June 24, 1958 J. F. NOTTELMANN ET AL 2,840,734

SPRING ASSEMBLY FOR CARBON BRUSH HOLDER

Filed Sept. 4, 1956

Fig. 1.

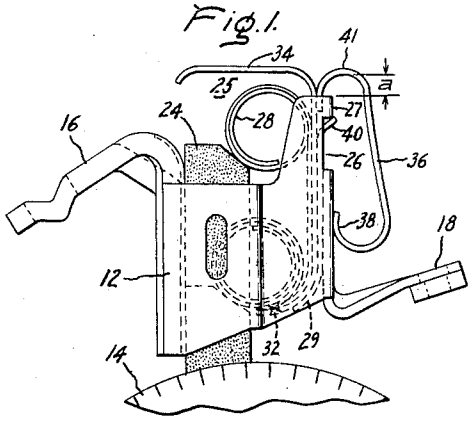


Fig. 3.

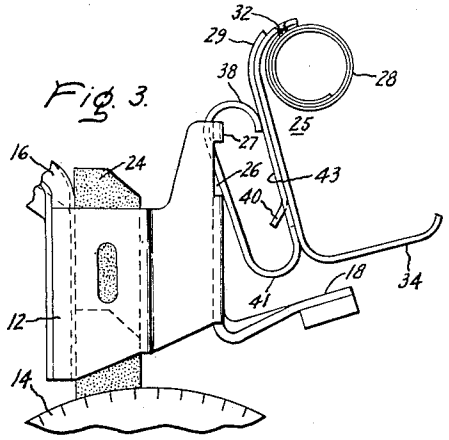


Fig. 2.

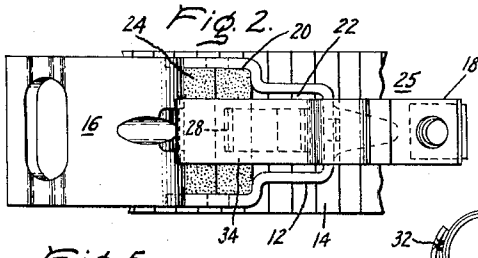


Fig. 4.

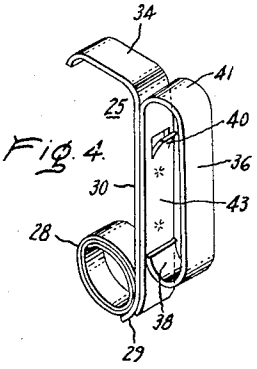


Fig. 5.

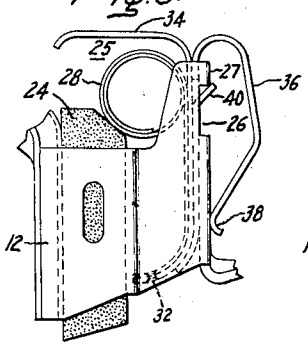


Fig. 6.

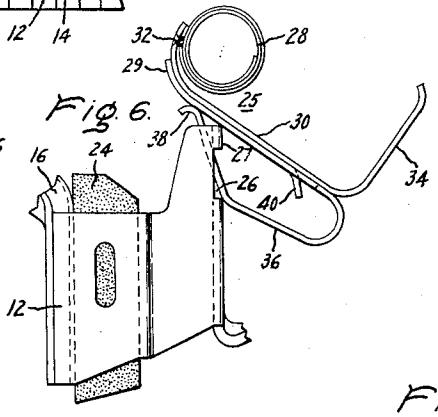


Fig. 7.

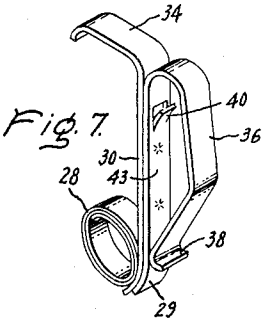


Fig. 8.

