

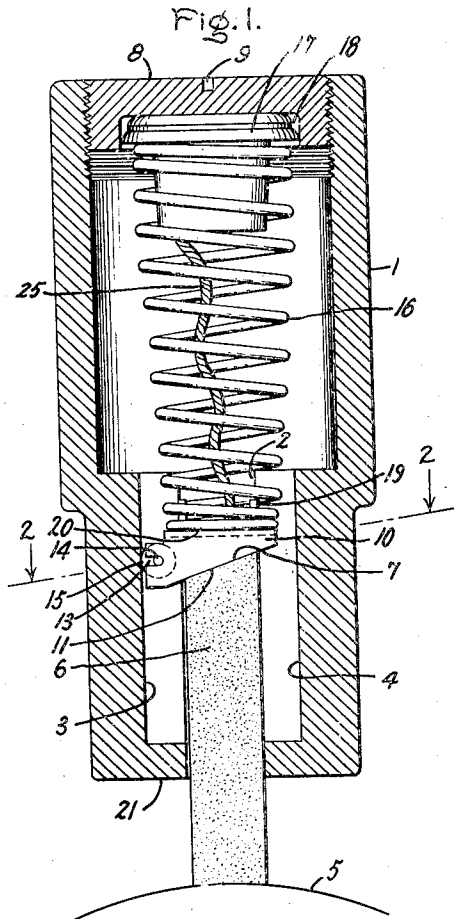
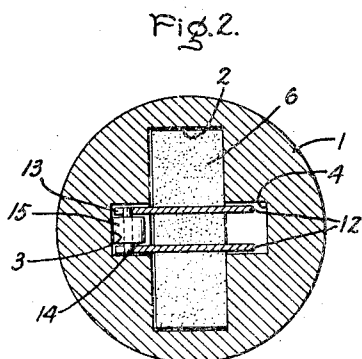
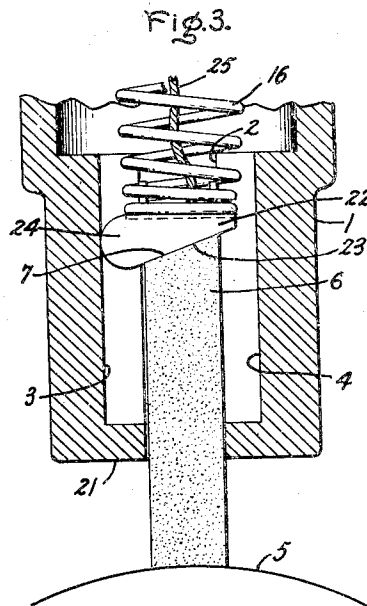
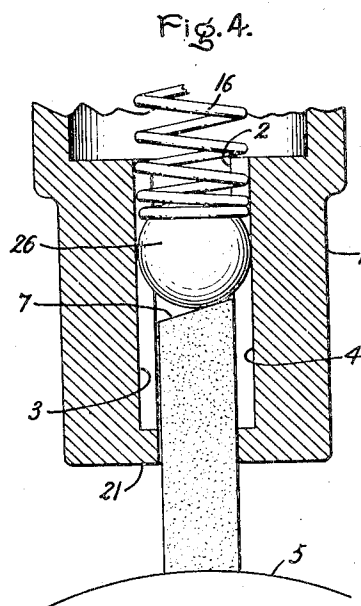
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BRUSH MECHANISM

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BRUSH MECHANISM

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This invention relates to brush mechanisms and more particularly to such mechanisms having cartridge type brush holders having longitudinally movable contact brush members therein.

In the design of brush mechanisms for dynamoelectric machines, particularly cartridge type brush holder assemblies for motors of fractional horse power frame sizes, it is desirable to provide means for preventing chattering of the brush in the holder since chattering substantially reduces brush life and produces inferior commutation.

An object of this invention is to provide an improved brush mechanism.

Another object of this invention is to provide means for reducing chattering of brushes in brush holders.

A further object of this invention is to provide an improved brush holder assembly in which a single spring member provides both longitudinal and biasing pressure.

Further objects and advantages of this invention will become apparent and the invention will be better understood from the following description referring to the accompanying drawing. The features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming a part of this specification. In the drawing, Fig. 1 is a side elevational view, partly in section, illustrating the preferred embodiment of this invention; Fig. 2 is a cross sectional view taken along the line 2—2 of Fig. 1; Fig. 3 is an elevational view illustrating another embodiment of this invention; and Fig. 4 is an elevational view illustrating a further embodiment of this invention.

