

Sept. 26, 1961

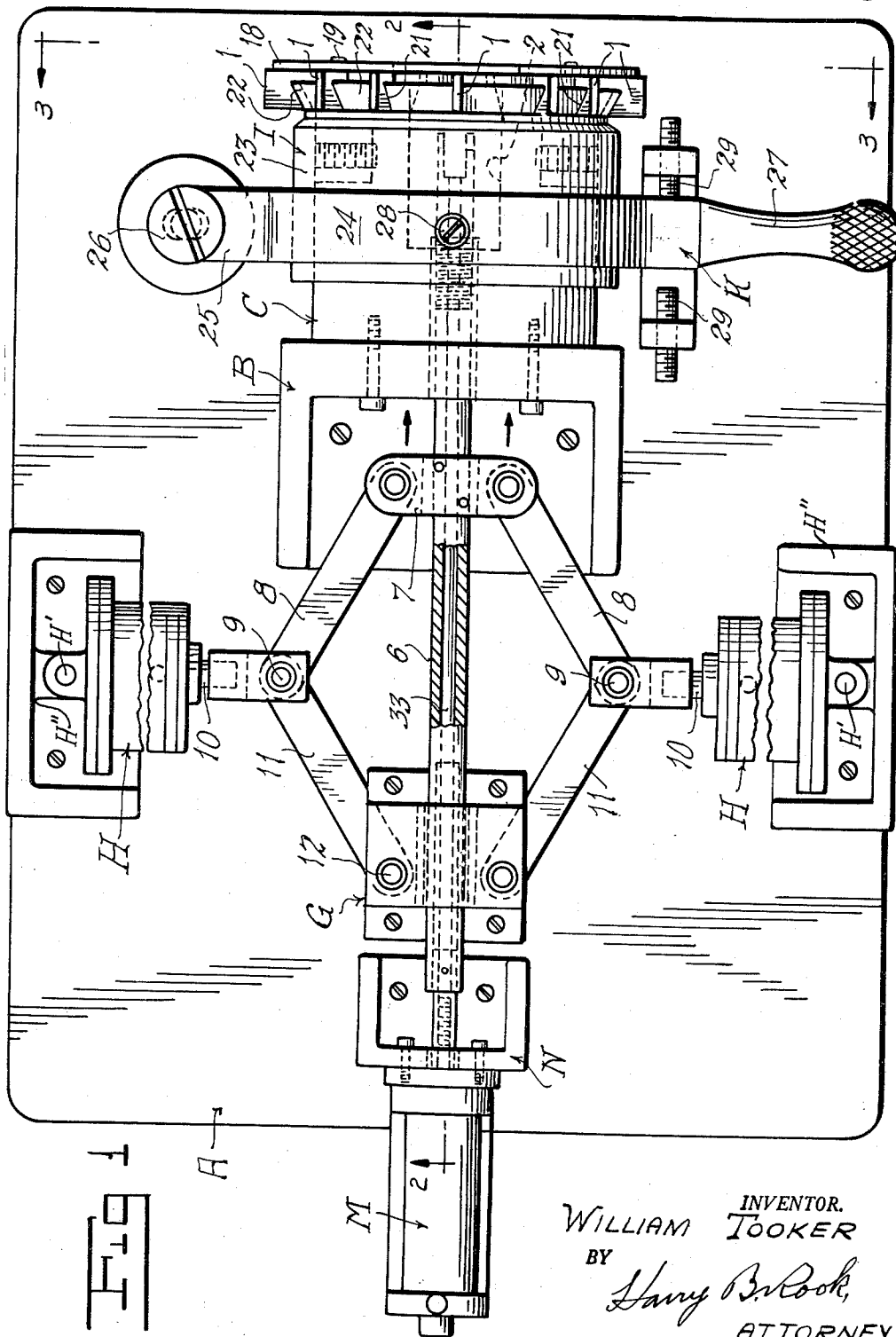
W. TOOKER

3,001,217

COMMUTATOR SLOT CLEANER

Filed Sept. 14, 1959

3 Sheets-Sheet 1



WILLIAM INVENTOR.
TOOKER
BY
Harry B. Cook,
ATTORNEY

Sept. 26, 1961

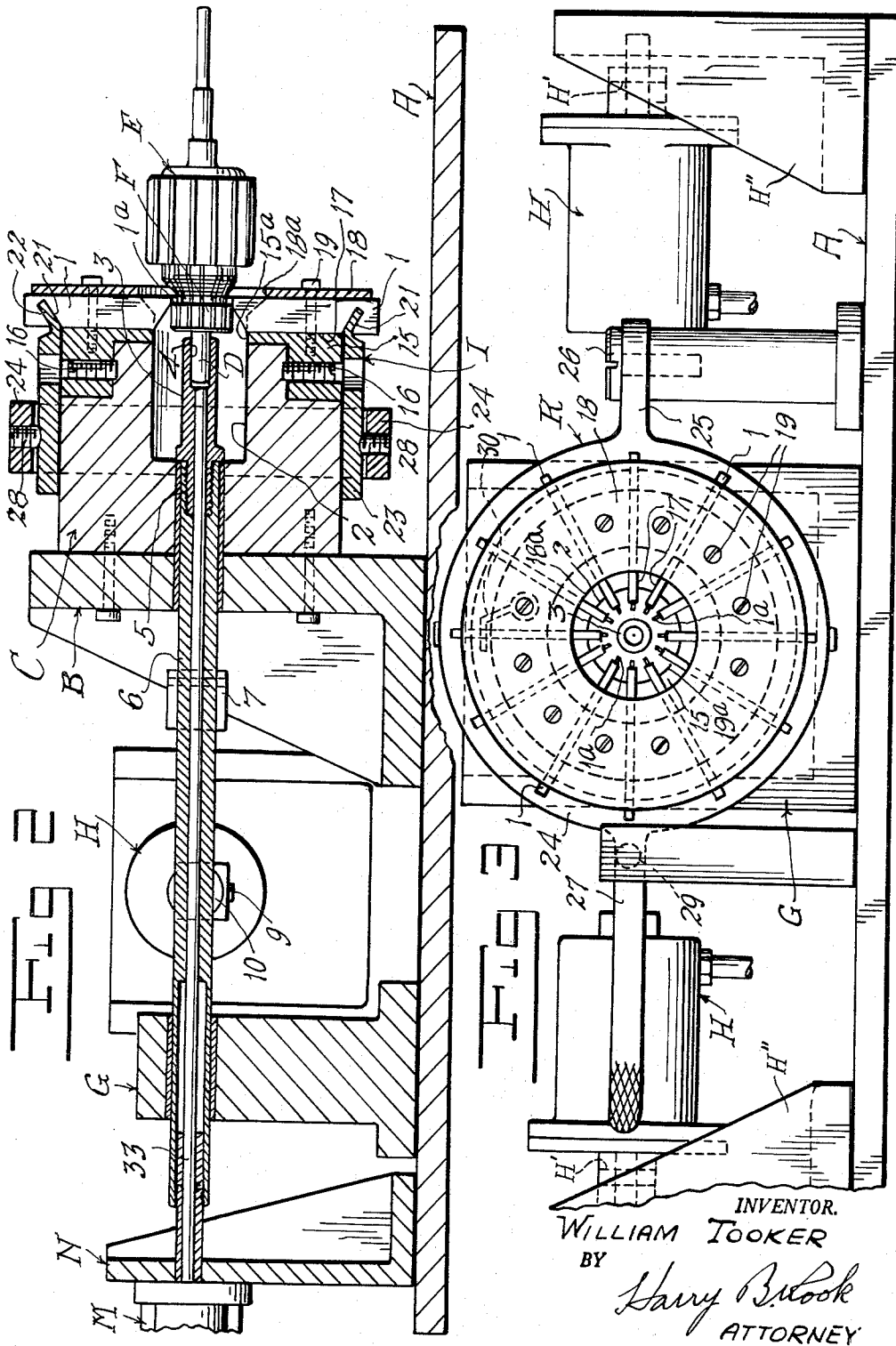
W. TOOKER

3,001,217

COMMUTATOR SLOT CLEANER

Filed Sept. 14, 1959

3 Sheets-Sheet 2



Sept. 26, 1961

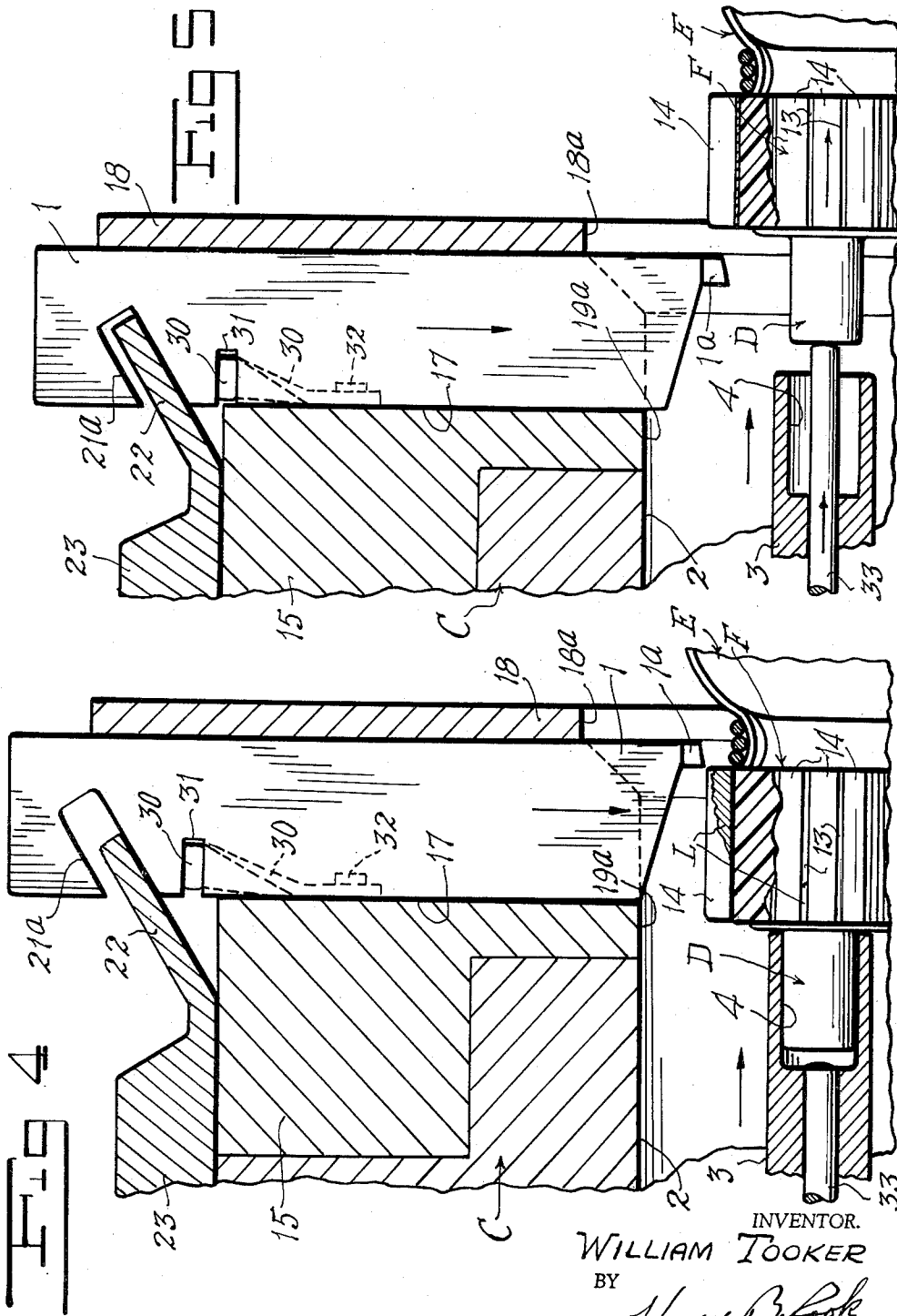
W. TOOKER

3,001,217

COMMUTATOR SLOT CLEANER

Filed Sept. 14, 1959

3 Sheets-Sheet 3



INVENTOR.
WILLIAM TOOKER
BY
Harry B. Book
ATTORNEY

1

3,001,217

COMMUTATOR SLOT CLEANER

William Tooker, Mountainside, N.J., assignor to Fransam Realty Corporation, Newark, N.J., a corporation of New Jersey

Filed Sept. 14, 1959, Ser. No. 839,798

12 Claims. (Cl. 15-93)

This invention relates in particular to a device or apparatus for cleaning the slots between the bars or segments of electrical commutators of the type that comprise a cylindrical body of insulation having bars or segments of conducting