

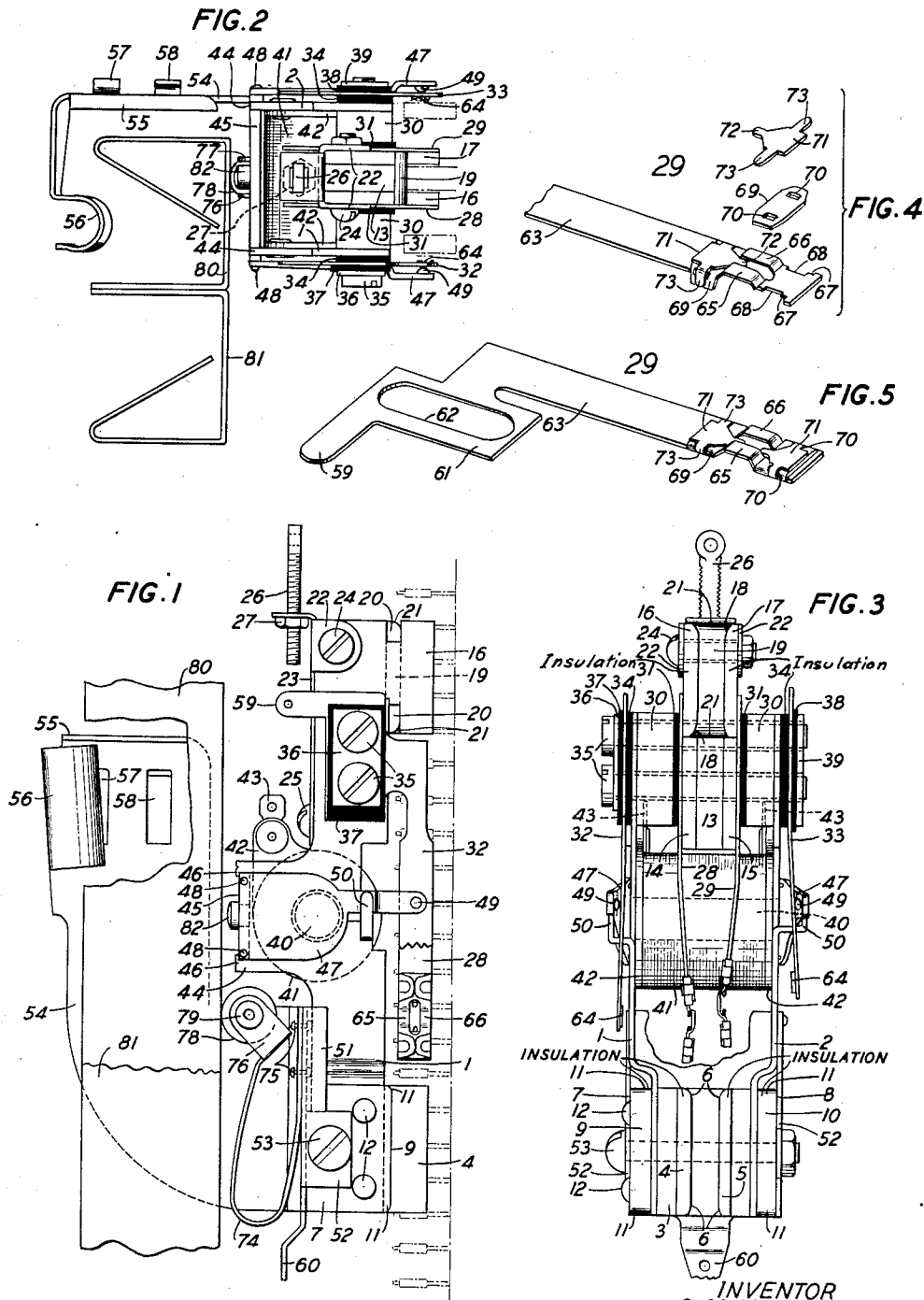
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BRUSH CARRIAGE FOR SELECTOR SWITCHES

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BRUSH CARRIAGE FOR SELECTOR SWITCHES

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This invention relates to selector switches for establishing connections in machine switching telephone systems and, more particularly, to a brush carriage for a selector switch of the type having access to banks of terminals.

