

Nov. 6, 1923.

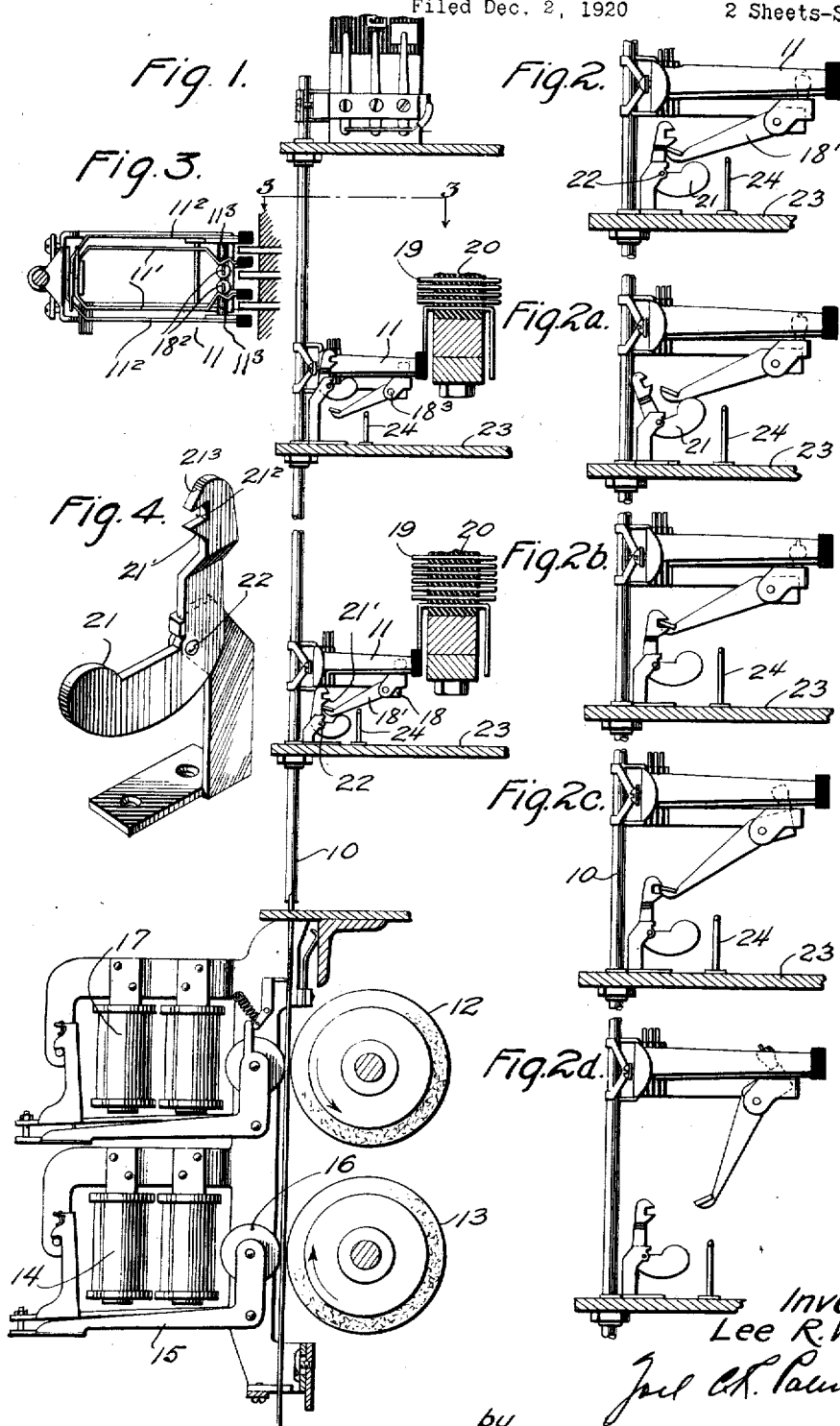
L. R. WALLER

1,472,818

BRUSH TRIPPING DEVICE

Filed Dec. 2, 1920

2 Sheets-Sheet 1



Inventor:
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Jul. C. Palmer

by

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2 Sheets-Sheet 2

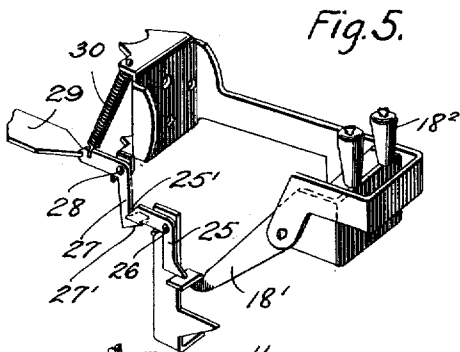


Fig. 5.

