April 17, 1928. 1,666,459

G. H. LELAND

BRUSH LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE

Filed July 13, 1927 2 Sheets-Shee 1

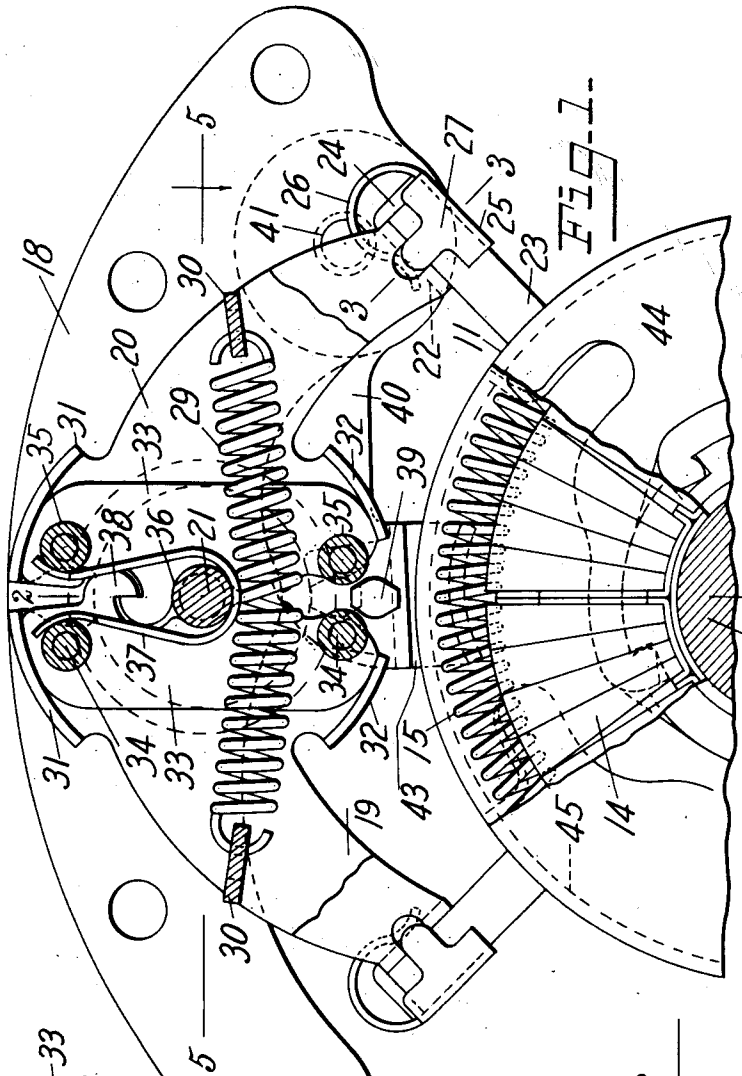


Fig. 1.

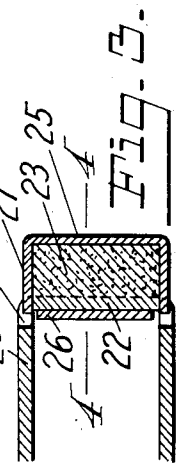


Fig. 3.

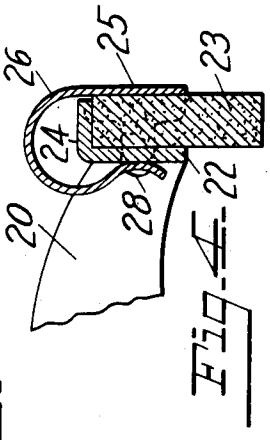


Fig. 4.

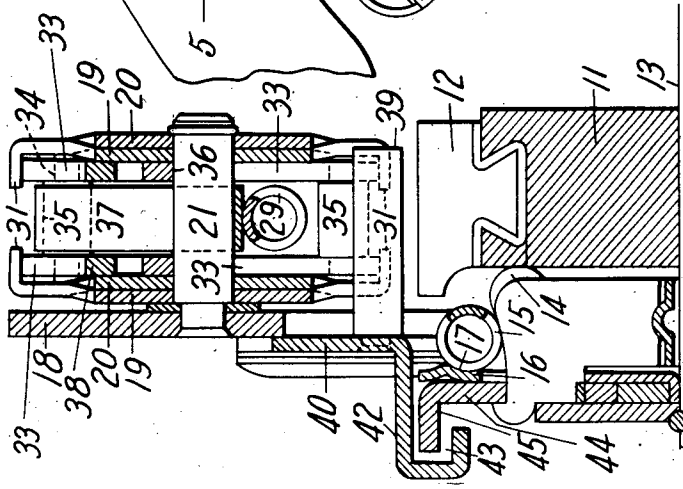


Fig. 2.

