

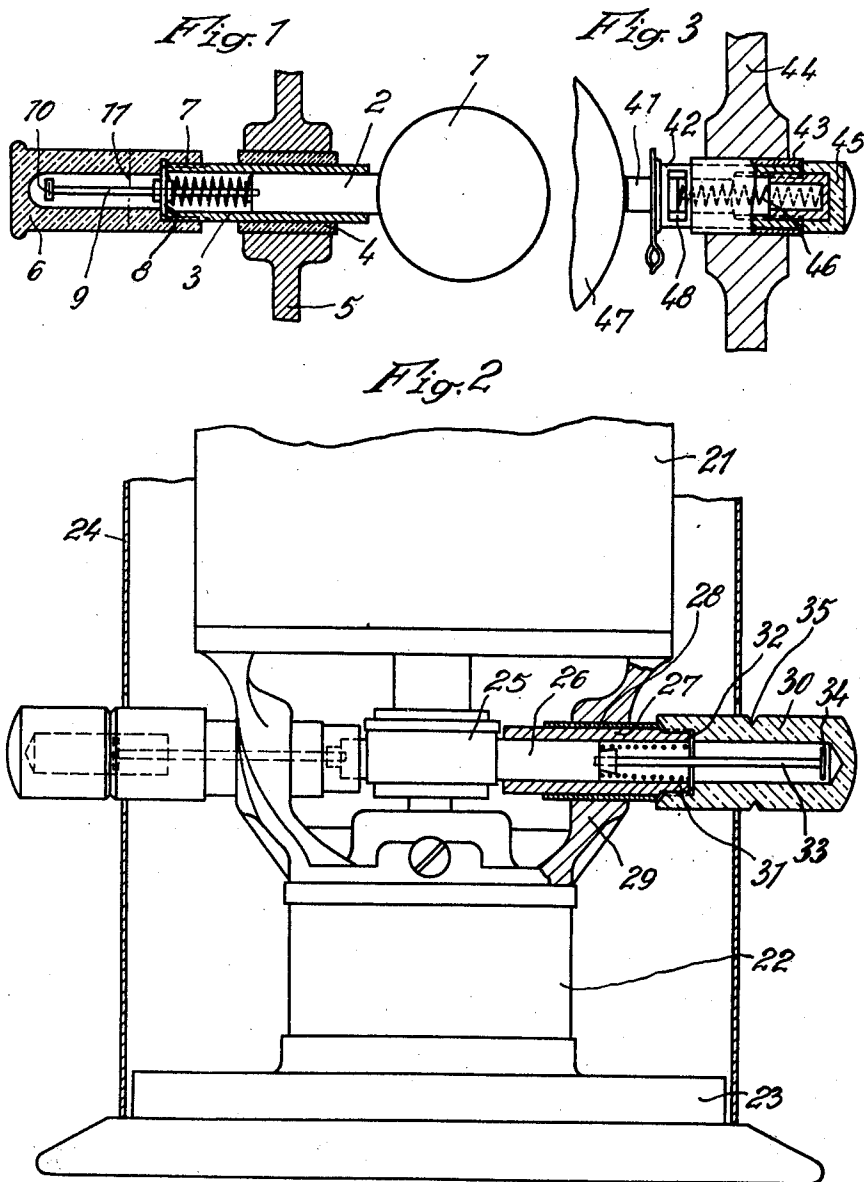
Aug. 10, 1937.

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2,089,678

POSITION INDICATOR FOR CARBON BRUSHES

Filed July 24, 1936



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UNITED STATES PATENT OFFICE

2,089,678

POSITION INDICATOR FOR CARBON
BRUSHES

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Application July 24, 1936, Serial No. 92,386
In Germany June 15, 1935

5 Claims. (Cl. 171—324)

My invention relates to devices for indicating the wearing away of carbon brushes of electric motors.

In electric motors, particularly fractional H. P. motors, such as for domestic appliances the carbon brushes serving to supply electric energy to the commutator are in most cases slidably mounted in closed insulated brush holders. Such an arrangement of brushes presents the drawback in that it is not possible to ascertain the extent to which the brushes have been worn away in order to replace them by new ones. To determine the degree of wear the brushes must be often removed for inspection from the brush holders which is, as a rule, neglected with the result that when the brushes have been completely worn away the compression spring serving to feed the brushes comes into engagement with the commutator and may possibly damage the latter seriously. It has already been proposed to remove this drawback by providing the brushes or the brush holder with devices which raise the remaining part of the brush from the commutator as soon as the brush is worn away. The assembly of such devices, particularly when using carbon brushes of small dimensions, cannot be carried out in all cases and is also complicated and comparatively expensive. A device will presently be described which renders it possible to ascertain from outside the degree of wear of the brushes without the need of taking the brush holder apart. To this end an indicating device is provided according to the invention which is controlled by the carbon brush as the latter wears away. The amount of wear of the carbon brush may then be easily ascertained on a graduated scale over which plays the pointer controlled directly or indirectly by the carbon brush. In this case the point may be indicated on the scale up to which the pointer is allowed to rotate, that is to say up to the point at which the maximum wear of the carbon brush is attained.

