Jan. 22, 1963 F. J. PEPWORTH 3,075,110

ELECTRIC BRUSH GEAR FOR HOLDING AND LIFTING

Filed Jan. 15, 1960

4 Sheets-Sheet 1

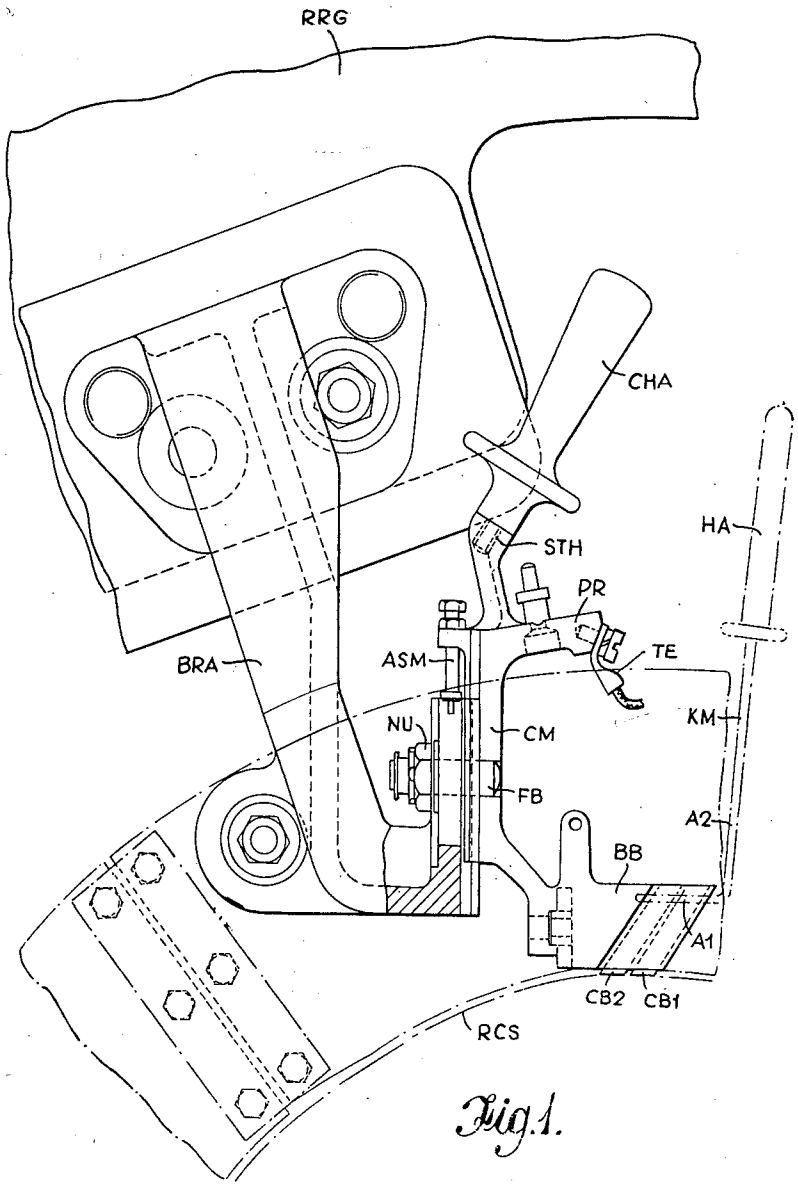

Fig. 1.

