J. G. ZIMMERMAN.

CURRENT COLLECTING DEVICE FOR DYNAMO ELECTRIC MACHINES.

APPLICATION FILED MAY 17, 1912.

1,055,963. Patented Mar. 11, 1913.

Fig. 4

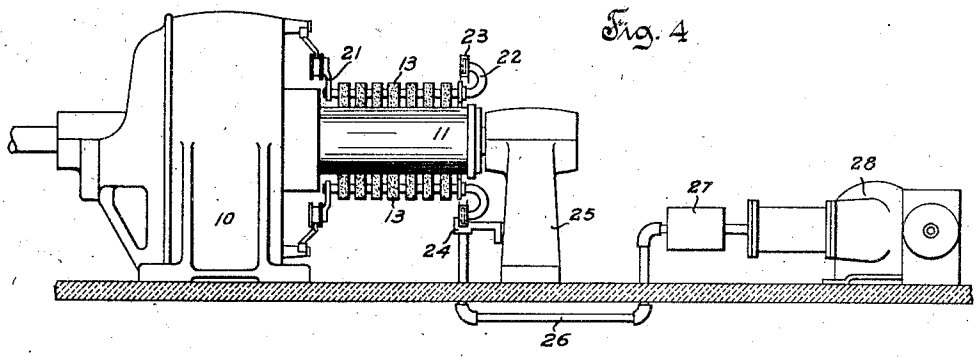
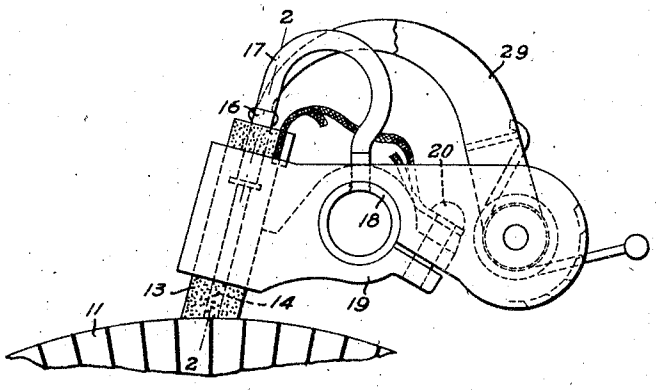


Fig. 1



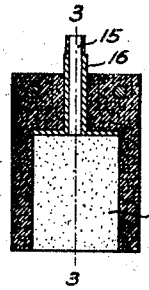


Fig. 2

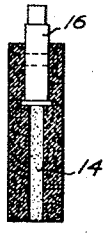


Fig. 3

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES G. ZIMMERMAN, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY.

CURRENT-COLLECTING DEVICE FOR DYNAMO-ELECTRIC MACHINES.

1,055,963. Specification of Letters Patent. Patented Mar. 11, 1913.

Application filed May 17, 1912. Serial No. 697,893.

To all whom it may concern:

Be it known that I, JAMES G. ZIMMERMAN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Current-Collecting Devices for Dynamo-Electric Machines, of which the following is a full, clear, and exact specification.

This invention relates to means for maintaining brushes in contact with their cooperating commutator or collecting surface, for keeping the brushes and commutators cool, and for overcoming sparking between brushes and commutators.

In the operation of dynamo-electric machines, and especially of high speed dynamo-electric machines, more or less of a problem is encountered in providing for maintaining current collecting brushes in contact at all times with the commutator. This is especially true where the commutator surface is rough. If the brushes jump or dance on the commutator surface more or less sparking, which may prove serious, is occasioned. Again, dust or particles of brush which have been worn away collect on the surface of the commutator, and in this way produce more or less sparking. At the same time special care has to be taken to keep the commutator and brushes in a cool condition to render efficient operation of the dynamo-electric machine.

It is therefore the object of my invention to maintain the brushes of dynamo-electric machines in contact with the commutator or current-collecting surface, to keep the commutator clean, and maintain the commutator and brushes cool under all conditions of operation. These objects are accomplished by providing a brush having an opening which extends to the commutator or current-collecting surface and is connected to a means for exhausting air for not only drawing foreign and spark-producing particles away from the commutator surface, maintaining the commutator and brush in a cool condition, but also causing a reduction of fluid pressure within the brush, for increasing the effect of the pressure on the outside of the brush tending to hold the brush in engagement with the commutator under all conditions of operation.

The invention is illustrated on the accompanying sheet of drawings, in which—

Figure 1 is a brush and brush holder embodying my invention; Fig. 2 is a sectional view of my brush taken along the line 2—2 of Fig. 1; Fig. 3 is a sectional view of the same brush taken along the line 3—3 of Fig. 2; and, Fig. 4 is an elevation, parts being in section, of a dynamo-electric machine equipped with my brush and brush holder rigging, the brushes being connected to a means for exhausting air.

The various novel features of my invention will be apparent from the description and drawings, and will be particularly set forth in the appended claims.

