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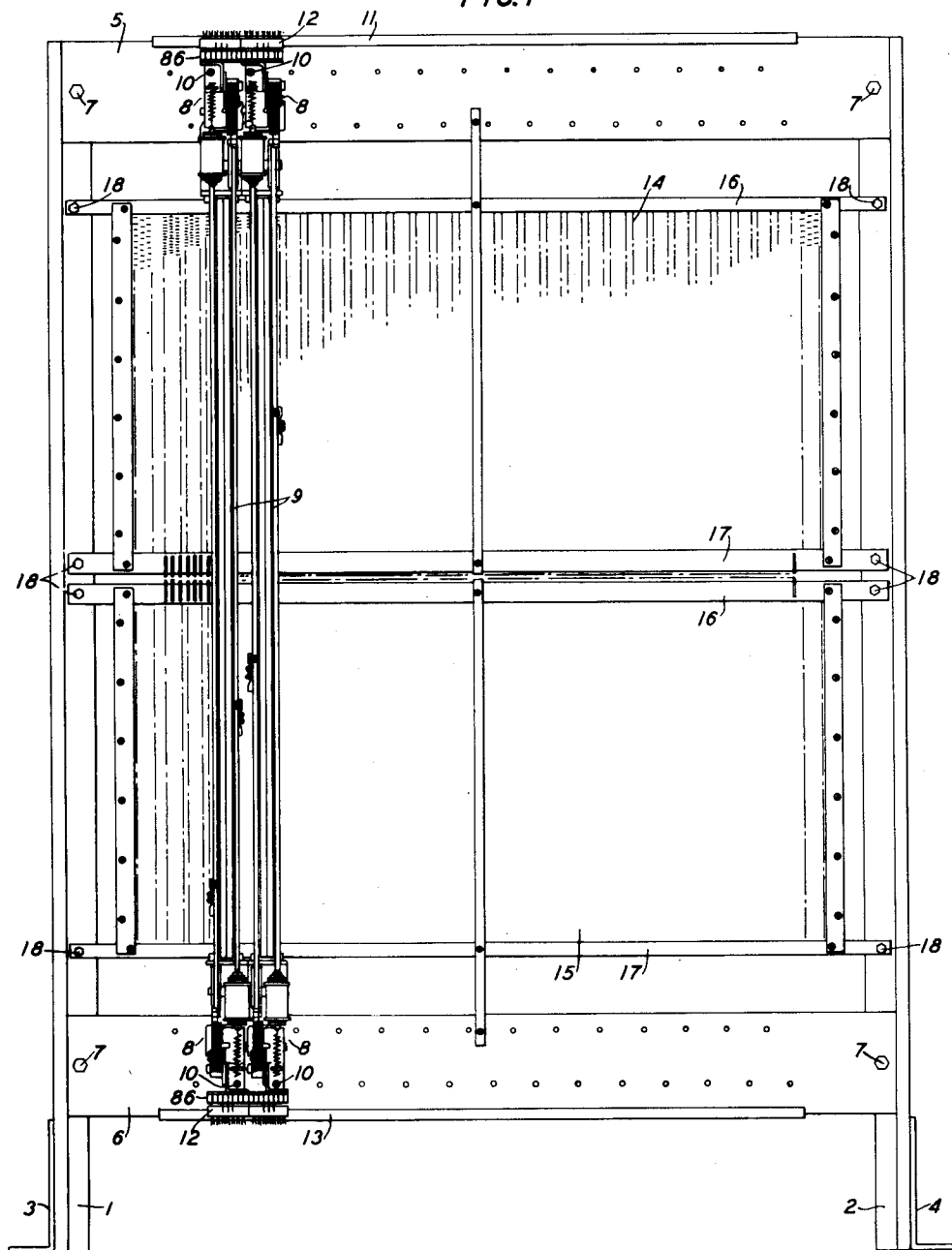
W. W. CARPENTER ET AL
SELECTOR SWITCH

