Dec. 24, 1940. B. F. LEWIS 2,225,646

SELECTOR SWITCH BRUSH

Filed Nov. 22, 1939

FIG. 1

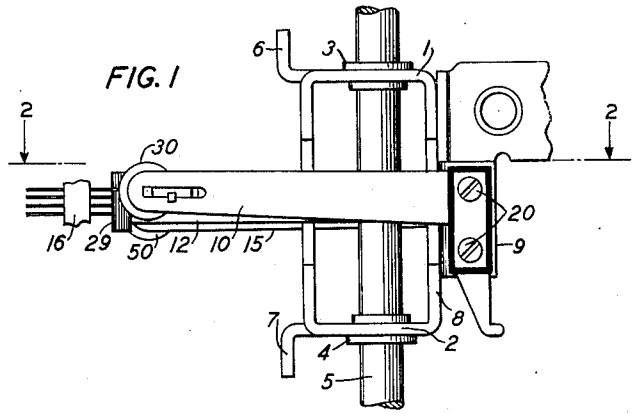


FIG. 2

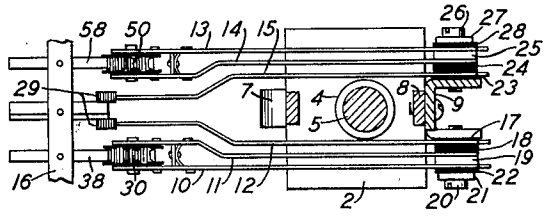


FIG. 3

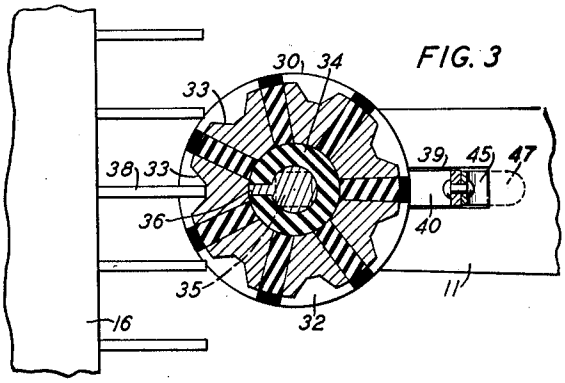


FIG. 4

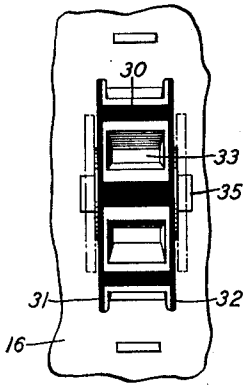


FIG. 5

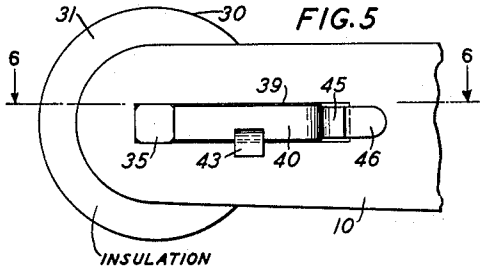
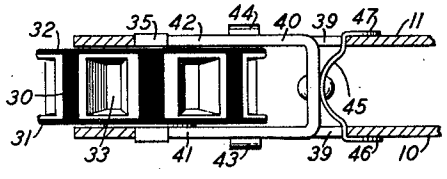


FIG. 6



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2,225,646

SELECTOR SWITCH BRUSH

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6 Claims. (Cl. 179—27.53)

This invention relates to a selector switch and more particularly to a brush set for a selector switch cooperative with a panel bank 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. These banks are either mounted one above the other or side by side. In some types of selector switches the brush sets are rigidly mounted on elevator rods which are guided in supports mounted on the switch frame and in other types they are slidably mounted on guide rods which are rigidly secured at their ends to end members of the frame. In either case, due to the extensive area of the bank and to the length of the elevator or guide rods, there may be a tendency for the brush supporting rod or bank to vibrate laterally with respect to each other, thereby causing a lateral sliding movement of the brushes on the terminals of the bank with which they are engaged. The vibratory movement may be due to building vibrations imparted to the switch frame or to vibrations set up in the frame due to the operation of other switches mounted on the same frame. These vibrations if imparted to brushes which are included in an established talking circuit are very undesirable since they may impose objectionable noise on the speech transmission circuit.

