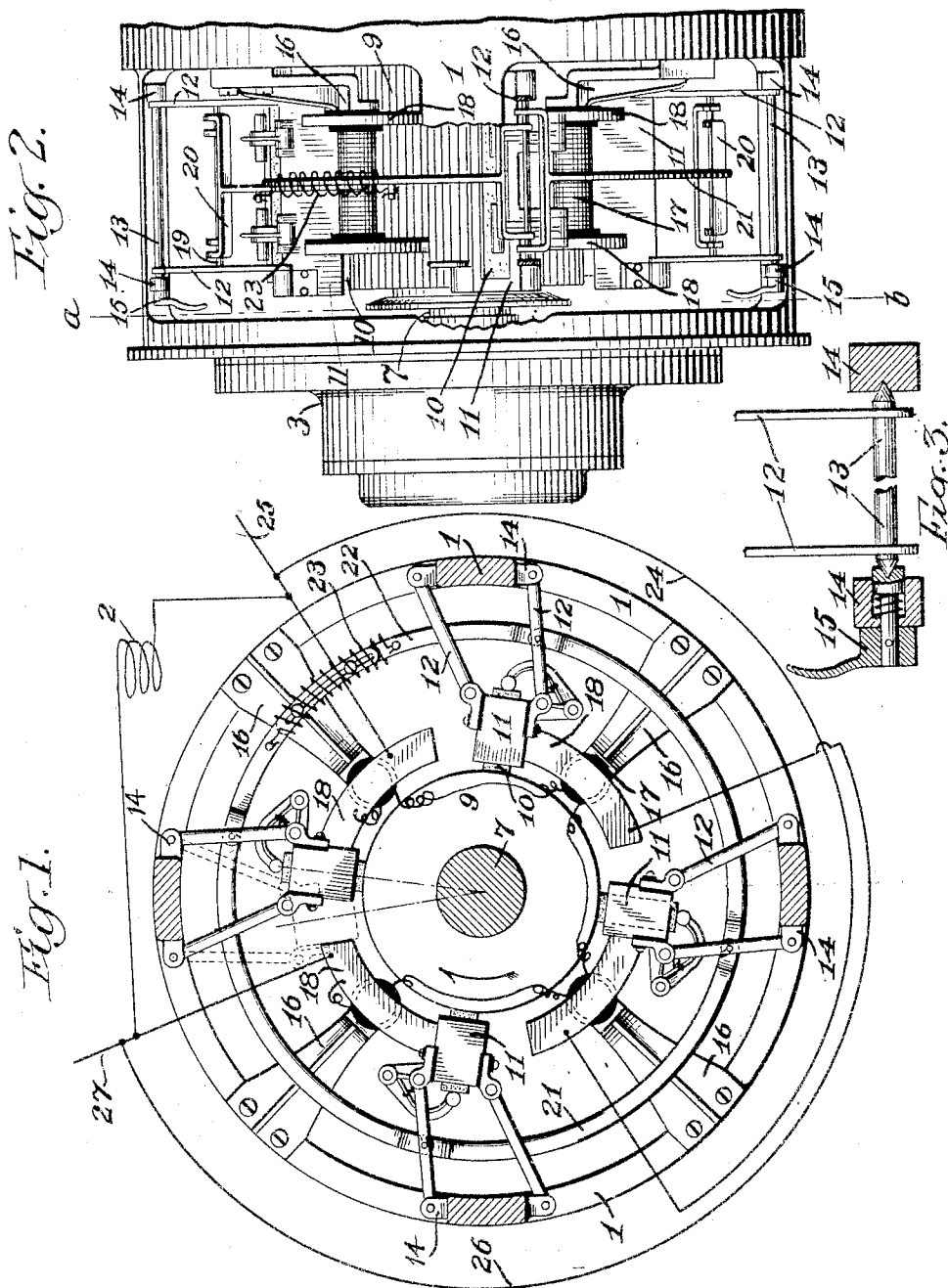


J. L. CREVELING.
 REVERSIBLE BRUSH HOLDER FOR USE WITH DYNAMOS.
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REVERSIBLE BRUSH-HOLDER FOR USE WITH DYNAMOS.

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To all whom it may concern:

Be it known that I, JOHN L. CREVELING, a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Reversible Brush-Holders for Use With Dynamos, as set forth in the annexed specification and drawings, forming a part thereof.

My invention pertains to that class of dynamos or generators having a rotor subject to reversals in direction of rotation and from which it is desired to collect current and supply the same to an external circuit in a constant direction.

My invention has for a particular object to provide means whereby the current may be collected from the commutator of an armature subject to reversals in rotation and the current thus collected supplied to line always in one direction.