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4 Sheets-Sheet 2

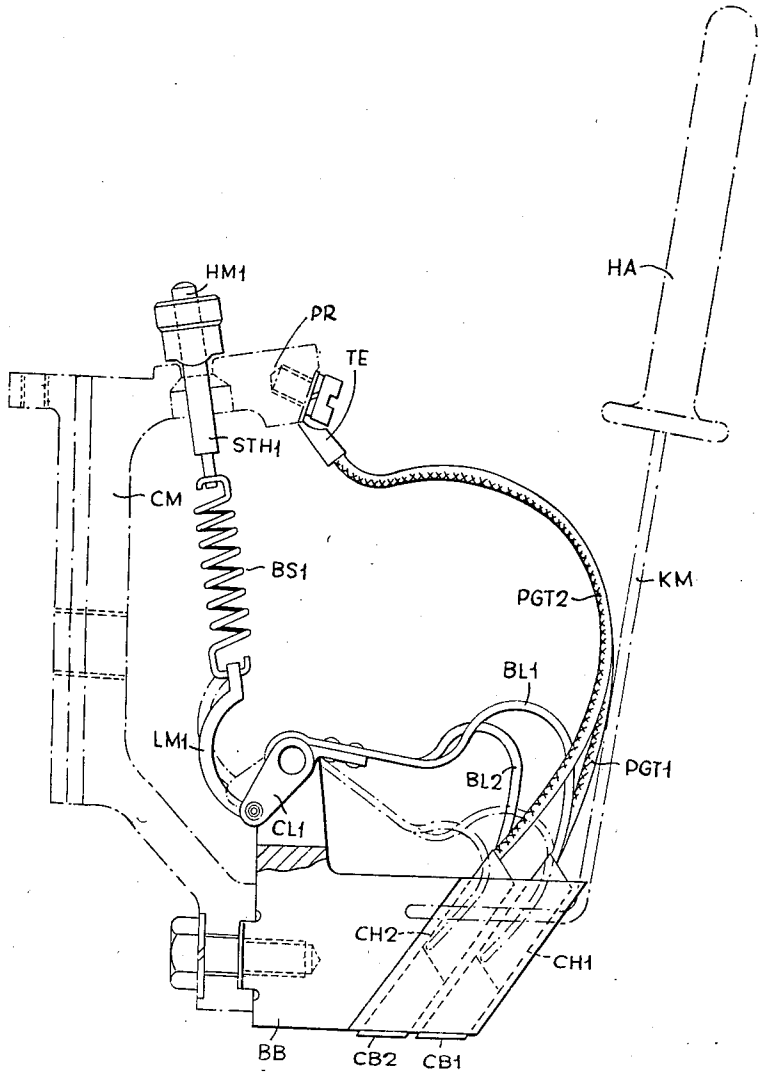

Fig. 2.

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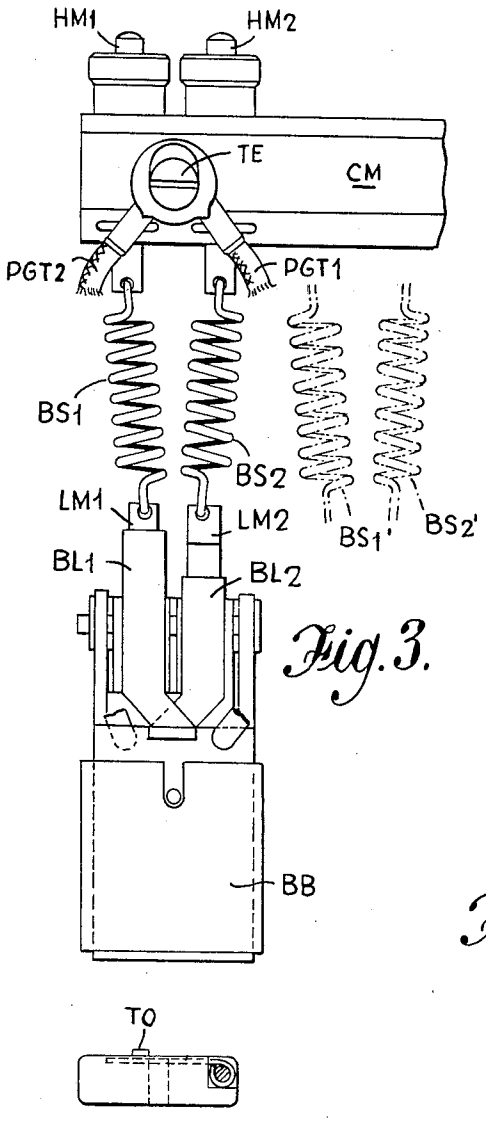

Fig. 3.

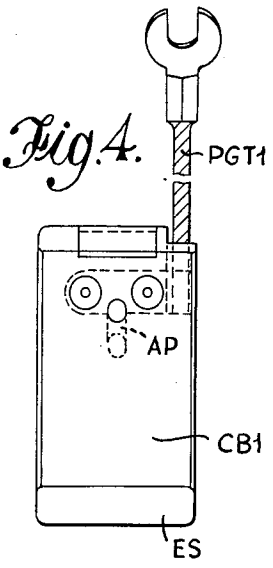

Fig. 4.

