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MAGNETO DYNAMO ARMATURE.

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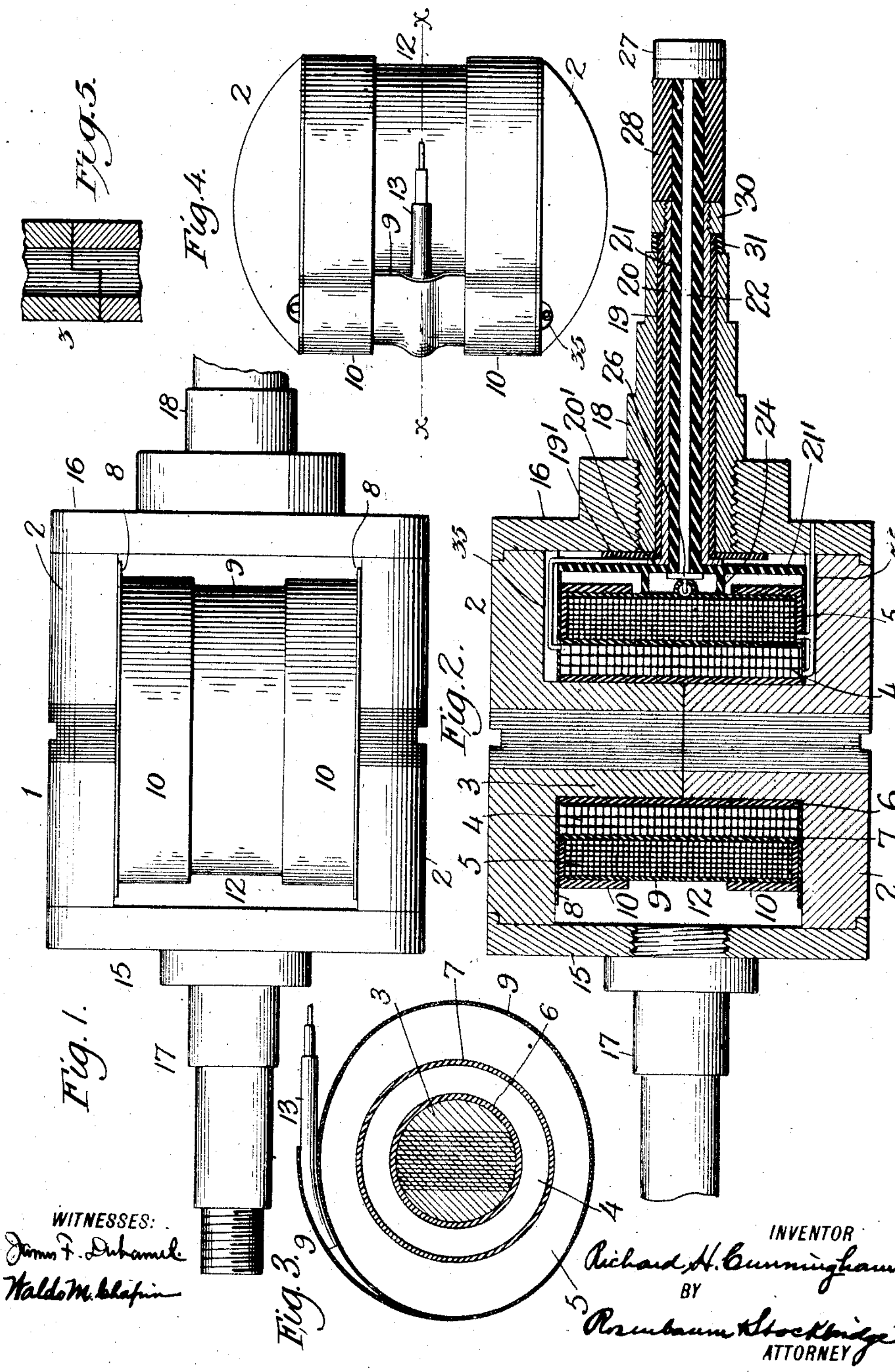
985,981. Patented Mar. 7, 1911.



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MAGNETO-DYNAMO ARMATURE.

985,981. Specification of Letters Patent. Patented Mar. 7, 1911.

