

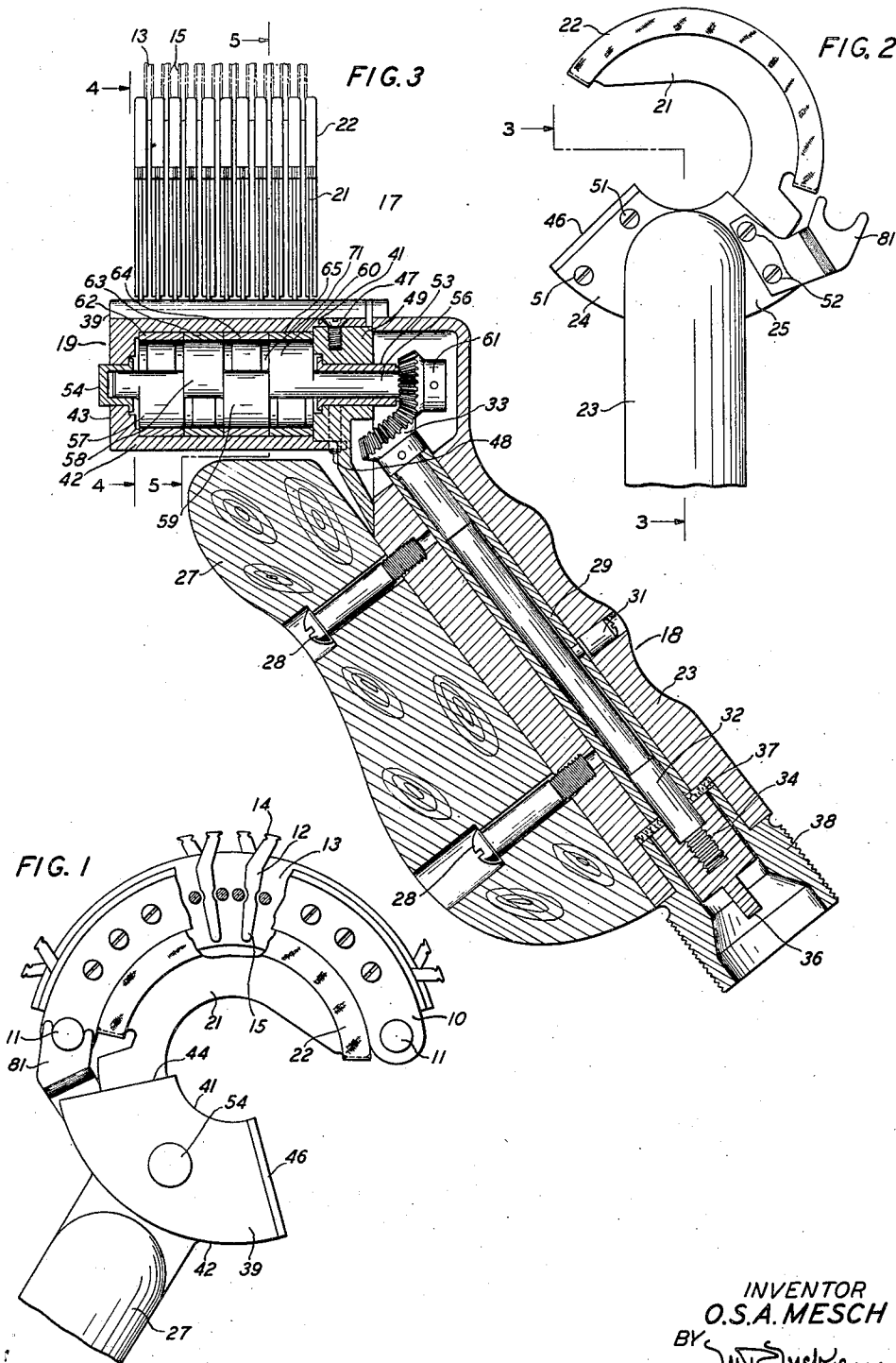
April 11, 1950

O. S. A. MESCH  
SWITCH CLEANING TOOL

2,503,558

Filed April 29, 1944

3 Sheets-Sheet 1



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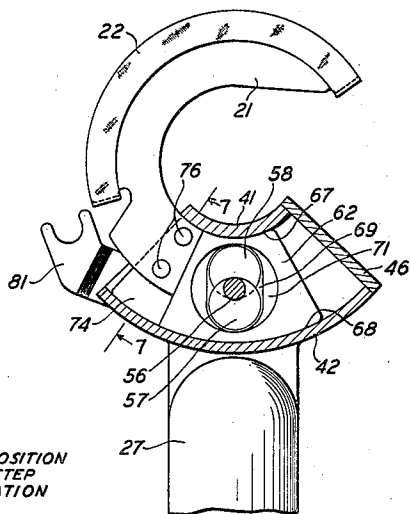
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FIG. 4



BIAS TAPE POSITION  
AT INITIAL STEP  
OF INSTALLATION

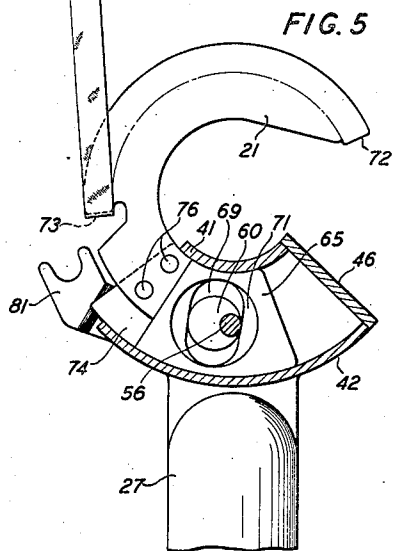


FIG. 5

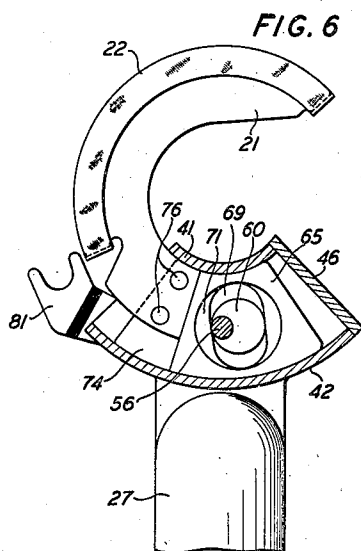


FIG. 6

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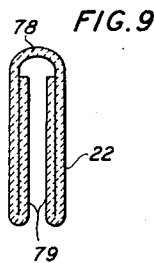
