March 24, 1953 J. E. OSTLINE 2,632,814

COMBINATION MULTICONTACT RELAY AND TERMINAL ASSEMBLY

Filed July 14, 1949 2 SHEETS—SHEET 1

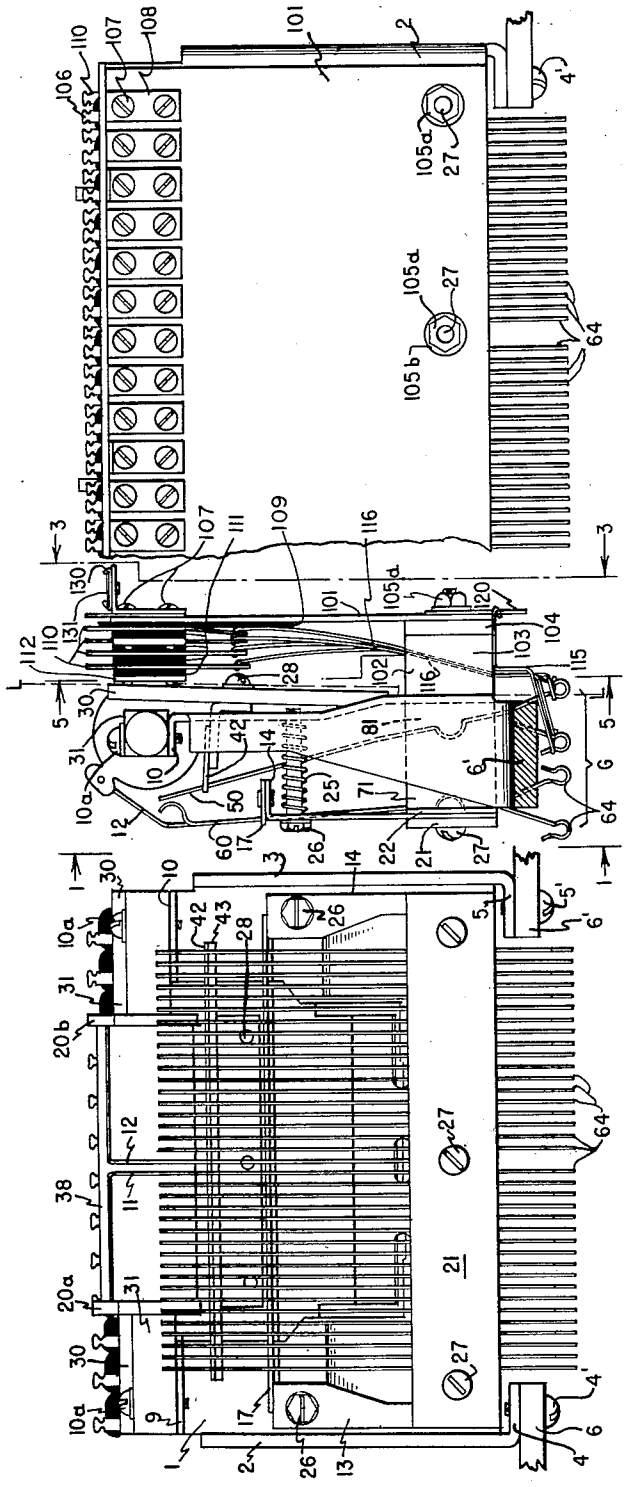


FIG. 3

FIG. 2

FIG. 1

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FIG. 4

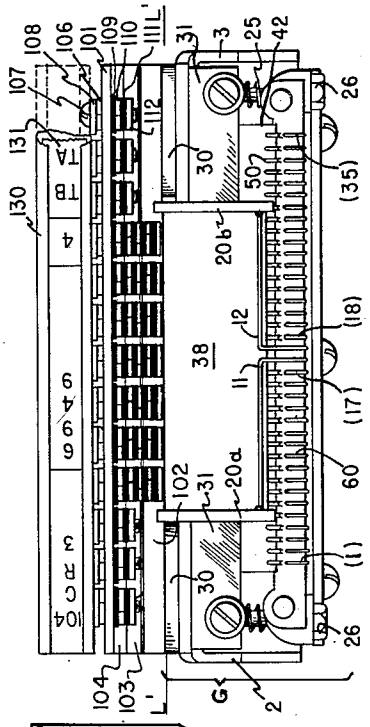


FIG. 5

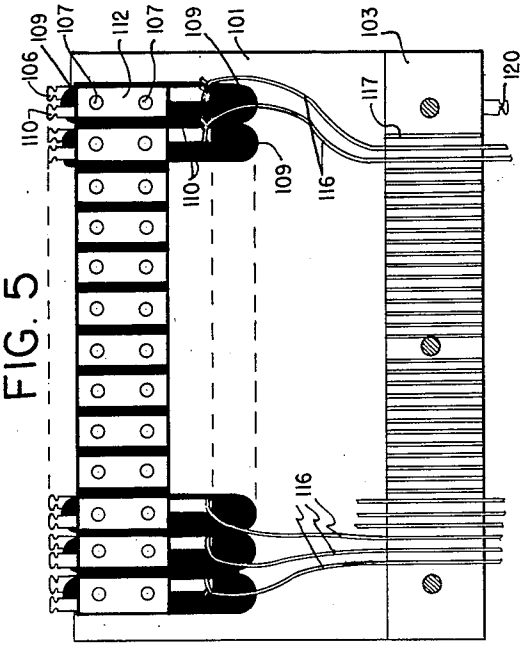
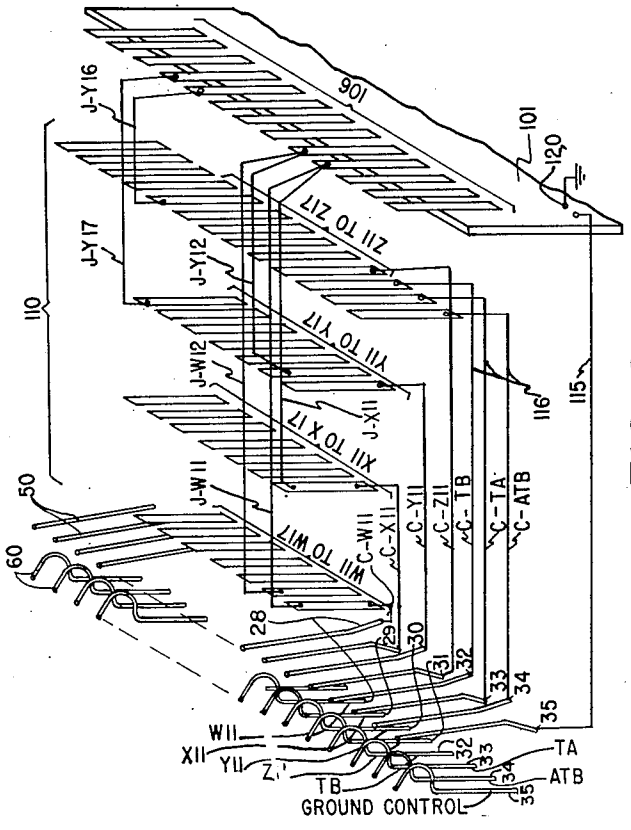


FIG. 6



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COMBINATION MULTICONTACT RELAY AND TERMINAL ASSEMBLY

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Application July 14, 1949, Serial No. 104,696

9 Claims. (Cl. 179—98)

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The present invention relates generally to multicontact devices and, more particularly, to improvements in a multicontact switching device which is capable of simultaneously controlling a relatively large number of electrical circuits.

In a relay of the above type there are usually provided numerous contact springs arranged in stacks or pairs in side-by-side relation so that the relay armature for actuating these contact springs must be of considerable width. Furthermore, in order to reduce the overall dimensions of the relay structure, the distance between each contact stack or pair of contact springs and the size of the individual contact springs have been reduced to a minimum. In addition to the foregoing, the terminal ends of the contact springs usually extend from the rear of the relay structure and the conductors of the electrical circuits to be controlled by the contact springs of the relay are soldered to such terminals. Due to the closeness of the terminal ends of adjacent contact springs and the fact that the terminal ends of the contact springs are located at the rear of the relay, it is very difficult to solder the external conductors to the contact spring terminals. Furthermore, after the conductors and the contact spring terminals have been soldered, further alterations in the soldered connections are virtually impossible. This objection becomes even more acute in an arrangement wherein a plurality of the multicontact switching devices are mounted on relay strips and the relay strips, in turn, are mounted on the front and rear sides of a relay rack or frame. In the later case, if any alteration is to be made in the soldered connections at the terminal ends of the contact springs, it is necessary to remove the relay