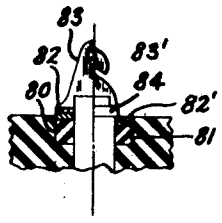


Fig. 3

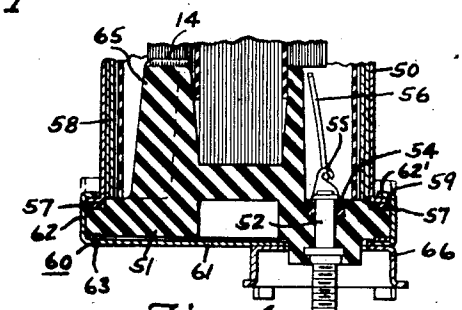


Fig. 4

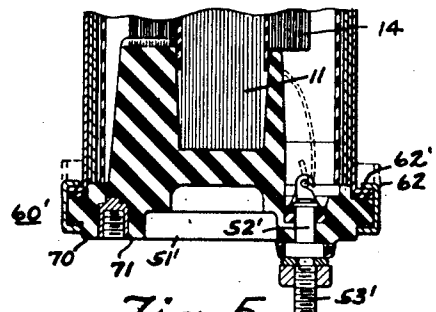


Fig. 5

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IGNITION COIL

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This invention relates to ignition coils particularly for use on automotive vehicles.

An object of the present invention is to provide an oil filled ignition coil of durable and economical construction and from which the oil cannot leak.

A further object is to provide a construction which permits fastening the connections of the coil windings to the terminals before the tubular container or case is assembled.

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 present invention is clearly shown.

In the drawings

Fig. 1 is a top view of the coil.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Fig. 3 illustrates the method of sealing a terminal and securing thereto a clip to which a wire may be fastened. The left half of Fig. 3 shows the parts before staking the terminal and the right half shows the part after staking the terminal.

Figs. 4 and 5 are fragmentary longitudinal sectional views showing modifications.

Referring to Fig. 2 a porcelain base 10 provides a socket for receiving the lower end of a bundle of core wires 11 which before assembly with the base have been pushed through a nonconducting tube 12 upon which is wound a secondary winding 13 comprising wire layers alternating with paper layers 14. The secondary winding is surrounded by primary winding 15. The inside lead of the secondary is connected with the core 11 and a portion of the outside lead of the secondary is indicated by numeral 16. The primary has an inside lead 17 and an outside lead 18. Leads 16 and 18 are connected together and are soldered to a clip 19 having a washer-like base 20 which surrounds a terminal 21 which is a metallic insert in a cap or cover 25 of molded insulating material. Terminal 21 includes a threaded portion 22 surrounded by a metal washer 23 and engaged by a nut 24. In a similar manner, the primary lead 17 is connected with a terminal 26 which is a metallic insert in the cap 25. Cap 25 provides a tubular skirt 27 for receiving the upper end of the core 11 and a compression spring 28. Cap 25 provides a plurality of fins 29 for engaging the upper margin of the turns of paper 14 separating the layers of the secondary windings.

The coil is assembled in the following manner. While the cap 25 is held in an inverted position the assembly of paper 14, core 11, secondary 13, primary 15 and the base 10 is placed thereon. The connections between leads 16 and 18 and the hook or terminal clip 19 are made and soldered. Likewise, the lead 17 is soldered to a clip, not shown, like the clip 19 which is electrically connected with the terminal 26. After these connections are made a nonconducting tube 30 is placed around the winding 15. The assembly is now ready to receive a container or can 31 into which has been placed a sleeve 32 comprising a few turns of magnetizable sheet iron which is longitudinally slitted in the manner shown in Hartzell United States Patent No. 1,883,905. While the cap 25 and parts thereon are still in inverted position, a washer 33 of neoprene (polychloroprene) is placed upon the annular flange 25a of the cap 25. The can 31 is moved down and around the parts assembled with the cap 25 until the annular flange 34 of the can engages the washer 33. The tubular flange 35 of the can extends from the annular flange 34 and fits around the flange 25a of the cap. Then the parts are inverted so that they occupy the position shown in Fig. 2. A spring washer of ruffled-like construction 36 is placed upon the flange 25a of the cap and the upwardly projecting end of the tubular flange 35 is spun over into the position 35' thereby flattening the washer 36 and compressing the washer 33 which is thereafter maintained in a state of compression by the resiliency of the washer 36. The operation of spinning over the flange 35 of the can causes the fins 29 of the cap 25 to bite into the margin of the coiled paper winding 14, thereby forcing the lower end of the paper winding firmly against the base 10 and forcing the base 10 against the bottom of the can which is made like an oil can bottom except that it is biased upwardly instead of downwardly. Consequently, the bottom of the can urges the base 10 and secondary paper wrapping 14 upwardly. Therefore, the wrapping 14 is confined under appreciable compression between the can base 10 and the fins 29 of the cap 25. Thus, longitudinal displacement of the winding relative to the can is prevented. The lower end of the core 11 fits snugly within the base 10 which is received by a recess in the can bottom provided by an annular bead 37. The upper end of the core fits snugly within the skirt 27 of the cap 25 therefore radial displacement of the windings relative to the can is prevented.