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To all whom it may concern:

Be it known that I, Richard H. Cunningham, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Magneto-Dynamo Armatures, of which the following is a full, clear, and exact description.

This invention relates to H-armatures for high-tension magnetos, and particularly to a variety of features of improvement in the construction thereof. The use of these machines, having the so-called "H" or H-shaped armature, is now standard practice in ignition systems, but difficulties are found in matters of insulation, and in making the construction reliable and free from possibility of any mechanical loosening, breakage or change of adjustment. These matters are particularly serious in the use of a magneto generator in motor vehicles for the reason that any defect in the magneto works great discomfort because the magneto by its nature is not susceptible to temporary repair. It is universally recognized that the magneto should be especially reliable in the automobile equipment. Nevertheless the magneto is subjected to severe mechanical conditions, including shocks and vibration and is driven at high and varying speeds. Electrically considered, its insulating parts are called upon to withstand potentials of 2000 volts and over. It has been the practice to make the mechanical construction and the insulation of magneto armatures with elaborate and painstaking care, but this care has rendered the first cost high and the repairs correspondingly expensive.

The main object of my invention is to so improve the various features of construction of a magneto, H-shaped armature throughout as to render it as proof as possible against breakage or failure from any cause, and further to provide a construction of such a nature that the elaborate care hitherto necessary is not so particularly required. And correspondingly it is a purpose of my invention to render repairs of the armature easy and inexpensive to make, if under any circumstances such repairs should become necessary.

More specifically stated, I aim to improve the construction of the H-shaped core so as to render the winding and assembling of the coil thereon easily accomplished, but without increasing the magnetic leakage or diminishing the efficiency of the magnetic circuit. Further I provide for insulating the windings and particularly the high potential portion of the secondary winding in a very simple manner, but with an efficiency as high as is possible in view of the nature of the conditions. Further I provide a means for leading out the primary and secondary terminals so that the wires will not be broken. This last is a most important source of failure that must be guarded against, because the wires carrying current as they do in a continuously varying magnetic field, are subjected to bending forces back and forth which are liable to rupture these conductors unless their anchorages are made particularly secure. In prior constructions this has been accomplished by running the conductors through ducts in the solid core in some cases; I obtain as great efficiency in a simpler and cheaper manner. Furthermore I lead the primary and secondary terminals to the collector brushes or contacts of the outside circuits, through the tubular shaft of the armature by a construction which may be considered as absolutely proof against failure from any cause. I further provide a simplified form of end plates or heads for the armature core and generally facilitate the construction and particularly the assembling of the complete device.

In the drawings: Figure 1 is a side elevation of the improved armature; Fig. 2 is a longitudinal section thereof; Fig. 3 is a section on line $x—x$ of Fig. 4, with the windings omitted, and Fig. 4 is an end elevation of the armature with the end plate 16 removed; Fig. 5 illustrates a modification.

Referring to the drawings, 1 denotes an H or H-shaped core for the armature of a high tension magneto. The core essentially comprises two segmental portions 2 joined together by a connecting web 3 which the coils are afterward made to surround, the segmental portions 2 acting as heads at the ends of the coils or windings. As in prior constructions, I prefer to make the core of cast iron with laminations extending transversely across the same, these laminations thus extending through and forming the major part of the web 3. The distinctive feature of novelty in my core, and which so far as I am aware is new in this class of machine, is the dividing of the web 3 in a plane between the segemental portions 2, the two juxtaposed faces of the thus divided web being carefully finished or machined. As will later appear these faces are pressed tightly together when the core is assembled so that the magnetic circuit is not impaired or the magnetic leakage increased. Instead of these plane faces, the web may be machined on a zig-zag or splice-joint path if desired as shown in Fig. 5. The primary and secondary windings are denoted 4 and 5 and are preferably machine wound in a lathe or winding machine so that in their completed form they may be fitted together upon the core by merely inserting and pressing together the two divided portions of the latter into the central opening of the associated coils or bobbins. In this relation the core parts are fixed and held by armature end plates or heads, hereinafter described. The primary 4 is wound on an insulating tubular shell 6 and a similar insulating tube 7 separates the primary from the secondary. Stamped insulating washers or plates 8 are located between the ends of the coils and the adjacent flat faces of the segmental portions 2 of the core.