Figure 1 is a vertical section of a structure embodying my invention, the view being taken substantially on the line *a-b*, Fig. 2, looking from left to right; Fig. 2 is a side elevation of the end of a dynamo electric machine, the shell or casing being broken away so as to illustrate the features of my invention, and Fig. 3 is a detail of a portion of the brush supporting means shown in Fig. 1.

In the drawing, 1 represents the field frame or shell of a dynamo provided with the usual field coils 2 and carrying the flanged end members 3 containing a usual form of ball-bearing (not shown) for the shaft 7, which carries the usual commutator 9.

10 indicates commutator brushes which are preferably of the radial carbon type, held within the brush holders 11 by the usual spring device bearing upon the brushes, as indicated. The brush holders 11 are each carried by four links 12, each having one extremity pivotally attached thereto and insulated therefrom as shown. The opposite ends of each pair of links on the same side of a brush holder are connected, as by the rods 13, rotatably held between the bosses 14 as by the trunnion arrangement controlled by the latch 15, the details of which are shown in Fig. 3. The bosses 14 are carried preferably by the webs of the shell, the positions of which are shown plainly in Fig. 1. To the frame 1, are secured brackets 16 which carry the H-shaped magnets provided

with curvilinear pole pieces 18 and a connecting core surrounded by the windings 17, said magnets being insulated from the brackets 16, as indicated. The pole pieces 18 limit the swinging movement that may be given to the brush holders 11, which are free to swing within certain limits upon their links 12, which links have the points of support at the bosses 14 further separated than their pivotal points at the brush holders in such manner that at the positions at which it is desired to arrest the motion of the brush holders they will present the brushes to the commutator with the center lines of the brushes as continuations of radii of the commutator. The pole pieces 18 are so shaped that when the brush holders are in this position they will arrest any further motion thereof in one direction and present thereto a smooth abutting surface. These brush holders are preferably made of iron or provided with iron faces and thus, when the windings 17 are energized, said holders in contact with the pole pieces 18 of the H-shaped magnets will be firmly held in place so as to be free from vibration so long as the winding 17 remains excited and the brush holders are also in electrical communication with the pole pieces with which they are in contact, and I so connect said pole pieces 18 that the ones diametrically opposite are in electrical communication with each other and one side of an external circuit, as indicated diagrammatically in Fig. 1. The field coils 2 are connected across the dynamo leads in the usual manner as one coil is shown connected diagrammatically in Fig. 1. The windings 17 are preferably connected in a series and across the leads as diagrammatically portrayed in this figure. If desired to join the various brush holders together mechanically so that on opposite sides they will balance each other, this may be done by joining one pair of links 12 of each holder with the transverse shaft or rod 19 engaging the bifurcated hook members 20 adapted to hook over the shafts or rods 19, as shown in Fig. 1. Three pairs of the said hook members may be joined together with a rigid curved metallic strip 21, while the fourth pair may be united by a contracting member permitting some extension as indicated at 22, the same being formed of two parts movably held together and drawn together by the spring 23.

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An operation of my invention is substantially as follows:—If the generator be started in such direction that the uppermost part of the armature in Fig. 1 be moving toward the observer, the commutator will move in that direction indicated by the arrow in Fig. 1, and the friction of the brushes 10 upon the commutator 9 will cause the same to revolve the brush holding mechanism into the positions shown in the drawings. That is, referring particularly to Fig. 1, the brush holders on the vertical diameter will swing into contact with the pole pieces 18 electrically united by the member 24 diagrammatically indicated in the said figure, which is connected with a portion 25 of an external circuit, and the brush holders 11 on the horizontal diameter will be swung into contact with the pole pieces 18 of the H-shaped magnets electrically connected as indicated diagrammatically by the wire 26 with a portion of the external circuit 27 and, thus the brushes at the opposite ends of the same diameter of the commutator are connected to the same sides of the external circuit as is necessary in a four pole machine as shown. If now the generator has its speed raised until its voltage is appreciable, the windings 17 will become energized and strongly grip the brush holders in contact therewith and hold the same firmly in proper positions, thus avoiding any chattering and vibration and forming an extremely good electrical connection between the brush holders, the terminals or binding posts and the external circuit. If, now, the generator stops, the brushes will remain in this position unless the armature has its direction of rotation reversed. Then, if the armature be revolved in the reverse direction to that indicated by the arrow in Fig. 1, the brush holders will be moved by the friction of the brushes upon the commutator in the direction of rotation thereof until arrested by the pole pieces of the H-shaped magnets on the opposite side of the brush holders from those with which they were in contact when the generator was running in the direction of the arrow. The limiting position that the uppermost brush holder will take is indicated in dotted lines in Fig. 1, and it will be noted that in this position the center line of the brushes is upon a radius of the commutator in the same manner as indicated in the full line view of the same brush holder when the armature is rotating in the direction of the arrow. With the brush holders shifted due to the friction of the brushes, as above mentioned, those on the vertical diameter will be in contact with the pole pieces 18 of the H-shaped magnets which are electrically connected to that portion of the external circuit indicated at 27, while the brush holders on the horizontal diameter will be in electrical communication with the pole pieces of the H-

