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H. SENGEBUSCH
MULTI-POSITION RELAYS

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2 Sheets-Sheet 1

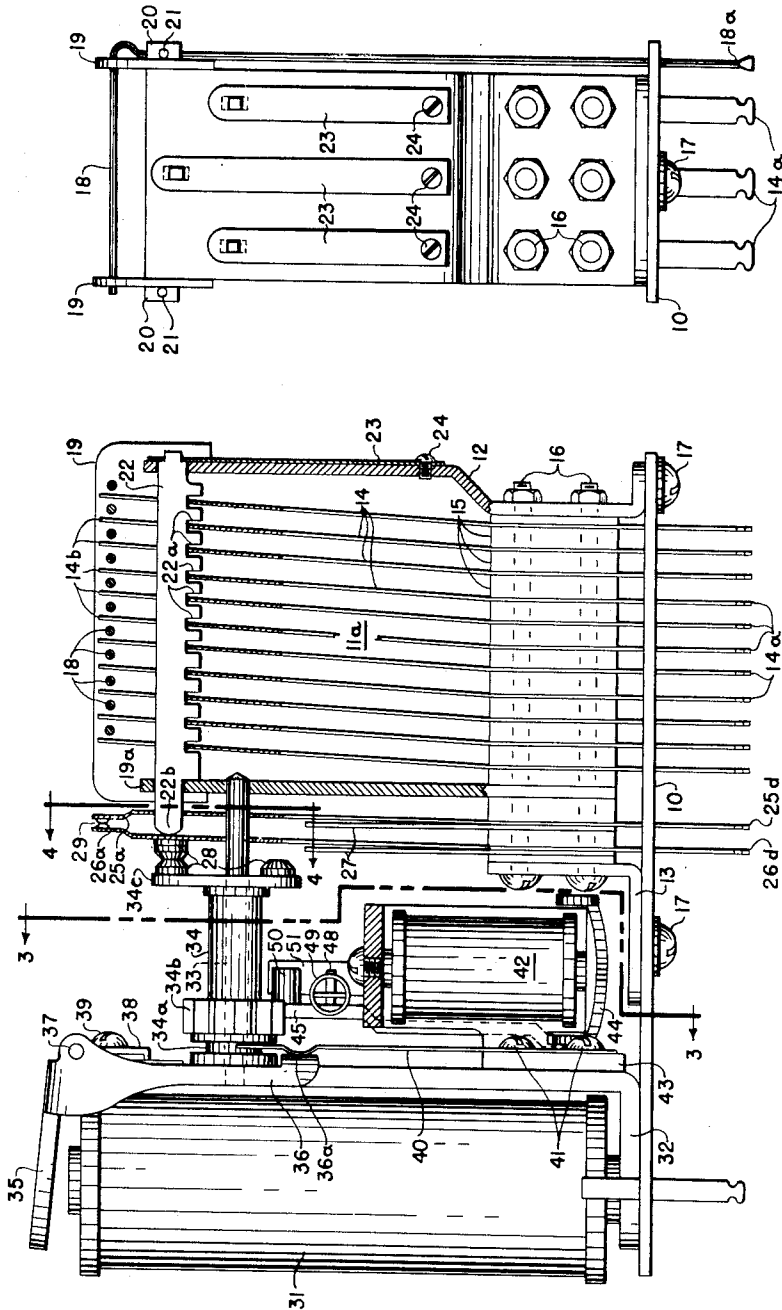


FIG. 2

FIG. 1

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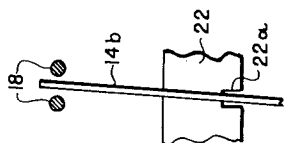
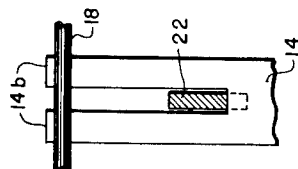
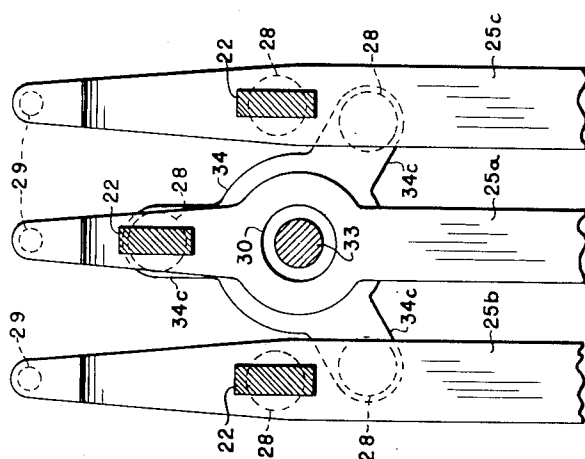
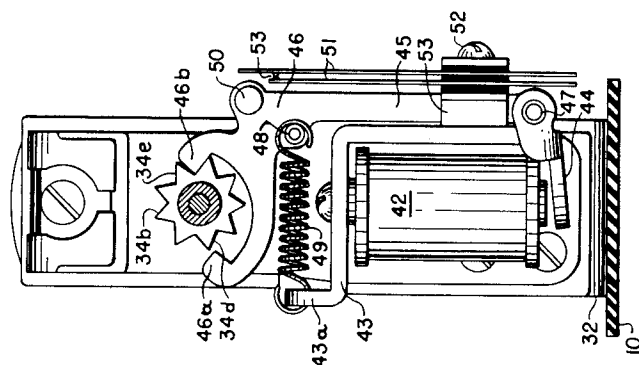
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2 Sheets-Sheet 2



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The Water Cure.

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MULTI-POSITION RELAYS

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Application August 30, 1954, Serial No. 452,749

13 Claims. (Cl. 179—27.52)

This invention relates generally to electromagnetic switching mechanisms and more particularly to improvements in multiple position relays having contacts capable of simultaneous operation, the relays being adaptable for employment in automatic telephone systems.

It is sometimes advantageous in automatic telephone systems to switch an entire group of conductors after selecting the group to be switched from among several of such groups. Various applications of a switching device to accomplish this selection and switching operation will present themselves to anyone skilled in the art. It is accordingly a principal object of this invention to provide a new and novel mechanism capable of operating any one of a plurality of contact spring sets by means of a single operating armature and magnet to switch one of a plurality of groups of conductors.

In accordance with the preceding object, it is another object of this invention to provide a new and novel means for selecting a predetermined one of the plurality of contact spring sets preparatory to the operation of the selected spring set by the single operating armature.

Another object of the present invention is the provision of a novel means for effecting the operation of any one of a plurality of contact spring sets by means of a single operating magnet and armature means comprising a multi-position element interposed between the armature of the single operating magnet and the plurality of contact spring sets.

