J. L. McQUARRIE.

SELECTOR SWITCH.

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1,279,893.

Patented Sept. 24, 1918.

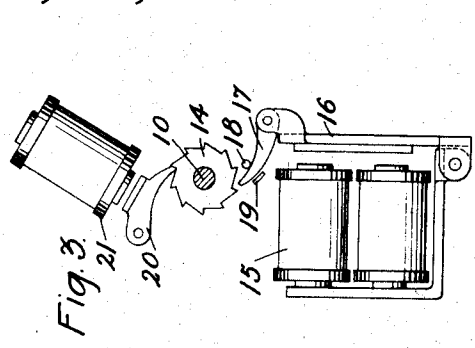
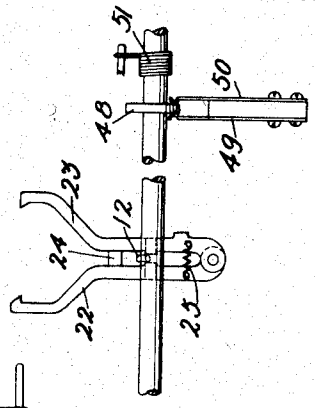


Fig. 3.



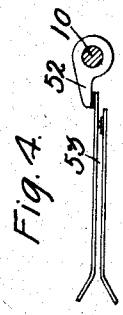


Fig. 4.

Fig. 1.

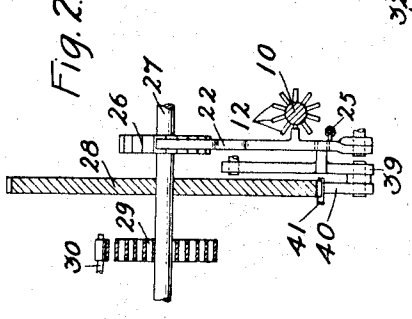


Fig. 2.

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UNITED STATES PATENT OFFICE.

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SELECTOR-SWITCH.

1,279,893. Specification of Letters Patent. Patented Sept. 24, 1918.

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To all whom it may concern:

Be it known that I, JAMES L. McQUARRIE, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Selector-Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to selector switches, and especially to switches of the type used in automatic and semi-automatic telephone systems.

One object of this invention is to produce a step-by-step rotary switch of large capacity in which any desired contact of the switch can be rapidly selected. Another object is to utilize a common operating mechanism to effect all the different acts necessary in the selection of any desired contact within the limits of the switch. A third object is to produce movement of a brush set by means of an operating spring and to provide escapement of said brush set under influence of said spring.

In operation, the first series of impulses rotates an operating rod to select the brush set individual to the particular contact bank containing the desired line. The tens impulses then actuate the operating rod, moving the same longitudinally to the left and releasing the movable contact of the selected switch in long steps until the desired group of contacts is reached. Thereupon the operating rod is moved longitudinally to the right to step back the movable contact a single contact at a time, until the desired contact in the selected group has been reached. In restoring, the operating rod is moved to the right and steps the brush back a single contact at a time until normal is reached. A spring which serves to move the brush during setting is rewound during this restoring operation. When the brush reaches normal, a holding means for the operating rod is released, whereupon springs automatically restore said rod to its normal position.

Referring to the drawings, Figure 1 shows a complete plan view of one of the switches, together with the escapement pawl of another, and the operating mechanism common to all the switches controlled by the same operating rod; Fig. 2 is a cross-section thereof on the line 2—2 of Fig. 1; Fig. 3 is a section on the line 3—3 of Fig. 1, showing the group stepping and holding magnet; and Fig. 4 illustrates a normal contact closed when the operating rod is rotated out of normal position.

The switch comprises a long operating rod 10 which serves to operate a plurality of rotary switches, one of such switches 11 being shown. The rod 10 may control a large number of rotary switches 11 and as illustrated would operate 10. Each rotary switch could have as many contacts as desired in its bank, a 100-point bank being shown. The rod 10 would, therefore, in the construction shown, control 1000 bank contacts. To effect selection of the desired switch 11 the rod 10 has pins, such as 12 and 12, arranged spirally thereon and having one of said pins individual to each of the switches which the rod 10 operates. Engagement of the pins 12 is effected by rotation of the rod 10 to position the desired pin in proper relation to operate its switch 11. A ratchet wheel 14, secured to the shaft 10, is moved by actuation of a switch selecting magnet 15 having an armature 16 carrying a pawl 17, pivoted to one end thereof. The pawl 17 is normally held out of engagement with the ratchet wheel 14 by a pin 18, but on energization of the magnet 15, the armature 16 is attracted and carries pawl 17 inwardly to engage the wheel 14 and move it one step. A wedging plate 19 is provided to force the pawl 17 into engagement with the wheel 14 on inward movement of the armature 16. The rod 10 is held in the position to which it is rotated by a catch pawl 20 which engages the ratchet wheel 14, and is in turn controlled by a release magnet 21 having the catch pawl 20 as its armature and actuated when it is desired to return the operating rod 10 to normal position.