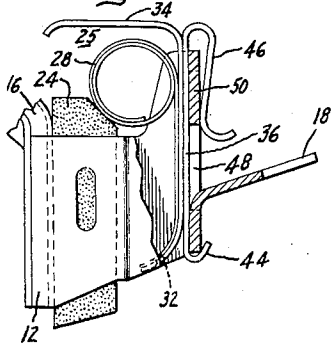
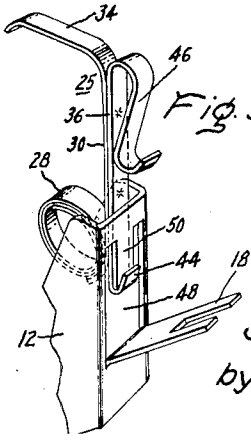


Fig. 9.



Inventors:
Carl E. Spaeder,
John F. Nottelmann,
by Vernon F. Kalb
Their Attorney.

United States Patent Office 2,840,734 Patented June 24, 1958

2,840,734

SPRING ASSEMBLY FOR CARBON BRUSH HOLDER

John F. Nottelmann and Carl E. Spaeder, Erie, Pa., assignors to General Electric Company, a corporation of New York

Application September 4, 1956, Serial No. 607,736

8 Claims. (Cl. 310—246)

The invention described herein relates to a spring assembly adapted for use with a brush holder attached adjacent the commutator of a dynamoelectric machine.

The object of our invention is first, to provide a spring assembly which will remain captive on the brush holder during the time an operator is engaged in replacing a carbon brush; second, to prevent the spring assembly and brush from becoming detached from the holder when the latter is subjected to shock; third, to retain the biasing portion of the spring within the holder in the event of breakage and thereby preclude it from rotating parts of the machine; fourth, to provide a spring assembly designed in a fashion to permit an operator to effect replacement of an old brush by using only one hand for the operation; and finally, to obtain additional advantages as will be apparent from the descriptive portion of the application describing the invention.

The prior art discloses the concept of utilizing various types of springs for urging a current collecting brush into contact with a rotating commutator. More recent developments in the spring field have resulted in the development of a spring which is pre-stressed so as to naturally wind into a free tight volute. Springs of this type have been successfully used in baising a carbon brush into contact with a commutator by attaching one end of the spring adjacent the lower end of the brush holder while the other end, which assumes the form of a helix, is arranged for contacting the upper portion of the brush. The pressure thereby extended by the spring causes the brush to engage the copper surface of the commutator at a constant predetermined pressure throughout the life of the brush.

In spite of the good results achieved by the use of this type spring, certain disadvantages result from its use when not properly applied to a brush holder. It is known for example, that if the machine containing a brush holder is subjected to shock, the brush and in some instances the biasing spring, are caused to be dislodged from their mounting in the brush holder thus making the machine and associated equipment inopeartive. Furthermore, as the carbon brush wears to a minimum point, the biasing spring occasionally breaks from its mounting because of the strain created at its point of attachment on the inner portions of the brush holder, thereby placing the broken part in a position to damage the commutator in the event it falls through the opening in the bottom of the brush holder. A still further disadvantage is that the prior art design of spring assemblies does not contain features capable of eleminating the tension in the spring, while simultaneously making the spring assembly captive on the brush holder body, during the brush replacement process. As a result, both hands of the operator must be used thereby increasing the danger of electrical shock and subjecting him to the hazard of a flying spring.

In carrying out our invention, we eliminate the above described disadvantages by providing a backing member curved at its lower end for receiving a pre-stressed spring

arranged to be unwound in a manner to exert a constant predetermined pressure on a brush in the brush holder body. The upper end is bent in a manner to extend a distance above the brush holder body and to overlie the opening for the brush so as to prevent ejection thereof under certain conditions of operation of the machine. The backing member is additionally provided with a second spring arm equipped with a projecting tab arranged to engage a detent in the brush holder for locking the spring assembly on the latter, the arm further serving to make the assembly captive on the brush holder when the tab is disengaged from its locked position.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which we regard as our invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawing in which:

Figure 1 is a view in elevation showing a brush holder having a carbon brush urged into contact with a commutator by the spring assembly of this invention;

Figure 2 is a plan view of the device shown in Figure 1;

Figure 3 is a view in elevation showing the captive arrangement of the spring assembly during the time when a new brush is being inserted in the brush holder;

Figure 4 is a perspective view of the spring assembly shown in Figures 1 through 3;

Figure 5 is a modification of the spring assembly shown in Figures 1 through 4 and is shown mounted in a brush holder and in an operative position;

Figure 6 is a view similar to Figure 5 showing the position of the spring assembly when in an inoperative position;

Figure 7 is a perspective view of the spring assembly shown in Figures 5 and 6;

Figure 8 is a modification showing still another spring assembly adapted for use with a different type of brush holder;

Figure 9 is a perspective view of the spring assembly of Figure 8 shown in an inoperative position.

Referring now to the drawing wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Figures 1 through 3, a brush holder **12** arranged for positioning adjacent a commutator **14** for a dynamoelectric machine. The brush holder comprises a square-like hollow member provided with a bracket **16** adapted for attachment to a supporting structure and oppositely disposed from the bracket is a connector **18** designed for receiving the wire shunt of a carbon brush. As shown in Figure 2, the main body of the brush holder is provided with a pair of chambers **20** and **22** for respectively receiving a carbon brush **24** and spring assembly **25** arranged for coaction therewith. A side of the brush holder **12** is equipped with an opening **26** which serves in part, to form a projection **27** for a purpose hereinafter described. The particular brush holder generally described above does not comprise a part of this invention since the same is disclosed and claimed in the application of Eugene W. Arsenault and John F. Nottelmann filed concurrently herewith and assigned to the same assignee as this invention.

As aforementioned, this invention is directed to the spring assembly, and as shown in Figure 4, comprises a spring **28** riveted to an inwardly turned spring receiving portion **29** of a backing member **30**. Riveting of the spring to a curved portion of the backing member serves two important functions; namely, that it permits the spring to become loaded more quickly than if it were attached to a straight portion of the backing member **30**, and because of its position when fully wound, it is adapted to give additional wearing depth to the brush which it urges into contact with the commutator **14**. It will be noted that

riveting of the spring at points 32 on the curved portion of the backing member, relieves the strain adjacent the end of the spring thereby precluding its snapping off after long continued use. It will be evident that other means could be utilized for attaching the spring 28 to portion 29, as by welding, for example.

The upper portion of backing member 30 is provided with a horizontal brush retainer 34 arranged to overlie the opening of the brush holder containing the spring and carbon brush. The purpose of this retainer is to prevent the brush and/or spring from being ejected out of the brush holder in the event the latter is subjected to severe shock encountered during unusual applications of the machine. It further prevents the spring from being unduly extended and becoming damaged. This simple but important expedient eliminates the necessity for providing means exterior to the brush holder for assuring retention of the brush in the brush holder body under all conditions of operations.

The structure thus far defined relates to that portion of the spring assembly utilized in holding the brush in the holder body. The following description is directed to parts used for locking the spring assembly on the holder and for making it captive during brush replacement. Referring to Figure 4, it will be seen that a second spring element 36 is welded or otherwise affixed to the backing member 30 and is provided with a reversely bent arm 38 arranged to engage that part welded to the backing member 30. The arm 38 is pre-stressed or pre-loaded in such a manner that it exerts pressure in the neighborhood of 2 p. s. i. on the backing member 30 so as to firmly anchor and add stability to the spring assembly by holding the assembly against its seat on the brush holder body, and for making the spring captive during brush replacement. The end of arm 38 which contacts the brush holder body is bent around an arc somewhat greater than 180° so as to preclude the sharp end thereof from digging into the holder body during removal of the spring assembly from the brush holder. Spring element 36 is provided with a tab 40 located a distance below part 41 sufficient to engage projection 27 when the spring assembly is inserted in the brush holder body as shown in Figure 1. The combined action of the spring element 36 and that of the spring 28 acting against the brush, causes the tab to move into position under the projection 27 thereby firmly locking the spring assembly to the brush holder.

