

1,428,083.

Patented Sept. 5, 1922.

2 SHEETS—SHEET 1.

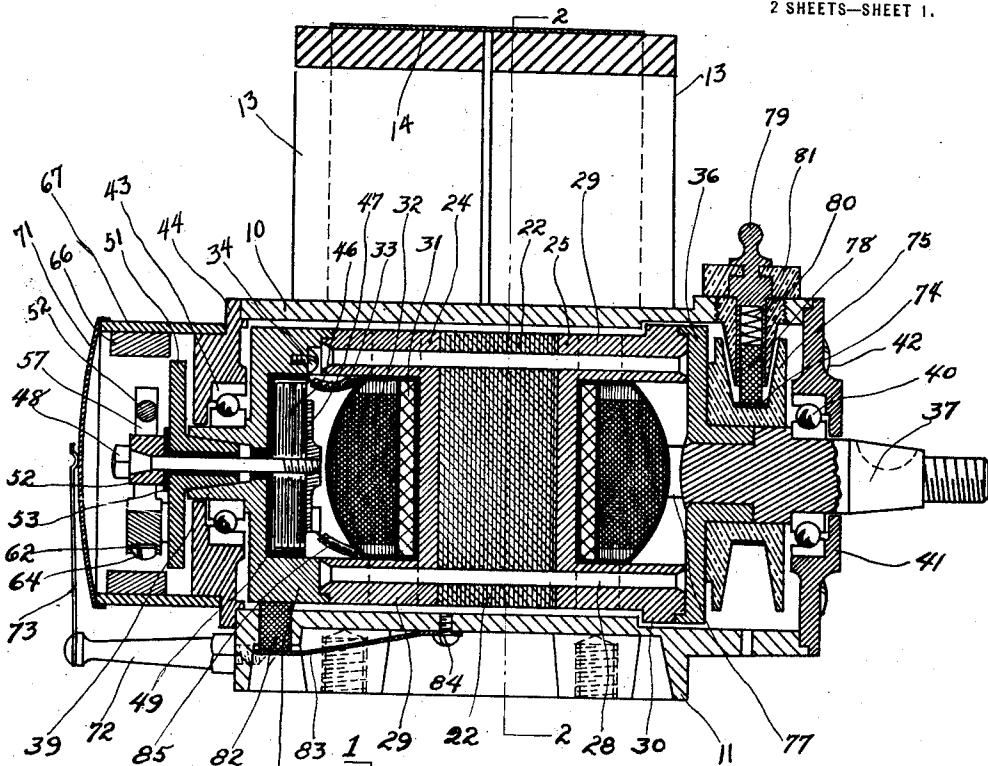


FIG. 2.

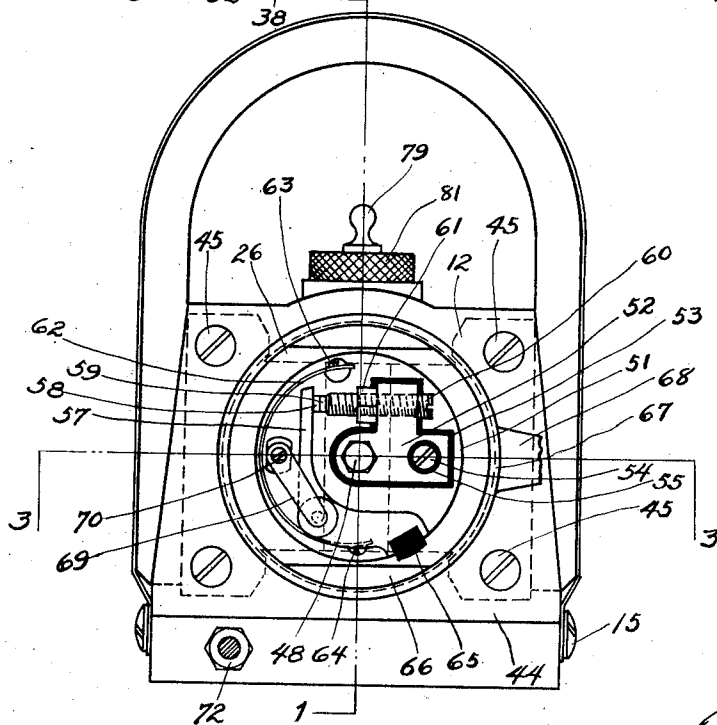


FIG. 1.