strip from the rack and it is also necessary to remove the individual multicontact switching devices from the relay strip. Even after the above steps have been taken, the closeness of the terminal ends of the contact springs on the switching device, and the large mass of conductors included in the relay rack cable makes it very difficult to unsolder and rearrange the various conductors connected to the terminal ends of the contact springs.

Accordingly, it is an object of the present invention to provide a combination multicontact switching mechanism and terminal assembly which will eliminate the above-mentioned difficulties.

Another object of the invention is to provide a multicontact relay mechanism having facilities for readily altering the circuits to be controlled through the contacts of the relay without removing the mechanism from either its relay mounting strip or the relay rack structure.

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It is another object of the invention to provide a combined multicontact relay mechanism and terminal assembly constructed and arranged with the terminal assembly readily accessible from the front of the relay so that circuits to be controlled through the contact springs of the relay mechanism may be selectively determined and wired at the terminal assembly and, if necessary, rewired in any desired manner without removing the combined structure from its mounting.

It is still another object of the invention to provide a unitary structure comprising a combination multicontact switching device and a terminal assembly which is constructed and arranged to utilize a minimum amount of space and which is provided with a jumper field accessible from the front of the structure whereby circuits including the contact springs of the structure may be selectively marked with appropriate marking potentials by interconnecting certain of the terminals in the terminal assembly.

A still further object of the invention is to provide a combined multicontact relay mechanism and terminal assembly which is of simple and economical construction, thoroughly reliable in operation and which may be selectively wired from the front of the mechanism to perform various circuit controlling operations.

Further objects and features of the invention pertain to the particular arrangement of the structural elements of the mechanism whereby the above-outlined and additional features are attained.

