H. C. THOMSON.

INCASED INDUCTION COIL.

APPLICATION FILED MAR. 6, 1909.

981,718. Patented Jan. 17, 1911.

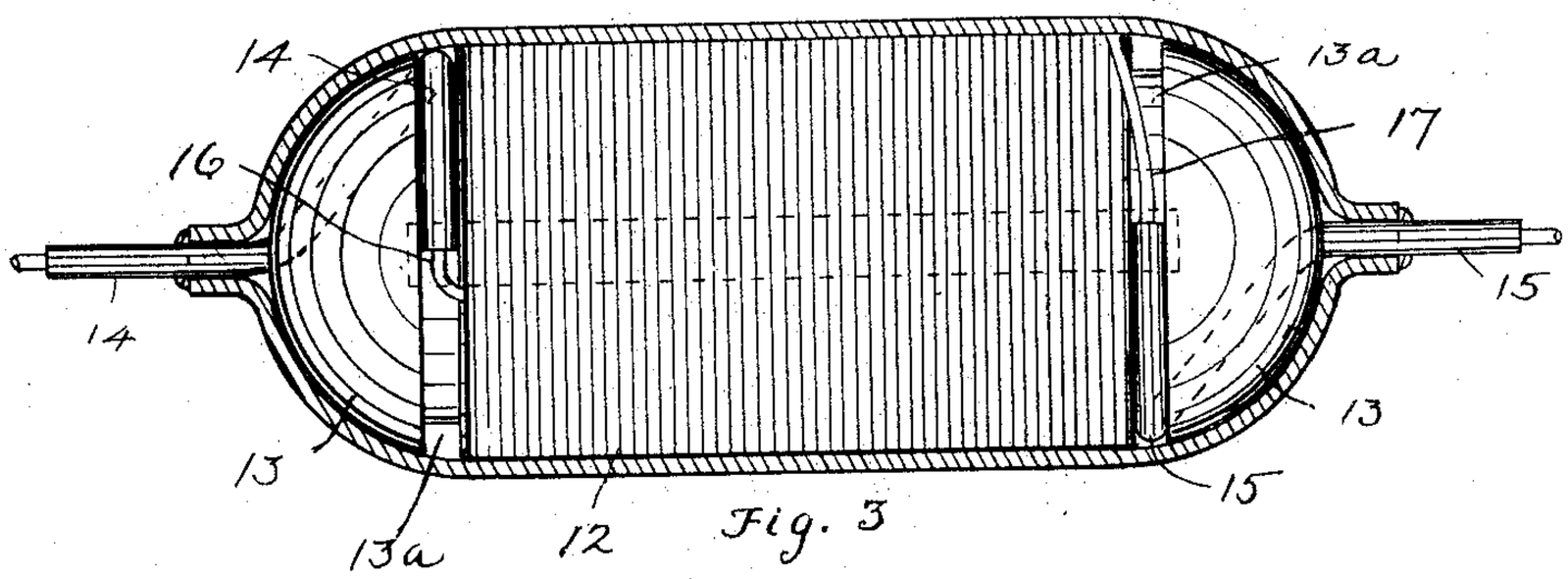

Fig. 3

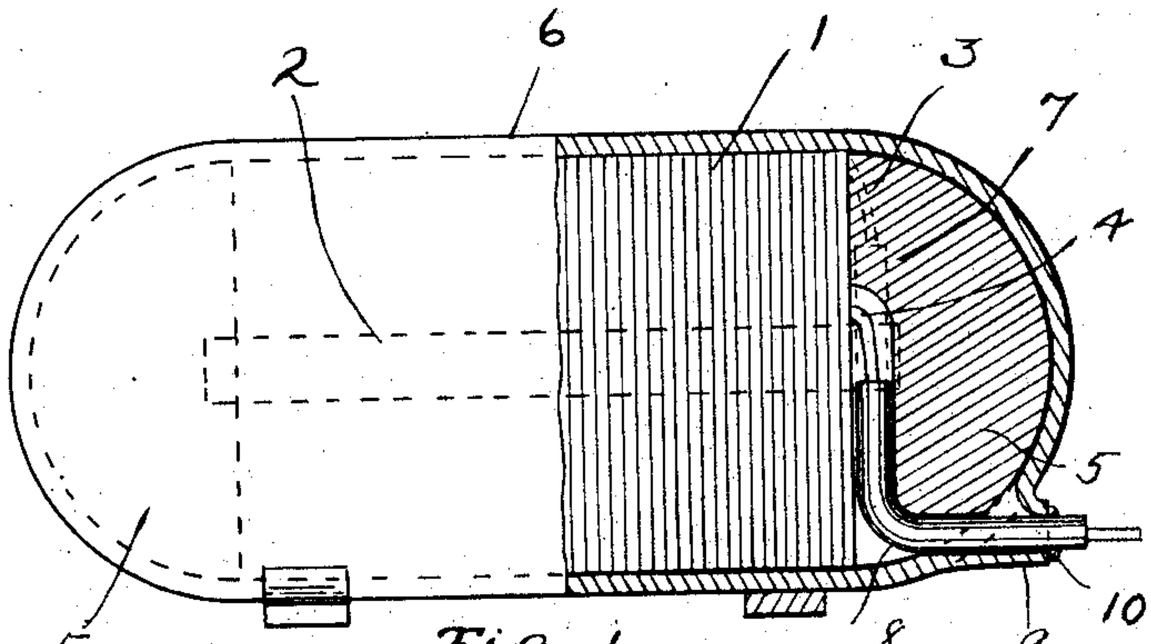

Fig. 1.

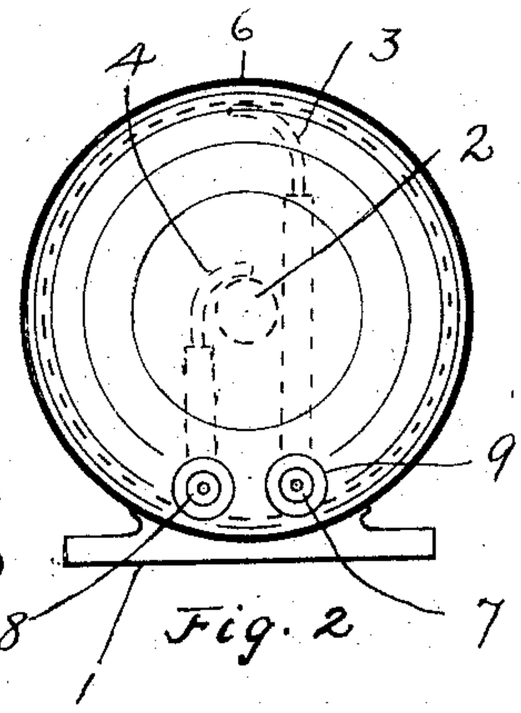

Fig. 2