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BRUSH LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE

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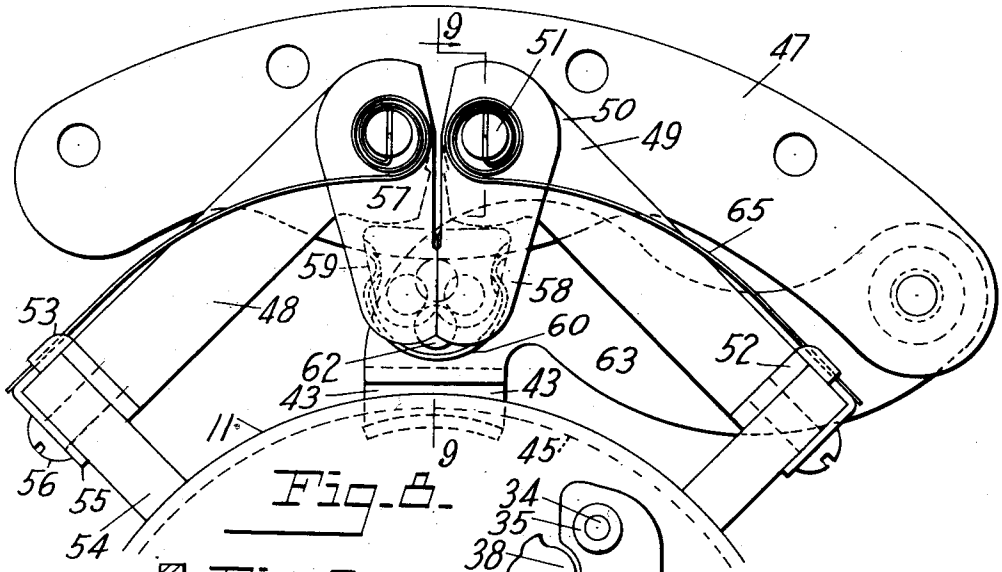


Fig. 8.

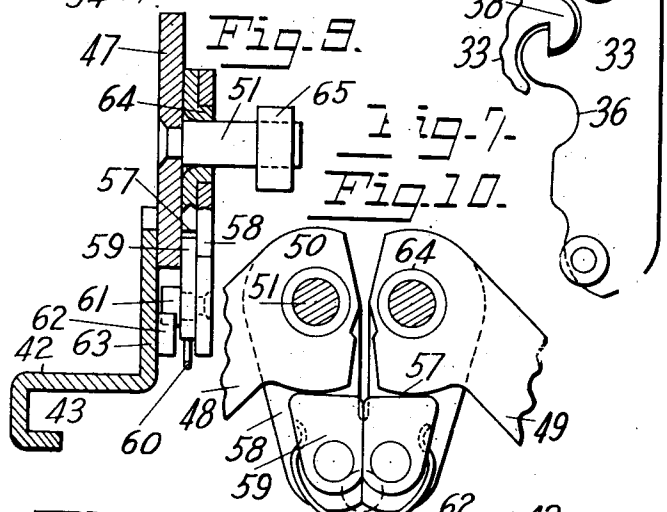


Fig. 9.

Fig. 7.

Fig. 10.

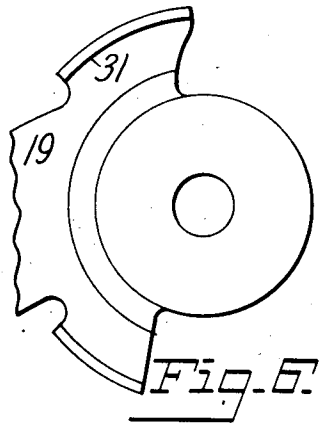
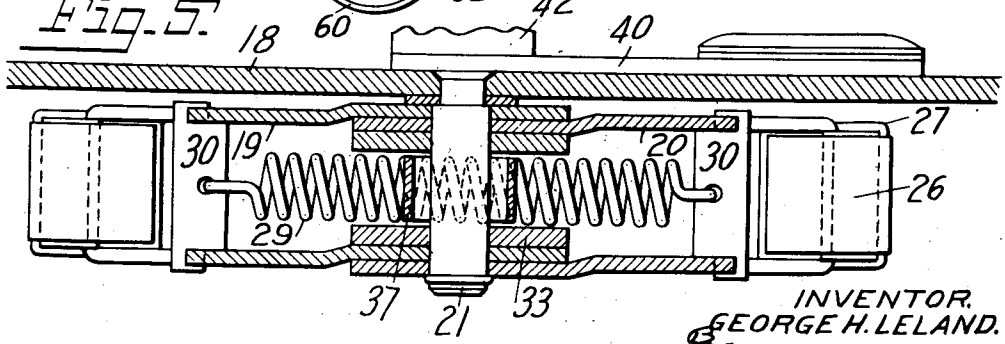