In accordance with this invention, there is provided a brush having an angled surface remote from the current collector end and arranged for longitudinal movement in a cartridge type brush holder. An irregular shape brush engaging member is arranged to engage the angled surface of the brush and a side of the brush slot. A coil spring member is held in compression between the irregular shaped member and a cap at the end of the brush holder tube remote from the commutator end. The irregular shaped brush engaging member in cooperation with the angular surface of the brush and the side wall of the brush slot provides a component of the force exerted by the spring parallel with the axis of the brush holder for resiliently urging the brush against the current collector and another component of the force at right angles to

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the axis for biasing the brush against a side of the slot thereby preventing chattering. A feature of this invention is the provision of means whereby a single spring provides both longitudinal and transverse pressure to force the brush against the current collector and against a wall of the brush slot.

Referring to Fig. 1, there is shown an embodiment of the brush holder assembly of this invention. Here, there is provided a brush holder member 1 of the cartridge type which has a longitudinally extending brush slot 2 formed therein with longitudinally extending grooves 3 and 4 formed in the transverse sides of the slot 2. These grooves extend on the leading and trailing sides of the slot 2 respectively considered with reference to a current collector member 5 associated with the brush holder.

A contact brush member 6, which may be formed of any suitable material, is arranged for longitudinal movement in the slot 2. This brush is provided with an angular surface 7 at its end remote from the current collector end. A cap member 8 threadably engages the end of the brush holder 1 remote from the current collector end and may be conveniently provided with a screw driver slot 9 for ease in insertion and removal. This cap member serves as a closure for the brush slot 2 of the brush holder member 1.

In order to minimize chattering of the brush member 6, the arrangement now to be described is provided. A brush engaging member 10 is positioned in the slot 2 and has a surface 11 which is complementary to and arranged in sliding engagement with the angular surface 7 of the brush member 6. This engaging member may be conveniently fabricated from sheet conductive material providing two leg portions 12 which engage the brush member 6. The engaging member 10 is provided at one transverse side with a slot 13 formed in the legs 12 in which is seated a pin 14. A small roller 15 is rotatably mounted on the pin 14 and engages a side of the longitudinal groove 3. A coil spring member 16 is held in compression between the cap member 8 and the brush engaging member 10, the spring being seated in a spring seat 17 adapted to be positioned in recess 18 in the inner surface of the cap member 8 and a spring seat 19 formed on the surface 20 of the brush engaging member. The surface 20 of the brush engaging member 10 is perpendicular to the longitudinal axis of the brush holder tube 1, thereby positioning spring 16 parallel with the longitudinal axis of the brush holder tube. It can now be readily seen that

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the spring 16 exerts a force on the brush engaging member 10 which is parallel with the longitudinal axis of the brush holder tube. Through the sliding engagement of the surface 11 of the brush engaging member 10 with the angular surface 7 of the brush member 6 and the engagement of roller 15 with the side of the groove 3, the force exerted by the spring 16 is resolved into a component parallel with the axis of the brush holder tube which resiliently urges the brush member against the current collector 5 and another component perpendicular to the axis of the brush holder tube which biases the brush member 6 against the side of the slot 2 opposite the groove 3. It will now be readily apparent that the provision of the irregular shaped brush engaging member 10 cooperating with the angular surface of the brush 7 and the side of the groove 3 permits the spring 16 to supply a component of pressure for urging the brush against the current collector and another component for biasing the brush against a side of the slot for preventing chattering.

As the brush 6 is worn down, it is desirable to provide some means for preventing the brush engaging member 10 from contacting the current collector 5. Accordingly, a stop 21 is provided at the current collector end of the brush holder 1. It can be readily seen that the brush engaging member 10 will be engaged by this stop prior to the complete dissipation of the brush member 6 thereby preventing the injurious results which would be occasioned if the brush engaging member contacted the current collector.

Referring now to Fig. 3 in which like parts are designated by like numerals, there is again provided a brush holder tube 1 of the cartridge type having a longitudinally extending slot 2 formed therein with transverse grooves 3 and 4 in the leading and trailing edges of the slot. A brush member 6 is positioned in the slot 2 and arranged for longitudinal movement therein. The brush is provided with an angular surface 7 at its end remote from the current collector 5. A brush engaging member 22 is positioned in the slot 2 and is provided with a surface 23 complementary to and arranged in sliding engagement with the angular surface 7 of the brush 6. The brush engaging member 22, which may be formed of sheet metal in a manner similar to the brush engaging member 10 of Fig. 1, is provided with a rounded portion 24 which engages a side of the longitudinal groove 3. The coil spring member 16 is held in compression between the cap member (not shown) and the upper surface 20 of the brush engaging member. The surface 20 of the brush engaging member 22 is provided with a spring seat 19 which positions the spring 16 parallel to the longitudinal axis of the brush holder member 1. The brush engaging member 22 through the sliding cooperation of its surface 23 and with the angular surface 7 of the brush 6 and the engagement of the portion 24 with the side of the groove 3 provides a component of the force exerted by the spring 16 parallel with the longitudinal axis of the brush holder 1 for resiliently urging the brush 6 against the current collector 5 and another component perpendicular to the brush holder tube axis for biasing the brush 6 against a side of the slot 2 opposite the groove 3 for preventing chattering. The brush holder tube 1 is again provided with a stop 21 at its end adjacent the current collector 5 for preventing the brush engaging member 22 from contacting the current

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collector 5. A brush pig-tail 25 may be provided as shown in Figs. 1 and 2, for greater current carrying capacity. The pig-tail 25 may be secured to the brush engaging member 10 or 22, thus simplifying the replacement of the brushes 6.