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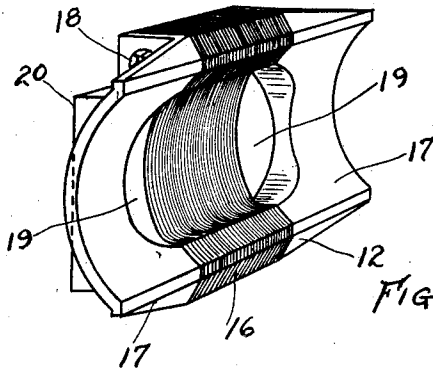


FIG. 5

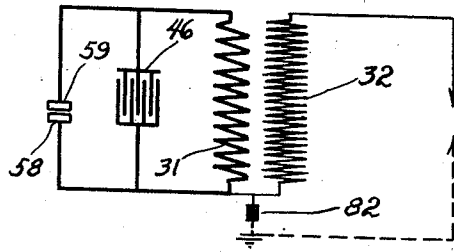


FIG. 6.

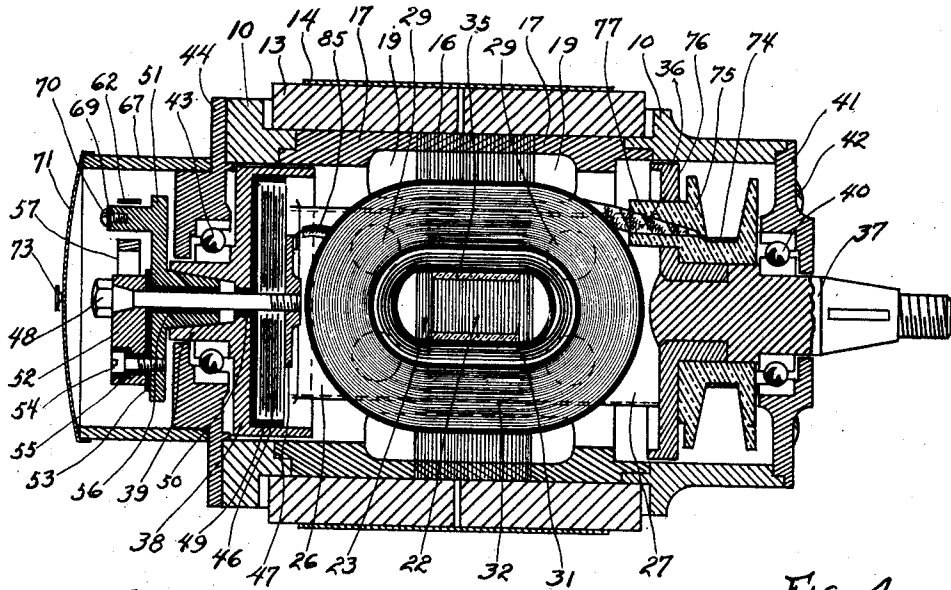


FIG. 4.

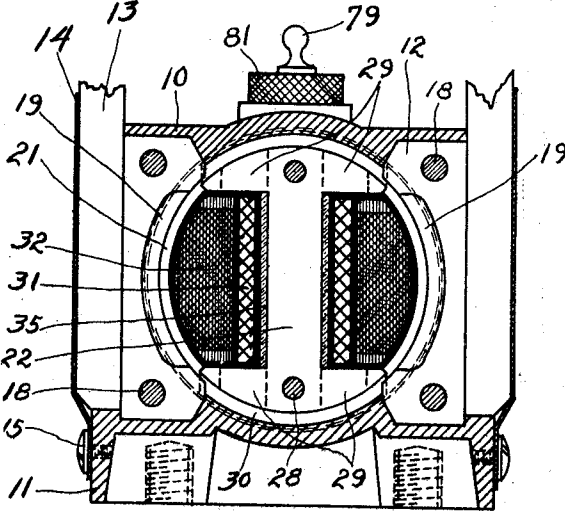


FIG. 3.

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HARRY FOREST GEIST, OF HARTSVILLE, SOUTH CAROLINA.

MAGNETO.

Application filed October 30, 1920. Serial No. 420,776.

