

Jan. 31, 1950

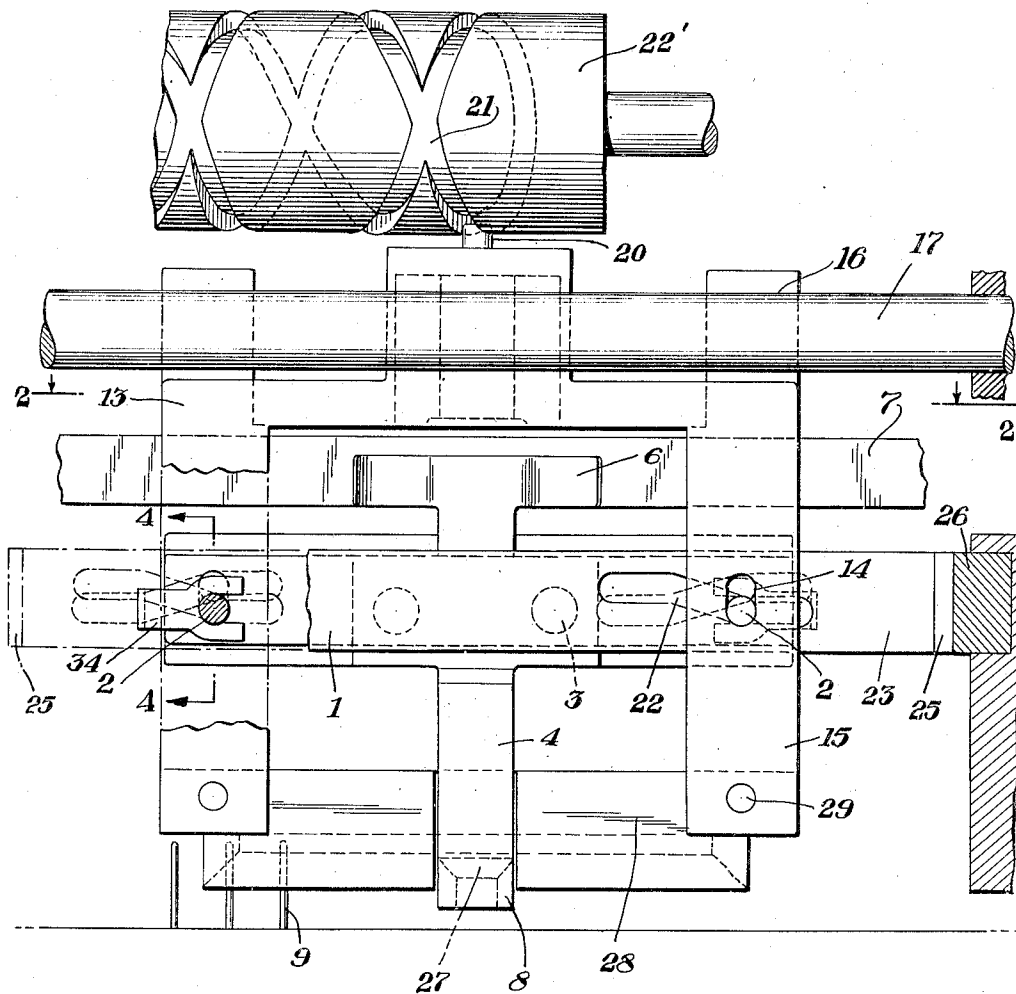
G. DEAKIN
COMBINED CONTACT BRUSH GUIDE AND SPREADER
FOR ELECTRIC SELECTOR SWITCHES

2,495,702

Filed Dec. 13, 1944

4 Sheets-Sheet 1

Fig. 1.



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4 Sheets-Sheet 2

Fig. 2.