2,173,548

Filed June 15, 1938

5 Sheets-Sheet 1

FIG. 1



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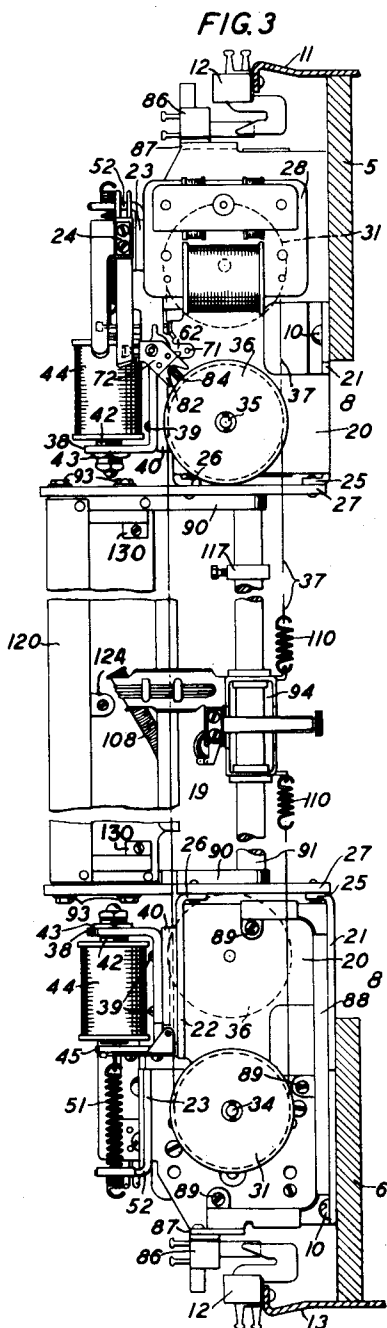
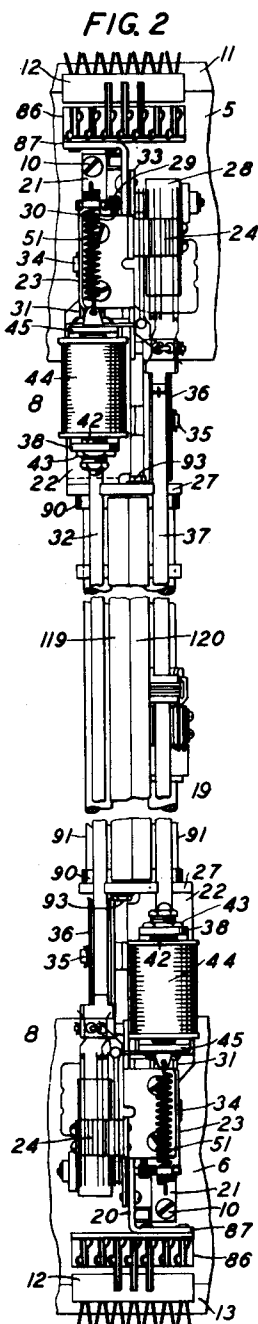
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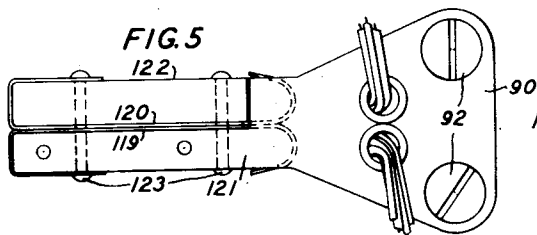
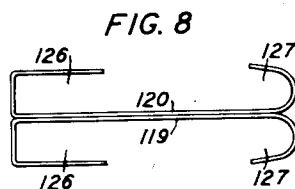
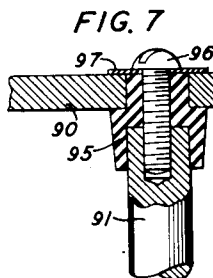
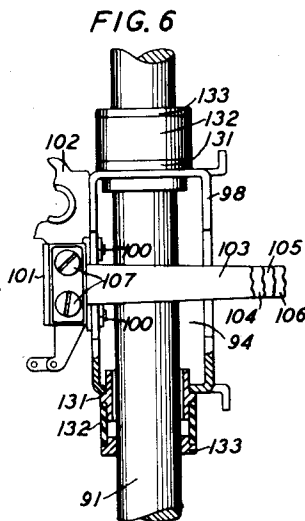
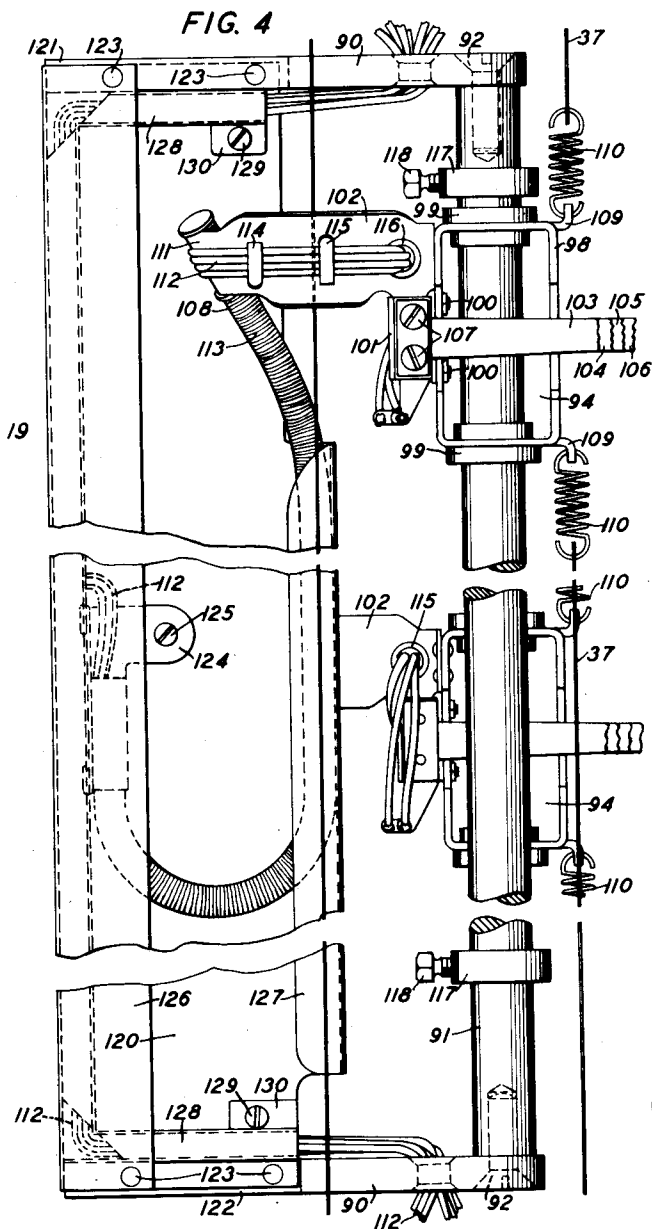
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SELECTOR SWITCH

