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BRUSH HOLDER ASSEMBLY

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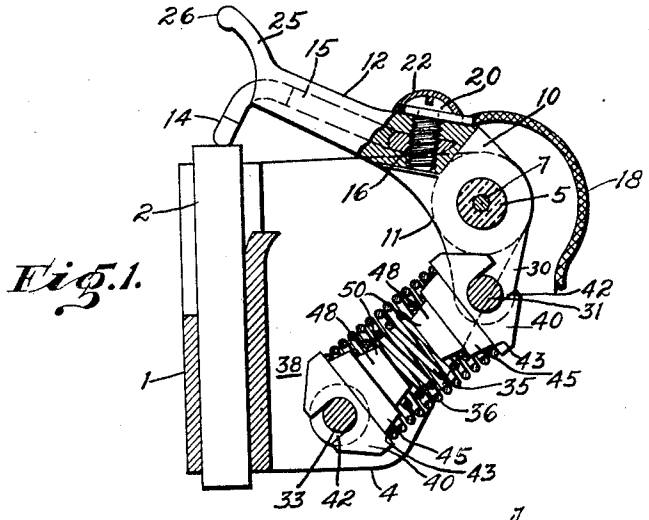


Fig. 1.

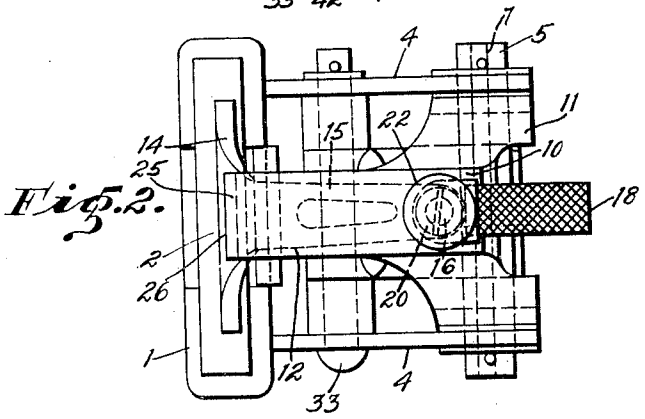


Fig. 2.

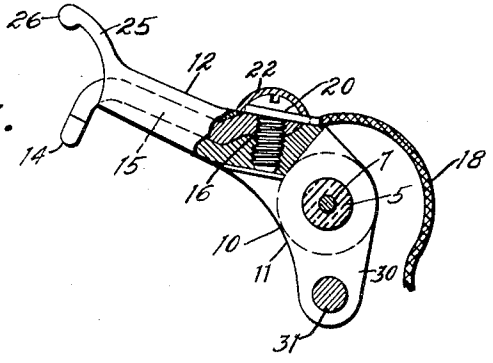


Fig. 3.

WITNESSES

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BRUSH-HOLDER ASSEMBLY

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7 Claims. (Cl. 171—324)

My invention relates to brush-holder assemblies and particularly to such assemblies as have light compression fingers actuated by dual compression springs.

The structural and operating characteristics of brush holders are becoming of increasing importance in the operation of modern motors. The brush holder must occupy a minimum amount of space and, at the same time, must maintain substantially perfect brush contact with the commutator cylinder.

As is well known, the wearing surface of current-collecting devices develops considerable roughness in service, and, in use, this roughness is sufficient to raise the brush out of contact with the current-collecting device. Such lifting of the brushes is liable to cause sparking or other commutation troubles. Not only does this sparking occur between the brush and the current-collecting device, but, because of the weight of the brush finger and the inertia of the biasing springs, the finger itself will be separated from the top of the brush and cause sparking between the brush finger and the brush. This sparking frequently results in serious pitting of the current-collecting device and the brush finger.

I have found that the cadmium-copper alloy contact tip disclosed in my Patent No. 1,820,699 materially improves the operation and practically eliminates pitting of the finger tip. In conjunction with the aluminum alloy finger of said application, the total inertia of the finger is materially reduced and the finger is capable of a more rapid follow-up and a consequent reduction of sparking. However, I have found that a spring capable of producing the necessary brush pressure has considerable inertia and is not sufficiently rapid in its follow-up to maintain contact between the brush finger and the brush. To eliminate this defect, I employ a dual biasing spring in which one of the spring elements is of sufficient strength to provide the major portion of the necessary brush pressure, and the other spring element is of sufficiently light weight to substantially overcome the troubles due to inertia while still being of sufficient strength to maintain the brush finger in firm contact with the outer end of the brush. The lighter spring for maintaining contact between the brush finger and the brush may be of different, and, preferably, of less, length than the main biasing spring.

Other objects and advantages of my improved brush holder will be apparent from the following detailed description, taken in conjunction with the accompanying drawing, in which

Figure 1 is a sectional elevation of a brush holder embodying my invention,

Fig. 2 is a plan view of my improved brush holder, and

Fig. 3 is a brush finger partially in section, showing a modification of my invention.

The apparatus disclosed in the drawing comprises a brush box 1 of suitable size and shape to accommodate the desired brush 2. A finger mounting or finger support 4, secured to one side of the brush box, is provided with a reenforced molded shaft. The reenforcement may consist of a central core 7 of steel or other suitable material, and the molded material is preferably graphitized micarta.