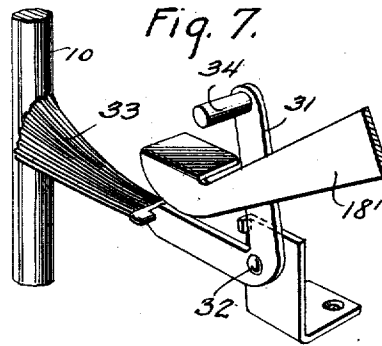


Fig. 7.

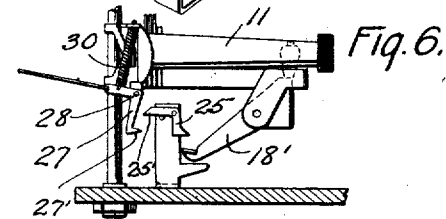


Fig. 6.

Fig. 8

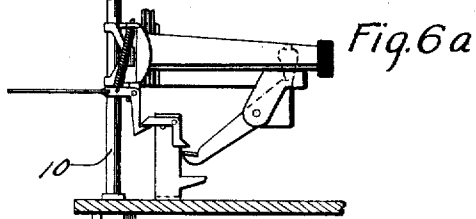
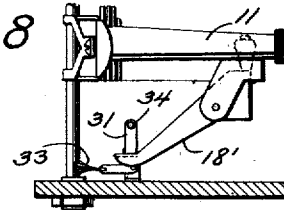


Fig. 6a

Fig. 8a.

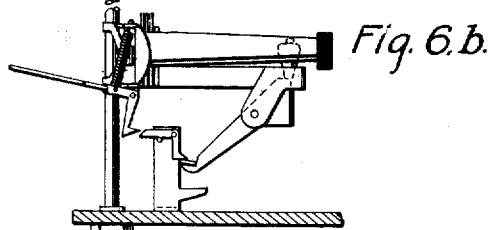
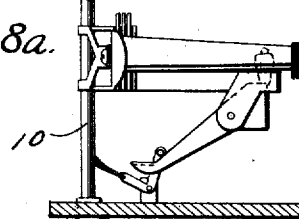


Fig. 6.b.

Fig. 8b.

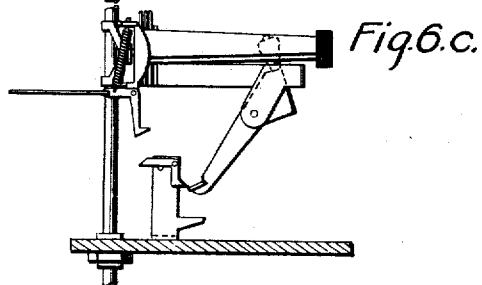
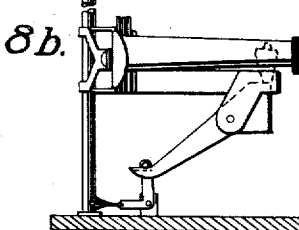
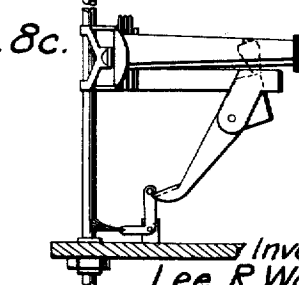


Fig. 6.c.

Fig. 8c.



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Patented Nov. 6, 1923.

1,472,818

UNITED STATES PATENT OFFICE.

LEE R. WALLER, OF WESTMOUNT, QUEBEC, CANADA, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

BRUSH-TRIPPING DEVICE.

Application filed December 2, 1920. Serial No. 427,850.

To all whom it may concern:

Be it known that I, LEE R. WALLER, a citizen of the United States, residing at Westmount, in the Province of Quebec and Dominion of Canada, have invented certain new and useful Improvements in Brush-Tripping Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to automatic and semi-automatic telephone exchange switching apparatus and more specifically to devices for tripping the contact brushes of selector and connector switches.