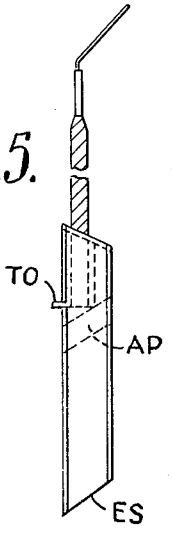

Fig. 5.

Fig. 6.

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ELECTRIC BRUSH GEAR FOR HOLDING AND LIFTING

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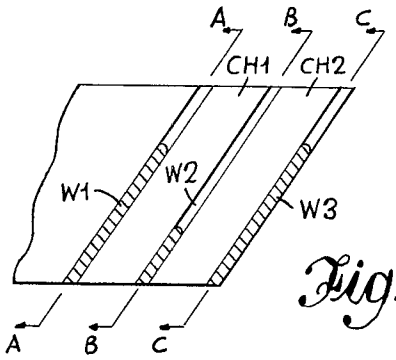

Fig. 7.

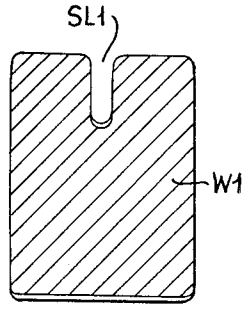

Fig. 8.

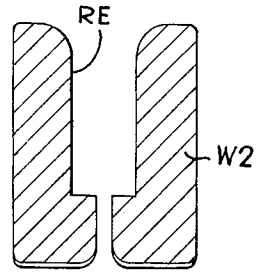

Fig. 9.

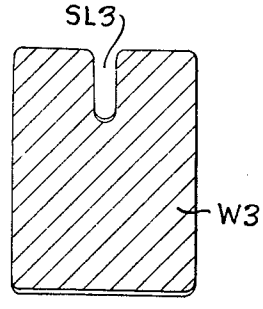

Fig. 10.

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ELECTRIC BRUSH GEAR FOR HOLDING AND LIFTING

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Claims priority, application Great Britain Jan. 28, 1959
7 Claims. (Cl. 310—240)

This invention relates to electric brush gear for holding several brushes in engagement with a rotating contact surface, such as a slip ring or commutator, for electrical connection thereof and aims at providing an improved construction which allows to disengage and reengage the brushes and contact surface without necessitating an interruption in the movement of the contact surface.

The invention is particularly advantageous where the gear is used with a plurality of parallel connected brush groups which are each held by a separate brush group carrier, on an exciter machine for a large generator for instance. In such an arrangement the invention makes it possible to replace individual brushes without discontinuing the operation of the machine, which may be alive during the brush removal and replacement.

This is achieved by the present invention which resides in an electric brush gear for holding a plurality of brushes in engagement with a rotating contact surface comprising a number of carrier members holding brush boxes, separate guiding and biasing means acting to secure correct engagement with the rotating contact surface, for each brush, also a portable key member having a handle that is electrically insulated, each brush and associated brush box being adapted for releasable engagement with, and thereby interconnection through, said key member, said interconnection serving to define a location of the brush relative to the brush box such that with the brush box in its normal position relative to the rotating contact surface, the brush is held out of engagement with said contact surface until the said key member is released to allow normal operational engagement under pressure to be caused between the brush and rotating contact surface through the said biasing means.

Conveniently the brush box is constructed to allow brush displacement under the biasing force towards the rotating surface as the brush surface is worn away during operation, and includes a means for stopping this movement after a predetermined amount of wear.

In a preferred embodiment the cross-sections of the brush in planes perpendicular to the brush movement are of similar shape, such as rectangular, and two such brushes are guided in channels of the brush box. Each brush is provided with a tongue projecting from the brush surface and the partition wall between the two channels is recessed so as to receive the tongues of both brushes which project into the recess from opposite sides, and to stop the brush displacement towards the rotating surface when the said tongues engage the bottom of the recess.

The outer walls of the brush box and the brushes can be provided with aligned apertures or slots, and holes respectively to receive one arm of a key member for holding the brushes in retracted position within the box, another arm of said member being inclined to the first arm and carrying an insulated handle.