A further object of this invention is the provision of means for testing the condition of the circuits associated with the springs of each of the contact spring sets preparatory to the operation of the selected spring set by the single operating magnet and armature means.

These objects are attained in the present invention by the arrangement of a rotor element, having a plurality of radially extending fingers, with a plurality of contact spring sets. The spring sets feature a novel serrated operating bar, or comb, to assure the simultaneous operation of the springs of a spring set. Longitudinal extensions of the operating combs are so placed that the fingers of the rotor element may be successively positioned opposite these extensions as the rotor is rotated. Thus when the spring set to be operated has been selected, one of the fingers will be positioned opposite the extension of the operating comb associated with the spring set selected and a subsequent longitudinal movement of the rotor element will cause the springs to be operated. Since at this point in the rotation of the rotor element none of the other radial fingers find themselves opposite a comb extension only the selected spring set will be operated. A single operating magnet is employed to impart longitudinal movement to the rotor element by means of its armature operating through a clutch arrangement which is another novel feature of this invention.

Rotary motion is given to the rotor element of the preferred embodiment of the invention by a pawl and ratchet mechanism powered by a magnet, but it is to be

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noted that any means well-known in the art may be used to effect this rotary motion. As each radially extending finger in its rotation passes a comb extension, test springs are operated to test the condition of the circuits associated with the contact spring sets. Since the test springs are included in circuits which although not a part of this invention, control the energizing circuit of the rotary driving magnet, the rotation of the rotor element can be arrested and therefore the radial fingers positioned opposite any one of the plurality of contact spring sets in accordance with either a busy or idle condition of the associated conductor circuits as may be desired in any particular application.

