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CONTACT SPRING ASSEMBLY FOR RELAYS

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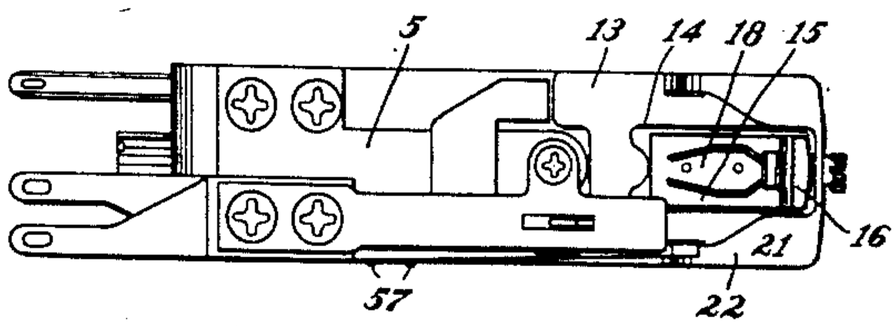

Fig. 1

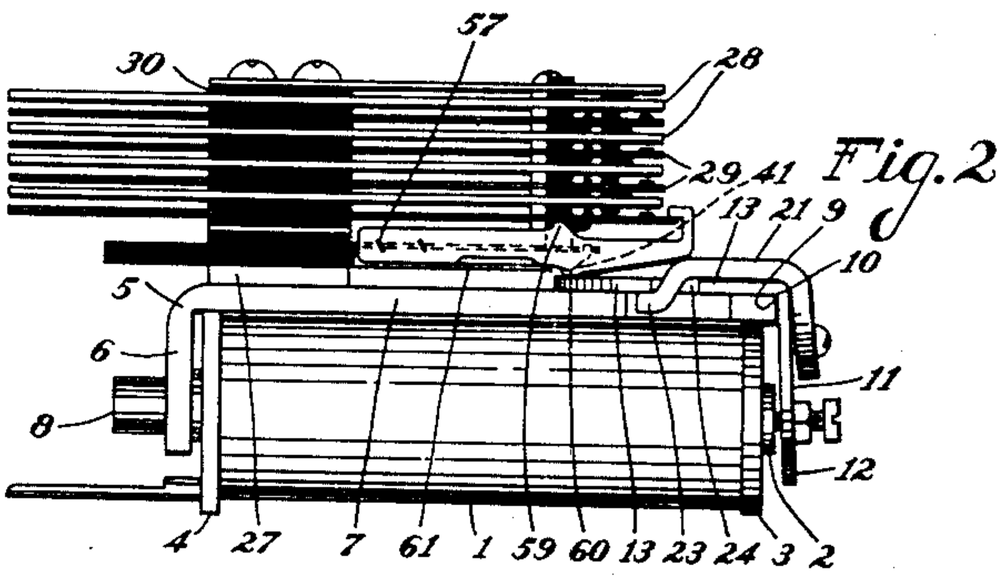

Fig. 2

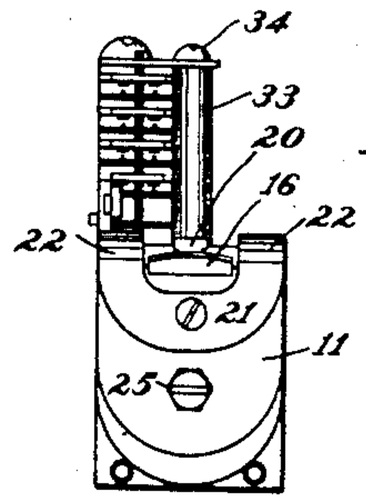

Fig. 3

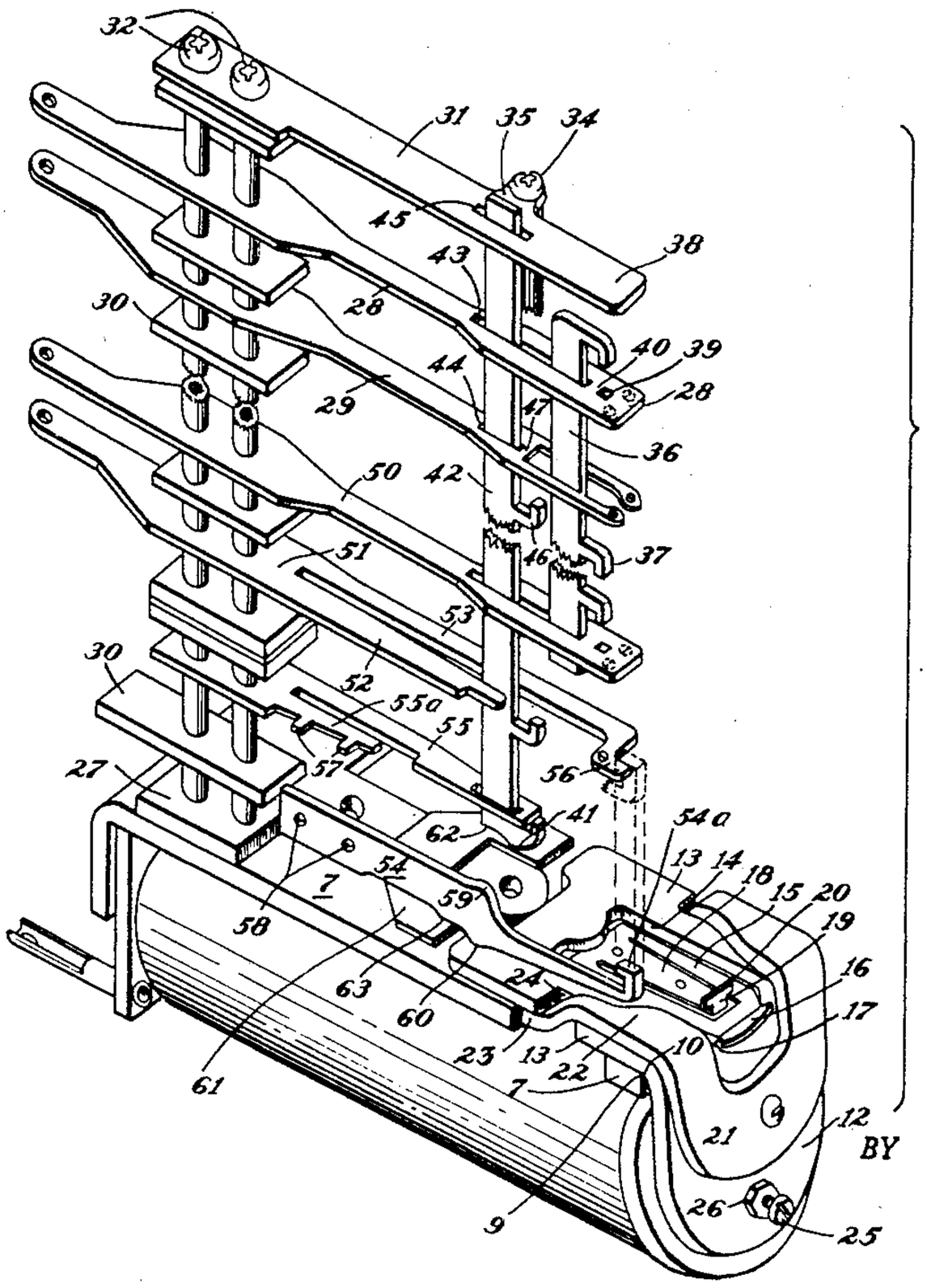

Fig. 4

INVENTOR.
ANDREW W. VINCENT

BY

J. L. Bowers

ATTORNEY

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CONTACT SPRING ASSEMBLY FOR RELAYS

Andrew W. Vincent, Rochester, N. Y., assignor to Stromberg-Carlson Company, a corporation of New York

Original application February 15, 1946, Serial No. 647,890, now Patent No. 2,602,867, dated July 8, 1952. Divided and this application February 1, 1952, Serial No. 270,026

4 Claims. (Cl. 200—1)

1

This is a division of my copending application for United States patent, Serial No. 647,890, filed February 15, 1946, now Patent No. 2,602,867, dated July 8, 1952, and assigned to the same assignee as the present invention.

This invention relates to relays and the like and, more particularly to relays especially adapted for use in telephone systems.

It is an object of my invention to provide a relay which is relatively easy to manufacture, which can be quickly adjusted and which has a high degree of stability in operation.

It is another object of my invention to provide a relay of the type having a spring contact assembly comprising positively spaced, relatively fixed contact springs and positive means for directing the movable spring contacts into circuit closing engagement with the fixed contact springs.

It is a still another object of my invention to provide a relay of the type having a fixed contact spring assembly comprising relatively fixed and relatively movable contact springs and also an auxiliary contact assembly, the relay being so assembled that the first mentioned contact spring assembly imposes no load on the armature until after operation of the auxiliary contact spring assembly, thereby providing a relay of rapid and positive action.

Another object of my invention is to provide a relay comprising a spring contact assembly including one or more fixed contact springs and one or more movable contact springs, the movable contact springs being biased in one direction and also having means associated with the movable contact spring or springs for normally restraining movement of the movable springs until the armature operates to release the restraining force.