Referring now to Fig. 4, there is shown a further embodiment of this invention with like parts indicated by like numerals. In this embodiment, a ball 26 formed of conductive material is substituted for the brush engaging members 10 and 22 of Figs. 1 and 3. Here, the ball 26 engages the angular surface 7 of the brush 6 and also engages a side of the groove 3. The ball 26 is preferably formed with a diameter slightly larger than the outside diameter of the spring 16. It can be readily seen that the ball 26 through cooperating with the angular surface 7 of the brush 6 and engagement with the side of the groove 3 provides a component of the force exerted by the spring 16 parallel with the longitudinal axis of the brush holder tube 1 for resiliently urging the brush 6 against the current collector 5 and another component perpendicular to the brush holder tube axis for biasing the brush 6 against the side of the slot 2 opposite the groove 3. This embodiment is also provided with a stop 21 formed at the end of the brush holder tube 1 adjacent the current collector 5 for preventing the ball 26 from contacting the current collector 5 when the brush 6 is worn out.

An 11,000 R. P. M., 115 volt, 60 cycle, integral horse power universal motor was tested first with a conventional brush mechanism. At the end of 150 hours of continuous operation, there were marks of arcing on the brush face, trailing brush side and on the trailing side of the commutator bars. At this point, the life indication of the brush was 370 hours. The same motor was then tested using the improved chatter preventing arrangement of Fig. 1 with 6 lbs. per square inch initial brush pressure. After 214.5 hours of continuous operation, the indicated life of the brushes was still 591 hours. In contrast to the operation of the motor with the conventional brush mechanism where the commutation became poorer the longer the motor was operated, commutation of the motor with the improved brush mechanism of this invention actually improved with long operation. At the end of the 214.5 hours run, there were no marks of arcing on the trailing side of the brushes, only faint marks of arcing on the brush face and very little indication of arcing on the commutator. The same motor was again tested using an initial brush pressure of 4 lbs. per square inch instead of 6 lbs. per square inch used on the first tests. With this reduction in brush pressure, the spring length could be reduced and a brush wearing length of .75 inch was secured as compared with .4375 inch with the heavier spring. With this arrangement, after a total of 324.25 hours of continuous operation, the indicated life of the brushes was still 1290 hours. At this point, the maximum overall commutator and bar-to-bar eccentricity was within the limits for new motors.

It can now be seen that the improved brush mechanism of this invention provides a simple and inexpensive method for preventing brush chattering and thereby substantially increasing brush life and improving commutation. It has been found that brushes without the anti-chatter device of this invention tend to wedge in the holder and build up at times a very high pressure against the high side of the commutator. This not only causes rapid wear of the brush but also

causes grooving of the commutator surface. The improved brush mechanism of this invention prevents wedging of the brushes with the accompanying build up of heavy pressure on the commutator and, therefore, wearing or grooving of the commutator is substantially reduced. An additional advantage of this improved brush mechanism is the fact that there is no machining of the brush necessary in order to utilize this construction and, furthermore, with proper design, practically the whole length of the brush can be utilized.

While there is illustrated and described particular embodiments of this invention, modifications thereof will occur to those skilled in the art. It is to be understood, therefore, that this invention is not to be limited to the particular arrangements disclosed, and it is intended in the appended claims to cover all modifications which do not depart from the spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing sides of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a brush engaging member formed of conductive material in said slot arranged in sliding engagement with said angular surface of said brush member and having a portion arranged in engagement with a side of one of said grooves, and a spring member in said slot held in compression between said closure means said engaging member and exerting a force thereon, said engaging member in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said tube member for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering.

2. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing edge of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a brush engaging member formed of conductive material in said slot arranged in sliding engagement with said angular surface of said brush member, said engaging member having rolling means arranged in engagement with a side of one of said grooves, and a spring member in said slot held in compression between said closure means and said engaging member and exerting a force thereon, said engaging member in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said brush holder tube for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of

said slot opposite said one side for preventing chattering.

3. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing edge of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a brush engaging member formed of sheet conductive material positioned in said slot, said engaging member having a central spring seat portion remote from said current collector and two leg portions depending therefrom extending toward said current collector, each of said leg portions having a surface complementary to said angular surface of said brush member and arranged in sliding engagement therewith, said engaging member having a roller rotatably secured between said legs and arranged for rolling engagement with one side of said slot, and a coil spring member in said slot held in compression between said closure means and said spring seat portion of said engaging member and exerting a force thereon, said engaging member in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said brush holder tube for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering.

4. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing sides of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a brush engaging member formed of sheet conductive material positioned in said slot, said engaging member having a central spring seat portion remote from said current collector and two leg portions depending therefrom extending toward said current collector, each of said leg portions having a surface complementary to said angular surface of said brush member and arranged in sliding engagement therewith, each of said leg portions having a portion arranged in engagement with a side of one of said grooves, and a spring member in said slot held in compression between said closure means and said spring seat portion of said engaging member and exerting a force thereon, said engaging member in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said tube member for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering.

5. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing edge of said slot, a current collector

contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a ball formed of conductive material in said slot arranged in engagement with said angular surface of said brush member and a side of one of said grooves, and a spring member in said slot held in compression between said closure means and said ball and exerting a force thereon, said ball in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said brush holder tube for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering.

6. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing edge of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a brush engaging member formed of conductive material in said slot arranged in sliding engagement with said angular surface of said brush member, said brush engaging member having rolling means arranged in engagement with a side of one of said grooves, and a coil spring member in said slot held in compression between said closure means and said engaging member and exerting a force thereon, said engaging member in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said brush holder tube for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering, said brush holder tube having a stop formed at its end adjacent said current collector for preventing said engaging member from contacting said current collector.

7. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing sides of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holding tube remote from said current collector adapted to close said slot, a brush engaging member formed of conductive material in said slot having a surface complementary to said angular surface of said brush member and arranged in sliding engagement therewith, said engaging member having a portion arranged in engagement with a side of one of said grooves, and a spring member in said slot held in compression between said closure means and said engaging member and exerting a force thereon, said engaging member

in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel with the axis of said tube member for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering, said brush holder tube having a stop formed at its end adjacent said current collector for preventing said engaging member from contacting said current collector.

8. In combination, a brush holder tube of the cartridge type having a longitudinal slot formed therein with a longitudinal groove in the leading and trailing edge of said slot, a current collector contact brush member arranged for longitudinal movement in said slot for contacting a current collector and having an angular surface remote from said current collector, means on the end of said brush holder tube remote from said current collector adapted to close said slot, a ball formed of conductive material in said slot arranged in engagement with said angular surface of said brush member and a side of one of said grooves, and a spring member in said slot held in compression between said closure means and said ball and exerting a force thereon, said ball in cooperation with said angular surface and said side of said one groove providing a component of the force exerted by said spring member parallel to the axis of said brush holder tube for resiliently urging said brush member against said current collector and another component of said force at right angles to said axis for biasing said brush member against the side of said slot opposite said one groove for preventing chattering, said brush holder tube having a stop formed at its end adjacent said current collector for preventing said ball from contacting said current collector.

9. In a brush holder assembly including a cartridge type brush holder tube having a longitudinal slot formed therein with a longitudinal groove in a side of said slot and a current collector contact brush member arranged for longitudinal movement in said slot under resilient pressure of a spring member and having an angular surface remote from said current collector, a brush engaging member formed of sheet conductive material adapted to be positioned in said slot, said engaging member having a central spring seat portion and two leg portions depending therefrom, each of said leg portions having a surface complementary to said angular surface of said brush and adapted to be arranged in sliding engagement therewith, each of said leg portions having a portion adapted to be arranged in engagement with a side of one of said grooves, said engaging member being adapted to cooperate with said angular surface of said brush and said side of said groove providing a component of the force exerted by said spring for resiliently urging said brush member against said current collector and another component of said force at right angles to said first-mentioned component for biasing said brush member against the side of said slot opposite said groove for preventing chattering.

10. In a brush holder assembly including a cartridge type brush holder tube having a longitudinal slot formed therein with a longitudinal groove in a side of said slot and a current collector contact brush member arranged for longitudinal

movement in said slot under resilient pressure of a spring member and having an angular surface remote from said current collector, a brush engaging member formed of sheet conductive material adapted to be positioned in said slot, said engaging member having a central spring seat portion and two leg portions depending therefrom, each of said leg portions having a surface complementary to said angular surface of said brush and adapted to be arranged in sliding engagement therewith, and a roller member rotatably mounted between said leg portions and adapted to be arranged in rolling engagement with said grooves, said engaging member being adapted to cooperate with said angular surface of said brush and said side of said groove providing a component of the force exerted by said spring for resiliently urging said brush member against said current collector and another com-

ponent of said force at right angles to said first-mentioned component for biasing said brush member against the side of said slot opposite said groove for preventing chattering.

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