Jan. 15, 1929. 1,698,799

G. H. LELAND

BRUSH LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE

Filed July 13, 1927 2 Sheets-Sheet 1

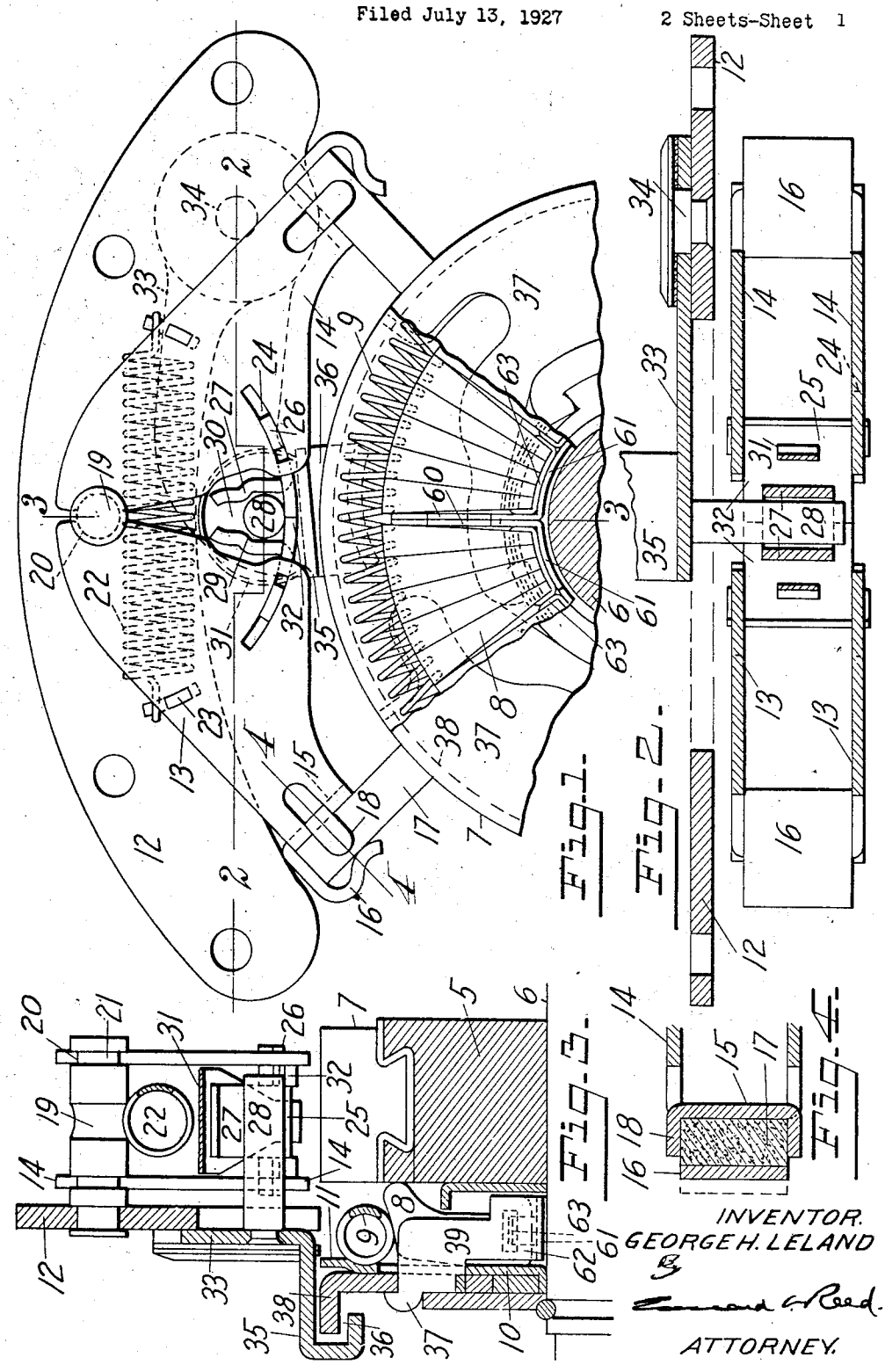


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

INVENTOR.
GEORGE H. LELAND
By Edmund C. Reed.
ATTORNEY.

