

Oct. 20, 1942.

H. W. RUBINSTEIN ET AL

2,299,498

SWITCH MECHANISM

Filed Oct. 9, 1939

4 Sheets-Sheet 1

Fig. 1.

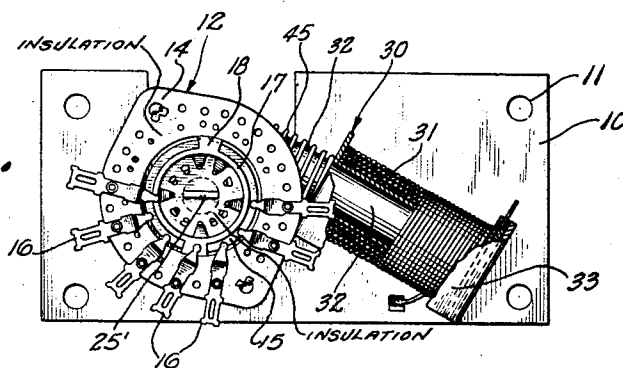


Fig. 2.

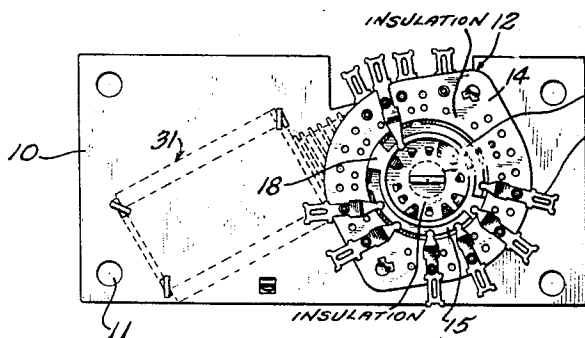


Fig. 3.

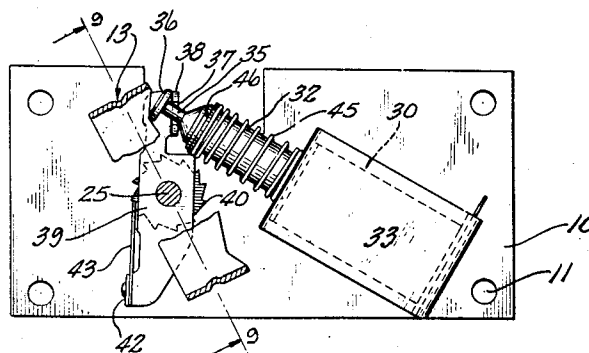
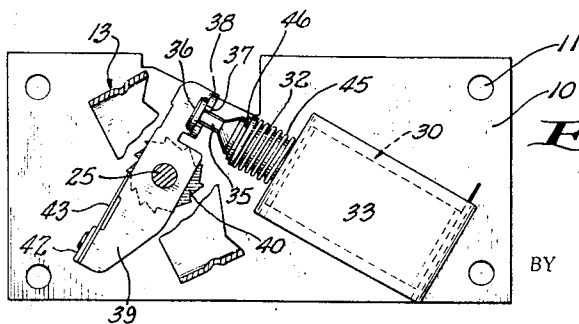


Fig. 4.



INVENTOR.
HARRY W. RUBINSTEIN
HERBERT L. ZIMMERMAN
BY *John W. Michael*
ATTORNEY.

Oct. 20, 1942.

