

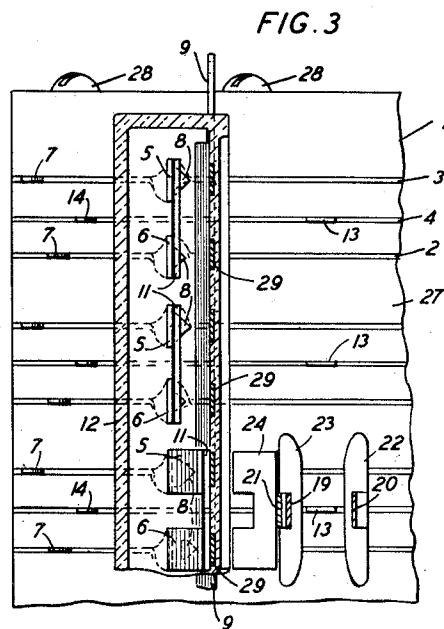
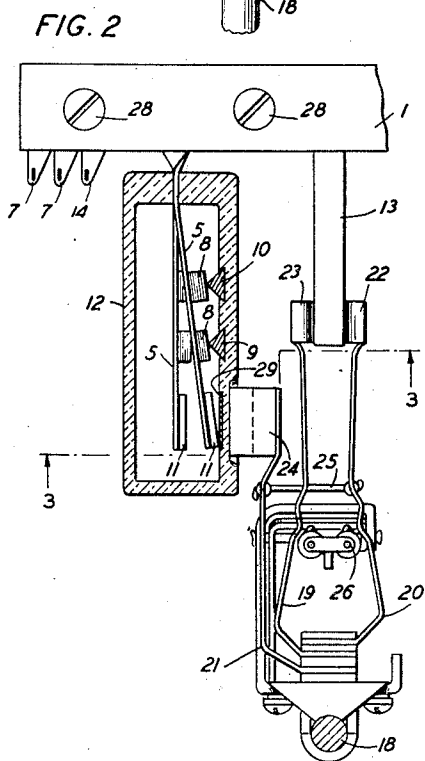
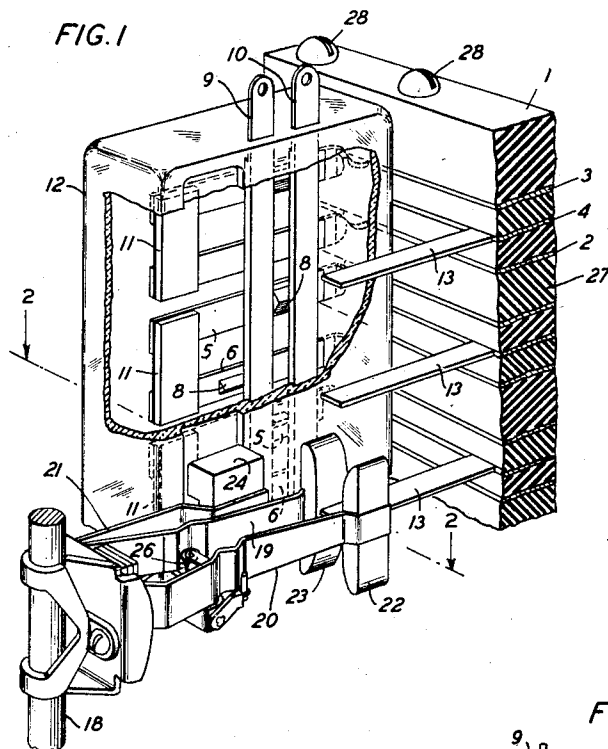
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**2,361,579**

## PANEL SELECTOR SWITCH

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## UNITED STATES PATENT OFFICE

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## PANEL SELECTOR SWITCH

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2 Claims. (Cl. 179—27.53)

This invention relates to selector switches for establishing connections in machine switching telephone systems, and more particularly to a new panel bank and a selector switch brush set having access thereto.