Fig. 6.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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BRUSH-LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE.

Application filed July 13, 1927. Serial No. 205,286.

This invention relates to a brush lifting mechanism for an electric motor or the like. In certain types of motor, more particularly in motors of the repulsion-induction type, where the commutator is short circuited after the motor reaches speed, it is sometimes desirable that the brushes be lifted out of contact with the commutator while the motor is in operation. Various devices have been suggested for this purpose some of which were centrifugally operated but for the most part these devices were more or less complicated in their construction and operation and did not embody means for compensating for the wear of the brushes.

One object of the present invention is to provide a simple efficient device for lifting the brushes out of engagement with the commutator which can be produced at a low cost.

A further object of the invention is to provide such a device in which the brush supporting devices may move toward the commutator as the brushes wear away and in which the actuating devices will operate the brush supporting devices to lift the brushes a substantially uniform distance regardless of the position of the supporting devices with relation to the commutator.

Other objects of the invention will appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a sectional view, taken transversely to the axis of the motor shaft, of a brush lifting device embodying my invention, showing the commutator partly broken away; Fig. 2 is a section taken on the line 2—2 of Fig. 1; Fig. 3 is a section taken on the line 3—3 of Fig. 1; Fig. 4 is a section taken on the line 4—4 of Fig. 3; Fig. 5 is a section taken on the line 5—5 of Fig. 1; Fig. 6 is a detail view of the inner end portion of one of the brush lifting arms; Fig. 7 is a detail of one of the actuating devices; Fig. 8 is a rear elevation of a modified form of the brush lifting mechanism; Fig. 9 is a section taken on the line 9—9 of Fig. 8; and Fig. 10 is a detail view of the actuating devices and the end portions of the brush supporting arms.

In these drawings I have illustrated two embodiments of my invention and have shown the same as applied to the commutator of a repulsion-induction motor but it will be understood that these embodiments have been chosen for the purpose of illustration only and that the lifting mechanism may take various forms and may be applied to motors or other devices of various kinds without departing from the spirit of the invention.

As here illustrated the mechanism is shown in connection with the commutator 11 of a repulsion-induction motor, which commutator has the usual insulated contact bars 12 and is carried by the motor shaft 13. Cooperating with the commutator is a series of short circuiting weights 14 arranged in circumferential series about the motor shaft and adapted to be actuated by centrifugal force to move the same into short circuiting contact with the commutator bars 12. An annular contractile band or spring 15 acts on the outer ends of the weights to resist their outward movement, and a retaining plate 16 has an annular shoulder 17 which cooperates with the spring 15 to retard the movement of the weights until the force applied thereto is sufficient to move all the weights simultaneously and quickly into their extended or contracted positions as the case may be. This short circuiting mechanism forms no part of the present invention and need not be here described in detail.

The brush lifting mechanism comprises two brush supporting devices, preferably in the form of oppositely extending arms pivotally mounted near their adjacent ends and having means at their outer ends for supporting the brushes. Each brush supporting arm has a part provided with a friction surface, and cooperating with the brush supporting arms are actuating devices having friction surfaces arranged to operatively engage the respective friction surfaces of the brush supporting arms. The several friction surfaces are so arranged that when the actuating devices are in their normal or inoperative positions their friction surfaces will be in inoperative relation to the friction surfaces of the arms but when operative movement is imparted to the actuating devices their friction surfaces will operatively engage the corresponding friction surfaces of the arms so as to establish operative connection between the actuating devices and the arms and cause the arms to move with the actuating devices upon the further movement of the latter. Thus when the actuating devices are in their inoperative positions the arms can move inwardly with relation

thereto to compensate for the wear on the brushes, and when the actuating devices are operated the operative connection between the same and the arms will be established regardless of the position to which the arms may have been moved with relation to the actuating devices. The construction of the brush supporting devices and the actuating devices and the arrangement of the corresponding friction surfaces may take various forms and I have, in the present instance, showed two somewhat different mechanisms, both of which operate on the same principle and embody broadly the same features of construction.