material imbedded therein and disposed longitudinally thereof in circumferentially spaced relation. It is well known in the art, that in the manufacture of such commutators particles of metal and insulation accumulate in the slots between the commutator segments, and these particles, especially particles of metal, must be removed before the commutator can be used so that the possibility of short circuiting of the segments by such particles and interference by the particles with brushes coacting with the commutator, shall be eliminated.

A primary object of the invention is to provide a novel and improved apparatus or device for removing undesirable particles of metal and insulation from all of the slots or spaces between the commutator segments, simultaneously and in one operation.

Another object is to provide such a device or apparatus which shall comprise a plurality of blades or cutters, one for each commutator slot, means for supporting a commutator in proper relation to be operated upon by said blades, and means for causing relative movement of the commutator and blades so that all of said blades pass simultaneously through the commutator slots to clean from the slots any undesired particles of metal or insulation.

A further object is to provide a device or apparatus of this character which shall include novel and improved means for indexing the blades or cutters with respect to the commutator slots whereby a commutator may be set in a rest or support and all of the blades can be properly and simultaneously aligned with their respective commutator slots.

Still another object is to provide such a commutator slot cleaning apparatus, which shall include a novel and improved construction and combination of a support for the part such as an armature with which the commutator is associated, a support for the blades or cutters, means for indexing and locating the cutters in alignment with their respective slots at one end of the commutator, means for causing movement of the commutator and the blade or cutter support with the blades therein longitudinally of the commutator to remove the undesired particles from the commutator slots, and means for ejecting the part carrying the armature from its support.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

FIGURE 1 is a plan view of a commutator slot cleaner embodying the invention.

FIGURE 2 is a central vertical longitudinal sectional view approximately on the plane of the line 2-2 of FIGURE 1 and showing a commutator in position for the slot-cleaning operation.

FIGURE 3 is a front elevational view of the commutator slot cleaner from approximately the plane of the line 3-3 of FIGURE 1.

FIGURE 4 is a fragmentary greatly enlarged central vertical sectional view through a portion of the blade supporting head, and a portion of the armature and commutator, showing the parts in position preliminary to the slot-cleaning operation; and

2

FIGURE 5 is a similar view showing the parts at the end of the slot-cleaning operation.