Panel type selector switch frames are provided with one or more flat or panel banks of terminals with which the brush sets of a plurality of selector switches cooperate. In some types of selector switches such, for example, as that disclosed in Patent 2,173,548, granted September 19, 1939, to W. W. Carpenter and R. F. Mallina, the brush carriage is driven at a very high speed to traverse the brushes carried thereby along rows of terminals of panel banks. Some difficulty has heretofore been experienced in securing reliable contacts between such brushes and the bank terminals due to the vibratory movement imparted to the brush carriage or to the bank by building vibrations or due to the movement of other switches mounted on the same frame and cooperating with the same bank of terminals. This difficulty has been largely overcome by the provision of a brush carriage of the type disclosed in Patent 2,164,034, granted to me on June 27, 1939 in which the four brush springs are attached to a sled which rests on the ends of the terminals of the rows of bank terminals with which the switch is assigned to cooperate and which is provided with parallelly disposed portions or ribs which enter between the edges of adjacent rows of terminals whereby the sled is guided in its movement over the rows of terminals. The sled is arranged for movement longitudinally over the rows of terminals and since it is pressed against the banks by a roller, spring supported on the sled, which engages a member secured between the end brackets of the switch unit and positioned parallel to the face of the bank, the entire brush carriage may partake of any lateral vibratory movement of the face of the bank and, as a consequence reduce the tendency of the brushes to slide with respect to the bank terminals upon which they have been arrested in the selective movement of the switch.

It is an object of the present invention to further reduce the objectionable noise imposed on the speech transmission circuit in which switch brushes of the above described type are included, by providing that the tip and ring brushes of the brush carriage shall not engage bank terminals during the terminal selection movement of the switch and that all of the brushes of the brush carriage shall, due to their improved con-

struction, make better contacts with bank terminals.

It is a further object of the invention to so improve the construction of the brush carriage and the construction of the brushes thereof that the amount of power required to traverse the brush carriage in its terminal selection movement is materially reduced.

In accordance with the invention these objects are attained by securing the four brush springs to the brush carriage with the contact shoes of the two inner springs engaging the edges of the two inner rows of terminals of the bank with which the switch is assigned to cooperate, for example, with the test and metering terminals, and with the contact ends of the two outer springs positioned for engagement with the edges of the two outer rows of terminals, that is, the tip and ring terminals but held out of engagement with such terminals until the brush carriage has been arrested with the contact shoe of its test brush spring engaged with the test terminal of a desired terminal set. Since the tip and ring brush springs have no sliding movement over the edges of the terminals of the rows with which they cooperate, they require no contact shoes and may be of the relay spring type thereby insuring better contact engagement with the bank terminals. For engaging such springs with the bank terminals, the brush carriage is provided with a small magnet, the armature of which are positioned to press the contact ends of such springs against the edges of the tip and ring bank terminals of the set opposite which they have been positioned by the selective movement of the brush carriage.

The two inner brush springs are, in accordance with the present invention, of the so-called "wafer" type. That is their contact shoes, due to the improved construction, are much thinner than contact shoes heretofore provided and therefore provide greater clearance from the inner edges of the tip and ring rows of bank terminals with a better insurance against snagging thereon during the movement of the brush carriage. The contact portion of the end of each of these springs is raised from the body of the spring and is flanked on each side by a slider insulated from the spring, the contact portions and the sliders having chromium-plated surfaces to reduce friction. By this construction, a metal-to-metal contact between the brush spring shoe and the edges of the terminals is always insured thereby eliminating the fouling of terminals and chemical reactions thereat by

the engagement of insulating portions of brush spring shoes therewith as was possible with the contact shoes of the type heretofore employed. Actual tests have shown a very marked improvement with the metal-to-metal engagement.

For a more complete understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 is a side elevational view of a brush carriage constructed in accordance with the invention;

Fig. 2 is a top plan view of the brush carriage disclosed in Fig. 1;

Fig. 3 is a rear elevational view of the brush carriage of Fig. 1;

Fig. 4 discloses in perspective the portions of a partially assembled brush spring; and

Fig. 5 is a perspective view of the brush spring of Fig. 4 completely assembled.