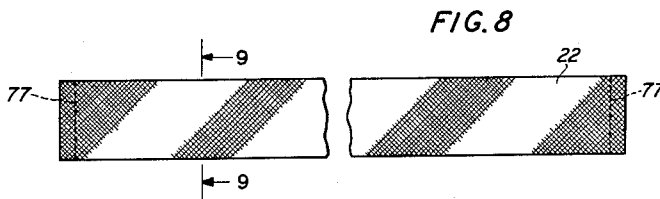
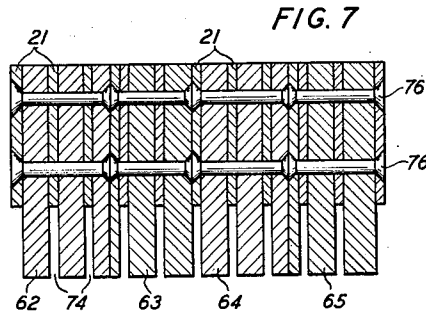
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# UNITED STATES PATENT OFFICE

2,503,558

## SWITCH CLEANING TOOL

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Application April 29, 1944, Serial No. 533,424

10 Claims. (Cl. 15—97)

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The invention relates to cleaners and particularly to a cleaning device for burnishing switch bank contacts of automatic telephone systems.