The invention may be embodied in many different details of construction, but for the purpose of illustrating the principles of the invention, a slot cleaner has been shown as comprising a suitable support A that may comprise, for example, the top of a table or stand and on which is fixedly mounted a bearing bracket or standard B that has mounted thereon a support or head C for a plurality of broaching or cutting blades 1. The head C has a central horizontal recess 2 therein that opens through one end thereof and in which is disposed an adaptor support 3 for the machine part of the electrical apparatus with which the commutator is associated. The outer end of the adaptor support has a recess 4 to removably receive a portion of said machine part, for example the commutator end of the shaft D of an armature E with which the commutator F is associated. The adaptor support 3 is removably mounted as by screw threads 5 on the end of a tubular shaft 6 so that the adaptor supports can be interchanged to accommodate machine parts or shafts of different sizes. The shaft 6 is slidable in the bearing bracket B and another bearing bracket G on the main support A. The shaft 6 may be longitudinally moved by any suitable means, even manually, to move the commutator relative to the blades 1, but as shown, a crosshead 7 is rigidly connected to the shaft and has connected to each of opposite ends thereof one end of a link 8 the other end of which is pivotally connected at 9 to the piston rod 10 of a reciprocating hydraulic motor H which is pivotally connected at H' to a support bracket H'' on the main support A. Each piston rod 10 is connected to one end of another link 11 the other end of which is pivotally connected at 12 to the bearing bracket G, so that upon simultaneous movement of the piston rods 10 toward each other in FIGURE 1, the shaft 6 will be slid longitudinally in one direction, that is, to the right in FIGURES 1 and 2 and thereby move the machine part or armature outwardly from the recess 2 of the head C relatively to the blades 1.

An important feature of the invention is the mounting and indexing of the blades 1. Obviously there will be a number of blades equal to the number of slots 13 between the commutator parts or segments 14, and the blades are arranged radially with respect to the axis of the adaptor support 3 as best shown in FIGURES 2 and 3. Inasmuch as the number of commutator slots will vary, depending upon the nature of the machine part with which the commutator is associated, the invention also contemplates the provision of a plurality of sets of blades that include different numbers of blades for use with commutators having different numbers of slots.

For this purpose, a blade carrier 15 is provided and separately mounted on the head C as by means of set screws 16 and has one face approximately perpendicular to the axis of the adaptor support 3. The carrier has formed in its said face a plurality of slots 17 one for each blade and the blades are removably mounted in the carrier so that they may be inspected, sharpened and interchanged when desired. As shown, a back-up or closure plate 18 is secured to said face of the carrier, as by cap screws 19, in overlying relation to the blades, and longitudinal movement of the blades is limited by an actuating means to be described. Each blade has a cutting point 1a of length and width corresponding to the depth and width of the commutator slots respectively and the edges of each point are so related as to cut the undesired metal and insulation from the slot as the commutator is moved longitudinally beneath the blade with the blade point in the slot. The carrier plate and the cover plate have the respective openings 15a and 18a

coaxial with the recess 2 of the adaptor support and provide clearance for the insertion of the machine part or armature into the adaptor support 3.

The blades are movable longitudinally and radially of the carrier plate so that the points 1a can be moved into and out of alignment with their respective commutator slots, and one of the blades is adjustable to facilitate indexing of the blades. While different means may be utilized, in the means shown, each blade has a diagonal slot 21 adjacent its outer end with which coacts a cam flange 22 on one end of an actuator sleeve 23 that is coaxially longitudinally slidable on the head C by any suitable means such as an operating lever K which includes a ring 24 that has a radial outwardly projecting arm 25 pivotally connected at 26 to the main support A and also has a handgrip extension 27 diametrically opposite the pivot arm 25, said ring having diametrical pivotal connections with the sleeve 23 as by means of screws 28. Adjustable stops 29 are provided for limiting the swinging movement of the lever K.

With this construction, it will be observed that upon movement of the sleeve 23 in one direction, that is to the left in FIGURES 1 and 2, the cam flange 22 in slots 21 will cause the blades to be moved radially outwardly to clear the commutator as shown in FIGURE 4, while when the sleeve is moved in the other direction, the blades will be moved inwardly to locate the points 1a in position to clean the commutator slots as shown in FIGURE 2.