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SELECTOR SWITCH

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FIG. 9

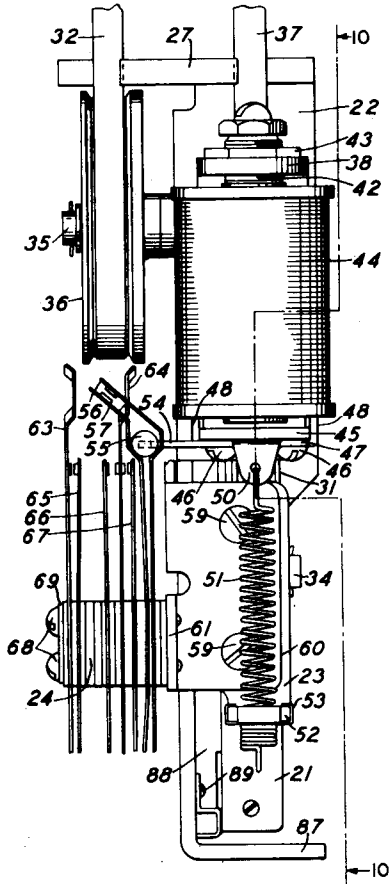


FIG. 10

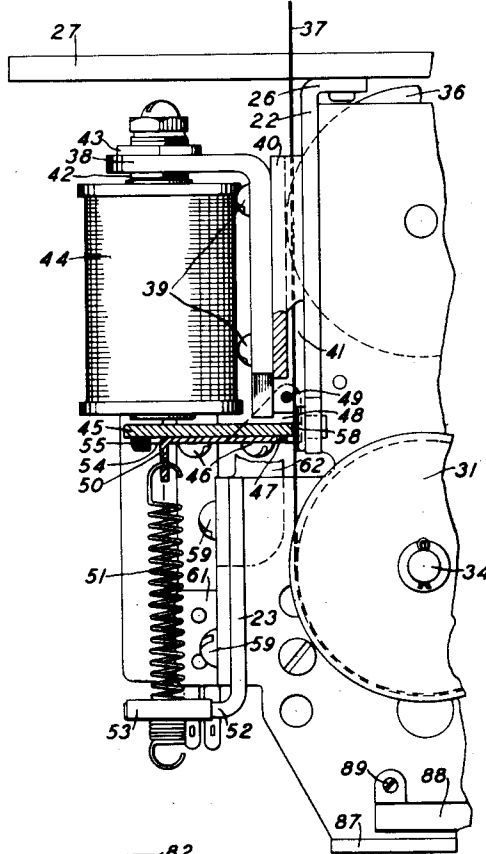


FIG. 11

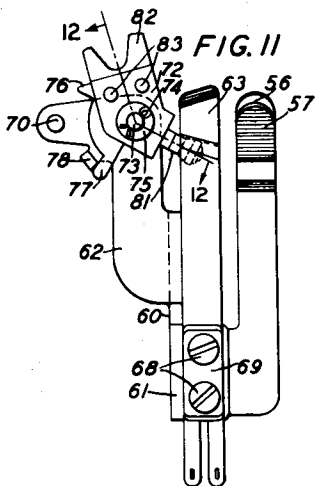


FIG. 12

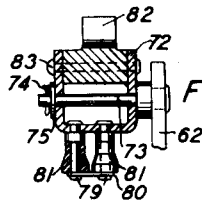


FIG. 13



FIG. 14



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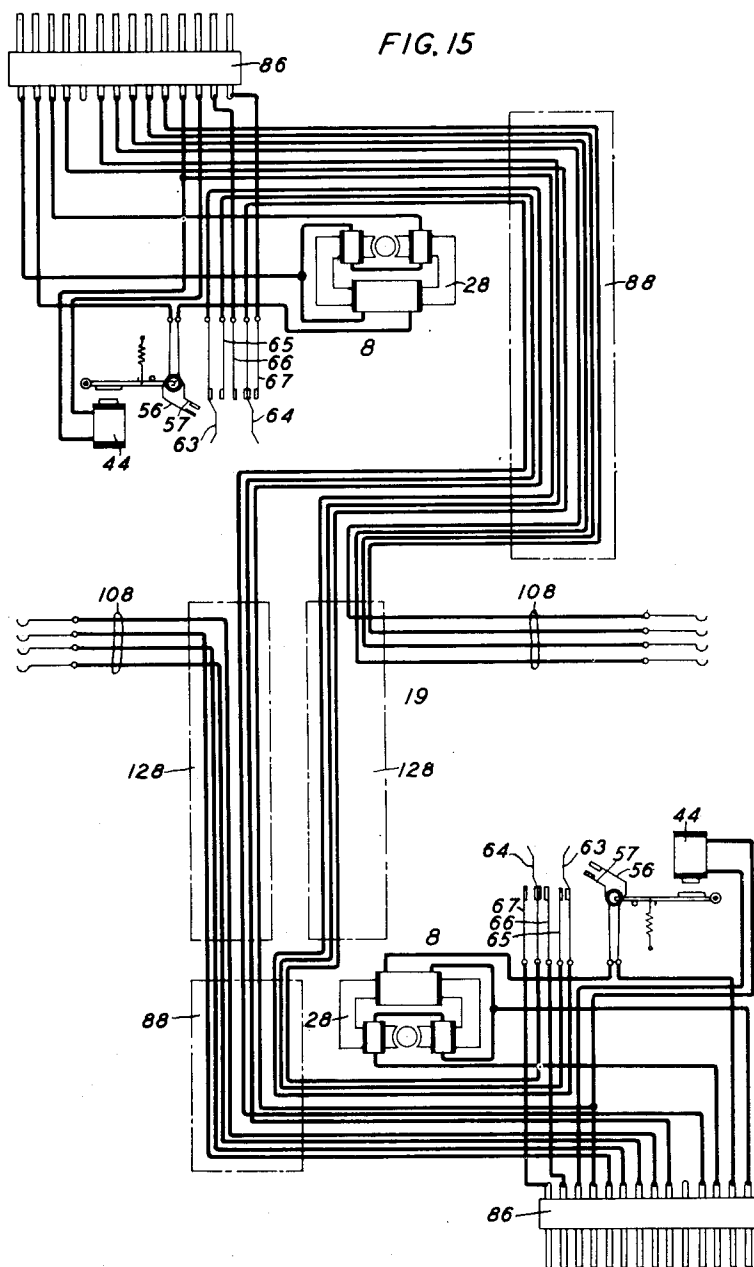
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SELECTOR SWITCH

Filed June 15, 1938

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,173,548

SELECTOR SWITCH

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Application June 15, 1938, Serial No. 213,743

12 Claims. (Cl. 179—27.53)

This invention relates to selector switches applicable for use in dial switching telephone systems and more particularly to switches of the terminal hunting type which may be driven at high terminal hunting speeds.

