April 14, 1942. C. I. BAKER 2,279,811

RELAY

Filed June 19, 1940

FIG. 1

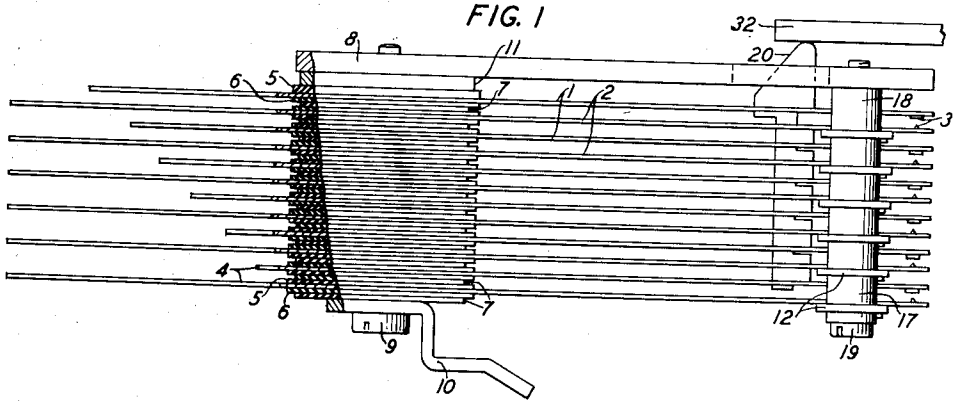


FIG. 3

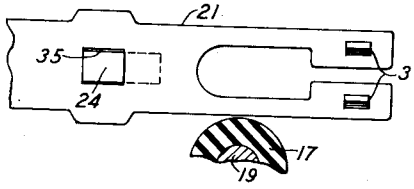


FIG. 2

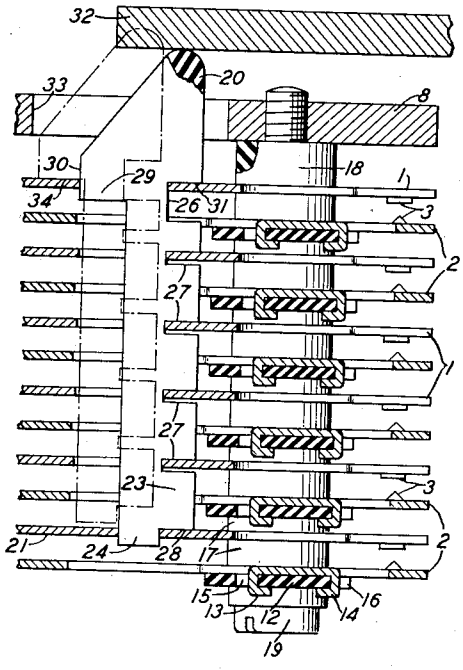


FIG. 4

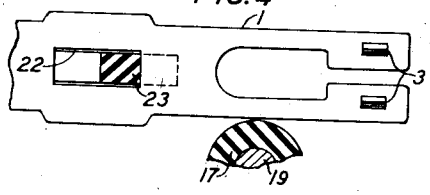
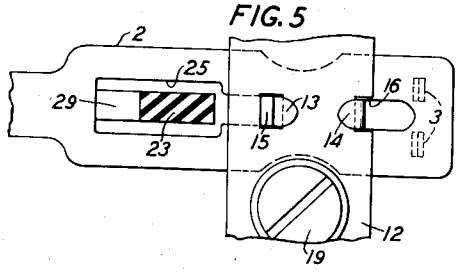


FIG. 5



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UNITED STATES PATENT OFFICE

2,279,811

RELAY

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2 Claims. (Cl. 200—1)

This invention relates to switching devices and more particularly to a type of switching device in which a plurality of contact springs is operable simultaneously under the control of an operating magnet.

It has heretofore been the well-known practice as disclosed for example in Patent 2,169,551, granted to me and others on August 15, 1939, to move the operating springs of a relay into engagement with their mate or stationary springs by studs of insulating material connected to such springs and extending freely through holes in the mate springs, which studs are engageable by the armature of the relay. I am also aware of the fact that notched members of insulating material have been proposed for simultaneously moving a plurality of operating springs of a relay, but no simple means have been devised for securing such members to the operating springs.

It is therefore the object of this invention to provide an operating member for a group of relay springs which is so designed that the member when coupled to the springs operable thereby locks itself in such coupled relationship without the addition of any special locking means.

It is a further object of the invention to simplify the construction of multicontact relays and to thereby reduce their cost of construction.