For the sake of illustration, my invention is shown in connection with a direct current dynamo-electric machine 10 having a commutator 11 normally engaged by brushes 13. Each brush is preferably provided with an opening 14 extending through the central portion of the brush and communicating with the comparatively small opening 15 in the member 16 formed in the brush. This member 16 is adapted to receive one end of a flexible hose or tube 17, the other end of which is connected to a hollow stud 18. The brush holder 19, in which the brushes 13 are mounted, are adapted to be clamped onto the hollow studs 18 by any suitable means, such as by screws 20. Any number of these brush holders may be mounted upon a single stud, depending upon the length of commutator being used. One end 21 of each hollow stud is closed and the other end of each of the hollow studs is connected by a curved tube 22 to a hollow annular member 23 which is supported by a bracket 24 secured to one bearing pedestal 25. This hollow annular member 23 is connected by hollow members

or tubes 26 to a vacuum receptacle or chamber 27, the reduction of air pressure in which is maintained by any suitable source, as a motor driven air pump 28.

Bearing upon each of the brushes 13 is a spring-pressed follower 29 adapted to yieldingly hold the brushes in contact with the commutator. As is well known, however, under certain conditions of operation the spring-pressed follower does not respond quickly enough to the inaccuracies of the commutator surface. For this reason the brushes dance more or less upon the commutator, especially if the commutator surface is more or less irregular. By means of the hollow portion 14 of the brush being connected through hollow members 16, 17, 18, 22, 23, and 26 to the vacuum chamber 27 in which there is a relatively low fluid pressure, a corresponding low fluid pressure is maintained within the hollow brush 13. This means that the pressure of the air on the outside of the brush is greater than the pressure within the brush. This difference in pressure causes the brush 13 to remain in contact with the commutator far better than it would if only a spring-pressed follower were employed. At the same time dust particles or spark-producing particles which may have collected on the surface of the commutator 11, are drawn through the hollow brush and taken away from the surface of the commutator to prevent sparking from this source. By this continual drawing or sucking action away from the commutator through the hollow brush, the commutator and brush are maintained in a cool and economical operating condition.

As here shown, the lower part of the brush is provided with an opening which extends from the bottom of the brush to a point beyond the middle of the brush, the opening being comparatively wide in one direction and narrow in another direction. In other words, the brush may be cored, the core being in the form of a rectangular prism the height of the prism being the greatest dimension, the width being less than the height and the thickness of the prism being very much less than the width of the prism. These dimensions, may, however, be varied, depending upon the requirements. The member 16, which is formed in the brush, is preferably of metal and is T-shaped in section, the main leg being hollowed or in the form of a tube which communicates with the low pressure source through the various interconnecting hollow members.

There may be various modifications and arrangements other than that here specifically shown and described, and it is my intention to cover all such modifications and arrangements which do not involve a departure from the spirit and scope of the invention as set forth in the appended claims.

What I claim as new is:

1. A brush for dynamo-electric machines having an air passageway therethrough.

2. A brush for dynamo-electric machines having an air passageway extending therethrough, part of said air passageway being restricted.

3. A brush for dynamo-electric machines having a hollow portion and a member located within said hollow portion having an opening completing an air passageway through said brush.

4. A brush for dynamo-electric machines having a prismatic hollow portion and a restricted opening forming an air passageway through said brush.

5. In combination, a hollow brush, a brush holder in which said brush is mounted, a hollow stud upon which said brush holder is mounted, and a hollow member extending between the hollow portion in said brush and said hollow stud forming a continuous fluid passageway.

6. In combination, a brush having a hollow portion, and means for creating a reduction of fluid pressure in the hollow portion of said brush.

7. In combination, a hollow brush, a chamber in which there is a relatively low fluid pressure, and connections between said brush and chamber for causing a reduction of fluid pressure in said brush.

8. In combination, a hollow brush for dynamo-electric machines, a holder for said brush having a hollow portion connected with the hollow portion of said brush, and means for producing a reduction of fluid pressure in said hollow brush to cause a flow of fluid from said brush through said hollow member to said means.

9. In combination, a commutator, a hollow brush adapted to engage said commutator, and means for creating a reduction of air pressure in said brush to cause air exterior to said brush to assist in yieldingly holding said brush in contact with said commutator.

10. In combination, a commutator, a brush having a hollow portion and adapted to engage said commutator, a means for producing a reduction in fluid pressure, and a communicative connection between said hollow brush and means for causing a suction from said hollow brush to said means.

11. In combination, a dynamo-electric machine having a commutator, hollow brushes adapted to engage said commutator, brush holders in which said brushes are mounted, hollow studs upon which said brush holders are mounted, a support for

said studs, a means for producing a reduction in fluid pressure, and communicative connections from said means through said hollow studs and brushes to cause a suction from said hollow brushes to said means thereby causing a reduction of fluid pressure within the hollow brushes.

Milwaukee, Wis., May 13, 1912.

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

JAMES G. ZIMMERMAN.

Witnesses:

CHAS. L. BYRON,

ROB. E. STOLL.