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J. F. EBERT

2,356,836

EQUALIZED DOUBLE CONTACT ARM

Filed Sept. 12, 1942

Fig. 1

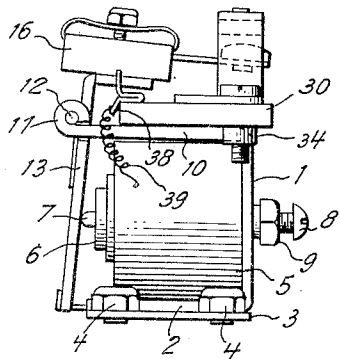


Fig. 2

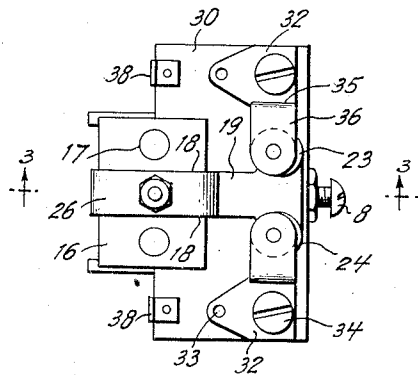


Fig. 3

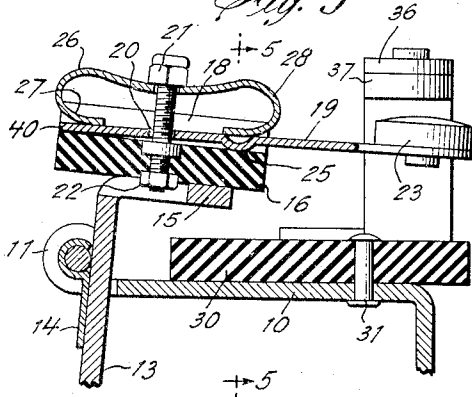


Fig. 4

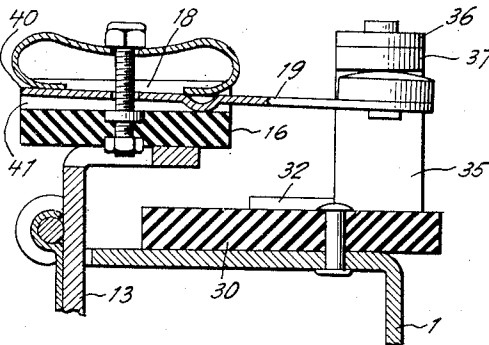


Fig. 5

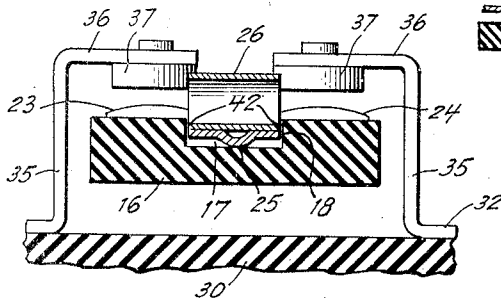
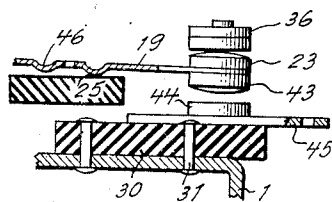


Fig. 6



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EQUALIZED DOUBLE CONTACT ARM

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2 Claims. (Cl. 200—165)

The present invention is directed to relays, more particularly, to such relays wherein a plurality of contact members are caused to move from a single source in order to make simultaneous contacts.

Relays generally include a coil for the setting up of a magnetic field and an armature acted upon by said coil, said armature being moved and carrying one or more contact members which close circuits upon making contact with cooperating members. In some relays the armature carries a plurality of contact members which move simultaneously with the armature and are intended to make contact with the cooperating members simultaneously. However, in order to obtain adequate contact between such cooperating members it is necessary that the movable contact members make such contacts perfectly and at the same time. This, in the past, has proved very difficult since even an extremely slight variation in any one of the factors which make up the relay will prevent adequate electrical contact being made. Such defects may arise either in the fabrication of the individual parts or in the assembly thereof where even a very slight variation may either prevent a contact or make such an imperfect one as to, in a short time, destroy the contact faces. Even if when originally made the contacts are perfect, it often occurs that in usage slight distortions take place sometimes even by mere vibration, so that the perfect contact is lost.