Jan. 15, 1929. 1,698,799

G. H. LELAND

BRUSH LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE

Filed July 13, 1927 2 Sheets-Sheet 2

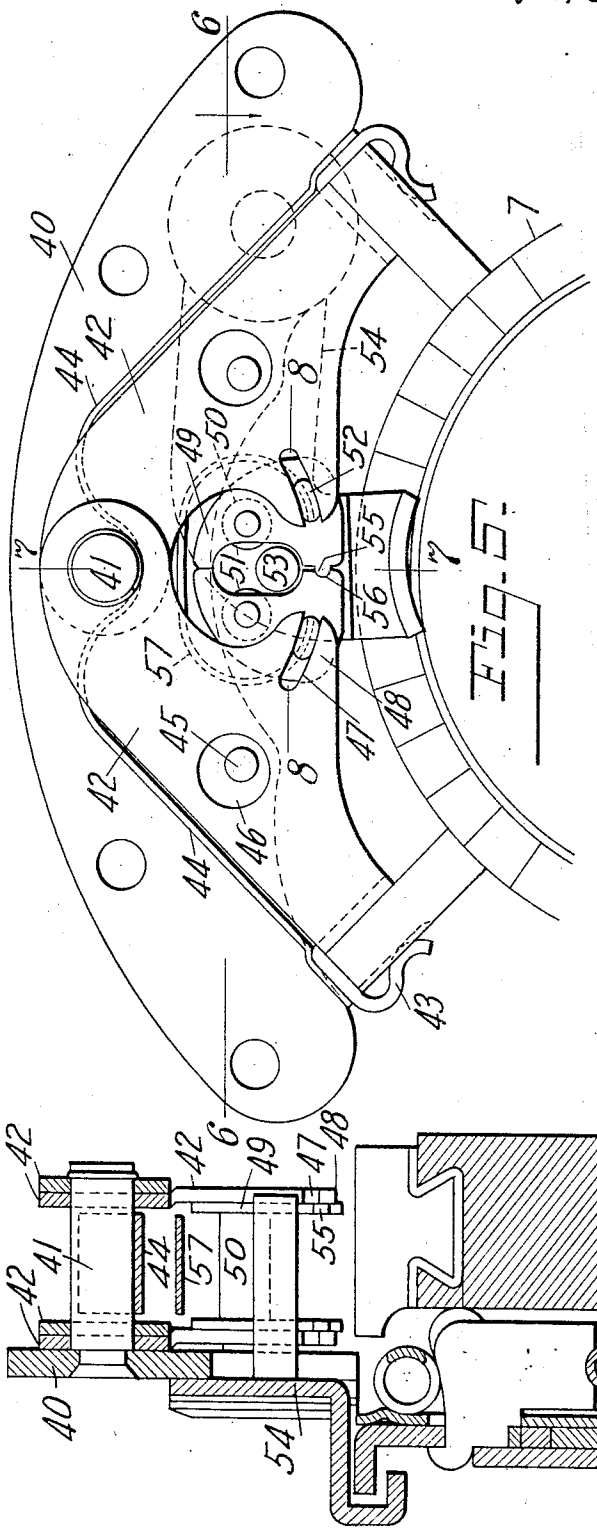


Fig. 5.

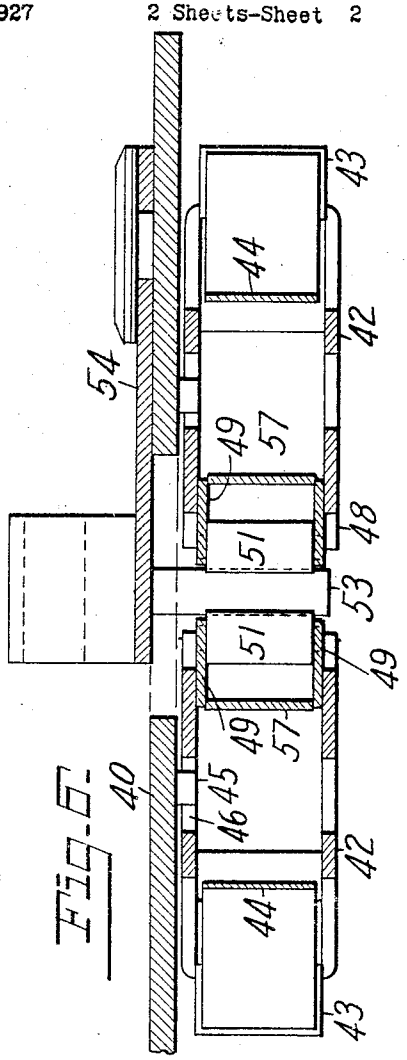


Fig. 6.