In that form of the mechanism shown in Figs. 1 to 7, the brush lifting mechanism comprises a supporting structure or plate 18 adapted to be mounted in a fixed position with relation to the commutator, and which is preferably carried by the motor casing, which is not here shown. Carried by the supporting structure 18 are two brush supporting devices which are preferably in the form of oppositely extending arms 19 and 20 which are pivotally supported at their adjacent ends on a common axis, and are shown as supported by a single stud 21 rigidly secured to and extending rearwardly from the supporting structure or plate 18. In this form of the device each brush supporting arm comprises two substantially parallel side members connected one to the other at their outer ends by a transverse bar 22 and, if desired, each arm may be formed from a single piece of metal bent to the desired shape. Each arm is provided at its outer end with means for supporting a brush 23 thereon and, as here shown, the transverse bar 22 has an outwardly extending portion 24 at its upper edge, which cooperates with the bar 22 to form a seat for the brush. A spring clip comprising an outer portion 25, which contacts with the outer face of the brush, and an inwardly and downwardly curved portion 26, which has resilient contact with the rear face of the transverse bar 22, serves to hold the brush firmly in contact with its seat. The outer or contact portion 25 of the clip has inwardly extending parts 27 to engage the edges of the brush and hold the same against lateral displacement. Preferably the inner portions of these parts 27 are of reduced width and enter recesses or slots 28 in the respective side members of the arm and thus establish an interlocking connection between the clip and the arm which holds the clip against vertical displacement with relation thereto. The inner or adjacent portions of the two arms are here shown as enlarged and the corresponding side members of the two arms overlap so that the stud 21 may extend through both side members of both arms. A spring 29 is connected at its ends with the respective arms, preferably by means of lugs 30, and tends to move the brushes toward the commutator.

The friction surfaces of the arms and the actuating devices which cooperate with those friction surfaces may take various forms and in this form of the invention the enlarged inner portions of the side members of each arm are provided with inwardly extending flanges 31 and 32, which are here shown as curved about the axis of the stud 21, and the flanges of the two side members of each arm extend one toward the other. The inner surfaces of these flanges constitute the friction surfaces of the respective arms. There is preferably a separate actuating device for each arm and, in the present construction, each actuating device comprises two plates 33, the two plates of each actuating device being rigidly connected one to the other, near their upper and lower ends, by tie bars or pins 34 and, if desired, each pin may be provided with a roller 35. These actuating devices are, in this mechanism, supported upon the stud 21 and, as here shown, each plate of each actuating device has in its inner edge a recess 36 to embrace the adjacent portion of the stud and form a support for the actuating device. A spring 37 acts on the upper rollers 35 of the two actuating devices and tends to move the upper portions of the actuating devices one from the other. This movement is limited by interlocking parts of the two actuating devices. As here shown, the corresponding plates 33 of the two actuating devices have opposed lugs 38 which are moved into contact one with the other by the action of the spring 37 and thus limit the outward movement of the upper portions of the actuating devices and also constitute a fulcrum about which the lower portions of the actuating devices may be moved. Due to this interlocking connection between the two actuating devices the spring 37 tends to move the lower portions of the actuating devices one toward the other and to thus retain the actuating devices in their normal or inoperative positions. The upper and lower edges of the two plates of each actuating device constitute friction surfaces and are arranged in cooperative relation with the respective friction surfaces 31 and 32 of the brush lifting arms. The friction surfaces of the actuating devices are of such a character that when these actuating devices are in their normal positions the friction surfaces thereof will be in inoperative relation to the friction surfaces of the arms and no connection will be established between the arms and the actuating devices, but the arms will be free to move with relation to the actuating devices under the influence of the spring 29. When the lower portions of the two actuating devices are separated the actuating devices will move about the fulcrum established

by the interlocking parts 38 and the edges thereof will be brought into operative engagement with the respective friction surfaces of the arms, thus establishing an operative connection between the actuating devices and the arms, so that the further movement of the actuating devices will impart movement to the arms and the brushes carried thereby.