9 denotes an insulating wrapping on the outside of the secondary 5. These insulating wrappings separate all parts of different potential from one another, but I provide special means, constituting an important part of my invention, to insulate the high potential portions of the secondary, *i. e.* those portions which have voltages of 10,000 or 20,000 volts, and by virtue of which the insulation is alone subjected to any considerable dielectric stress.

10 denote formed cups of hard rubber or insulating material, perforated to closely receive the tube or shell 7 which covers the primary winding, and adapted to fit over the ends of the secondary winding so as to fill out and make the completed length of the latter equal to the length of the primary winding plus the space between the interior faces of the segmental portions 2. It is further to be noted that the secondary winding, being shorter than the primary is adapted to be most efficiently located thereon, *i. e.* so as to occupy the best theoretical zone of the magnetic field. These cups 10 are of round, oval or oblong shape, corresponding to the form of the secondary and slide or fit closely over the peripheral surface of the latter so as to leave only a narrow central band or zone 12 of said secondary winding uncovered. At this particular zone the winding is, of course, protected by the wrapping 9 which is applied spirally and lapped (see Fig. 4) to permit the exit of the high potential secondary terminal. The latter is closely inclosed in a hard rubber tube 13 inserted between the ends of the wrapping 9 at the point of issuance of said terminal so as to prevent it from working or bending under the electrical forces set up, in the manner already referred to. Inasmuch as the potential in the secondary increases from zero at its inner layers to a maximum at its outer layers, it is evident that dielectric stresses to cause a spark can only be exerted either directly through the material of the cups 10 or along the entire inner surface thereof, in addition to traversing or passing around the insulating shell 7 and plates 8. The central zone 12 of the secondary winding is separated by a considerable gap from the end plates 15, 16 of the armature, and by its nature also from the poles of the field magnet, and is further protected by the insulating wrapping 9, so that no liability to break down at this point need be feared.

It will be observed that everything thus far described, even including the windings, is capable of being made, formed or stamped out cheaply, and furthermore is adapted to be quickly assembled.

As an important part of the characteristics permitting the foregoing advantages, it is to be noted that the terminals of the primary winding are received in grooves of the core by the mere assembling or positioning of the parts of the latter, but are nevertheless anchored with the greatest possible firmness in subsequent use. A groove 35 is formed on the internal face of each segmental portion 2, the grooves extending parallel to the axis of the armature and located opposite the points of exit of the terminals at the ends of the primary coil. In this way the two primary terminals are brought to one end of the armature on diametrically opposite outer portions thereof, and the secondary terminal is likewise brought to this same end of the armature at the middle in the manner already described. The inner end of the secondary is grounded on the primary terminal adjacent thereto the latter being located in its appropriate groove at this point.

15, 16 denote the end plates of the armature which I make of simple form or construction, being merely metallic disks with permanently associated stub-shafts 17, 18, projecting therefrom. The stub-shaft 18 is hollow and is tightly fitted with three interior concentric sleeves 19, 20 and 21 of insulation, steel or metal, and again insulation, successively. At the center there is tightly fitted a steel or conducting rod 22. The two insulating sleeves 19, 21 are both flanged or provided with equivalent insulating washers 19′, 21′ at their inner ends. The steel or conducting tube 20 is also flanged, this flange 20′ being located between the insulating flanges 19′, 21′. One primary terminal is connected to this flange

20′ of the steel tube and the other primary terminal is passed through a hole in the end plate 16 and grounded thereat.

24 denotes a tubular nipple projecting from the flange 21′ of the insulating sleeve 21 so as to form an insulating chamber in which the high potential secondary terminal is wholly inclosed. The inner end of the central rod 22 projects into this chamber where it has a head 26 to which the secondary terminal is soldered. At its other end this rod has a cap or head 27 which is separated from the nearest adjacent metal by an insulating bushing 28 which is slipped on the insulating sleeve 21.

30 denotes a conducting ring screwed on the steel or conducting tube 20 at the inner end of the insulating bushing 28. This metallic ring is separated from the metal of the stub-shaft 18 by an insulating ring 31 fitted on the end of the insulating sleeve.