Fig. 7.

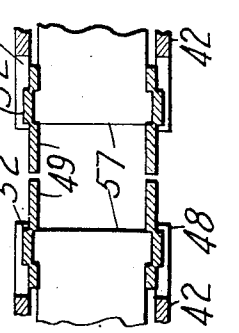


Fig. 8.

INVENTOR.
GEORGE H. LELAND.
By Edward A. Reed
ATTORNEY

Patented Jan. 15, 1929. 1,698,799

UNITED STATES PATENT OFFICE.

GEORGE H. LELAND, OF DAYTON, OHIO, ASSIGNOR TO THE LELAND ELECTRIC COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO.

BRUSH-LIFTING MECHANISM FOR ELECTRIC MOTORS OR THE LIKE.

Application filed July 13, 1927. Serial No. 205,287.

This invention relates to brush lifting mechanism for an electric motor or the like.

In certain types of motors and more particularly in the repulsion-induction type motor, in which the commutator is short circuited after it reaches a predetermined speed, it is desirable that the brushes should be lifted out of engagement with the commutator. Various devices have been proposed for this purpose, some of which were operated by centrifugal force but the most, if not all, of these devices have been open to more or less serious objection. Many of them were complicated in their construction and operation and expensive to manufacture and maintain in service. One fault common to many of these devices was a lack of compensation for the wearing away of the brush. The constructions were such that if a relatively short movement was imparted to the brush any material variations in the length of the brush would render the device inoperative, and in order to lift either a short brush or a long brush out of engagement with the commutator an excessively long movement of the brush lifting mechanism was necessary. In some devices it has been proposed to provide a clutching or clamping connection between the brush and the lifting device but such devices have for the most part been unsatisfactory because they require a very delicate adjustment of the parts and a slight disarrangement of the parts or a variation in the relative strength of the springs would render the device inoperative.

One object of the present invention is to provide a brush lifting mechanism which will automatically accommodate itself to the varying length of the brush as the latter wears away.

A further object of the invention is to provide a brush lifting mechanism in which the brush will be maintained in a fixed position with relation to its supporting member and in which the actuating device for the supporting member will cause the latter to move the brush a predetermined distance regardless of the length of the brush or the position of the supporting member with relation to the commutator.

A further object of the invention is to provide such a brush lifting mechanism which will be simple in its construction, efficient in its operation and which can be produced at a low cost.

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

In the accompanying drawings Fig. 1 is a rear elevation of the brush lifting mechanism embodying my invention showing the same in connection with the commutator of a motor; 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 through the brush holder on the line 4—4 of Fig. 1; Fig. 5 is a front elevation of a slightly modified form of the device; Fig. 6 is a section taken on the line 6—6 of Fig. 5; Fig. 7 is a section taken on the line 7—7 of Fig. 5; and Fig. 8 is a section taken on the line 8—8 of Fig. 5.

In these drawings I have illustrated two embodiments of my invention and have shown the same in connection with a commutator of a repulsion-induction motor but it will be understood that these particular embodiments have been chosen for the purpose of illustration only and that the device may take various forms and may be used with motors or other devices of various kinds.

In illustrating the invention I have shown a portion only of the commutator 5 of the motor which is mounted on the motor shaft 6 and has the usual circumferential series of insulated contact bars 7. Arranged about the axis of the commutator are a series of short circuiting weights 8 which are moved outwardly by centrifugal force and the outward movement of which is resisted by an annular spring 9 which engages the outer edges of the short circuiting weights. The several weights are divided into groups by radial spacing plates 60 having at their inner ends circumferentially extending portions 61 which support the weights of the respective groups. Preferably the several weights are perforated near their inner ends, as shown at 62, and a clip 63 extends beneath the inner ends of the plates and has its inner portions bent outwardly and then transversely to enter the perforations in the adjacent weights. A retaining plate 10 has an annular shoulder 11 which retards the movement of the weights in either direction until the force exerted thereon is sufficient to move all the weights simultaneously and to complete their movement. This short circuiting device forms no part of the present invention and a further description of the same is thought to be unnecessary.