Further objects and features of the invention are concerned in the main with the details of carrying out the aforesaid objects and accomplishing the manner of operation summarily described above. This invention will be understood best from the detailed description which follows taken in connection with the accompanying drawings of which,

Fig. 1 is a broken side elevation of the mechanism showing the disposition of the individual springs of a single contact spring set with respect to its operating comb and the relative disposition of the operating magnet, rotor element, test springs of the single spring set shown, and the operating comb,

Fig. 2 is a view of the mechanism taken from the right of Fig. 1 showing the operating comb retaining details and the arrangement of common wire contact members,

Fig. 3 is a section view taken along the line 3—3 of Fig. 1 and looking in the direction of the arrows showing the pawl and ratchet mechanism associated with the rotor element,

Fig. 4 is a sectional end view taken along the line 4—4 of Fig. 1 and looking in the direction of the arrows showing only the operational relationship of the rotor fingers, the operating combs and the testing springs, and

Figs. 5a and 5b are partial end views showing the details of the contacting surfaces of a single contact spring, common wire contact member, and a portion of an operating comb.

Referring now more particularly to the figures of the drawings it will be noted that all of the components of the invention are positioned with respect to an insulating base plate 10. To facilitate maintenance and replacement the components have been so designed that the operating mechanisms may be removed without disturbing the contacting or switching unit and for purposes of description these components may be designated as the mechanical section and the contacting section. The sectional side elevation of Figure 1 shows clearly the relation of the two sections so designated. A plurality of contact spring sets 11, one of which, 11a, is shown in Figure 1, is secured to the insulation base plate 10 at one end by a framework 12 extending substantially the height of the spring set and at the other end by a framework 13 extending only partially the height of the spring set. The individual contact springs 14 are spaced and separated by insulating elements 15 and are securely held within the framework 12 and 13 by clamping means 16. The framework 12 and 13 may be rigidly mounted on the insulating base plate 10 in any manner well-known in the art such as by means of screws 17. The contact springs 14 of each of the spring sets 11a, b and c are provided at one end with terminals 14a extending through the insulating base plate 10 and at the other end with a bifurcated contacting surface 14b, more clearly shown in Figure 5. The contact springs 14 are adapted to contact transversely arranged wire contact members 18, each of the corresponding contact springs 14 of the plurality of contact spring sets 11a, b and c being associated with a corresponding common

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one of the wire contact members 18. The members 18 are supported on either side by parallel insulating side rails 19 shown in Figures 1 and 2, through which they extend. At one of the side rails 19 the wire members 18 are turned at right angles thereupon extending downward through the insulated base plate 10 to form the terminals 18a, which, together with the terminals 14a complete the conductor circuit terminals. The insulating side rails 19 in turn are secured at one end to the framework 12 and at the other end to a third framework 19a which extends substantially to the height of the framework 12 and is secured in a rigid relationship with the other supporting members by means of the clamping means 16. The side rails 19 may be mounted as shown in Figure 2 by means of outwardly extending lugs 20 on the framework 12 and 19a, the insulating side rails 19 being slotted to receive the lugs 20, the side rails 19 then being held in place by pins 21 passing outside the rails through holes in the lugs 20.

The bifurcation of the contacting end of each of the contact springs 14 is made to serve a two-fold purpose. In the first place, as shown in Figure 5, contact reliability is assured since the bifurcation results in the formation of the twin contacts 14b. Thus the presence of any foreign matter under one contact will not prevent the other from making adequate contact. Incidentally, it will be noted that the individual springs 14 are set at a slight angle with the result that when the contacts 14b are brought into contact with a wire member 18 a slight rubbing action is effected thereby further insuring proper contact.