The invention both as to its organization and method of operation, together with further objects and advantages thereof will best be understood by reference to the specification taken in connection with the accompanying drawings in which:

Fig. 1 is a side view, taken along the line 1—1 of Fig. 2, of the combined multicontact relay and terminal assembly constructed and arranged in accordance with the present invention;

Fig. 2 is a right end view of the device shown in Fig. 1;

Fig. 3 is the partial side view, taken along line 3—3 of Fig. 2;

Fig. 4 is a front or top view of the device;

Fig. 5 is a sectional view, taken along the line 5—5 of Fig. 2; and

Fig. 6 is an exploded perspective view of the device, wherein certain parts of the structure have

been omitted in order more clearly to diagrammatically illustrate one method of wiring.

Before proceeding with the description of the multicontact relay mechanism, it should be understood that the mechanism may be utilized as a translator relay in a register translator mechanism of the type embodied in a toll ticketing system disclosed in the copending John E. Ostline application Serial No. 75,985, filed February 12, 1949. In the copending application a plurality of multicontact relays are shown on Fig. 14 and are designated R1410, R1420, R1440 etc. These relays have been schematically shown in the copending application in order more clearly to illustrate the manner in which the various circuits may be wired and connected through the contacts of the multicontact relays. In the particular arrangement utilized in the copending application several sets of four WXYZ conductors are soldered to the terminal ends of the contacts of each of the relays and a terminal block (schematically illustrated) is provided for each relay with corresponding terminals whereby ground potential may be jumpered to selected contact springs to mark the several sets of four WXYZ conductors with the ground potential in accordance with the well-known WXYZ code marking. More specifically, the ground potential may be applied to any one of the four WXYZ conductors or to any combination of two of the four WXYZ conductors in order to apply markings thereto in accordance with the digits 1 to 9 and 0. Accordingly, it will be understood that in response to the energization of one of the relays a plurality of sets of four WXYZ conductors may simultaneously be marked in code form in accordance with desired digits.

Referring now particularly to Figs. 2 and 4 of the drawings, the disclosed multicontact relay G is exactly the same as the multicontact relay disclosed and described in the copending Kenneth W. Graybill application Serial No. 683,304, filed July 13, 1946, now Patent No. 2,515,769, granted July 18, 1950. While the improved combined multicontact relay and terminal assembly structure of the present invention has been illustrated in conjunction with the relay structure of the Graybill application, it should be understood, by those skilled in the art, that any multicontact relay structure may be substituted, such, for example, as the multicontact relay illustrated in the Obergfell Patent No. 2,135,832. In other words, the present invention resides in the combination of a multicontact switching mechanism and a terminal assembly constructed and arranged as a single unit. The unitary structure of the present invention may be mounted and wired in place on a supporting frame with the terminal assembly readily accessible in order to provide facilities for altering the circuits controlled by the mechanism by merely changing the jumpers at the terminal assembly.

In order more clearly to illustrate and describe the unitary structure of the present invention, the Graybill relay mechanism is designated G and is shown to the left of the line L—L in Fig. 2 and below the line L'—L' in Fig. 4.

Referring now to Figs. 1, 2 and 4 a brief description will first be given of the multicontact relay portion of the combined structure. The relay structure is provided with a U-shaped supporting frame 1 for supporting all of the remaining parts of the combined structure. Side plates 2 and 3 are formed integrally with the supporting frame 1 at the left and right-hand sides thereof

and at the lower ends they are turned inwardly at right angles to form mounting lugs 4 and 5 for the structure. The lugs 4 and 5 are provided with threaded holes to receive the mounting screws 4' and 5' whereby the entire structure is mounted on the supporting framework 6 and 6' of a relay rack. At the upper portion of the supporting frame 1, two right angle brackets 9 and 10 are formed in order to provide mounting brackets for supporting the electromagnet of the device.

The electromagnet comprises a coil 38 and a core member 31 which, as is shown in Fig. 1, extends through the coil 38 and is supported upon the brackets 9 and 10 of the frame member 1 by means of a pair of screws 10a. The ends of the wires of the winding of the coil 38 terminate respectively in terminals provided in the spool heads 20a and 20b of the coil 38.

The relay portion of the combined structure is also provided with a U-shaped armature 30 which is pivotally supported at its lower end, in the manner described in detail in the above-mentioned Graybill application and it is spaced apart at its upper free end from the core member 31. Generally stated, the armature 30 is attached to a reed spring which is clamped in place in the contact spring pile-up of the device. The reed spring pivotally supports the armature 30 and is tensioned to maintain the two upper ends of the U-shaped armature away from the core member 31.

In order to complete the circuit for energizing the coil 38, a pair of self-supporting wires 11 and 12 are soldered at the upper ends thereof to the coil terminals formed in the spool heads 20a and 20b and are placed in individual grooves formed in the insulator 71. The wires 11 and 12 are clamped in the grooves between the insulator 71 and the insulator 22. The lower ends of the wires 11 and 12 extend below the lower edge of the insulator 71 and are formed into U-shaped terminals 64. Accordingly, it will be seen that the pair of wires 11 and 12, which are utilized in completing the circuit for energizing the coil 38, are provided with U-shaped terminals at the bottom or rear of the relay structure for soldering the external controlling circuits thereto.