In the drawings the pin 12 is shown as rotated to a position to operate its switch 11. In this position, pin 12 is located between two pawl arms 22, 23, which are pivoted together, but held slightly spaced apart by a lug 24 on one of said arms. A spring 25 serves to normally hold the arms 22, 23 in the position shown on the drawings. The pawl arm 22 engages a ratchet wheel 26 secured on a shaft 27 which also carries a toothed plate 28, and a spiral spring 29 thereon. The spiral spring 29 has one end securely fastened to the shaft 27 and the other end secured to a pin 30 suitably lo-

cated on a fixed part of the frame of the switch 11. The toothed wheel 28 carries a movable brush set 31 which engages the contacts 32 of an arcuate contact bank 33. The contacts of a bank may be divided into groups of any desired size, determined by the number of contacts passed over on a single tooth escapement of the ratchet wheel 26. These groups generally contain ten contacts. The spring 29 tends to move the brush set 31 to the extreme right-hand side of the bank 33, but the pawl arm 22 engaging the ratchet wheel 26 normally prevents such movement and holds the brush set 31 in the extreme left position with the spring 29 tightly wound. The operating rod 10 also carries another set of spirally arranged pins, similar to the set comprising the pins 12 and equal in number to said set. One of the pins 34 of this set is shown, and when the pin 12 engages the pawl arms 22, 23, the pin 34 individual to the selected switch 11 is in position to engage a spring-pressed catch pawl 35, of the selected switch, which normally engages the toothed wheel 28 to hold the same against movement.

The proper switch having been selected, escapement of the brush set 31 to the proper group is effected by moving the operating rod 10 longitudinally to the left. The rod 10 has a member 36 thereon with which an armature 37 of a tens or group selecting magnet 38 engages. The energization of the tens magnet operates the same to attract its armature and moves the operating rod 10 to the left. In moving to the left, the rod 10 disengages the catch pawl 35 from the toothed wheel 28 and also disengages the pawl arm 22 from the ratchet wheel 26, which thereupon moves one step to the right, carrying the brush set 31 forward one group. In this position the catch pawl 23 prevents further movement. On deënergization of the magnet 38, the rod 10 returns to its normal longitudinal position and the catch pawl 35 and pawl arm 22 again engage wheel 26. Succeeding impulses are set through the group magnet 38 until the brush set 31 is stepped to the desired group.

To step the brush set 31 to the desired contact in a group, an arm 39 secured to the switch frame is mounted adjacent to and normally engaged with the pawl arm 23. This arm 39 carries a stepping pawl 40 pivoted thereto and normally held out of engagement with the toothed wheel 28 by a pin 41. A wedge plate 42 serves to force the pawl 40 into engagement with a tooth of the wheel 28 upon operation thereof. The proper group having been found, a units magnet 43 having an armature 44 engaging with a member 45 on the rod 10 is operated. On energization the magnet 43 moves the rod 10 to the right, whereupon pin 12 moves the pawl arm 23, which, in turn, moves the arm 39, whereupon the pawl 40 moves the toothed wheel a units step to the left, in which position it is retained by the catch pawl 35. On deënergization of magnet 43, the rod 10 returns to its normal longitudinal position. Succeeding impulses are supplied to the magnet 43 to step the brush set 31 to the desired contact in the selected group.

Restoration of the brush set 31 to normal is accomplished by actuation of the magnet 43, whose circuit is interrupted until a projecting lug 46, carried on the toothed wheel 28, engages with a normal contact 47 of the selected switch 11. This contact is thus closed and may be used to control a circuit to the reset magnet 21 which, on being energized, withdraws its armature 20, whereupon the rod 10 is free to rotate to normal. To effect normal longitudinal positioning of the rod 10, an annular projection 48 is secured thereto and engaged on one side by a spring 49 and on the other side by a spring 50, these springs being suitably secured to some part of the switch structure. A coiled retractile spring 51 has one end secured to the rod 10 and the other end suitably secured to a fixed part of the switch structure to insure the rotation of the rod 10 to its normal position. The rod 10 carries a projection 52 which engages and closes a normal contact 53 suitably secured to the switch structure, and which serves as a rotary stop for the normal position of the rod 10.

