

Oct. 27, 1942.

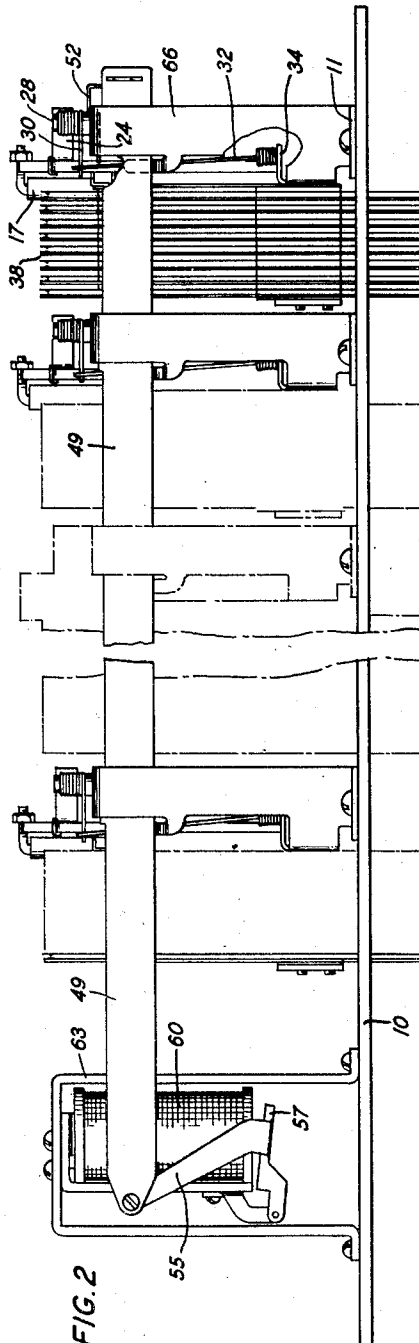
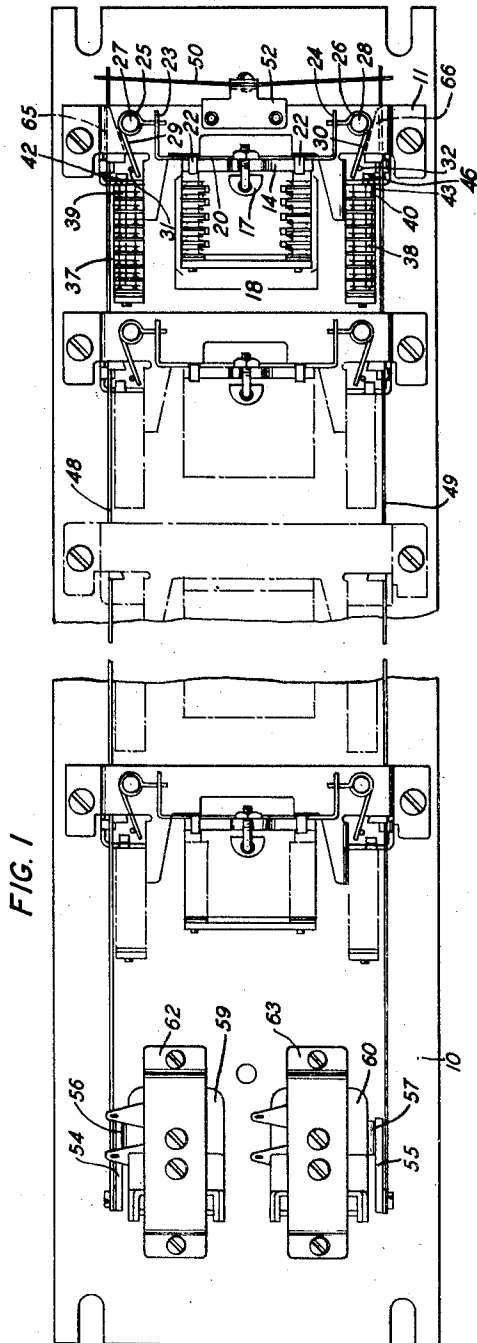
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2,300,371

