Dec. 2, 1924. 1,517,281

L. B. EHRLICH

DYNAMO

Filed Jan. 28, 1924

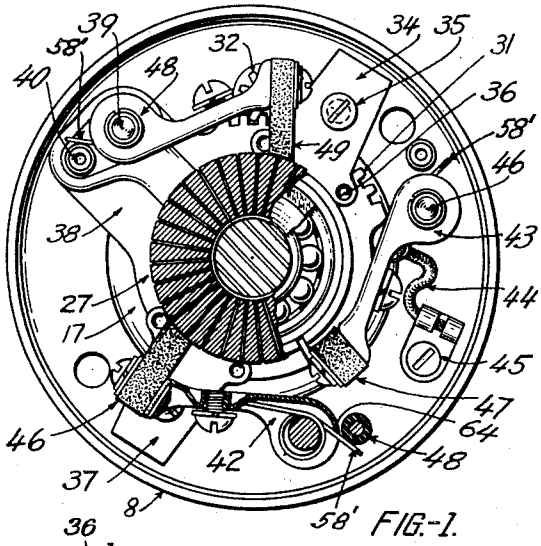


FIG.-1.

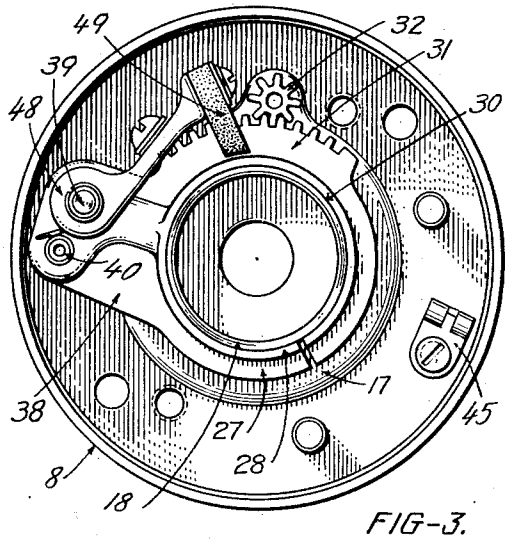


FIG-3.

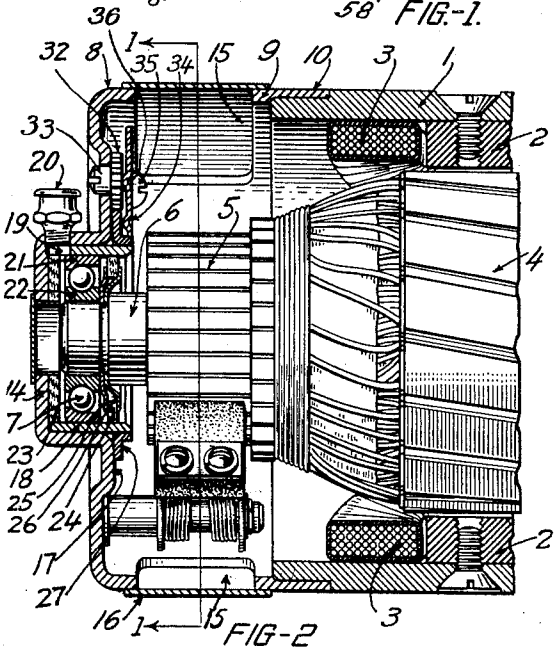


FIG-2

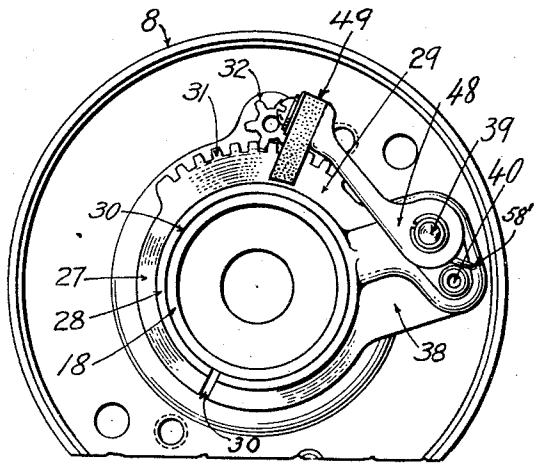


FIG.-4.