The operation of the device is as follows: The switch having been associated with a calling line, the calling party operates a sender to transmit a definite number of impulses, corresponding to the individual switch 11 desired. The circuits are so controlled that these impulses are utilized to actuate the switch selecting magnet 15, which rotates the shaft 10 to position a pin 12 to select the proper switch 11 represented by the impulses sent. These impulses having been completed, the suitable circuit controlling means prepares a circuit for the tens or group magnet 38 which is actuated by the impulses next sent by the calling party, these impulses generally representing the tens digits. These result in operating the selected switch 11 the number of group steps represented by the impulses sent. The circuit controlling means thereupon prepares a circuit for a units magnet 43 which responds to the units impulses now sent by the calling party to step the brush set 31 of the selected switch 11 one contact at a time until the desired contact is reached. In case the switch 11 is used as a connector, the number of units steps would correspond to the number of units impulses sent by the calling party, but if used as a trunk selector, interrupted current could be supplied to the magnet 43 until the brush set 31 reached an idle trunk contact. On termination of the

conversation, a circuit controlling switch would supply the units magnet 43, now acting as a restoring magnet, with interrupted current to actuate the same until the brush set 31 of the selected switch 11 had been stepped back to normal, whereupon the circuit controlling switch would be actuated to cut off the current to the units magnet. On reaching normal, the projection 46 would close the contact 47, completing a circuit for and actuating the reset magnet 21, thus disengaging pawl 20 from the ratchet wheel 14, which thereupon rotates to its normal position under the influence of a spring 51. On rotating to normal, the contact 53 would be closed. This contact may be used to complete a circuit for a circuit controlling switch, serving to move the same to normal position and leave the selector switch ready for subsequent operation.

What is claimed is:

1. In an electrically operated switch, a plurality of series of fixed contacts composed of groups, a plurality of movable contact arms one for each of said series of contacts for making connection with any one contact of said series of contacts, a common shaft, means for rotating said shaft to select a movable contact arm, and means for reciprocating said shaft to move the selected contact arm in steps of one length to select a group and in steps of a different length to select a contact in the selected group.

2. In an electrically operated switch, groups of fixed contacts, a movable contact arranged to engage any of said fixed contacts, motive means for moving said movable contact, escapement means for controlling the movement of said movable contact by groups, a stepping mechanism for moving said movable contact from one fixed contact to the next, said stepping mechanism being also actuated to restore said movable contacts to normal and to restore energy to said motive means.

3. In an electric switch, a contact bank having a plurality of contacts arranged in groups, a rotatable member, contact means associated for movement therewith to engage said contacts, a spring to move said rotatable member, means to move said contact to a desired group of contacts, and a single mechanism to move said contact means to a desired contact in the desired group, and subsequently to restore said contact means to normal position and rewind said spring.

4. In an electric switch, a contact bank having a plurality of contacts arranged in groups, a rotatable member, contact means associated for movement therewith to engage said contacts, a spring to move said rotatable member, means to escape said member by groups to move said contact means to any desired group of contacts, and a single mechanism to move said contact means to any desired contact in the desired group and to restore said contact means and spring to normal position.

5. In an electric switch, a plurality of contacts, a movable contact to engage any of said plurality of contacts, a member to move said movable contact, a spring to move said member, an escapement device for said member to escape the same by long steps, and a single mechanism to move the member by shorter steps to engage the movable contact with any of said plurality of contacts, and subsequently to return said member to normal and rewind said spring.

6. In an electric switch, a plurality of contacts, a movable contact to engage any of said plurality of contacts, a toothed plate carrying said movable contact, a spring to move said plate, an escapement device for said plate to escape the same under influence of said spring to operate said movable contact, and means to move said toothed plate in a reverse direction to associate said movable contact with any of said plurality of contacts and to rewind said spring.