These objects are attained by providing all of the springs of a spring pile-up with aligned slots extending axially of the springs, the slots in the operating springs being shorter than the slots in the stationary springs. An operating member or strip of insulating material which is insertable through the slots is provided along one edge with notches in which the forward edges of the slots of the operating springs are engageable, is provided at its outer end with a projecting lug which fits into a slot in the outer operating spring of the pile-up and with an enlargement adjacent its inner end for filling the entire slot in the inner operating spring. The member is assembled with the relay armature removed by passing it through a clearance hole in the relay frame plate and then through the aligned slots of the springs to a point where it can be moved laterally to engage its notches with the forward edges of the slots of the operating springs at which time its outer end will pass through the slot in the outer operating spring and the enlarged portion will pass into the slot in the inner operating spring. The member is then securely locked in place in the spring pile-up in engagement with the operating springs but freely movable with respect to the stationary springs.

For a more comprehensive understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 is an end view of the spring pile-up of a relay embodying the invention;

Fig. 2 is an enlarged sectional view of the contact end of the spring pile-up;

Fig. 3 is a partial plan view of the outer operating spring of the pile-up;

Fig. 4 is a partial plan view of one of the other operating springs of the pile-up; and,

Fig. 5 is a partial plan view of one of the stationary springs of the pile-up.

For convenience of illustration, the invention has been disclosed in connection with a multicontact relay of the type covered by Patent 2,169,551 hereinbefore referred to, but it will be obvious that the invention is equally applicable to other types of relays which have a plurality of springs in the spring pile-up thereof. To simplify the drawing only the spring pile-up of a relay has been disclosed together with a portion of an associated armature.

The spring pile-up comprises a plurality of layers of movable or operating springs 1 and 21 and a plurality of layers of mate or stationary springs 2. Each spring is provided at one end with a pair of contacts 3 and terminates at the other end in a soldering terminal 4. Each layer of springs is positioned between two strips 5 and 6 of insulating material which extend transversely across the springs near their terminal ends, each spring being attached to the associated strip 6 by a pair of lugs (not shown) struck up therefrom. Interposed between adjacent strips 5 and 6 are metal separator strips 7. The entire pile-up is secured to the rear edge of supporting plate 8 by screws 9 which pass through aligned poles in the clamping plate 10 and strips 5, 6 and 7, through holes in the separator strip 11 and into threaded holes in the plate 8. Since the screws are positioned intermediate the springs of the layers, they are effectively insulated from the springs by the insulating strips 5 and 6.

The springs 2 of each layer of stationary springs are clamped adjacent their contact ends to a transversely extending strip 12 of insulating material by pairs of lugs 13 and 14 struck up from the springs, the lugs 13 extending through holes 15 in the strip and the lugs 14 extending through notches 16 in one edge of the strip and then bent over toward each other on the strip as best disclosed in Fig. 5. The strips 12 of the several layers of stationary springs are held in

fixed relationship to each other and to the plate 8 by spacing washers 17 and 18 and are secured in an assembled position on the plate 8 by screws 19 which extend through holes in the strips 12 and through the spacing washers into threaded holes in the plate 8. The layers of stationary springs are thus rigidly supported near each end from the plate 8. The contact end of each operating spring 1 and 21 is bifurcated as disclosed in Figs. 3 and 4 and each section of such bifurcated end carries a contact 3 for engagement with one of the contacts carried on the adjacent face of the stationary spring 2 which mates with it.

For moving the operating springs 1 and 21 of each aligned row of the spring pile-up into engagement with the mate or stationary springs 2 of the same row, a member or strip 20 of insulating material is provided which is insertable through aligned axially extending slots in the operating and stationary springs. The slots 22 in all of the operating springs 1 with the exception of the outermost operating spring 21 are, as disclosed in Fig. 4, of sufficient width and length to just permit the insertion of the shank portion 23 of the member 20 therethrough whereas the slot 35 in the outermost operating spring 21 is of such size as to just admit the lug 24 formed on the outer end of the member 20. The slots 25 in all of the stationary springs 2 are, as disclosed in Fig. 5, of a greater width than the thickness of the shank 23 of the member 20 and of greater length than the over-all width of the member so that when the shank 23 of the member has been inserted therethrough and moved to the assembled position shown in Figs. 2 and 5, the shank 23 of the member may move freely without engagement with any one of the stationary springs 2.

