June 2, 1931. H. E. WHITE 1,807,815

CONTROL APPARATUS

Filed April 6, 1927

Fig. 1.

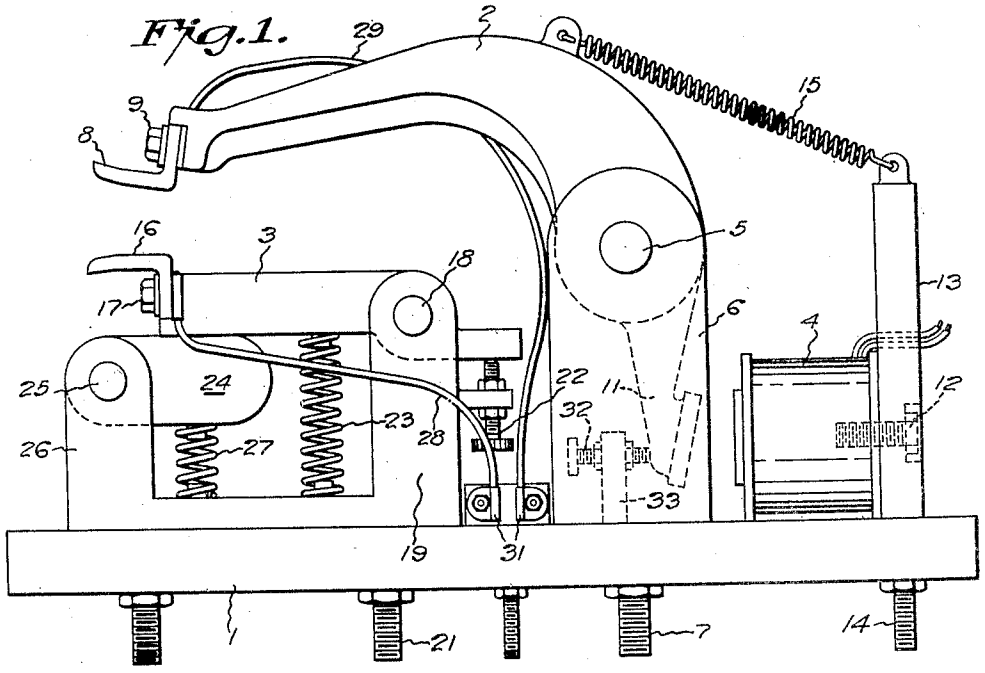
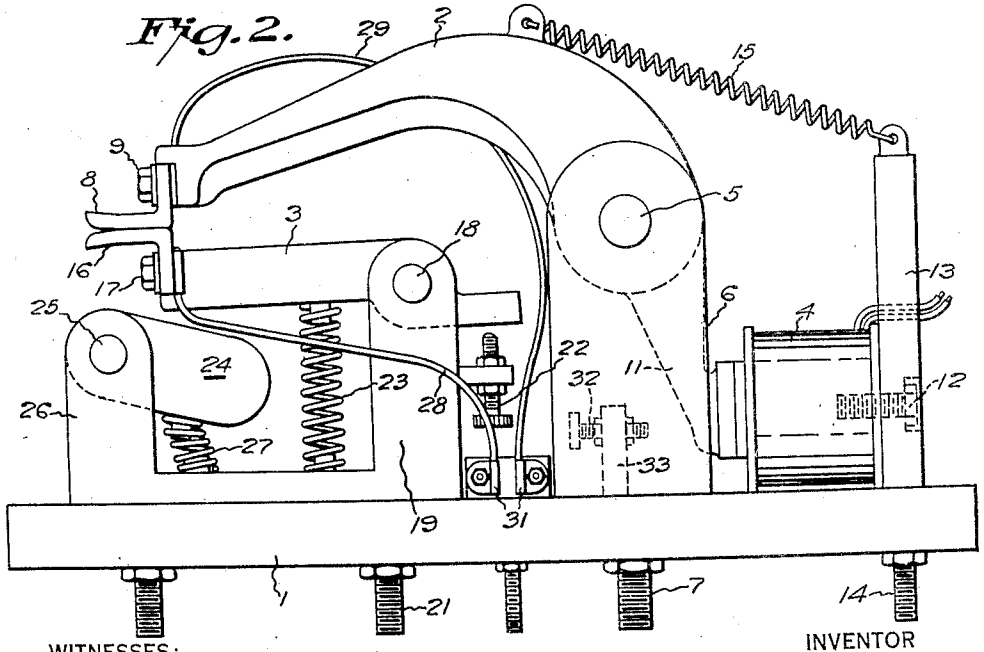


Fig. 2.



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UNITED STATES PATENT OFFICE

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CONTROL APPARATUS

Application filed April 6, 1927. Serial No. 181,315.

My invention relates to control apparatus and more particularly to circuit-interrupting devices.

It is desirable, in apparatus such as circuit breakers and especially contactors of the snap-action type, that means be provided for reducing the vibration between the contact-making element when they are closed to avoid the arcing difficulties which are generally encountered.

An object of my invention, generally stated, is to make provision for reducing the vibration of the contact of snap-action contactors or similarly operated devices.

