



# UNITED STATES PATENT OFFICE.

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## BRUSH-HOLDER.

SPECIFICATION forming part of Letters Patent No. 705,055, dated July 22, 1902.

Application filed December 20, 1900. Serial No. 40,512. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN F. T. ERBEN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Brush-Holders, (Case No. 1,614,) of which the following is a specification.

The present invention relates to improvements in brush-holders for electric machines.

The improvements aim at efficiency in operation, simplicity and economy of construction, and durability under the adverse conditions to which brush-holders are subjected.

Of the drawings, Figure 1 is a side elevation of a brush-holder constructed in accordance with the invention, showing the brush in the holder and in operative engagement with the commutator of the electric machine.

Fig. 2 is a plan of the holder. Fig. 3 is a partial sectional view of the holder, showing the location of the spring which presses the brush against the commutator; and Fig. 4 is an elevation of the movable pivot upon which the end of the spring is mounted.

As shown in Fig. 1, the main portion or holder itself consists chiefly of a split ring J, which with the aid of the bolt W is mounted upon a suitable supporting-stud S. A rotatable pivot P is mounted in a suitable portion of the holder, and a spring or resilient arm A is secured to this pivot, the free end B of the spring being adapted to bear on the top of the brush E to press it against the commutator M. By means of the arm G, which is mounted on the pivot and engages in the stops R of the holder, the tension of the spring on the brush can be adjusted and the spring can be revolved entirely away from the top of the brush-box D, so that the brush can be readily removed therefrom.

Hitherto in brush-holders of the type shown herein the spring bearing on the brush has been pressed against the brush by a second spring. In the present case such second spring is dispensed with. It is clear, therefore, that the single spring herein has a greater range, and hence its end would naturally engage with different parts of the top of the brush. An important feature of this invention, there-

fore, is the means by which the end B of the brush is caused to always bear on the same central point Z of the brush no matter what the vertical position of the brush may be within very wide limits and without respect to the change of the tension of the spring. This result is of great importance, because if pressure is exerted on the top of the brush from any other but the central point or is exerted upon any other portion than the proper one the brush will bind in its box, will bear with unequal pressure upon the commutator, and will therefore wear unevenly and cause sparking. Furthermore, it will not readily rise above ridges in the commutator, which it is the express function of the spring A to permit it to do. This result is accomplished by curving the spring, as shown, so that it will automatically compensate for its change of rectilinear extent caused by movements of the brush or by the changes in its adjustment—that is to say, when the arm G is moved to the left to cause the spring to exert a greater pressure upon the brush the spring will be flattened; but instead of forcing the part B to the left a portion nearest the right will move farther to the right in the direction of the arrow, so that the part B bears on the same part Z of the top of the brush. Conversely, when the adjusting-arm is moved to the right to decrease the pressure of the spring upon the brush the curvature of the spring will increase and the portion at the right will move in a direction opposite the arrow. Also as the brush wears away the curvature of the spring will increase in proportion as the distance between its fixed point and its bearing-point on the top of the brush diminishes. Likewise in case the brush is forced upward the spring is flattened and lengthens in accordance with the increased distance from its bearing-point to its fixed point. The figures are drawn to scale, and I have found that the curvature of the spring A will cause the above results for the particular size of brush-holder shown. The actual curvature is shown in the dotted spring in Fig. 1 and in full lines in Fig. 3, the spring in full lines in Fig. 1 being slightly flattened, owing to the engagement of the arm G in the first notch. The actual curva-

ture of the spring must be varied by the designer or mechanic for different sizes of brush-holders or for springs of different lengths.

The pivot P is shown in detail in Fig. 4, whereby it may be seen that it consists of a split bolt screw-threaded at Q for the reception of a nut and having a perforation through its head for the reception of a portion V of the adjusting-arm G. This portion V of the adjusting-arm is swiveled in the perforation in the head of the bolt in order that the arm may be moved in and out of the stops R. (Shown in Fig. 1.) The end of the spring A is inserted in the split bolt L, and the nut N, which is screwed on the threaded portion Q, serves to securely clamp the end of the spring in position. As shown in Fig. 3, the spring has a number of turns coiled about the pivot. In the position of the spring shown in Fig. 3 the adjusting-arm has been removed from engagement with the stops and the spring is being revolved from above the box D to permit the removal of the brush. Its final position in this direction is shown in dotted lines in Fig. 1.

The brush box or guide D, mounted in the left-hand portion of the holder, is preferably constructed from sheet metal, which is punched and bent to the required shape. The box D is provided with wings X, which are perforated for the reception of the bolt H, by which the box is pivoted to the holder, so that its angle may be adjusted when desired. By means of stops, such as U and the nut H, the box may be securely held at any desired angle with respect to the holder. The box D is formed with a cut-away portion Y to permit the passage of the flexible connection F. The connection F is suitably secured at one end to the brush D and at its other is provided a conducting-clip I, which is secured to the holder by a screw K. The connection F takes most of the current, and thus prevents a flow of current through the spring A, which would impair its resiliency.

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

1. The combination with a holder, of a curved resilient arm, one end of which bears on the brush, and a pivot by which the other end of the arm is supported, and about which a portion of the arm is coiled in an inverse direction to said curve.

2. The combination with a holder, of a resilient arm, one end of which bears on the brush, and a bifurcated rotatable pivot to which the other end of the arm is fixed, whereby the arm can be revolved to permit the removal of the brush.

3. The combination with a holder, of a curved resilient arm, one end of which bears on the brush, and a rotatable pivot to which the other end of the arm is fixed, and about which a portion of the arm is coiled in an inverse direction to said curve.

4. The combination with a holder, of a resilient arm, one end of which bears on the brush, a bifurcated rotatable pivot to which the other end of the arm is fixed, and means for holding the pivot in various positions to vary the tension of the resilient arm.

5. The combination with a holder, of a curved resilient arm, one end of which bears on the brush, a rotatable pivot about which the other end of the arm is coiled in an inverse direction to said curve, suitable stops in the holder, and a device connected with the pivot which engages the stops, to hold the pivot in various positions.

6. The combination with a holder, of a curved resilient arm, one end of which bears on the brush, and the other end of which is coiled in an inverse direction to said curve, a rotatable pivot which supports said coiled end of the arm, and means for holding the pivot in various positions.

7. The combination with a holder, of a resilient arm, one end of which bears on the top of the brush, and the other end of which is coiled, and a rotatable pivot which supports said coiled end, the arm having a curve intermediate its ends, whereby in all operative positions of the pivot and all positions of the brush, the free end of the arm bears always on the same portion of the top of the brush.

8. The combination with a holder, of a resilient arm, one end of which bears on the top of the brush, a suitable support for the other end of the arm, said arm intermediate its ends being curved, whereby the free end of the arm bears always upon the same portion of the top of the brush.

9. The combination with a holder, of a resilient arm, one end of which bears on the top of the brush, and the other end of which is coiled, a rotatable pivot which supports said coiled end of the arm, said arm being curved intermediate its ends so that when the pivot is rotated to tighten the coil, the curve of the arm is flattened, while the free end remains in contact with the same part of the top of the brush.

10. The combination with a holder, of a resilient arm, one end of which is suitably supported, and the other end of which bears always on the same portion of the top of the brush.

11. The combination with a holder, of a resilient arm, one end of which bears on the top of the brush, and means for varying the tension of said arm, the arm being curved whereby it always bears on the same part of the brush.

In witness whereof I have hereunto set my hand this 17th day of December, 1900.

HERMANN F. T. ERBEN.

Witnesses:

BENJAMIN B. HULL,  
FRED RUSS.