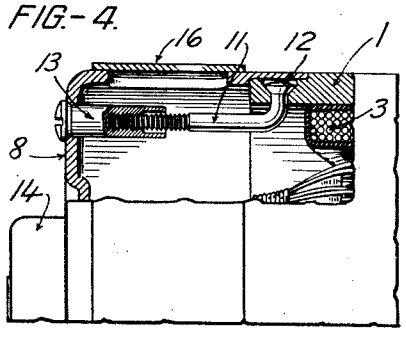


FIG-7.

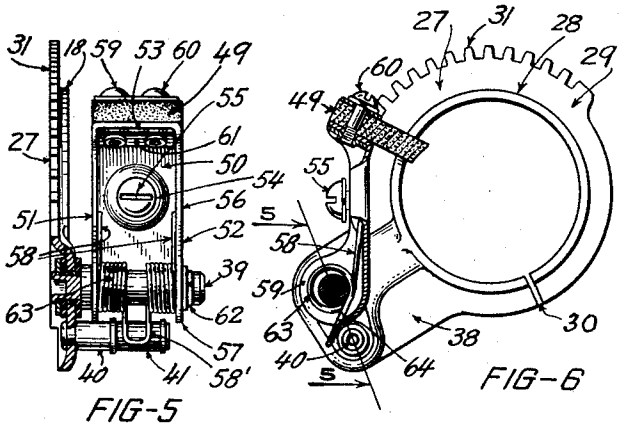


FIG-5

FIG-6

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UNITED STATES PATENT OFFICE.

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DYNAMO.

Application filed January 28, 1924. Serial No. 688,966.

To all whom it may concern:

Be it known that I, LOUIS B. EHRLICH, a citizen of the United States, residing at 37 Egremont Road, Brookline, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Dynamos; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to dynamo electric machines, and particularly to the brush rigging thereof comprising the brush holders, the endcap supporting them, and, where provided, the carrier-ring for angularly adjusting one or more of the brush holders.

Where the endcap was of cast iron, it was customary to machine a flange for supporting the carrier-ring, and where it was of sheet metal, it was customary to rivet or otherwise fasten such a flange to it. My invention comprehends the use of a tube for this purpose fixed, as by a press fit, in the bearing nose of the endcap, and having inner and outer surfaces concentric with that flange of the endcap that fits the field frame, so that when the carrier-ring is turned on the tube for angular adjustment, the one or more brush holders carried by the carrier-ring retain their angle and area of contact with the commutator without change, which is of utmost importance particularly in a third brush generator of the small size usual for automobiles. To further assist in maintaining this condition, the endcap may have a flat annular surface on its inside adjacent the bearing nose, against which is held by suitable means the flat annular surface on the carrier-ring, and the carrier-ring may also have a bearing flange fitting the tube. By splitting the carrier-ring and giving it a diameter which when unrestrained is slightly less than the diameter of the tube, a tight turning fit is readily obtained in all adjusted positions, particularly when of pressed-up sheet metal. The angular adjustment of the carrier-ring is provided by stamping out gear teeth in its rim and having a pinion meshed therewith.

In any of the foregoing constructions, I may provide a spring which not only holds the carrier-ring against the endcap, but also holds the pinion in mesh with the gear teeth, the pinion and the spring being supported by the endcap. Also, for drawing up and holding the endcap to the limit of its seat on the field frame, I may provide a plurality of bent stay wires which are fastened to the field frame and to the endcap and which have adjustable means for the purpose.

Irrespective of the construction of the endcap or of the carrier-ring, my invention also comprehends a pressed-up sheet-metal brush holder of the swinging arm type, having a web portion integral with side flanges and an end flange to combine lightness with rigidity. The end flange has a flat outer portion to abut the face of a brush, so as to provide sufficient contact area therewith, and the side flanges terminate at the other end in ears having holes for bearings for the brush holder stud. Preferably the intermediate portion of the side flange is of lesser height than the ears or the end flange, and merge thereinto, so as to provide more space above the brush holder without sacrificing strength. Also the web portion may have a cup-shaped protrusion which is screw threaded, thus further adding to the strength of the brush holder and also providing for a screw for a connecting lead.