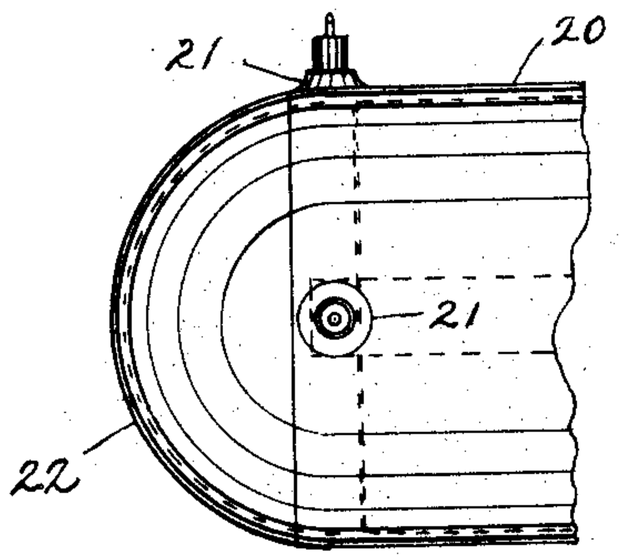

Fig. 4.

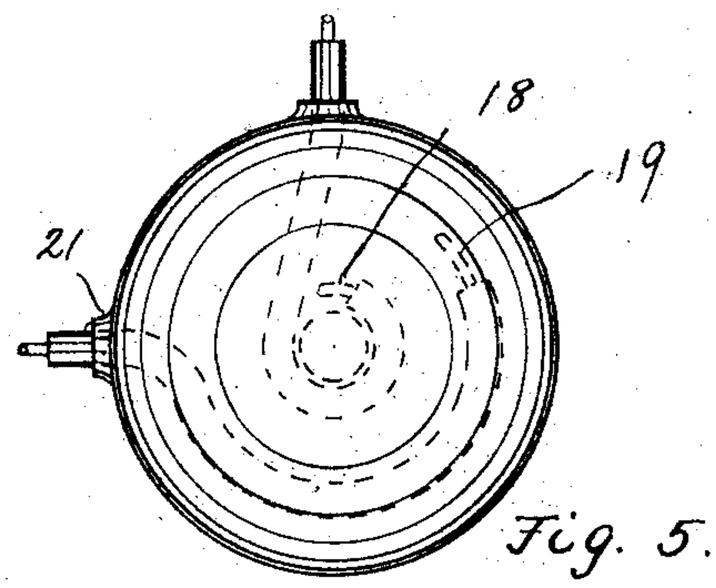

Fig. 5.

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UNITED STATES PATENT OFFICE.

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INCASED INDUCTION-COIL.