The switch of the present invention is of the general type disclosed in the Patent No. 2,123,229, granted on July 12, 1938, to W. W. Carpenter and R. F. Mallina, in which a single brush set is advanced from a normal position in a hunting movement over either one of two panel banks by a motor driven tape belt and is moved back to a marked terminal in the event the brush set overruns the marked terminal in its hunting movement and in which a magnetically controlled brake is provided for quickly arresting the movement of the tape and the brush set controlled thereby. This switch has, however, been modified in accordance with the present invention with respect to several details thereof.

It is the object of the present invention to provide a high speed selector switch which is economical to manufacture and maintain in a high state of mechanical and electrical efficiency.

This object is attained by providing a switch unit comprising two line or trunk finders mounted vertically on a switch frame and having access to two panel banks of terminals disposed one above the other on the switch frame with their rows of terminal sets vertically aligned. Each switch unit comprises three main assembly structures two of which are identical upper and lower motor and brake assemblies and the third of which is an intermediate assembly interconnecting the two other assemblies.

Each motor and brake assembly comprises a mounting bracket, which may be secured to a cross member of the switch frame, on which is mounted a driving motor the rotor of which is geared to a tape driving pulley for driving the tape of one of the switches of the unit, an idler pulley for the tape of the other switch of the unit, a magnetically operated brake mechanism cooperative with the tape of the first switch, a spring pile-up comprising springs operable by the brake magnet and off-normal switch springs and an off-normal switch operating mechanism operated by the tape of the latter switch. The intermediate assembly which is attachable to the mounting brackets of the other assemblies comprises guide rods upon which the brush carriages of the two switches are slidably positioned, flexible cables of conductors attached to the respective brush carriages and channel members

within which the depending loops of the flexible cables are guided.

The off-normal switch operating mechanism comprises a member pivoted on the mounting bracket, one end of which is provided with cam rollers of insulating material for camming the springs of the off-normal switch into engagement and the other end of which is notched for engagement by a lug secured to the tape. The movement of the tape in one direction from its normal position, in which position the brush set controlled thereby is maintained midway between the two banks of terminals, is operative to rotate the off-normal switch operating member in a direction to close certain of the off-normal springs and the movement of the tape in the opposite direction is effective to rotate the member in a reverse direction to cause a closure of other of the off-normal springs. The off-normal switch is effective to control circuits to restore the operated brush set to its normal position upon the release of a connection established by the switch.

To reduce the effect of vibrations either transmitted to the switch frame from the building or incident to the operation of other switches mounted on the switch frame, provision is made for cushioning the ends of the guide rods on which the brush carriages slide at their points of attachment to the end plates of the intermediate assembly structure by sleeves of live rubber and to cushion the brush carriages with respect to the guide rods by means of tubular rubber bushings.

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

Fig. 1 is a front elevational view of a switch frame showing two switch units or four selector switches embodying the invention installed thereon;

Fig. 2 is a front elevational view of one switch unit;

Fig. 3 is a side elevational view of the switch unit shown in Fig. 2;

Fig. 4 is a side elevational view of the intermediate assembly of a switch unit;

Fig. 5 is a bottom plan view of the intermediate assembly with certain parts omitted to clarify the disclosure;

Fig. 6 is a detail view partly in cross-section of a brush carriage showing the cushioned mounting thereof on the guide rod;

Fig. 7 is a detail view of a modified cushioned

attachment of a guide rod to an end plate of the intermediate assembly;

Fig. 8 is a cross-sectional view of the flexible cable guide channels of the switch unit;

Fig. 9 is a front elevational view of the brake magnet and spring pile-up comprising the magnet operated springs and off-normal springs;

Fig. 10 is a side elevational view, partly in cross-section of the brake magnet taken along section lines 10—10 of Fig. 9;

Fig. 11 is a side elevational view of off-normal spring operating mechanism;

Fig. 12 is a detail view taken along section line 12—12 of Fig. 11;

Fig. 13 shows the lug-link in the tape belt for controlling the off-normal spring operating mechanism;

Fig. 14 is a side view of the lug-link disclosed in Fig. 13; and

Fig. 15 is a wiring diagram of the two switches of a unit.

Referring now to the drawings, the switch frame, as disclosed in Fig. 1, comprises two vertical angle-iron uprights 1 and 2 which may be secured at their lower ends to the floor by angle members 3 and 4 and upper and lower cross members 5 and 6, the upper member 5 being secured by lag screws 7 to the upper ends of uprights 1 and 2 and the member 6 being similarly secured to the uprights 1 and 2 near their lower ends. The upper cross member 5 serves as a mounting plate to each face of which the upper assemblies 8 of a plurality of switch units 9 may be secured by screws 10. The lower cross member 6 also serves as a mounting plate to each face of which the lower assemblies 2 of the switch units are secured by screws 10. Secured to the upper edge of cross member 5, in any desirable manner, is a horizontal channel member 11, the downwardly extending flanges of which are disposed on opposite sides of the cross member 5 and serve to support the terminal jacks 12, there being a jack mounted thereon immediately above each switch unit. A similar channel member 13 is secured to the lower edge of cross member 6 to the upwardly extending flanges of which other terminal jacks 12 individual to the switch units are secured.

Secured between the uprights 1 and 2, one above the other, are two panel terminal banks 14 and 15. Each bank is of the general type disclosed, for example, in Patent 1,127,741 granted February 9, 1915 to A. F. Dixon and comprises two horizontal side members 16 and 17 between which a plurality of sets of multiple terminal strips and insulating separators are clamped. The banks are secured to the uprights 1 and 2 by lag screws 18 which pass through the ends of the side members 16 and 17 of the bank. Each terminal strip is provided with thirty multiple terminals extending outwardly therefrom on each side of the bank and with soldering terminals at each end whereby accessibility is offered to thirty selector switch units or sixty selector switches, fifteen of such units being mounted on each side of the switch frame. The terminal strips are arranged in sets of four to which the tip, ring, sleeve and metering leads of subscribers' lines may be connected, although in some instances, as for example, when the switch frame is being used for some purpose other than a line switch frame, each set might comprise but three terminal strips. The corresponding sets of multiple terminals of the several sets of strips in both banks are aligned

vertically and individualized to different selector switches of the several units 9.