The object of the invention is the provision of a simple and reliable mechanism which will operate automatically to trip a set of brushes without involving the use of electromagnets.

The invention is set forth in connection with a switch of the well known panel type but its application is not limited to switches of that particular type.

The fundamental feature of the invention as well as its more specific features can best be set forth by means of a detailed description of the mechanism and its operation. Before entering into such a detailed description, however, it is thought best to give a brief general description of a panel type selector switch.

The panel type selector switch is so called because of the flat panel like terminal bank which is employed in connection therewith. The faces of the bank are situated vertically and stationary contact terminals are provided on both sides thereof. The terminals are arranged in vertical rows, each row consisting usually of five hundred sets of terminals. These rows are multiplied horizontally across the face of the bank.

A bank is ordinarily divided into five individual sections which are arranged in superimposed relation one to the other. As there are a total of five hundred sets of terminals, in each vertical row there would, then, be one hundred sets in each row of each section.

Associated with each vertical row of terminals on the bank is a vertical brush rod which is adapted to be moved up and down. There are five sets of contact brushes attached to each brush rod and adapted to be moved up and down therewith. Each brush set is associated with the contact terminals in one section, that is one hundred terminals.

The brush sets are all normally held under tension in such a manner that they will not engage the bank terminals when moved thereover.

The brush rods together with the brush sets mounted thereon normally stand in their lowermost positions. Means are provided for elevating the brush rod when it is desired to establish a connection between one of the brush sets and a set of bank terminals. Means are also provided for lowering the brush rod, i. e. restoring it to normal. When a call is to be extended through a particular selector switch, an idle brush rod, that is one standing in its normal position is selected. One of the brush sets must then be released to permit it to engage its associated bank terminals, the other brush sets being left in their normal positions. The brush set to be selected depends upon which section of the bank contains the terminals of the desired line. After the selected brush set is released the brush rod moves up until the desired terminals are engaged whereupon the brush rod is immediately stopped. No further movement takes place until the communication is completed when the brush rod is moved downward to its normal position and the selected brush set is also restored to normal.

This invention concerns only the releasing of the selected brush set. The operation of releasing the brushes is more commonly termed tripping the brushes and that expression will be used hereinafter.

In the accompanying drawings, three separate embodiments of the invention are shown. Figure 1 is a partial sectional view of a panel type selector switch; Figures 2, 2^a, 2^b, 2^c and 2^d illustrate the operation of that embodiment of the invention shown in Figure 1; Figure 3 is an enlarged sectional view taken on the line 3—3 of Figure 1, showing a brush set in detail; Figure 4 is a perspective view of the tripping device of Figure 1; Figure 5 is a perspective view illustrating a second embodiment of the invention; Figures 6, 6^a, 6^b and 6^c illustrate the operation of that embodiment of the invention shown in Figure 5; Figure 7 is a perspective view of a third embodiment of the invention and Figures 8, 8^a, 8^b and 8^c illustrate the operation of the last mentioned embodiment.

In Figure 1 there is shown mounted on

the vertical brush rod 10, two sets of contact brushes 11. As previously stated there are ordinarily five sets of brushes mounted on each brush rod. The brush rod and brushes

are movable vertically by means of the constantly rotating rollers 12 and 13, the former operating to move the brush rod downwardly, and the latter to move it upwardly. Electro-magnet 14 when energized draws up its armature 15 thereby pressing roller 16 against brush rod 10, and the latter in turn, against driving roller 13. The brush rod moves upwardly as long as magnet 14 remains energized. Energization of electro-magnet 17 likewise operates to effect downward operation of the brush rod.

Referring to Figure 3, it will be noted that each brush set 11 comprises four brushes arranged in pairs, the two inner brushes 11¹ forming one pair, and the two outer brushes 11² forming the other pair. Each brush 11¹ is mechanically connected to a brush 11² by an insulating separator 11³. Brushes 11¹ are normally held apart against their own tension by the insulating rollers 18¹. Brushes 11² are also normally pushed outwardly by brushes 11¹ due to the separators 11³. When the brushes are thus held apart they may be moved vertically over the terminals 19 of the tank 20 without engaging those terminals. The insulating rollers 18² are mounted on carriage 18 which is pivoted on pin 18¹. A trigger 18³ is integral with carriage 18. A downward movement of the trigger will rotate carriage 18 about its pivots and cause the rollers 18² to be withdrawn from the position shown in Figure 3 permitting the ends of the brushes to move toward each other and engage the terminals 19.