The member 20 is provided with notches 26 and 27 in one edge thereof in which the operating springs 1 are engaged when the member is in its assembled position as disclosed in Fig. 2, the outermost operating spring 21 being at that time engaged against the shoulder 28 formed by the lug 24 on the outer end of the member. The innermost end of the member is provided with an enlarged portion 29 which is of just sufficient width from its outer edge 30 to the base of the notch 26 to fill the slot 22 in the innermost operating spring 1. As shown in the assembled position by the full lines of Fig. 2, the shoulder 31 of the notch 26 is engaged against the face of the innermost operating spring 1, the shoulders of the intermediate notches 27 are engaged against the faces of the intermediate operating springs 1 and the shoulder 28 is engaged against the face of the outermost operating spring 21. Thus when the armature 32, only that portion of which that engages the inner end of member 20 being disclosed, is operated, the member is moved downwardly as viewed in Figs. 1 and 2 thereby moving all of the operating springs to engage their contacts with the contacts of the stationary springs 2.

To assemble the member 20 in the row of contact springs the armature 32 is removed and the member is first inserted through the slot 33 in the plate 8 and through the slots in the operating and stationary springs to the position illustrated in dot-dash lines in Fig. 2 at which time the shoulder 34 of the enlarged portion 29 engages the face of the innermost operating spring 1 and the end of lug 24 engages the inner face of the outermost operating spring 21. The member 20 is then further pressed downwardly as viewed in Fig. 2, thereby deflecting the innermost operating spring 1 and the outermost operating spring 21 until the notches 27 of the member are in alignment with the outer ends of the slots 22 of the intermediate operating springs whereupon the member is pressed laterally into the position illustrated in full lines in Fig. 2 with the ends of the slots 22 of all the operating springs 1 seated in the bottoms of the notches 26 and 27 of the member. Since in this position the outer edge 30 of the enlargement 29 of the member is aligned with the inner end of the slot 22 of the innermost operating spring 1, and the lug 24 on the outer end of the member is aligned with the slot 35 of the outermost operating spring 21, these springs now snap back into their normal positions illustrated in Fig. 2. The member 20 is now locked to the operating springs since it cannot move laterally with respect thereto because the enlargement 29 fully fills the slot 22 in the innermost operating spring 1 and the lug 24 fully fills the slot 35 in the outermost operating spring 21 and since it cannot move endwise with respect to the operating springs because of the engagement of the intermediate operating springs 1 in the slots 27.

After all of the members 20 have been assembled in the spring pile-up in the manner previously described, the armature 32 may be assembled in its operating position with its operating face in engagement with the ends of the members.

Should it become necessary to replace one of the members 20 with another member, the armature 32 is first removed and then the innermost operating spring 1 and the outermost operating spring 21 are depressed to such positions that the lug 24 is completely removed from the slot 35 in spring 21 and the face of the innermost operating spring lies below the shoulder 34 of the enlargement 29. The member 20 may then be moved laterally to the left, as viewed in Fig. 2, and then removed lengthwise entirely out of the slots in all the springs of the row with which it is associated. A new member may then be inserted in the manner previously described.

It is to be understood that while the invention has been illustrated in connection with a specific type of relay, it will be obvious that it is equally applicable to other types of relays and that the scope of the invention is to be considered as limited only by the bounds set forth in the appended claims.

What is claimed is:

1. In a switching device having an operating means, a contact spring assembly comprising a plurality of operating springs and a plurality of stationary springs, each of said springs being insulatedly supported adjacent to one end and having an axially extending slot therein adjacent to its free end, and a member of insulating material operable by said operating means and insertable through the aligned slots of said springs, said member having notches in one edge thereof in which the portions of said springs immediately adjacent to the corresponding ends of said slots are seated when said member is moved in said slots in the axial direction of said springs and having integral locking projections on each end thereof completely filling the slots in the outer two operating springs of said assembly for locking itself to said operating springs, the slots in said stationary springs being of such width and length that said member moves freely there-

through when said member is locked to said operating springs.

2. In a switching device having an operating means, a contact spring assembly comprising a plurality of operating springs and a plurality of stationary springs, each of said springs being insulatedly supported adjacent to one end and having an axially extending slot therein adjacent to its free end, and a member of insulating material operable by said operating means and insertable through the aligned slots of said springs, said member having a shank portion provided with notches in one edge thereof in which portions of said springs adjacent to the corresponding ends of said slots are seated when said member is moved in said slots in the axial direction of said springs, having an integral lug projecting from one end thereof which completely fills the slot in one outside operating spring and having an integral enlarged portion adjoining the other end which completely fills the slot in the other outside operating spring whereby said member is locked to said operating springs, the slots in said stationary springs being of such width and length that the shank portion of said member moves freely therethrough when said member is locked to said operating springs.

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