It is a further object of my invention to provide a spring contact assembly which imposes no load on the armature until energization thereof and which imposes no loading other than a normal bias on the movable portion of the contact assembly after the assembly is operated by movement of the armature even though the armature remains operated.

Other objects and advantages will become apparent as the following description proceeds. For a better understanding of my invention reference may be made to the following description and to the accompanying drawing in which Fig. 1 is a plan view of a relay embodying the principles of my invention; Fig. 2 is a side elevation of the relay shown in Fig. 1; Fig. 3 is a right-hand view of the relay shown in Figs. 1 and 2; and

2

Fig. 4, is a fragmentary, exploded, perspective view of the relay shown in the other figures of the drawing.

In the drawing, there is shown a relay embodying the principles of my invention including an energizing coil 1 which is removably secured on a suitable core 2 of magnetic material. The coil 1 may be wound on a spool of insulating material of which only the end plates 3 and 4 are visible or it may be wound directly on the core 2 in which case the insulating plates 3 and 4 may be mounted directly on the core in order to position the coil. There is provided an L-shaped frame 5 of magnetic material having a short portion 6 mounted on the left end of the core as viewed in Fig. 2 and having its long portion 7 extending longitudinally of the coil 1 and being substantially equal in length to the core and also extending in spaced parallel relationship to the right end thereof. The frame may be mounted on the core in any suitable manner as, for example, by a threaded member 8. Portion 7 of the frame has its free end machined to provide a corner or bearing 9 on which the inner corner 10 of an angular or folded armature 11 can rock. This armature has a part 12 adapted to move toward and away from the head of core 2 and has a part 13 which extends generally in the direction of part 7 of the frame and approximately at right angles with respect to part 12. As shown in Figs. 1 and 4 the center of the part 13 of the armature is punched out as indicated by the numeral 14 to accommodate armature retaining means. There is welded or otherwise suitably fastened to the end portion 7 of the frame a spring latch 15, preferably of non-magnetic material, extending generally lengthwise of the frame. This latch has a lip 16 that fits over corner 17 of the opening in the armature. This latch resiliently holds the armature on the end of the frame and yet the armature can be readily disengaged from the frame by moving the armature toward the right as viewed in Fig. 2, for example. In order to insure that the spring latch will not be sprung beyond its elastic limit, the latch is provided with a stop comprising strip 18 having one end thereof integral with the latch spring 15 while the remainder of the strip is punched or otherwise separated from the intermediate portion of the latch. The free end of the strip is formed into an upstanding portion 19 having laterally projecting lugs 20 in a position to limit the upward movement of the lip 16. The armature at the opening 14 thereof is so disposed that the edge 17 engaging the lip 16 is in alignment with the

inner corner 10 of the armature. By this construction the corner 9 of the frame portion 7 which contacts the inner corner 10 of the armature and the position of the latch 16 of the retaining latch 15 which engages the corner 17 of the armature are in alignment so that the armature rocks on a line bearing.

It is frequently desirable to adjust the air gap of the armature and for this purpose there is provided a generally U-shaped piece 21 having legs 22 folded to conform generally to the angular shape of the armature. The ends 23 of these legs are bent to extend through or hook into notches 24 in the armature where they engage the underside of the armature portion 13. A screw 25 is threaded into the armature portion 12 so that by loosening or tightening this screw the angularity of the armature and, therefore, the air gap between the armature and the end of the core may be changed at will. Locking means such as the lock nut 26 may be used to retain the screw 25 in the desired position.

The arrangement of the armature and frame and the relation of the parts described above are disclosed and claimed in the above identified copending application.

The armature in the course of its rocking movement changes the relation between certain of the contacts of a contact spring assembly. The contact spring assembly, as illustrated herein, comprises an elongated mounting plate 27 adapted to be secured as by screws to the top portion 7 of the frame. On this mounting plate there is secured a stack of contact spring sets, although it will be understood that my invention is not limited to this arrangement since one or more stacks may be used. Each stack of springs comprises a plurality of relatively fixed or stationary contact springs 28 and relatively movable or armature springs 29. These springs at their left ends as viewed in the drawing are separated from each other and the mounting plate by strips of insulation 30, the strips of insulation and the contact springs being secured to the mounting plate by a suitable clamping plate 31 and suitable fastening members 32 such as bolts having threaded engagement with tapped openings in plate 27. The right hand or free end of the clamping plate 31 is maintained exactly spaced from the relay frame by a spacing sleeve 33, a bolt 34 passing through an opening in a lug or projection of the mounting plate 31 and the sleeve 33 into threaded engagement with suitable openings in portion 7 of the frame, thereby securing the several parts in position.