981,718. Specification of Letters Patent. **Patented Jan. 17, 1911.**

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To all whom it may concern:

Be it known that I, HENRY C. THOMSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Incased Induction-Coils, of which the following is a specification.

My invention relates to spark or induction coils, or the like, and has for its object the production of a coil more especially adapted for use in situations where said coil is exposed to moisture or to injurious gases.

More specifically my invention aims at the production of a coil of the nature described which has applied thereto a metallic casing hermetically sealed around the said coil so as to completely inclose the same and adapted to exclude all moisture, vapor, or gas from the said coil. Furthermore, said coil embodies, leading in conductors passing through said casing and electrically connected with the terminals of said coil, said conductors being incased for that portion of their length adjacent to the said casing in metal conduits or tubes, which they preferably so completely fill as to hermetically seal the interior of the said conduits or tubes. Said conduits or tubes are attached to the coil casing at the points where they pass through the same, preferably by solder or other suitable material in such manner as to form hermetically sealed joints therewith.

My invention is shown in the drawings accompanying this specification in several of its preferred embodiments.

In said drawings Figure 1. is a view partly in section, showing my invention as applied to a spark coil having the inleading conductors positioned side by side and emerging through the casing at one end of the coil. Fig. 2. is an end view of the coil shown in Fig. 1, illustrating the location of the inleading conductors. Fig. 3. is a view, partly in section, showing my invention as applied to a spark coil having the inleading conductors emerging substantially axially at either end of the coil. Fig. 4. is an external view of one end of a coil having double winding and consequently four terminals and inleading conductors, two for each winding; two of such inleading conductors only being shown in such Fig. 4. Fig. 5. is an end view of the coil shown in Fig. 4, showing the location of the inleading conductors.

Referring to said Fig. 1. I represents a coil of insulated wire wound in usual manner on the core (2); (3) representing one terminal and (4) the other terminal of said wire. Preferably at each end of the coil is placed an end form (5), the same ordinarily consisting of a hemispherical or rounded block of wood having a flat surface adapted to fit against the end of the coil and centrally positioned with respect thereto in any desired manner, as by engagement with the end of the core (2). Around the coil and end forms is the casing 6, the same preferably comprising a hermetically impervious covering of ductile metal, as for example, lead, which is radially contracted upon the coil and the end forms so as to fit securely and firmly over the same. The terminals of said coil are preferably brought to one end of the coil and to the same are electrically connected the inleading conductors (7) and (8) consisting of pieces of insulated wire which are inclosed in metal conduits or tubes either throughout their entire length or for a short portion of their length adjacent to the coil. Said insulated wires preferably fit within the said tubes so closely as to hermetically seal the same. In practice the said insulated wire and the metal conduits are found conveniently combined in the lead covered insulated wire in common use. The inleading conductors are therefore for convenience alternately referred to in the specification as lead covered insulated wires. Said inleading conductors, (7) and (8) after electrical connection with said terminals (3) and (4) are brought across the end of the coil to a point preferably near the outer circumference of the same, and are then bent, preferably substantially at right angle so as to emerge through the casing laterally adjacent each other and preferably substantially parallel with the axis of said coil; the end form being recessed or cut away to permit the passage of the said inleading conductors in the manner above pointed out. Preferably the casing at the points where the said lead covered wires emerge is punched so as to leave outwardly projecting necks (9) as shown, closely fitting around the lead covered inleading conductors. Said inleading conductors are secured in said necks and are

hermetically sealed within the same preferably by solder (10) applied to the joint. In this way a spark coil is produced which is entirely inclosed within a hermetically sealed casing, so that moisture, vapor or gas cannot have access to the same. Furthermore the mechanical attachment of said inleading conductors with the casing as described, not only seals the joints where the said conductors pass through the casing, but serves to throw any longitudinal pull or strain on the said conductors upon end form and the casing, and so minimizes the chance of said inleading conductors pulling away from the coil terminals with which they are electrically connected.

The manner of assembling the coil, casing and inleading conductors hereinabove described is as follows: The casing is first prepared by forming, in any desired manner, a preferably seamless cylindrical leaden receptacle having one end closed and rounded so as to conform interiorly with the shape of the rounded surface of one of the end forms. The rounded end of the casing is then punched outwardly from within so as to leave two apertures, preferably with the necks (10) for the inleading conductors to pass through. The coil having been wound and its terminals electrically connected with suitable pieces of lead incased insulated wires, one end form, previously recessed or cut away to permit the said lead incased wires to be brought across the end of the coil and to position them as above described axially coincident with the necks (10), is placed on the coil, and the free ends of said pieces of lead incased wires are bent so as to lie substantially parallel with axis of the coil. The free ends of the lead incased wires are then passed through recess (10) and the coil is slipped within the casing until the end form on the entering end of the same becomes firmly seated against the rounded end of the casing. The second end form is then slipped through the open end of the casing until its flat side rests on the end of the coil. The open end of the casing is then contracted over the rounded end of the second end form, preferably by the process of spinning, until it is completely closed over the same, any surplus being cut off, and any small axial opening that may remain after the said surplus is cut away being closed by application of solder. Finally the inleading conductors are put under a longitudinal strain sufficient to take up any slack, and the joints where they emerge through the necks (9) are closed preferably by soldering. If desired feet or brackets (11) may be attached to the exterior of the casing for the purposes of mounting the coil in the location desired.

