L. W. TURNBULL.

BRUSH HOLDING DEVICE.

APPLICATION FILED NOV. 6, 1914.

1,251,845. Patented Jan. 1, 1918.

Fig. 1.

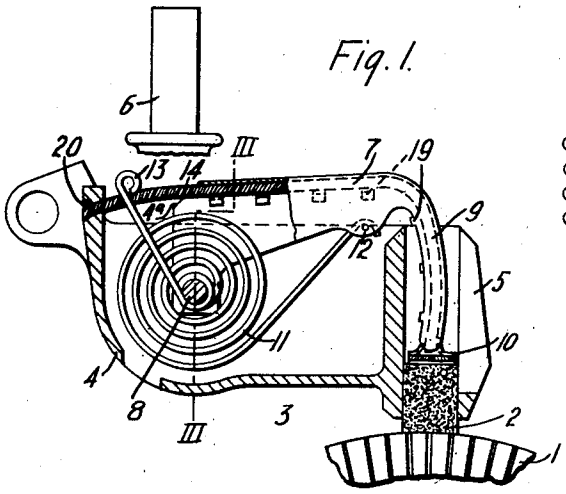
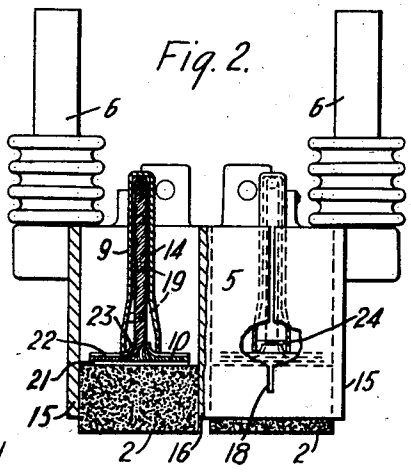


Fig. 2.



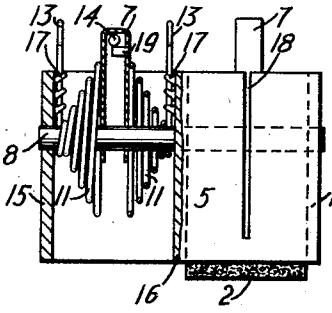


Fig. 3.

Fig. 4.

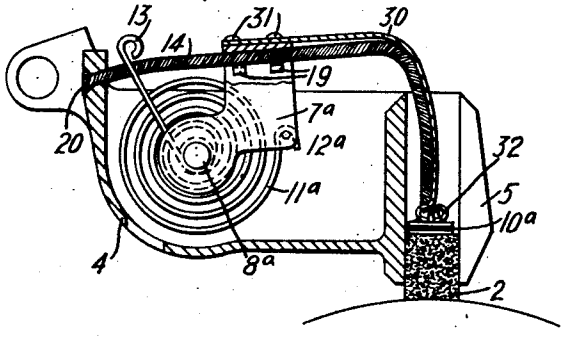
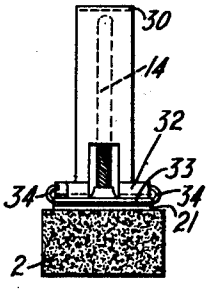


Fig. 5.



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BRUSH-HOLDING DEVICE.

1,251,845. Specification of Letters Patent. Patented Jan. 1, 1918.

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To all whom it may concern:

Be it known that I, LAWRENCE W. TURNBULL, a subject of the King of England, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Brush-Holding Devices, of which the following is a specification.

My invention relates to brush-holding devices, and it has for its object to provide a device of this character which shall be simple and inexpensive in construction and effective and reliable in operation.

Another object of my invention is to provide a device of the above-indicated character which shall permit of relative adjustment of the pressures on opposite sides of the brush to prevent tilting thereof, with its consequent bad results.

Another object of my invention is to provide a brush-holding device which shall have a relatively large current-carrying and heat-dissipating surface in contact with the brush.

A further object of my invention is to provide a novel type of sliding joint between brush-biasing carriages and brush contact-hammers, to prevent the hammers from undesirably cutting into brushes and to maintain a relatively large and stationary contact surface on the brushes.