Journalled on the shaft is a brush contact finger 10, preferably of cast aluminum alloy having an enlarged base 11 for engagement with the shaft 5 and a finger-like extension 12. The finger-like extension is provided with a contact tip 14, preferably of cadmium-copper alloy, having a shank 15 embedded in the cast finger. The shank 15 of the copper tip preferably extends substantially throughout the entire length of the finger 12 and has a tapped opening 16 near the base of the finger for direct connection with a current-carrying shunt 18 of any desired construction. However, I prefer to use a pig-tail shunt of fine copper construction. The shunt 18 is directly connected to the copper shank 15 by means of a suitable connection, preferably a screw 20. The direct connection between the pig-tail and the tip eliminates any possibility of a high-resistance connection because of oxidized aluminum surfaces. The low-resistance character of this contact is further assured by soldering or otherwise integrally connecting the shunt directly to the screw and the surface of the finger, as at 22. The soldering also prevents the connection from working loose in service much more effectively than can be done by the use of lock washers or other locking devices.

If the tip shank 15 is totally imbedded in the finger, as shown in Fig. 1, the solder composition must be capable of adhesion to the aluminum surface. However, if the tip shank is brought to the surface, as shown in Fig. 3, it will not be necessary to use an aluminum solder.

The outer extremity of the contact finger 12 is provided with an improved lift which comprises an integral arcuate portion 25 extending upwardly and outwardly from the tip of the finger and terminating in a substantially cylindrical end portion 26. The end portion 26 is so shaped that the hand of the operator may firmly

grasp the lift and, when so grasped, the end portion of the lift will form a retaining depression in the operator's hand without danger of cutting or abrading the same.

The contact finger is provided, at its base portion, with an angularly extending portion adapted for contact with a biasing spring. Preferably, the angularly extending portion consists of spaced parallel extensions 30 having a spring seat support 31 of suitable material between them. In the illustration, the spring seat is a steel pin extending between the extension fingers. A similar spring seat support 33 is provided in the finger support 4. Between these spring seat supports is mounted my improved biasing spring.

My biasing spring comprises inner and outer spring members 35 and 36, both connected to spring seats 40 for engagement with the spring seat supports 31 and 33. The outer spring element 36 is made of comparatively large spring wire and is capable of furnishing sufficient energy for maintaining the brush in proper contact with a current-collecting device (not shown).

Preferably, the inner and outer spring elements are wound in different directions so that, in operation, there will be no possibility of one spring fouling the other, as would be the case if both springs were wound in the same direction. The inner spring element 35 will be of substantially lighter spring wire and is used primarily for maintaining contact between the brush finger and the top of the brush.

My dual compression spring is provided with improved spring seats 40 for maintaining the spring elements in proper relation. The spring seat 40 comprises a head portion having a groove 42 for engagement with the spring seat supports and an annular portion 43 for engaging the terminus of the outer spring element 35. A substantially cylindrical guide portion 45 within the spring 36 is provided to maintain the spring in proper relation to the spring seat. This guide portion 45 is further provided with an annular portion 48 for engagement with the end of the inner spring 35 and a reduced guide portion 50 extending within the inner spring.

While I have shown and described a specific embodiment of my invention, it is evident that various modifications thereof may be effected without departing from the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. A brush-holder finger comprising a cast alloy of aluminum body having an enlarged base and an extending finger, a finger lift extending above the end of the finger and having means for providing a firm grip on said lift, a cadmium-copper tip having its shank imbedded in the finger for substantially its entire length, and a flexible shunt connected directly to the copper shank of the tip near the base of the finger.

2. A brush finger comprising a body portion of cast aluminum alloy, a finger portion extending from said body, a cadmium-copper contact-tip having a shank imbedded in said finger, a pigtail connected directly to said shank and a spring support angularly disposed in relation to said finger portion.

3. A brush-holder assembly comprising a brush guide, a brush finger support connected thereto, a brush finger pivotally mounted on said support, said brush finger comprising a body of cast aluminum alloy having a finger extending from said body, a contact member having a shank imbedded in said finger, and a spring support in angularly disposed relation to said finger, a spring seat on said support and a plurality of helical compression springs connected to said seat.

4. A brush-finger assembly comprising a cast aluminum alloy finger having an integral enlarged base, a copper tip extending from the end of said finger and having a shank extending substantially the entire length of the finger, a dual biasing spring attached to said base for holding the finger tip in contact with a brush, a current-carrying shunt extending to the top of said finger, and a connector extending through the shunt and making metallic connection with the tip shank, said shunt being soldered to said connector and to said finger.

5. A brush-holder assembly comprising a brush box, a plurality of parallel plate-like supports for a brush finger brazed to said brush box, a graphitized molded material shaft secured in said supports, a brush finger journalled on said shaft, a contact tip imbedded in said finger, a shunt for supplying current to said finger, means for making direct contact between said shunt and said tip, an offset spring support on said finger and a dual biasing spring for biasing said finger toward said brush box.

6. A spring-finger assembly for a brush holder comprising a cast aluminum alloy body having an enlarged base and a copper contact tip, a compound helical biasing spring connected to said base, an offset spring support on said base for receiving the end of said spring, a bearing in the base, a reenforced shaft of graphitized molded material extending through the bearing for supporting said finger.

7. In combination, a brush box, a finger support on said box, a reenforced graphitized micarta shaft secured on said support, a brush finger of cast aluminum alloy journalled on said shaft, a spring support on said finger, a spring support on said support and a dual biasing spring between said supports for biasing said brush finger toward said brush box.

HARRY F. HARTMAN.