Preferably one of the blades is so mounted and constructed that it may serve as an index element for properly indexing all the blades simultaneously in proper operating relation to their respective slots. As shown in FIGURES 4 and 5 the slot 21 in one of the blades is made wider than the slots in the other blades as indicated at 21a so as to provide a clearance between the side walls of the slot and the cam flange 22 to permit the blade to be individually pushed toward the commutator, whereupon the commutator can be rotated to bring one of the slots into proper operating relation to the point of said blade which results in the other slots of the commutator being simultaneously properly located with respect to their corresponding blades. For normally biasing the indexing blade outwardly into its normal position clear of the commutator, an angular spring 30 has one end seated in a notch 31 in the blade and its other end fixedly connected to the carrier plate 15 as indicated at 32. When it is desired to use the blade for indexing, the blade is simply pushed inwardly, or downwardly in FIGURE 4, against the influence of the spring 30, and upon release of the downward or inward pressure, the spring will return the blade to its normal position as shown in FIGURES 4 and 5. It will be understood that outward radial movement of the blades will be prevented by abutment of the inner sides of the slots with the underside of the cam flange 22, and that inward radial movement of all of the blades except the indexing blade will be limited by engagement of the outer sides of the slots 21 with the outer surface of said cam flange.

In the operation of the machine, the machine part or armature will be inserted into the recess 4 of the socket adaptor so as to locate the commutator in proper relation to the blades and in the recess 2 wholly beyond the points 1a of the blades as shown in FIGURE 4. The machine part and commutator are thus supported by the adaptor support 3, but an additional rest for the machine part may be provided if desired. The actuator K is then swung to move the sleeve 23 to the right in FIGURES 1 and 2 and thereby actuate the blades inwardly into a position behind the commutator as shown in FIGURE 2. Thereupon the shaft 6 is slid longitudinally to the right, by the hydraulic motor H so as to push the commutator to the right in FIGURE 2 from the position shown in FIGURE 4 to the position shown in FIGURE 5. Thus the commutator is caused to move relatively to the points 1a of the blades which, being lo-

cated in the commutator slots, cut or push the undesired particles of metal or insulation L (FIGURE 4) out of the corresponding slots. The operating lever K will then be swung to move the actuator sleeve 23 to the left and thus push the blades outwardly to their normal position where they can be indexed again each in a common plane with one of the slots of another commutator to repeat the slot-cleaning operation.

The commutator can be removed from the apparatus in any suitable manner. Obviously the machine part or the commutator can be manually pulled out of the adaptor support, but preferably mechanical means is provided for that purpose, which, in the present instance, is shown as comprising a push rod 33 that is slidable through the tubular shaft 6 with one end extending into the recess 4 in the adaptor support so that as the rod is pushed to the right it will eject the machine part or armature as shown in FIGURE 5. Any suitable motor means may be provided for actuating the push rod but as shown a reciprocating hydraulic motor M is mounted on a bracket N on the main support A and has its piston rod connected to the push rod 33.

It will be understood by those skilled in the art that the hydraulic motors H and M may be operated in both directions by hydraulic pressure or may be operated by hydraulic pressure in one direction and by springs in the opposite direction, and that suitable valves for controlling the flow of hydraulic fluid to and from the motors, and an electrical mechanism for controlling said valves, may be provided as desired. Also, mechanism may be provided for automatically controlling movement of the shaft 6 and adaptor support 3 upon the swinging of the operating lever K or upon the pushing of a button.

I claim:

1. Apparatus for cleaning the slots between the conductor segments of a cylindrical commutator, comprising a main support, a blade for each slot having a point to enter the slot, means mounted on said support including a circular blade holder for holding said commutator and all of said blades with the point of each blade in a common plane with one of said slots, and means for causing coaxial relative movement longitudinally of the commutator, of said commutator and said blade holder with all of said blades with the point of each blade in one of said slots providing for the ejection from each slot of all material accumulated therein.