In the prior art, many types of brush-holding devices have embodied brush-biasing springs of the familiar cylindrical spiral type, the inner ends thereof being secured to movable bearing-pins, upon which were mounted suitable ratchets that engaged co-operating pawls, and suitable rods have been attached to the pins for purposes of adjustment, in conjunction with appropriate fingers or lugs on the walls of the brush-holding frame, thereby requiring a relatively large number of parts. Moreover, in case a brush tended to tilt, jamming of the brush and uneven commutator contact pressures on a relatively small area have been obtained in many instances. Again, brush-containing boxes have customarily been provided with relatively large front and rear wall openings to permit of the operation of the spring-biased contact hammer as the brush wore down. Furthermore, contact-hammers have usually been rigidly secured to the brush-biasing carriages, thereby often causing the formation of recesses in the brush ends, with consequent jamming and poor contact.

According to my present invention, I provide a brush-holding device comprising a frame having a plurality of sets of oppositely-disposed, internally extending fingers, a brush slidably held in a box having relatively unbroken walls of dimensions corresponding to those of a new brush, thereby providing relatively large current-carrying and heat-dissipating contact surfaces; a movable carriage having one end adapted to slide on a contact-hammer that flexibly bears on the brush; and a plurality of outwardly converging conical spiral springs that are preferably constructed of round steel wire and that respectively have their outer ends secured to the carriage, the inner ends having integral lateral extensions that are respectively adapted for independently adjustable engagement with the respective sets of fingers, thereby permitting a ready regulation of the relative pressures on opposite sides of the brush to prevent the tilting mentioned above.

In the accompanying drawing, Figure 1 is a view in longitudinal section of a brush-holding device constructed in accordance with my invention; Fig. 2 is a view in front elevation, with parts broken away for clearness, of the device illustrated in Fig. 1; Fig. 3 is a view, partially in elevation, and partially in section, taken on the line III—III of Fig. 1; Fig. 4 is a view, chiefly in longitudinal section, but partially in elevation, of a modified form of brush-holding device embodying my invention; and Fig. 5 is a view in front elevation of a portion of the structure shown in Fig. 4.

Referring to the drawing, the apparatus here illustrated comprises a suitable commutator cylinder 1 of a dynamo-electric machine (not shown) upon which bears one or more brushes 2, of any usual type, that are suitably supported in a holding device 3.

The device 3 comprises a suitable box-like frame 4 having a brush-containing box 5 at one end thereof, and one or more suitably insulated rods 6 for attachment to the frame (not shown) of the dynamo-electric machine in accordance with familiar practice; a plurality of movable brush-biasing channel-sectioned carriages 7, preferably of pressed steel, each of which has one end pivotally

mounted upon a bearing pin 8 that extends transversely of the frame 4 and has its other end constituting a suitably curved and downwardly extending arm 9, with the lower extremity of which a contact member 10 is associated, as hereinafter described; a plurality of outwardly converging conical spiral springs 11 that respectively have their outer ends secured to the carriages 7 at the points 12, and their inner ends, after passing around the pin 8, respectively adapted to constitute laterally extending integral arms 13; and a plurality of shunts or conductors 14, preferably of round stranded wire for purposes to be discussed, and adapted to prevent the springs 11 from carrying any material or injurious amount of current, in accordance with a familiar practice.

The frame 4 comprises a plurality of side walls 15 and an intermediate partition or web 16. A plurality of oppositely located sets of integral, internally-extending lugs or fingers 17 are suitably disposed upon the inner faces of the wall 15 and both faces of the web 16, for the purpose of suitably respectively engaging the arms 13 of the springs 11. The brush-containing box 5 is provided with substantially unbroken walls, with the exception of a plurality of narrow slits 18 in the front face of the box for the purpose of permitting a ready removal of brushes by means of a knife, screw-driver, or the like. The box 5 is adapted to suitably inclose the brushes 2 and its radial dimension is preferably slightly greater than that of a new brush, thereby providing for the proper initial guidance of the contact hammer 10. It will be observed that this construction provides a relatively large current-carrying and heat-dissipating surface in contact with the brush 2.

The downwardly extending arm 9 and the body portion of each carriage 7 are shown as provided with a plurality of lugs or tabs 19 that extend inwardly in alternately opposite directions, for the purpose of suitably loosely holding in position the corresponding conductor 14, which has one end 20 suitably intimately secured to the rear wall of the frame 4.