The contacts of switch banks, such as those of the step-by-step type, which are disposed in a plurality of superposed layers, collect dust and dirt and after a while the accumulation thereof introduces a variable high resistance into the telephone circuit when engaged by the switch wiper, so that crackling noises are heard by the subscriber. In order to keep these disturbances at a minimum it is necessary to periodically clean the switch bank contacts, the cleaning operation formerly having been performed by hand-driven cleaning tools and more recently by power driven cleaning tools.

In an improved power cleaning device, as disclosed by copending application of Bertram D. Lorimer, Serial No. 533,423, filed April 29, 1944, the cleaning blades, which are actuated by a balanced cam arrangement, are covered with a sleeving material of soft cloth for burnishing the contacts of the switch bank. This cloth sleeve must necessarily be of exact shape and size in order to provide a smooth surface and must be threaded upon the cleaning blades. Since the cleaning blades are separated from each other by a relatively small space, in conformity with the rows of contacts, it is very difficult to thread the cloth sleeve while the blades are affixed to this tool, so that every time a soiled sleeve is to be replaced the blades must be removed from the holder. The replacement of the sleeve must take place frequently and accordingly offers substantial obstacles to the use of a power driven tool. Various expedients have been tried such as designing a tool with easily removable blades in order to facilitate the rethreading operation, but as far as applicant is aware, none of these is entirely satisfactory.

An object of the present invention, therefore, is to devise an improved power driven cleaning tool having a plurality of cleaning blades in which the burnishing cloth may be readily replaced.

A further object of the invention is to provide a burnishing cloth of such characteristics that it is readily formed around the peripheral edge of a cleaning blade without buckling.

According to a feature of the present invention, advantages are secured over the prior arrangements by cutting a section of burnishing tape on a bias, double folding the tape longitudinally in the shape of a channel, and closing each end thereof. The resultant bias tape is then fitted to the peripheral edge of the cleaning blade by securing

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the closed ends thereof to projections provided on the blade.

Another feature of the invention resides in an improved balanced cam driven power cleaning tool having four groups of cleaning blades slidably oscillated by four associated cams disposed at 180 degrees whereby at any instant the torque produced by two groups of blades moving in one direction is balanced by the torque produced by the other two groups moving in the opposite direction.

These and other features of the invention will be more fully described in the following specification, taken in connection with the accompanying drawing in which:

Fig. 1 illustrates a top plan view of a switch bank with a cleaning tool, made in accordance with the present invention, in engagement with the contacts thereof;

Fig. 2 illustrates a bottom plan view of the cleaning tool shown in Fig. 1;

Fig. 3 illustrates a cross-sectional view of the cleaning tool taken along line 3—3 of Fig. 2;

Fig. 4 illustrates a cross-sectional view taken along line 4—4 of Fig. 3 in which the relative positions of the cams and cleaning blades are shown;

Fig. 5 is a cross-sectional view taken along line 5—5 of Fig. 3 in which the cam for the lower group of cleaning blades is shown in the extreme left position;

Fig. 6 is a cross-sectional view similar to Fig. 5 in which the cam is shown in the extreme right position;

Fig. 7 is a cross-sectional view taken along line 7—7 of Fig. 4 of the slidable supporting means for the four groups of blades;

Fig. 8 is a plan view of a bias burnishing tape; and

Fig. 9 is a cross-sectional view of the bias tape taken along line 9—9 of Fig. 8.