SWITCHING DEVICES

Filed July 12, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

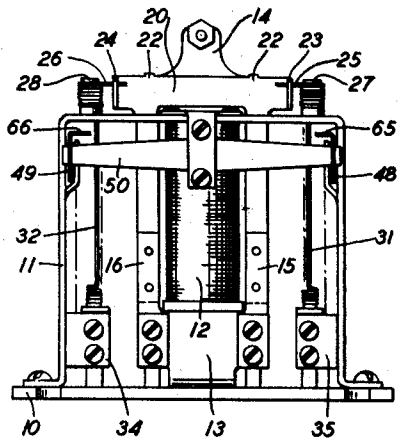


FIG. 3

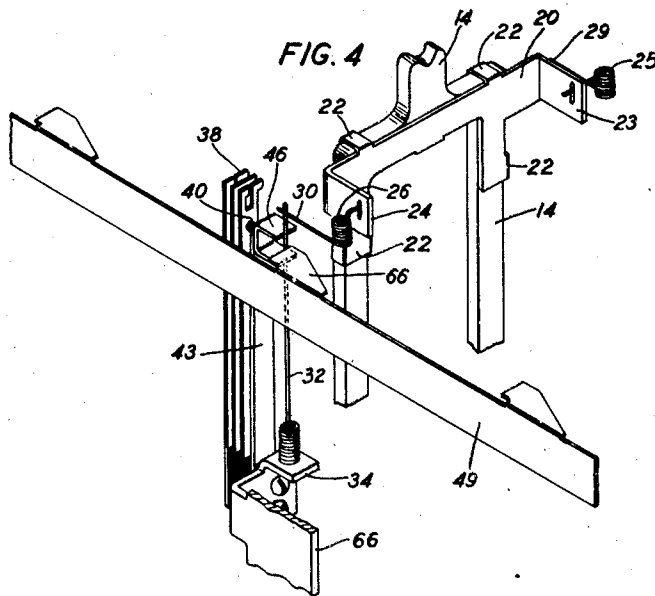


FIG. 4

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SWITCHING DEVICE

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6 Claims. (Cl. 179—27.54)

This invention relates to switching devices and particularly to improvements in such devices as employed in telephone systems.

An object is to simplify the operating characteristics and reduce the cost of switching devices of the type in which a comparatively small number of automatically established electrical connections are desired.

Heretofore such minor switches were generally of the so-called rotary type in which a set of wipers are rotated in steps to establish connections with terminals in semicircular banks. Other types of minor switches have also been employed in which selections to establish connections between sets of contacts were obtained by the use of code bars operated by code impulses. Such switches often partake of the principles embodied in the well-known cross-bar types of switches.

The present invention relates to this latter type of switching mechanisms and the features thereof relate to certain construction details and their arrangements in the switch structure. The present switching mechanism may consist of a common mounting plate on which select magnets are mounted in a row on individual frame members with a set of contact springs mounted on each of said frame members on opposite sides of the associated magnet to form two opposite rows of such sets of springs. Each magnet is provided with an armature on which a cross member is mounted that cooperates with bell crank levers mounted on said frame member adjacent said sets of contact springs. A select finger and an operating spring are also provided for each set of contact springs so that on the operation of a magnet, the cross member operates on the bell crank levers to place the associated fingers in front of the associated operating springs and a hold-bar is provided outside of each row of contact springs with a magnet for each bar to move it longitudinally and projections on said bars so located that when a finger has been placed in front of an associated operating spring and a bar is moved longitudinally, an associated projection will move the finger and the actuating spring to actuate the associated set of contact springs to establish circuit connections.

The invention has been illustrated in the accompanying drawings in which:

Fig. 1 shows a top view of a switching mechanism in accordance with the applicant's invention.

Fig. 2 is a front view of the mechanism shown in Fig. 1; and

Fig. 3 is an end view of this mechanism, while, Fig. 4 is a fragmentary perspective view to illustrate the operating characteristics of the mechanism.

