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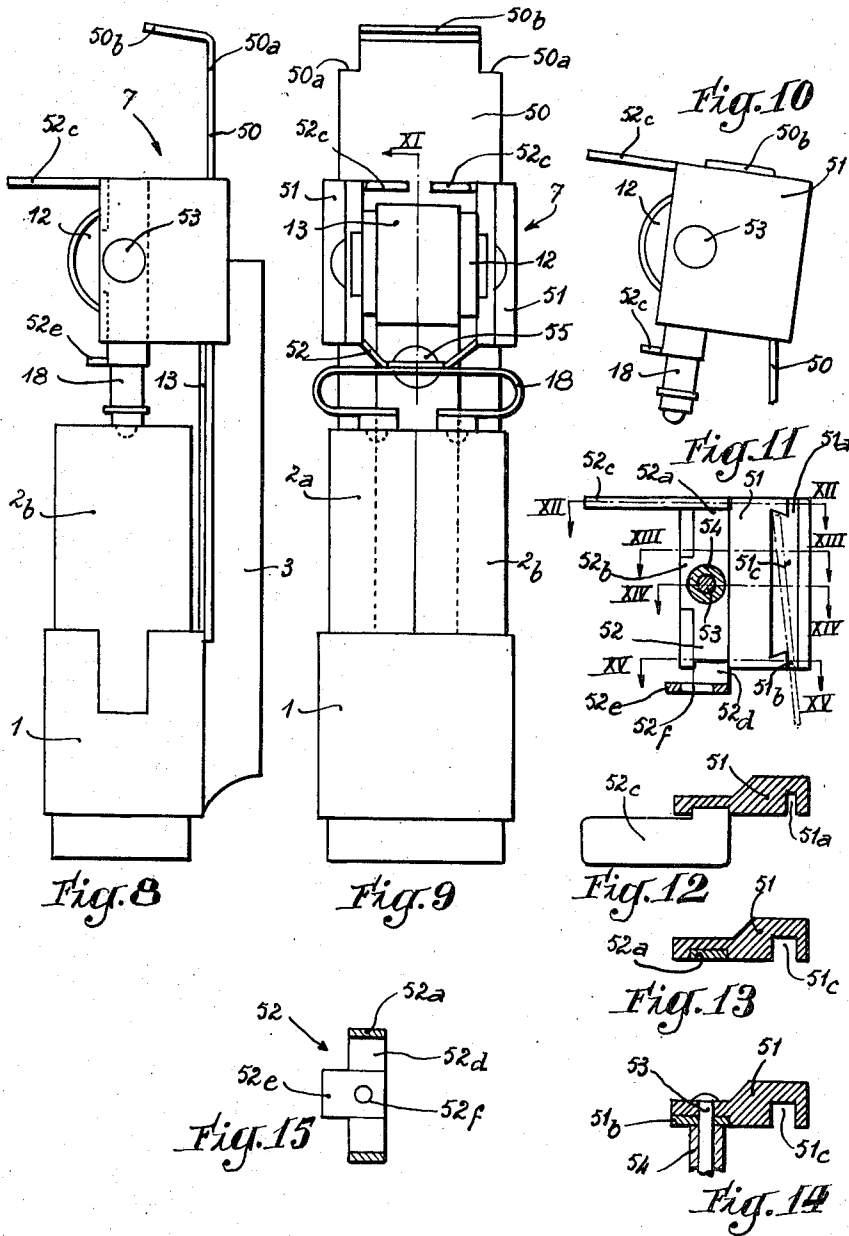
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BRUSH-HOLDERS

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BRUSH-HOLDERS

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This invention relates to brush-holders for rotary electric machines, in which a substantially constant pressure of the brush against the commutator or like rotary current-collecting member is obtained by means of a resilient strip having one end secured to the brush holder while its other end tends to roll on itself to form a loop which acts on the brush. In such brush-holders the loop is generally in direct engagement with the free end of the brush. The disadvantage of this arrangement is that during the unavoidable longitudinal displacements of the brush within the brush-holder, the loop rotates on itself and therefore imparts to the brush transverse frictional components which cause vibrations and irregularities in the distribution of pressure on the contacting area between the brush and the rotary current-collecting member.

