

May 27, 1952

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2,598,519

CIRCUIT CONTROLLING APPARATUS

Filed March 22, 1950

2 SHEETS—SHEET 1

FIG. 3.

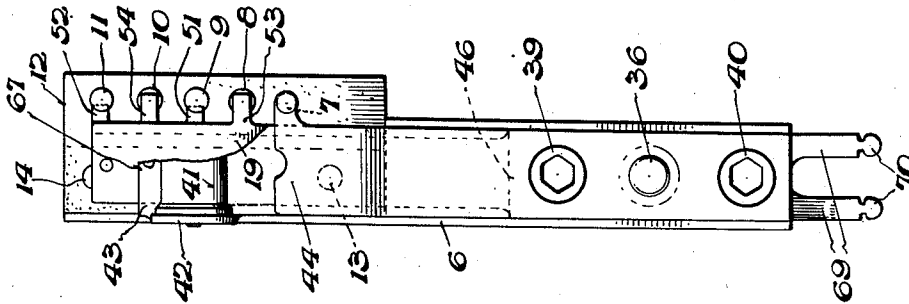
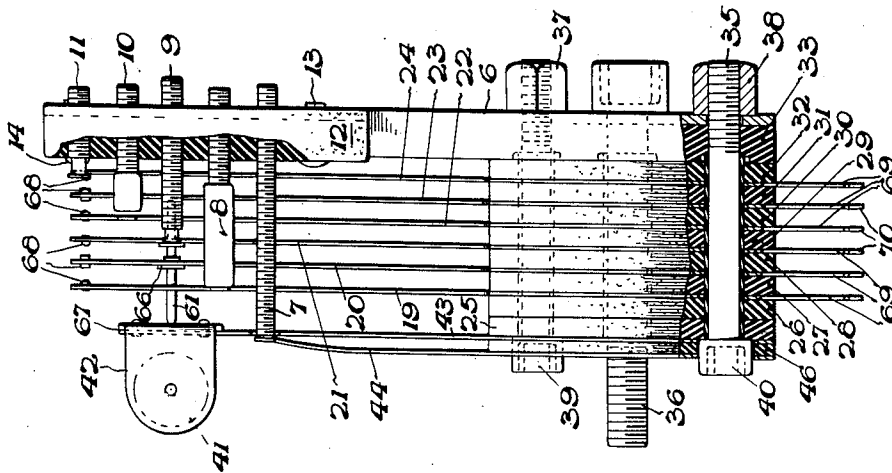


FIG. 1.