A particularly advantageous and simple way of carrying out the invention consists in securing a rod or the like provided with an indicator to the end of the carbon brush, the rod being preferably arranged in the extension of the longitudinal axis of the brush. In this case in addition to the indicator secured to the rod a mark is preferably arranged on the brush holder up to which the movable indicator may move. The indicating device is further preferably arranged in the enclosure of the brush holder consisting of a transparent material. The enclosure must as a rule be then amply designed so as to have a

sufficiently large hollow space for the displacement of the movable pointer or indicator. The marks are colored, for instance red, in order that they may be clearly seen. In some cases the entire portion of the brush holder denoted as a zone of danger may receive, for instance, a red color. The operator is then able to ascertain by observing the position of the marks the amount of wear of the carbon brushes. In this manner too great a wear of the brushes is avoided and new brushes may be substituted in time without any difficulty whatever.

In Figs. 1, 2 and 3 several embodiments of my invention are shown in longitudinal sectional elevation.

Referring to Fig. 1, 1 denotes the commutator of an electric motor, with which the carbon brushes are held in slight pressing engagement. For the sake of simplicity only one brush is shown. The brush 2 is slidably mounted in a guide sleeve 3 located in the motor casing 5 and insulated therefrom by a ferrule 4. On one end of the guide sleeve 3 a threaded cap 6 of transparent material such as urea, glass, pressed material or the like is secured thereto. However, this cap serves first of all as fastening means and as abutment for the compression spring 7 which presses the brush 2 against the commutator 1. At the point of the cap at which the spring 7 abuts a disc 8 is preferably arranged.

The rear end of the brush 2 is provided with a hole, in which the rod 9 is inserted, which extends through an aperture of the disc 8 into the interior tubular space of the cap 6, the length of this space being approximately the same as that of the brush. An indicator 10 colored red is secured to the end of the rod 9. On the cap 6 a mark 11 is provided preferably also colored red and is arranged perpendicularly to the axis of the rod 9. The mark 11 indicates how far the indicator 10 is secured to the rod 9 may be displaced before it becomes necessary to replace the worn down brush. If the indicator 10 has moved down to the mark 11 owing to wear caused by the commutator 1 the operator need only unscrew the cap 6 and remove the brush 2 together with the parts 7, 8 and 9 mounted thereon, insert a new brush and screw the cap 6 again on the guide sleeve 3.

The distance from the indicator 10 to the disc 8 is so chosen that it is somewhat smaller than the length of the brush 2. Even if the brush in such a device should have not been replaced in due time no damage to the commutator by the compression spring 7 can occur in this case, for

the brush can only be displaced as long as the indicator 10 does not engage the disc 3. Consequently, a further feed of the brush ceases automatically.

5 It is preferable to provide the indicator and the mark with contrasting colors or with self luminous substances.

If such a device should be employed for motors enclosed in a protective casing, such as driving 10 motors for vacuum cleaners, it is preferable to design the device in such a manner that the cap of the brush holder is of such length that it projects from the protective casing. The wear of the brush may then be easily ascertained without the necessity of removing the protective 15 casing.

Fig. 2 shows such an embodiment of the invention as applied to the motor of a vacuum cleaner. 21 denotes the driving motor of a 20 vacuum cleaner mounted on an elastic support 22. The latter rests on a base-plate 23 on which is supported a cylinder 24 of sheet-iron surrounding the motor concentrically. The brushes 26, each of which is slidably mounted in a guide 25 sleeve 27, arranged in the bearing end shield 29 of the motor and insulated therefrom by a ferrule 28, are held in slight pressing engagement with the commutator. On to the outer end of the guide sleeve 27 a cap 20 of transparent material, such 30 as glass, pressed material or the like is threaded. This cap serves as fastening means and as abutment for the compression spring 30 mounted in the guide sleeve and which presses the carbon brush against the commutator 25. Between the guide sleeve 27 and the cap 30 a circular disc 32 is placed against which the spring 31 abuts. Into the rear end of the brush is inserted a rod 33 in axial alinement with the brush and extending into the cylindrical interior of the cap 30 which has a length approximately equal to 40 that of the brush. At the end of the rod 33 an indicator 34 is arranged colored preferably red. On the transparent cap 30 a mark 35 is provided preferably also colored red and arranged perpendicularly to the rod 33. The mark 35 indicates how far the rod 33 or the indicator 34 secured thereto may be displaced before it becomes necessary to replace the worn down brush. Guide sleeve 27 is of such length that cap 30 50 protrudes outside of cylindrical casing 24 a sufficient distance to render the indicator mark 35 visible from outside. Thus the operator can observe the wear of the brush from outside and need only unscrew the cap 30 and remove the 55 brush 26 together with the parts 31, 32, 33 and 34 mounted thereon, insert a new brush and screw the cap 30 again on the guide sleeve 27.