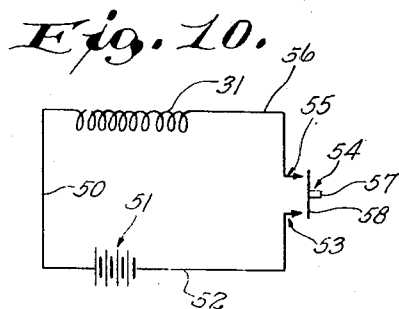
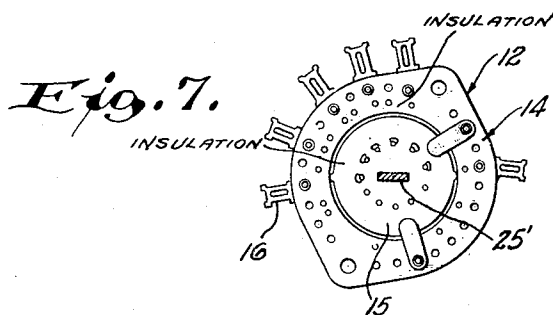
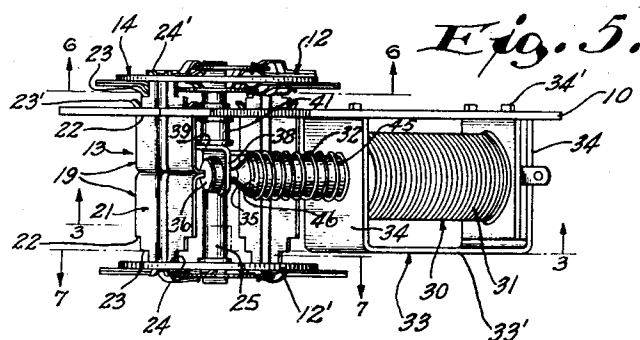
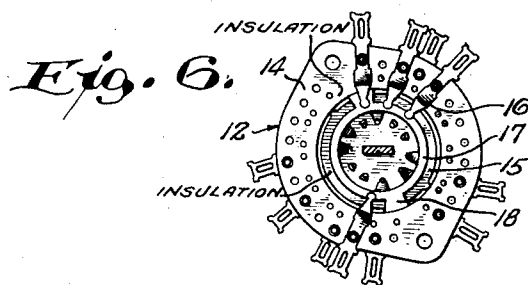
H. W. RUBINSTEIN ET AL

2,299,498

SWITCH MECHANISM

Filed Oct. 9, 1939

4 Sheets-Sheet 2



BY

INVENTOR.
HARRY W. RUBINSTEIN
HERBERT L. ZIMMERMAN

John W. Michael
ATTORNEY.

Oct. 20, 1942.

H. W. RUBINSTEIN ET AL

2,299,498

SWITCH MECHANISM

Filed Oct. 9, 1939

4 Sheets-Sheet 3

Fig. 8

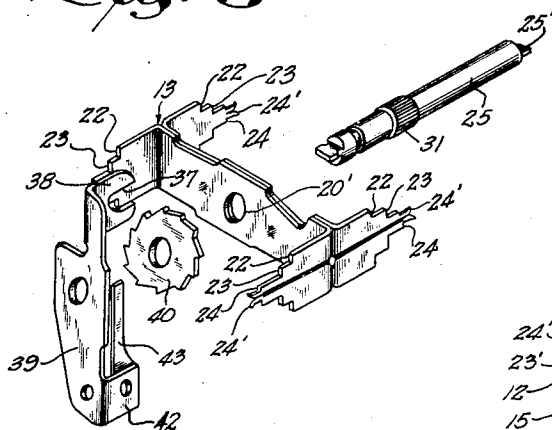


Fig. 9.

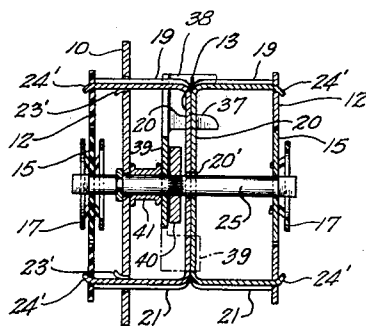


Fig. 11.