The present invention is intended and adapted to overcome such disadvantages and to provide a relay carrying a plurality of movable contacts, the arrangement being such that under all conditions of manufacture and service, full, complete and perfect contact is obtained.

The invention also contemplates the provision of a structure which, under all conditions of use and regardless of possible injury to the relay, will continue to function to make perfect multiple contacts.

In practicing the invention I provide a relay generally of a well-known construction wherein an armature is pivoted to a support and a coil is provided which, when energized, is adapted to cause movement of the armature about its pivot. The armature also carries a contact arm having two or more contact members or buttons which are adapted to make electrical contact with a corresponding number of stationary contact members or buttons supported by the relay. The contact arm, instead of being fixed to the armature as heretofore, is so mounted that it is capable of movement relative to the armature. Usually, to accomplish this there is provided a projecting portion on the arm bearing against the armature to form a pivot point, allowing practically universal movement of the contact arm. In order

to hold the latter in operative position a spring is provided biasing the arm and holding it in relative position to the armature.

With such a structure, if the alinement of the contact buttons on the arm is not perfect and the armature moves to make electrical contact, when one of the contacts is made the pressure produced thereby will cause a movement of the arm about the projecting point pivot which will cause the other contact button to move into pressure relationship with its fixed cooperating button. Thereby, when contact is made, the pressures on the several sets of contacts is always the same.

In the accompanying drawing constituting a part hereof and in which like reference characters indicate like parts:

Fig. 1 is a side elevational view of a relay embody the present invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a fragmentary vertical cross-sectional view through the contact arm taken along the line 3—3 of Fig. 2, the relay being in such a position that no contact is made;

Fig. 4 is a view similar to Fig. 3 showing the relay in contact-making position;

Fig. 5 is a fragmentary transverse-sectional view illustrating the mounting of the contact arm, taken along the line 5—5 of Fig. 2; and

Fig. 6 is a view similar to Fig. 4 showing a modified form of the invention.

There is provided a plate 1 constituting the magnetic circuit having one end 2 bent at right angles, the latter having a base member 3 secured thereto, the base having nuts 4 fixed thereon whereby the relay may be attached to a suitable support. A relay coil 5 is mounted on plate 1 and a hollow cylindrical core 6 is inserted therein. A member 7 is held within the core being pressed outwardly by a spring, not shown, and a screw 8 may be used for adjusting the tension on the spring. A lock nut 9 holds screw 8 in adjusted position.

The opposite end of plate 1 is bent at right angles as shown at 10 and the free end thereof is curled over as shown at 11 to form a pair of eyes in which hinge pin 12 is inserted. An armature 13 is secured to pin 12 by plate 14 and is pressed outwardly by member 7. The end 15 of the armature on the opposite side of the hinge is bent at right angles and an insulating block 16 is secured to the top thereof. A groove 17 is formed longitudinally of block 16 and has substantially parallel side walls 18.

Contact arm 19 fits into groove 17 relatively loosely and has an opening 20 through which bolt 21 passes loosely and is held in cooperative relation to block 16 by nut 22. The free end of contact arm 19 is provided with a pair of contact buttons 23 and 24.

A small projection 25 is pressed out of arm 19, said projection being dome-shaped and acting as a pivot, allowing practically universal motion of arm 19 except as it is restricted by the confines of groove 17 and walls 18. A spring 26 has a central opening through which bolt 21 passes, and the ends 27 and 28 thereof are looped as shown in Figs. 3 and 4. The extreme ends of the spring press against spaced portions of arm 19 within groove 17.

An insulating plate 30 is secured to extension 10 by rivets 31. A pair of metallic strips or conductors 32 are secured to insulating plate 30 by rivets 33. Each has a terminal screw 34 to which an electric conductor wire may be attached. Extending upwardly from strips 32 are vertical portions 35 and inwardly extending horizontal portions 36. Contact buttons 37 are secured to the underside of the portions 36 to cooperate with buttons 23 and 24 to make contacts for suitable circuits. Also mounted on plate 30 are terminals 38 having wires 39 secured thereto, said wires being attached to the free ends of the wires of coil 5.