In that particular embodiment of the invention shown in Figs. 1 to 4, the brush lifting mechanism comprises a supporting structure or plate 12 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. Movably mounted on this supporting structure are two brush supporting devices which are preferably in the form of oppositely extending arms 13 pivotally supported near their adjacent ends on the supporting plate 12 and having means at their outer ends for attaching the brushes thereto. In the present device each arm 13 comprises two side members 14 connected one to the other at their outer ends by a transverse bar 15. If desired, each arm may be formed of a single piece of metal bent to the desired shape. The transverse bar of each arm has at its upper edge an outwardly and downwardly extending portion 16 constituting a resilient clip adapted to grip a brush 17 and press the same against the transverse bar 15 of the arm. The outwardly extending portion of the clip serves to limit the upward movement of the brush with relation to the arm and thus holds the brush in a fixed position with relation to the arm. The side members of the arm have outwardly extending parts or lips 18 to engage the edges of the brush and hold the same against lateral displacement with relation to the arm.

The arms may be pivotally mounted on the supporting structure in any suitable manner but are here shown as mounted for movement about a common axis. In the present device, a stud 19 is rigidly secured to and extends rearwardly from the supporting structure or plate 12 and the side members of each arm are provided with substantially semi-circular recesses 20 to embrace the stud and pivotally support the arm thereon. Preferably the stud has circumferential recesses 21 to receive the adjacent portions of the arms and thus hold the latter against movement lengthwise of the stud. A spring 22 is connected at its ends with the respective arms, by means of lugs or plates 23, and serves to hold the recessed portions of the arms in contact with the stud 19 and to move the arms about the axis of that stud to cause the brushes which are carried by the arms to engage the commutator.

Any suitable means may be provided for actuating the two arms to move the same against the action of the spring 22 and lift the brushes out of engagement with the commutator. Preferably there is a separate actuating device for each arm and this actuating device is of such a character and is so arranged that normally it has no operative connection with the arm and the arm is free to move with relation thereto, but when operative movement is imparted to the actuating device an operative connection will be established between the arm and the actuating device, regardless of the relative positions of these parts, and the arm will be caused to move with the actuating device upon the continued movement thereof. As here shown, the arm has a contact surface, which is preferably curved about the axis of the arm, and the actuating device has a part cooperating with this contact surface to establish the connection between the arm and the actuating device. In that particular form of the device here shown each side member of the arm has an arcuate slot 24 curved about the axis of the stud 19, the walls of these slots constitute the contact surfaces of the arm. Each actuating device is in the form of a plate 25 arranged between the side members of the arm and having laterally extending portions or lugs 26 which enter the respective slots 24 and, in the present instance, serve both to support the actuating device on the arm and to control the connection between the actuating device and the arm. The laterally extending parts or lugs 26 are non-circular in shape and are here shown as curved to conform to the curvature of the slots. When the actuating device is in its normal position and the surfaces of the lugs are substantially parallel with the walls of the slots it will be apparent that there will be no operative engagement between the lugs and the arm and that the arm is free to move with relation to the actuating device. However, a slight tilting movement of the actuating device will cause the lugs to turn in the slots sufficiently to grip the walls thereof and establish an operative connection between the same and the arm and this connection will be established when operative moment is imparted to the actuating device regardless of the position of the arm with relation to the actuating device. Each actuating device comprises an upwardly extending portion 27 having a cam surface to cooperate with an operating member, such as a pin or stud 28, which is mounted for upward movement with relation to the actuating devices. In the present instance, the parts 27 of the actuating devices converge upwardly and while they may be provided with straight converging surfaces I prefer to so shape the same as to provide each actuating device with a shoulder 29 arranged just beyond the operating stud 28 and with which that stud will have initial contact when it is moved upwardly. Beyond the shoulders 29 each actuating device has a recess or seat 30 to receive the operating stud when the latter has been moved to its outermost position. A spring 31 acts on the two actuating devices to move the same one toward the other and this movement is limited by inwardly extending parts

32 carried by the respective actuating devices and here shown as arranged beneath the operating stud 28. In the absence of the abutting parts 32 the inward movement of the actuating devices will be limited by the operating stud itself. When the operating stud is in its lowermost position the actuating devices will be held in their normal positions and the arms will be free to move with relation thereto. Consequently as the brushes wear away the arms will shift their positions with relation to the repective actuating devices but the relation between the lugs 26 of the actuating devices and the slots 24 remains the same in all positions of the arms with relation to the actuating devices, and consequently the operative movement of the actuating devices will cause the lugs to engage the walls of the slots and establish operative connection between the actuating devices and the arms, regardless of the positions of the arms with relation to the actuating devices, and the further movement of the actuating devices will impart lifting movement to the arms and this lifting movement will always be the same. The adjacent edges of the two arms are so arranged with relation to the operating stud that these edges will engage the stud and check the movement of the arms before the outer ends of the arms have moved far enough to engage the commutator, thus positively preventing any contact between either arm and the commutator regardless of whether the brushes wear away equally or unequally.