To all whom it may concern:

Be it known that I, HARRY F. GEIST, a citizen of the United States, residing at Hartsville, in the county of Darlington and State of South Carolina, have invented new and useful Improvements in Magnetos, of which the following is a specification.

The invention relates to magnetos for ignition purposes.

The invention is more particularly designed to provide a magneto of the armature wound type, in which by reason of the construction of the field pole pieces and the armature, a magneto of efficient magnetic and electrical properties is obtained.

The invention is further designed to provide a magneto of the armature wound type which may be readily assembled or taken apart due to the simplicity of its construction and the arrangement of its parts.

The invention consists further in the several features hereinafter set forth and more particularly defined by claims at the conclusion thereof.

In the drawings,

Fig. 1 is an end elevation of the device, with the interrupter housing cover removed and the cover supporting spring and interrupter timing lever cut away.

Fig. 2 is a vertical section on the line 1—1 of Fig. 1.

Fig. 3 is a vertical section on the line 2—2 of Fig. 2.

Fig. 4 is an horizontal section on the line 3—3 of Fig. 1.

Fig. 5 is an isometric view of the special pole piece.

Fig. 6 is a diagram of the electrical circuits of the device.

For convenience in explanation, the mechanical construction of the frame, field, armature and interrupter will be described first and the circuit connections of the machine together with its operation, thereafter.

The frame consists of the portion 10 having a base 11 adapted to be mounted on any suitable support adjacent to the engine to which the magneto is operatively connected.

The field consists of pole shoes designed as a whole as 12 and permanent magnets 13 contacting with said pole shoes and connected to the frame by a metal strip 14 surrounding said magnets and connected at its lower ends to the frame 10 by any suitable means, such as screws 15.

The pole shoes are of special construction

so as to reduce the iron losses due to eddy currents as much as possible and to reduce the time constant of the secondary winding. These pole shoes consists of a plurality of soft iron laminæ 16 clamped between solid iron or steel blocks 17 by means of rivets 18, both the laminæ and the blocks contacting with the magnets and having their inner sides curved to accommodate the armature, as shown in Fig. 3. The laminæ 16 used in the field serve to break up the eddy currents which travel through the field at right angles to the plane of said laminæ and thus reduce the iron losses of the field. Holes or recesses 19 are provided in the blocks 17 to reduce the coefficient of self-induction of the secondary winding and by so doing reduce the time constant of the secondary winding. The laminæ 16 are also so shaped as to present themselves to the bore of the machine, for close magnetic coaction with the armature, at the pole shoe tips only, the central area being cut away to form a connecting recess between the recesses 19 of the parts 17. The pole shoe considered as a whole is therefore of basin shape as shown by Fig. 5 and the recess as a whole does not penetrate through the pole shoe but allows a bottom or web formed by back parts 20 of the parts 17 and the laminæ for contact with the polar faces of the magnets 13 as shown by Fig. 4. A further advantage gained by this basin shaped recess is that for sparking positions of the armature such as in the neighborhood of that shown in Fig. 3, the central pole piece areas will be sufficiently distant from the high tension or secondary winding to reduce high tension energy leakage to a minimum.

For convenience in manufacture, the frame 10 is cast around the laminæ 16 and blocks 17 by a die-casting method so that the whole forms a unitary structure having a bore 21 therein to receive the armature and its bearings.

The armature consists of an I-shaped core formed by I shaped soft iron laminæ 22 and 23 clamped between solid iron pieces 24 and 25 having extensions 26 and 27, all being securely fastened together by screws or rivets 28 to form an integral core and further consists of the armature windings hereinafter described. The laminæ 22 and 23 are provided in the core to reduce the iron losses by breaking up the eddy currents set up therein. The laminæ 22 are narrower at

the central portion which passes directly through the windings than is true of the laminæ 23 and the parts of 24 and 25 which pass through the windings, so as to allow the central parts of the core to be spaced from the primary winding. The purpose of this spacing is to make the different layers of the primary winding more nearly of the same electro-magnetic characteristics. Attention is called, herewith, to the fact that the armature core construction which permits the primary windings to be spaced from the central parts of the core by reliefs therein is thought to be new and novel; that it is made a part of and claimed in a copending application, Serial #321,065 filed September 2nd, 1919, for magnetos of similar type and will not therefore be claimed in this application. The solid parts 24 and 25 with their extension 26 and 27 form continuations of the coil space recess of the I shaped laminæ and continuations also of the curved faces of the laminæ, forming as a whole a core adapted to carry a winding and to present face areas for coaction with the pole shoes that are joined by a portion that passes directly through the windings.