To extend a connection one of the several brush sets is selected and tripped, and the selected brush set is moved over the row of terminals 19 until it engages the desired set of terminals whereupon the brush rod is stopped.

Associated with each set of brushes there is a member 21 (shown in detail in Figure 4). The members 21 are each pivoted on a pin 22 and normally stand in the position shown in Figures 1 and 4. Each member 21 is mounted at a different height from the lowermost position of the end of its associated trigger 18³, that is, when the latter are in their normal positions as shown in Figure 1.

To select a brush set, the brush rod 10 is given a short preliminary upward movement and stopped. During the preliminary movement one or more of the triggers 18³ engages the angular surface 21¹ of member 21 and causes the latter to swing away from the trigger. This action is illustrated in Figures 2 and 2^a. A notch 21² is adapted to engage the end of the trigger 18³ when the

latter is stopped in juxtaposition thereto, following the preliminary movement as illustrated in Figure 2^b. Only one trigger at a time is stopped in juxtaposition to a notch 21², the remaining triggers either stopping short of, or being carried past the notches of their respectively associated members 21 and consequently only the one trigger is engaged.

In Figure 2^c, the brush rod has started on a secondary movement in the same direction as the preliminary movement, and the brush set is being tripped. In Figure 2^d tripping of the brush set is completed.

Each member 21 swings like a pendulum on its pivot 22 and it may be designed to have any desired period so that it will return neither too quickly nor too slowly.

When the brush rod is moved downwardly to its normal position the untripped triggers will wipe over the curved surface 21¹ of members 21 and move the latter out of the way. The tripped trigger will not interfere with member 21 on its downward movement. The tripped brush set is restored to normal when the brush rod reaches its lowermost position by the bar 24 which is adapted to engage trigger 18³ when the latter is off normal.

Another embodiment of the invention is shown in Figures 5, 6, 6^a, 6^b and 6^c. A bell-crank lever 25 is pivoted on pin 26 and normally stands as shown. Another bell-crank 27 is carried by the brush rod 10 and is pivoted on pin 28. A vane 29 attached to bell-crank 27 is adapted to be acted upon by air pressure to rotate the latter against the tension of retractile spring 30, upon upward movement of the brush rod. When thus moving upwardly, the lug 27¹ will engage the end 25¹ of bell-crank 25 and rotate the latter so that the end of trigger 18³ will pass bell-crank 25 without being engaged and tripped thereby. If, however, the brush rod stops, after its preliminary movement just before the lug 27¹ of bell-crank 27 engages the end 25¹ of bell-crank 25, the latter will not be engaged by the lug 27¹ upon the secondary movement of the brush rod because the time interval required for the lug 27¹ to pass the end 25¹ is shorter than the time required for bell-crank 27 to be rotated into interfering position by the air pressure acting on vane 29. It will be understood that the air pressure which acts on vanes 29 is due to the rapid movement of the brush rod.

Figures 6 to 6^c inclusive illustrate the sequence of operations of the last described embodiment. In Figure 6 the brush rod is in its normal position in Figure 6^a the brush rod has been given a preliminary movement upwardly and stopped. In Figure 6^b bell-crank 27 has been rotated by retractile spring 30 into a position wherein it does not

interfere with bell-crank 25. The brush rod is then started on its secondary movement upwardly, whereupon trigger 18' is engaged by bell-crank 25 and the brush set is tripped as shown in Figure 6^c.

Another embodiment of the invention is illustrated by Figures 7, 8, 8^a, 8^b and 8^c. In this case there is employed a bell-crank 31 which is pivoted on a pin 32, a brush 33 preferably of bristles, is carried by the bell-crank 31 and bears against brush rod 10. A pin 34 on the bell-crank is adapted to intercept the path of trigger 18' when the brush rod is at rest (Figure 8). When the brush rod is started upwardly on its preliminary movement friction between brush 33 and the brush rod causes bell-crank 31 to be rotated as illustrated in Figure 8^a. When the brush rod is stopped the brush 33 allows bell-crank 31 to return to its normal position in which pin 34 intercepts the path of the trigger.