An important feature of the spring assembly resides in the arrangement of parts effective in preventing disengagement of the assembly from the holder during brush removal and replacement. When the assembly is released from its locked position, spring 28 urges the assembly upward against the slight frictional force created by the spring element 36 against the outer surface of the holder. Further upward movement causes the arm 38 to slide into opening 26 and engage surface 43 whereupon it is made captive on the projection 27 provided on the brush holder.

The spring assembly is further designed to have a clearance "*a*" between the top of the brush holder body and the under side of part 41 of the spring assembly in order to prevent the assembly from engaging the commutator in the event spring 28 is broken or otherwise detached from the backing member 30.

In operation, after a new brush is inserted in the brush holder, spring element 36 of the spring assembly is flexed outwardly and slid over the projection 27 provided on the top of the brush holder body. Further movement in a downward direction, as shown in Figure 1, causes the arm 38 to engage the outer surface of the brush holder body while the spring 28, at this time, is caused to engage the brush. The biasing action of spring element 36 and spring 28 as above mentioned, causes the tab 40 to assume a position beneath the projection 27 thereby locking the spring assembly in an operative position.

When it is desired to replace a brush or otherwise remove the spring assembly from the holder, the assembly is pushed down and forwardly at the top to disengage the tab from its projection which permits the assembly to move upwardly until the arm 38 engages the projection 27 provided on the brush holder body. As shown in Figure 3, the spring assembly can be rotated in a clockwise direction to remove it from a position above the brush holder body for facilitating insertion of a new brush. A distinct advantage obtained from this design of spring assembly is that the above described operation can be manually performed by an operator using only one hand and therefore eliminates to a large degree the possibility of electrical shock to which he otherwise would be subjected.

The modification shown in Figures 5, 6 and 7 is the same as that described above except for the design of arm 38 on the bottom of spring element 36. In this species, the arm is bent outwardly and is provided with a round smooth surface to prevent the arm from digging into the side of the brush holder during spring assembly removal. However, as in the foregoing embodiment, it will snap into the opening at the top of the holder thereby permitting the spring assembly to be rotated out of position without disengaging it from the holder when a new brush is inserted therein.

The modification shown in Figures 8 and 9 is different from those previously disclosed in that the spring element is of an entirely different design but is arranged to serve substantially the same function and in somewhat a different manner. As shown, the spring element 36 is provided with a hook 44 arranged for positioning over the lower exposed surface of the brush holder body while the upper end 46 is curved back on itself in the manner of a hairpin to hold the spring assembly in a fixed position relative to the brush holder body. The hook 44 at the bottom part of the spring assembly serves to prevent the backing strip 30 from moving into a position where it could foul brush 24. The spring assembly is released by pressing down and pulling backward to unlatch the hook 44 from the bottom of the brush holder, whereupon the biasing action of spring 28 causes the assembly to move upwardly until the hook slips into opening 48 and catches on the projection 50 provided adjacent the top of the brush holder body. The spring assembly at this time is held captive and assumes the position shown in Figure 9 of the drawing. In the event it is desired to remove the brush further, it is merely unhooked a second time and completely removed from the brush holder body. The spring assembly in this modification, does not remain captive with the brush holder while a brush is being changed.

It will be evident that many modifications and variations are possible in light of the above teachings. For example, it is not absolutely essential to successful operation of the device that the spring element assume a specific configuration as evidenced by the different types of spring elements disclosed herein. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

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

1. A spring assembly adapted for use with a carbon brush holder comprising a backing member having oppositely disposed ends turned inwardly on the same side of said member, a coil spring rigidly attached to one end of said backing member to permit the volute of said coil spring to rest on one of said inwardly turned ends and thereby relieve strain created by said spring at the point of attachment on said backing member, and locking means affixed to said backing member for coacting with a brush holder to prevent accidental dislodging of said spring assembly therefrom and for retaining said

spring assembly captive on said brush holder during the time that a new brush is being inserted therein.