Referring now to the drawings and particularly to Figs. 1 to 3, the switch structure is mounted on the mounting plate 10. On this mounting plate are secured individual frame members 11 on which in turn are mounted practically all the details for the establishing of connections by two sets of contact springs. The parts associated with this frame member 11 are as follows: a magnetic coil 12 which is mounted directly on plate 10 by means of yoke piece 13 and on this yoke piece is hinged a U-shaped armature 14 through leaf springs 15 and 16 as shown in Fig. 3 for attraction by the core 17 of the magnet 12 when energized. This armature operates on two piles or sets of contact springs that may be employed for any special purpose such as off-normal connections when this mechanism is used in telephone systems. These sets are marked 18 and may, of course, be omitted where such special connections are not desired. On the armature 14 at the free end thereof is mounted a cross member 20 by means of projections such as 22 hooked over the upper end and side members of the armature or in any other suitable manner. This cross member is provided with angular projections 23 and 24 on the opposite sides of the armature. These projections 23 and 24 engage, each through slots, one arm of bell crank levers 25 and 26, respectively. These bell crank levers may be made from wire having two lever arms and a central coil portion mounted on posts 27 and 28, respectively, these posts being in turn mounted on the frame member 11. The other arms 29 and 30 of the bell crank levers 25 and 26 engage in turn the free ends of selecting fingers 31 and 32 which are connected respectively on angular extensions 34 and 35 from the frame member 11 and are of the usual type provided with a coil portion at the base and a straight portion for the remainder of the fingers. On the angular extensions 34 and 35 are also mounted in separate piles two sets of selecting spring pile-ups 37 and 38 each consisting of a series of stationary springs and a series of movable springs. The movable springs are connected by studs 39 and 40 respectively and the right-hand ends of these studs looking at Fig. 1 are in connective engagement with operating springs 42 and 43, respectively, which are also mounted on the frame member 11 with the spring pile-ups 37 and 38. The free ends of these operating springs are U-shaped as shown, for

example, in Fig. 4 at 46 in particular. A plurality of such individual structures as hereinbefore described are mounted side by side on the plate 10 to form a row of magnet and associated structural details as described and in which the pile-ups 37 of the different individual structures form one row of spring pile-ups while an opposite row of spring pile-ups is formed by the spring pile-ups 38. Outside of the row of spring pile-up 37 is mounted a holding bar in the form of a tape 48 and outside the row of spring pile-ups 38 is mounted a similar holding bar or tape 49. These tapes are held in their normal position towards the right looking at Fig. 1 by a spring member 50 which is mounted on a bracket 52 mounted on the member 11. The opposite ends of these holding bars 48 and 49 are respectively connected to extensions 54 and 55 of armatures 56 and 57 that are mounted on the yoke pieces of magnets 59 and 60, respectively. These magnets are mounted through their yoke pieces to individual U-shaped brackets 62, 63, respectively, the operation of these magnets causing the armature thereof to shift the holding bars 48, 49 towards the left looking at Fig. 1. These holding bars 48 and 49 are provided adjacent each U-shaped portion of the operating springs with angular projections for each unit. These projections are marked 65 and 66 for the unit shown at the extreme right in Fig. 1. These projections are located toward the right of the select fingers 31 and 32 so that the fingers when operated may pass between these projections and the U-shaped portions of the operating springs.

The operation of this mechanism will now be described with special reference to Figs. 1 and 4 which show a fragmentary perspective view of the mechanism relating to the operation of a spring pile-up such as 33. If the springs in the pile-up 33 are to be operated to establish electrical connections, the first operation that will take place will be the energization of the magnet 12 shown in Fig. 1. The energization of this magnet causes the attraction of the armature 14 to rotate the bell crank levers 25 and 26 by having the cross member 23 engage the vertical arms of these levers to cause the arms 29 and 30 to move the select finger 31 between the projection 65 and the U-shaped portion of operating spring 42 in the case of arm 29 and the finger 32 between the projection 66 and the U-shaped portion 46 of the operating spring 43. If now the magnet 60 is operated so as to attract its armature 57, the extension 55 thereon will shift the holding bar 49 towards the left so that the projection 66 will engage the finger 32 and move it and the operating spring 43 towards the left. This spring will then act on stud 40 to cause the movable springs in the pile-up 33 to engage with the stationary springs to establish a connection between these select springs. In case the spring pile-up 37 was to be selected in place of spring pile-up 38, the operation will be the same except that the magnet 59 would operate to shift the holding bar 48 towards the left and thus cause the projection 65 to move finger 31, operating spring 42 and stud 39 to actuate the movable springs in the pile-up 33 to establish connections with the stationary springs.

This switching mechanism may be arranged for a capacity of, for example, twenty sets of select springs for establishing one out of twenty selectors each time it operates, that is, there will be ten magnets like magnet 12 and the operation of any one of these magnets will make a preselect-

tion to include one spring pile-up on either side of this magnet from either of the groups of ten sets of spring pile-ups and select one or the other of these sets by a subsequent operation of one or the other holding bars 48 or 49. It should be observed, of course, that after one of these holding bars, for example 48, is operated to select a set of spring pile-ups in the upper row, looking at Fig. 1, the operated magnet may be released so that another selection may be made from the opposite group of spring pile-ups by operating any of the magnets, and the other holding bar 49, thus two simultaneous connections may be maintained through the medium of this switching mechanism.