The bifurcations serve another purpose in providing a channel through which an operating comb 22 is moved longitudinally along its axis to simultaneously move the springs 14. Serrations 22a of the comb 22 engage the springs 14 at the base of the bifurcation. The operating combs 22 are slidably passed at either end through the framework 12 and 19a in which suitable slots for this purpose have been provided. In addition to the tension of the springs 14 a bias is provided by retaining springs 23 which serves to hold the combs 22 in a non-operative position. The retaining springs 23 are slotted to receive a slight extension of one end of each of the operating combs 22 and are secured at one extremity to the framework 12 by any convenient means such as screws 24.

Also included in each of the spring sets 11a, b and c is a pair of test springs 25a, b and c and 26a, b and c, as shown in Figures 1 and 4. The test springs are also spaced and separated by insulating elements such as 15 and securely held by the clamping means 16. Back supports 27 are provided for each of the test springs to limit their movement, the supports also being rigidly held by the clamping means 16. The test springs extend through the insulating base plate 10 forming terminals 25d and 26d for a test circuit not shown. One of each of the pairs of test springs, namely 25a, b and c, is slotted to freely admit an extension 22b of each of the operating combs 22. Each of the remaining test springs, 26a, b and c, has mounted thereon a buffer 28 so positioned as to be in the longitudinal axis of the associated operating comb 22. As is evident from Figure 4, the buffers 28 and the longitudinal axes of the operating combs 22 are circularly disposed about an axis passing through the test springs 25a and 26a. This axis will be more definitely located hereinafter in connection with the description of the mechanical section. The pairs of test springs are so arranged that after complete contact has been made, that is, when, for example, the spring 26a has reached the limit of its travel it will be barely in contact with the extension 22b of the operating comb 22. It will be further noted that the test springs 25a and 26a are enlarged to encompass a circular aperture 30, the purpose for which will also become apparent hereinafter.

The selection of the spring set to be operated is accomplished and the selected spring set is operated through the operating comb 22 by means of the mechanical sec-

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tion. This section comprises an operating magnet 31 which is mounted by means of a heelpiece 32 to the insulated base plate 10 in any convenient manner. Extending at right angles therefrom and rigidly mounted to the heelpiece 32 by any suitable means known in the art is a shaft 33, which shaft, passing through the aperture 30 of the test springs 25a and 26a, finds support in the framework 19a of the contacting section to insure a proper alignment of its associated components. A rotor element 34 is mounted rotatably and longitudinally slidable on the shaft 33. As is most clearly shown in Figure 1 the rotor element 34 is divided into three integral sections: annularly slotted section 34a, the ratchet 34b, and the selecting fingers 34c. The functions of each will become apparent from the description following. Each of the fingers 34c is provided with a buffer 28 identical to the buffer 28 mounted on each of the test springs 26a, b and c. The fingers 34c extend radially and at right angles from the rotor element 34 about the axis of the shaft 33 and describe equal angles between themselves. As is evident from Figure 4 the opposing buffers 28 of the radial fingers 34c and the test springs 26a, b and c and the axes of the operating combs 22 are also disposed to lie in an arc about the axis of the shaft 33.

The operating magnet 31 is provided with an armature 35 having a pair of armature levers 36 pivotally mounted on the heelpiece 32 by means of a pivot pin 37, armature yoke 38 and mounting means 39. A bifurcated shifting fork 40 composed of a flat spring is mounted on the heelpiece 32 by mounting means 41 and is adapted to ride in the annular slot 34a as the rotor element 34 is rotated. The armature levers 36 engage the shifting fork 40 at the lugs 36a of the armature levers 36 and the bias of the spring action of the fork 40 maintains the armature 35 in a normal position. The rotor element 34 is also held in a normal longitudinal position by the pressure of the spring action of the shifting fork 40 against the rear wall of the annular slot 34a at the same time being free to rotate.

At this point it should be noted that with the rotor element 34 held in its normal position on the shaft 33 the buffers 28 on the fingers 34c will successively make contact, as the rotor element 34 is rotated, with the buffers 28 on the test springs 26a, b and c thereby successively making and breaking the contacts 29 of the test springs without at the same time moving the operating combs 22. When the test springs 25a, b and c and 26a, b and c are in their normal positions, that is, maintained against their respective supports 27, the buffers 28 of the springs 26a, b and c will lie in the operating arc of the buffers 28 of the fingers 34c.

