Aug. 18, 1959 G. GÄRTNER ET AL 2,900,540

BRUSH HOLDER FOR DYNAMOELECTRIC MACHINES

Filed Nov. 7, 1956

Fig.1.

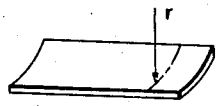


Fig.2.

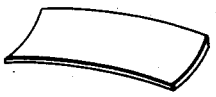


Fig.3.

Fig.4.

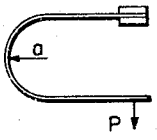


Fig.5.

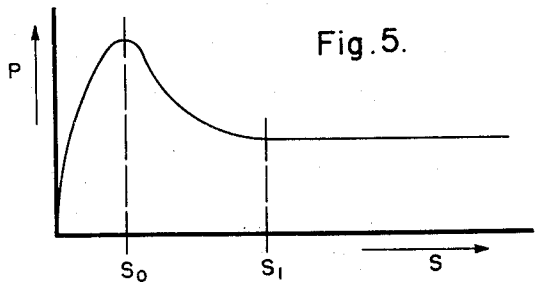
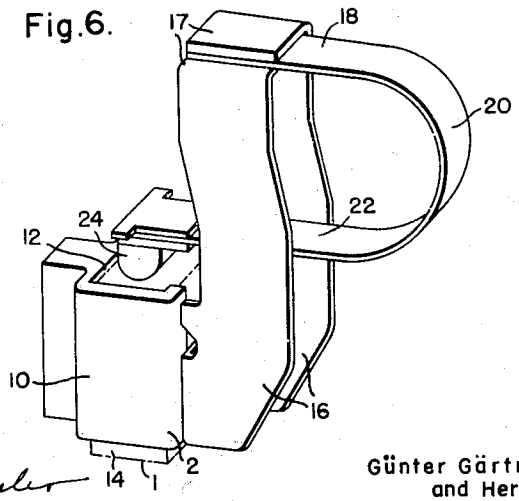


Fig.6.



WITNESSES

Edwin E. Bassler

E. H. Lisa

INVENTORS

Günter Gärtner, August Schwab and Hermann Harz.

BY J. P. Lyle

ATTORNEY

United States Patent Office 2,900,540 Patented Aug. 18, 1959

2,900,540

BRUSH HOLDER FOR DYNAMOELECTRIC MACHINES

Günter Gärtner, Berlin-Weidmannslust, and August Schwab and Hermann Harz, Berlin-Siemensstadt, Germany, assignors to Siemens-Schuckertwerke Aktiengesellschaft, Erlangen, Germany, a corporation of Germany

Application November 7, 1956, Serial No. 620,927

3 Claims. (Cl. 310—246)

The present invention relates to a brush holder for dynamoelectric machines and more particularly to a brush holder having a constant force brush biasing spring.

Brush wear, as well as commutator wear, is accelerated by excessive friction caused by unnecessary high brush pressure. Lower pressures give poor contact, causing sparking, heating, and increased electrical wear. It can be seen, therefore, that there is an optimum brush pressure at which the combined brush wear due to poor electrical contact and due to excessive friction is a minimum. Since, in conventional types of springs, the force varies with the deflection of the spring, the pressure on the brush varies with brush wear. Therefore, this optimum pressure utilizing a conventional spring cannot be maintained. It is the usual practice to overstress the brush spring on new machines. As the brush material wears, the contact pressure decreases. For a short period the brush pressure is at the optimum value, and as the brush continues to wear, the contact pressure decreases, and electrical wear increases. When arcing occurs, the conventional brush is then adjusted to increase brush pressure. This adjustment introduces human error, and at best this may provide the optimum value of brush pressure for only brief periods.

To avoid this excessive brush wear, it is desirable to provide a constant force brush spring which is initially adjusted to exert less brush pressure consistent with good contact between the brush and the commutator or slip ring.

The principal object of the invention is to provide a brush holder for dynamoelectric machines which can be manufactured at low cost, is simple in construction, and which will provide constant brush pressure for the life of the brush.

Another object of this invention is to provide a brush holder having a constant force spring for applying pressure to the brush which spring will require no adjustment.

A further object of the invention is to provide a brush holder having a constant force spring which will reduce electrical and mechanical wear of the brush material to a minimum.

Other objects and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawing in which:

Figure 1 is a perspective view of a transversely curved flat spring;

Fig. 2 is a perspective view of a transversely curved flat spring bent in a contrary sense;

Fig. 3 is a perspective view of a transversely curved flat spring bent in a normal sense;

Fig. 4 is a side elevation of the spring disclosed in this invention;

Fig. 5 is a graphical representation showing the dependence of the loading of the free end of the spring upon the spring deflection; and

Fig. 6 is a perspective view of an embodiment of the brush holder of this invention.

The brush holder shown in the drawing includes a substantially rectangular-shaped brush support **10** having a rectanglular-shaped longitudinal opening **12** formed therein. Received in the longitudinal opening is a brush **14** arranged for longitudinal movement within the longitudinal opening **12**. Secured at one side of the brush holder **10** are a pair of vertical-extending arms **16**. Arms **16** extend upwardly a substantial distance above brush holder **10**. Arms **16** are parallel to each other. Each of the arms **16** are bent perpendicular to their longitudinal axes adjacent their upper ends. The bent portions extend toward each other and are in overlapping relationship and slightly separated to provide an opening for the reception of an end of a leg **18** of a U-shaped spring **20**. U-shaped spring **20** is secured between bent portions **17** by welding, brazing or in any suitable manner.