In addition to the foregoing, the multicontact relay portion of the combined structure is provided with two spaced apart rows of thirty-five contact springs 59 and 60. Referring to Figs. 1 and 2 it will be seen that the outer or left-hand row of contact springs 60 are securely clamped between the insulator 71 and the flat insulator 22. Each of the springs 60 extends upwardly therefrom and is formed, at its upper end, to provide a semi-circular shaped contact member. The lower end of the contact springs 60 extend below the insulators 71 and 22 and are provided with a U-shaped terminal end, such as the terminal end 64. Accordingly, it will be seen by referring to Fig. 1 that the seventeen contact springs 60 shown at the left-hand end of the relay and the eighteen contact springs 60 shown at the right-hand end of the relay, constitute the thirty-five stationary contact springs of the relay mechanism.

Directly in alignment with the above-mentioned thirty-five stationary contact springs 60, there is also provided thirty-five cooperating movable contact springs 50, which are more clearly illustrated in Figs. 2 and 4. The movable contact springs 50 are clamped near the lower ends

thereof between the insulators 71 and 81. Each movable contact spring 50 extends upwardly therefrom and is formed at its upper end, to provide a contact, which cooperates with the contact of a stationary spring 60. The lower end of each of the contact springs 50 extends below the insulators 71 and 81 and is provided with a U-shaped terminal end, such as the terminal end 64. The upper ends of the movable contact springs 50 are positioned to engage the semicircular contact portions of the associated stationary contact springs 60 under control of the armature 30.

The actuating member for the thirty-five movable contact springs 50 comprises a comb-shaped insulator 42, a bracket 43 and the armature 30. The comb-shaped insulator 42 is secured to the bracket 43 and the latter, in turn, is secured to the midportion of the armature 30 by means of a plurality of screws 28. The comb-shaped insulator 42 is provided with a plurality of adjacent spaced-apart slots into which the movable contact springs 50 are placed so that they will retain the alignment with their associatated stationary contact springs 60 during actuation of the armature 30.

When an energizing circuit is completed for the coil 38, the armature 30 is attracted, at its upper end, against the core member 31 and since it is pivotally mounted at its lower end, the comb-shaped insulator 42 moves all of the movable contact springs 50 to the left (Fig. 2) into engagement with the associated stationary contact springs 60. This action of the relay structure will complete at least thirty-five individual circuits through the thirty-five separate pairs of contacts 50 and 60. When the energizing circuit for the coil 38 is disconnected, the attracting force of the core member 31 is terminated and the spring biased armature 30 restores to its original position, as seen in Fig. 2, thereby to disengage the movable contact springs 50 from the associated stationary contact springs 60.

In order to adjust the air gap between the upper contact ends of each of the contact springs 50 and 60, an adjustable member is provided for the stationary contact springs 60. The adjustable member includes a comb-shaped insulating member 17 provided with a plurality of spaced-apart slots into which the contact springs 60 are placed so that they are retained in alignment with the cooperating movable contact springs 50. The comb-shaped insulator 17 is secured at opposite ends thereof to a pair of oppositely disposed upwardly extending side members 13 and 14 (Fig. 1). The members 13 and 14 are secured at the lower ends with the contact springs 50 and 60 to the frame member 1, by means of a clamp-ign plate 21 and a plurality of screws 27. The air gap between the contact springs 50 and 60 may be adjusted by moving the side members 13 and 14 to the left or to the right as seen in Fig. 2, by means of the helical spring 25 and the adjusting screws 26. The screws 26 are threaded into the frame member 1 and they may be turned in either direction to adjust the air gap between contact surfaces at the upper ends of the contact springs 50 and 60.

The reference characters and the associated structural elements of the relay mechanism described above correspond respectively to the structure described and illustrated in the previously mentioned copending Graybill application. Consequently, for a complete description of the details of the relay structure, reference may be had to the previously noted Graybill application.

A description will now be given of the terminal assembly and jumper field arrangement which is supported by and mounted as an integral part of the previously described multicontact relay mechanism. The terminal assembly and jumper field arrangement may best be seen by referring to Figs. 2 to 5, inclusive. In Fig. 2, for example, a terminal support member 101 is provided for supporting the terminal assembly on the relay structure. The terminal support member 101 is formed of a rectangularly shaped flat strip of metal provided with three mounting holes at the lower end thereof for securing the support to the supporting frame 1 of the relay mechanism. At the upper end of the terminal support member 101 a plurality of pairs of holes are provided for securing thereto a plurality of terminals. In order to mount the terminal support 101 in a definite spaced relationship with respect to the support frame 1 of the relay mechanism, two insulating strips 102, 103 and a clamping strip 104 are provided. The insulating strips 102 and 103 and the clamping strip 104 are each provided with three mounting holes which correspond respectively to the mounting holes provided in the lower end of the terminal support 101. The above-mentioned parts are threaded onto the three screws 27 and are secured in place by the nuts and washers 105*a* and 105*b*. Consequently, it will be understood that the three screws 27 which secure the plurality of contact springs 50 and 60 in cooperating slots of the insulator strips 71 and 81, also secure the insulator strips 102 and 103, the clamping strip 104 and the terminal support member 101 to the frame 1 of the relay mechanism. The insulators 102 and 103 are provided with a plurality of cooperating slots or grooves which are adapted to receive a corresponding plurality of insulated conductors 116. The conductors 116 are provided to interconnect the terminal ends, such as the terminal ends 64, of the movable contact springs 50 and the lower ends of a corresponding plurality of terminals secured to the upper end of the terminal support member 101. The manner in which the insulator 103 is grooved, as described above, is clearly illustrated in Fig. 5.