To rotate the rotor element 34, thereby accomplishing the selective function of this invention, a magnet operated pallet is associated with the ratchet wheel 34b which is an integral part of the rotor element 34. As shown in Figures 1 and 3, a magnet 42 is mounted by means of its heelpiece 43 to the heelpiece 32 of the magnet 31 by mounting means 41. An armature 44 having an armature lever 45 is pivotally mounted on a pivot pin 47 in a manner well known in the art. The armature lever 45 terminates in a pallet 46 having a pair of opposing teeth 46a and 46b alternately engageable with the teeth of the ratchet 34b of the rotor element 34. A restoring tension spring 49 is extended between a post 48 mounted on the pallet 46 and a lug 43a formed by a turn-up extension of the heelpiece 43. The spring 49 maintains the pallet tooth 46b in engagement with the ratchet 34b and restores the armature 44 together with the pallet 46 when the magnet 42 is deenergized after operation. Interrupter springs 51 are provided to control the energizing circuit, not shown, for the magnet 42 and may be mounted on the heelpiece 43 in any convenient manner such as mounting screw 52 and insulated block 53. The springs 51 are operated and the contacts 53 broken when a post 50 mounted on the pallet 46 engages

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one of the springs 51 when the magnet 42 operates the armature lever 45.

In the preferred embodiment of the present invention three contact spring sets 11 each having a pair of test springs 25 and 26 are provided and the rotor element 34 has three radially extending fingers 34c. As will be explained hereinafter the ratchet 34b is provided in this embodiment with nine teeth. It is to be understood, however, that with only a slight modification this invention is applicable to a device having a greater or lesser number of springs sets and the invention is not to be limited to the number of spring sets shown and described.

The relay is operated, that is, one of the plurality of spring sets 11 is made to contact the common wire members 18, after one of the spring sets has been selected for operation. This is accomplished by means of the testing circuits, not shown, associated with the test springs 25 and 26 which control the energizing circuit, also not shown, of the rotating magnet 42. This selecting operation will now be described in greater detail.

The rotor element 34 is initially rotated by the operation of the pallet 46 in cooperation with the ratchet 34b. Beginning with the position of the components as shown in Figure 3, the pallet tooth 46b is held engaged between two adjacent teeth of the ratchet 34b by the spring 49. As the magnet 42 is energized the armature 44 through its lever 45 moves the pallet tooth 46b out of engagement with the ratchet 34b against the tension of the spring 49 and at the same time moves the pallet tooth 46a into engagement with the ratchet 34b. As is evident from Figure 3 there is no space between adjacent teeth of the ratchet 34b immediately opposite the tooth 46a, therefore, as the tooth 46a moves forward it will first engage the surface 34d of the nearest ratchet tooth and as its forward motion continues, the tooth 46a continues to operate on the surface 34d until the ratchet 34b has been brought around to the point where the tooth 46a has been completely seated between a pair of adjacent ratchet teeth. In the embodiment shown in Figure 3 the ratchet 34b has nine teeth and the pallet teeth 46a and 46b have been so arranged that at this point the ratchet 34b and the rotor element 34 have been caused to make a one-eighteenth clockwise rotation.

At this point also the post 50 mounted on the pallet 46 has moved against one of the springs 51 controlling the energizing circuit, not shown, of the magnet 42 and the contacts 53 are opened. As a result magnet 42 is de-energized whereupon the spring 49 restores the armature 44 and its lever arm 45 and pallet 46. However, now there is no space between adjacent teeth of the ratchet 34b immediately opposite the pallet tooth 46b and, as the spring 49 moves to restore the pallet 46, this tooth will operate on the surface 34e of the nearest ratchet tooth to move the ratchet around until the tooth 46b is completely seated in the next succeeding space between adjacent ratchet teeth. The ratchet 34b and the rotor element 34 is thereby caused to make a further one-eighteenth clockwise revolution. Thus one complete operation of the magnet 42 will rotate the rotor element a one-ninth revolution in a clockwise direction as viewed in Figures 3 and 4. Then, assuming the initial position of the rotor element fingers 34c as shown in Figure 4, it is evident that the buffers 28 of one of the fingers 34c and the next succeeding test spring 25b will engage after a single operation and restoration of the magnet resulting in a one-ninth revolution.