shaped magnets in electrical communication with that portion of the external circuit indicated at 25, and thus it will be seen that the revolution of the commutator in an opposite direction from that indicated by the arrow shifted the electrical connection of the brush holders with respect to the H-shaped magnets in such manner as to compensate for the reversal in direction of the armature to deliver current to line in a constant direction. If the speed be raised until the generator voltage be appreciable, the winding 17 will cause the brush holders to be firmly held and connected to the circuits as described above with respect to the reverse revolution. If it be desired to take out a brush holder, it is simply necessary to unhook the members 20 against the tension of spring 23 and then if the latches 15 be simply pulled back, the rods 13 will be released and the entire brush holder with its links may be removed, and when replaced, the hook members 20 may again be placed upon the rods 19 and the whole apparatus will work as before, it being understood, however, that the hook members 20 and their cooperating parts, whereby the various brush holders are mechanically joined, may be dispensed with, if desired, in which event the brush holders may be taken out by simple manipulation of the latches 15.

In the drawing, I have shown the brush holders as having a considerable travel in each direction upon reversals in direction of rotation of the armature. However, in practice this may be very small and preferably just that angle found most advantageous for lead.

From the foregoing, it will be obvious that I have produced a dynamo which will deliver current from its binding posts or terminals to an external circuit in a constant direction regardless of direction of reversals of the rotor thereof, also that I have produced a simple brush holding mechanism adapted to give generator brushes the desired lead in either direction depending upon direction of rotation of the armature. Also, I have produced brush holding mechanism free to move when the generator armature is very slowly rotated and held firmly and free from vibration or chattering when the generator is running and supplying useful current. Also, I have produced a movable brush holder which may be readily removed without the necessity of disconnecting flexible or other electrical connections.

I make no claim herein to the broad idea of a stop for the brush-holders, in combination with additional means for holding the brushes at the point of arrest, nor to the broad idea of magnetic means for holding the brushes under control by current generated by the machine, as the same are made the subject of my application filed August 139

7, 1911, Serial No. 642,582. Nor do I make claim herein to electro-magnetic means, broadly, for restraining the brush-holders, as such feature is made the subject of my application filed August 19, 1911, Serial No. 644,983. Nor do I claim herein the broad idea of means of securing the brushes together about the commutator, as such feature, in the proper combination, is made the subject of my application filed September 25, 1911, Serial No. 651,022. Nor do I claim herein the broad idea of supporting the brush-holding devices on a stationary part of the machine with ability to move relatively to the commutator and into engagement with stops, as the same and other features which are similar, and not herein claimed, are made the subject of my application filed November 3, 1911, Serial No. 658,414, together with my application Serial No. 667,740, filed December 26, 1911. Nor do I claim herein, broadly, means for pivotally supporting brush-holders in cooperative relation to the commutator, in combination with means for detaching the pivotal support; nor the broad idea of means for supporting the brush-holders in either of two positions with respect to the commutator of the machine, in combination with means on either side of the brush-holders for limiting the movement of the latter, as said features, in the proper combinations, and other combinative arrangements thereof, are made the subject-matter of my application Serial No. 667,740, aforesaid.

I do not wish in any way to limit myself to details of construction nor to the exact mode of operation set forth in this specification to illustrate one embodiment of my invention, for it will be obvious that wide departure may be made in the way of details without departing from the spirit and scope of my invention which is as set forth in the following claims:

1. The combination with a commutator and brushes in operative relation thereto; of brush carrying means allowing some motion of the brushes with the commutator; and means for arresting said motion and connecting the brushes with the circuit terminals whereby the brushes are connected with opposite branches of said circuit upon reversals in direction of the commutator, said arresting means comprising electro-magnets having segmental pole pieces arranged circumferentially of the commutator and in the path of movement of the brush-carrying means.

