Dec. 16, 1958 W. SCHMITZ 2,864,913

RELAY CONTACT ARRANGEMENT AND OPERATION

Filed Feb. 28, 1955

Fig.3

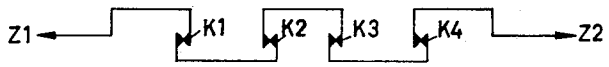


Fig.1

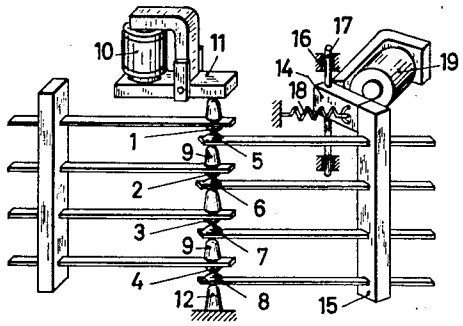
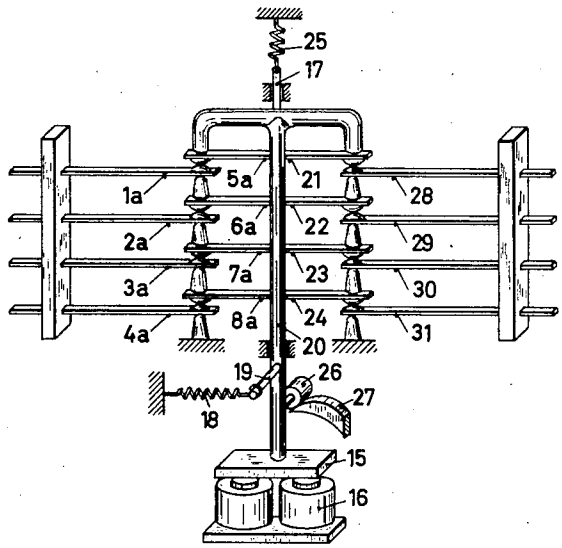


Fig.2



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United States Patent Office 2,864,913
Patented Dec. 16, 1958

2,864,913

RELAY CONTACT ARRANGEMENT AND OPERATION

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Application February 28, 1955, Serial No. 491,093

Claims priority, application Germany April 9, 1954

7 Claims. (Cl. 200—104)

This invention relates to relays, especially for use in railroad signal apparatus, and is particularly concerned with a contact arrangement resulting in improved and more efficient operation of such relays.

The number of simultaneously energized relays, as they are, for example, used in railroad signal apparatus may require considerable energy. Efforts have therefore been made to build relays requiring relatively little current. Relays can be made more efficient by employing small contact spring pressures and by making the operating stroke of contact spring pressures and by making the operating stroke of contact springs as small as possible. Various recently introduced contact materials also give favorable possibilities toward making the operation of relays more efficient. However, limits are nevertheless reached and further efforts at improved efficiency must seek improvements in different directions. Especially troublesome are the normal or break contacts, that is, the contacts which are closed in the deenergized condition of the relays. The required contact pressure must be supplied by spring or weight means and the corresponding force must be exerted over the entire switching path of the make contacts incident to the switching of the relay to energized position.

In accordance with the invention, the energy for producing the required contact pressure may be greatly reduced by arranging the contacts chainlike in mutually supporting series relationship so that the contact pressure is propagated from contact to contact. Insulating members may for this purpose be disposed between the individual contacts forming supports therefor. The opening of the individual contacts may be effected, for example, by first releasing the contact pressure and thereafter removing parts of the contact elements laterally, that is, in a direction perpendicular to the direction in which the contact pressure is exerted.

Examples of the invention will now be described with reference to the accompanying diagrammatic drawings, in which

Fig. 1 shows in schematic manner an embodiment comprising a pair of magnets for respectively supplying the contact pressure and for effecting the relative displacement of certain contact elements.

Fig. 2 illustrates in like manner an embodiment comprising a single magnet for controlling both functions; and

Fig. 3 represents an embodiment in which the contact pressure is produced by exerting on the contacts a pulling force.

The embodiment according to Fig. 1 comprises springs carrying contact points indicated at 1 to 8. The contact points are in closed position disposed in pairs forming respectively coacting contacts. Each contact comprising two contact points is supported relative to the next successive contact by an insulating member such as the member 9 disposed between the contacts having the points ⅛ and ⅞, respectively. The insulating member extending from the spring carrying the contact point 1 is disposed underneath the pressure controlling magnet 10 having a pivoted

armature with an extension which presses in attracted position upon the corresponding insulating member to press the coacting contacts downwardly against a stationary insulating member 12. Upon deenergization of the magnet 10, the pressure on the coacting contacts will be relieved and they will lie loosely in their respective positions. The disconnect control magnet 19 may now be energized to attract its armature 14 so as to rotate the rod 15 about the pivot axis of the shaft 17 journalled at 16, thereby swinging the springs carrying the contact points 5 to 8 laterally outwardly away from the springs carrying the respective ly coacting contact points 1 to 4. Numeral 18 designates a spring for restoring the springs carrying the contact points 5 to 8, upon deenergization of the magnet 19, to their positions for coaction with the contact points 1 to 4.