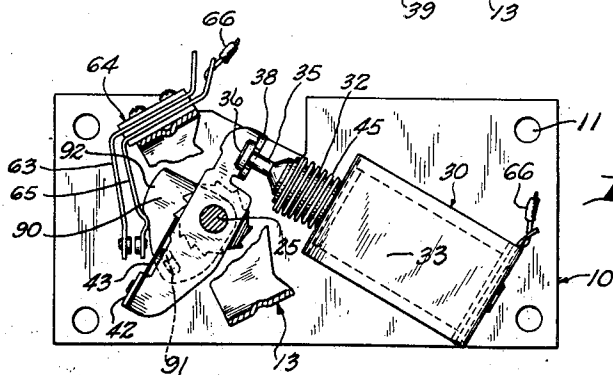
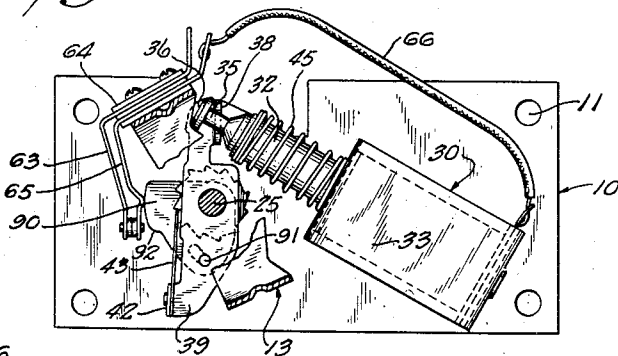


Fig. 12.

BY

INVENTOR
HARRY W. RUBINSTEIN
HERBERT L. ZIMMERMAN
John W. Michael
ATTORNEY.

Oct. 20, 1942.

H. W. RUBINSTEIN ET AL

2,299,498

SWITCH MECHANISM

Filed Oct. 9, 1939

4 Sheets-Sheet 4

Fig. 13.

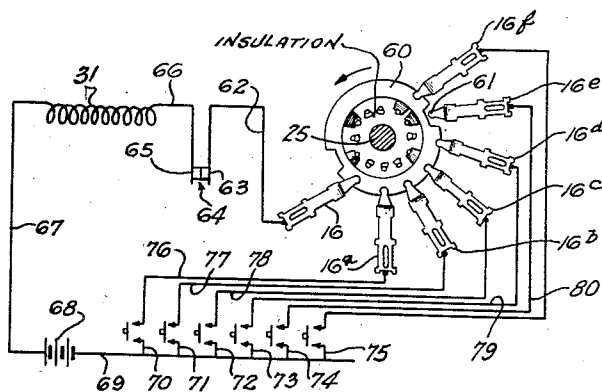
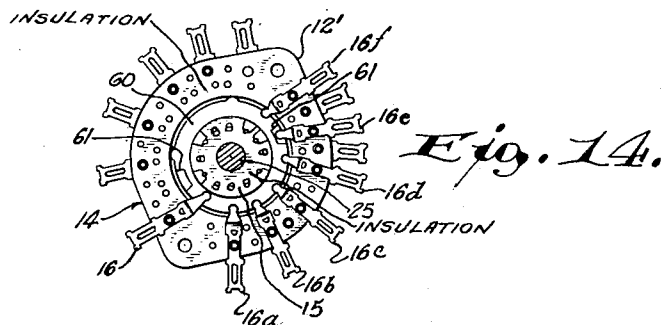
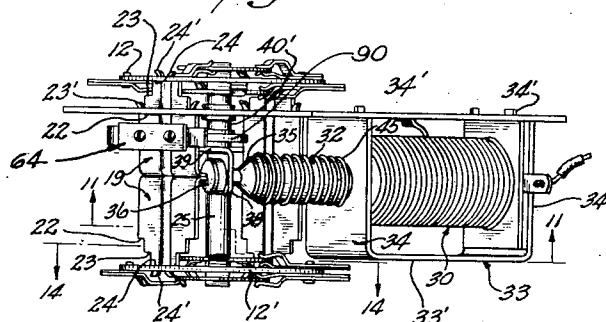


Fig. 15.

INVENTOR
HARRY W. RUBINSTEIN
HERBERT L. ZIMMERMAN
BY *John W. Michael*
ATTORNEY

UNITED STATES PATENT OFFICE

2,299,498

SWITCH MECHANISM

Harry W. Rubinstein and Herbert L. Zimmerman, Milwaukee, Wis., assignors to Globe-Union Inc., Milwaukee, Wis., a corporation of Delaware

Application October 9, 1939, Serial No. 298,590

4 Claims. (Cl. 200—11)

This invention relates to a push button controlled electro-magnetically actuated switch mechanism especially designed for use with radio receivers although also adapted for other uses, such as on testing equipment.