In the operation of the relay, upon the closing of the circuit of coil 25, a magnetic field is set up whereby armature 13 is drawn inwardly against the action of the spring within the coil. The movement causes a raising of block 16 and of arm 19, causing buttons 23 and 24 to come in contact with buttons 37. In Fig. 3 it will be seen that just prior to such contact, the left-hand end 40 of arm 19 rests upon block 25. As soon as contact is made and the further upward movement of contact arm 19 places a strain upon the assembly, pivoting of arm 19 takes place about projection 25 as a center, raising end 40 so that a space 41 as shown in Fig. 4 is left between the block and the arm. By reason of this action there is a slight rubbing between the contacting buttons, giving a wiping action and a removal of any film of insulating character which might tend to prevent adequate electrical contact.

If, for instance, one of the buttons 37 should be somewhat higher than the other button then the lower button makes contact first and strain is placed upon arm 19 by the spring pressure associated with the making of contact. This causes a tilting of one or the other of the side edges 42 of arm 19 about projection 25 as a pivot, as shown in Fig. 5. This tilting will take place until the pressures on the two sets of buttons are equalized. The tilting also causes an additional wiping action to assist in the electrical contact.

In Fig. 6 is shown a modification of the invention wherein the contact arm 19 is adapted to make contact with two terminals whereby in one position one circuit is closed, and in the other another circuit is closed. At the end of arm 19 there is provided an upper contact button 23 and a lower contact button 43. The upper terminal 36 cooperates with button 23 and a lower terminal 44 cooperates with button 43. Terminal 44 is mounted on insulating plate 30 and has an extended portion 45 having an opening in which a suitable lead-in wire may be secured. In addition to the projection 25, located to the right of pivot 18, a similar projection 46 is provided to the left of pivot 18. Projection 46 operates as a universal joint in a manner similar to projection 25, but is operative when the arm 19 is in its lower positions to make contact with terminal 44. Thereby, the same action is obtained whether arm 19 is in its upper or its lower positions.

There are numerous advantages residing in the

construction of the present relay, not only as set forth above, but because of the equalization of the pressure, even damaged relays may still function, in some cases, where there has been a very substantial amount of misalignment or bending of a number of parts. The fabrication of a relay of this character is quite simple and the number of parts may be reduced while at the same time avoiding the necessity of highly skilled labor because it is not necessary to adjust the contacts and associated parts to the minute accuracy previously necessary. The relay of the present invention, even though compact, is capable of carrying extremely heavy currents such as in the past required relays of several times the size of the present relay. Therefore, the present relay may be fitted into positions where relays of the prior art could not be used.

It will be noted that the present relay has a minimum mounting area with the terminals all on the side opposite to the base. This gives full accessibility to the terminals for purpose of securing lead-in wires and for repairs. The armature is of the balanced type so that the action thereof is positive under all conditions. The pressure of spring 26 is directly upon the projections in all positions of the arm 19, thereby insuring that the universal movement of the device will be obtained under all conditions.

Although I have described my invention, setting forth a single specific embodiment thereof, my invention is not limited thereto, but many changes in the details of construction are possible within the scope of the invention. It is not necessary that the projections be formed in arm 19, as block 16 may have the projections contacting with the arm, or other means may be used for giving the universal action of the present invention. The spring 26 may be of a different form than described. These and other changes in the details of the construction may be made without departing from the spirit of the invention, the scope of which is defined by the character of the claims appended hereto.

What I claim is:

1. In an electrical apparatus, a swinging member, a contact arm having an aperture, a stud of less cross-section than said aperture carried by said member and extending through said aperture, a projection formed on said arm and engaging said member to constitute a pivot for the arm, a leaf spring having a central aperture receiving said stud and having its ends formed into loops engaging said arm, a head on said stud in contact with said leaf spring, contact buttons on said arm laterally spaced from said projection, and stationary complementary contact buttons whereby equalization of contact pressure on said buttons is obtained.

2. In an electrical apparatus, a swinging member, a contact arm having an aperture, a stud of less cross-section than said aperture carried by said member and extending through said aperture, a projection formed on said arm and engaging said member to constitute a pivot for the arm, a leaf spring having a central aperture receiving said stud and having its ends formed into loops engaging said arm with one loop contacting said arm opposite said projection, a head on said stud in contact with said leaf spring, contact buttons on said arm laterally spaced from said projection, and stationary complementary contact buttons whereby equalization of contact pressure on said buttons is obtained.

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