What is claimed is:

1. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of sets of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of springs, a flexible finger associated with each operating spring, a bell crank lever associated with each finger, means associated with the armature of each magnet for actuating the two oppositely located bell crank levers to place the associated fingers in front of the associated operating springs, a tape located along the side of each row of sets of springs, a magnet for each tape to move it longitudinally, and projections on each tape so located that when a tape is moved longitudinally it will engage a finger that has been moved opposite an associated operating spring to cause said finger and operating spring to actuate the associated set of contacts to establish connections between them.

2. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of sets of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of contacts, a flexible finger associated with each operating spring, a bell crank lever associated with each finger, means associated with the armature of each magnet for actuating the two oppositely located bell crank levers to place the associated fingers in front of the associated operating springs, a tape located along the side of each row of sets of contact springs, a magnet for each tape to move it longitudinally, projections on each tape so located that when a tape is moved longitudinally, it will engage a finger that has been moved opposite an associated operating spring to cause said finger and operating spring to actuate the associated set of contact springs to establish a connection between them, a frame member associated with each magnet for mounting the associated sets of contacts, bell crank levers, fingers and means for actuating the fingers and levers, and a common base plate for mounting said magnets and said frames in a row.

3. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of contacts, a flexible finger associated with each operating spring, a bell crank lever associated with each finger, means associated with the armature of each magnet for actuating the two oppositely located bell crank levers to place the associated fingers in front of the associated operating springs, a tape located along the side of each row of sets of contact springs,

a magnet for each tape to move it longitudinally, projections on each tape so located that when a tape is moved longitudinally, it will engage a finger that has been moved opposite an associated set of contacts to establish a connection between them, said fingers, operating spring and projections on the tape being so constructed that when a tape has been moved to actuate a set of contact springs, the associated finger will be held in operated position to permit the release of the actuated select magnet.

4. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of sets of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of contacts, a flexible finger associated with each operating spring, a bell crank lever having one end thereof in position to move an associated finger, a member attached to the armature of each magnet for engaging the other end of two opposite bell crank levers simultaneously to rotate them around their pivotal points to actuate their respectively associated fingers to place them in front of the associated operating springs and means for operating either of said fingers and their associated operating springs to close connections between the contact springs in their associated sets and for maintaining said connection after the magnet is released to restore the bell crank lever to normal.

5. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of contacts, a flexible finger associated with each operating spring, a resilient bell crank lever associated with each finger, means associated with the armature of each magnet for actuating the two oppositely located bell crank levers to place the associated fingers in front of the associated operating springs, a tape located along the side of each row of sets of contact springs, a magnet for each tape to move it longitudinally, projections on each tape so located that when a tape is moved longitudinally it will engage a finger that has been moved opposite an associated operating spring to cause said finger and operating spring to actuate the associated set of contacts to establish connections be-

tween them, and a common restoring spring for both of said tapes to restore them to the release position after they have been released by the associated magnets.

6. In a switching device, a row of select magnets, a set of contact springs located on opposite sides of each magnet to form parallel rows of sets of contact springs on opposite sides of the row of select magnets, an operating spring associated with each set of contact springs, a flexible finger associated with each operating spring, a bell crank lever associated with each finger, a member mounted on the armature of each magnet for actuating the two oppositely located bell crank levers to place the associated fingers in front of the associated operating springs, a tape located along the side of each row of sets of contact springs, a magnet for each tape to move it longitudinally, projections on each tape so located that when a tape is moved longitudinally, it will engage the finger that has been moved opposite the associated operating spring to cause said finger and operating spring to actuate the associated set of contact springs to establish connections between them, a common restoring spring for both said tapes to restore them to the released position after they have been released by the associated magnets, a U-shaped frame, member associated with each magnet on the bottom member of which is mounted the two associated bell crank levers and having projections extending from the side members thereof on which the two associated sets of contact springs, select fingers and operating springs are mounted and having other projections on the side members for guiding the associated tapes in their longitudinal movements, a member mounted on the bottom member of one of the U-shaped frame members and on which the common restoring spring for the two tapes is mounted, a common base plate on which the U-shaped frame members and their associated magnets are mounted to form a row of magnets with the frame members mounted transversely across the common plate so that the guide members on the side members of each frame member form straight lines for guiding of the associated tapes and a U-shaped member for each tape operating magnet mounted in parallel relation on the common plate on one side of the row of magnets and their associated frame members.

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