Operative movement may be imparted to the actuating devices in any suitable manner but I prefer to employ an upwardly movable operating member or stud 39 arranged normally in an inoperative position with relation to the rollers 35 at the lower ends of the actuating plates and adapted to engage those rollers when upward movement is imparted to the stud and thus separate the rollers and operate the actuating devices. This stud preferably has its greatest thickness at its horizontal diameter and is so arranged that it will be supported in its uppermost position, as shown in dotted lines in Fig. 1, by the rollers but will hold those rollers in their separated positions. In the present instance, this stud is carried by a lever 40 pivotally mounted at 41 on the supporting structure or plate 18, and having means for operatively connecting the same with a centrifugal device. As here shown, the lever has at its free end, and adjacent to the stud 39, a forwardly extending portion 42, the forward end of which is bent downwardly and inwardly to form a groove 43. The centrifugal device comprises a series of weights 44 mounted about the axis of the motor shaft and each having at its outer edge a forwardly extending flange 45 which enters the groove 43 of the lever 40, so that the movement of the centrifugal weights will be imparted to the lever. The arrangement of the lever with relation to the weights is such that when these parts are in either their outermost or innermost positions the flange 45 will be out of contact with both the inner and outer walls of the groove 43. Inasmuch as the centrifugal device and its operative connection with the lever do not in themselves form any part of the present invention it is not necessary to here describe them in detail.

As illustrative of the various forms the mechanism may take I have shown in Figs. 8, 9 and 10, another arrangement of the mechanism. As shown in these figures the mechanism comprises a supporting structure or plate 47 adapted to be supported on the motor casing or in any other suitable manner. The brush supporting devices comprises oppositely extending arms 48 and 49 which are pivotally mounted at their adjacent ends on the supporting structure. In this instance the arms are mounted on separate axes and each is shown as having an enlarged inner end portion 50, which end portions are journaled on studs 51 rigidly secured to the supporting structure. Each arm consists of a single member which has at its outer end a transverse portion or bar 52 provided with an overhanging upper end portion 53 to constitute a seat for the brush 54. A clip 55 engages the outer surface of the brush and is secured to the cross bar 52 by a screw 56.

The lower edge 57 of the enlarged portion of each arm constitutes a friction surface and these surfaces are preferably curved about the axes of the respective studs 51. The actuating devices are shown in the form of plates 58 pivotally mounted on the studs 51 and having pivotally mounted on other lower portions upwardly extending supplemental plates 59, the upper edges of which constitute friction surfaces to cooperate with the respective friction surfaces 57 of the arms 48 and 49. A spring 60 acts on the supplemental plates 59 to move the upper portions thereof one toward the other and also to move the lower portions of the plate 58 one toward the other. Each of the supplemental plates has a forwardly extending stud 61 which, in the present instance, forms a part of the pivot pin by means of which the plate is connected with the supporting arm 58. An operating member or stud 62, mounted on a lever 63 and operated as above described, is arranged to engage the stud 61 and separate the lower ends of the actuator plates 58. The spring 60 acting directly upon the supplemental plates 59 holds the upper ends of these plates in contact one with the other while the lower portions of the plates are being separated, thus causing the friction surfaces of the plates 59 to engage the friction surfaces of the respective arms and establish an operative connection between the actuating devices and the respective arms, which results in the arms moving with the actuating devices upon the further movement of the latter. The brush supporting arms are moved toward the commutator by a spring of any suitable character and, as here shown, flat springs 65 have their inner ends secured to and coiled about the respective studs 51 and have their outer ends connected with the outer ends of the respective levers to press the brushes toward the commutator.

It will be apparent that in the operation of the device an upward thrust is exerted on the arms 49 and a downward thrust on the actuator plates 58. To relieve the studs 51 of these strains and to maintain the parts in their correct relative positions I prefer to support the actuator plates on the arms. As here shown, each arm has a rearwardly extending boss 64 through which the stud 51 passes and the actuator plates are supported on the respective bosses.

While I have shown and described certain

embodiments of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A brush lifting mechanism for an electric motor or the like, comprising a movable device having means to support a brush either in or out of engagement with the commutator of said motor and having a friction surface, an actuating device comprising a plate having its edge arranged to cooperate with the friction surface of said supporting device, said friction surface and said plate being normally so positioned that said supporting device will be free to move with relation to said actuating device, and means for imparting movement to said actuating device to cause the edge of said plate to operatively engage said friction surface and to actuate said supporting device.