Whether the brush holder is of sheet metal or is built up, or has any other form or construction, I prefer to provide it with means for lifting the brush spring from the spring post at a predetermined angular position of the brush holder on its stud, so that when the brush has worn to its predetermined limit, it automatically loses its effective contact with the collector or commutator, this result preferably being obtained by accordingly constructing the web portion of the brush holder.

In the accompanying drawings illustrating the application of my invention, as an example, to a four-pole third brush generator having ball bearings and an angularly adjustable third brush,

Fig. 1 is a view representing in part a section on line 1—1 of Fig. 2, in part broken away and in part in elevation; Fig. 2 represents a longitudinal section, partly in elevation, of the commutator end of the generator; Fig. 3 represents an elevation of the inside of the endcap; Fig. 4 is similar to

Fig. 3 except the carrier-ring is for the opposite direction of rotation; Fig. 5 represents a section on line 5—5 of Fig. 6; Fig. 6 represents, partly in elevation and partly in section, the carrier-ring with its brush holder; and Fig. 7 represents a detail of one of the stay wires.

The field frame 1 has four pole pieces 2 wound with field coils 3. The armature 4 and commutator 5 are mounted on the shaft 6 for rotation in the field frame in the ball bearing 7 at one end and a similar one at the other end (not shown).

The endcap 8 is of pressed-up sheet steel having a peripheral flange 9 with its end portion 10 tightly fitting a seat around the end of the field frame and being drawn up to the limit thereof, as shown best in Fig. 7, by means of two stay wires 11 diametrically opposite each other. Each has a head 12 counter-sunk in a hole in the field frame, and a screw threaded end which is engaged by a nipple 13 countersunk in the endcap for tightening from the outside. The endcap also has a bearing nose 14 at its central portion and around its peripheral flange a plurality of openings at 15 covered by the usual garter strap 16. Inside the endcap is a flat annular surface 17 adjacent the bearing nose.

A tube 18, projecting inwardly beyond the flat surface 17, has a press fit in the bearing nose to fix it therein and has a cutout at 19 registering with the oiler 20. The inner and outer surfaces of the tube are concentric with the end portion 9 of the peripheral flange and at right angles to the flat surface 17, this being accomplished by machining those surfaces in a single set-up with the tube in place. The outer race 21 of the ball bearing is then fixed in the tube by a suction fit, and the inner race 22 is pressed on the armature shaft 6, so that the shaft is supported at that end and also at the other end to maintain the armature and commutator concentric with the machined surfaces of the tube and field frame. The felt washers 23 and 24 prevent the entrance of dust into and the loss of oil from the ball bearing 7. The retainers 25 and 26 hold the washer 24 in place.

The carrier-ring 27 is of pressed-up sheet steel having a bearing flange 28 and a peripheral flange 29 opposite the flat annular surface 17 of the endcap. Both flanges are split radially at 30 and the inner diameter of the bearing flange is, when unrestrained, about .005 inch less in diameter than the outside surface of the tube, so that when pressed on the tube, it fits tightly and yet is capable of turning thereon.

The peripheral flange 29 has gear teeth 31 stamped from its rim. The pinion 32 has an integral extension 33 projecting through the endcap for support thereby and has a screw-driver slot for turning it from the outside. This pinion is held against the inner face of the endcap in mesh with the gear teeth 31 by pressure of a spring plate 34 fastened to the endcap by the screw 35. The two struck-up nibs 36 of the spring plate also bear against the carrier-ring 27 to hold its annular surface in intimate contact with the flat annular surface 17 of the endcap, assisted diametrically opposite by an identical spring plate 37. Thus when the pinion is turned, the carrier-ring is turned on the tube to adjust the third brush in angular position with respect to the main brushes, the movement being limited in both directions by the terminal gear teeth.

The carrier-ring 27 also has an extension 38 for supporting the brush holder stud 39 and the spring post 40. The stud is riveted in the carrier-ring with insulating washers and a tube to insulate it therefrom, and the spring post is riveted into the carrier-ring and carries an insulating sleeve 41, as shown best in Figs. 5 and 6. Two brush holders 42 and 43 are similarly mounted on studs riveted to the endcap and insulated therefrom by insulating washers and an insulating tube. So also, each has a spring post riveted to the endcap and carrying an insulating sleeve. The brush holder 43 is grounded on the endcap by the connecting lead 44 and clip 45.