More details will become apparent from the following description referring to the accompanying drawings which show by way of example preferred embodiments of the invention, and in which:

FIG. 1 illustrates a brush gear embodying the invention the brush carrier being supported by a brush rocker ring for instance;

FIGS. 2 and 3 are two views taken at right angles to each other of the brush carrier, also showing a pair of brushes held retracted within the brush box by a key member, and means for exerting upon each brush a biasing force which tends to move the brush towards the rotating contact surface;

FIGS. 4, 5 and 6 are front, side and top views of a brush suitable to be used in a gear according to the invention;

FIG. 7 shows the brush box of FIG. 1 in a section taken along a plane perpendicular to the cylindrical rotating contact surface of FIG. 1; and

FIGS. 8, 9 and 10 show sections through the three parallel walls of the brush box taken along lines AA, BB, CC of FIG. 7.

Referring to FIG. 1 a cylindrical rotating contact surface is indicated at RCS. For holding brushes CB1, CB2 in engagement with the surface RCS and guiding the brushes a carrier member CM has detachably connected thereto a brush box BB. A key member KM is shown in dash dot lines only to indicate that as long as it is in the inserted position the brushes are retracted and cannot contact the surface RCS. The member KM is preferably of angular shape, so that when one arm A1 is inserted through aligned holes in the brushes and three parallel walls of the brush box its other arm A2 which has a handle HA of insulating material at the end, extends substantially radially with respect to the surface RCS.

A handle CHA of insulating material is detachably connected to the carrier member CM such as by screw threads STH, and terminals TE are provided on a projection PR at the top of the carrier member CM to allow the connection of pig-tail conductors of the brushes shown in FIG. 2.

The carrier member CM is secured to a bracket BRA by means of a fixed screw stud FB, and an anti-vibration nut NU, a guiding means being provided by projections of the backplate of the carrier member engaging grooves in the bracket, and the bracket is slotted for the stud FB to allow adjustment of the carrier member in relation of the bracket as determined by an adjustable stop means ASM. Some constructional details relating to the connection and positioning of the carrier member relative to the bracket and preferably used in conjunction with the present invention are described in greater detail in the specification of our co-pending patent application No. 769,738. In the embodiment shown the bracket BRA is insulatedly secured to a rocker ring RRG of a dynamo-electric machine, which may be of a convenient construction and provided with means (not shown) for angularly displacing the rocker ring as required for conventional regulation. It will be understood that two or more brackets BRA each carrying two or more carrier members CM for groups of brushes CB which are electrically connected and insulated as required can be secured to a common support which may or may not comprise a rocker ring.

Referring more particularly to FIGS. 2 and 3 it will be seen that the brushes CB1, CB2 are guided in channels CH1, CH2 of the brush box BB, and pig-tail connectors PGT1, PGT2 are provided for connecting the brushes CB1, CB2 to a common terminal TE on the carrier member CM. For biasing the brushes individually into contact with the rotating contact surface there are provided coiled tension springs BS1, BS2 one end of which is fastened to a holding member HM1, HM2 the position of which in relation to the carrier member CM can be adjusted as by screw threads STH1 in order to vary the biasing forces exerted by the springs BS1, BS2. The biasing force is transmitted to each one of the brushes CB1, CB2 via link members LM1, LM2, crank

levers CL1, CL2, and curved blade springs BL1, BL2. As can be seen from FIG. 3 the free ends of the blade springs are cranked towards the centre plane of brush box BB so that the biasing forces are exerted upon the centre portions of the upper ends of the brushes. As indicated in FIG. 3 by dotted biasing springs BS1', BS2', one, or if desired more brush pairs biased by such springs can be provided as additional brush groups, guided in similar brush boxes which are secured to the same carrier member CM.

In a preferred embodiment the brushes are of carbonaceous material and of rectangular cross-section as shown in FIGS. 4, 5 and 6. The lower contact surface ES of each brush is inclined in this case at an angle of 55° to the long brush surface and the axis of each channel CH1, CH2 (shown on FIG. 7) must be inclined to ensure that the lower brush ends engage the rotating contact surface along tangents. Such inclination is advantageous if the brush gear is used on high speed machines, such as the exciter machine mentioned before. In order to prevent jamming or damage of the inclined brushes means must be provided to ensure that the brush boxes are fastened in their operational position before the brushes engage the contact surface. This is achieved if the key member KM is inserted into an aperture AP in each brush, the axis of which is substantially parallel to the end surface ES of the brush, and is held in slots SL1, SL3 of the brush box, as will be seen from FIGS. 7 to 10 illustrating in greater detail the three parallel walls W1, W2, W3 of the brush box. The outer walls W1, W3 are of similar shape and provided each with a slot SL1, SL3. The inner wall W2 forms the partition between the channels CH1, CH2 and is provided with a recess RE extending from the upper edge towards the lower end of the wall W2 so that the bottom of the recess RE is nearer the lower end of the brush box than the bottom of slots SL1, SL3.