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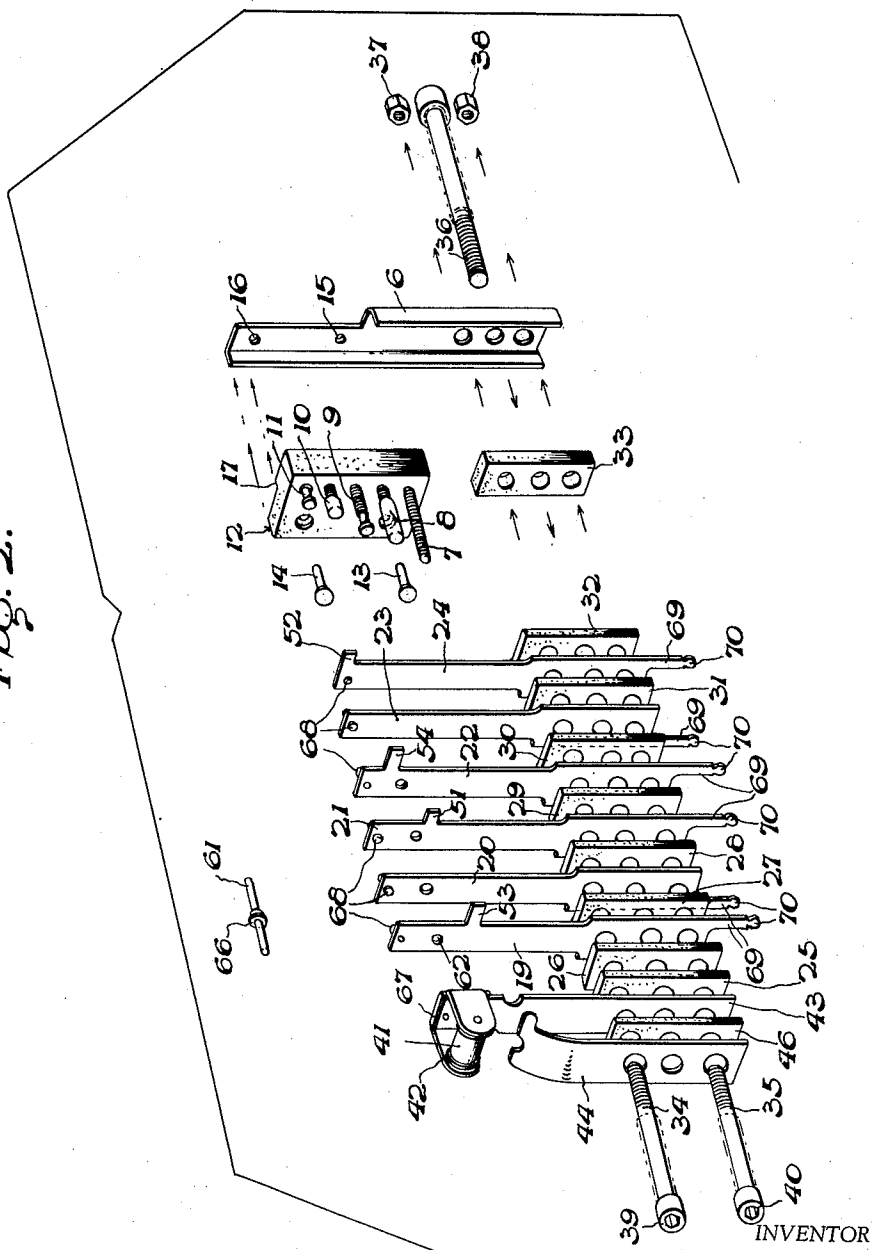
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2 SHEETS—SHEET 2

Fig. 2.



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CIRCUIT CONTROLLING APPARATUS

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3 Claims. (Cl. 200-166)

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This invention relates to circuit controlling apparatus and particularly to the control of a plurality of associated circuits adapted for operation in accordance with a predetermined time sequence pattern such as is required for control of various associated functions incidental to operation of a telephone system.

In telephone exchanges it is customary to employ rotating cams or equivalent mechanical devices for the successive opening and closing of associated signalling circuits through the intermediary of spring contacts assembled in groups and adapted for operation by such cam either directly or through the intervention of a cam follower adapted to transmit to the spring contacts a pressure exerted thereupon periodically by the rotating cam. The present invention provides a number of improvements in the construction and inter-relationships between the component parts of such a circuit controlling mechanism; these improvements affecting not only the contact elements themselves but also the mechanical operating, adjusting, supporting and assembling methods and means associated therewith.

More specifically, an object of the invention is to provide, in a circuit controlling apparatus of the character indicated, novel means for adjusting, and holding in adjustment, the individual contact elements of the complete switch assembly. In this connection a feature of the invention is the inter-relationship of successive spring contacts of the assembly to each other and to adjusting screws associated therewith, which novel relationships facilitate rigid setting of all contacts with proper tension on each, the adjusting means being readily accessible for this purpose and operable without any disturbance of the assembly as a whole.

A second object of the invention is the provision of means automatically dividing the complete assembly into a number of sub-assemblies in such manner that any one of such sub-assemblies may be removed from the complete assembly without any disturbance whatever of the remaining sub-assemblies. Wherefore, it is possible to effect an inspection and repair of one sub-assembly independently of the remainder of the unit and if necessary the replacement of one such sub-assembly without the necessity or expense of replacing the complete mechanism.

A third object of the invention is to provide in a switch assembly of the character indicated and including a plurality of spring contacts individually adjustable by adjusting screws engag-

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able therewith, novel means serving the double function of first supporting the complete assembly of adjusting screws, and secondly serving automatically as a physical lock upon each screw, assuring the maintenance of the screw in the position to which it has been set for as long a period as is desired.

In this connection a feature of the invention is the use of nylon or equivalent material having the inherent capacity to contract and expand as required for the purpose of first permitting an adjusting element such as a threaded pin or screw to be passed therethrough and rotated therein, and secondly to expand into the recesses between successive threads of such a pin or screw to set up a firm gripping and locking relationship therewith, effective to hold the pin or screw in whatever position it occupies at the completion of the adjusting process.