7. In an electric switch, a plurality of contacts, a movable contact for association with any one of said plurality of contacts, a toothed wheel carrying said movable contact, an escapement wheel associated for movement with said toothed wheel, a spring to effect movement of said wheels, escapement means for said escapement wheel comprising two pawl arms joined together, a spring drawing said arms toward each other, a third pawl arm operated by one of said first-mentioned pawl arms to engage said toothed wheel, and means engaging one of said first-mentioned pawl arms on movement in one direction to disengage said pawl arm and on movement in the other direction engaging the other of said first-mentioned pawl arms to actuate the third pawl to move said toothed wheel.

8. In an electric switch, a plurality of contacts, a movable contact for association with any one of said plurality of contacts, a toothed wheel carrying said movable contact, an escapement wheel associated for movement with said toothed wheel, a spring to effect movement of said wheels, an escapement means for said escapement wheel comprising two pawl arms joined together, a spring drawing said arms toward each other, a catch holding said toothed wheel against escapement, a third pawl operated by one of said first-mentioned pawl arms to engage said toothed wheel, means engaging one of said first-mentioned pawl arms on movement in one direction to disengage said pawl arm and on movement in the other direction to engage the other of said first-mentioned pawl arms to actuate the third pawl to move said toothed wheel, and means to withdraw

said catch when the means engaging said first-mentioned pawl arm moves to release said escapement wheel.

9. In an electric switch, a plurality of contact banks each divided into groups of contacts, contact means individual to said banks to engage the contacts of their respective banks, and common means to select any desired contact means, said common means being arranged to move any selected contact means in one direction to any desired group in its associated bank and also being arranged to move any selected contact means in the reverse direction to any desired contact in a selected group.

10. In a rotary switch, a plurality of arcuate contact banks, contact means individual to said banks to engage the contacts of their respective banks, common mechanical means to select any desired contact means, means for moving the selected contact means to engage any desired contact in its respective bank, and means for restoring the contact means to normal.

11. In an electric switch, a plurality of contact banks each divided into groups, contact means individual to said banks to engage the contacts of their respective banks, common operating means, means operated on rotary movement of said operating means to select any desired contact means, means operated on longitudinal movement of said operating means in one direction to move said selected means to any desired group in its respective bank, and means operated on longitudinal movement of said operating means in the opposite direction to move said selected contact means to any desired contact in the selected group.

12. In a rotary switch, a plurality of arcuate contact banks each divided into groups, rotary contact means individual to said banks to engage the contacts of their respective banks, a common means to select any desired contact means, means to rotate the selected contact means in group steps, means to rotate the selected contact means in unit steps, and means to restore said contact means to normal position.

13. In a rotary switch, a plurality of arcuate contact banks, a spring actuated escapement wheel individual to each bank, a toothed wheel individual to each bank movable with said escapement wheel, a contact brush individual to each bank movable with said wheels to engage the contacts of its associated bank, a stepping pawl means individual to each bank movable to escape said escapement wheel and to move said toothed wheel, an operating means to actuate any desired one of said pawl means, and means to associate said operating means with any desired pawl means.

14. In a rotary switch, a plurality of arcuate contact banks, a spring actuated escapement wheel individual to each bank, a toothed wheel individual to each bank movable with said escapement wheel, a contact brush individual to each bank movable with said wheels to engage the contacts of its associated bank, a stepping pawl means individual to each bank operable to move said wheels, a catch individual to each bank to coöperate with its associated pawl means and operating means to actuate any desired pawl means and its respective catch, and means to associate said operating means with any desired pawl means and its respective catch.

15. In an electric switch, a plurality of contact banks, contact means individual to each of said banks to engage the contacts of its associated bank, a rotatable and longitudinally movable shaft; means on said shaft to select any desired contact means to rotate said shaft to effect said selection, means individual to each of said contact means to be engaged by said shaft and escape said contact means in long steps on longitudinal movement of said shaft in one direction, means individual to said contact means to be engaged by said shaft and to move said contact means in shorter steps to engage any of said plurality of contacts in its respective bank on longitudinal movement of said shaft in the opposite direction, means to move said shaft longitudinally in either direction, and means to effect the return of said shaft to its normal position.

16. In an electric switch, a plurality of contact banks, each divided into groups of contacts, contact means individual to said banks to engage the contacts of their respective banks, an operating member common to said contact means, means for moving said member to select any desired contact means, means for imparting a reciprocating motion to said member to move the selected contact means to any desired group in its associated bank, and means for imparting a reciprocating motion to said member to move said contact means to any contact in the selected group.

In witness whereof, I hereunto subscribe my name this 30th of August, A. D. 1916.

JAMES L. McQUARRIE.