One of the objects of the present invention is to provide a switching mechanism of this character which may be constituted to provide for selective or progressive tuning of a radio receiver for selective wave band switching, or for remote tuning.

Another object of the invention is to provide a switching mechanism of this character, which is simple and compact as well as rugged and durable in construction, which may be fabricated largely from sheet metal parts, and is composed of a minimum number of parts, which insures good reception and is otherwise reliable and efficient in operation and easy and comparatively inexpensive to manufacture.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts, which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view illustrating a switching mechanism embodying the present invention showing the same principally in rear elevation, parts being broken away and shown in vertical cross section for the sake of illustration.

Figure 2 is a view in elevation of the other side of the switching mechanism from that shown in Figure 1.

Figure 3 is a view in longitudinal vertical cross section taken on line 3—3 of Figure 5, and illustrating the parts as they are positioned when the solenoid is deenergized.

Figure 4 is a view similar to Figure 3 but illustrating the parts as they are positioned when the solenoid is energized.

Figure 5 is a view in top plan of the switching mechanism shown in Figures 1 to 4, inclusive.

Figures 6 and 7 are views in longitudinal vertical cross section taken on lines 6—6 and 7—7, respectively, and looking in the direction of the arrows.

Figure 8 is a group in perspective view of the H frame, ratchet lever, ratchet wheel, and associated shaft, employed in the switching mechanism illustrated in Figure 7.

Figure 9 is a view in section taken on line 9—9 of Figure 3.

Figure 10 is a diagram of the electric circuits

in which the solenoid winding is incorporated when the control device is designed for progressive tuning and is controlled by a single push button.

Figure 11 is a view in cross section taken on line 11—11 of Figure 13 and showing the invention when adapted for selective tuning.

Figure 12 is a view similar to Figure 11 but showing a different position of parts.

Figure 13 is a view in top plan of the embodiment of the invention illustrated in Figures 11 and 12.

Figure 14 is a view in transverse vertical cross section taken on line 14—14 of Figure 13; and Figure 15 is a diagram of the electrical circuits employed in the embodiment of the invention shown in Figures 11 to 14 for the purpose of effecting the selective tuning.

Referring to the drawings, it will be seen that in both embodiments of the invention the switching mechanism comprises a mounting plate 10 which may be constituted of a piece of sheet metal, and which is provided at its corners with openings 11 to facilitate its fastening or mounting on the chassis of the radio receiver, or to a bracket provided therefor on the chassis.

The sections of the switch designated at 12, in the form of the invention shown in Figures 1 to 10, and at 12' in the form of the invention shown in Figures 11 to 15, are supported by an H-shaped frame designated generally at 13, which in turn is carried by the mounting plate 10. The details of the construction of the switch sections 12 and 12' form no part of the present invention, and are fully disclosed and claimed in the application of John S. Coldwell for "Switches," filed September 20, 1939, Serial No. 295,707, and owned by the assignee of this application. For the purposes of the present invention it is sufficient to bear in mind that each switch section has an annular stator 14 of the insulating material surrounding a rotor 15 also of insulating material. Each stator 14 has contact clips 16 fixed thereto and cooperable with the contact lugs 18 and contact ring 17 carried by the rotor, with the exception of the switch section 12' included in the form of the invention shown in Figures 11 to 15, and which, as will be later described, has the rotor contact on its inner rotor face of special construction to provide for selective as distinguished from progressive tuning.