These and other objects of the invention are further explained in the following description of the embodiment of the invention illustrated in the annexed drawings wherein:

Fig. 1 is a view in side elevation of a switch assembly embodying the invention; Fig. 2 is an exploded perspective view of the assembly of Fig. 1; and Fig. 3 is a view at right angles to the viewpoint of Fig. 1, showing a part of the assembly of Fig. 1.

As shown in the drawing, the switch assembly is composed of three main divisions, each constituting a sub-assembly; the first sub-assembly consisting of the metallic backing plate 6, the set of adjusting screws 7, 8, 9, 10 and 11, and the screw retaining block 12 adapted to be mounted at one end of the backing plate 6 by suitable means such as the two screws 13 and 14 insertible through the holes 15 and 16, respectively, of the backing plate and adapted to penetrate into the nylon insulating material of the block 12 for retention of said block upon the plate 6. Both the block 12 and backing plate 6 have cooperating right angled recesses as indicated at 17 and 18, to facilitate proper mounting of the block upon the plate and in such position that insertion of the retaining screws 13 and 14 will not interfere with subsequent manipulation of the screws 7 to 11 inclusive for proper adjustment of the respective spring contacts controlled thereby.

The second sub-assembly includes the complete series of contact strips 19, 20, 21, 22, 23 and 24 (the number of which may, of course, vary in accordance with the telephone signalling or other electrical system with which the switch assembly

is to be employed) constructed of spring metal or equivalent resilient metal, together with the spacer blocks 25 to 33 inclusive of moulded insulating material disposed in inter-leaving relationship with the successive contact strips 13 to 24 and all provided with a series of holes adapted to align with the corresponding holes provided in the plate 6 and also in the contact strips so that the three assembly screws 34, 35 and 36 may be passed therethrough. Screws 34 and 35 are inserted through these holes from left to right as viewed in the drawings and are retained by the attachment to the right hand ends of retaining nuts 37 and 38 respectively.

It will be observed that these screws 34 and 35 are of the type having recessed heads as indicated at 39 and 40, respectively, adapted to receive wrenches to facilitate the proper tightening of the screws or removal thereof without the necessity of employing any tool engageable with the external surfaces of the screw heads. The use of screw heads of this character also facilitate the separate assembly and removal of the third main sub-assembly, consisting of the cam follower 41, its mounting bracket 42, the strip 43 supporting said bracket 42, the resilient strip 44 for resiliently urging the strip 43 into contact with the end of screw 7 by which adjustably positioned, and the spacer elements 45 and 46 for maintaining proper spacing of the parts just enumerated. This third sub-assembly is held in position upon the mounting wall (not shown) by only the single screw 36, therefore the removal of this single screw 36 allows the complete assembly to be removed as a unit, after which the sub-assembly consisting of the cam follower 41 and its associated parts 42 and 46 inclusive can be removed from the remainder of the assembly simply by drawing these parts off the heads 39—40 of the screws 34—35, which operation does in no way disturb the remainder of the assembly which is held together by said screws 34—35. On the other hand, if it is also desired to separate the remainder of the assembly into its two major parts, these screws 34—35 may likewise be removed by turning off the nuts 37 and 38, thus separating the contact assembly from the basic sub-assembly consisting of the channel plate 6, the nylon block 12 and the adjusting screws therein, which basic sub-assembly therefore remains undisturbed in its component elements so that replacement of the spring assembly is possible without the necessity of changing the adjustments as determined by the previous setting of the adjusting screws 1 to 11 inclusive.

To facilitate maintenance of the complete assembly upon its mounting bracket against the danger of any possible shifting thereof, in view of there being only the single screw 36 to support the weight of the assembly, the said mounting wall may be provided with recesses positioned to receive the projecting portions of the heads 39 and 40, thus providing three point inter-locking of the switch assembly with its mounting wall, even though only a single screw actually retains one part upon the other.