Panel type selectors, in the broadest sense, are provided with one or more flat or panel terminal banks to which the brush sets of a plurality of selector switches have access. These banks may be mounted either one above the other or side by side. In the type of selector switch herein contemplated as the subject of the invention, the brush sets thereof are rigidly mounted upon an elevator rod which is guided by supports mounted on the switch frame. It has been found, however, that a selector switch of this type is subject to certain limitations which have a tendency to impair its efficiency, particularly with respect to those terminals and brush contacts over which the talking circuit is established. Thus, due to the extensive area of the terminal bank, there is a tendency on the part of the brush supporting rods and the terminal banks to vibrate laterally and vertically with respect to each other in consequence of which a brush engaged with a set of terminals moves or vibrates relative thereto. This vibrating movement may be caused by building vibrations or by the operation of the brush rod driving mechanism or by the operation of other switches mounted on the same frame or, as in the case of high-speed selectors, by the engagement of a brush with the bank terminals as the former travels rapidly over the latter. Obviously, if this vibration is imparted to the contacts of a brush set over which the talking circuit is established, a variable resistance is introduced in the circuit path which will be productive of variations in the speech current and a corresponding reduction in the quality of the speech.

Also, because the bank terminals and the brush sets are exposed to the atmosphere, slight corrosion may develop on the terminals and on the contact-making elements of the brush sets which will introduce a high resistance therebetween, while dust, dirt and other foreign particles, becoming temporarily lodged between the terminals and the contacts of the brushes, will tend to produce the same result. If the contacts and terminals so impaired are those through which the talking circuit of a telephone connection is established, it is obvious that the quality of speech transmission thereover will be reduced.

It is, therefore, the object of the present invention to provide a selector switch of the panel

type in which the effects of vibration are nullified by the use of flexible terminals and two common conducting strips disposed opposite and perpendicular to such terminals for engagement therewith by means mounted upon the brush rod that will cause a selected pair of terminals to be pressed against the strips, and in which corrosion of the terminals and the strips is prevented and the accumulation of dust and dirt thereon is avoided by enclosing the same within a chamber filled with a corrosion-preventing gas like argon, for example, the means mounted upon the brush rod for effecting the closure of selected terminals to the strips operating outside of the chamber.

In accordance with the invention, this object is attained by means of a terminal bank in which strips used for the establishment of the speech circuit are made of spring metal formed with twisted finger-like extensions. These strips and another strip of conventional design are stacked with suitable insulation therebetween and bolted together to form a terminal bank which has a number of vertical columns of fingers. To the end of one finger of a strip and that of another in the strip superimposed immediately thereabove, there is insulatedly secured an armature which will cause these fingers to flex horizontally when traction is applied to the armature. Each column of fingers, or terminals, is enclosed in the air-tight vessel filled at low pressure with an inert gas, said vessel having vertically mounted therewithin two parallel terminal strips disposed coordinately with respect to the column of terminals, one of said strips being reserved for engagement with the "tip" or corresponding terminals in the one series of alternate strips of the terminal stack and the other for engagement with the "ring" or corresponding terminals in the other series. A brush carrier of well-known construction is provided having mounted thereon a pair of sleeve brushes and a mechanically linked permanent magnet adapted to be "tripped" by a trip rod mechanism which releases the sleeve brushes for engagement with the sleeve terminals of the bank and depresses the magnet within a track formed against that side of the spring enclosing chamber which is immediately opposite the enclosed column of armatures. As the brush rod is caused to move over the associated column of terminals the sleeve brush springs will engage the successive sleeve terminals in the usual way while the magnet will attract consecutively the enclosed terminal armatures, thereby causing the paired fingers to flex and engage the stationary vertical strips, the armatures re-

leasing in succession to disengage the terminals from the strips as the brush moves the field of its magnet away from a previously engaged armature. When the brush comes to rest upon a selected set of terminals, the brush magnet, being positioned opposite the armature of the paired terminals in the set, will hold said armature in an attracted position and cause the terminals attached thereto to engage the vertical strips, said engagement being maintained as long as the brush remains in a stationary position. The talking circuit may then be completed through the terminals and the strips over conductors connected to external wiring lugs thereof.

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

Fig. 1 shows a conventionalized perspective view of a portion of the selector switch, a part of the terminal-enclosing chamber being removed to disclose the two vertical contact strips and four terminals paired by armatures attached to each of two terminals;

Fig. 2 is a plan view of a portion of the switch taken partly along the section line 2—2 of Fig. 1; while

Fig. 3 is a front view of the switch taken along the section line 3—3 of Fig. 2.

In order to avoid needless duplication of the parts and to more clearly illustrate the invention, only those parts of the switch are shown as pertain directly to the invention.