The U-shaped spring **20** is formed from flat spring steel stock having a transverse curvature of radius *r*, as shown in Fig. 1. Spring **20** is bent longitudinally into a U-shape either in a sense contrary to the transverse curvature, as shown in Fig. 2, or in the same sense as the transverse curvature, as shown in Fig. 3. Spring **20** is bent longitudinally beyond its buckling point. The longitudinal radius of curvature *a*, Fig. 4, should be equal to the transverse radius of curvature *r*. Fig. 5 illustrates the result of a spring such as **20** being curved transversely and bent beyond its buckling point. The ordinate P represents the loading of such a spring. The abscissa S represents the deflection of the free end of the spring. It will be noted that the load P in the hypercritical range, which is to the right of the buckling point S_0, starting approximately at S_1, is substantially independent of the spring deflection S. Spring **20** is designed to operate in the hypercritical range to the right of point S_1, so that as brush **14** wears down, the pressure exerted by spring **20** thereon will remain constant.

To the end of the free leg **22** of spring **20** is secured by any suitable means a pressure piece **24**. The spring pressure produced by the transversely curved U-shaped spring **20** is conveyed over the pressure piece **24** to the brush **14**. If desired, brush **14** may be formed at its upper end with a depression corresponding to the shape of pressure piece **24**. The pressure piece **24** may be made of an insulating material in which case the current supply is carried by a copper wire directly connected to the brush **14**. In special cases, the pressure piece **24** can be designed as a conducting contact piece. In this case the current supply can be carried by a copper wire connected to the spring **20**. Because of its substantially large surface, the transversely curved U-shaped spring **20** provides a satisfactory cooling of the contact point.

Certain modifications of the brush holder, not shown in the drawing, can obviously be made. For example, it is possible to obtain a clearance free guiding of the brush in the brush holder by a slight inclination of the supporting of the bent portions **17** which would exert over the pressure piece **24** a transverse force preferably in a peripheral direction. The bent portions **17** can also be inclined in such a manner that a certain pressure will be exerted in tangential direction so that the brush will bear against a wall of the brush holder. In some cases this will secure a smoother operation of the brush.

It should now be apparent that a brush holder has been provided which is of simple construction which can be readily produced at minimum cost. As previously pointed out, a constant force is applied to the brush throughout the life of the brush. No adjustment is required to maintain optimum brush pressure.

A preferred embodiment of the invention has been shown and described for the purpose of illustration, but it will be apparent that various modifications may be

made, and it is to be understood that the invention in its broadest aspects is not limited to the specific details of construction shown but includes all equal embodiments and modifications which come within the scope of the invention.

We claim as our invention:

1. A brush holder for dynamoelectric machines, said brush holder comprising a brush support having a longitudinal opening formed therein adapted to have a brush arranged therein for longitudinal movement toward the periphery of a substantially cylindrical rotating member, a brush biasing means including a transversely curved, U-shaped flat spring, said U-shaped spring being longitudinally curved beyond its buckling point, the initial radius of curvature of said transverse curve and the radius of curvature of said longitudinal curve being substantially the same, spring support means secured to said brush support and extending vertically upward from said brush support, one leg of said U-shaped flat spring being secured to the upper end of said spring support, a pressure piece secured to the other leg of said U-shaped spring, said pressure piece overlying said brush and bearing thereon to urge said brush toward the periphery of said rotating member whereby constant pressure is applied to the brush throughout its useful life.

2. A brush holder for dynamoelectric machines, said brush holder comprising a brush support having a longitudinal opening formed therein adapted to have a brush arranged therein for longitudinal movement toward the periphery of a substantially cylindrical rotating member, a brush biasing means including a transversely curved, U-shaped flat spring, said U-shaped spring being longitudinally curved beyond its buckling point, the initial radius of curvature of said transverse curve and the radius of curvature of said longitudinal curve being substantially the same, spring support means secured to said brush support and extending vertically upward from said brush support, one leg of said U-shaped flat spring being secured to the upper end of said spring support, an insulating pressure piece secured to the other leg of said U-shaped spring, said pressure piece overlying said brush and bearing thereon to urge said brush toward the periphery of said rotating member whereby constant pressure is applied to the brush throughout its useful life.

3. A brush holder for dynamoelectric machines, said brush holder comprising a brush support having a longitudinal opening formed therein adapted to have a brush arranged therein for longitudinal movement toward the periphery of a substantially cylindrical rotating member, a brush biasing means including a transversely curved, U-shaped flat spring, said U-shaped spring being longitudinally curved beyond its buckling point, the initial radius of curvature of said transverse curve and the radius of curvature of said longitudinal curve being substantially the same, spring support means secured to said brush support and extending vertically upward from said brush support, one leg of said U-shaped flat spring being secured to the upper end of said spring support, a conducting pressure piece secured to the other leg of said U-shaped spring, said pressure piece overlying said brush and bearing thereon to urge said brush toward the periphery of said rotating member whereby constant pressure is applied to the brush throughout its useful life.

References Cited in the file of this patent

UNITED STATES PATENTS

437,946	Sweet	Oct. 7, 1890
505,665	Lundell	Sept. 26, 1893
848,182	Lindall	Mar. 26, 1907
2,024,362	Hoopes	Dec. 17, 1935
2,683,829	Gerber	July 13, 1954

FOREIGN PATENTS

201,471	Great Britain	Aug. 2, 1923