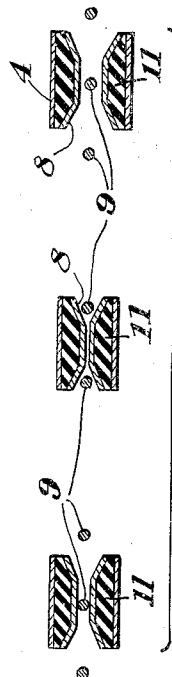
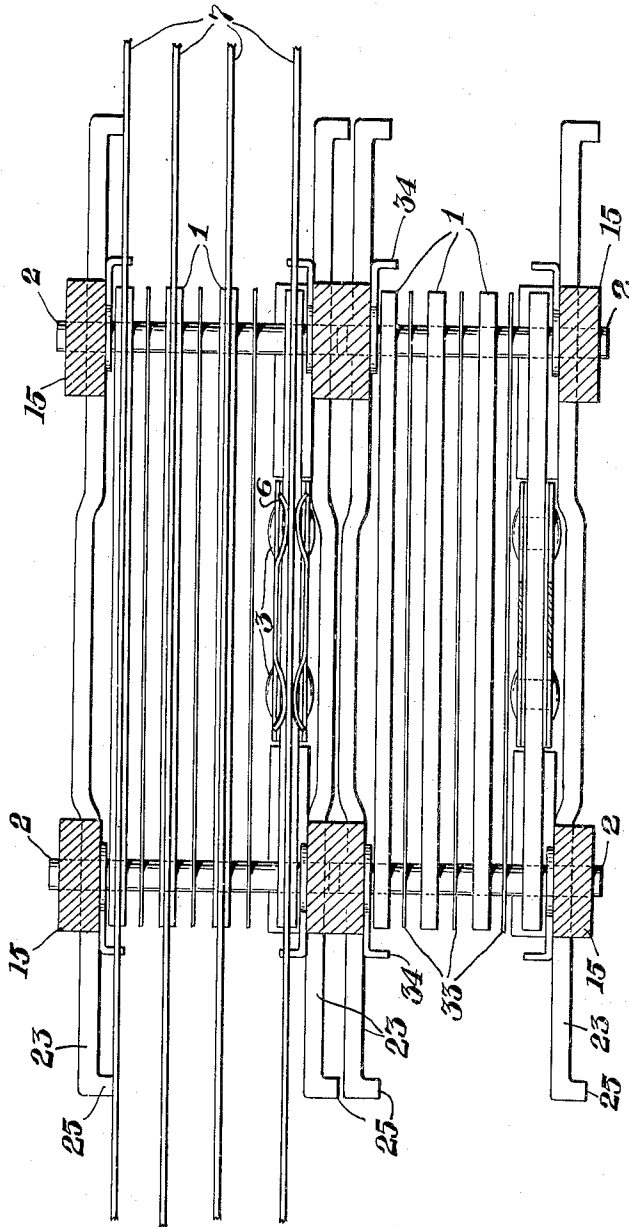


Fig. 10.

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4 Sheets-Sheet 3

Fig. 4.

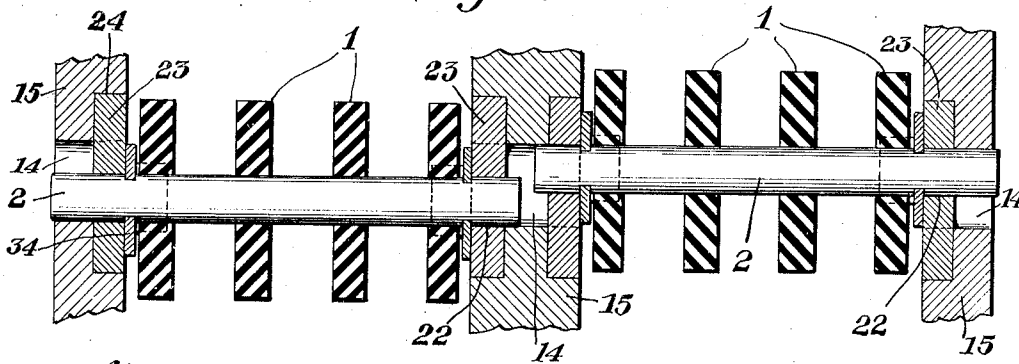
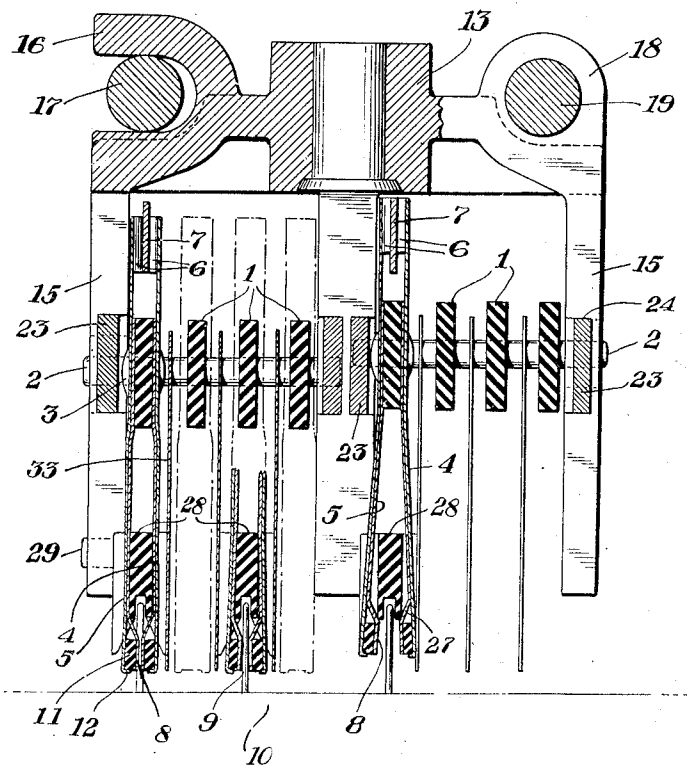