It is important that the stationary springs maintain a predetermined space relationship therebetween and that all of the armature or movable springs have a like motion so that uniform contact pressures can be maintained at the various springs of the stack. There is provided for this purpose an insulated spring stop 36 preferably made of a strip of insulating material, such as a phenolic material, and provided with parts having predetermined spacing therebetween, such as a series of downwardly directed hooks 37, one hook or part being provided for each stationary contact spring. The stop strip 36 extends through vertically aligned openings 43 through all the springs of the stack and its upper end engages an extension 38 of the clamping plate 31, this extension being adapted to be bent upward or downward in the course of adjustment of the relay to locate the free ends of the stationary springs in the desired position. The downwardly directed hooks or portions 37 are adapted to extend into that part of opening 43 indicated by reference numeral 39 and, hence, engage the bridges 40 on the stationary contact springs. Since the upper end of the strip 36 engages the extension 38 of the clamping plate which is positively located by sleeve 33 and fastening means 34, and since the hooks on the strip are a predetermined distance apart, the upward or downward adjustment of the extension on the clamping plate causes a corresponding movement of the stationary contact springs, and the space in between these springs will always be maintained uniformly. The armature or movable springs 29 partake of the rocking movement of the free end of the portion of the armature through engagement of portion 13 of the armature and the rounded portion 41 at the bottom end of a pusher or operating member 42 which extends upwardly through vertically aligned openings in the various spring contact members such as the openings 43 in the fixed springs and openings 44 in the movable springs. The pusher 42 is likewise insulated and is preferably made of a strip of insulated material such as a suitable phenolic. The upper end of the pusher member 42 extends through an opening 45 in the clamping plate 31. This strip or member 41 is likewise provided with a series of parts having a predetermined spaced relationship such as hooks or portions 46 which extend upwardly in the illustrated form of my invention to engage bridges 47 on the movable springs, thereby serving to move the armature or movable springs upwardly into engagement with the stationary springs when actuated by the armature. In order to restore the pusher 42 to its unoperated position, there is provided a biasing or restoring member 55.

In some applications where relays such as those described herein are employed, it may be desirable to have an auxiliary contact spring set or perhaps a set comprising a plurality of contact spring members to operate before operation of the main contact spring assembly. For example, it may be desired to cut out a finder switch as rapidly as possible after the finding of a calling line in a telephone system.

In the drawing there is illustrated an additional spring assembly and operating mechanism therefor which will accomplish the desired purpose. There is shown a relatively fixed spring 50 which can be identical to the fixed springs 28. There is also provided a relatively movable spring 51 which is preset to provide a bias for the spring contact member into engagement with fixed spring 50. This spring 51 is shown split to provide a short portion 52, the purpose of which will be explained below, and a contact bearing portion 53. In order to permit operation independently of the main stack, cross-piece or bridge 47 is omitted from the spring 51.

Means is provided for normally restraining the movable spring from moving to circuit closing position with respect to spring 50 when the relay is de-energized. For this purpose there is provided an insulated operating member 54, preferably a strip of insulating material such as a suitable phenolic having an extended portion suitably disposed and positioned to engage the contact bearing movable portion 53 of spring 51 in such a way as to counteract the normal bias of the spring. In the illustrated embodiment of my invention this portion terminates in a hook 54*a* which extends beyond the end of

the movable spring portion 53 then upwardly and then rearwardly above an offset portion 56 of the portion 53 as indicated by the dashed lines in Fig. 4.

In order to support the operating member 54 in its operative position the biasing or restoring member 55 for pusher 42 is provided with an arm 55*a* having transversely extended portions or ears 57 arranged to extend through openings 58 in the member 54. The portions 57 may be twisted to secure the member 54. The member 54 is provided on the upper edge thereof a generally rounded portion 59 which in the assembled position of the relay engages the underside of spring portion 52 which exercises a downward restoring pressure against the operating member 54 which operates through the hooked portion 54*a* of the member 54 to restrain the movable spring 51.

In order to remove the restraint and to permit the movement of spring 51 into circuit closing engagement with spring 50, the member 54 is provided on its lower edge with a suitably shaped portion 60 adapted for engagement by the armature in its rocking motion.