The distance from the indicator 34 to the disc 32 is preferably chosen so that it is somewhat 60 smaller than the length of the brush 26. If the inner diameter of the disc 32 is smaller than the diameter of the indicator 34 the brush 26 can be displaced by the spring 31 only as long as the indicator 34 is not in engagement with the disc 65 32. The further displacement of the brush is thus automatically prevented, so that the commutator is not liable to be damaged by the compression spring 31.

A further embodiment of my invention may 70 consist in providing the guide sleeve of the brush holder with apertures, for instance with one or more slots through which the feed of the brush may be observed. The operator may then easily ascertain, when occasionally cleaning the ap- 75 pliance under consideration, the degree of wear

of the brushes and renew, if necessary, the same. Such a device is particularly simple and economical.

The apertures may be carried out in different forms, for instance, in the form of longitudinal 5 slots. Further the apertures may also be closed by a transparent material, such as glass, pressed material or the like, in order to prevent dust or the like from entering the guide sleeve.

A particularly favorable arrangement consists 10 in providing the guide sleeve for the brush with an elongated slot extending at right angles to the longitudinal axis of the sleeve. This arrangement has the advantage that the hollow space serving to guide the brush retains at all events 15 its rectangular cross-section so that no lateral jammings or the like may occur in operation which impair the uniform feed of the brush.

Fig. 3 shows a longitudinal sectional view of this embodiment of my invention. 41 denotes a 20 brush which has, for instance, a circular or rectangular cross-section and is slidably mounted in the metallic guide sleeve 42. The latter is surrounded by an insulating sleeve 43 which is mounted in a suitable frame portion 44 of the 25 motor. The outer end of guide sleeve 42 is closed by a threaded cap 45 consisting, as a rule, of insulating material. The brush is slightly pressed against the commutator 47 by the compression spring 46. The end of the guide sleeve 42 in the 30 neighborhood of the commutator is provided with a slot 48 through which the feed and, therefore, the wear of the brush 41 may be observed. The gradual wear of the brush may be observed by providing special marks or the like on the brush. 35 The slot is so arranged as not to be hidden by the other parts of the motor. By such an arrangement it is possible to renew the brushes, for instance, of the motors for vacuum cleaners in due time. 40

I claim as my invention:

1. Carbon brush holder for electric machines or the like, comprising the movable brush elements, brush housings for guiding said elements and entirely surrounding said brush elements 45 toward the outside and including removable caps permitting the insertion of said brush elements, means for rendering at least one of said brush elements visible through said housings, and a gauge mark on said housings for indicating the 50 extreme position to which the visible brush element may travel for the purpose described.

2. Carbon brush holder for electric machines or the like, comprising a movable brush and a gauge rod attached to the rear end of said brush, a brush housing for guiding said brush and entirely surrounding said brush and rod toward the 55 outside and including a removable transparent cap permitting the insertion of said brush elements into the housing, said rod having an indicator element at its outer end, visible through 60 said cap, and a gauge mark on said cap for indicating the extreme position to which the indicator element may travel for the purpose described. 65

3. Carbon brush holder for electric machines or the like, comprising a movable brush and a gauge rod attached to the rear end of said brush, a brush housing for guiding said brush and entirely surrounding said brush and rod toward the 70 outside and including a removable transparent cap permitting the insertion of said brush elements into the housing, said rod having an indicator element at its outer end, visible through 75 said cap, a gauge mark on said cap for indicating

the extreme position to which the indicator element may travel for the purpose described, and a stop element on said indicator element for arresting the brush movement when the brush
5 has travelled to a predetermined point.

4. In an electric machine having a casing, a carbon brush holder comprising a movable brush and a gauge rod attached to the rear end of said brush, a brush housing for guiding said brush
10 and entirely surrounding said brush and rod toward the outside and including a transparent cap protruding beyond said machine casing and permitting the insertion of said brush element into said housing, said rod extending into said cap
15 and having an indicator element at its outer end,

visible through said cap from outside said machine casing, and a gauge mark on the protruding portion of said cap for indicating the extreme position to which the indicator element may travel for the purpose described.

5. Carbon brush holder for electric machines or the like, comprising a movable brush, a brush housing for guiding said brush and for entirely surrounding it and protecting it from the outside, said housing including a removable cap permitting the insertion of said brush, said housing having at least one aperture in its wall, through which the position of said brush may be observed for the purpose described.

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