2. A brush lifting mechanism for an electric motor or the like, comprising a pivoted brush supporting arm having a friction surface, means acting on said arm to move a brush carried thereby into engagement with the commutator of said motor, an actuating device comprising a plate having an edge portion movable into and out of operative engagement with the friction surface of said arm and held normally in an inoperative position to permit said arm to move with relation to said actuating device, and means for imparting pivotal movement to said plate to cause the edge thereof to operatively engage said friction surface and to then cause said actuating device to impart movement to said arm.

3. A brush lifting mechanism for an electric motor or the like, comprising a pair of oppositely extending arms each having means for supporting a brush at the outer end thereof and each having a friction surface, an actuating device for each of said arms having an edge arranged to cooperate with the friction surface of the corresponding arm, said actuating devices being movable toward and from each other, means acting on said actuating devices to hold the edges thereof normally in inoperative relation to the friction surfaces of the respective arms, a device to impart movement to said actuating devices to cause said edges thereof to operatively engage the friction surfaces of the respective arms and to then impart further movement to said actuating devices to cause said arms to lift the brushes out of engagement with said commutator, and a centrifugal device to operate the last mentioned device.

4. A brush lifting device for electric motors or the like, comprising a pivoted brush supporting arm having a laterally extending portion provided with a friction surface, means acting on said arm to move a brush supported thereby toward the commutator of said motor, an actuating device pivotally supported adjacent to said arm and having a part to engage said friction surface of said arm, said actuating device being normally arranged to permit the free movement of said arm with relation thereto, and means for imparting movement to said actuating device to cause said part thereof to operatively engage said friction surface of said arm and to actuate said arm.

5. A brush lifting mechanism for an electric motor or the like, comprising a pivoted brush supporting arm having oppositely facing friction surfaces arranged on the opposite sides of its axis and having means to support a brush near the outer end thereof, means acting on said arm to move a brush supported thereby toward the commutator of said motor, an actuating device supported adjacent to said arm and having parts arranged to engage the respective friction surfaces of said arm, said parts being normally so arranged with relation to said friction surfaces as to permit the free movement of said arm with relation to said actuating device, and means for imparting movement to said actuating device to cause said parts thereof to operatively engage the friction surfaces of said arm and to actuate said arm.

6. A brush lifting mechanism for an electric motor or the like, comprising a pivoted brush supporting arm having oppositely facing friction surfaces arranged on the opposite sides of its axis and having means to support a brush near the outer end thereof, means acting on said arm to move a brush supported thereby toward the commutator of said motor, an actuating device pivotally supported adjacent to said arm and having parts to cooperate with the respective friction surfaces of said arm, means for holding said actuating device normally in a position to support said parts in inoperative relation to the respective friction surfaces, and means to impart pivotal movement to said actuating device to cause said parts thereof to operatively engage the respective friction surfaces of said arm and to impart movement to said arm.

7. A brush lifting mechanism for an electric motor or the like comprising an arm pivotally supported near the inner end thereof and having laterally extending flanges near the upper and lower edges of the inner portion thereof and also having means for supporting a brush near the outer end thereof, an actuating device comprising a plate arranged between said flanges and having its edges adapted to cooperate with said flanges to establish an operative connection between said actuating devices and said arm, means

for holding said plate normally in a position to interrupt the connection between the same and said arm, and means for actuating said plate to cause said edges thereof to engage the respective flanges and establish an operative connection between said plate and said arm.

8. A brush lifting mechanism for electric motors or the like, comprising a pair of oppositely extending arms pivotally mounted on a common axis and each having a laterally extending portion provided with a friction surface and each having means for supporting a brush at the outer end thereof, actuating devices comprising plates supported adjacent to the respective arms and each having an edge portion to cooperate with the friction surface of the adjacent arm, means acting on said plates to hold said edges thereof normally in inoperative positions with relation to the respective friction surfaces, and means for imparting turning movement to said plates to cause said edges to operatively engage the respective friction surfaces and actuate said arms.