The operating member or stud 28 may be supported and actuated in any suitable manner. As here shown, it is carried by a lever 33 pivotally mounted at 34 on the supporting structure or plate 12. Inasmuch as the brushes are usually to be lifted only after the motor has attained a certain speed it is preferable that this operating member be centrifugally controlled and, in the present construction, the lever 33 which carries the operating stud has a forwardly extending portion 35, the forward end of which is bent downwardly and then rearwardly to provide a rearwardly facing groove 36. The centrifugal device as here shown comprises a series of weights 37 arranged circumferentially of the motor shaft and each having at its outer edge a forwardly extending flange 38 adapted to enter the groove 36 of the stud supporting arm 33. These centrifugal weights are yieldably retained in their retracted positions and, in the present instance, each weight 37 has secured thereto a lug 39, as shown in Fig. 3, which is acted upon by the spring 9 of the short circuiting device. The downward movement of the stud 28 and supporting lever 33 is so limited that when the centrifugal device is in its retracted position the flange 38 at the outer edge thereof will be spaced out of contact with both the upper and lower walls of the groove 36 of the lever, thus permitting the centrifugal device to rotate without engaging the lever. In the present instance, the movement of the stud is limited by the parts 32 of the actuating devices. When the centrifugal device moves outwardly the flange will engage the outer wall of the groove 36 and impart upward movement to the lever and stud 28 and when the stud has reached its outermost position it will be seated in the recesses 30 of the two actuating devices and the action of the spring 31 on the actuating devices will serve to retain the stud in this position until sufficient force is exerted thereon to disengage it from the recessed portions of the actuating devices. The positions of the recesses or seats in the actuating devices is such that when the stud is in its outermost position the lever will be supported in such relation to the flange of the centrifugal device, the weights of which are then in their extended positions, that there will be no contact between this flange and the walls of the groove. To this end the recesses 30 are so shaped that the pressure of the actuating devices on the stud will impart a slight further movement thereto after the centrifugal device has completed its outward movement, thus moving the lever out of contact with the flange of the centrifugal device. When the speed of the motor falls below the predetermined rate the action of the spring 9 on the centrifugal device will retract the same, thus withdrawing the stud from the recesses of the actuating devices and permitting the parts to return to their normal positions. The particular construction of the centrifugal device forms no part of the present invention and need not be here described but a full description thereof will be found in my copending application filed March 18, 1926, Serial No. 95,579.

In Figs. 5 to 8 I have illustrated a slightly modified form of the device, which, in some respects, is superior to the form above described. As there shown, the apparatus comprises a supporting plate 40 having a rearwardly extending stud 41. Mounted on this stud are two brush supporting members or arms 42. These arms are similar to those above described in that each of them comprises two side members connected one to the other at their outer ends and there provided with a clip 43 to secure the brush thereto. In this form of the device I have omitted the parts which engage the lateral edges of the plate. The adjacent ends of the corresponding parts of the two arms overlap one another and are pivotally mounted on a stud 41 so that the two arms will have pivotal movement relatively one to the other. A flat spring 44 has a depressed central portion arranged beneath the

stud 41 and has its ends engaging the outer or end portions of the two arms to press the brushes normally into contact with the commutator 5. The supporting plate 40 has rearwardly extending projections or studs 45 which extend through openings 46 in the respective arms and constitute stops to limit the inward movement of the arms. It will be noted that the openings 46 are so arranged with relation to the studs as to permit of the outward movement of the arms to lift the brushes out of contact with the commutator and to permit the arms to move inwardly as the brushes wear away but that they will engage the arms and interrupt the movement thereof before the outer ends of the arms can contact with the commutator bars. Each member of each arm has an arcuate slot 47 curved about the axis thereof and providing contact surfaces for the arm. In this form of the device the arms have inwardly extending portions or projections 48 in which the slots are formed and the slots open through the inner edges of these projections.