Fig. 3.



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4 Sheets-Sheet 4

Fig. 5.

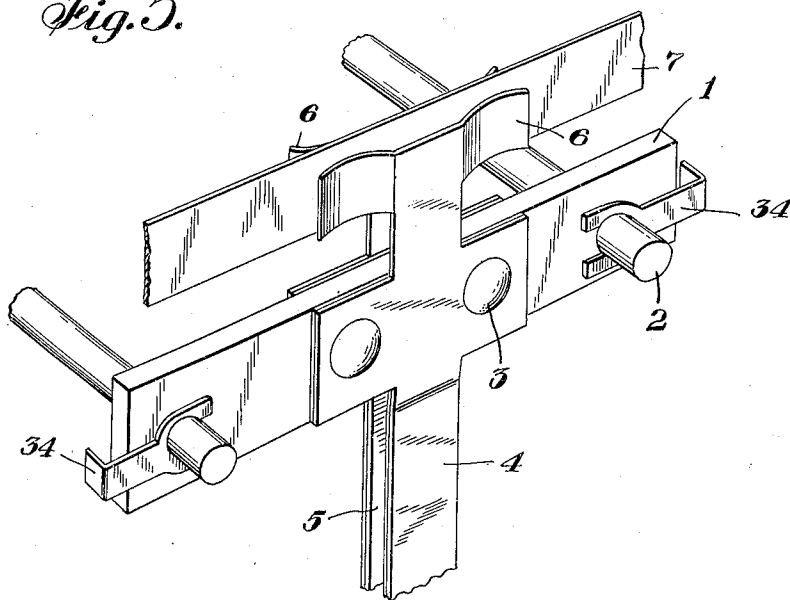


Fig. 6.

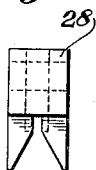


Fig. 7.

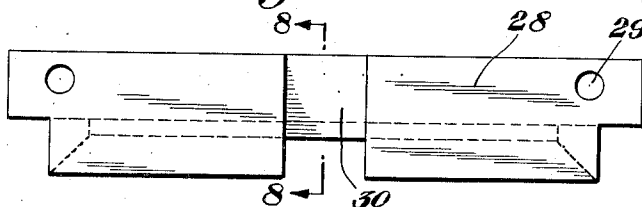


Fig. 8.

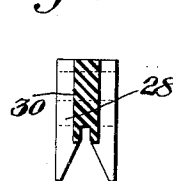
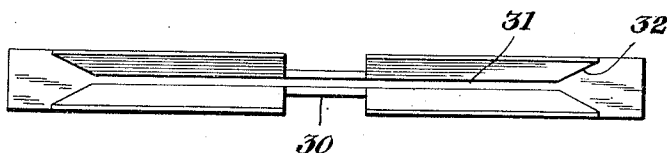


Fig. 9.