It is, therefore, the object of the present invention to improve the contact engagement between selector switch brushes and bank terminals whereby the introduction of noise into the speech transmission circuit extending thereover is materially reduced.

In accordance with the invention, this object is attained by providing the tip and ring brushes over which the talking circuit is established with rotatable contact rollers which, during the movement of the brush carriage, roll over the ends of the rows of tip and ring bank terminals and which are spring pressed towards the ends of such terminals. The other brushes of the brush set may be provided with sliding contact shoes of the general type disclosed in Patent 1,161,884, granted November 30, 1915, to J. N. Reynolds. Each roller type brush shoe comprises a small toothed roller molded from insulating material, the teeth of which have a spacing equal to the spacing between successive bank terminals of the row with which it cooperates. The roller is provided with flanges for guiding it along the row of terminals and with conducting segments in the depressions between the teeth. The roller is journaled on a sleeve of insulating material having a central square mounting shaft provided with a laterally disposed contact finger extending for engagement with successive conducting segments of the roller as the roller is rotated by its geared association with the bank terminals during the movement of the brush set. The squared ends of the sleeve shaft are mounted for sliding movement toward and away from the face of the bank in slots in two supporting springs, one disposed on either side of the roller, which springs are supported by the frame of the brush carriage. Normally, the roller is pressed toward the face of the bank by a leaf spring supported by the supporting springs which presses against the base of a yoke, the ends of the arms of which engage against the suporting shaft of the roller.

For a clearer understanding of the invention, reference may be had to the following detailed description thereof read in connection with the accompanying drawing in which:

Fig. 1 is a side elevational view of a brush carriage having brush springs embodying the present invention;

Fig. 2 is a cross-sectional view taken along section line 2—2 of Fig. 1;

Fig. 3 is an enlarged side elevational view of a portion of a terminal bank and the roller end of a brush spring, the roller being shown in cross-section to better disclose its construction;

Fig. 4 is an enlarged rear elevational view of the roller looking toward the face of the terminal bank;

Fig. 5 is an enlarged side elevational view of the roller disclosing the manner in which it is yieldably mounted in the ends of the supporting springs; and

Fig. 6 is an enlarged top plan view of the roller and supporting spring taken along section line 6—6 of Fig. 5.

The brush carriage has been disclosed as suitable for use in a selector switch of the type disclosed in Patent 2,123,227 granted July 12, 1938, to W. W. Carpenter and R. F. Mallina, but it will be obvious that the invention is equally applicable to other well-known types of selector switches. The carriage comprises a substantially rectangular frame in the end arms 1 and 2 of which are positioned fiber bushings 3 and 4 by means of which the carriage is slidably supported on a guide rod 5. The guide rod is secured at its ends to the end brackets of the switch. The end arms 1 and 2 are provided with ears 6 and 7 to

which the ends of a tape belt may be secured for traversing the brush carriage along the guide rod 5.

Secured to the vertical arm 8 of the brush carriage frame is a channel member 9 to the outer faces of the flanges of which the brush springs 10 to 15, inclusive, are secured. Spring 10, 11 and 12 are supported on one flange thereof and extend toward the terminal bank 16 on one side of the brush carriage frame, the springs 11 and 12 being insulated from each other and from the channel member by interposed strips 17 and 18 of insulating material and the springs 10 and 11 being connected together by a metallic separator 19. These three springs are secured to the channel member by screws 20 which pass through holes in the clamping plate 21, insulating separator 22, spring 10, separator 19, spring 11, separator 18, spring 12, separator 17, and into threaded holes in the flange of member 9. The springs 13, 14 and 15 are supported on the other flange of the member 9 and extend toward the terminal bank on the other side of the brush carriage frame, springs 14 and 15 being insulated from each other and from the channel member by interposed strips 23 and 24 of insulating material and the springs 13 and 14 being connected together by a metallic separator 25. These three springs are secured to the channel member by screws 26 which pass through holes in the clamping plate 27, insulating separator 28, spring 13, separator 25, spring 14, separator 24, spring 15, separator 23 into threaded holes in the flange of member 9. The screws 20 and 26 are insulated from the springs through which they pass by the usual insulating sleeves (not shown).

The inner springs 12 and 15 are provided on their outer ends with contact shoes 29 of the type disclosed in the patent to Reynolds hereinbefore referred to. These contact shoes are arranged to engage the edges of the two inner rows of bank terminals, as disclosed in Fig. 2, and may serve to establish the sleeve or testing circuit and to establish a meter control circuit.