The actuating devices for the respective arms are arranged between the side members of those arms and each of said actuating devices comprises two members or plates 49 connected one to the other by a pin 50, the intermediate portion of which is enlarged to form a roller 51. These rollers constitute opposed cam surfaces for engagement by the operating member to impart movement to the actuating devices. Each member of each actuating device has an outwardly extending projection or elongated stud 52 and these studs are shaped to fit within the slots of the corresponding parts of the arms, the arrangement being such that when the several parts are in their normal positions the arms will move freely with relation to the studs but that a slight turning movement imparted to the studs will cause them to operatively engage the contact surfaces of the arms and thus cause the arms to move with the actuating devices. If desired, these projections or studs may be integral with the respective parts of the actuating devices and, as shown in Fig. 8, may be formed by pressing outwardly portions of the side plates 49 of the actuating devices. The corresponding side plates 49 of the two actuating devices have contact one with the other at their upper and lower ends but are recessed between their upper and lower ends to provide a space through which extends the operating member or stud 53, this stud being carried by a pivoted arm 54 and actuated in the same manner as the stud 28 above described. Preferably the actuating devices have interlocking connection to prevent the relative vertical displacement thereof and, as here shown, the side plates of one actuating device are provided near their lower ends with projections or tongues 55 adapted to extend into recesses 56 in the corresponding plates of the other actuating device. When upward movement is imparted to the operating stud 53 this stud will engage the opposed cam surfaces or rollers 51 of the two actuating devices and will first separate the upper ends of the actuating devices, causing the actuating devices to have pivotal movement about their points of contact at the lower ends thereof. This pivotal movement will shift the position of the parts 52 of the actuating devices sufficiently to cause them to operatively engage and firmly grip the contact surfaces of the respective arms. The further movement of the operating stud will impart bodily movement to the two actuating devices, thus causing the lower parts thereof to be separated and causing movement to be imparted to the respective arms to lift the brushes out of contact with the commutator. This movement of the operating stud will carry the axis thereof beyond the plane of the axes of the rollers 51 and these rollers will support the stud in its elevated position but will not permit a sufficient inward movement of the actuating devices to release the arms. A spring 57 similar to the spring 31 above described tends to move the two actuating devices one toward the other.

While I have shown and described two 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 brush supporting device, means acting on said supporting device to cause a brush supported thereby to be moved toward the commutator of said motor, an actuating device to cause said supporting device to move said brush from said commutator, said supporting device being normally movable with relation to said actuating device in a direction to move said brush toward said commutator and said actuating device being adapted to pick up said supporting device at any position which it may assume and move the same from said commutator, operating means to impart operative movement to said actuating device, and means controlled by the speed of the motor to actuate said operating means.

2. A brush lifting mechanism for an electric motor or the like, comprising a movable device having means to support a brush in a fixed position thereon and to cause said brush to engage the commutator of said motor, an actuating device to cause said supporting device to move said brush out of engagement with said commutator, said

supporting device being normally movable with relation to said actuating device and said actuating device being adapted to engage said supporting device at different points determined by the position thereof, and means controlled by the speed of said motor to cause said actuating device to impart movement to said supporting device.

3. A brush lifting mechanism for electric motors and the like, comprising a movable device having means to support a brush thereon and cause the same to engage the commutator of said motor, an actuating device to cause said supporting device to move said brush out of engagement with said commutator, said supporting device and said actuating device having cooperating parts arranged normally in inoperative relation to permit said supporting device to have movement with relation to said actuating device and adapted to be brought into operative relation when in any one of a plurality of relative positions, and means controlled by the speed of said motor to cause said actuating device to operatively engage said supporting device and move said brush to an inoperative position.

4. A brush lifting mechanism for an electric motor or the like, comprising a movable device having means to support a brush thereon and cause the same to engage the commutator of said motor, an actuating device arranged normally in an inoperative position with relation to said supporting device to permit said supporting device to have movement relatively thereto and adapted to be brought into operative relation with said supporting device in any position which the latter may assume with relation thereto, and means to cause said actuating device to operatively engage said supporting device and to impart movement thereto in a direction to lift said brush.