Referring now to the three figures of the drawing in which identical designations refer to identical parts of the switch, 1 represents the terminal bank comprising a pile-up of stacked conducting strips as, for example, strips 2 and 3, the perpendicular extensions of which are to be enclosed in a chamber, and the sleeve strip 4, the perpendicular extensions of which are disposed outside of the chamber. These strips are separated from each other by strips of insulation of suitable thickness, such as insulation strip 27 for example, sleeve strip 4 being stacked between strips 3 and 2 in order to provide suitable spacing between their associated terminal extensions. The strips 2 and 3 are preferably of spring metal formed with a wide supporting portion and long narrow rectangular extensions or fingers or terminals 5 and 6 along the front edge thereof equally spaced throughout the length of the strip except for a small portion on the left or right end reserved for the wiring lug 7. The number of terminals in each strip 2 and 3 (the number of terminals being the same for each of said strips) and the spacing thereof depends upon the number of terminal columns to be provided for the entire frame, said number of columns depending, in turn, upon the number of selectors which are to have access to the columns, there being one such selector for each column. Each terminal 5 and 6 of each strip 2 and 3 is twisted 90 degrees where it joins the supporting portion so that the flat part of the terminal lies in a perpendicular plane with respect to said flat portion. The strips are stacked in the manner above indicated to form a terminal bank, said strips together with the sleeve strip 4 and the insulating strips 27 interposed therebetween being held securely together by insulated bolts 28 that pass through aligned apertures (not shown) in all of the strips, said bolts being held in position by suitable lock nuts at the bottom of the terminal stack. Since all terminals 5 and 6 are equally spaced, the lat-

ter will form a vertical column of fingers all lying in one vertical plane.

To the right surface of each finger 5 and 6 there is secured, in any suitable manner, a contacting piece 8, preferably knife-edged, for engagement with a vertical strip 9 or 10. These contact pieces are displaced horizontally relative to each other so that the piece of a lower terminal contacts the strip 9 and the piece secured to the upper terminal contacts strip 10. This arrangement, however, may be reversed if desired, but whichever arrangement is used, the contact pieces of all the upper terminals in a row are to be in vertical alignment and the contact pieces of all the lower terminals are also to be in vertical alignment.

To the ends of each pair of adjacent vertical terminals, that is, the terminals of strips such as 2 and 3 separated by the sleeve strip 4, for example, there is secured a rectangular armature 11 between which and the terminals that support it is interposed a thin insulating strip to prevent any metallic connection between the armature and the terminals and between the terminals themselves. Since the armature for each pair of terminals is secured to the terminals so that its outer edge is flush with the edges of said terminals, the armatures connected to each of the paired terminals are in substantial vertical alignment.

Each column of terminals, indicated in part by terminals 5 and 6, is enclosed within a chamber 12 filled with some inert gas at low pressure. Enclosed within the chamber to the right side thereof looking from the front of the frame there are secured in any suitable manner the two knife-edge metal strips 9 and 10 having their respective knife-edge contacts facing inwardly towards the faces of the terminals. The strips are so disposed within the chamber relative to each other and to the contact pieces 8 of the terminals that when any pair of said terminals is flexed to the right in the manner shortly to be described, the contact piece of the lower terminal 6 will engage the outer metal strip 9 and the contact piece of the upper terminal 5 will engage the inner metal strip 10, thereby completing a series metallic path between the conductors connected to the wiring lugs 7 of the terminal strips 2 and 3 and the conductors connected to the wiring lugs of the vertical strips 9 and 10, said latter wiring lugs being formed on extensions of said strips outside of the chamber. The chamber is formed with an external rectangular groove directly facing the armatures 11, said groove acting as a track for the selector brush magnet 24 as hereinafter set forth. Inserted on the opposite side of the groove within the chamber are the solid iron extension pieces 29 of which two are provided for each armature 11. These extensions are of equal cross section with each of the pole faces of armature 24 and are fitted on the inside of the groove so as to be between the pole faces of the magnet and the face of each of the armatures when the magnet is positioned opposite an armature. These extensions serve to reduce the air-gap between the armature and the magnet and thereby reduce the required pulling power of the latter in attracting the armature when positioned thereagainst.

To the right of the enclosing chamber 12 and separated therefrom by a suitable clearance is the row of "sleeve" terminals 13 of which one is provided for each pair of enclosed terminals 5

and 6 and disposed between the strips 2 and 3 thereof. The sleeve terminal strip 4 is formed of any suitable metal having the body portion for stacking between strips of insulation and a row of equally spaced rectangular terminals 13 extending throughout the length thereof, the spacing between terminals being determined by the amount of separation required between the right face of the chamber 12 of the enclosed column of terminals immediately to the left thereof and the left face of the chamber of the enclosed column of terminals immediately to the right, it being understood that one column of sleeve terminals is associated with each column of enclosed terminals. To the extreme left (or right) of the sleeve strip 4 the wiring lug 14 is provided by which electrical connection is made thereto.