2. The combination in a generator provided with an armature and a commutator; of means for collecting current from said commutator and delivering the same in constant direction regardless of reversals in direction of rotation of the armature, said means including collecting means in fric-

tional contact with said commutator, means for supporting the collecting means and permitting some motion of the same, means for arresting said motion and connecting the collecting means with the circuit terminals so as to supply current thereto in a uniform direction, and electro-magnets on opposite sides of the collecting means energized by said generator to firmly hold the collecting means in place and in electrical communication with opposite branches of an external circuit upon reversals in direction of rotation of the armature.

3. In a generator provided with a field frame, an armature and a commutator, the combination with brushes in operative frictional contact with said commutator, of brush holders for carrying said brushes, means pivotally attached to the field frame for supporting said brush holders in movable relation to said commutator, means for arresting the motion of said brush holders, said supporting means being adapted to rock the brushes into radial positions when in a position of contact with the arresting means.

4. In a generator provided with a field frame, an armature and a commutator, the combination with brushes in operative frictional contact with said commutator, of brush holders for carrying said brushes, means for supporting said brush holders in movable relation to said commutator, means for arresting the motion of said brush holders, said supporting means being adapted to rock the brushes into radial positions when in a position of contact with the arresting means and means for connecting the arresting means with the circuit terminals.

5. In a generator provided with a field frame, an armature and a commutator, the combination with brushes in operative frictional contact with said commutator, of brush holders for carrying said brushes, means for supporting said brush holders in movable relation to said commutator, means for arresting the motion of said brush holders, said supporting means being adapted to rock the brushes into radial positions when in a position of contact with the arresting means, means for connecting the arresting means with the circuit terminals and electro-magnetic means whereby the arresting means holds the brush holders in operative positions.

6. The combination in a generator provided with a field frame, an armature and a commutator, of brushes in operative relation to said commutator, brush carrying means for holding said brushes comprising a plurality of links attached to said field frame and embodying means for maintaining holding the brushes in radial relation to the commutator in a plurality of positions.

7. In a generator provided with a field frame, an armature and a commutator, the

combination of a plurality of brushes resting in frictional contact upon said commutator, means for supporting said brushes, comprehending brush holders and links operatively uniting said brush holders with the dynamo frame and allowing the brushes to move through their frictional contact with the commutator, said links being arranged to give the brushes a radial relationship to the commutator in certain definite positions, electro-magnetic arresting means, for restraining the movement of the brushes beyond these definite positions, cooperating with the brush holders to hold the same in definite operative positions, and electrically connecting the same with the terminals of the generator, depending upon the direction of rotation of the armature.

8. In a dynamo electric machine having a commutator; the combination of a plurality of brush-holders carrying brushes in contact with the commutator; a plurality of electromagnets located between said brush-holders and energized by current from the commutator; and means for mounting said brush-holders so that they may move circumferentially on the commutator, whereby the position thereof may be changed when the commutator reverses, said brush-holders being adapted to be attracted by said magnets to hold them firmly in position when the commutator rotates in either direction.

9. In a dynamo electric machine having a commutator; the combination of a plurality of brush-holders; a plurality of electromagnets located between said brush-holders and having poles extending circumferentially of the commutator; and means for mounting said brush-holders so as to be movable circumferentially of the commutator when the commutator reverses, said brush-holders being adapted to be attracted by the pole pieces of the magnets to hold the same securely in operative relation to the commutator when the commutator rotates in either direction.

10. A brush-holder, in combination with a dynamo electric machine; means for pivotally supporting said brush-holder in either of two positions with respect to the commutator of said machine; and electromagnetic

means on each side of said holder for limiting the movement of said holder in either direction.

11. A brush-holder, in combination with a dynamo electric machine; means for supporting said holder in either of two positions with respect to the commutator of said machine; and electromagnetic means on either side of said holder for limiting the movement of said holder in either direction and for temporarily securing said holder at said limits of movement.

12. A brush-holder, in combination with a dynamo electric machine; means for supporting said holder in either of two positions with respect to the commutator of said machine; and electromagnetic means on each side of said holder permanently connected to a fixed part of the machine for limiting the movement of said holder in either direction.

13. In a dynamo electric machine having a commutator, the combination of a plurality of movably supported brush-holders arranged circumferentially of the commutator; means for connecting said brush-holders together whereby they may all move in unison in the same direction and to the same extent; and means for engaging the brush-holders for limiting said movement, whereby to maintain the proper relation of the brushes to the commutator.

14. In a dynamo electric machine having a commutator, the combination of a plurality of movably supported brush-holders arranged circumferentially of the commutator; means for connecting said brush-holders together whereby they may all move in unison in the same direction and to the same extent; and means for limiting the movement of said brush-holders including means for causing said brush-holders to cleave to the limiting means for a predetermined period, whereby the brushes may be held in proper operative relation to the commutator.

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