The arm A1 of the key member KM when extending through the apertures AP of the two brushes CB1, CB2 rests on the bottom of the slots SL1, SL3 to hold the brushes retracted inside the brush box. Each brush has a lateral tongue TO (FIGS. 5 and 6) which extends into the recess RE, the tongues of the two brushes being offset so that they are positioned one by the side of the other in the recess RE when the brushes are inserted into the channels of the brush box.

It will be understood that when the brushes are held retracted by the key member the tongues are near the upper end of the recess RE and that when they are released and the tongues arrive at the bottom end of the recess RE, due to contact wear of the brush ends, no further such wear nor displacement of the brushes is possible under the biasing force exerted by springs BS1, BS2.

When replacement of a brush is required the nut NU of the fastening stud FB is loosened, using an insulated spanner, and the carrier member CM with its brush box and brushes is removed by means of the insulated handle CHA without necessitating interruption of the rotation of the contact surface RCS. In this operation the tongues TO may fall with the brush to engage the bottom of the recess RE but prevent the brushes from falling out of the brush boxes. After brush replacements have been inserted into the brush box and retained in their retracted position by means of the key member KM the carrier member is restored and secured in its operational position. When the key member KM is removed the brushes are allowed to engage the rotating contact surface under the contact pressure determined by the biasing means, without danger to the brushes.

While preferred embodiments of the invention have been described it will be understood that constructional details can be varied without departing from this invention.

What I claim is:

1. An electric brush gear for holding a brush in contact with a rotating cylindrical contact surface, a stationary bracket in a fixed position relative to the axis of said surface, a carrier member detachably connected to said bracket, a brush box secured to the carrier member, and a brush, said box having means for slidably mounting said brush to guide it towards the said cylindrical contact surface, said brush having a hole, opposite walls of said box having recesses with a common axis which is parallel to the axis of the brush-hole, a removable key member having a cross-section fitting the cross sections of the said hole and recesses, and the relative positions of said hole and recesses being selected relative to the lengths of the brush and brush box to retain the brush out of contact with the said cylindrical surface when the key member is inserted through the hole and recesses and the carrier member is connected in a specific position on the bracket.

2. A brush gear as recited in claim 1, wherein the brush comprises a carbonaceous core with front and rear walls of metal, and aligned apertures are provided in said walls and core.

3. A brush gear as recited in claim 2, wherein one of said walls has a tongue projecting at right-angles therefrom to engage a portion of the brush box whereby to limit the movement of the brush through the brush box.

4. A brush gear as recited in claim 1, wherein the box has a partition wall forming with one and the other of two opposite walls of the box two compartments for holding therein two parallel brushes.

5. A brush gear as recited in claim 4, wherein said partition wall has a recess in its top end, and brushes in the two compartments have tongues projecting at right angles to the axis of the rotating surface and positioned for engaging the bottom of the said recess to limit brush movement toward said rotating surface.

6. An electric brush gear for holding a plurality of brushes in engagement with a rotating contact surface comprising a support that is slidably shiftable toward and away from said rotating surface, a brush box mounted on said support, at least two brushes mounted in said brush box for sliding displacement toward and away from said rotating surface, resilient means biasing said brushes toward said rotating surface, and means providing laterally aligned apertures in the walls of said box and in said brushes, whereby a key inserted through said apertures will hold the brushes in outwardly displaced position until said support with the brushes thereon is shifted to locate the brush box operatively adjacent said rotating surface and then when the key is removed from said apertures permitting said resilient means to displace said brushes into contact with said rotating surface.

7. In the electric brush gear defined in claim 6, said brush box having internal wall means recessed toward said brushes, and each brush has a projection extending into said internal wall recession.

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