It is therefore an object of the present invention to provide a brush-holder construction wherein the loop formed by the resilient strip will impart no transverse frictional component to the brush.

Another object of this invention is to provide a brush-holder wherein the loop of the resilient strip will be formed on a spool rotatably carried by a movable member adapted to act on the brush.

A further object of this invention is to provide a brush-holder wherein the movable member which carries the spool on which the resilient strip is wound will be positively guided in parallel relation to the displacement of the brush within the brush-holder.

Still a further object of this invention is to provide a brush-holder wherein the axis of the spool on which the resilient strip is wound will be supported by the movable member substantially in a plane containing the axis of displacement of the pressure head carried by the said member to act on the brush, in such a manner that the movable member may freely slide in its guides without being submitted to any torque about an axis transverse to its direction of displacement.

In the annexed drawings:

FIG. 1 is a side view with parts in section illustrating a brush holder according to this invention.

FIG. 2 is the corresponding plan view.

FIG. 3 is a front view of the frame adapted to support the spool on which the resilient strip is wound.

FIG. 4 is a side view thereof.

FIGS. 5 and 6 are cross-sections taken along lines V—V and VI—VI of FIG. 1, but only showing the removable guiding cage of the movable carriage which supports the spool.

FIG. 7 is a cross-section taken along line VII—VII of FIG. 1.

FIG. 8 is a side view of another embodiment of this invention.

FIG. 9 is the corresponding front view.

FIG. 10 is a fragmental side view illustrating the carriage retained at the upper end of its guiding blade.

FIG. 11 is a section taken along line XI—XI of FIG. 9, but only illustrating the movable carriage without the winding spool and the pressure head.

FIGS. 12 to 14 a fragmental section corresponding to lines XII—XII, XIII—XIII and XIV—XIV of FIG. 11.

FIG. 15 is a section taken along line XV—XV of FIG.

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11 to show the central metallic frame of the movable carriage.

Referring to FIGS. 1 to 7 the brush-holder comprises a box-like frame 1 in which is slidably mounted a brush 2 adapted to cooperate with a rotating current collecting member such as M, this frame being in one with a rear post 3 provided with two lateral grooves 3a. A tooth 3b is formed at the upper end of the side of post 3 which faces frame 1. Tooth 3b retains a guiding cage 4 made of pressed sheet-iron and provided with lateral fingers 4a which engage the lateral grooves 3a of post 3 (see FIG. 7). As shown in FIG. 6 the portion of the guiding cage 4 which is applied against the front side of post 3 is U-shaped in cross-section and it is formed with downwardly extending arms 4b which carry fingers 4a. Cage 4 further extends upwardly in the form of two vertical gutter-shaped portions 4c which face each other, as clearly shown in FIG. 5. Cage 4 carries two vertical guides 5 (FIGS. 5 and 6) which fit into the aforesaid gutter-shaped portions 4c and extend downwardly to the lower edge of the U-shaped portion of cage 4. Guides 5 are made of an insulating material and they are secured to cage 4 as by means of rivets 6. Each has a vertical groove 5a and in these grooves is slidably mounted a flat carriage 7 which supports a pressure head 8 adapted to act on the free upper end of brush 2. On the side of carriage 7 which faces post 3 is mounted a metallic frame 9 secured by means of rivets 10. As illustrated in FIGS. 3 and 4, the vertical sides of frame 9 are at 90° with respect to the plane of frame 9 and each is formed with a lug 9a which extends through a central aperture 7a provided in carriage 7. Lugs 9a are perforated to receive a transverse pin 11 which rotatably carries a spool 12 made of insulating material and disposed within the aforesaid aperture 7a of carriage 7. It is to be noted that the horizontal geometrical axis of pin 11 substantially intersects the vertical axis of the pressure head 8 (i.e. both axes are substantially in the same plane) and that the ends of pin 11 are retained by the vertical sides of aperture 7a once frame 9 is secured to carriage 7.