The assembly is now ready for filling with a suitable dielectric oil which is poured in through an opening 40 in the cap 25. A screw 41 is threaded through the opening 40 the lower end of which engages the spring 28 to make an electrical

connection through the spring 28 and the core 11 with the inside lead of the secondary 13. The screw 41 passes through the base of a metal terminal socket 42 received by the socket 43 provided by the cap 25 through a metal washer 44 and through a washer 45 of polychloroprene or other oil resistant material. The threading of the screw 41 through the openings 40 compresses the washer 45 to cause it to provide a seal to prevent escape of oil such as might find its way along the threads formed by the screw 41.

The coil shown in Figs. 1 and 2 has both primary terminals located on the cap 25. Features of construction of this coil can be used in making a coil which has the primary terminals located respectively at opposite ends of the tubular case. Such constructions are shown in Figs. 4 and 5. Instead of a can having an oil can-like base the enclosure for the coil comprises a cap 25 shown in Fig. 2. A tubular case 50 and a base 51 of molded plastic material in which is molded an insert 52 threaded at 53 for screw threaded connection with a conductor and attached to a metal washer 54 having a hook 55 with which a primary lead 56 is connected, said connection being made, of course, before the case 50 is assembled. After making this connection and the connections shown in the upper part of Fig. 2, a polychloroprene washer 57 is placed upon the base 51 and then case 50 with the magnetizable convolutions 58 therein is placed around the windings with the flange 59 of the case 50 resting on the washer 57. This assembly is placed within a cup-like member 60 having a base 61 and a cylindrical flange 62, a ruffle-like spring washer 63 having been located between the base 61 and the base 51. Then the parts are assembled together by spinning the flange 62 into the position 62' which compresses the washer 57 and the spring 63 and maintains a seal at the bottom of the container. Spinning of the flange 62 forces the base 51 upwardly and causes fin 65 thereof to bite into the lower edge of the margin or paper wrapping 14 and forces said paper 14 against the fins provided by the cap at the upper end of the coil. Therefore, in the construction shown in Fig. 4 the wrapping 14 is confined between base fins and cap fins instead of between cap fins and the resilient oil can-like base of the can as shown in Fig. 2. If the coil as shown in Fig. 4 is to be used with an extension lock switch such as shown in United States Patent 2,283,732 the part 66 attached to cup 60 is used to make connection with a fitting attached to a cable armor which connects the coil with a lock switch on the dash.

Fig. 5 shows a construction similar to that shown in Fig. 4 with the exception that the part 60' equivalent of part 60 of Fig. 4 is apertured to receive an annular boss 70 of part 51' equivalent to part 51 of Fig. 4. Part 51' carries an internally threaded insert 71 for receiving a screw by which some accessory device may be attached to the coil. Terminal 52' threaded at 53' is equivalent of terminal 52 of Fig. 4.