Referring now to the drawings and particularly to Fig. 1 a portion of a standard switch bank 10, supported by rods 11, is shown in which the usual ten rows of insulated terminals 12 are disposed arcuately in superposed layers. The terminals 12 are generally disposed in pairs, being separated by an arcuate insulating strip 13 which projects inwardly beyond that of the terminals 12. One end 14 of terminal 12 is adapted for connection to a wire (not shown) while the contact end 15 is adapted for engagement with the usual switch wiper spring (not shown). In order to provide satisfactory engagement between stationary contact 15 and the movable switch wiper, contact 15

should be free from dust and dirt and accordingly, it is necessary periodically to burnish these contacts. An improved cleaning tool 17 for burnishing said contacts is shown in operative position in Fig. 1.

Referring particularly to Fig. 3, a sectional view of cleaning tool 17 illustrates in detail the assembly of the various elements. These elements comprise a handle 18, preferably in the form of a casting, a head 19 secured thereto for housing cam mechanism, and a plurality of oscillatable cleaning blades 21 having bias tapes 22 attached thereto for burnishing the switch bank contacts 15. Handle 18 comprises a hand-shaped tubular casting 23 having flanges 24, 25 (Fig. 2) integral therewith at the forward end for attachment to the head 19 and a complementary hand-shaped wood detail 27 attached to casting 23 by screws 28. Within casting 23 are included a tubular bearing 29 secured thereto by set screw 31 and a rotatable driving shaft 32 having a bevel gear 33 fixedly mounted at one end and a rotatable connecting member 34 threadedly engaged therewith at the other end. Member 34, which has a diametral projection 36 for connection with a slotted flexible shaft (not shown) in turn connected to a portable driving motor (not shown), abuts against a washer 37, preferably of felt, and rotates within a bushing 38, fixedly secured to casting 23 in any suitable manner as by a drive fit.

The head 19 of the cleaning tool 17 comprises an arcuately-shaped casing 39 having front and rear members 41, 42 respectively, concentric with the arcuate rows of terminals 12, a flat top 43 and a left side 44 (Fig. 1), the right side and bottom thereof being open. A right side cover 46 is removably fastened both to top 43 and flange 24 by screws (not shown). The front and rear concentric members 41, 42, respectively, are secured at the bottom extremities by screw 47 and pin 48 to an intermediate adapter 49 which in turn is secured to flanges 24, 25 by screws 51, 52 respectively (Fig. 2), thereby forming a closed bottom for casing 39. An open bushing 53 in adapter 49 and a closed bushing 54, secured to the top member 43 in any suitable manner, as by a drive fit, provide a rotatable bearing for cam shaft 56, which has four cams 57, 58, 59, 60, helically disposed thereon, the eccentricities of which are disposed at 180 degrees with respect to adjacent cams. One end of cam shaft 56 extends beyond bushing 53 and has affixed thereto a bevel gear 61 that meshes with associated bevel gear 33, thereby coupling the cam shaft 56 with the driving shaft 32.

Slidably mounted in casing 39 and embracingly engaging cams 57, 58, 59, 60 are four sets of arcuate cleaning blade supports 62, 63, 64, 65, respectively, the front and back portions 67, 58 (Fig. 4) of each set conforming in curvature with the front and back members 41, 42, respectively of the casing 39. The blade supports thus translate the rotary motion produced by shaft 56 to an oscillatory motion imparted to cleaning blades 21. An elongated hole 69 (Fig. 4) is provided in each of the blade supports 62, 63, 64, 65 for engagement with cams 57, 58, 59, 60 respectively, while a circular clearance hole 71 of nominal depth, such as a counterbore, is also provided in each of said supports for preventing interference between a cam and its adjacent non-coupled blade support. In Fig. 4 the 180-degree eccentric disposition of cams 57, 58, as well as cams 59, 60, is illustrated and in this position of cam shaft 56 the respective blade supports 62, 63, 64, 65 are

in their neutral or central positions. In Fig. 5, cam 60 and associated support 65 are shown in their extreme left positions while in Fig. 6 they are shown in their extreme right positions. It is thus evident from the different positions illustrated in Figs. 4, 5, and 6 that in view of the 180-degree cam displacement blade supports 62, 64 move in opposite directions to that of supports 63, 65, respectively, so that the torques developed by blade supports 62, 64 are balanced out by that of blade supports 63, 65, thereby resulting in a continuously smooth operation of the cleaning device 17.

