June 7, 1932. F. H. NICHOLSON ET AL 1,861,641

CONTACT DEVICE

Filed Nov 17, 1930

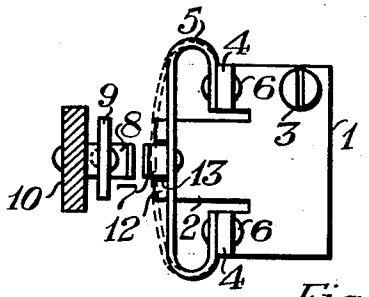


Fig. 1.

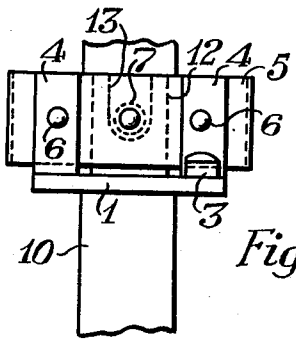


Fig. 3.

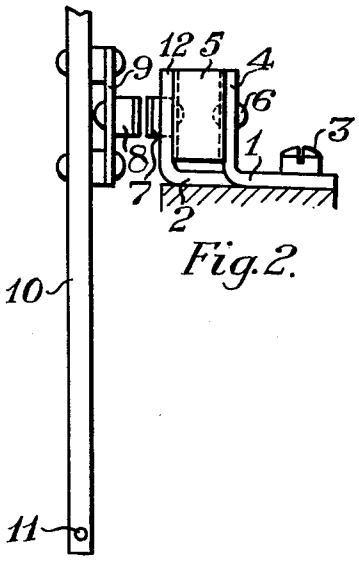


Fig. 2.

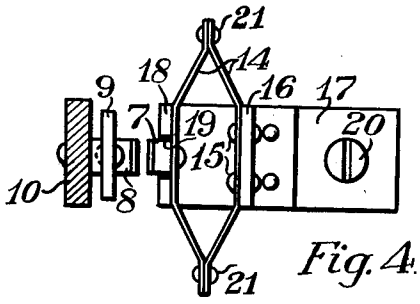


Fig. 4.

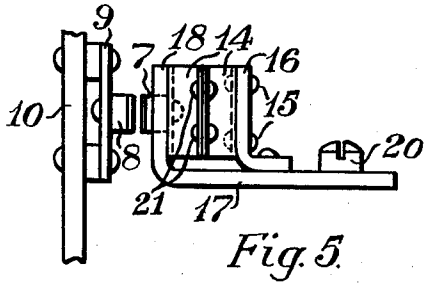


Fig. 5.

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UNITED STATES PATENT OFFICE

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CONTACT DEVICE

Application filed November 17, 1930. Serial No. 496,154.

Our invention relates to contact devices, and particularly to contact devices which embody a relatively fixed contact element mounted on a resilient support for engagement by a movable contact element, and which are employed in connection with high speed relays.

One feature of our invention is the provision, in contact devices of the character described, of means for damping the vibrations of the resiliently supported contact element each time the movable element moves out of engagement therewith, so as to make uniform and be free from chattering at the next succeeding contact between these elements.

We will describe two forms of contact devices embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is a plan view of one form of contact device constructed in accordance with our invention. Fig. 2 is a side elevational view of the structure shown in Fig. 1. Fig. 3 is a side elevational view of the device taken at right angles to Fig. 2. Fig. 4 is a plan view of a modified form of the contact device shown in Fig. 1 and also embodying our invention. Fig. 5 is a side elevational view of the structure shown in Fig. 4.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1, 2 and 3 of the drawing, a contact device constructed in accordance with our invention is shown as comprising a bracket, having a base plate 1 formed with an extension 2 of reduced width and provided with a terminal post 3. One edge of the plate 1 is provided with a pair of vertically extending ears 4, one to each side of the extension 2, to which the ends of a flexible contact support such as a semi-elliptic spring 5 are secured by rivets 6. This spring is of substantially C-shape and carries a relatively fixed contact element 7 intermediate its extremities for engagement by a movable contact element 8. The contact element 8 is fixed to a plate 9 carried by an arm 10 which is pivotally mounted, as at 11, for oscillatory movement toward and away from the contact element 7, and which may be the armature of a relay operable at relatively high frequencies, such as 150 cycles per minute, for example.