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UNITED STATES PATENT OFFICE

2,495,702

COMBINED CONTACT BRUSH GUIDE
AND SPREADER FOR ELECTRIC SE-
LECTOR SWITCHESGerald Deakin, New York, N. Y., assignor to In-
ternational Standard Electric Corporation, New
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Application December 13, 1944, Serial No. 567,997

16 Claims. (Cl. 179—27.5)

1

The present invention relates to selector switches of the kind used in telecommunication systems as for example automatic and semi-automatic telephone exchange systems and the like.

The object of the invention is to produce a switch of robust construction adapted to economical manufacture and of a structural arrangement facilitating assembling and removal of the parts for inspection and repair and which moreover will operate satisfactorily over long periods of service with a minimum of attention.

A further object of the invention is to provide a design and structural arrangement of the brush unit of a selector switch which may be moved at high speeds and with a minimum of vibration over a line of terminal pins to make effective rubbing contact so as to establish good electrical connection with the pins for a maximum period and with reduced danger of short circuiting adjacent pins or of damage either to the pins or to the brushes. A further object is the provision of means of improved design for spreading the contact brushes to convert from a rubbing or circuit closing to a non-rubbing or open circuit position. This feature is particularly applicable to a flat type of switch having two sets of brushes which are traversed over a terminal bank with a linear reciprocatory movement, only one and a different set of brushes making rubbing contact with bank terminals in each direction of movement.

A further object is to provide a brush unit construction incorporating a simplified and advantageous structure for spreading of the contact brushes in the manner referred to and employing a minimum number of parts and with the elimination of articulated connections. The structure is further operative with a rectilinear movement of the brush engaging parts thereof thus to eliminate lateral stresses on the brush springs. In consequence there is obtained better maintenance of alignment, more uniform wear distribution and reduced danger of vibration incident to wear on the parts.

The foregoing objects and other advantages are attained in the manner and by the structural arrangement more fully understood by reference to the accompanying drawing wherein like reference characters are applied to the corresponding parts in the several views.

In the drawings:

Fig. 1 is a front elevation of a brush carriage partially broken away better to illustrate the operation.

2

Fig. 2 is a sectional view taken in a plane horizontal on line 2—2 of Fig. 1.

Fig. 3 is a vertical cross sectional view taken centrally of Fig. 1.

Fig. 4 is a partial sectional view corresponding to Fig. 3 taken on line 4—4 of Fig. 1.

Fig. 5 is a perspective view of the upper portion of the brush mounting.

Figs. 6, 7 and 8 are respectively an end view, a view in front elevation and a cross sectional view on the line 8—8 of the brush guide.

Fig. 9 is a bottom plan of the brush guide.

Fig. 10 is an end view of the brushes in positions respectively of engagement, intermediate of the terminals and for non-engagement.

The present improvements are disclosed as embodied in a flat type selector switch of the kind in which the brush carriage is driven to have a reciprocal rectilinear movement by a rotating continuous thread or worm groove as disclosed in my Patent #2,330,812, issued October 5, 1943. In the disclosure there is shown a brush carriage assembly of a type comprising eight brushes. It will be understood that any suitable number of brush units may be mounted on a brush carriage.

Referring first to Figs. 1 to 3, a brush unit comprises an insulating fiber supporting strip 1 provided with holes for the reception of supporting pins 2 and to which are secured by rivets 3 two outer phosphor bronze springs 4 and two inner brush springs 5 underlying the outer springs as shown.

The inner and outer brush springs are shown secured to the opposite sides of the supporting strip in opposed relation and are formed at their lower extended portions for resilient inward movement such as would normally, without restraining engagement, effect the inter-engagement of the lower contact end portions. The lower ends of the inner brush springs 5 have inwardly deflected contact end portions 8 having flared entry formation and positioned to wipe over the contact pins 9 of the contact bank 10. The pins 9 of the contact bank are made of a hard metal such as phosphor bronze and are positioned in suitable spaced relation parallel to the paths of movement of the brushes as determined by operation of the supporting carriage therefor.

The upper portions of the outer brush springs 4 are formed with lateral resilient and flared extensions 6 positioned for wiping engagement with the sides of a feeder bar 7 to maintain electrical connection with the brushes continuously throughout their movement.