Each switch unit 9 comprises two complete selector switches and to simplify manufacture and assembly is constructed in three separate assemblies, two identical end assemblies 8 and an intermediate assembly 19. Each end assembly comprises a substantially channel-shaped mounting bracket 20, one flange 21 of which is provided with screw holes through which screws 10 may be inserted to secure the bracket to a cross member 5 or 6 of the switch frame. The other flange of the bracket 20 is formed in two sections one of which 22 serves to support the brake magnet and the other of which 23 serves to support the spring pile-up 24.

The ends of flanges 21 and 22 of the bracket 20 are bent inwardly at right angles to form legs 25 and 26 to which the end plate 27 is secured by rivets or other suitable means. Mounted on one side of the web of the mounting bracket is a driving motor 28 having a base plate 33. The motor is preferably of the synchronous reversible type and may be designed to operate on single or polyphase alternating current. The rotor shaft of the motor extends through an opening in the web of the bracket and has on its outer end a pinion 29 which meshes with a gear 30 secured to a driving pulley 31 for driving the tape belt of one switch of the unit. The pulley 31 and attached gear 30 are rotatable on a stub shaft 34 secured to a lug on the base plate 33 of the motor which extends through an opening (not shown) in the web of the mounting bracket. Secured to the web of the mounting bracket on the same side thereof as the motor 28 is a collared stub shaft 35 upon which the idler pulley 36 for the tape belt of the other switch of the unit is rotatably mounted.

Mounted on the flange 22 of the mounting plate is a magnetic brake best disclosed in Figs. 9 and 10. This brake comprises an L-shaped heel-piece 38, the vertical arm of which is secured to the flange 22 by screws 39 which extend through an interposed member 40 channeled as indicated at 41 to permit a traverse of the tape to be threaded therethrough. The core 42 of the magnet, upon which the energizing coil 44 is positioned, lies parallel to the vertical arm of the heel-piece and is threaded through a tapped opening in the horizontal arm of the heel-piece whereby the air-gap between the end of the core and the magnet armature 45 may be adjusted. To hold the core in its adjusted position in the heel-piece the lock-nut 43 is provided. The magnet armature 45 is fastened by screws 46 to a hinge plate 47 having ears 48 through which and the end of member 40, a hinge pin 49 is extended. The hinge plate is also provided with an ear 50 to which one end of the spring 51 is attached. The other end of the spring extends through a hole in an extension 52 of the flange 23 of the mounting plate and is adjustably anchored thereto by a key 53. The hinge plate 47 is also provided with an arm 54 having a member 55 of insulating material thereon cooperating with the springs 56 and 57 of the spring pile-up. With the coil 44 of the magnet deenergized spring 51 holds the member 55 in such a position as to maintain the contact springs 56 and 57 out of engagement with each other. When, however, the coil is energized, the member 55 moves to such a position as to permit these springs to engage.

Staked into a hole in the flange 22 of the

mounting plate and in alignment with the center line of the armature 45 is a cast-iron brake shoe 58 between the face of which and the inner edge of the armature one traverse of the tape 37 is gripped when the armature is in its unattracted position, as shown in Fig. 10. The normal gripping pressure is supplied by the spring 51, the tension of which may be adjusted by moving the end of the spring with respect to the extension 52 of the flange 23. When the magnet coil is energized and attracts the armature 45, the pressure between the inner edge of the armature and the brake shoe 58 is released, thereby freeing the tape for movement.

Secured to the flange 23 of the mounting plate by screws 59 is a plate 60 having two oppositely extending arms 61 and 62. The arm 61 serves as a support for the spring pile-up 24. The spring pile-up includes the brake magnet operated springs 56 and 57, hereinbefore referred to, and the off-normal springs comprising the active or cam operated springs 63 and 64 and the passive springs 65, 66 and 67 cooperating therewith. These springs are all suitably insulated from each other and from the arm 61 of the mounting plate 60 by interposed strips of insulating material and are secured to the arm 61 by screws 68 which pass through the outer clamping plate 69 through the springs and insulating strips into threaded holes in the arm 61. It will be noted by reference to Fig. 11 that the springs 56 and 57 are offset with respect to the off-normal springs to position them in proper alignment with the insulating member 55 carried by the hinge plate 47 of the magnet armature and to prevent interference with the operation of the off-normal springs. By mounting all the springs as a unit with the planes of the springs all extending in the same direction or perpendicular to the face of the switch frame, all springs are readily accessible for adjustment.

The arm 62 of the supporting plate 60 is so bent as to be positioned adjacent to the face of the web of the mounting bracket 20. The outer end of this arm is, for the purpose of accurately positioning the arm and the off-normal switch operating mechanism carried thereby with respect to the periphery of the idler pulley 36, provided with a hole 70 through which a stud 71, staked into the web of the mounting plate 20, extends as most clearly disclosed in Fig. 3. The off-normal switch operating mechanism comprises a U-shaped member 72 pivoted on a shouldered stud 73 staked to the arm 62 and extending through the two arms of the member 72. The member 72 is retained on the stud by a cotter pin 74 extending through the outer end of the stud, a washer 75 being interposed between the cotter pin and the outer arm of the member. The inner arm of the member 72 is provided with projections 76 and 77 which engage with the lug 78 bent up from the edge of the arm 62 to limit the rotary movement of the member 72.