The jumper field portion of the terminal assembly comprises a plurality of strapping terminals and a plurality of control terminals secured to the upper end of the terminal support 101. Thirty-four of the strapping terminals are mounted on the left-hand side of the support member 101, as seen in Fig. 2, and on the lower side of the support member 101, as shown in Fig. 4. Thirteen of the control terminals are mounted on the right hand side of the support member 101, as seen in Fig. 2, and on the upper side of the support member 101, as seen in Fig. 4. All of the strapping and control terminals, noted above, are mounted on the support member 101 with one terminal end of each of the terminals positioned at the front end of the mechanism in order to provide a terminal field which is readily accessible at the front of the mechanism for selectively jumpering the terminals in any desired manner. In passing, it should be noted that the disclosed multicontact relay mechanism is provided with seventeen pairs of contact springs at the left-hand end of the relay and eighteen pairs of contact springs at the right-hand end thereof, as seen in Fig. 4 thereby to provide thirty-five sets of make contacts. The thirty-four strapping terminals are

connected respectively to one of the contact springs in each of the thirty-four pairs of contact springs. The thirty fifth pair of contact springs, located at the right hand end of the mechanism (Fig. 1) is connected and arranged so that one of its contacts is directly connected to the grounded terminal 120 secured to the lower portion of the terminal support member 101.

Referring to the right-hand end of the terminal support member 101, it is noted that two screws 107 are provided which extend through a metal clamping strip 108, a single ended control terminal 106, the support member 101, an insulator 109, a double ended strapping terminal 110, an insulator 111 and, finally, are threaded into a metal clamping plate 112. In order to stagger the alignment of the upper terminal ends of the terminals 106 and 110, the terminals have been made with their terminal ends slightly offset with respect to the vertical center line of the terminals. Consequently, it will be understood that the upper portion of the terminal 106 and the upper portion of the terminal 110 are exactly the same configuration. In mounting these terminals, one terminal is reversed with respect to the other terminal in order to align the respective terminals on opposite sides of the center line of the mounting hole therein; as is best illustrated in Fig. 5. The three terminal pile-ups shown at the left and right hand ends of the structure, as seen in Figs. 4 and 5, are identical in that one of the terminals is a grounded control terminal, such as terminal 106, which is not insulated from the support member 101, whereas the other terminal is a strapping terminal, such as the terminal 110 which is electrically insulated from the support frame member 101, the clamping strip 112 and the screws 107.

Referring again to Fig. 4 it is noted that in the central portion of the structure seven additional sub-groups of terminal pile-ups are shown.

Each of these terminal pile-ups comprise two mounting screws 107 which extend through a metal clamping strip 108, a single ended control terminal 106, an insulator 109, four double ended strapping terminals 110, four insulators 111 and, finally, are threaded into a metal clamping strip 112. In all of the terminal pile-ups the insulator 109 is placed between the support member 101 and the first double ended strapping terminal 110 and the remaining double ended strapping terminals 110 are insulated from each other by the insulators 111.

In view of the foregoing it will be seen that thirty-four insulated strapping terminals 110 are provided at the upper end of the support member 101 and that the terminals are divided into seven individual rows of four strapping terminals each, and six additional individual rows of only one strapping terminal each. With this arrangement thirteen rows of terminals are provided and each row is individually provided with a grounded control terminal 106.

The above-mentioned thirty-four insulated strapping terminals 110 are connected respectively to the terminal ends of the thirty-four movable contact springs 50, by means of separate individual insulated conductors 116. The interconnecting conductors 116 are soldered to the terminal ends of the movable contact springs 50 and to the lower terminal ends of the strapping terminals 110. The thirty-fifth movable contact spring 50, shown at the right-hand end of the row of contact springs in Fig. 4, is connected, by means of an insulated conductor 115, to a terminal 120 secured to the lower portion of the support member 101 (Fig. 2).

In order to illustrate the manner in which the individual strapping terminals 110 are connected to the terminal ends of the contact springs 50, only one interconnection will be described in connection with Figs. 1 to 5, inclusive. For example, the conductor 116 is soldered to the terminal end, such as the terminal end 64, of the thirty-fourth movable contact spring 50, that is, the second contact spring from the right-hand end of the structure as seen in Figs. 4 and 5. The conductor 116 is then placed in a groove, such as the groove 117, in the insulator 103 and then soldered to the lower terminal end of the strapping terminal 110, shown at the right-hand end of Fig. 5.

In order to insure complete electrical isolation between the strapping terminals 110 and the support member 101, the insulators 109 extend a considerable distance below the lower end of the strapping terminals 110. This precaution is only necessary between the strapping terminals 110 which are adjacent the support member 101, because the remaining strapping terminals 110 are adequately spaced from each other by means of the separating insulators 111 and also because the upper and lower terminal ends of the terminals 110 are mounted in each row in staggered relation with respect to each other.