In the embodiment shown in Fig. 2, there is provided a single magnet 16 having an armature 15 for performing the functions of the magnets 10 and 19 employed in Fig. 1. The parts of the relay of the embodiment Fig. 2 are shown in operated position, the magnet 16 being assumed to be energized. The armature 15 is accordingly attracted. The rod 20 carrying the contact springs 5*a*/21, 6*a*/22, 7*a*/23, 8*a*/24 has been pulled down and the contact points carried by these springs are pressed against their coacting contact points carried by the springs 1*a* to 4*a* and 28 to 31. This pressure is propagated downwardly from contact to contact through the medium of insulating members carried by the intervening springs 6*a*/22, 7*a*/23, 8*a*/24. The contact points are thus held under the requisite pressure throughout their corresponding circuit closing operation. It is understood, of course, that the springs 1*a* to 4*a* and 28 to 31 may be connected by suitable means with desired, respectively associated circuits.

Upon deenergization of the magnet 16, the force of the spring 25 will be effective to raise the rod 20 and with it its contact springs 5*a*/21, 8*a*/24 and the contact pressure between the various contacts is thus immediately relieved. The force of the spring 18 linked to the lever 19 extending from the rod 20 will rotate such rod within its journals including the journal pin 17. The rod 20 carries a small roller 26 and such roller will ride upwardly along a stationary wedge-shaped camming member 27 thus raising the rod 20 and therewith the springs 5*a*/21 . . . 8*a*/24, thus further relieving the pressure on the various contacts. Upon further rotation of the rod 20, the springs 5*a* to 8*a* and 21 to 24 will be rotated laterally outwardly relative to their respectively cooperating springs 1*a* to 5*a* and 28 to 31 to open the circuits controlled thereby.

Energization of the magnet 16 and consequent attraction of the armature 15 exerts a downward pull on the rod 20. The roller 26 rides downwardly along the camming member 27. The rod 20 is thus rotated to insert the springs 5*a*/21 . . . 8*a*/24 again for coaction with the relatively stationary springs 1*a* to 4*a* and 28 to 31.

The arrangement according to Fig. 2 gives the known advantages of a two-pole circuit breaker.

In a structure provided with break contacts, the arrangement may be such that contact points on the springs such as the springs 5*a* to 8*a* and 21 to 24, respectively, face in their laterally retracted position other springs for coaction therewith. The guide roller may thereby cooperate with means in the terminal position thereof, for freeing a spring for actuation.

Instead of swinging certain contact springs laterally relative to stationary contact springs, as described with reference to Figs. 1 and 2, the insulating members shown, such as the members 9 in Fig. 1, may be wedge-shaped and secured on a common actuating member, and the latter may be rotated in the manner in which the springs are rotated in the illustrated examples, so as to move the insulating members relative to associated contact springs

to effect the operation thereof either in closing or opening sense as desired.

In accordance with the invention, the contacts may be arranged arcuately about a fixed axis and different levels may be utilized for contact operation.

The contact springs are either made so thin that substantially no mechanical resistance is produced thereby or they may be provided with links so that they cannot exert individual mechanical resistance responsive to the contact pressure produced thereon.

The invention may also be practiced so as to swing the contacts outwardly while they are under pressure because of the relatively low frictional components that may be considered in certain uses.

The arrangement may also be such that the contact pressure is produced by exerting a pull on the corresponding contacts as is diagrammatically indicated in Fig. 3. The contact pressure of contacts K1 to K4 is produced by arranging the contacts serially along a common axis as in the other embodiments and exerting a pulling force effective in either one or in both directions Z1 and Z2. One of the other of the points Z1 or Z2 may be stationary if the pulling force is applied in only one direction.

Changes may be made within the scope and spirit of the appended claims.

I claim:

1. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, means for applying a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point included in said assembly, and means for laterally displacing said relatively movable springs with respect to said relatively stationary springs in a direction extending perpendicular to the direction of said force.

2. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, first control means for applying a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point in said assembly, and second control means for laterally displacing said relatively movable springs with respect to said relatively stationary springs in a direction extending perpendicular to the direction of said force.

3. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, first electromagnetic control means for applying a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point in said assembly, and second electromagnetic control means for laterally displacing said relatively movable springs with respect to said relatively stationary springs in a direction extending perpendicular to the direction of said force.

4. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, first electromagnetic control means for applying a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point in said assembly, and second means governed by said electromagnetic control means for laterally displacing said relatively movable springs with respect to said relatively stationary springs in a direction extending perpendicular to the direction of said force.

5. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively movable springs and laterally relatively stationary springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, a rotatable and axially movably disposed operating member for mounting said laterally relatively movable springs, electromagnetic control means for axially moving said operating member to apply a force which is operative in the direction of and along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point included in said assembly, and mechanical means effective upon release of said electromagnetic control means for axially moving said operating member in reverse direction and for rotating it to rotate said relatively movable springs so as to move the contact points carried thereby in a direction perpendicular to the direction of said force.

6. A relay having a contact assembly comprising a plurality of circuit-controlling springs including laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively carried by said relatively laterally stationary springs and respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis, means for applying a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point included in said assembly, and means effective after said force is relaxed to move said laterally relatively movable springs so as to displace the contact points carried thereby in a direction perpendicular to the direction of said force.

7. A relay having a contact assembly comprising a plurality of circuit-controlling springs including respectively laterally relatively stationary and laterally relatively movable springs, each spring carrying at least one contact point for electrical contact-making engagement with a similar contact point carried by an adjacent spring, insulating members respectively disposed between springs controlling different circuits, said contact points and said insulating members extending along a common axis,

means for exerting a pull on at least one of said springs, said pull producing a force which is operative in the direction of and applied along said common axis to produce contact pressure which is propagated through said insulating members along said axis from contact point to contact point included in said assembly, and means for laterally displacing said relatively movable springs with respect to said relatively stationary springs in a direction extending perpendicular to the direction of said force.

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