The extensions 26 and 27 of the solid iron blocks of the armature core are provided with holes or apertures 29 that are intended to reduce the time constant of the secondary winding. The extension 27 at the driven end of the armature core is provided with flanges 30 of larger diameter than the rest of the armature so as to provide a substantial means of securing the driving shaft plate to it. Special provision is made in the bore 21 of the machine to receive the large diameter end of the armature in the form of a counterbore.

It will be noted from Fig. 3 that the ends of the armature core faces overlap the gap between opposite pole shoes, so that the magnets are never open circuited.

The armature windings comprise a primary coil 31 which is insulated from the core and a secondary winding 32 that is insulated from the primary windings and from the core, both coils being wound around the web portion of the I shaped core between the armature faces. The primary coil is grounded to the core by having one of its terminals 33 connected to the core by a grounding screw 34. The secondary is also grounded to the core by having one of its terminals soldered to terminal 33 of the primary winding as is usual in such devices.

Fibre plates 35 are employed to fill the spaces made by the difference between the widths of laminæ 22 and 23.

The armature is provided with a brass or other non-magnetic end plate 36 suitably dowelled and secured at its drive end to the core extension 27 having flanges 30. The plate 36 has the armature shaft 37 fixedly

mounted therein in a manner well known to the art. The armature is further provided at its other end with a brass or non-magnetic plate 38 having a shaft projection or boss 39 integral with it. The shaft 37 is journaled in a ball bearing 40 mounted on a bearing plate 41 that is secured to the frame 10 by screws 42 through which the shaft extends and which forms a frame end plate. The shaft 37 is connected up to any suitable source of power for rotating it such as a gear connection with the engine, and the shaft extension of the armature end plate 38 is journaled in a ball bearing 43 mounted on a bearing plate 44 that is secured to the frame 10 by screws 45. On the removal of the end plate 41 and the breaker parts, the whole armature may be withdrawn from the frame.

The primary circuit is also provided with a suitable condenser 46 mounted on the armature end plate 38 by means of a threaded plate 47 and a cap screw 48 which also serves to secure the interrupter in position as hereinafter described, the condenser being insulated from the conductor parts by a plate 49 and bushing 50 of insulating material.

One terminal of the condenser is grounded to the core by the screw 34.

The interrupter consists of a metal disk 51 having a tapered projection seated and keyed in a female tapered seat of the shaft projection 39 of the armature end plate 38 and having mounted thereon but insulated therefrom a contact carrying member 52. The plate 53 serves to insulate 51 from 52. A screw 54 passing through an insulating bushing 55 serves to fasten 51 and 52 together. The screw 48 passing through a hole in the contact carrying member 52 and through a hole in the tapered projection of the disk 51 completes the electrical circuit between the condenser 46 and the interrupter contact carrying member 52 through the threaded condenser plate 47 which represents one terminal of the condenser.

The screw 48 also serves to mechanically secure the interrupter mechanism fixedly but removably to the armature and in keyed relation to it.

A contact lever 57 is pivotally mounted on the disk 51 and is provided with a contact point 58 adapted to engage with an adjustable contact 59 mounted upon a screw 60 that assembles to the member 52 and may be adjusted and locked in place by the nut 61. The contacts 58 and 59 are normally held in contact with each other by means of a spring 62 secured to the lever 57 at one end by a screw 64 and to the disk 51 at the other end by a screw 63. When in contact, 58 grounds the insulated contact 59 to the armature core by means of the lever 57, the spring 62 and the disk 51, and the circuit is interrupted by breaking the contact between 58 and 59 by means of a fibre bumper block

65 that engages a cam 66 that is carried upon an adjustable sleeve 67 mounted upon a cylindrical boss of the bearing plate 44, and is provided with an operating lever 68 that
 5 controls the time of break at the interrupter and its relation to the position of the armature core with respect to the field pole shoes, thus timing the spark with respect to the engine. As the armature revolves the inter-
 10 rupter lever rotates with it and the fibre bumper block 65 strikes against the cam 66 and separates the contacts 58 and 59, contact 58 being quickly moved from contact with 59.