With the upper ends of the various terminals 106 and 110 positioned at the front or top of the relay structure in the manner illustrated, the exposed upper terminal ends provide a readily accessible jumper field whereby the various grounded control terminals 106 may be jumpered to the various strapping terminals 110 in the associated rows of strapping terminals or, if necessary, in any row of strapping terminals. In this manner a marking ground potential may be selectively connected to the desired ones of the movable contact springs 50 of the multicontact relay mechanism.

When the electromagnet is operated in response to energization thereof, the armature 30 will be attracted, in the well-known manner, thereby to cause all of the movable contact springs 50 respectively to engage the corresponding stationary contact springs 60, thereby to control external circuits connected to the stationary contact springs.

When a combined multicontact relay and terminal assembly mechanism, constructed and arranged in accordance with the present invention, is mounted on a rack or frame with the front or top of the mechanism exposed, the permanent exchange wiring between the apparatus to be controlled by the mechanism and terminal ends of the stationary contacts 60, are at the rear or the bottom of the mechanism and are normally not accessible to the installer or maintenance man. With the present arrangement the jumper field terminal assembly is positioned at the front or top of the relay and, accordingly, is readily accessible to the installer or maintenance man without removing the mechanism from its supporting structure. Therefore, when alterations are required in the jumpering arrangement on the exposed terminal ends of the jumper field, the alterations can be easily made by unsoldering the jumpers between the grounded control terminals 106 and selected ones of the strapping terminals 110 and by resolder-

ing the jumpers to the various terminals in accordance with any new circuit controlling arrangement.

In order to indicate to the installer or the exchange maintenance man the manner in which the particular jumper field is connected, a designation card support strip 130 may be provided and secured in place at the front of the structure by two or more of the screws 107. A designation card 131 may then be inserted into the designation strip 130 and a description of the jumpering arrangement between the control terminals 106 and the various strapping terminals 110 may be printed thereon for convenience.

Referring now to the schematic diagram illustrated in Fig. 6, a description will be given of one method of wiring the combined multicontact switching device and terminal asembly. The illustrated wiring arrangement is somewhat similar to the wiring arrangement disclosed in Fig. 14 of the previously mentioned Ostline application Serial No. 75,985, filed February 12, 1949. In the above-mentioned Ostline application seven sets of four WXYZ conductors are employed to register a maximum of seven digits in an associated register sender or director. The seven sets of WXYZ conductors are respectively designated WXYZ11 to WXYZ17 inclusive. In addition to the foregoing, the copending Ostline application, noted above, employs several additional control conductors which are designated TA, TB, TC, TD, TE and ATB. Each of the above-mentioned WXYZ conductors and TA, TB, etc. conductors terminate in register relays and in an associated register sender and the respective register relays are operated in accordance with the selective connection of ground potentials to the various conductors noted in accordance with the WXYZ code.

In Fig. 6 the stationary contact springs 60 of the combined multicontact switching device and terminal assembly are partially shown and associated therewith the cooperating movable contacts 50 are also disclosed. These pairs of contacts are respectively numbered 1 to 35, inclusive, and correspond respectively to the contacts shown in Fig. 4. In addition to the above, the 34 strapping terminals 110 are schematically illustrated and have been separated into four rows in accordance with the jumper field terminal assembly arrangement described above in connection with Figs. 1 to 5, inclusive. The left-hand row of seven strapping terminals 110 are also designated respectively, from left to right, W11 to W17, inclusive; the next row of strapping terminals 110 are also designated respectively X11 to X17, inclusive; the third row is designated Y11 to Y17, inclusive; and the seven strapping terminals 110 shown in the middle section of the fourth row of strapping terminals are designated respectively Z11 to Z17, inclusive. The above 28 strapping terminals 110 are in alignment and are physically separated from each other so that each row of four terminals may be selectively connected through the contact springs 60 and 50 to four corresponding external WXYZ conductors terminating in the stationary contact springs 60 upon operation of the device. One set of four external WXYZ11 conductors have been shown and they respectively terminate in the four stationary contact springs 60 which are respectively numbered 28, 29, 30 and 31. The cooperating movable contact springs 50 are respectively connected to the four correspondingly designated strapping terminals by means of four conductors respectively designated C–W11, C–X11, C–Y11 and C–Z11. The above-mentioned conductors interconnecting the contact springs 50 and the strapping terminals 110 correspond to the conductors 115 shown in Figs. 2 and 5. The remaining four stationary contact springs 60 are respectively numbered 32 to 35, inclusive, and they terminate four external conductors extending to the register sender of the copending Ostline application Serial No. 75,985 whereby they terminate in registers or load circuits designated respectively TB, TA, ATB and Ground Control. The associated movable contact springs 50, numbered 32, 33 and 34, are connected to the three left-hand strapping terminals 110 in the fourth row of strapping terminals by means of the conductors C–TB, C–TA and C–ATB. Finally, the movable contact spring 50, numbered 35, is directly connected by means of the conductor 115 to the terminal assembly support member 101.

In the previous description of the combined structure it was pointed out that the support member 101 was grounded at the terminal 120 and that the thirteen control terminals 106 are directly mounted upon the support member 101 so that each of the control terminals is effectively grounded. Consequently, various jumpers may be soldered to the upper ends of the terminals 106 and to the upper ends of any number of selected strapping terminals 110 in order selectively to connect ground potential by way of the selected strapping terminals 110 to corresponding movable contact springs 50.