The natural period of vibration of the spring 5 may differ from the frequency of movement of the arm 10 and, therefore, if the vibration of the spring 5 is not restrained, the contact element 8 may engage the contact element 7 at different points within the amplitude of its vibrations. For example, the contact element 8 may engage the contact element 7 when the latter is in either of its extreme positions in its oscillatory travel or at any of its intermediate points and also while the contact elements 7 and 8 are moving either toward or away from one another. Obviously, this will not only cause a variance in both the interval between the times of contact and in the duration of such contact, but will result in an irregularity of contact which is termed "chattering".

In order, therefore, to avoid this undesired and faulty operation, the device is provided with means for damping the vibrations of the spring 5 caused by successive impacts of the contact element 8, substantially simultaneously with the formation of such vibrations. As shown in the drawing, this means comprises an ear 12 which extends vertically from the outer end of the extension 2 and which is formed with a notch 13 through which the contact element 7 is adapted to extend. This ear is located at a point within the natural amplitude of the spring 5, and holds the spring under stress in the position shown in Fig. 1. As a result, the ear 12 constitutes a stop or abutment against which the spring 5 bears when the contact elements 7 and 8 are separated, and which limits the movement of the spring 5 toward its completely relaxed position indicated by the broken lines in Fig. 1.

By means of this construction, when the movable contact element 8 engages the fixed contact element 7, it flexes the spring 5 away from the ear 12, and upon the movement of the arm 10 in the opposite direction, the spring 5 is permitted to move into engagement with the ear 12, whereupon the contact

7—8 opens. It will be noted that the spring 5 is at all times under restraint in that when it is out of engagement with the ear 12, the contact element 7 carried thereby is engaged by the contact element 8 and that when the contact element 8 is out of engagement with the contact element 7, the spring 5 is in engagement with the ear 12. Vibration of the contact element 7 is thus effectually prevented. Each circuit controlled by the device shown in Figs. 1, 2 and 3 is, for the purpose of such control, connected with terminal post 3 and with the movable contact element 8.

In Figs. 4 and 5, we have shown another form of apparatus embodying our invention in which two spring elements 14 are fastened together by rivets 21 to form a spring of substantially elliptic type. In this construction, one of the spring elements 14 is secured by rivets 15 to a vertically extending bracket 16 carried by a base plate 17. The other spring element 14 carries the contact element 7 intermediate its ends, and bears against a stop or abutment 18 which is preferably formed by an upwardly extending portion of the plate 17. This stop is also provided with a notch 19, as in the contact device shown in Fig. 1, through which the contact element 7 is adapted to extend for engagement by the movable contact element 8 carried by the arm 10. A terminal post 20 is mounted on the base plate 17. Each circuit controlled by the contact device shown in Figs. 4 and 5 is, for the purpose of such control, connected with terminal post 20 and with the movable contact element 8. The operation of the contact device above described is identical with that previously described in connection with Figs. 1 and 2.

As a result of the above described constructions any tendency for the spring support to vibrate when released by the movement of the contact element 8 out of engagement with the contact element 7 is restricted through its engagement with the adjacent stop 12 or 18, respectively, before it reaches its relaxed or natural position. In both of the forms hereinbefore described, the spring support may rebound slightly after engagement with the associated stop, but any oscillatory movement is quickly and effectively damped before the contact element 7 carried thereby is again engaged by the movable contact element 8.

It will be noted that, in each of the forms hereinbefore described, the spring supports engage the stops with a pounding action, and consequently, all tendency for the parts to wear by a rubbing action between the parts, which is noticeable in certain prior devices employing leaf spring damping elements, is practically eliminated.

Although we have herein shown and described only two forms of apparatus embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. A contact device comprising a spring having a relatively high frequency of vibration, a first contact element carried thereby, a second contact element mounted for successive engagement with said first contact element and having a relatively low frequency of vibration, and a stop for confining said spring under stress within its natural range of movement in one direction, whereby the vibration of said spring is completely damped during the interval when said second contact element is out of engagement with said first contact element.

2. A contact device comprising a spring having a relatively high frequency of vibration, a first contact element carried thereby, a stop for confining said spring under stress within its natural range of movement in one direction, and a second contact element having a relatively low frequency of vibration adapted to successively engage said first contact element and to flex said spring away from said stop, said stop being adapted to completely damp the vibrations of said spring after said second contact element moves out of engagement with said first contact element and before said second contact element reengages said first contact element.

In testimony whereof we affix our signatures.

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