15 The adjustable sleeve 67 may be equipped with one or two cams 66 depending upon the number of sparks desired per revolution of the armature and depending also upon the means for collecting and distributing the
 20 high tension spark current.

The interrupter lever 57 is held in place by a spring 69 that is secured to the disk 51 by means of a screw 70.

The interrupter mechanism is covered by
 25 a plate cover 71 that fits over the outer end of the sleeve 67 and is held removably in place by a spring 73 which is mounted upon a post 72, said post being assembled to the base or other part of the frame casting 10.

30 A means is also provided for collecting the high tension current from the secondary circuit on the armature, consisting of a collector ring 74 mounted in an annular groove of a spool 75 that is made of insulating material, said spool being mounted directly
 35 upon the armature drive shaft 37. The ring 74 is connected electrically to the secondary coil by an insulated lead or terminal conductor wire 76 which passes through an insulating boss 77 on spool 75 that projects
 40 through a hole in the armature end plate 36.

A contact brush 78 yieldingly slidably mounted with a spring 80 in a binding post 79 contacts with the ring 74, the post 79 and
 45 brush 78 being insulated from the frame 10 by a socket member 81 of insulating material. The contact brush 78 is adapted to be connected to the spark plug of the engine by means of the binding post 79.

50 A discharge brush 82 held yieldingly in place by a spring 83 which is secured to the frame 10 by a screw 84 serves to ground the armature to the frame so that high tension current will not pass through the ball bear-
 55 ings.

A circuit wire 85 connects the primary coil directly to the insulated lead of the condenser and thence to the insulated member of the interrupter by the cap screw 48, so
 60 that when the contacts 58 and 59 of the interrupter are normally together, both the primary coil and the condenser are short circuited through them.

In Fig. 6, I have shown the electrical
 65 circuit connections of the device in a dia-

grammatical manner, showing the relation between the primary coil, the secondary coil, the interrupter and the condenser. These connections are the same as is usual in devices of this class.

The Fig. 6 shows the primary coil 31 and the condenser 46 connected in multiple and so connected to the interrupter that the interrupter contacts 58 and 59 either close or open both the primary coil and the con-
 75 denser circuits at the same instant.

The secondary coil 32 which is wound directly over the primary coil on the armature is open circuited for the production of a "jump" spark at the spark plug of the
 80 engine.

The operation of the device is as follows.

As the armature passes from the horizontal position to the vertical position shown in Fig. 3, the tendency is for all of
 85 the magnetic flux to pass or shift from complete interlinkage with the coils to a set of by-pass magnetic circuits outside of the coils entirely. These by-pass circuits are formed
 90 by the armature faces which bridge the pole shoe tip gaps. As rotation continues beyond the vertical position the flux of course shifts back into interlinkage with the coils in the reverse direction. The maximum rate of
 95 flux shift takes place in the neighborhood of the vertical position so that it is during just a few degrees of rotation, after the vertical position has been passed, that the maximum energy generation takes place. The
 100 primary coil is short circuited during the period that the armature is advancing from the horizontal to the vertical position and allows a maximum amount of energy to be generated and stored in its windings and
 105 the interlinked magnetic circuit, in the form of electromagnetic energy. The condenser and the secondary are both inoperative during this period, due to the short circuit condition of the condenser and the open circuit
 110 of the secondary.

When the energy generation and storage reaches about its maximum, just after the vertical position has been passed, the interrupter functions and brings the condenser suddenly into the circuit, at the same in-
 115 stant that the energized primary coil is open circuited.

The combined results of suddenly checking the energization of the primary coil and suddenly putting the condenser under conditions for its energization is that a very
 120 high voltage will be induced in the windings of the coils. Because of the fact that the secondary coil is wound with a high number of turns, this induced voltage will
 125 be high enough to produce a jump spark at the spark plug of the engine. The condenser will absorb the energy left in the primary and thus prevent arcing at the interrupter contacts. The phenomena just re-
 130

viewed are in general common to practically all self-contained high tension magnetos of which my device is one.