2. A spring assembly for a carbon brush holder comprising a prestressed spring of volute construction adapted for exerting a constant force against an expendable carbon brush during the life thereof, a backing member having inwardly directed ends for respectively providing support for said spring and for overlying said carbon brush to prevent ejection thereof from said brush holder, and means affixed to said backing member including a locking device adapted for securing said spring assembly to said brush holder and a spring element for preventing detachment of said spring assembly from said brush holder during the process of replacing a carbon brush in said holder.

3. The combination according to claim 2 wherein said spring element is provided with a reversely bent end for facilitating engagement with a projecting portion on said brush holder and thereby prevent removal of said spring assembly during the process of replacing the brush in said holder.

4. The combination according to claim 2 wherein said spring element is curved outwardly from said backing member to effect mounting of said spring assembly on asid brush holder and to prevent removal therefrom during the process of inserting a new brush in said holder.

5. A spring assembly adapted for use with a carbon brush holder comprising a backing member having an inwardly directed end for receiving a pre-stressed spring adapted for urging a carbon brush into contact with a commutator, the other end of said backing member being arranged to overlie said carbon brush to prevent ejection from said holder, a second spring element rigidly affixed to said backing member and provided with an outwardly directed tab effective in locking said spring assembly to said brush holder, the upper end of said second spring element being formed in the shape of an inverted U and arranged to provide a distance between the top of said brush holder and the turn of said U of an amount sufficient to prevent said spring assembly from contacting said commutator in the event the spring becomes broken or otherwise detached from said backing member.

6. A spring assembly for a carbon brush holder comprising a prestressed spring of volute construction arranged to exert a constant force against a carbon brush throughout the life of said brush, a backing member having inwardly directed ends for respectively receiving said spring and for overlying said carbon brush to prevent ejection therefrom when said brush holder is subjected to shock, a second spring element rigidly affixed to said backing member having a hook on one end for engaging the bottom of said brush holder and being provided with a reversely bent member on its other end for firmly positioning said spring assembly on said brush holder.

7. A spring assembly for a carbon brush holder comprising a prestressed spring wound in the form of a volute and being constructed and arranged to exert a constant force against a carbon brush throughout the life of said brush, a backing member having inwardly directed ends for respectively receiving said spring and for overlying said carbon brush to prevent ejection therefrom when said brush holder is subjected to shock, a second backing member rigidly affixed to first backing member and having an end reversely bent in a manner to engage said brush holder and firmly position said spring assembly therein, the other end of said second backing member having a reversely bent member constructed and arranged to contact a wall of said brush holder to prevent removal therefrom during operation of said machine but effective to retain said spring assembly in an inoperative position when a new brush is being inserted in said brush holder.

8. An improved brush holder for a dynamoelectric machine comprising a box provided with a pair of channels for respectively receiving a carbon brush and a spring assembly for urging said carbon brush into contact with a commutator for said machine, a side of said brush holder adjacent said channel for holding said spring assembly being formed with an opening, a projecting member on said side arranged to extend into said opening, said spring assembly comprising a backing member having a spring attached to one side thereof for urging said carbon brush into contact with said commutator, a second spring member having reversely bent ends attached to said backing member, the lower of said ends being arranged to engage the bottom of said brush holder on the side containing said projecting member so as to firmly lock said spring assembly on said holder when said assembly is in an operative position on said holder, the upper of said ends being arranged to extend over the top of said holder and to exert a pressure thereagainst when in an operative position, said holder being constructed and arranged to permit said lower end to engage said projecting member when said spring assembly is moved outward from said holder thereby locking said assembly on said holder in an inoperative position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,602,100 McDonald ---------- July 1, 1952