Staked in holes in the end of member 72 are two shouldered studs 79 united at their outer ends by a cross-bar 80 on which are rotatably supported two cam rollers 81 of insulating material. These rollers are positioned as shown in Fig. 11 between the springs 63 and 64 of the off-normal springs for cooperating with the cam surfaces thereof and in the normal position of the member 72 engage the portions of the springs between the cam surfaces thereof to hold these springs out of engagement with the passive springs 65, 66 and 67. When the member 72

is rotated into the position disclosed in Fig. 11, the spring 64 is cammed into engagement with spring 67 and spring 63 is permitted by its initial tension to move into engagement with spring 65. When, however, the member 72 is rotated to the other extreme of its movement, at which time the projection 76 thereof engages the lug 78, both pretensioned springs 63 and 64 are permitted to engage respectively with springs 65 and 66.

For rotating the member 72 in response to the movement of the tape belt in either direction, a notched member 82, preferably of phenol fibre is secured between the arms of member 72 by rivets 83. With the tape belt in its normal position, at which time the brush carriage to which the ends of the tape are secured is positioned with the brush set carried thereby midway between the two panel banks of terminals 14 and 15, a lug-link 84 interposed in the tape is engaged in the notch in the member 82, thereby holding the member 72 in its neutral position previously described and disclosed in Fig. 3. As disclosed in Figs. 13 and 14, the lug-link 84 is secured to the tape by wire links 85. It will be apparent by reference to Fig. 3 that the movement of the tape in a clockwise direction will rotate the member 72 in a counter-clockwise direction to permit the closure of spring 63 with spring 65 and the closure of spring 64 with spring 66 and that the movement of the tape in a counter-clockwise direction will rotate the member 72 in a clockwise direction to permit the closure of spring 63 with spring 64 and to cam spring 64 into engagement with spring 67.

To enable the switch unit to be easily installed on or removed from the switch frame without necessitating the soldering or unsoldering of conductors extending to the various elements of the unit, each end assembly 8 of the unit is provided with a plug 86 secured to the mounting bracket of the assembly for cooperation with a jack 12 mounted on a cross member of the frame, the plug carried by the upper end assembly being allocated to one switch of the unit and the plug carried by the lower end assembly being allocated to the other switch of the unit. The plug 86 is secured to an angular extension 87 of the web of the mounting bracket 20 as more clearly disclosed in Figs. 2 and 3 and comprises a plurality of springs insulated from each other and provided with soldering lugs to which conductors extending to the electrical elements of a switch of the unit are soldered. When the switch unit is secured in position on the switch frame as disclosed in Fig. 3, the springs of plugs 86 engage with the springs of jacks 12 to which conductors extending to the external control circuits of the switches are connected.

In order that the conductors extending from the springs of plug 86 may be conveniently positioned in the end assembly, a channel member 88 is secured to the web of the mounting bracket 20 by screws 89, as more clearly shown in the lower portion of Fig. 3, in which the conductors are enclosed.

Interposed between the end assemblies of the switch unit is an intermediate assembly 19 having two end plates 90 between which the brush carriage guide rods 91 of the two switches of the unit are secured by the screws 92. Screws 92 extend through holes in the end plates into threaded holes in the ends of the guide rods. For attaching the end assemblies to the intermediate assembly lag screws 93 are provided which extend through holes in the end plate 27

of each end assembly into threaded holes in the end plates 90 of the intermediate assembly.

As an alternative construction to prevent the transmission of vibration from the switch frame to the brush carriage 94 positioned on the guide rod 91, a sleeve 95 of live rubber may be interposed between the end of the guide rod and the end plate 90 as disclosed in Fig. 7, with the end of the guide rod 91 supported in a hole in one end of the sleeve and the other end of a sleeve supported in a hole in the plate 90. For retaining the guide rod, sleeve and plate in assembled relationship, a screw 96 having its head bearing through a washer 97 on the surface of the plate 90 is threaded into an axial hole in the end of the guide rod.

The brush carriage 94 comprises a rectangular frame 98 the ends of which are provided with sleeves 99 which slidably embrace the guide rod 91. Secured to the front side member of the frame 98 by bolts 100 is a channel member 101 and a cable supporting arm 102. To the flanges of the member 101 four brush springs 103 to 106, inclusive, are insulatedly secured by screws 107, two brush springs being secured to each flange and extending forwardly on either side of the guide rod. Each spring is provided with a soldering terminal to which terminals the conductors of a flexible cable 108 may be connected. The frame 98 is also provided with ears 109 to which the ends of the tape belt are secured through the interposed shock absorbing and belt tensioning springs 110. The cable supporting arm 102 extends outwardly from the brush carriage with its end turned at right angles and terminating in a cylindrical portion 111 in which one end of the flexible cable 108 is supported. The other end of the cable is anchored as will be hereinafter described.

A cable is provided for each brush carriage for the purpose of extending conductors to the brush springs thereof while permitting freedom of movement of the brush carriage along the guide rod. Each cable comprises three or more insulated conductors 112 surrounded by a spirally wound wire sheath 113. At the brush carriage end of the cable the conductors thereof are held in position on the arm 102 by tongues 114 and 115 struck up therefrom, are passed through the eyelet 116 and are soldered to the soldering terminals of the brush springs.

For limiting the movement of the brush carriage along the guide rod 91 in the event of failure of the control circuit of the switch to properly arrest the movement of the brush carriage in either direction, collars 117 are provided on the guide rod on either side of the brush carriage which may be held in adjusted position by set screws 118.

To guide the depending loops of the flexible cables 108 whereby the cables may not become entangled with each other due to the movement of the brush carriages, two sheet metal C-shaped channel guides 119 and 120 are provided. These channels are positioned back to back and throughout the major portion of their lengths have the cross-sectional form illustrated in Fig. 8. The channels extend between the end plates 90 with the upper end of channel 120 embracing the arm 121 of the upper plate 90 and with the lower end of channel 119 embracing the arm 121 of the lower plate 90 as disclosed in Fig. 5. Positioned within the upper end of channel 119 and within the lower end of channel 120 are clamping strips 122. The ends of the channels are

secured to the arms 121 of the end plates by rivets 123 which extend through the outer flanges and webs of the channels, through the clamping strips 122 and through the arms 121 as most clearly shown in Fig. 5.