The brush holders 42 and 43, for the main brushes 46 and 47, are supported directly by the endcap, and the brush holder 48 for the third brush 49 is fixed to the angularly adjustable carrier-ring supported by the endcap. They are identical in construction except that as shown the main brushes are thicker than the third brush. Each brush holder is made of pressed-up sheet steel having a web portion 50, two side flanges 51 and 52, and an end flange 53. The web portion has a cup-shaped protrusion 54 which is screw threaded to receive a screw 55 for securing a connecting lead thereto. Each of the side flanges has an intermediate portion 56 merging into the end flange 53 at one end and into the ear 57 at the other end, and being of lesser height than either to provide for the stay wires 11 without sacrificing rigidity. The end flange 53 has a flat outer surface which is held in intimate contact with the brush by screws 59 and 60 screw threaded into the clamping plate 61. The ears 57 have bearing holes to receive the studs 39, the brush holder being prevented from movement off the stud by the spring ring 62.

As shown best in Figs. 5 and 6, a double coil brush spring 63 is housed between the ears 57 and coiled around the stud 39, having its two ends 58 pressing against the web portion of the brush holder, and its central portion 58′ pressing against the insulated roller 41. The web portion of each brush

holder extends up in a curve to an end 64 which is so constructed and arranged that at a predetermined angular position of the brush holder on the stud, the spring is lifted off the insulating roller and the pressure on the brush holder is removed. Thus when the brush is worn down in operation to its predetermined limit, as indicated in the case of brush 47 in Fig. 1, it is no longer held in operative contact with the commutator.

The brush holders may be reversed on their studs for the opposite direction of rotation of the armature, the carrier-ring being replaced by one otherwise the same but adapted therefor, as shown in Fig. 4.

Having thus described my invention what I claim is:

1. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, an endcap having a flange fitting the field frame and having a bearing nose, a tube fixed in the bearing nose and having inner and outer surfaces concentric with said flange, a carrier-ring tightly fitting on said outer surface of the tube, a brush holder carried by the carrier-ring for cooperation with the commutator, and means for turning the carrier-ring to adjusted angular position on the tube.

2. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, an endcap having a flange fitting the field frame and having a bearing nose and also having a flat annular surface on the inside adjacent the bearing nose, a tube fixed in the bearing nose and having inner and outer surfaces concentric with said flange, a carrier-ring tightly fitting on said outer surface of the tube and having a flat annular surface opposite the flat annular surface of the endcap, a brush holder carried by the carrier-ring for cooperation with the commutator, means for turning the carrier-ring to adjusted angular position on the tube, and means for holding said annular surfaces in contact in all adjusted positions of the carrier-ring.

3. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, an endcap having a flange fitting the field frame and having a bearing nose and also having a flat annular surface on the inside adjacent the bearing nose, a tube fixed in the bearing nose and having inner and outer surfaces concentric with said flange, a carrier-ring having a bearing flange tightly fitting around the outer surface of the tube and having a flat annular rim opposite the flat annular surface of the endcap, a brush holder carried by the carrier-ring for cooperation with the commutator, means for turning the carrier-ring to adjusted angular position on the tube, and means for holding said annular rim in contact with the annular surface of the endcap in all adjusted positions of the carrier-ring.

4. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, an endcap carried by the field frame and having an armature bearing and a support, a carrier-ring which is split and has a diameter which, when unrestrained, is slightly less than the diameter of the support so as to fit tightly thereon for turning, a brush holder carried by the carrier-ring for cooperation with the commutator, and means for turning the carrier-ring to adjusted angular position on the support.

5. In a dynamo electric machine, a field frame, an armature and commutator for rotation in the field frame, an endcap carried by the field frame and having an armature bearing and a support, a pressed-up sheet-metal carrier-ring having a bearing flange tightly fitting the support and an annular rim having gear teeth, said flange and rim being split so that when unrestrained the flange is of slightly less diameter than the support, a brush holder carried by the carrier-ring for cooperation with the commutator, and a pinion meshed with said gear teeth to turn the carrier-ring to adjusted angular position on the support.

6. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, an endcap carried by the field frame and having an armature bearing and a support, a carrier-ring mounted on said support and carrying gear teeth, a pinion supported by the endcap in mesh with said gear teeth to turn the carrier-ring to angularly adjusted position on the support, a spring fastened to the endplate and pressing against the carrier-ring and the pinion to maintain the carrier-ring against the endcap and the pinion meshed with said gear teeth in all adjusted positions of the carrier-ring, and a brush holder carried by the carrier-ring for cooperation with the commutator.

7. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, a pressed-up sheet-metal endcap having a flange with a cylindrical seat fitting around the field frame and also having a bearing nose and also having a flat annular surface on the inside adjacent the bearing nose, a tube fixed in the bearing nose and having inner and outer surfaces concentric with said cylindrical seat, a carrier ring tightly fitting on said outer surface of the tube and having a flat annular surface opposite the flat annular surface of the endcap, a brush holder carried by the carrier-ring for cooperation with the commutator, means for turning

the carrier-ring for adjusted annular position on the tube, and means for holding said annular surfaces in contact in all adjusted positions of the carrier-ring.

8. In a dynamo electric machine, a field frame, an armature and commutator arranged for rotation in the field frame, a pressed-up sheet-metal endcap having a flange with a cylindrical seat fitting around the field frame and also having a bearing nose and also having a flat annular surface on the inside adjacent the bearing nose, a tube fixed in the bearing nose and having inner and outer surfaces concentric with said cylindrical seat, a pressed-up sheet-metal carrier-ring having a bearing flange tightly fitting the tube and having an annular rim with gear teeth, said flange and rim being split so that when unrestrained the flange is of slightly less diameter than the tube, a brush holder carried by the carrier-ring for cooperation with the commutator, a plurality of brush holders carried by the endcap, a pinion supported by the endcap and meshed with said gear teeth to turn the carrier-ring to adjusted position on the tube, and means for holding said annular rim in contact with the annular surface of the endcap and for holding the pinion in mesh with the gear teeth in all adjusted positions of the carrier-ring.

9. In a dynamo electric machine, a field frame, an armature and collector arranged for rotation in the field frame, a pressed-up sheet-metal endcap having a flange with a cylindrical seat fitting around the field frame and also having an armature bearing, a plurality of brushes supported by the endcap, and a plurality of bent stay wires which are fastened to the field frame and to the endcap and which have adjustable means for drawing the endcap to the limit of its seat on the field frame.

10. In a dynamo electric machine, an endcap, and a pressed-up sheet-metal brush holder of the swinging arm type supported by the endcap and having a web portion integral with side flanges and an end flange, said web portion having a cup-shaped protrusion which is screw threaded, said end flange having a flat outer portion to abut the face of a brush, and said side flanges terminating at the other end in ears having holes to form bearings for a brush-holder stud.

11. In a dynamo electric machine; an endcap; and a brush holder of the swinging arm type supported by the endcap, a stud forming a pivot for the brush holder, a post, and a spring pressing against the brush holder and the post, said brush holder being constructed and arranged to lift the spring from the post when the brush holder reaches a predetermined angular position on the stud.

12. In a dynamo electric machine; an endcap; and a brush holder of the swinging arm type supported by the endcap and having a web portion and side flanges, a stud forming a pivot for the brush holder, a post, and a spring pressing against the brush holder and the post, said web portion being constructed and arranged to lift the spring from the post when the brush holder reaches a predetermined angular position on the stud.

13. In a dynamo electric machine; an endcap; and a pressed-up sheet-metal brush holder of the swinging arm type supported by the endcap and having a web portion and side flanges, a stud forming a pivot for the brush holder, a post, and a spring pressing against the brush holder and the post, said web portion being constructed and arranged to lift the spring from the post when the brush holder reaches a predetermined angular position on the stud.

14. In a dynamo electric machine, an endcap, and a pressed-up sheet-metal brush holder of the swinging arm type supported by the endcap and having a web portion integral with the side flanges and an end flange, said end flange having a flat outer portion and said side flanges terminating in ears having holes, a brush fastened against the flat outer portion of the end flange, a stud supported by the endcap and passing through the holes in the ears, a post supported by the end cap, a double coiled spring housed between the ears and having its ends pressing against the brush holder and its intermediate portion pressing against the post, the end of said web portion being constructed and arranged to lift the intermediate portion of the spring off the stud when the brush holder reaches a predetermined angular position on the stud.

In testimony whereof I affix my signature.

LOUIS B. EHRLICH.