The brush carriage comprises two parallelly disposed frame members 1 and 2, preferably of a light non-magnetic material such as aluminum, between the lower ends of which is positioned a grooved spacing block 3 also of aluminum. Positioned in the grooves of the block 3 are two strips 4 and 5 of insulating material which serve as guide ribs to guide the brush carriage along a row of terminal sets of a terminal bank. The ends of these strips are rounded off as indicated at 6 to prevent snagging on the edges of terminals. The spacing between the inner surfaces of these strips is made only slightly greater than the combined width of the two inner rows of bank terminals and the strips are sufficiently thin to permit them to move freely between the inner and the outer rows of terminals of the row of terminal sets to which the brush carriage is assigned. Positioned outside of the frame members 1 and 2 are two shoes 7 and 8 of insulating material, the outer surfaces 9 and 10 of which are so positioned as to ride on the ends of the outer rows of terminals of the terminal sets and which have rounded corners as indicated at 11 to prevent them from snagging on terminals. The shoes 7 and 8, the spacer 3 and the guide strips 4 and 5 positioned within the grooves of the spacer 3, are secured together and to the ends of the frame members 1 and 2 by the rivets 12.

Positioned between the upper ends of the frame members 1 and 2 is a spacer 13 of aluminum, flanked by two strips 14 and 15 of insulating material provided at their upper ends with portions 16 and 17 which serve as guide ribs to guide the upper end of the brush carriage along a row of bank terminal sets. These guide ribs have their inner surfaces spaced by the spacing block 13 so that such spacing is only slightly greater than the combined width of the two inner rows of bank terminals as disclosed more clearly in Fig. 2 and have the ends of such surfaces rounded off as indicated at 18 to prevent snagging on the edges of the terminals during the movement of the brush carriage. Positioned between the guide members or ribs 16 and 17 is a shoe 19 of insulating material for sliding engagement against the ends of the two inner rows of bank terminal sets. This shoe is retained in position against the edge of the spacer 13 by ears 20 formed in the edges thereof which are engaged in notches in the top and bottom edges of the guide ribs 16 and 17. To prevent the shoe from snagging on the ends of bank terminals during the movement thereof, the ends of the shoe 19 are rounded off as indicated at 21. The upper ends

of the strips 14 and 15 and of the spacer 13 are clamped by bolt 24 between the ears 22 bent parallelly from the edges of the bracket 23.

The lower end of the bracket 23 is secured to the spacer 13 by a screw 25 which extends through a hole in the bracket into a threaded hole in the spacer 13. The upper ends of the bracket is bent outwardly at right angles and is provided with a rectangularly shaped hole through which the threaded flat shank of an adjusting screw 26 extends and which shank is retained therein by the nut 27 threaded thereon. The screw 26 is provided with an eyelet to which one end of the brush carriage driving tape of the switch may be secured. By the provision of the flat shank on the screw and a rectangular hole in the bracket through which the shank extends, the rotation of the screw is prevented when the nut 27 is turned on the thread of the screw to adjust the tension of the driving tape.

Assembled outside of the two strips 14 and 15 and positioned adjacent to their outer surfaces are two brush springs 28 and 29, to be later described, and interposed between each of these springs and the inner surfaces of the frame members 1 and 2 are spacing blocks 30 preferably of aluminum insulated from the springs by strips 31 of insulating material. Assembled outside of the frame members 1 and 2 are two additional brush springs 32 and 33, to be later described, which are insulated from the frame members 1 and 2 by interposed strips 34 of insulating material. The strips 14 and 15, insulating strips 31 and 34, spacers 13 and 30, springs 28, 29, 32 and 33 are secured to the upper ends of the frame members 1 and 2 by screws 35 which extend through aligned holes in the clamping plate 36 and insulating strip 37, through aligned holes in the aforesaid insulating strips, brush springs, spacers, and frame members, thence through aligned holes in the insulating strip 38 into tapped holes in the clamping plate 39. These screws are suitably insulated from the brush spring by sleeves of insulating material which surround the shanks of such screws.

Extending between the frame members 1 and 2 at a position substantially mid-way of their length is a magnet core 40, the ends of which are reduced in diameter and extend through holes in the frame members 1 and 2. A magnet coil 41 surrounds the core 40 and has two spoolheads 42 of insulating material to each of which is attached a coil terminal lug 43.

The frame members 1 and 2 are provided with extensions 44, the ends of which are notched to receive a flat bar 45 of magnetic material, the bar being held in place by staking the ends of the extensions 44 as indicated at 46 in Fig. 1. An armature 47 is pivoted to each end of the bar 45 by headed pins 48 whose shanks extend freely through holes in the hinge ends of the armatures and have drive fits into holes in the ends of the bar 45. The free ends of the armatures are provided with studs 49 of insulating material which are engaged by the outer brush springs 32 and 33. The core 40, bar 45 and armatures 47 constitute a complete magnetic circuit whereby when the coil 41 is energized, the armatures are attracted toward the ends of the core 40 and press the brush springs 32 and 33 inwardly against the outer edges of the tip and ring terminals of the two outer rows of terminals of a selected terminal set. To serve as backstops for the armatures 47, the tongues 50 are struck from the frame members 1 and 2 and bent outwardly and

upwardly as best disclosed in Fig. 3 against which the armatures are normally engaged by the pre-tensioned brush springs 32 and 33.