Eleven cleaning blades 21 are provided for simultaneously cleaning the ten rows of contacts 15 at one operative disposition of the cleaning tool 17. Each cleaning blade 21 consists of an arcuate member, preferably of stamped steel, shaped to conform at the burnishing portion with the curvature of the rows of contacts 15 of switch bank 10 and at the supporting portion with arcuate member 41 with which it is slidably engaged. A tapering blunt end 72 (Fig. 5) and an undercut shoulder 73 in each of blades 21 is provided for securing the ends of bias tape 22. The blades 21 are segregated into four groups, one group for each of supports 62, 63, 64, 65, and are secured in slots 74 of said supports by rivets 76 (Fig. 7). The hereinbefore described oscillatory motion of the blade supports is thus imparted to the cleaning blades 21, which being subdivided in substantially equal groups produce substantially balanced torques when engaged in burnishing the contacts 15.

In Fig. 8 is shown a cleaning tape 22 of applicant's invention which has solved the difficult problem of replacement of soiled cleaning cloths previously comprising a sleeve member threaded upon a cleaning blade. Tape 22 is prepared by cutting a predetermined section, preferably rectangular, of cloth out of suitably soft material, or for that matter out of any type of burnishing material, on a bias, that is, at an angle with respect to the direction of the threads comprising the material, which bias cutting operation is well known in the dress trade. The section of bias cloth material 22 is then double folded along its longer dimension, as shown in cross-section in Fig. 9, into an inverted U or channel, which is closed at the ends thereof in any suitable manner, as by threaded stitches 77. The closed upper portion 78 of the tape 22 is disposed against the outer peripheral edge of the cleaning blade 21 while the inner portions 79 thereof embrace the sides of the blade 21. It is to be noted that bias tape 22, in view of the angularity of the threads thereof, has certain resilient characteristics that enable it to be stretched both longitudinally and laterally, so that the procedure in fitting a bias tape 22 to a blade 21 is quite simple. One of the closed ends of bias tape 22 is first slipped over the outer peripheral edge of blade 21 and hooked onto shoulder 73, the tape assuming the initial direction and shape shown in Fig. 5. The tape 22 is then slipped over the remainder of the peripheral edge of blade 21 and then stretched sufficiently to enable the other closed end of the tape to be hooked onto blunt end 72, the tape readily conforming to the curvature of the blade. It has been demonstrated in actual installations that a bias tape of the proper length when so fitted produces a smooth surface without any buckling thereof on the cleaning blade and that the two ends of the tape are held securely to the blade in view of the resilient characteristics inherent in a

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bias cut tape. A soiled bias tape 22 may be removed by simply pulling the tape free of end 72, drawing it away from the blade 21, and disengaging it from shoulder 73. It is thus seen that applicant's bias tape may be easily and readily installed on any of the closely spaced cleaning blades 21 without removal of the blade from the tool. By use of applicant's bias tape a more simple and economical tool has been made possible since it is no longer necessary to provide for ready removal of the cleaning blades.

In the cleaning operation, the tool 17 is first placed with bifurcated bracket 81, which is secured to flange 25 also by screws 52 (Fig. 2), held against rod 11 (Fig. 1), the cleaning blades 21 also being snugly disposed in the interstices between the contact rows with the bias cleaning tapes 22 bearing against the faces of the contacts 15. The driving shaft 32 is then rotated mechanically by a portable motor, as described hereinbefore, cams 57, 58, 59, 60 rotating therewith by virtue of coupling gears 33, 51, and blade supports 62, 63, 64, 65 translating this rotary motion to an oscillating translatory motion in the eleven cleaning blades 21, which in turn sweep back and forth across the ten rows of contacts 15. After the contacts 15 are satisfactorily cleaned, the mechanical power is disconnected and the tool 17 is withdrawn from the switch bank 10. The above operation is then repeated for cleaning other switch banks 10. Thus by use of a tool embodying applicant's invention the cleaning operation of automatic telephone switch banks is substantially expedited.