The outer pair of springs 10 and 11 support between their outer ends the contact roller 30 which during the movement of the brush carriage rolls in engagement with the ends of the row of tip terminals 38 of the bank and the outer pair of springs 13 and 14 similarly support between their outer ends a contact roller 50 which during the movement of the brush carriage rolls in engagement with the ends of the row of ring terminals 58 of the bank.

As shown more clearly in Fig. 3, the body of the contact roller 30 is made of insulating material and is toothed with a tooth pitch equal to the spacing between the terminals of the row of the bank terminals with which it cooperates. Embedded in the depressions between the teeth of the roller and extending through to the axial bore of the roller are segments 33 of conducting material. Side flanges 31 and 32 are provided on the roller for guiding its rolling movement along the row of terminals, These flanges are of insulating material on their outer surfaces but their inner surfaces which engage against the edges of the terminals, as more clearly shown in Figs. 4 and 6, are of alternate portions of insulating material formed as flanges on the ends of the insulating portions of the teeth and of conducting material formed as flanges on the ends of the segments 33. This construction reduces the area of the insulating material which engages the edges of the terminals and thereby minimizes the tendency for the insulating material to be worn off and to foul the terminals. Preferably, the roller is made as a unit by a molding process. The roller is supported for rotation on a sleeve 34 of insulating material having an axial shaft 35 molded therein provided with a finger 36 extending laterally therefrom toward the terminal banks to be in alignment with a bank terminal when the brush carriage has advanced to center the depressed portion of a segment 33 in engagement with the end of a terminal such as the terminal 38 as illustrated in Fig. 3.

The ends of the shaft 35 are squared as shown in Fig. 5 and are supported in slots 39 formed axially in the ends of the supporting springs 10 and 11 whereby the roller and its supporting shaft are enabled to move in a direction toward or away from the face of the bank but the shaft is prevented from rotating. Positioned in the slots 39 of the supporting springs and slidable therein is a U-shaped yoke 40, the ends of whose arms 41 and 42 engage against the squared ends of the shaft 35. The yoke is retained in position within the slots by the outwardly and downwardly extending tabs 43 and 44 which engage against the outer faces of the supporting springs 10 and 11. To the base of a yoke a leaf spring 45 is riveted or otherwise secured with its ends extending through the slots 39 and engaged against the inner ends of the slots as disclosed in Fig. 6. The ends 46 and 47 of the leaf spring are bent at right angles and overlie the outer surfaces of the supporting springs 10 and 11 and serve to retain the leaf spring and the yoke in position in the slots 39. The leaf spring is tensioned to normally force the yoke 40 and the shaft 35 of the roller toward the outer ends of the slots 39, thereby tending to move the roller toward the face of the terminal bank.

The roller 50 is similarly constructed and mounted in the outer ends of its supporting springs 13 and 14.

In the movement of the brush carriage along the guide rod 5 in a direction parallel to the face of the bank the shoes 29 on the brush springs 12 and 15 engage the edges of the inner terminals of successive terminal sets of the bank and the rollers 30 and 50 because of their toothed structure, which in effect gears them to the rows of bank terminals with which they cooperate, are caused to roll into engagement with the ends of successive terminals of the terminal sets, the slidable mounting of the shafts of the rollers in the ends of their supporting springs permitting them to move laterally toward and away from the face of the bank during their rolling progress along the rows of terminals. The spring 45 associated with each roller, however, insures that when the roller has been moved to center one of its conducting segments 33, with respect to the end of a bank terminal, a firm contact will be made with the end of the terminal. At this time the pressure applied by the leaf spring will force the end of the contact finger 36 of the shaft 35 against the inner surface of the segment 33 whereby a good conductive path is established from the terminal through the segment and shaft to the supporting springs such as 10 and 11. Since the end of the contact finger 36 is narrow and is in alignment with the end of the bank terminal, the unit pressure between the end of the finger and the metal segment 33 of the roller and between the end of the bank terminal and the segment is high, in the order of several hun-

dred grams, thus insuring a high contact pressure irrespective of the vibration which may be imparted to the brush carriage or to the bank. Should the guide rod **5** now vibrate with respect to the face of the bank, the lateral motion of the supporting springs **10** and **11** will not impart their movement to the roller **30** since the leaf spring **45** will be effective to still hold the roller pressed firmly against the bank terminal.