Referring principally to Fig. 2, it will be observed that certain of the contact strips have short lateral extensions as indicated at 51 and 52 while certain other strips have longer lateral extensions as indicated at 53 and 54 and still other contact strips have no such lateral extensions. Those having no lateral extensions are adapted to serve as movable electrodes or terminals for the periodic opening and closing of

circuits associated with the stationary contact strips located on either side of said movable strips. Thus, for example, stationary strip 21 is adapted to be brought into electrical relationship with movable strip 20 during that portion of such succeeding cycle wherein movement of said strip 20 to the right occurs as a result of pressure exerted on the cam follower 41 by the cam (not shown) that is periodically engaged therewith; and movable contact strip 20 under the influence of the same cam pressure is adapted to move out of electrical contact with the stationary strip 19; thereafter strip 20 returns to circuits closing position as respects strips 19, by reason of its resilient bias in that direction, following departure of the cam from engagement with the cam follower 41.

Due to the lateral extension 51, for example, being shorter than the lateral extension 53, the former is adapted for engagement by the screw 9, whereas the latter is adapted for engagement by the end of screw 8; and since the screw 9 is provided with a mushroom type of head, the effect of the screw will be to hold the contact strip 21 against shift to the left, whereas the screw 8 will hold the contact strip 19 against shift to the right. Accordingly, the springs 19 and 21 are oppositely tensioned, that is, the inherent resilient bias of the spring 19 is toward the right, whereas the inherent bias of the spring 21 is toward the left. Similar opposite tensioning exists as between the springs 22 and 24 which function in conjunction with the movable contact 23. By this method of oppositely acting adjusting screws in conjunction therewith, it becomes possible to adjust all individual switches merely by turning the screws in the retaining block 17; the turning being effective by application of wrenches to the socketed outer ends of the screws.

It will also be observed that the heads of the screws 7 to 11 inclusive are readily accessible at a location separate and distinct from the location of the spring contacts themselves, therefore any relative crowding that may exist as to the spring contacts themselves will not in any way affect the ease of adjustment thereof.

The means for transmitting pressure to the contact strips 20 to 24, in response to right-ward pressure upon cam follower 41, when engaged by its operating cam (not shown) takes the form of a nylon thrust pin 61 movable freely through clearance holes 62, of the strips 19, 21 and 22, respectively, and held fast to strip 20 by forming the double flange 66 centrally of the pin, which flange also serves as the pressure transmitter. The outer end of pin 61 is engaged by the flat central portion 67 of the cam follower bracket, while the inner end of the pin bears against contact strip 23 and presses said strip in engagement with 24, at the proper stages in the cycle—or, rather causes the contact tips 68 thereof to inter-engage; it being understood that strips 20 and 23 have such tips 68 on both sides thereof, while strips 19, 21, 22 and 24 have such tips on only the side facing the strip 20, or the strip 23, as the case may be. All six strips have lower extensions 69 provided with head and neck portions 70 to receive circuit wires (not shown) attachable thereto in any conventional manner.

What I claim is:

1. In circuit controlling apparatus, the combination with a stack of switch elements and insulating spacers disposed in inter-leaving relationship, of a cam follower disposed at one end

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of said switch stack, adjusting means for positioning certain of said switch elements in desired relationship to other switch elements electrically complementary thereto, mounting means for said adjusting means, and means for retaining said cam follower, switch stack, and mounting means in an assembled relationship consisting of three sub-assemblies so united that each of two of said sub-assemblies can be separated into its constituent parts while the other two remain unseparated.

2. In circuit controlling apparatus, the combination with a stack of switch elements and insulating spacers disposed in inter-leaving relationship, of a cam follower disposed at one end of said switch stack, said cam follower being resiliently biased outwardly from said switch stack, and certain of said switch elements being resiliently biased oppositely to certain others, a backing plate for said switch stack, means for pressing said switch elements in the direction of said backing plate, in response to pressure exerted against the cam follower, and adjustable means abutting opposite sides of certain of said switch elements to limit their motion in the re-

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spective directions to which they are resiliently biased.

3. In circuit controlling apparatus, the combination with a plurality of switch elements, of means including a cam follower for operating said switch elements, mounting means for said switch elements, said mounting means including adjusting means individual to said switch elements, and means for retaining said cam follower, switch elements, and mounting means in assembly in such manner that either said cam follower or said switch elements may be removed from the assembly without disturbing the setting of said individual adjusting means.

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