In both embodiments of the invention the H-shaped frame 13 is made up of two similar U-shaped sheet metal sections or members 19, which

have their body portions 20 placed back to back and spot-welded together. The legs 21 of the two sheet metal sections 19 of the H-frame 13 are aligned with each other but extend in opposite directions, and their outer ends are of step formation to provide shoulders 22, 23, and 24. The mounting plate 10 is provided with spaced parallel slots through which the stepped ends of the legs 21 of one of the sections 19 are extended, the shoulders 22 of the legs of such section 19 abutting or overlapping the inside of the mounting plate just beyond the ends of these slots, and the shoulders 23 of these same legs being then split or upset as at 23' into fastening engagement with the outside face of the mounting plate. The extreme outer ends or tips of the legs of both sections 19 of the H-shaped frame 13 pass through openings provided therefor in the stators 14, and are also split or upset as at 24' into fastening engagement therewith, the stators abutting against the outermost shoulders 24.

The rotors 15 of the switch sections 12 and 12' have central slots in which the flattened ends 25' of the switch operating shaft 25 are fitted so that as the shaft is turned the rotors 15 are turned to bring the lugs 17 successively into engagement with different stator contact clips 16. The shaft 25 is supported for rotation in a bearing opening 26 provided therefor in the mounting plate 10, and also in bearing openings 20' provided therefor in the body portions 20 of the sections of the H-shaped frame, the H-shaped frame thus affording an outboard bearing for the switch-operating shaft 25.

Electro-magnetic means is provided for imparting a step-by-step motion to the switch-operating shaft 25. This means comprises a solenoid designated generally at 30, made up of an electro-magnetic winding 31 provided with an axial opening in which the plunger or core 32 of the solenoid is slidable. The electro-magnetic winding is supported on a U-shaped sheet metal frame 33, which has its body portion 33' in spaced parallel relation to the member plate 10, and has its legs 34 extending between its body portion and the plate 10 and formed with attaching lugs or tabs 34' extending through openings in the plate 10 and riveted over into place. The frame 33 is constituted of metal, which has the requisite permeability, and the panel or mounting plate 10 is similarly constituted so that the frame and panel not only serve to support the solenoid, but also provide an endless flux path for the electro-magnetic flux set up when the winding is excited, thereby increasing the efficiency of the magnet.

The outer end of the plunger 32 is reduced to form a neck 35 which has an integral and somewhat enlarged head 36 at its outer end. This neck and head structure is interfitted with a notch 37 formed in a laterally offset portion 38 of an oscillating or rocking ratchet lever 39, so as to provide a driving connection between the plunger or core 32 of the solenoid and the ratchet lever 39. The ratchet lever 39 is pivotally supported at a point intermediate its ends on the shaft 25. One side face of the rocking arm lies flush up against a ratchet wheel 40 affixed to the shaft 25.

In the embodiment of the invention shown in Figures 1 to 10, the other side of the ratchet lever 39 engages one end of a spacing eyelet 41 mounted on the shaft 25 between the ratchet lever 39 and the panel or mounting plate 10.

In the embodiment of the invention shown in

Figures 11 to 15 a somewhat shorter eyelet designated at 40' is used in order to accommodate a cam plate to be later described. In both embodiments of the invention, at the end of the ratchet lever 39 opposite the notched laterally offset portion 38 thereof, is an integral laterally offset lug 42 to which a spring detent or pawl 43 is riveted or otherwise secured. The free end of the detent 43 rides upon and engages the teeth of the ratchet wheel 40.

With this construction, when electric current flows through the windings 31 of the solenoid, and the solenoid is energized, it sucks in the plunger 32, and such movement of plunger 32 is transmitted to the ratchet lever 39 to rock it from the position shown in Figure 3 to the position shown in Figure 4. The spring detent 43 engages one of the teeth of the ratchet wheel 40 so as to transmit the turning movement of the ratchet lever 39 to the ratchet wheel 40, and consequently to the shaft 25 and rotors 15, whereby the rotors 15 and their contact lugs 17 and contact rings 18 are rotated through a definite angular distance, thereby bringing the lugs 17 into engagement with certain of the stator contact clips 16.