A channel-shaped bracket 51 is clamped around the outside of the lower shoes 9 and 10 by a bolt 53 which extends through aligned holes in the flanges 52 of such bracket, through holes in the shoes 9 and 10, in the frame members 1 and 2 and in the spaced block 3. One flange of this bracket is bent outwardly and has riveted thereto the arm 54. The upper edge of the arm 54 is bent at right angles as indicated at 55 to add rigidity thereto and is provided with a cylindrical sleeve portion 56 in which the end of a cable of flexible conductors may be secured. The arm 54 is also provided with tabs 57 and 58 struck up therefrom for holding in place the conductors extending from the flexible cable of conductors to the soldering lugs, such as 59, of the brush springs 28, 29, 32 and 33. The web of the bracket 51 is extended as a tab 60 to which the other end of the driving tape may be secured.

Each of the brush springs is substantially L-shaped, as disclosed most clearly in Fig. 5, and comprises an upper rectangular supporting section 61 having an elongated opening 62 therein through which the clamping screws 35 and their insulating sleeves may extend, a rearwardly extending soldering lug 59 and a downwardly extending spring arm 63. The arms of the outer or tip and ring brushes 32 and 33 are bifurcated at their free ends like relay springs and each section thus formed has welded thereto a contact bar 64 as illustrated in Figs. 2 and 3. Brush springs 32 and 33 are similar except that the spring 32 is slightly longer than the spring 33 and that the contact bars 64 are positioned on one face of spring 32 and on the opposite face of spring 33.

Springs 28 and 29 are each provided with a contact shoe of the type disclosed in Figs. 4 and 5. To form the shoe the spring is bent transversely near its free end and slotted to form two raised or contact portions 65 and 66 and its edges are notched at either end of the raised portions as indicated at 67 in Fig. 4. Each notch has its central portion more deeply cut as indicated at 68 for a purpose to be later described. Positioned transversely across the spring on each side of the raised contact portions 65 and 66 is a strip 69 of insulating fiber, rendered flexible during the assembly operations by soaking, having the rectangular holes 70 therein. The ends of the strip are bent downwardly and seated in the oppositely disposed notches 67 as best illustrated in the partly assembled brush spring of Fig. 4 and are then bent upwardly against the back surface of the brush spring. Positioned on each strip 69 is a slider plate 71, of the shape disclosed in the upper portion of Fig. 4, preferably stamped from phosphor bronze sheet material. In assembling a slider on the spring, it is positioned on the fiber strip 69 with its tongue portion 72 positioned in the slot between the raised portions 65 and 66 but out of contact therewith and with its clamping arms 73 aligned with the notches formed in the ends of the strip 69 by the holes 70 thereof when such strip is bent over the edges of the spring as previously described. Arms 73 are then bent downwardly into such notches but out of contact with the edges of the spring due to the deepened portions 68 of the notches 67 and are then bent upwardly against the ends of the strip 69 on the back of the spring whereby the slider is clamped to the spring and insulated

therefrom by the insulating strip. The completely assembled brush spring appears as disclosed in Fig. 5. The exposed faces of the sliders 71 and portions 65 and 66 are preferably polished and then chromium plated to reduce wear and to reduce friction. The brush springs 28 and 29 are similar except that the spring 28 is slightly longer than the spring 29 and the sliders and raised portions are positioned on one face of spring 28 and on the opposite face of spring 29.

It will be noted that with this spring construction, the contact shoe is very thin thus insuring that the back of the spring will not engage the terminals of an adjacent row of the terminal bank during the movement of the brush carriage. Furthermore, during the movement of the brush shoe along a row of bank terminals, a metal-to-metal contact is always made without danger of cross-connecting adjacent or succeeding terminals of the row and, since the surfaces of the tongue portions 72 of the sliders, where they project into the slots between the raised portions 65 and 66, are only slightly below the contact faces of such raised portions, there is no tendency for the raised portions to snag on terminals and no tendency to produce a bouncing of the end of the brush spring when the contact portions ride over the edge of a terminal. Since there is no insulating material brought into engagement with the edge of the terminal by the movement of the brush shoe thereover, the fouling of the contact surfaces of bank terminals by the deposit of insulating material thereon is obviated.