During the rotation of the roller when two metal segments are in engagement with two adjacent bank terminals, such bank terminals do not become cross-connected through the segments because of the interposed insulating portion of the tooth separating such segments and because at that time the end of the contact finger **36** is out of engagement with both segments and is in engagement with the inner surface of the insulating portion of the tooth.

From the foregoing description it will be apparent that in accordance with the invention brush structures are provided for engaging the tip and ring terminals of a terminal bank, that is, the terminals over which voice currents are transmitted, which are effective to establish firm contacts with such terminals irrespective of vibrations imparted to the brush carriage or to the terminal bank, thus minimizing the imposition of noise into the circuit over which speech is being transmitted.

What is claimed is:

1. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising a shaft movable toward and away from the face of said bank, a toothed roller of insulating material journaled on said shaft having a tooth pitch equal to the spacing between the terminals of said row of terminals and having conducting segments disposed in the depressions between said teeth for successive engagement with the ends of successive ones of said terminals when said roller rolls over the ends of said terminals, and a spring for moving said shaft and roller toward the face of said bank.

2. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising a shaft movable toward and away from the face of said bank, a toothed roller of insulating material journaled on said shaft having a tooth pitch equal to the spacing between the terminals of said row of terminals, having conducting segments disposed in the depressions between said teeth for successive engagement with the ends of successive ones of said terminals when said roller rolls over the ends of said terminals and having flanges of insulating material for guiding said roller in its movement along the row of terminals, and a spring for moving said shaft and roller toward the face of said bank.

3. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising slotted supporting springs, a shaft slidable in the slots of said springs in a direction toward or away from the face of said bank, a sleeve of insulating material surrounding said shaft and positioned between the inside faces of said supporting springs, a contact finger extending from said shaft to the peripheral surface of said sleeve on the bank side thereof, a toothed roller of insulating material journaled on said sleeve having a tooth pitch equal to the spacing between the terminals of said row of terminals and having conducting segments disposed in the depressions between said teeth for successive engagement with the ends of successive ones of said terminals and with said contact finger when said roller rolls over the ends of said terminals, and a spring for normally moving said shaft and roller toward the face of said bank.

4. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising two slotted supporting springs, a shaft slidably but non-rotatably supported in the slots of said springs whereby said shaft is movable in a direction toward or away from the face of said bank, a yoke slidably supported in said slots with the ends of its arms engaged against the ends of said shaft, a leaf spring secured to the base of said yoke with its ends engaged against the rear ends of said slots for forcing said shaft toward the face of said bank, a sleeve of insulating material surrounding said shaft and positioned between the inner faces of said supporting springs, a contact finger extending from said shaft to the peripheral surface of said sleeve on the bank side thereof, and a flanged toothed roller of insulating material journaled on said sleeve having a tooth pitch equal to the spacing between the terminals of said row of terminals and having conducting segments disposed in the depressions between said teeth for successive engagement with the ends of successive ones of said terminals and with said contact finger when said roller rolls over the ends of said terminals.

5. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising a spring supported shaft and a contact roller journaled thereon, said roller being toothed with a tooth pitch equal to the spacing between the terminals of said row of terminals, each tooth having a central portion of insulating material and the sides of each tooth and the depressions between adjacent teeth being formed of conducting material whereby, as said roller rolls along said row of terminals, successive conducting portions of said roller engage the ends of successive terminals of said row and cross-connection between adjacent terminals is avoided.

6. In a selector switch, a terminal bank, a row of terminals thereon and a brush cooperative therewith, said brush comprising a spring supported shaft, a sleeve of insulating material surrounding said shaft, a contact finger extending from said shaft to the peripheral surface of said sleeve on the bank side thereof and a contact roller journaled on said sleeve, said roller being toothed with a tooth pitch equal to the spacing between the terminals of said row of terminals, each tooth having a central portion of insulating material and the sides of each tooth and the depressions between adjacent teeth being formed of conducting material whereby, as said roller rolls along said row of terminals, successive conducting portions of said roller engage the ends of successive terminals of said row and engage said contact finger, and whereby, when two adjacent conducting portions are in engagement with adjacent terminals of said row, they are out of bridging engagement with said contact finger.

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