Upon the restoration to the normal position of the pallet 46 the post 50 will disengage the interrupter springs 51 and the contacts 53 will again be made thereby again completing the associated energizing circuit for the magnet 42 whereupon the above operation will be repeated unless the operation of the magnet 42 is prevented.

As the rotating fingers 34c of the rotor element 34 successively close the test springs 25 and 26, a control circuit, not shown, controlling the energizing circuit for

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the magnet 42 is alternately closed and opened. Further, such a control circuit may also be controlled by means operated responsive to the condition of the conductor circuits associated with each of the spring sets 11, that is, whether such associated circuits are idle or busy. Thus if the control circuit has been partially prepared by, say, an idle condition of the circuits associated with a spring set, such as the spring set 11a, operation of the particular test springs, such as 25a and 26a shown in Figure 1, by one of the fingers 34c will complete the circuit with the result that the energizing circuit for the magnet 42 will be opened. The rotor element 34 will then be prevented from further rotation and the engaging finger of the fingers 34c will remain in its position opposite the test spring 26 associated with the idle spring set, say 11a of Figure 1, selected, the test spring remaining operated. The relay has now been prepared for its final operation, the actual operating of the spring set selected.

This is accomplished when the magnet 31 is energized. The armature levers 36 are pivoted about the pivot pin 37 in a counterclockwise direction and the levers 36, already held in a normal position by the spring action of the shifting fork 40, exert a counterpressure against the fork 40 by means of the lugs 36a of the levers 36. The shifting fork 40 is caused to move in a clockwise direction about its mounting means 41 and the fork 40 operating in the annular slot 34a of the rotor element 34 causes the rotor element 34 to be moved longitudinally along the shaft 33. The finger of the rotor fingers 34c presently engaging one of the test springs, say, 26a as shown in Figure 1, will also be moved longitudinally and, through the test spring 26a, will cause the operating comb 22 associated with the spring set selected, such as set 11a, to simultaneously operate the individual contact springs 14 against the bias of the comb retaining spring 23.

Upon the de-energization of the magnet 31 the spring action of the shifting fork 40 will restore the armature 35 and by the same action the rotor element 34 will be restored to its normal position on the shaft 33. The action of the retaining spring 23 will restore the operating comb 22 thereby restoring the contact springs 14 to their normal position. The relay will now be ready for another operation; either the same spring set may again be operated or the selecting mechanism may be operated to position one of the fingers 34c into cooperation with another spring set.

While what has been described is considered to be the preferred embodiment of this invention various modifications may be made in the structure and arrangement of the component parts without departing from the true spirit and scope of the invention as defined in the claims which follow.

What is claimed is:

1. A relay having in combination a plurality of contact spring sets, operating means for operating the springs of each of said spring sets, a fixed shaft, rotor means rotatably mounted on said shaft and capable of being moved longitudinally along said shaft, said rotor means having a plurality of outwardly extending fingers adapted for cooperation with said spring operating means to operate the springs of any one of said plurality of contact spring sets as said rotor means is moved longitudinally, means for rotating said rotor means to position one of said fingers into cooperative relation with one of said spring operating means, means for moving said rotor means longitudinally along said shaft including a magnet and an armature, and means for energizing said magnet.

2. In a relay, in combination, a plurality of contact spring sets, each spring set comprising a plurality of pairs of wire contact members and associated contact springs, an operating means for each of said spring sets for simultaneously operating said contact springs, a fixed shaft, rotor means rotatably mounted on said shaft, and capable

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of being moved longitudinally along said shaft, a plurality of fingers rigidly mounted on said rotor means and extending outwardly therefrom, said fingers adapted for cooperation with any one of said spring operating means to simultaneously operate the springs of the associated contact spring set as said rotor means is moved longitudinally along said shaft, pawl and ratchet means associated with said rotor means for rotating said rotor means to position one of said fingers into cooperative relation with one of said spring operating means, and means for moving said rotor means longitudinally along said shaft including a magnet, an armature and means for energizing said magnet.