For maintaining the brush carriage shoes in engagement against the ends of the terminals of the rows of bank terminals with which they are assigned to cooperate, a U-shaped spring 74 is provided, one arm of which is loosely secured to the bracket 51 by rivets 75 and the other arm of which terminates in two ears 76 and 77 between which a roller 78 is rotatably secured by the pivot rivet 79. The roller engages the inner face of the channel member 80, the ends of which are secured to plates (not shown) secured to the end brackets of the switch in such a manner as to position the face of the channel member parallel to the face of the terminal bank. The roller end of spring 74 is so positioned that with the roller engaged on the face of the channel member 80, the shoes 8, 9 and 19 of the brush carriage are firmly forced against the ends of the bank terminals. The channel member 80 also serves as a guide for the depending loop of the flexible cable (not shown) one end of which is secured in the sleeve 56 of the brush carriage arm 54. The channel member 81 serves the same purpose in connection with the brush carriage of a second switch of the same switch unit. To prevent the brush carriage from falling back from the face of the bank when it is abruptly stopped in its movement, a bumper stud 82 is secured to the bar 45 with its end normally slightly spaced from the face of the channel member 80.

When the brush carriage is moved in either direction by the tape attached to the eyelet of screw 26 and to the tab 60, the shoes 8, 9 and 19 are held firmly against the ends of the rows of bank terminals by the engagement of roller 78 with the inner face of channel member 80 and are guided along the rows of terminals by the guide ribs 4, 5, 16 and 17. The contact shoes of the brush springs 28 and 29 engage successive terminals of the two inner rows of terminals, that is, the sleeve or test and the meter control terminals, but the outer brushes 32 and 33 do not

engage terminals of the two outer or tip and ring rows of terminals. When, however, the test or sleeve brush, for example brush 28, engages a marked sleeve terminal, the circuit of coil 41 may be completed in any desired manner whereby the armatures 47 become attracted to move the contact ends of the springs 32 and 33 into engagement with the tip and ring terminals of the terminal set in which such test terminal is located.

What is claimed is:

1. In a brush for a selector switch, a flexible spring member having a raised contact portion extending transversely thereof adjacent to its free end, and a slider insulatedly supported on said spring on each side of said raised contact portion.

2. In a brush for a selector switch, a flexible spring member having a raised portion extending transversely thereof adjacent to its free end and divided into two contact sections by a slot extending axially of the spring, and a slider insulatedly supported on said spring on each side of said raised portion and each having a tongue portion extending into the slot between said contact sections.

3. In a brush for a selector switch, a flexible spring member having a raised portion extending transversely thereof adjacent to its free end and divided into two contact sections by a slot extending axially of the spring, and a slider insulatedly supported on said spring on each side of said raised portion and each having a tongue portion extending into the slot between said contact sections, said contact portions and said sliders having their exposed surfaces polished and chromium plated to reduce wear and friction.

4. In a brush for a selector switch, a flexible spring member having a raised portion extending transversely thereof adjacent to its free end and divided into two contact sections by a slot extend-

ing axially of the spring, a band of insulating material surrounding said spring on either side of said raised portion and a slider supported on each of said bands adjacent to said raised portion having tabs bent over on the back surface of said band for clamping it in position and each having a tongue portion extending into the slot between said contact sections.

5. In a brush for a selector switch, a flexible spring member having a raised portion extending transversely thereof adjacent to its free end and divided into two contact sections by a slot extending axially of the spring and having oppositely disposed notches in its edges at each side of said raised portion, a band of insulating material seated in each pair of said notches and surrounding said spring, and a slider supported on each of said bands adjacent to said raised portion having tabs bent over on the back surface of said band for clamping it in position, and each having a tongue portion extending into the slot between said contact sections.

6. In a brush for a selector switch, a flexible spring member having a raised portion extending transversely thereof adjacent to its free end and divided into two contact sections by a slot extending axially of the spring and having oppositely disposed notches in its edges at each side of said raised portion, a band of insulating material seated in each pair of said notches and surrounding said spring and having notches in the portions thereof which are bent over the edges of said notches and a slider supported on each of said bands adjacent to said raised portion having tabs bent over on the back surface of said band and lying in the notches thereof and each having a tongue portion extending into the slot between said contact sections.

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