9. A brush lifting mechanism for an electric motor or the like, comprising a pair of oppositely extending arms pivotally mounted at their adjacent ends on a common axis and each having means for supporting a brush near its outer end, each of said arms having a laterally extending portion provided with a friction surface, actuating plates pivotally mounted between their ends and each having an edge portion on one side of its axis arranged to cooperate with the friction surface of one of said arms, springs acting on said plates to hold said edges normally in inoperative positions with relation to said friction surfaces, and means acting on each plate on the other side of the axis thereof to cause said edges to operatively engage said friction surfaces and to then move said plates with relation one to the other to actuate said arms.

10. A brush lifting mechanism for electric motors or the like, comprising oppositely extending arms pivotally mounted near their adjacent ends on a common axis and each having means for supporting a brush near the outer end thereof, each of said arms having a laterally extending portion provided with a friction surface, actuating members arranged adjacent to the respective arms and each having a part to cooperate with the friction surface of the adjacent arm to establish an operative connection between said actuating device and said arm, a spring acting on said actuating devices to move said parts thereof one from the other, said actuating devices having interlocking parts to limit the relative movement of the first mentioned parts, and means to engage said actuating devices and move the same about the fulcrum formed by said interlocking parts to cause said actuating devices to operatively engage the friction surfaces of the respective arms.

11. A brush lifting mechanism for an electric motor or the like, comprising oppositely extending arms each having near its inner end a laterally extending portion provided with a friction surface and each having near its outer end means for supporting a brush, a supporting stud on which said arms are pivotally mounted, actuating members supported by said stud and each having a part to engage the friction surface of one of said arms, a spring acting on said devices to move said parts thereof one from the other, said actuating devices having interlocking portions to limit the movement thereof by said spring, and an operating member arranged to engage said actuating devices on that side of said stud opposite the arm engaging parts thereof to cause said arm engaging parts to operatively engage the friction surfaces of the respective arms and to impart movement to said arms.

12. A brush lifting device for an electric motor or the like, comprising a pair of oppositely extending arms, a stud on which said arms are pivotally mounted, each of said arms having near its inner end laterally extending flanges provided with friction surfaces and each of said arms having near its outer ends means for supporting a brush, actuating devices each comprising a plate arranged between the flanges of one of said arms and having its edges adapted to cooperate with said flanges to establish a connection between the same and said arm, said actuating devices being pivotally supported on said stud and being capable of movement transversely to said stud, a spring acting on said actuating devices on one side of said stud to move the adjacent portions thereof one from the other, said actuating devices having cooperating parts to limit the movement thereof by said spring, and an operating member to engage said actuating devices on that side of said stud opposite the first mentioned parts thereof to move the same about the fulcrum established by said cooperating parts and to cause said edges thereof to operatively engage the respective flanges of said arm and to impart movement to said arm.

13. A brush lifting mechanism for an electric motor or the like, comprising oppositely extending arms, a stud on which said arms are pivotally mounted, each of said arms having near the pivoted end thereof laterally extending parts curved about the axis of said stud and comprising friction surfaces, each of said arms also having means for supporting a brush near the outer end thereof, actuating devices comprising plates arranged between the flanges of the respective arms and having their edges ar-

ranged to cooperate with said flanges to establish operative connections between said actuating devices and the respective arms, each of said plates having an intermediate recess in the inner edge thereof to embrace said stud and having above said stud interlocking parts to limit the movement of the upper portions of said plates with relation one to the other, a spring acting on the upper portions of said plates to hold said interlocking parts normally in engagement, and an operating member to move the lower portions of said plates one from the other and thus cause the edges of said plates to operatively engage the respective flanges of said arm.

14. A brush lifting device for electric motors or the like, comprising oppositely extending arms, each arm consisting of parallel side members and each side member of each arm having near its upper and lower edges curved flanges extending toward the other side member of that arm, and each of said arms having means at the outer end thereof for supporting a brush, a stud extending through the inner portions of both side members of both arms and pivotally supporting said arms, actuating members arranged on opposite sides of said stud and each comprising plates rigidly connected one to the other, each plate having its upper and lower edges arranged to cooperate with the flanges of the adjacent side member of one of said arms, a spring acting on the upper ends of the actuating devices to separate the same, the corresponding plates of the two actuating devices having interlocking parts to limit the movement of the upper portions thereof by said spring, said plates having recesses in the edges thereof beneath said interlocking parts to embrace said stud and support said plates thereon, and an operating member to act on the lower portions of said actuating devices to separate the same and cause the edges of the several plates to engage the respective flanges of said arms.

In testimony whereof, I affix my signature hereto.

GEORGE H. LELAND.