A resilient metallic strip 13 is wound on spool 12 by its upper end while its lower end is secured to the lower portion of the transverse side of the U-shaped guiding cage 4. Strip 13 is so formed as to tend to roll on itself and to thus impart to spool 12 a downwardly directed force which is practically independent of the position of carriage 7 within cage 4.

It will be understood that carriage 7 is positively guided by guides 5 and that therefore pressure head 8 applies to brush 2 a vertical force without any transverse component. Further since the axis of spool 12 is substantially situated in a vertical plane containing the axis of displacement of pressure head 8, carriage 7 is not submitted to any torque about a transverse axis and therefore it may slide freely in grooves 5a with no noticeable friction. The guiding cage 4 is readily removable from the brush-holder, together with guides 5, carriage 4, spool 12 and strip 13, by merely disengaging the upper edge of cage 4 from the tooth 3b of post 3, then by raising cage 4, by swinging same clockwise in FIG. 1, and by lowering it until it is possible to disengage fingers 4a from grooves 3a which open downwardly and rearwardly, as shown (being noted that grooves 3a could also open upwardly, if desired). Brush 2 is then directly accessible.

The brush-holder of FIGS. 1 to 7 has also the advantage that its overall dimensions in a plane perpendicular to the displacement of the brush (horizontal plane) are not greater than those of a conventional brush-holder of the so-called rack type wherein the brush is urged by a coil spring the upper end of which rests against a plate adjustable in position along a rack-shaped post. This type of brush-holder is of advantage when

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the available space is limited, but it has the drawback that it should be adjusted at frequent intervals as the brush wears to maintain the pressure of the brush against the commutator or slip ring. The brush-holder according to the present invention has the above advantage of limited transverse dimension, but it wholly eliminates the inconvenience of frequent re-adjustments since the pressure exerted on the brush is constant. It is further to be remarked that the frame 1-3 of FIGS. 1 and 2 is substantially identical with the frame of a rack-type brush-holder wherein all the teeth of the rack, apart from the upper one, would have been removed by grinding or otherwise.

In the embodiment of FIGS. 8 to 15 the brush-holder has two elementary brushes 2a and 2b slidably disposed within the same box-like frame 1. The post 3 integral with the said frame 1 carries on its front side which faces frame 1 a substantially rigid guiding blade 50 which is secured by screws not illustrated. The lower end of the resilient strip 13 is attached to the lower end of blade 50.

The pressure head 18 which acts on brushes 2a, 2b is here in the form of a transverse spring blade having its ends turned at 180° and the movable carriage by which it is supported is slidably guided by the rigid guiding blade 50. This carriage comprises two lateral cheeks 51 made of insulating material and a central U-shaped metallic frame 52 secured to cheeks 51 by means of a single transverse rivet 53 which carries the spool 12 on which the upper end of the resilient strip 13 is wound. As illustrated in FIGS. 11 to 15 each cheek 51 grooved to receive a vertical branch 52a of frame 52 and each branch 52a has a wider central portion 52b which is perforated for passage of rivet 53. On rivet 53 is disposed a tubular spacing stay 54 which maintains branches 52a at the proper distance from each other and which forms a supporting pin for spool 12 (not illustrated in FIG. 11). The upper end of each branch 52a is formed with a forwardly extending wing 52c which is bent horizontally in such manner as to form an actuating member when it is desired to raise the carriage. The intermediate portion 52d of frame 52 has a central lug 53e (FIG. 15) which is perforated for passage of the rivet 55 (see FIG. 3) by means of which the pressure head 18 is secured to frame 52.