While this invention has been shown and described as embodying certain features merely for the purpose of illustration, it is, of course understood that various modifications may be made in the details thereof and that the features may be applied to many other and widely varied fields without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. A cleaning device for burnishing contacts of a switch bank comprising an arcuate blade, a fabric tape cut on a bias to the weave of the fabric, and tensioning means for stretching said tape along said arcuate blade, so that said tape conforms smoothly to said arcuate blade, for wiping engagement with said contacts.

2. A cleaning device for burnishing contacts of a switch bank comprising a plurality of arcuately shaped blades, a plurality of woven tapes each cut on a bias to the weave, and a plurality of tensioning means for stretching said tapes individually along each of said arcuate blades, so that each of said tapes conforms smoothly to an arcuate blade, for wiping engagement with said contacts.

3. A power-driven cleaning device for burnishing contacts of a switch bank comprising an arcuate blade, spaced, substantially fixed, securing elements on said blade, and an extensible burnishing element tensioned between said securing elements and conforming smoothly to a surface of said blade, for wiping engagement with said contacts.

4. A contact cleaning device comprising a support, a plurality of arcuate cleaning blades mounted on said support, and a burnishing cloth for each of said blades, said cloth being cut on a bias and embracingly fitted around a peripheral edge of each of said blades.

5. A device for cleaning switch contacts comprising a supporting member, a plurality of arcuate cleaning blades movably secured to said mem-

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ber, said blades segregated into four groups, a source of mechanical power for actuating said blades, means for oscillating one pair of said groups simultaneously in one direction and the other pair of said groups in the opposite direction, whereby the torque developed by said one pair of groups of blades is substantially balanced by the torque developed by the other pair of said groups of blades, an extensible burnishing element individual to each of said blades and means in said device for tensioning each of said elements in close conformity with a surface of its individual blade to prevent wrinkling of said elements, so as to maintain said torques in balance, as said elements wipe over said contacts.

6. A device for cleaning switch bank terminals comprising an arcuate cleaning blade, a strip of cloth with its weave disposed on a bias, said strip formed into an extensible envelope, said envelope fitted smoothly about the arcuate surface of said blade, and means for driving said blade so fitted over the surfaces of said terminals.

7. A device for cleaning switch bank terminals comprising an arcuate cleaning blade, a rectangular envelope formed of an extensible burnishing material tensioned on said blade to facilitate the shaping of said envelope to conform to the curvature of said blade, and means for oscillating said blade over the surfaces of said terminals.

8. A device for cleaning switch bank terminals comprising a plurality of closely spaced arcuate cleaning blades, a linear strip of extensible burnishing material for each blade, means on each of said blades for securing said material, when extended, under tension, so that said material is shaped and fitted smoothly to the surfaces of the arcuate blade, and means for driving said blades in a reciprocal motion over the surfaces of said terminals.

9. A device for cleaning switch bank terminals comprising a plurality of closely spaced arcuate cleaning blades, a linear strip of cloth tape for each blade, said tape having a channel shape to cover both flat surfaces of said blade and having its weave disposed on a bias enabling it to conform to the arcuate shape and to fit snugly to the flat surfaces of the blade, and power means for causing said blades to wipe over the surfaces of said terminals.

10. A readily mountable and demountable substantially rectangular elongated extensible envelope of cleaning and burnishing material, said envelope being closed along one elongated longitudinal edge and along its two ends and having one elongated longitudinal edge open, said envelope being adaptable when stretched to conform smoothly to the surfaces of an arcuate elongated blade-like element larger than said unstretched envelope, embraced within said envelope and such an element so embraced within said envelope.

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