3. In a relay as claimed in claim 2, said pawl and ratchet means comprising a plurality of ratchet teeth associated with said rotor means, a bifurcated pawl adapted to be operated between two extreme positions, said pawl having a pair of opposing teeth alternately engageable with opposing teeth of said plurality of ratchet teeth as said pawl is operated to thereby rotate said rotor means, magnet means for operating said pawl, and means for alternately energizing and de-energizing said magnet means.

4. A relay having, in combination, a plurality of contact spring sets, a fixed shaft, a rotor rotatably mounted on said shaft and adapted for longitudinal movement, said rotor having a plurality of outwardly extending fingers, said fingers adapted for cooperation with said spring sets as said rotor is rotated, a ratchet wheel rotatably mounted on said shaft and rigidly secured to said rotor, said ratchet wheel provided with an annular slot, an operating pawl associated with said ratchet wheel for rotating said ratchet wheel and said rotor to position one of said fingers into cooperative relation with one of said spring sets, magnet means for operating said pawl, a shifting fork associated with said annular slot of said ratchet wheel for moving said rotor longitudinally along said shaft, said one of said fingers thereby effective to operate the said one of said spring sets, and a second magnet means including an armature and operating arm, said operating arm operating said shifting fork to move said rotor longitudinally as said second magnet is energized and to restore said rotor as said second magnet is de-energized.

5. A relay having, in combination, a plurality of wire contact members, a plurality of bifurcated contact spring sets, the bifurcation of each spring of said spring sets forming a multiple contact, said contacts disposed for cooperation with said wire contact members, each of said members being common to corresponding springs of said plurality of spring sets, an operating comb for each of said spring sets, said comb having a series of teeth and adapted for longitudinal movement within said bifurcations, said teeth arranged to engage said contact springs and operate said springs when said comb is moved in one direction and to restore said springs when said comb is moved in a reverse direction, rotor means pivotally secured and adapted for longitudinal operation, said rotor means having a plurality of fingers arranged to engage any one of said operating combs, means for positioning any one of said fingers into cooperation with any one of said combs, and means including an armature and operating arm for longitudinally operating said rotor means, energization of said magnet causing the said one of said fingers to move the said one of said combs in one direction and de-energization of said magnet causing the said comb to be moved in a reverse direction.

6. In a relay, in combination, a plurality of wire contact members, a plurality of bifurcated contact spring sets, the bifurcation of each spring of said spring sets forming a multiple contact, said contacts disposed for cooperation with said wire contact members, each of said members being common to corresponding springs of said plurality of spring sets, an operating comb for each of said spring sets, said comb having a plurality

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of teeth and adapted to be operated longitudinally within said bifurcations, said teeth arranged to engage said contact springs and operate said springs when said comb is operated, spring means for biasing said comb in an unoperated direction, a fixed shaft, a rotor rotatably and slidably mounted on said shaft, said rotor having a plurality of outwardly extending fingers, said fingers engageable with any one of said operating combs, a ratchet wheel rotatably mounted on said shaft and rigidly secured to said rotor, said ratchet being provided with an annular slot, a bifurcated pawl having a pair of opposing teeth associated with the teeth of said ratchet wheel and arranged to partially rotate said ratchet wheel as said pawl is operated from a normal position and returned, said partial rotation of said ratchet wheel rotating one of said fingers opposite a predetermined one of said operating combs, a first magnet means for operating said pawl, energization of said first magnet operating said pawl from a normal position and de-energization of said first magnet returning said pawl to a normal position, a second magnet means including an armature operating arm, and a shifting fork associated with said annular slot of said ratchet wheel operated by said armature operating arm to slide said rotor along said shaft in one direction thereby causing the said one of said fingers to operate the said predetermined one of said operating combs against the bias of said spring means when said second magnet is energized and to slide said rotor along said shaft in the reverse direction thereby permitting said spring means to restore said operating comb when said second magnet is deenergized.