The facing sides of cheeks 51 are of course grooved to slidably receive the vertical edges of the guiding blade 50. Each groove comprises two end portions 51a and 51b (FIG. 11) having a width only very slightly larger than the thickness of blade 50, and an intermediate portion 51c of much larger width. As shown in FIG. 9 the guiding blade 50 has an upper portion of somewhat reduced width which determines two lateral shoulders 50a. The free end of the upper portion of blade 50 is bent forwardly as indicated at 50b in FIGS. 8 and 9.

The brush-holder of FIGS. 8 to 15 operates as described with reference to the embodiment of FIGS. 1 to 7. Here again the tendency of the resilient strip 13 to roll on itself on spool 12 produces a substantially constant downwardly directed force which is uniformly applied to brushes 2a, 2b by pressure head 18. The axis of spool 12 being situated in the same plane as the axis of displacement of head 18 (this latter axis being of course the vertical axis of rivet 55), no torque is applied to carriage 51-52 which may slide freely on blade 50 with no noticeable friction.

When carriage 51-52 is raised manually by acting on wings 52c, it is of course submitted to a torque of transverse axis which tends to rock same clockwise as seen in FIG. 8, this torque resulting from the fact that the vertical raising force is applied to the carriage at a horizontal distance from the axis of spool 12. This torque is supported by the guiding surfaces of blade 50 and of the portions 51a, 51b of the grooves of cheeks 51. But when the upper shoulders 50a reach the wide intermediate portion 51c, the carriage may tilt through a limited angle and it assumes the oblique position illustrated in FIG. 10.

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At this position the guiding blade 50 is itself obliquely disposed relatively to the carriage, as indicated in dash and dot lines in FIG. 11 and therefore shoulders 50a are situated below the inner shoulders which join each widened portion 51c with corresponding narrow upper portion 51a. When the carriage is released, it will be retained at the position shown in FIG. 10 until it is positively tilted counterclockwise to be returned to its normal vertical position.

The forwardly directed upper end 50b of blade 50 forms an abutment to limit the upward stroke of the carriage. The ends of the widened portion 51c of each groove of cheeks 51 may be somewhat recessed as shown in order to obtain that the carriage be safely retained at the raised position of FIG. 10.

The brush-holder according to the present invention is of particular interest in the case of electric machines comprising a large number of brushes in a space of limited dimensions, as for instance in alternators in which direct current of high intensity is supplied to the rotor by means of a pair of slip rings. It has hitherto been customary with such machines to use brush-holders of the rack-type, i.e. in which the brush is urged towards the slip ring by a compression spring resting against a small carriage which may be locked at the desired position along a toothed lateral vertical post. Such a type of brush-holder is of quite small dimensions in the longitudinal and transverse direction with respect to the axis of the machine, and it therefore permits of disposing a quite large number of brushes along the periphery of a pair of adjacent slip rings. Further the carriage is easily removable when it is desired to remove the brush. But as the height or length of the brush decreases under the action of wear, the pressure exerted by the spring on this brush also decreases and it is therefore necessary to proceed from time to time to a re-adjustment of all the brush-holders of the machine. The brush-holder according to the present invention may be established to the dimensions and contour of the known rack-type brush-holders. It may therefore be used in the same electric machines with the advantage that the pressure applied to the brush remains constant, which dispenses with any kind of re-adjustment.

I claim:

1. A brush-holder for an electric machine having a rotatable member, comprising an open-ended box-like frame to slidably receive a brush which is movable therein in a pre-determined direction to engage said rotatable current-collecting member; a pressure head acting on said brush to urge same in said direction into contact with said rotatable current-collecting member, said pressure head being movable along an axis of displacement substantially parallel to said direction; a movable member to which said pressure head is secured; means on said frame to guide said movable member in a direction substantially parallel to the direction of movement of said brush in said frame; a spool rotatably carried by said movable member with the axis of said spool disposed substantially at right angles to the axis of displacement of said pressure head and with both axes lying substantially in the same plane; and a resilient strip having a first end secured to said frame and a second end wound on said spool, said resilient strip being so formed that it tends to roll on itself so as to impart to said spool a substantially constant force substantially parallel to the direction of movement of said brush and directed towards said rotatable current-collecting member.