The fixed ends of the two flexible cables 108 are secured to brackets 124 positioned within the outer flanged portions 126 of the channels at approximately the mid-point of their length. These brackets are both secured to the webs of the channels by a bolt 125. The depending loops of the flexible cables are guided during movement of the brush carriage by the outer flanged portion 126 and the inner flanged portion 127 of the guide channels.

Positioned in the outer flange 126 of each guide channel, is a channel member 128, these members being retained therein by bolts 129 which pass through ears 130 formed integrally therewith and through the webs of the channel guides 119 and 120. These channel members serve to enclose conductors extending between the upper and lower end assemblies 8 and the conductors 112 of the flexible cables 108 extending to either the upper or lower end assemblies as may be required.

In case it should be found desirable to further prevent the transmission of vibrations from the switch frame to the brushes carried by the brush carriages 94, the construction disclosed in Fig. 6 may be employed. As disclosed in this figure, the sleeves 131 positioned in the ends of the brush carriage frame 98 do not slidably engage the guide rod 91 but are connected by tubes 132 of live rubber to auxiliary sleeves 133 which slide on the guide rod. The tubes 132 are cemented or otherwise secured on the sleeves 131 and 133 and serve to resiliently support the brush carriage on the guide rod whereby vibrations of the guide rod are not transmitted to the brushes of the brush carriage.

With the entire switch unit in assembled position, the tape belt 32 of one switch of the unit passes over the driving pulley 31 of the upper end assembly between the brake shoe 58 and the end of armature 45 of the upper end assembly and over the idler pulley 36 of the lower end assembly and is secured at its ends through the tensioning springs 110 to one of the brush carriages 94. The tape belt 37 of the other switch similarly passes over the driving pulley 31 of the lower end assembly between the brake shoe 58 and the end of armature 45 of the lower end assembly, thence over the idler pulley 36 of the upper end assembly and is secured at its ends through tensioning springs 110 to the other brush carriage. The brake mechanism of the upper end assembly and the off-normal switch operating mechanism of the lower end assembly cooperate with the belt 32 and the brake mechanism of the lower end assembly and the off-normal switch of the upper end assembly cooperate with the belt 37.

The wiring diagram of the assembled unit as disclosed in Fig. 15 schematically illustrates in the upper portion thereof plug 86, motor 28, brake magnet coil 44, the brake magnet operated contact springs and the off-normal springs of the upper end assembly and in the lower portion thereof the corresponding equipment of the lower end assembly. The magnet coil 44, the contact springs 56 and 57 controlled thereby, motor 28 and off-normal springs 66 and 67 of each end assembly are interconnected or connected to terminals of plug 86 individual to the assembly by

local conductors. To the other terminals of the plug 86 and to the off-normal springs 63, 64 and 65 of each end assembly are connected conductors which are run through the channel member 88 individual to the assembly and are then divided into two groups one of which is run through one of the channel members 128 located in channel guide 119 and the other of which is run through the other channel member 128 located in channel guide 120. Some of these conductors then extend through the channel member 88 of the other end assembly to equipment in such assembly, while other conductors extend through the flexible cable 108 to the brush springs of one of the switches of the unit.

The external circuits for controlling the switches of a unit have not been disclosed but might be of the type disclosed in the patent granted to W. W. Carpenter and R. F. Mallina hereinbefore referred to.

What is claimed is:

1. In a selector switch having two banks of terminals, a brush set cooperating therewith normally positioned midway between said banks and a belt for traversing said brush set over either one of said banks, a double-throw off-normal switch and a member secured to said belt engageable with said off-normal switch when said brush set is in its normal position for holding said off-normal switch in its neutral position and for moving said off-normal switch into one or the other of its operated positions dependent upon the direction of movement of said brush set.

2. In a selector switch having two panel banks of terminals, a brush set cooperating therewith normally positioned midway between said banks and a belt for traversing said brush set over either one of said banks, a double-throw off-normal switch comprising a movable spring, a fixed spring on either side thereof, a pivoted actuating member engageable with said movable spring to move it into engagement with either one of said fixed springs, said member having a notch in one end thereof and a lug secured to said belt engageable with said notch when said brush set is in its normal position for holding said member in its neutral position and for rotating said member in one or the other direction to engage said movable spring with one or the other of said fixed springs dependent upon the direction of movement of said brush set.

3. In a selector switch having two panel banks of terminals, a brush set cooperating therewith normally positioned midway between said banks and a belt for traversing said brush set over either one of said banks, a double-throw off-normal switch comprising a movable spring having cam surfaces thereon, a fixed spring on either side thereof, a pivoted actuated member having a cam roller engageable with the cam surfaces of said movable spring and having a notch in one end thereof and a lug secured to said belt engageable with said notch when said brush set is in its normal position for holding said member in its neutral position and for rotating said member in one or the other direction to cam said movable spring into engagement with one or the other of said fixed springs dependent upon the direction of movement of said brush set.

4. In a selector switch having two panel banks of terminals, a brush set cooperating therewith normally positioned midway between said banks and a belt for traversing said brush set over either one of said banks, a double-throw off-normal switch comprising first and second pretensioned

springs each having cam surfaces thereon, a fixed spring on either side of said first spring and a fixed spring associated with said second spring, a pivoted actuating member having cam rollers engageable with the cam surfaces of said pretensioned springs to control their engagement with their associated fixed springs, a notched member secured to said actuating member and a lug secured to said belt engageable in said notch when said brush set is in its normal position for holding said operating member in a neutral position in which said springs are all maintained out of contact with each other and for rotating said operating member in one direction to permit the engagement of said first pretensioned spring with one of its fixed springs and the engagement of said second pretensioned spring with its associated fixed spring and for rotating said operating member in the other direction to cam said first pretensioned spring into engagement with the other fixed spring associated therewith and to permit the engagement of said second pretensioned spring with its associated fixed spring dependent upon the direction of movement of said brush set.