Referring specifically to the four strapping terminals 110 which have been designated W11 to Z11, inclusive, any one or any two of these strapping terminals may be jumpered to one of the grounded control terminals 106 in accordance with a predetermined WXYZ code whereby any digit from 1 to 9 and 0 may be marked on the associated WXYZ11 conductors extending to the register sender or load circuit. The code employed in the illustrated arrangement is as follows:

Digit	Jumper Grounded Terminal 106 to Strapping Terminal	
1	W11	X11
2	W11	Y11
3	W11	Z11
4	X11	Y11
5	X11	Z11
6	Y11	Z11
7	W11	-------
8	X11	-------
9	Y11	-------
0	Z11	-------

In the present example one of the grounded control terminals 106 is jumpered to the strapping terminal 110 designated W11 by means of the jumper J–W11 and it is also jumpered to the strapping terminal 110 designated X11 by means of the jumper J–X11. Accordingly, the digit 1 is marked in code form on the four strapping terminals 110 which are designated W11 to Z11, inclusive. The next row of strapping terminals 110 designated W12 to Z12, inclusive, are marked in code form by means of the jumpers J–W12 and J–Y12 in accordance with the digit 2.

With the strapping terminals W11 to Z11, inclusive, jumpered to the grounded terminals 106 in the manner described above, the actuation of the armature 30 of the structure to close the associated contact springs 50 and 60, will thereby extend the ground potential applied to the se-

lected strapping terminals W11 and X11 to the associated code marking conductors W11 and X11. In this manner, the digit 1 will be transferred over the code conductors to the register sender and registered therein in associated register relays. From the foregoing it will be appreciated that the strapping terminals 110 terminating the conductors C–TB, C–TA and C–ATB may also be selectively grounded by jumper connections in the manner described above.

It will be appreciated by those skilled in the art that while the illustrated combined multicontact device and terminal assembly has been disclosed with the control terminals 106 directly connected to the grounded support frame 101 so that each of the terminals is grounded, that these terminals may be insulated from the grounded frame member 101 so that the terminals may be connected to different potentials, such as battery potential or an alternating current potential of some particular frequency, in order to mark the external conductors terminating in the contacts of the relays in accordance with such other potentials.

While one embodiment of the invention has been disclosed, it will be understood that various modifications, such, for example, as the modification mentioned above, may be made therein which are within the true spirit and scope of the invention.

What is claimed is:

1. A multicontact relay adapted to be removably supported as a unit upon an associated rack; said unitary relay comprising a plurality of load springs, each of said load springs provided with a load spring terminal, a plurality of line springs, each of said line springs provided with a line spring terminal, a plurality of strapping terminals, a plurality of main line terminals connectible to a source of potential, conductors interconnecting respectively each of said line spring terminals and each of said strapping terminals, a jumper field comprising said strapping terminals and said main line terminals, jumper conductors in said jumper field interconnecting selected ones of said strapping terminals and one of said main line terminals for selectively connecting said source of potential at said one main line terminal to said selected strapping terminals in order to extend said potential to selected line springs corresponding to said selected strapping terminals, and control means for controlling said load springs and said line springs to extend said potential from said selected line springs to corresponding ones of said load springs.

2. A multicontact relay adapted to be removably supported as a unit upon the front of an associated rack; said unitary relay comprising a plurality of pairs of springs, each pair comprising a load spring and a line spring, terminals for said springs disposed at the rear of said relay, a plurality of strapping terminals supported at the front of said relay, conductors interconnecting respectively each of said line spring terminals and each of said strapping terminals, a plurality of control terminals supported at the front of said relay connectible to a source of potential, a strapping field supported at the front of said relay formed by said strapping terminals and said control terminals, strapping means in said field interconnecting selected ones of said strapping terminals and desired ones of said control terminals in order to connect said potential to said selected strapping terminals, and means for simultaneously controlling at least one of the springs of each of said pairs of springs to interconnect associated pairs of springs in order to extend the potential connected to said selected strapping terminals to the corresponding load springs, thereby simultaneously to control electrical circuits connected to said corresponding load spring terminals.

3. A multicontact relay adapted to be removably supported as a unit upon the front of an associated rack; said unitary relay comprising a plurality of pairs of movable springs having contacts formed at the front end thereof and terminals formed at the rear end thereof, a first group and a second group of stationary members, each of said members having a terminal formed at one end thereof, means interconnecting the terminal ends of one of the springs of each of said pairs of springs and said first group of stationary members, said second group of stationary members connectible to a source of potential, a jumper field terminal assembly supported on said unitary relay at the front end thereof formed by the terminal ends of said first and said second groups of stationary members, jumper means in said field interconnecting selected terminals in said first group of terminals with any of said terminals in said second group of terminals, and means including an armature of said relay for controlling said movable springs in order to connect said source of potential as determined by said jumper means to corresponding ones of the other of said terminals of said pairs of springs.