By the foregoing construction the hollow stub-shaft 18 is made substantially as strong as if it were integrally solid, and the primary and secondary terminals are led out by a construction which may be considered as practically proof against failure either mechanically or electrically. The cap 27 forms the secondary terminal and is widely separated from any grounded metal part. The ring 30 is adapted to be engaged by a brush of any suitable construction to efficiently complete the primary circuit. Within the armature the primary terminals are separated at every point from any adjacent metal and are so confined as not to be vibrated or broken in use. The secondary terminal is completely inclosed and widely separated by both air gap and insulation from any low potential metal part. The two sections of the core are held together by the end plates 15, 16 which are rimmed and screwed thereon in the usual manner not necessary to be described.

It is believed that the foregoing armature realizes all the advantages pointed out in the preliminary part of this specification, but is adapted to be simply constructed and assembled without the extraordinary painstaking care generally necessary in these constructions.

Having described my invention, I claim:

1. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided between said segmental portions.

2. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided midway between said segmental portions.

3. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided with two juxtaposed machined faces transverse thereto and midway between said segmental portions, as and for the purpose set forth.

4. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, a solid non-magnetic end plate, a tubular shaft fixed to said end plate, a conducting tube tightly bushed in said shaft, a conducting rod tightly bushed in said tube, a primary winding having a terminal connected to said tube and a secondary winding having a wrapping with a lapped outside end, and a terminal extending under the lapped portion of said wrapping, said terminal being joined to said rod.

5. In a high tension armature for a magneto dynamo, an H-shaped core, a primary winding received on said core and having central and peripheral tubular insulating shells, a secondary winding shorter than said primary, formed insulating cups fitting over the ends of said secondary and filling out the length thereof to equal the length of the primary, and a wrapping on said secondary exposed in a zone between said cups and under the lapped outer extremity of which the secondary high potential terminal is led.

6. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided between said segmental portions, associated primary and secondary windings, and formed insulating cups fitting over the ends of the secondary to separate the latter from the adjacent faces of the core.

7. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided between said segmental portions, associated primary and secondary windings insulated from one another and from said web and from the segmental portions of said core, and formed insulating cups fitting over the ends of the secondary and separating the same from the segmental portions of the core, said cups approaching one another to leave a narrow exposed band of said secondary midway between the segmental portions of the core.

8. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided between said segmental portions, associated primary and secondary windings insulated from one another and from said web and from the segmental portions of said core, formed insulating cups fitting over the ends of the secondary and separating the same from the segmental portions of the core, said cups approaching one another to leave a narrow exposed band of said secondary midway

between the segmental portions of the core, and a high potential terminal of said secondary led out in said exposed zone between said cups.

9. In a high tension armature for a magneto dynamo, an H-shaped core, an end plate, a tubular shaft fixed thereto, a conducting tube and a conducting rod within said shaft, insulating sleeves separating said rod and tube from one another and from said shaft, said sleeves having insulating flanges, a primary winding having a terminal joined to said tube between the flanges of said sleeves, and a secondary winding having a terminal joined to said rod, one of said flanges being formed with an insulating tubular nipple to wholly inclose said secondary terminal in an insulating chamber.

10. In a high tension armature for a magneto dynamo, an H-shaped core having two segmental portions joined by a connecting web, said web being divided between said segmental portions, and said segmental portions being respectively grooved on an interior flat face, and windings having terminal wires led outward therefrom, said wires being received in said grooves when the parts of said core are assembled together.

11. In a high tension armature for a magneto dynamo, an H-shaped core, a non-magnetic end plate, a tubular shaft fixed thereto, an insulating sleeve within said shaft, a conducting tube within said sleeve, a conducting ring on said tube, an insulating ring separating said conducting ring from said shaft, an insulating sleeve within said tube and projecting beyond the latter at its outer end, a conducting rod within said latter sleeve, a cap on said rod, an insulating bushing separating said cap from said conducting ring, and primary and secondary windings having terminals respectively connected to said tube and rod.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

RICHARD H. CUNNINGHAM.

Witnesses:
WALDO M. CHAPIN,
WILLIAM C. LANG.