5. A brush lifting mechanism for electric motors and the like comprising a pivoted device having means to support a brush and cause the same to engage the commutator of said motor and having a contact surface curved about the axis thereof, an actuating device having a part adjacent to but normally out of operative engagement with said contact surface, said part being so arranged that the initial movement of said actuating device will cause said part to operatively engage said contact surface at a point determined by the position of said supporting device with relation thereto and the further movement of said actuating device will impart movement to said supporting device and move the inner end of said brush a fixed distance from the commutator regardless of the initial position of said supporting device, and means for imparting movement to said actuating device.

6. A brush lifting mechanism for electric motors and the like comprising a pivoted arm having means for supporting a brush and having a contact surface curved about the axis thereof, an actuating device having a part arranged normally in inoperative relation to said contact surface, said actuating device being capable of pivotal movement to cause said part thereof to operatively engage said contact surface at different points determined by the position of said supporting arm and to connect said actuating device with said arm, and means for imparting movement to said actuating device to first establish said connection and to then actuate said arm.

7. A brush lifting mechanism for electric motors and the like, comprising a movable device having means to support a brush, a device for actuating said supporting device, one of said members having a slot extending substantially parallel with its line of movement and the other of said members having a part extending into said slot and normally so arranged with relation thereto that said supporting device is free to move with relation to said actuating device, and means for imparting movement to said actuating device to cause an operative connection to be established between the walls of said slot and the part extending into said slot and to then actuate said supporting device.

8. A brush lifting mechanism for an electric motor or the like comprising a movable device having means for supporting a brush and having a slot extending substantially parallel with its line of movement, an actuating device having a non-circular part extending into said slot and normally so arranged with relation thereto that said supporting device is free to move with relation to said actuating device, and means for imparting movement to said actuating device to first cause said part to grip the walls of said slot and to then actuate said supporting device.

9. A brush lifting mechanism for electric motors and the like, comprising an arm pivotally supported near one end thereof, having means for supporting a brush in fixed relation to the other end thereof and having a slot curved about its axis, an actuating device having a non-circular part extending into said slot to support said actuating device on said arm and having a cam surface, an operating member to engage said cam surface of said actuating device to cause said part to grip the wall of said slot and to then actuate said arm, and means to impart movement to said operating member.

10. A brush lifting mechanism comprising a pair of oppositely extending arms pivotally supported near their adjacent ends for relative movement and each having means for supporting a brush near the free end thereof, means acting on said arms to move

said brushes into engagement with the commutator of said motor, actuating devices for the respective arms, said actuating devices being arranged normally to permit the free movement of said arms with relation thereto, and means for simultaneously imparting movement to said actuating devices to cause them to operatively engage said arms at different points determined by the positions of said arms and actuate the respective arms.

11. A brush lifting mechanism for electric motors and the like, comprising a pair of oppositely extending arms pivotally supported near their adjacent ends for relative movement, each having means for supporting a brush near the free end thereof and each having a contact surface curved about the axis thereof, means acting on said arms to move said brushes into engagement with the commutator of said motor, actuating devices for the respective arms, each having a part adapted to engage the contact surface of the corresponding arm at any one of a plurality of points and arranged normally in an inoperative position with relation thereto, and means for simultaneously operating said actuating devices to cause said parts to operatively engage the respective contact surfaces and impart movement to said arms.

12. A brush lifting mechanism for electric motors and the like comprising a pair of oppositely extending arms pivotally supported near their adjacent ends, each having means for supporting a brush near the free end thereof and each having an arcuate slot, means acting on said arms to move said brushes into engagement with the commutator of said motor, actuating devices for the respective arms, each having a non-circular portion extending into the slot in the corresponding arm and so arranged with relation thereto that said arm is normally movable with relation thereto, and means for simultaneously operating said actuating devices to cause said parts thereof to be moved into operative contact with the walls of the respective slots and to thus establish an operative connection between the actuating devices and said arms and impart movement to said arms.

13. A brush lifting mechanism for electric motors and the like comprising a pair of oppositely extending arms pivotally supported near their adjacent ends for relative movement, each having means for supporting a brush near the free end thereof and each having a contact surface, actuating devices for the respective arms each having a part arranged normally in inoperative relation to the contact surface of the corresponding arm and adapted to engage said contact surface at any one of a plurality of points and each having a cam surface, and an operating member arranged to engage the cam surfaces of said actuating devices to move the respective parts thereof into operative engagement with the contact surfaces of the respective arms and to then move said arms about their axes.