Although terminal 52 is a metal insert around which the material of the base 51 is molded, it is nevertheless desirable to seal the joint between the insert and base. This is done in the manner shown in Fig. 3. The base 51 is provided with a socket 80 for receiving a polychloroprene washer 81 and a metal washer 82 integral with a hook 83. After these parts are assembled as shown in the left hand portion of Fig. 3 the insert is staked circularly to form a bead 84

which is caused to force washer 82 to position 82' and the washer 81 to be compressed as shown in right hand portion of Fig. 3. A seal is provided in a similar manner between the insert 52' and the base 51'. In a similar manner, the joints between the cap 25 (Fig. 2) and the inserts 22 and 26 are sealed.

From the foregoing description of the embodiments of the present invention, it is apparent that the present invention provides a leak-proof oil filled coil of economical and durable construction and a coil in which longitudinal displacement of the windings relative to the case is prevented by virtue of squeezing the secondary paper margins between parts integral with or extending from members providing the ends of the casing.

While the embodiment of the present invention as herein disclosed, 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 is claimed is as follows:

1. In a sealing structure for an ignition coil, the combination comprising, a metal case having an oil-can bottom; a coil assembly including an iron core, a secondary winding having layers of wires alternating with layers of paper, said paper layers extending beyond both ends of the wire layers, a primary winding about the secondary winding, an engaging element of non-conducting material having radial fins at both ends of the paper layers, said coil assembly and elements being located within the case so that one of the elements rests against the bottom; an annular resilient member disposed between a shoulder provided by the case and a flange provided by the other engaging element; means for clamping the flange against the shoulder, said clamping being such that it causes the radial fins of the engaging elements to bite into their respective ends of paper layers and compress the resilient member to form a fluid tight seal between the shoulder and flange and also urge said oil-can bottom out of its normal position to store energy therein so as to confine the coil assembly between the elements and prevent longitudinal displacement and circular movements of the coil assembly relative to the case.

2. In an ignition coil the combination comprising, a coil unit including an iron core and alternate layers of wire and dielectric paper with the marginal edges of the paper extending beyond the layers of wire at each end thereof; a container for enclosing the coil unit, said container including a closed end capable of being flexed out of its normal position and into another shape to store energy therein; a closure for the other end of the container having radial fins extending therefrom; a gasket of compressible fluid proof material disposed between the closure and container; means for clamping the gasket between the closure and container in order to compress the gasket and to seal the joint between the closure and the container and also cause the fins to bite radially into the marginal edges of the paper to prevent longitudinal and rotary movements of the unit relative to the container.

3. In an ignition coil the combination comprising, a coil unit including a primary winding and a secondary having alternate layers of wire and paper with the marginal edges of the paper layers extending beyond the layers of wire; a one piece tubular container therefor, said con-

tainer having a closed end flexed upwardly within the container; an insulating base resting on the closed end and having radial fins capable of engaging the marginal edges of the paper at one end of the unit; a closure for the container, said closure having fins engaging the other marginal edges of the paper at the one end of the unit; a compressible gasket disposed between the closure and the container; means including part of the container for securing the closure to the container and for compressing the gasket to form a fluid tight seal between the gasket and the closure and the container and placing the flexed closed end under tension and causing the fins on the base and closure to bite into their respective marginal paper edges, said bottom when under tension being effective to prevent longitudinal displacement and rotary movements of the coil unit relative to the container.

4. In a sealing structure for an ignition coil comprising, a one piece tubular metallic casing closed at one end and having an annular shoulder near its rim; an annular resilient member disposed on the shoulder; a coil assembly within the casing including an iron core, a secondary winding having layers of wire alternating with layers of paper, said paper layers extending beyond both ends of the wire layers, a primary winding about the secondary winding; a pair of molded end structures each having a socket for receiving the ends of the core and located one at the closed end of the casing and one at the rim, said last mentioned structure having a plurality of spaced radial fins extending axially a short distance below and outwardly from the socket but terminating short of the inner surface

of the casing and having a flange superimposed over the resilient member and confined within the rim; and means for compressing the resilient member and retaining it on the shoulder whereby when the parts are assembled, said flange compresses the resilient member to exert radial pressure toward the rim and thereby provide fluid tight seals between the flange and the resilient member and between the resilient member and the shoulder, said means also urging the fins to make spaced radial impressions in the upper ends of the paper layers to confine firmly the coil assembly between the molded structures and prevent circular movements of the coil assembly relative to the casing.

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