The present invention provides for return movement of the rocker arm when the magnet is deenergized, and may, for this purpose, combine a spring 45 with the plunger of the solenoid which projects beyond its frame 33. One end of the spring abuts the adjacent leg 34 of the frame 33, and the other abuts a C-ring or snap ring 46, which is snapped into an annular groove provided on the plunger adjacent the neck 38 thereof. When the plunger 32 is drawn into its windings 31 upon excitation of the magnet 30, the spring 45 is compressed so that when the magnet 30 is deenergized its spring 45 will act to force the plunger 32 outwardly and thereby return the ratchet lever 39 from the position shown in Figure 4 to the position shown in Figure 3. During this movement of the ratchet lever 39 its spring detent 43 freely travels or idles over a tooth of the ratchet wheel 40 and shaft 25, and parts controlled thereby will remain in their previously selected position.

The embodiment of the invention shown in Figures 1 to 10, inclusive, is designed to effect progressive tuning of the radio receiver, and, as illustrated in Figure 10, may be incorporated in the electrical circuit controlled by the single push button. This is advantageous especially for auto radios. As shown in Figure 10, the winding 31 of the solenoid has one of its terminals connected by wire 50 to one terminal of the battery or other source of current designated at 51. The other terminal of the battery connects by wire 52 to one of the fixed contacts 53 of a push button switch designated at 54. The switch 54 has a second fixed contact 55 connected by a wire 56 to one terminal of the winding 31. The push button 57 of the switch 54 controls the position of a movable bridging contact 58, which, when engaged with the contacts 53 and 55, will complete the circuit through the winding 31. As usual, the push button switch 54 is spring-biased to open position.

The embodiment of the invention shown in Figures 11 to 15 is modified somewhat to adopt the mechanism for selective tuning of a radio receiver. For this purpose the inner side or face of the rotor 15 of the switch section 12' has a contact ring 60 secured thereto, which is provided at diametrically opposite points in its outer edge

or periphery with notches 61. Inwardly of the notches 61 the ring is an unbroken and continuous annulus, and is always in contact with the long stator clip 16 provided on this side of the switch section 12'. The short stator clips 16a, 16b, 16c, 16d, 16e, and 16f of this side of the switch section 12' are also engaged with the ring 60 at all times except when the notches 61 are brought into alinement or juxtaposition therewith. The long stator clip 16 is connected by a wire or conductor 62 to the fixed contact 63 of a breaker or interrupter switch designated generally at 64. Cooperable with this fixed contact is a movable contact 65, which is biased by virtue of its own resiliency to spring away from the contact 63 and open the breaker switch. As shown in Figures 11 and 12, the breaker switch may be constituted of two sheet metal strips supported upon the H-frame 13 and insulated from each other, the contacts 63 and 65 proper being in the form of contact buttons. The contact 65 is connected by a wire or conductor 66 with one terminal of the coil or electro-magnetic winding 31. The other terminal of this winding connects by means of a wire 67 to one terminal of a battery or other source of current 68. The other terminal of this battery is connected by means of a wire 69 and its branches to fixed contacts of push button switches 70, 71, 72, 73, 74, and 75. The other fixed contacts of these push button switches are connected by wires 76, 77, 78, 79, and 80 to the short stator clips 16a, 16b, 16c, 16d, 16e, and 16f.

The push button switches are biased to open position. When the push button switches are all open, then the mechanism is in the position shown in Figure 11, and at this time a cam plate 90, pivotally supported on the shaft 25, and having a pin and slot connection 91 with the ratchet lever 39, has its nose 92 pressing against the movable contact 65 of the breaker switch to cause it to engage the fixed contact 63 thereof and maintain the switch closed. Now, if any one of the push buttons, except that one connected to the short stator clip, which lies in one of the notches 61, is pressed, then current will flow through the battery through the closed push button switch, to its stator clip, thence through the ring 60, long stator clip 16, to the conductor 62 and through the breaker switch 64 to the electro-magnetic winding 31, and thence to the battery. This, as previously described, energizes the solenoid winding to cause it to shift its plunger and swing or rock the ratchet lever from the position shown in Figure 11 to the position shown in Figure 12. During a substantial fraction of the movement of the ratchet lever 39 it is driving only the ratchet wheel 40 since there is a lost motion connection 91 between the ratchet lever and the cam 90 provided by the pin slot connection 91, but eventually, and before the movement is completed, a driving connection is had between ratchet lever 39 and cam 90, and the cam 90 is pulled up as shown in Figure 12 to allow the breaker switch 64 to open. The spring then returns the parts to the position shown in Figure 11, whereupon the breaker switch is again closed. If now a short stator clip has been selected, which will be brought into alinement with the notch, nothing further will occur, but if some of the others have been selected then the operation is automatically repeated until the short stator clip selected lies in one of the notches 61. Thus the station is automatically selected.