14. A brush lifting mechanism for an electric motor or the like, comprising a pivoted arm having means for supporting a brush at the free end thereof and having a curved slot, an actuating device having a part extending into said slot and arranged normally in inoperative relation to the walls thereof, said actuating device having a cam surface, and an operating member arranged to act on said cam surface to cause said part of said actuating member to be turned into operative engagement with the walls of said slot and to then impart movement to said actuating device and said arm.

15. A brush lifting mechanism for electric motors and the like, comprising a pivoted arm having side members spaced one from the other and having means for supporting a brush at the outer end thereof and having slots in each side member thereof, an actuating device arranged between said side members and having parts extending into the respective slots to support said actuating member on said arm, said parts being arranged normally to permit the movement of said arm with relation thereto, said actuating device having a cam surface, an operating device arranged to engage said cam surface to first cause said parts of said actuating device to operatively engage the walls of said slot and to then impart movement to said actuating device and said arm.

16. A brush lifting mechanism for electric motors and the like comprising a pair of oppositely extending arms pivotally supported near their adjacent ends and each having means for supporting a brush near the free end thereof, means acting on said arms to move said brushes into engagement with the commutator of said motor, actuating devices for the respective arms arranged normally in inoperative relation thereto to permit the free movement of said arms with relation to said actuating device and having opposed contact surfaces, and means arranged to act on the opposed contact surfaces of said actuating devices to establish operative connection between said devices and the respective arms at points determined by the positions of said arms and to impart movement to said arms.

17. A brush lifting mechanism for electric motors and the like comprising a pair of oppositely extending arms pivotally supported near their adjacent ends and each having means for supporting a brush near the free end thereof, means acting on said arms to move said brushes into engagement with the commutator of said motor, actuating devices for the respective arms arranged normally in inoperative relation thereto to

permit the free movement of said arms with relation to said actuating devices, adapted to be brought into operative relation with said arms at points determined by the position of said arms, and having opposed cam surfaces, and having opposed recesses above said cam surfaces, a stud arranged between said actuating devices, and means for moving said stud against said opposed surfaces to impart movement to said actuating devices and to cause the stud to enter said recesses, and a spring to resist the movement of said actuating devices one from the other.

18. A brush lifting mechanism for electric motors and the like comprising a pair of oppositely extending arms pivotally supported near their adjacent ends and each having means for supporting a brush near the free end thereof, means acting on said arms to move said brushes into engagement with the commutator of said motor, actuating devices for the respective arms arranged normally in inoperative relation thereto to permit the free movement of said arms with relation to said actuating device and adapted to be brought into operative relation to said arms at points determined by the positions of said arms, a stud arranged between said actuating devices, a lever on which said stud is mounted, and centrifugally controlled means for actuating said lever to cause said stud to impart movement to said actuating devices, to first establish an operative connection between said actuating devices and the respective arms and for then imparting movement to said arms.

19. A brush lifting mechanism comprising a pair of oppositely extending arms pivotally supported near their adjacent ends for relative movement and each having means for supporting a brush near the free end thereof, means acting on said arms to move said brushes into engagement with the communtator of said motor, actuating devices for the respective arms, said actuating devices being arranged normally to permit the free movement of said arms with relation thereto, means for simultaneously imparting movement to said actuating devices to cause them to operatively engage said arms at points determined by the positions thereof and actuate the respective arms, each of said arms having a part arranged to engage a relatively fixed part of said mechanism to limit the movement of said arm toward said commutator.

20. A brush lifting mechanism for electric motors and the like, comprising a pair of oppositely extending arms pivotally supported near their adjacent ends for relative movement, each having means for supporting a brush near the free end thereof and each having a contact surface, actuating devices for the respective arms having parts arranged normally in inoperative relation to the contact surfaces of the corresponding arms and adapted to engage said contact surface at points determined by the positions of said arms, said actuating devices having contact one with the other near the upper and lower ends thereof and having opposed cam surfaces between said upper and lower ends, an operating member arranged to engage said opposed surfaces and to first impart pivotal movement to said actuating devices about their points of contact at one end thereof to cause said parts of said actuating devices to operatively engage the contact surfaces of the respective arms and to then impart bodily movement to said actuating devices to actuate said arms, and means for imparting movement to said operating member.

In testimony whereof, I affix my signature hereto.

GEORGE H. LELAND.