Fig. 3. shows an embodiment of my invention in which the inleading conductors emerge substantially axially at each end. As before the coil (12), has an end form (13) located at each end, as shown. Said end forms preferably have a groove 13ª extending peripherally around the form, and situated adjacent to the end of the coil. In said forms a passage is furthermore provided which extends through the form from said groove and emerges substantially axially at the rounded ends of the forms. The inleading conductors (14) and (15) which as before described preferably consist of lead covered insulated wires, are electrically connected with the terminals (16) and (17) of the coil, and are then introduced for a short portion of their length into said peripheral grooves 13ª whence they pass through the passage provided and emerge at either end so as to lie substantially co-axial with the coil. A casing of ductile metal incloses the coil and the end forms, the said casing at its ends being contracted over the end forms and closed against the said inleading conductors so as to form a leakage proof joint therewith, said joint being subsequently further sealed by soldering if desired. The casing is preferably initially applied to the coil as a seamless open ended tube of ductile metal, said open ends being subsequently radially contracted upon the end forms and the inleading conductors, preferably by the process of spinning.

A further modification of my invention showing the same as applied to coils embodying primary and secondary windings, and having one pair of inleading conductors for each such winding, is shown in Figs. 4 and 5. Here preferably the coil is of the usual type (18), Fig. 5, representing one terminal of the primary and (19) one terminal of the secondary winding, the other terminal of each winding preferably being located at the other end of the coil and not shown in the drawings. To each terminal is attached a piece of lead incased insulated wire adapted to serve as an inleading conductor. Around the coil is the casing preferably comprising a main portion (20) if in the form of a cylinder a little longer than the coil and is preferably provided with outwardly projecting necks (21) surrounding apertures near its ends through which said inleading conductors may be passed. The inleading conductors, after connection with the terminals of the coil windings, are brought around along the end of the coil for a short distance as shown in Fig. 5, and are then passed through the apertures in the main portion (20) of the casing inclosed by the necks (21). Preferably an end form, similar to that above described in connection with Figs. 1 and 2, and suitably recessed in its flat side to fit over said inleading conductors lying on the coil end, is placed on each end of the coil. A casing endpiece (22) rounded to fit over

the end form is fitted over the same and soldered along its edge to the adjacent edge of the main portion (20) of the casing so as to unite the same thereto in leakage proof relation. Finally the inleading conductors are drawn tight to take up all slack and they are soldered in the apertures, through which they emerge from the interior of the casing so as to form leakage proof joints therewith.

Having described my invention I claim as new and desire to secure by Letters Patent,

1. In combination with a coil of electrically insulated wire spooled about a longitudinal core, a tubular casing of ductile metal inclosing said coil, one end of said casing being radially contracted over the end of said coil and hermetically sealed with reference to the same, and inleading conductors electrically connected with the terminals of said coil, passing through said casing and forming leakage proof joints therewith.

2. In combination with an induction coil, or the like, a seamless tubular casing of ductile metal inclosing said coil, one end of said casing being spun down over the end of the coil and hermetically sealed with reference to the same, and insulated electrical conductors inclosed in the metallic tubes and electrically connected with the terminals of said coil, said tubes being led through said casing so as to form leakage proof joints therewith.

3. In combination with an induction coil, or the like, of a seamless tubular casing of ductile material inclosing said coil, said casing being radially contracted upon said coil by the process of spinning and hermetically sealed with reference to the same, and metal incased conductors electrically communicating with the terminals of said coil and passing through said casing, and forming leakage proof joints therewith.

4. The combination with an induction coil having metal incased conductors electrically connected to the terminals of the said coil, and a metallic casing inclosing said coil and sealing the same within its interior, said conductors being passed through said casing and forming leakage proof joints therewith, of an end form interposed between an end of the casing and an end of the coil.

5. The combination with an induction coil having metal incased conductors electrically connected to the terminals of the said coil, and a metallic casing inclosing said coil and sealing the same within its interior, said conductors being passed through said casing and forming leakage proof joints therewith, an end form interposed between an end of the casing and an end of the coil, and adapted to coöperate with said casing in resisting a longitudinal stress upon said conductors.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY C. THOMSON.

Witnesses:
NATHAN B. DAY,
CHAS. F. RANDALL.