2. Apparatus for cleaning the slots between the parallel conductor segments of a cylindrical commutator, comprising a main support, a blade for each slot having a point to enter the slot, means mounted on said support including a circular blade holder for holding the commutator and all of the blades with the point of each blade in a common plane with one of said slots and for moving said commutator longitudinally coaxially with said blade holder relatively to all of said blades with the point of each blade in one of said slots providing for the ejection simultaneously from all of said slots of all material accumulated therein.

3. Apparatus as defined in claim 1 wherein the first-named means includes a support for the commutator, the blades are slidably adjustable in said holder to and from a commutator in said support, and means for simultaneously sliding all of said blades to the commutator for starting the slot-cleaning operation and for moving all of the blades simultaneously away from the commutator at the end of the cleaning operation.

4. Apparatus as defined in claim 1 wherein the first-named means includes a support for the commutator, the blades are slidably adjustable in said holder to and from a commutator in said support, each blade having a slot therein, and with the addition of an actuator movably mounted on said holder and having a cam portion in said slots providing for simultaneous movement of all of said blades to and from said commutator upon movement of said actuator in opposite directions respectively.

5. Apparatus as defined in claim 3 wherein one of said

5

blades is yieldably mounted in said holder for sliding movement toward the commutator independently of the other blades for indexing the blades with respect to their corresponding commutator slots.

6. Apparatus as defined in claim 2 wherein the first-named means includes a support for the commutator, the blades are slidably adjustable in said holder to and from a commutator in said support, means for simultaneously sliding all of said blades to and from the commutator, and a device for moving said support for the commutator.

7. Apparatus for cleaning the slots between the parallel conductor segments of a cylindrical commutator that has a shaft projecting coaxially from one end thereof, comprising an adaptor-support having a recess to rotatably receive said shaft, a blade for each slot having a point to enter the slot, a holder in which said blades are slidably mounted in radial relation to the axis of said recess in said adaptor-support providing for the positioning of each blade in a common plane with one of said slots, means for simultaneously moving said blades to and from said commutator, and means for moving said adaptor-support and said commutator longitudinally along said axis of said recess with the point of each blade in one of said slots to eject from said slots all material accumulated therein and thereby clean the slots.

8. Apparatus for cleaning the slots between the parallel conductor segments of a cylindrical commutator, a support for a commutator, a blade for each slot having a point to enter the slot, a holder for said blades in which the blades are mounted in radial relation to a commutator in said support and for movement toward and from the commutator, each blade having a slot therein, and an actuator reciprocally mounted on said holder and having a cam portion coactive with said slots in all of the blades

6

providing for simultaneous movement of all of said blades to and from the commutator upon movement of said actuator in opposite directions respectively.

9. Apparatus as defined in claim 8 wherein said commutator is rotatably mounted in said support, one of said blades is yieldably mounted for movement toward the commutator independently of said actuator and the other blades for indexing all of the blades with respect to their corresponding commutator slots.

10. Apparatus as defined in claim 1 wherein the first-named means includes a support in which said commutator is removably mounted, and with the addition of means for ejecting the commutator from said support at the end of said relative movement of the commutator and the blades.

11. Apparatus as defined in claim 7 with the addition of means for pushing said shaft of the commutator out of said recess of the adaptor-support at the end of the slot-cleaning movement of said adaptor-support.

12. Apparatus as defined in claim 7 wherein there is a longitudinally reciprocable tubular shaft on one end of which said adaptor-support is mounted, and with the addition of a push rod longitudinally slidable in said tubular shaft with one end movable into and out of said recess to abut said commutator shaft and push it out of said recess upon movement of said push rod in one direction.

References Cited in the file of this patent

UNITED STATES PATENTS

1,366,784	Gardner	Jan. 25, 1921
2,145,091	Mansfield	Jan. 24, 1939
2,303,106	Baurhenn	Nov. 24, 1942
2,478,026	Thorell	Aug. 2, 1949