While we have shown and described several modifications in which the invention may be ad-

vantageously embodied, it is to be understood that the constructions shown have been selected merely for the purpose of illustration or example, and that various changes in the size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

We claim:

1. A switch mechanism of the character described comprising a mounting plate having bearing openings, a shaft rotatably supported in said bearing opening and projecting beyond both sides of said plate, an H-frame made up of a pair of U-shaped sections secured together with their body portions back to back, the legs of one of said sections being engaged with and fastened to the mounting plate, the body portions of the sections having alined bearing openings providing an outboard bearing for said shaft, a pair of switch sections, each switch section including a stator of insulating material, one of said stators being engaged with and secured to the ends of the legs of one of said sections of the frame, the other being engaged with and secured to the ends of the legs of the other section of the frame, each of said switch sections also including a rotor disposed within the confines of its stator and rotatively coupled to said shaft, cooperable contact clips and contact members carried by the stator and rotor of each switch section, and means for imparting a step-by-step movement to said shaft.

2. A switch mechanism of the character described comprising a mounting plate having bearing openings, a shaft rotatably supported in said bearing opening and projecting beyond both sides of said plate, an H-frame made up of a pair of U-shaped sections secured together with their body portions back to back, the legs of one of said sections being engaged with and fastened to the mounting plate, the body portions of the sections having alined bearing openings providing an outboard bearing for said shaft, a pair of switch sections, each switch section including a stator of insulating material, one of said stators being engaged with and secured to the ends of the legs of one of said sections of the frame, the other being engaged with and secured to the ends of the legs of the other section of the frame, each of said switch sections also including a rotor disposed within the confines of its stator and rotatively coupled to said shaft, cooperable contact clips and contact members carried by the stator and rotor of each switch section.

3. A switching mechanism of the character described comprising a mounting plate having a bearing opening, a shaft rotatably supported in said bearing opening and projecting beyond both sides of said plate, an H-shaped frame made up of a pair of U-shaped sections secured together with their body portions back to back, the legs of both of said sections having stepped ends, the stepped ends of the legs of one of said sections being interengaged with and secured to the mounting plate and projecting beyond one side thereof, the body portions of the sections having alined bearing openings providing an outboard bearing for said shaft, a pair of switch sections, each switch section including a stator of insulating material interengaged with and secured to the outermost step of the legs of its adjacent frame section, each switch section also including a rotor cooperatively related to its stator and rotatably coupled to said shaft, and means for imparting a step by step motion to the shaft.

4. A switching mechanism of the character de-

scribed comprising a mounting plate having a bearing opening, a shaft rotatably supported in said bearing opening and projecting beyond both sides of said plate, an H-shaped frame made up of a pair of U-shaped sections secured together with their body portions back to back, the legs of both of said sections having stepped ends, the stepped ends of the legs of one of said sections being interengaged with and secured to the mounting plate and projecting beyond one side thereof, the body portions of the sections having

5 aligned bearing openings providing an outboard bearing for said shaft, a pair of switch sections, each switch section including a stator of insulating material interengaged with and secured to the outermost step of the legs of its adjacent frame section, each switch section also including a rotor cooperatively related to its stator and rotatably coupled to said shaft.

HARRY W. RUBINSTEIN.
HERBERT L. ZIMMERMAN.