The other end of the shunt 14 is suitably flattened out, and is disposed upon a suitable brush-contact plate 21, preferably of copper or some other good conducting material, and a wearing-plate 22 preferably of steel, is disposed around the shunt 14 upon the other side of the above mentioned flattened portion, the two plates 21 and 22 together with the flattened portion of the shunt being intimately secured together by means of silver soldering, or brazing, to constitute a substantially unitary contact hammer 10. The steel plate 22 is preferably provided with a central, upwardly punched flange 23 for the purpose of preventing chafing or undue wear of the shunt 14 at that point, and the extremity of the arm 9 of each carriage 7 is provided with a front opening or recess 24. The construction of the contact hammer 10 and its mechanical relation to the arm 9 is such that a relatively flexible joint is provided, without imposing any undue strain upon the shunt. A relatively large current-carrying surface of the contact plate 21 is thus maintained in contact with the brush 2 at all times. The provision of the front opening 24 in the extremity of the arm 9 is also serviceable in permitting a suitable flexible movement of the hammer 10 and, moreover, will permit of considerable wear before interfering in any way with the desired freedom of movement. The purpose of the structure just described is to permit the use of a flat stationary contact hammer of relatively large area and to cause the arm 9 to flexibly slide over the wearing plate 22 as the brush moves. In this way, no cutting into the brush end occurs and good contact is maintained throughout the life of the brush.

The springs 11 are disposed in coöperating complementary pairs in association with each carriage 7 and by reason of their conical construction, the laterally extending arms 13 are adapted for perfectly free and independently adjustable movement in conjunction with the corresponding set of fingers 17. In this way, any tendency of the brush to tilt, or any uneven contact pressure on the commutator surface 1 may be readily compensated for, by merely varying the relative torques exerted by the pairs of springs that operate upon each carriage 7.

Moreover, in many prior structures, an additional flat spring has been associated with the free end of the brush-biasing carriage employed, to prevent "chattering" of the sluggishly-operating carriage from the relatively rapid movements of the brush. The structure just recited dispenses with this additional spring by reason of the attachment of one end of the spring 11 to the carriage 7 at the point 12, the outer coil of the spring in effect functioning in the same manner as the above-mentioned flat spring.

Reference may now be had to Figs. 4 and 5, which disclose a modified structure embodying my invention that comprises the frame 4; the brush-containing box 5; the shunt or conductor 14; a movable carriage 7^a that is suitably mounted upon a transversely extending pin 8^a, and is provided with a suitably curved spring arm 30 that may be secured to the carriage 7^a by means of rivets 31, or in any other suitable manner, the arm having a suitably curled lower end 32 with which is associated a contact hammer 10^a, comprising the contact plate 21, the flattened portion of the shunt 14 and a suitably intimately associated wearing plate 33 that is

provided with a plurality of hooked end projections 34 for loosely engaging the curled portion 32 of the arm 30. The brush-biasing springs 11^a are similar to those illustrated in the former figures and respectively have their outer ends attached to the carriages 7^a at the points 12^a, and are again provided with lateral extensions 13 of their inner ends. Each shunt 14 may extend from the point 20 in the rear wall of the frame 4 through the carriage 7^a, wherein it may be loosely held by a plurality of the tabs 19, to the brush contact hammer 10^a in a manner similar to that shown in Fig. 2, or any other suitable arrangement may be employed.

It should be noted, however, that a round stranded conductor is preferably employed as a current shunt, not only because of its greater current-carrying capacity, but also because of its relative rigidity and ruggedness compared with the flat type of shunt that is often employed.

The curled portion 32 of the spring arm 30 is of sufficient width to permit of the sliding movement of the arm on the relatively stationary hammer 10^a, as described in connection with the arm 9 and the hammer 10. The resilient arm 30 serves to prevent the "chattering" of the carriage hereinbefore referred to, and is desirable in this case, inasmuch as the supporting-point 12^a for the spring 11^a is relatively distant from the plane of action of the brush, as compared with the corresponding point 12 in Fig. 1.

I do not wish to be restricted to the specific structural details or arrangement of parts herein set forth, but desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a brush-holding device, the combination with a brush, and a contact-hammer therefor, of a brush-biasing carriage connected to said hammer by a flexible conductor and adapted to move laterally with respect thereto as the brush moves in said device.

2. In a brush-holding device, the combination with a brush, and a contact-hammer therefor, adapted to remain stationary thereon, of a brush-biasing carriage flexibly connected to said hammer by a current-carrying conductor and adapted to compensate for brush movement by sliding on the hammer.

3. In a brush-holding device, the combination with a brush, and a contact-hammer therefor, of relatively large contact area, of a brush-biasing carriage having said hammer flexibly secured thereto by a current-carrying conductor and adapted to slide on the hammer as the brush moves, whereby the hammer remains substantially stationary relative to said brush.

In testimony whereof, I have hereunto subscribed my name this 15th day of Oct., 1914.

LAWRENCE W. TURNBULL.

Witnesses:
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