3

The inner and outer brush springs 4 and 5 are substantially straight and in contact for the major portion of their length but near the tip the inner brush spring 5 is bent inwardly at an angle to provide a space between the tips of the brush springs as best shown in Fig. 3. Within this space there is positioned and secured a small block 11 of resilient material such as neoprene. As shown it is held in position by inturned lips 12 on the end and side extremities of the outer spring. The brush unit, comprising the supporting strip 1 and the described brush springs rigidly mounted thereon, are supported in the brush carriage 13 by means of the supporting pins 2 fitting vertical slots 14 formed in the supporting leg portions 15 of the brush carriage. The latter are as shown in opposed and parallel relation and are an integral part of the carriage member 13. This carriage member at its upper portion, as illustrated and as best shown in Figs. 1 and 3 has at one side thereof a slotted slide-way bearing portion 16 having slide bearing engagement with a fixed bearing rod 17 and its opposite side has a collar bearing 18 having a slide bearing fit upon the guide rod 19 supported parallel to the bearing rod 17. These rods are supported parallel to the bank contact or terminal pins 9 for guiding of the carriage movement in parallel relation thereto. To impart the reciprocal travel motion to the carriage the latter has centrally supported thereon a swiveled, elongated and tapered end shoe 20 fitted to a reversing spiral feed slot 21 of a suitably driven feed roller 22' journaled parallel to the path of movement of the carriage and adapted to impart to the latter a reciprocating motion for traversing of the brushes over the respective rows of contacts in the customary manner.

As shown in the drawings the brush carriage is constructed to accommodate eight brush units each of which cooperates with a row of terminal pins and these brush units are supported on the carriage to be operable in two sets of four brush units each arranged to be similarly but reversely operated and positioned at opposite sides of the central vertical axis as illustrated in Fig. 3. The arrangement is further such that the opposite sets of the brushes shall be alternately controlled or operated in a manner whereby when the carriage is traversed in one direction one set of brushes will make circuit closing or rubbing contact with the terminal pins while the other set is retained in non-engaging open circuit position. On the return traverse movement provision is made for automatically reversing the operating relation effective at the end of each movement of the carriage. This is accomplished by spreading the brush contact end portions throughout one direction of the traveling movement which in accordance with the present invention is effected by movement of the brush units with relation to a rigidly supported member positioned to be engaged by inward and angularly disposed deflecting portions of the inner brushes.

The structure arrangement to be so operable includes the arrangement of independent supporting pins 2 on each side of the central axis as shown in Fig. 3 each of which is supported in vertical slots 14 in the carriage supporting legs 15 to be capable of vertical movement. Each of the pins 2 supports four brush units and has each of its end portions received in and engaged by a cam slot 22 formed in a shift bar 23 extended parallel to the path of movement of the carriage and operating within slideway bearing

4

recess 24 formed in the carriage depending leg portions. As best shown in Fig. 1 the slots 22 extend longitudinally of the shift bar with the parallel end portions thereof in different planes to determine elevated and depressed positions of the brush units with an inclined or camming connecting portion between the slot ends. Also as indicated the cam slots of the associated pairs of shift bars at each side of the central axis of the carriage are similarly arranged but reversely arranged with relation to the cam slots of the shift bars at the opposite side of the central axis. They will accordingly be operative in a reverse sense as will be readily understood. The shift bars 23 are longitudinally extended on each side of the carriage and formed with their contact end portions 25 positioned to engage stationary buttresses 26 immediately prior to the end of the carriage travel in each direction thereby to shift these bars 23 relative to the brush units and accordingly to alternately raise and lower the supporting pins 2 thereof.

Responsive to the vertical movement thus imparted to the brush units, at the extremities of their travel movement, coating camming means are provided to effect positioning of the brush ends alternately for non-engagement with the contact pins 9 for open circuit movement in the one direction and for engaging circuit closing position of the contact brush ends in the opposite direction of movement. This is effected by the formation of the brush ends, as shown, which have downwardly and inwardly inclined camming portions 27 connecting the straight portions of the springs with the contacting brush ends 8 and by the provision of a member fixed to the carriage to be engaged thereby upon elevating of the brush unit in a manner to effect outward deflection or spreading of the brush ends into a position of clearance with relation to the contact pins 9.