7. In combination, in a switching mechanism, a plurality of contact operating means, a fixed shaft, a rotor pivotally and slidably mounted on said shaft, said rotor having a plurality of outwardly extending fingers adapted for cooperation with any one of said contact operating means, a ratchet wheel rotatably mounted on said shaft and rigidly secured to said rotor, said ratchet wheel having provided thereon an annularly disposed slot, a bifurcated pawl, means for reciprocating said pawl between two extreme positions, said ratchet wheel rotated by said pawl during said movement from one extreme position to the other to position one of said fingers into a cooperative relation with a predetermined one of said plurality of contact operating means, a shifting fork adapted to engage said annular slot of said ratchet wheel and operable to slide said rotor along said shaft to cause the said one of said fingers to operate the predetermined one of said contact operating means, and means for operating said shifting fork.

8. In a switching mechanism the combination as claimed in claim 7, said means for operating said shifting fork comprising an electromagnet and an armature, said armature having an operating arm operatively associated with said shifting fork, energization of said magnet causing said fork to slide said ratchet wheel and said rotor in one direction and de-energization of said magnet causing said fork to slide said ratchet wheel and said rotor in a reverse direction.

9. A switching mechanism comprising, a plurality of contact spring sets representing circuit groups, an operating means for each of said spring sets, said operating means effective to simultaneously operate the springs of a spring set, a fixed shaft, a rotor rotatably and slidably mounted on said shaft, said rotor having a plurality of outwardly extending fingers, said fingers adapted to be successively positioned into a cooperative relation with each of said spring operating means as said rotor is rotated, testing means associated with each spring set, the testing means of each set operated by said rotor fingers whenever the fingers are positioned in each cooperative relation with the associated set, and magnet means for sliding said rotor along said shaft to cause the said one of said fingers to operate the said spring operating means.

10. A switching mechanism comprising a plurality of contact spring sets representing circuit groups, an operat-

ing means for each of said spring sets, said operating means effective to simultaneously operate the springs of a spring set, a fixed shaft, a rotor slidably mounted on said shaft, said rotor having a plurality of outwardly extending fingers, said fingers adapted for cooperative relation with each of said spring operating means, a pair of test springs associated respectively with each of said contact spring sets said test spring sets operated by said rotor fingers, means for positioning said rotor fingers, said positioning means operated to position one of said fingers into cooperative relation with the spring operating means of a particular spring set and to operate the test spring set associated therewith, and magnet means for sliding said rotor along said shaft to cause the said one of said fingers to operate the said spring operating means.

11. In a switching mechanism, in combination, a plurality of spring sets, each of said spring sets having a plurality of contact springs, an operating comb having teeth simultaneously engaging said contact springs, biasing means for biasing said operating comb in an unoperated position, said comb simultaneously operating said contact springs when operated against the bias of said biasing means, and a pair of test springs; a fixed shaft; a rotor mounted rotatably and longitudinally slidable on said shaft, said rotor having a plurality of outwardly extending fingers, said fingers adapted for engagement with said operating comb; means for positioning one of said fingers opposite one of said operating combs, said test springs operated each time one of said fingers is positioned opposite the said one of said operating combs; and magnet means for sliding said rotor longitudinally along said shaft

to thereby cause the said one of said fingers to operate the said one of said operating combs.

12. In a mechanism as claimed in claim 11, said positioning means comprising a ratchet wheel rotatably mounted on said shaft and rigidly secured to said rotor and a magnet operated pawl adapted to engage said ratchet wheel, a single operation of said pawl from one extreme position to another and return effective to rotate said ratchet wheel and said rotor a partial revolution to thereby move one of said fingers opposite the next succeeding operating comb.

13. Switching means comprising an electromagnet, an armature operated upon energization of said magnet, a plurality of contact spring sets, actuating means individually associated with each of said spring sets for simultaneously operating said springs, means associated with said armature whereby operation of the latter is effective to operate any one of said actuating means, means for positioning said last mentioned means into cooperative relation with a particular one of said actuating means, subsequent operation of said armature effective to cause the said particular one of said actuating means to operate the associated contact springs.

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