4. A multicontact relay adapted to be removably supported as a unit upon an associated rack; said unitary relay comprising in combination, a plurality of movable contacts, a like plurality of associated stationary contacts, a support for said contacts, means for actuating said movable contacts to individually engage said associated stationary contacts, a terminal block including a first group of terminals mounted on said support, each of said terminals in said first group connected at one end thereof to one end of said movable contacts, a second group of terminals on said terminal block connectible to a source of potential, said terminal block forming a jumper field for selectively connecting jumper wires between the terminals in said second group of terminals and desired ones of the terminals in said first group of terminals selectively to mark the same with said potential, and a magnet for simultaneously controlling said actuating means to connect the potential applied to said marked terminals in said first group of terminals by way of corresponding ones of said movable contacts to the associated ones of said stationary contacts.

5. A multicontact relay adapted to be removably supported as a unit upon an associated rack; said unitary relay including a frame member, a number of pairs of contact springs mounted on said member, an electromagnet mounted on said member, an armature for said electromagnet, said electromagnet being operative to actuate said armature in order to control at least one contact spring of each of said pairs of contact springs, a terminal support mounted on said frame member, strapping terminals carried by said support, said strapping terminals corresponding in number to the number of said pairs of contact springs, means interconnecting respectively each of said strapping terminals with one of the contact springs of each of said pairs of contact springs, a control terminal mounted on said support connectible to a source of potential, and jumper means interconnecting said control terminal and

selected ones of said strapping terminals in order selectively to connect said potential to the one contact spring of each of said pairs of contact springs interconnected with said selected strapping terminals, whereby actuation of said armature in response to operation of said electromagnet connects said potential to the other contact spring of each of said selected pairs of contact springs.

6. A multicontact relay adapted to be removably supported as a unit upon an associated rack; said unitary relay including a supporting frame, a plurality of sets of contact springs mounted on said frame, an electromagnet supported on said frame, an armature for said magnet, said magnet in response to energization thereof being adapted to actuate said armature in order to control said sets of contact springs, a plurality of strapping terminals and a control terminal, a member supporting said terminals at one end thereof and supported by said supporting frame at the other end thereof, connecting means respectively interconnecting each of said strapping terminals and one of the contact springs of each of said sets of contact springs, said control terminal being connectible to a source of potential, and strapping means interconnecting said control terminal and selected ones of said strapping terminals in order to extend said potential to the said one contact spring of each of said sets of contact springs corresponding to said selected strapping terminals, whereby actuation of said armature in response to energization of said magnet controls each of said sets of contacts in order further to extend said potential to the other of the contact springs of each of said selected sets of contact springs.

7. A multicontact relay adapted to be removably supported as a unit upon the front of an associated rack; said unitary relay comprising a support, a plurality of line springs and a corresponding plurality of load springs carried by said support, each of said springs being formed with a fixed terminal end and a free contact end, said terminal and contact ends being respectively disposed toward the rear and the front of said unitary relay, a terminal strip carried by said support, a first group and a second group of terminals carried by said terminal strip, connecting means interconnecting the terminal end of each of said line springs and corresponding terminals in said first group of terminals, each of the terminals in said second group of terminals being connectible to a source of potential, one end of each of the terminals in said first group and said second group of terminals disposed toward the front of said unitary relay in order to provide a jumper field to facilitate selective interconnecting of said first and said second groups of terminals, jumper means in said jumper field interconnecting selected terminals in said first group of terminals and selected terminals in said second group of terminals for selectively connecting said potential to certain of said line springs, and means carried by said support for interconnecting said free contact ends of said springs in order to mark certain of said load springs with said potential applied to said certain line springs.

8. A multicontact relay adapted to be removably supported as a unit upon the front of an associated rack; said unitary relay comprising a mounting frame, a plurality of pairs of contact springs secured to said frame, each of said springs having a movable contact end extending to the front of said unitary relay and a stationary terminal end extending to the rear of said unitary relay, a first group of strapping terminals secured to said frame forming a readily accessible jumper field at the front of said unitary relay, a plurality of conductors interconnecting said strapping terminals in said first group and the terminal ends of one of the contact springs of each of said pair of springs, a second group of strapping terminals secured to said frame and included in said jumper field, said second group of strapping terminals being connectible to a source of potential, jumper conductors in said jumper field interconnecting certain of said strapping terminals in said first group and certain of said strapping terminals in said second group in order selectively to determine the contact springs of said pairs of contact springs to which said potential is to be applied, and means for simultaneously actuating all of said movable contact ends of said contact springs in order to connect said source of potential only to said determined contact springs.

9. A multicontact relay adapted to be removably suported as a unit upon the front of an associated rack; said unitary relay including a frame member, a plurality of pairs of contact springs mounted on said frame member, an electromagnet mounted on said member, an armature for said electromagnet, said electromagnet being operative to actuate said armature in order simultaneously to control each of said pairs of contact springs, a plurality of strapping terminals, means interconnecting respectively one contact spring of each of said pair of contact springs and an individual one of said strapping terminals, a control terminal connectible to a source of potential, means supporting said strapping terminals and said control terminal on said frame member so that a front end of each of said terminals provides a readily accessible terminal field at the front of said unitary relay, and jumper means interconnecting said front end of said control terminal and said front end of selected ones of said strapping terminals in said terminal field in order to connect said potential to said one contact spring of each pair of said contact springs corresponding to said selected strapping terminals, whereby actuation of said armature in response to energization of said electromagnet interconnects each of said pairs of contact springs in order to connect said potential to the associated contact spring of each of said pairs of contact springs corresponding to said selected strapping terminals.

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