In accordance with the present invention the fixed member for cooperation with the brush cam surfaces 27 consists of a brush guide 28 extended longitudinally between the associated brush springs and supported at each end by pins 29 fitted to the lower ends of the carriage legs. The lower central surfaces of these brush guides are as best shown in Fig. 3 positioned to be engaged by the deflecting surface 27 of the brush end portions upon elevation of the brushes to effect the outward deflecting or spreading of the brush ends into open circuit position as shown while permitting inward movement of the brush ends into resilient contact engagement with the bank pins when the brush units are in lowered position. For guiding purposes the combined spreader and brush guide 28 has its central portion slotted on both sides as best shown in Figs. 6 to 9 to provide a section 30 of reduced thickness which limits the inward movement of the brushes when they are in an intermediate position between the terminal pins. At its under side the brush guide is formed with a longitudinally extending guide slot 31 extending the full length of the guide and formed outwardly flared at its lower edges and also with the ends of the slot 31 flared as indicated at 22 at its respective longitudinal end portions in order to guide the pins 9 into the slot as the guide moves over the terminal bank thereby at all times accurately positioning the brush contacts with relation to the pins.

The thickness of the reduced portion 30 of the guide is such as to determine that the brushes shall almost touch when they are between adja-

cent terminal pins and functions as will be understood to maintain alignment of the brush ends with relation to the terminal pins. In addition it provides a slight separation contributing to more accurate entry of the pins between the flared ends of the brushes particularly in the instance of a pin which may have become deflected in its position. The use of the guides as disclosed reduces vibration during the travel movement of the carriage and permits the employment of a maximum period of rubbing contact which in practice may be approximately 85% of the distance between the pin centers. If the brushes were not so accurately guided this would be impractical since in case of unequal tension on the brushes that brush having the greater tension would force its way through the space between the pins and short circuit adjacent pins in a closely spaced bank arrangement. As a further precaution to prevent short circuits between brushes each brush unit is separated from the adjacent one by a thin sheet 33 of insulating material such as phenol fibre which is supported by the pins 2 passed through holes in the sheet. The slots 31 of the guide member are slightly wider than the diameter of the terminal pins so as to provide sufficient clearance to obviate undue wear.

In the assembly of the brush units, coating shift bars and insulating sheets within the carriage, the parts are positioned within the apertures or slots in alignment and the pins 2 threaded therethrough and the latter is held in its assembled relation by means of slotted resilient retaining clips 34 positioned to the inner side of the carriage leg members and received within recesses or annular slots formed in the supporting pins.

The structural arrangement as described provides for alternating of the circuit closing contact engagements of the respective brush sets in the back and forth travel of the carriage in a manner to maintain effective and accurate alignment throughout long periods of use. An important contributing factor in the maintenance of accurate alignment and resulting elimination of disturbing vibration is the employment of the improved means for effecting the spreading of the brushes as a result of a rectilinear movement of the camming or brush deflecting surfaces. In consequence of this improved mode of operation lateral thrust or stress on the brush springs is eliminated and unequal wear of the engaging parts is avoided such as may tend to deflection of the parts from proper alignment and possible tendency to vibrate after long usage.

While I have described my invention as applied to a flat type selector switch, as will be appreciated, it is equally applicable to many other types of switches. Moreover many modifications as will be apparent may be made therein without departing from the scope of the invention as defined in the appended claims. For example although I have described in detail brush units comprising opposed inner and outer brush springs the features thereof are equally applicable to arrangements in which the outer brush spring is dispensed with and a single brush spring only is provided. Moreover, while the relative rectilinear movement of the brush unit and guide is shown as effected by shifting of the brush unit a reversal thereof may be employed in which the guide is the shiftable part.

What is claimed is:

1. A selector switch comprising a terminal bank,

a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the terminal bank, a brush engaging member mounted on the carriage, a brush supported by the carriage for movement relative thereto perpendicular to the direction of carriage travel and formed for camming engagement with the engaging member to effect shifting of the brush responsive to said perpendicular movement into an engaging and non-engaging position relative to the contact terminals and actuating means for the brush and operative to effect relative movement of the brush and engaging member reversely at the end of each traverse of the carriage.

2. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the terminal bank, a brush guide member mounted on the carriage, a brush supported by the carriage for movement relative thereto perpendicular to the direction of carriage travel, said brush engaging the guide member and formed for camming engagement therewith to effect shifting of the brush responsive to said perpendicular movement into an engaging and non-engaging position relative to the contact terminals and actuating means for the brush and operative to effect relative movement of the brush and engaging member reversely at the end of each traverse of the carriage.

3. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the terminal bank, a brush guide member mounted on the carriage in guiding engagement with the terminals, a brush unit provided with a resilient brush supported by the carriage for movement relative thereto perpendicular to the direction of carriage travel and said brush being formed for camming engagement with the guide member to effect shifting of the brush responsive to said perpendicular movement into an engaging and non-engaging position relative to the contact terminals and actuating means for the brush unit and operative to effect relative movement of the brush and guide member reversely at the end of each traverse of the carriage.

4. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the terminal bank, a brush guide member mounted on the carriage in guiding engagement with the terminals, a brush unit provided with a resilient brush supported by the carriage for rectilinear movement relative thereto perpendicular to the direction of carriage travel and formed for camming engagement with the guide member to effect shifting of the brush responsive to said perpendicular movement into an engaging and non-engaging position relative to the contact terminals and actuating means for the brush unit and operative to effect relative movement of the brush and engaging member reversely at the end of each traverse of the carriage.

5. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the terminal bank, brush engaging members mounted on the carriage, brushes supported by the carriage for movement relative thereto perpendicular to the direction of carriage travel and formed for camming engagement with the engaging members to effect shifting of

the brushes responsive to said perpendicular movement into an engaging and non-engaging position relative to the contact terminals and actuating means for the brushes operative to effect relative movement of the brushes and engaging member in alternate directions and reversely at the end of each traverse of the carriage.

6. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, brush engaging members and brush units mounted on the carriage for relative rectilinear movement and formed for camming engagement to effect shifting of the brush units responsive to said movement into engaging and non-engaging position relative to the contact terminals and actuating means operative to effect the relative movement of the brush units and engaging members alternately and reversely at the end of each traverse of the carriage.

7. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, brush guide members and brush units provided with resilient brushes mounted on the carriage, said brush units being supported for rectilinear movement perpendicular to the path of carriage movement and said brushes being formed for camming engagement with the guide members to effect shifting of the brush responsive to said movement into engaging and non-engaging position relative to the contact terminals and shift bars operative to effect the movement of the brush units in alternate direction and reversely at the end of each traverse of the carriage.

8. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, feed bars positioned to parallel the carriage movement, said carriage being provided with slide bearings extending perpendicular to the path of movement of the carriage, supporting rods, fitted to the bearings for movement therein, brush units mounted on the supporting rods and consisting of supporting members of insulating material fitted to the rods and resilient brush spring elements carried by the supporting members and formed for resilient contact with the feed bars and to have brush engagement with the contact terminals and with angularly disposed deflecting portions, shift bars having slide bearings in the carriage for movement parallel to the travel thereof and formed with slots having angularly disposed portions to which the supporting rods are fitted to effect rectilinear movement of the brush units upon shifting of the bars, means engaged by the shift bars at the extremities of the carriage movement to effect the shifting thereof and an engaging member supported on the carriage in position to be engaged by the brush deflecting portion upon shifting of the brush unit to effect movement of the brushes into engaging and non-engaging position with the contact terminals.

9. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, feed bars positioned to parallel the carriage movement, said carriage being provided with slide bearing slots extending perpendicular to the path of movement of the carriage, supporting rods fitted to the bearing slots for movement therein, brush units mounted on the supporting rods and consisting of support-

ing members of insulating material fitted to the rods and resilient brush spring elements carried by the supporting members and formed for resilient contact with the feed bars and to have brush engagement with the contact terminals and formed with angularly disposed deflecting portions, shift bars having slide bearing in the carriage for movement parallel to the travel thereof and formed with slots having angularly disposed portions to which the supporting rods are fitted to effect rectilinear movement of the brush units upon shifting of the bars, means engaged by the shift bars at the extremities of the carriage movement to effect the shifting thereof and a guide member supported on the carriage for guiding engagement with the terminals and brushes and adapted to be engaged by the brush deflecting portion upon shifting of the brush unit to effect movement of the brushes into engaging and non-engaging position with the contact terminals.

10. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, feed bars positioned to parallel the carriage movement, said carriage being provided with bearings extending perpendicular to the path of movement of the carriage, sets of supporting rods fitted to the bearings for movement therein, brush units mounted on the supporting rods and consisting of supporting members of insulating material fitted to the rods and resilient brush spring elements carried by the supporting members and formed for resilient contact with the feed bars and to have brush engagement with the contact terminals and formed with angularly disposed deflecting portions, sets of shift bars having slide bearing in the carriage for movement parallel to the travel thereof and formed with slots having angularly disposed portions to which the supporting rods are fitted to effect rectilinear movement of the brush units upon shifting of the bars, the respective sets of shift bars having their slots of opposite angularity, means engaged by the shift bars at the extremities of the carriage movement to effect the shifting thereof and an engaging member supported on the carriage in position to be engaged by the brush deflecting portion upon shifting of the brush unit to effect movement of the brushes into engaging and non-engaging position with the contact terminals.

11. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, feed bars positioned to parallel the carriage movement, said carriage being provided with bearing slots extending perpendicular to the path of movement of the carriage, sets of supporting rods fitted to the bearing slots for rectilinear movement therein, brush units mounted on the supporting rods and consisting of supporting members of insulating material fitted to the rods and resilient brush spring elements carried by the supporting members and formed for resilient contact with the feed bars and to have brush engagement with the contact terminals and formed with angularly disposed deflecting portions, sets of shift bars having slide bearing in the carriage for movement parallel to the travel thereof and formed with slots having angularly disposed portions to which the supporting rods are fitted to effect rectilinear movement of the brush units upon shifting of the bars, the respective sets of shift bars having their slots of opposite angularity, means engaged by the

shift bars at the extremities of the carriage movement to effect the shifting thereof and a guide member supported on the carriage for guiding engagement with the terminals and having a portion positioned to be engaged by the brush deflecting portion upon shifting of the brush unit to effect movement of the brushes into engaging and non-engaging position with the contact terminals.

12. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, a brush engaging member and a brush unit provided with a brush and mounted on the carriage for rectilinear movement and formed for camming engagement to effect shifting of the brush responsive to said movement into engaging and non-engaging position relative to the contact terminals and actuating means operative to effect the relative movement of the brush unit and engaging member reversely at the end of each traverse of the carriage, said actuating means comprising a shift bar shiftable parallel to the carriage movement and provided with a cam slot having parallel end portions to determine the shifted positions of the brush units connected by inclined intermediate portions and means connected to the brush units engaging within the slots.

13. A selector switch comprising a terminal bank, rows of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, feed bars positioned to parallel the carriage movement, said carriage being provided with bearings extending perpendicular to the path of movement of the carriage, supporting rods fitted to the bearings for movement therein, brush units mounted on the supporting rods and consisting of supporting members of insulating material fitted to the rods and resilient brush spring elements carried by the supporting members and formed for resilient contact with the feed bars and to have brush engagement with the contact terminals and formed with angularly disposed deflecting portions, shift bars having slide bearings in the carriage for movement parallel to the travel thereof and formed with slots having parallel and angularly disposed connecting portions to which the supporting rods are fitted to effect rectilinear movement of the brush units upon shifting of the bars, means engaged by the shift bars at the extremities of the carriage movement to effect the shifting thereof and an

engaging member supported on the carriage in position to be engaged by the brush deflecting portion upon shifting of the brush unit to effect movement of the brushes into engaging and non-engaging position with the contact terminals.

14. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage over the bank, a brush engaging member and a brush mounted on the carriage for relative rectilinear movement and formed for camming engagement to effect shifting of the brush responsive to said movement into engaging and non-engaging position relative to the contact terminals, and actuating means operative to effect the relative movement of the brush and engaging member.

15. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, a brush engaging member and a brush mounted on the carriage for relative rectilinear movement and formed for camming engagement to effect shifting of the brush responsive to said movement into engaging and non-engaging position relative to the contact terminals, and actuating means operative to effect the relative movement of the brush and engaging member reversely at the end of each traverse of the carriage.

16. A selector switch comprising a terminal bank, a row of contact terminals thereon, a brush carriage, means for moving the carriage back and forth over the bank, brush guide members and brushes mounted on the carriage for relative rectilinear movement and formed for camming engagement to effect shifting of the brush responsive to said movement into engaging and non-engaging position relative to the contact terminals, and actuating means operative to effect the relative movement of the brushes and guide members alternately in direction and reversely at the end of each traverse of the carriage.

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REFERENCES CITED

The following references are of record in the file of this patent:

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