2. In a brush-holder as claimed in claim 1, said guiding means being removable from said frame.

3. In a brush-holder as claimed in claim 1, said guiding means comprising co-operative stationary and movable surfaces formed on said frame and on said movable member.

4. In a brush-holder as claimed in claim 1, said movable member being in the form of a carriage slidably carried by said guiding means.

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5. A brush-holder for an electric machine having a rotatable current-collecting member, comprising an open-ended box-like frame to slidably receive a brush which is movable therein in a pre-determined direction to engage said rotatable current-collecting member; a pressure head acting on said brush to urge same in said direction into contact with said rotatable current-collecting member, said pressure head being movable along an axis of displacement substantially parallel to said direction; a movable carriage to which said pressure head is secured, said carriage having lateral edges; normally stationary guiding members disposed each side of said carriage, each of said guiding members having a groove wherein one lateral edge of said carriage is slidably guided in a direction substantially parallel to the direction of movement of said brush in said frame; a U-shaped supporting member embracing said guiding members with each of same secured to the inner side of one of the lateral wings of said supporting member; a post carried by said frame to support said supporting member; co-operative means on said post and on said supporting member to removably secure said supporting member to said post; a spool rotatably carried by said carriage with the axis of said spool disposed substantially at right angles to the axis of displacement of said pressure head and with both axes lying substantially in the same plane; and a resilient strip having a first end secured to said supporting member and a second end wound on said spool, said resilient strip being so formed that it tends to roll on itself so as to impart to said spool a substantially constant force substantially parallel to the direction of movement of said brush and directed towards said rotatable current-collecting member.

6. In a brush-holder as claimed in claim 5 said post having a tooth to retain said supporting member against the reaction exerted by said resilient strip, said post further having two lateral guideways substantially parallel to the direction of movement of said brush in said frame, and said supporting member being formed with lateral arms having fingers at their outer ends to engage said guideways and to thereby retain said supporting member transversely of said post.

7. In a brush-holder as claimed in claim 5, said guiding members and said spool being made of an insulating material.

8. A brush-holder for electric machines having a rotatable current-collecting member, comprising an open-ended box-like frame to slidably receive a brush which is mov-

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able therein in a pre-determined direction to engage said rotatable current-collecting member; a pressure head acting on said brush to urge same in said direction into contact with said rotatable current-collecting member, said pressure head being movable along an axis of displacement substantially parallel to said direction; a movable carriage to which said pressure head is secured, said carriage being formed with lateral cheeks facing each other, each having on its inner side a groove substantially parallel to the direction of movement of said brush; a substantially rigid stationary guiding blade having its edges slidably engaged in the grooves of said cheeks to guide said carriage; a post secured to said frame to support said guiding blade; a spool rotatably carried by said carriage with the axis of said spool disposed substantially at right angles to the axis of displacement of said pressure head and with both axes lying substantially in the same plane; and a resilient strip having a first end secured to said supporting member and a second end wound in said spool, said resilient strip being so formed that it tends to roll on itself so as to impart to said spool a substantially constant force substantially parallel to the direction of movement of said brush and directed towards said rotatable current-collecting member.

9. In a brush-holder as claimed in claim 8, means to retain said carriage at a position remote from said cage.

10. In a brush-holder as claimed in claim 8, each groove of each of said cheeks comprising two short end portions having a width substantially equal to the thickness of the corresponding edge of said guiding blade and an intermediate portion of substantially larger width, with an inner shoulder joining said intermediate portion with each end portion, and said guiding blade having at its end farthest from said frame a portion of reduced width determining a lateral shoulder on each of said lateral edges, in such manner that when said carriage is positively displaced against the action of said resilient strip until said lateral shoulders of said blade come into said intermediate portion of said grooves, said carriage may be tilted and moved backwards to bring said lateral shoulders into contact with said inner shoulders to retain said carriage at a position remote from said frame.

No references cited.

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