Means is provided for preventing loading of the armature by either spring assembly during the de-energized condition of the relay. For this purpose there is provided a suitable portion of the frame such as a stop member 61 secured in suitable fashion to, or constituting an integral portion of the upper surface of the frame 7, and being arranged to engage the pusher 42 as at the relatively flat portion 62 of the operating member 42 and as at the step-like portion 63 of member 54 in the de-energized position of the relay. As best seen in Fig. 2, the stop member 61 is elevated in the vertical direction with respect to the portion 14 of the armature. Furthermore, the rounded portion 60 of operating member 54 extends below the similarly rounded portion 41 of the pusher 42. Accordingly, during energization of the relay, the armature first engages the operating member 54 to permit engagement between springs 50 and 51, later in the travel of the armature the hooked portion of the operating member is elevated beyond engagement with the spring portion 53 thereby relieving all load on the auxiliary contacts except that created by the bias of the spring portion 53, and still later in point of time, the armature portion 13 engages the portion 41 of the pusher to cause operation of the main contact spring assembly. Upon de-energization of the relay, the bias, if any, of the movable springs and the bias of restoring member 55 causes restoration of the main assembly while bias of arm 52 causes restoration of the auxiliary assembly.

While I have shown and described a particular embodiment of my invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention in its broader aspects. For example, the operating member 54 is supported on a relatively resilient arm 55*a* so that the assembly acts as a hinge and a non-flexible beam. The same operation may be secured by using an operating member suitably pivoted to a non-resilient member. The insulating members 36, 42 and 54 need not be of solid insulation. Moreover, the principles of my invention are equally applicable to a one-step relay in which one set of contact springs operates before the other set and to a two-step or differential relay in which the armature moves sufficiently to actuate one set of spring

contacts in one condition and goes on to actuate the second set of contacts in a second condition. I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

The combination of a magnetically operated switch having two switch assemblies, one operable before the other, is described and claimed in the application of which this application is a division.

What I claim is:

1. In a relay, a contact spring assembly comprising sets of relatively fixed and movable interleaved contact springs, each spring having an opening, said openings being aligned with respect to each other, each fixed spring having a bridge across the opening therein, an insulated spacing member extending through said openings and having off-set portions in engagement with said bridges for spacing said fixed springs, each movable spring having a bridge across the opening therein, and an insulated operating member extending through said openings and having off-set portions in engagement with the last-mentioned bridge for moving said movable springs.

2. In a relay, a contact spring assembly comprising sets of relatively fixed and movable interleaved contact springs, each spring having an opening, said openings being aligned with respect to each other, each fixed spring having a bridge extending across the opening therein, an insulated spacing member extending through said openings and having off-set portions in engagement with said bridges for spacing said fixed springs, each movable spring having a bridge across the opening therein, an insulated operating member extending through said openings and having off-set portions in engagement with the last-mentioned bridges for moving said movable springs toward said fixed springs, and means positioned at one extremity of said spring assembly and having engagement with said spacing member to determine the positions of said fixed springs with respect to said movable springs.

3. In a relay, a contact spring assembly comprising sets of relatively fixed and movable interleaved contact springs, each spring having an opening, said openings being aligned with respect to each other, each fixed spring having a bridge extending across the opening therein, an insulated spacing member extending through said openings and having off-set portions in engagement with said bridges for spacing said fixed springs, each movable spring having a bridge across the opening therein, an insulated operating member extending through said openings and having off-set portions in engagement with the last-mentioned bridges for moving said movable springs toward said fixed springs, and means positioned at one extremity of said spring assembly and having engagement with said spacing member to determine the positions of said fixed springs with respect to said movable springs, said determining means being arranged for adjustment in a direction toward and away from said spacing means whereby adjustment of said unoperated position of said fixed springs with respect to said movable springs is provided.

4. In a relay, a contact spring assembly comprising sets of relatively fixed and movable interleaved contact springs, each spring having an opening, said openings being aligned with respect to each other, each fixed spring having a bridge extending across the opening therein, an insulated spacing member extending through said openings and having off-set portions in engage-

ment with said bridges for spacing said fixed springs, each movable spring having a bridge across the opening therein, an insulated operating member extending through said openings and having off-set portions in engagement with the last-mentioned bridges for moving said movable springs toward said fixed springs, a clamping plate at one extremity of said spring assembly, said clamping plate having a portion engaging said insulating spacing member, said plate cooperating with said spacing member to determine the unoperated positions of said fixed springs with respect to said movable springs, said portion of said plate being deformable toward or away from said spacing member whereby adjustment of said unoperated position of said fixed springs with

respect to said movable springs without disassembly of said spring assembly is provided.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,077,091	Brander	Apr. 13, 1937
2,279,811	Baker	Apr. 14, 1942
2,282,687	Vigren et al.	May 12, 1942
2,606,958	Saunders et al.	Aug. 12, 1952

FOREIGN PATENTS

Number	Country	Date
62,914	Norway	Oct. 7, 1940
246,823	Switzerland	Oct. 16, 1947