The selector proper, or the brush carrier, is but a modification of the one disclosed in Patent 1,123,696 issued to E. B. Craft and J. N. Reynolds on January 5, 1915. It is, therefore, shown only to the extent of the modifications necessary to make the same operative with the present invention. Upon the longitudinally moving shaft 18 there are mounted the required number of brush carriers, there being one such carrier in each selector for each terminal bank of the switch. Each brush carrier comprises three insulated spring arms 19, 20 and 21, arms 19 and 20 being provided at the outer ends thereof with brush structures consisting of conducting shoes 22 and 23 having their inner surfaces slightly curved. These shoes may be formed as continuations of the spring arms 19 and 20 respectively, or of separate strips of conducting material electrically secured to said arms in any desired manner. The length of both shoes 22 and 23 shall be sufficient to bridge successive sleeve terminals 13 as the selector engages in a selection movement. This provides means for maintaining a continuous electric circuit between succeeding terminals and thereby enables the selector motive power to be controlled by the electrical condition of the last terminal engaged by the shoes 22 and 23.

The left arm 21 has secured to its outer end the permanent horse-shoe magnet 24, the pole faces of which have a rectangular configuration, the magnet itself having a length substantially equal to that of the armature 11. The effective length of the arm 21 is such that when the brush is activated, the magnet will enter the groove track formed on the side of the chamber 12. The arm 21 is linked to arm 20 by the rod 25 which enables both arms to partake of similar movement. In the unactivated position of the brush, the twin rollers 26 are lodged in the indentations formed by the inner bent portions of arms 19 and 20 causing arms 19 and 20 to be spread out under tension and prevent the engagement of the shoes 22 and 23 with any sleeve terminal. Since arm 21 is linked to arm 20, the spreading of the latter arm to the right will similarly cause arm 21 to be pulled to the right, thereby keeping the magnet 24 out of the groove track. When the brush is actively engaged by the operation of the tripping mechanism (not

shown), the twin rollers 26 are rotated toward the face of the terminal bank and the two spring arms 19 and 20 are caused to come nearer to each other, arm 21 being released to the left to cause magnet 24 to enter the groove track. When the shaft 18 moves the brush set upwards, the contact shoes 22 and 23 engage the first sleeve terminal 13 in the column while spring 21 presses the pole faces of the magnet 24 against the inner surface of the track thereby attracting the armature 11 of the first pair of enclosed terminals 5 and 6 and causing said two terminals to be flexed towards the right bringing their respective contacts 8 into engagement with the metal strips 9 and 10. As the brush moves upwards, the brush magnet 24 is brought into successive engagement with each of the enclosed magnets 11, causing each of them to be attracted thereto to close the contacts on their respective associated terminals with the metal strips 9 and 10.

While I have described my invention in connection with its specific application to a particular kind of terminal bank and associated moving brush carriage, it is to be understood that various other applications and embodiments thereof may be made by those skilled in the art without departing from the spirit of the invention as defined within the scope of the appended claims.

What is claimed is:

1. A selector switch comprising a plurality of pairs of movable terminals arranged in a column and a pair of spaced fixed conductors parallel to the column, said pairs of movable terminals and said pair of fixed conductors being enclosed in a gas-filled chamber, a plurality of fixed terminals arranged in a column disposed outside of said chamber, each of said fixed terminals forming a group with each pair of movable terminals, an armature insulatedly affixed to each of said pairs of movable terminals, and a selecting brush adapted for operation external to said chamber comprising contacting means for engaging one of the fixed terminals of a group of terminals and a magnet for operating the armature affixed to the pair of movable terminals of said group terminals whereby each of said movable terminals engages a conductor of said pair of fixed conductors.

2. A selector switch comprising a common terminal frame having multiple sets of movable line terminals in parallel columns, the terminals in each column being enclosed in a sealed gas-filled chamber, an armature insulatedly affixed to each pair of terminals, a pair of fixed conductors in said chamber, a switch member for each column of terminals adapted for movement outside of said chamber, and a magnet carried by said switch member for attracting the armature of a pair of terminals when the magnet comes into substantial alignment with said armature, whereby each terminal in said pair of terminals is moved to engage one conductor of said fixed pair of conductors.

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