Following the preliminary movement one of the triggers is stopped just below the normal position of the pin 34 with which it is associated, as shown in Figure 8^b. Upon the beginning of the secondary movement this trigger is engaged by pin 34 as shown in Figure 8^c and the brush set is tripped.

If, following the preliminary movement, a trigger is stopped above its associated pin 34 or at a point somewhat lower than that illustrated in Figure 8^b it will not be tripped on the secondary movement of the brush rod. In the latter case pin 34 will have been moved out of the path of the trigger before the latter is raised a sufficient distance to be engaged thereby.

The three embodiments of the invention set forth all come within the scope of a common underlying principle and they are all accordingly covered by the broad claims.

What is claimed is:

1. In a switch, a row of fixed contact terminals, a brush set adapted to be moved over said terminals, means for moving said brush set, means for normally holding said brush set non-operative relative to said terminals, during the movement of said brush set thereover, a tripping device comprising a pivoted member arranged to swing as a pendulum and adapted to effect a release of said brush set whereby the latter will engage said fixed contact terminals, said last mentioned means being effective only when said brush set is stopped at a pre-determined position following said preliminary movement.

2. In a switch, a row of fixed contact terminals, a brush set arranged to move over said terminals, means for moving said brush set, a device movable with said brush set adapted to normally maintain said brush set out of engagement with said terminals, a self-restoring tripping mechanism adapted to engage said device when said brush set is stopped in a predetermined position fol-

lowing a preliminary movement of said brush set, said tripping mechanism when so engaged with said device being adapted to trip the latter in response to a secondary movement of said brush set thereby effecting engagement between said brush set and said terminals.

3. In a switch, a row of fixed contact terminals, a brush set arranged to move over said terminals, means for moving said brush set, a tripping device including a trigger movable with said brush set and adapted to normally maintain said brush set out of engagement with said terminals, and a pivoted member situated in the normal path of said trigger, said pivoted member adapted to swing out of said path in response to a preliminary movement of said trigger and to thereafter swing back into said path, said pivoted member being adapted upon swinging back into said path to engage said trigger when the latter is stopped in a predetermined position following said preliminary movement, said engagement being effective to engage said brush set with said terminals upon a secondary movement of said brush set.

4. In a switch, a row of fixed contact terminals, a brush set arranged to move over said terminals, means for moving said brush set, a mechanism movable with and adapted to normally maintain said brush set out of engagement with said terminals, a trigger for said mechanism, a tripping device comprising a pivoted member arranged to swing as a pendulum, said tripping device having a surface angular to and normally in the path of movement of said trigger, and a detent in said tripping device adapted to engage said trigger when the latter is stopped in juxtaposition to the normal position of said detent, said tripping device being arranged to swing out of its normal position in response to an engagement between said angular surface and said trigger upon a preliminary movement of the latter and to swing back to its normal position to engage said trigger when the latter is stopped in juxtaposition to said detent following said preliminary movement.

5. An automatic switch comprising a movable shaft, a plurality of brushes resiliently secured thereto, controlling means individual to each brush for normally retaining said brushes in an inoperative position, a tripping device arranged to cooperate with each controlling means, means to successively actuate said tripping devices during the advance of said brush shaft, and means to release in operative position a desired one of said brushes by the joint action of the tripping device and controlling means as a result of continued motion of said brush shaft the continued movement being in the same direction as the preceding movement.

6. An automatic switch comprising a movable shaft, a plurality of brushes secured thereto, controlling means individual to each brush for normally retaining said brushes in inoperative condition, a tripping zone for each brush, means to successively advance said brushes through said tripping zones, and devices controlled in accordance with the time required for a brush to pass through a tripping zone to selectively render said brushes operative.

brush set arranged to move over said terminals, means for moving said brush set, a tripping device movable with said brush set for controlling engagement of the brushes with said terminals, a trigger adapted to be moved out of tripping position by said brush set, and means independent of said brush set for restoring said trigger.

In witness whereof I hereunto subscribe my name this 26th day of November, A. D. 1920.

7. In a switch, fixed contact terminals, a

LEE R. WALLER.