5. A switching device comprising a mounting frame, two panel banks of terminals mounted thereon and a switch unit mounted on said frame, said unit comprising two end brackets attached to end members of said frame, a guide rod, the ends of which are secured to said brackets, a brush carriage slidable on said guide rod and carrying a brush set cooperating with said banks, said brush set being normally positioned midway between said banks, a belt for traversing said brush set over either one of said banks, a driving pulley for said belt mounted on one of said brackets, an idler pulley for said belt mounted on the other of said brackets, a double-throw off-normal switch mounted on one of said brackets and a member secured to said belt engageable with said off-normal switch when said brush set is in its normal position for holding said off-normal switch in its neutral position and for moving said off-normal switch into one or the other of its operated positions dependent upon the direction of movement of said brush set.

6. In a switching device comprising a mounting frame and a terminal bank mounted thereon, a selector switch unit embodying two selector switches comprising identical first and second end assemblies and an interconnecting intermediate assembly, said intermediate assembly comprising for each of said switches a brush carriage having a brush set thereon for cooperating with the terminals of said bank and a guide rod on which said carriage is slidable, and each of said end assemblies comprising a driving motor, a driving pulley geared thereto and a brake magnet for one of said switches and an idler pulley and off-normal switch for the other of said switches, a driving belt for one of said switches extending around the driving pulley of the first of said end assemblies around the idler pulley of the second end assembly and attached to one of said brush carriages and a second driving belt for the other of said switches extending around the idler pulley of said first end assembly around the driving pulley of said second end assembly and attached to the other of said brush carriages.

7. In a switching device comprising a mounting frame and a terminal bank mounted thereon, a selector switch unit embodying two selector switches comprising identical first and second end assemblies and an interconnecting intermediate

assembly, said intermediate assembly comprising end plates, two brush carriage guide rods interconnecting said end plates and a brush carriage slidable on each of said guide rods having a brush set for cooperation with the terminals of said banks, and each of said end assemblies comprising an end plate, a mounting bracket secured thereto for attachment to said mounting frame and a driving motor, a driving pulley geared thereto and a brake magnet for one of said switches and an idler pulley and off-normal switch for the other of said switches mounted on said bracket, means for securing the end plates of said end assemblies respectively to the end plates of said intermediate assembly, a driving belt for one of said switches extending around the driving pulley of the first of said end assemblies around the idler pulley of the second end assembly and attached to one of said brush carriages and a second driving belt for the other of said switches extending around the idler pulley of said first end assembly around the driving pulley of said second end assembly and attached to the other of said brush carriages.

3. In a switching device comprising a mounting frame and a terminal bank mounted thereon, a selector switch unit embodying two selector switches comprising identical first and second end assemblies and an interconnecting intermediate assembly, said intermediate assembly comprising for each of said switches a brush carriage having a brush set thereon for cooperation with the terminals of said bank and a guide rod on which said carriage is slidable, and each of said end assemblies comprising a driving motor, a driving pulley geared thereto and a brake magnet for one of said switches and an idler pulley and off-normal switch for the other of said switches, a driving belt for one of said switches extending around the driving pulley of the first of said end assemblies around the idler pulley of the second assembly and attached to one of said brush carriages, a driving belt for the other of said switches extending around the idler pulley of said first end assembly around the driving pulley of said second end assembly and attached to the other of said brush carriages, channel ducts secured to each of said assemblies and conductors for interconnecting the apparatus of said assemblies extending through said ducts.

9. A switching device comprising a mounting frame, a panel bank of terminals mounted thereon and a switch unit mounted on said frame, said unit comprising two end brackets attached respectively to the end members of said frame, a brush carriage having a brush set thereon for cooperation with the terminals of said bank, a guide rod extending between said brackets upon which said brush carriage is slidable and sleeves

of soft rubber interposed between the ends of said guide rod and said brackets for cushioning said guide rod and brush carriage from vibratory movement of said frame.

10. A switching device comprising a mounting frame, a panel bank of terminals mounted thereon and a switch unit mounted on said frame, said unit comprising two end brackets attached respectively to the end members of said frame, a guide rod extending between said brackets and a brush carriage slidable on said guide rod, said brush carriage comprising a rectangular frame having openings in its ends through which said guide rod extends, a brush set mounted thereon for cooperation with said bank of terminals, bearing sleeves for said carriage slidable on said guide rod and sleeves of resilient material surrounding said guide rod and interposed between said bearing sleeves and the ends of said frame for cushioning said brush set from vibration imparted to said guide rod.

11. In a switching device comprising a mounting frame and a panel bank of terminals mounted thereon, a switch unit mounted on said frame comprising two end brackets attached respectively to the upper and lower cross members of said frame, a vertically disposed guide rod extending between each of said brackets, a brush carriage slidable on said guide rod and having a brush set cooperating with said bank of terminals, a flexible cable of conductors one end of which is secured to a stationary portion of said switch unit and the other end of which is secured to said brush set and a channel guide extending between said brackets in which the depending loop of said cable is retained whereby lateral swaying of said cable loop incident to the movement of said brush set is obviated.

12. In a switching device comprising a mounting frame and a panel bank of terminals mounted thereon, a switch unit mounted on said frame comprising two end brackets attached respectively to the upper and lower cross members of said frame, two vertically disposed guide rods extending between said brackets, a brush carriage slidable on each of said guide rods and having a brush set cooperating with said bank of terminals, two flexible cables of conductors individual respectively to said brush sets, one end of each cable being connected to one of said brush sets and the other end thereof being secured to a stationary portion of said switch unit and a channel guide for each of said cables extending between said brackets in which the depending loops of said cables are retained whereby interference between said cable loops incident to the movement of said brush sets is obviated.

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