In my invention the electrical phenomena are especially efficient due to the special construction of the pole shoes and the armature core which permit the electrical energy to be handled during the period of sparking very quickly. The basin shaped recess in the central portions of the pole shoes and the apertures of the armature extension castings are provided to remove as much iron from the immediate presence of the secondary winding during the sparking period as possible, so as to reduce the tendency of any lag that would be caused by such iron, to a minimum. The basin recess also reduces the amount of high tension energy leakage between the secondary winding and the pole shoes to a minimum.

The reduction of both the lag and the energy leakage by the removal of iron from the presence of the secondary in the form of recesses must not reduce the generative ability of the machine. This is taken care of in the magnetic circuit design by giving the pole shoe parts 17 and the laminae 16 ample area at the bore of the machine for close magnetic engagement with the armature faces for all positions of the armature. It will be noticed that the tip edges of the pole shoes are maintained as long as possible so as to produce a quick magnetic break with the long edges of the armature core faces.

The laminae also form a very efficient tie between the upper and the lower pole shoe tips in both pole shoes for handling the flux changes that take place from one pole tip to the other during the rotation of the armature.

It is very evident that these laminae do not have to come flush with the bore of the machine throughout the entire span from pole tip to pole tip in each pole shoe, so that it is possible to recess the laminae and get plenty of clearance between them and the secondary windings for the purposes set forth.

The advantage gained by the special construction of the magnetic circuit, which reduces the time-constant of the windings and reduces the energy leakage, is not alone that it permits of the delivery of a very quick and effective spark, but permits the use of fewer secondary turns, other secondary circuit conditions being the same.

I am aware that the specific construction herein described is subject to modifications and changes and I therefore desire it to be understood that such modifications and changes as come within the scope of the appended claims are within the spirit of my invention.

What I claim as my invention is.

1. In a wound armature type magneto, the combination of a revoluble armature and

windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes being substantially a hollowed square in shape to reduce the central magnetic areas presented for co-operation with said armature.

2. In a wound armature type magneto, the combination of a revoluble armature carrying windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes each including an area of contact with said magnets, and an area for co-operation with said armature, said area for co-operation with said armature being centrally relieved to reduce the proximity of said area to said windings without decreasing the area of contact of said pole shoes with said magnets.

3. In a wound armature type magneto, the combination of a revoluble armature carrying windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes having recesses to reduce the central magnetic areas in proximity to said windings, said recesses having bottoms in said pole shoes to maintain a full area of contact between said pole shoes and said magnets.

4. In a wound armature type magneto, the combination of a revoluble armature and windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes comprising a plurality of laminae presenting spaced apart projections for co-operation with said armature, said projections being integrally connected by a web section, said laminae being clamped together between solid iron parts.

5. In a wound armature type magneto, the combination of revoluble armature carrying windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes comprising a plurality of soft iron laminae presenting spaced apart projections for co-operation with said armature and parts contacting with said magnets, said spaced apart projections forming central area reliefs, said laminae being clamped between solid iron parts having reliefs in line with said laminated section reliefs, said solid parts also having parts in contact with said magnets in line with said parts of said laminae in contact with said magnets for maintaining full contact areas with said magnets.

6. In a wound armature type magneto, the combination of a revoluble armature and windings with a field structure comprising a frame, field magnets and pole shoes, said pole shoes comprising areas of contact with said magnets and areas for co-operation with said armature having upper and lower tip edges, said polar area for co-operation with said armature being centrally relieved without reducing said areas of contact with said

magnets and without reducing the length of said pole shoe tip edges for the purpose described.

5 7. A revoluble armature for apparatus of the class described, comprising windings, an iron core, a non-magnetic end plate with drive shaft projection and a non-magnetic
10 end plate with other shaft projection, said iron core comprising face area sections connected by an integral section through said
15 windings, said non-magnetic end plates being mechanically secured at each end of said core to the ends of said face area sections, said ends securing to said drive shaft non-magnetic plate being flanged to a larger di-

ameter to give a more rigid connection without increasing the diameter of the rest of said armature substantially as described.

8. A revoluble armature for apparatus of the class described comprising windings, an
20 iron core, drive end non-magnetic plate and other end non-magnetic plate mechanically secured to said core, said drive end non-magnetic plate and said core being of larger
25 diameter in their connection than said other end plate and the rest of the iron core to provide a more rigid mechanical connection at said drive end.

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