A more specific object of my invention is to provide for harmlessly dissipating the kinetic energy present in a moving member when it is projected into engagement with a stationary member.

A further object of my invention is to make provision for reducing to a minimum the vibration in a moving member itself at a point where it is projected into engagement with a stationary member.

It is also an object of my invention to provide a device of the character set forth which shall be relatively easy to manufacture and reliable in operation.

Other objects of the invention will become apparent when considered in connection with the accompanying drawings, wherein a single embodiment of my invention is shown.

This invention is disclosed in the embodiment thereof shown in the accompanying drawings and comprises the structural features, the combination of elements and the arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawing, in which;

Figure 1 is a view, in side elevation, of an electro-magnetic contactor constructed in accordance with my invention and illustrating the contactor in its circuit-interrupting position, and

Fig. 2 is a view, in side elevation, of the contactor and illustrating it as actuated to its circuit-making position.

Referring now to the drawings, I have illustrated a contactor which comprises a base member 1 upon which is mounted a movable contact-carrying element 2, a stationary contact-bearing member 3 and electro-magnetic means, such as a coil 4, for operating the movable contact-bearing element 2. The movable contact-bearing member 2 is pivotally mounted, by means of a trunnion 5, in a bifurcated support 6 which is securely fastened to the base 1 by means of a bolt 7.

The movable contact-bearing member 2 is proportioned to limit vibration.

In order to reduce the vibration of the contact bearing member 2, when the contact members are caused to engage, the movable member 2 is made comparatively large at its base where it is pivoted in its support 6 and is tapered toward the outer end where the contact tip 8 is mounted. The contact tip 8 is secured to the movable member 2 by any suitable means, such as a bolt 9. At the opposite end of the movable contact bearing member 2, a depending arm 11 is disposed in alinement with the actuating coil 4 to permit it to be utilized as an armature for actuating the movable contact-carrying member.

The actuating coil 4 is mounted on a post 13 in any suitable manner such, for example, as by means of a bolt 12. As shown, the post 13, supporting the coil 4 is attached to the base 1 by a bolt 14, and, in this embodiment of the invention, is utilized as an anchor for a resilient element, such as a spring 15, the spring 15 being connected between the post 13 and the movable contact member 2 for biasing the latter to its open-circuit position.

The stationary contact-carrying member 3 has a contact element 16 secured thereto by means of a bolt 17 and disposed to cooperate with the contact member 8 on the movable member 2 for circuit-making purposes.

The stationary contact-carrying member 3 is pivotally mounted by means of a trunnion 18 in a support 19 which is firmly fastened to the base member 1 by means of a bolt 21. In order to set the contact member 16 in different

positions to receive the contact member 8, a set screw 22 is mounted in a bracket carried by the support 19 and is disposed to engage the inner end of the contact-carrying member 3.

It will be noted that a spring 23 is interposed between the base 1 and the stationary contact-carrying member 3 to bias the latter toward engagement with the set screw 22. Therefore, it may be said that the stationary contact-carrying member 3 is adjustably and resiliently mounted.

Further, the stationary contact-carrying member 3 is arranged to rest upon an energy-absorbing member 24 and is illustrated as being pivotally mounted thereon by a trunnion 25 in a support 26 which is secured to the base member 1. The energy-absorbing member 24 is biased toward engagement with the stationary contact-carrying member 3 by means of the spring 27 mounted between it and the base 1, the spring 27 being so constructed that it will return slowly the energy-absorbing mass 24 to its normal position into engagement with the contact-carrying member 3, thus avoiding any vibration in the contact members.

Conductors 28 and 29, as shown, are connected between the terminals on binding posts 31 that are secured to the base member 1 and the contact tips 8 and 16, respectively. A set screw 32 and its support 33 are mounted upon the base member 1 between the arms of the support 6 and are so disposed that the adjustable set screw 32 may be utilized to limit the movement of armature 11 relative to the actuating coil 4.

In the operation of the device, the coil 4 may be energized from any suitable source of electrical energy (not illustrated). Upon the energization of the coil 4, the armature 11 and the contact-carrying member 2 are rotated counter-clockwise to project the contact tip 8 into engagement with the contact tip 16.

When the contact tips are projected together, the resultant impact tends to cause them to vibrate and bounce apart to produce sparking and arcing at the contacts. The vibration thus produced is damped out, inasmuch as the energy transmitted by the movable contact member 2 to the stationary contact-carrying member 3 is harmlessly dissipated in the energy-absorbing mass 24, thus permitting the contact members to come to rest with relatively no vibration.

The theory presented here is the same as that demonstrated by the action of a moving billiard ball when it comes into contact with one of two other billiard balls which are lying in contact with each other. The energy of the moving ball will pass to the ball which it hits and the latter in turn will transmit the energy to the third ball with the result that, under the right conditions, the third ball will be moved thereby and the second ball will remain stationary.

It will be further seen that, by developing the movable contact members as suggested above, so that the contact itself is supported on the end of a tapered member having a relatively large base, the tendency for the contact member to vibrate at the free end will be reduced, inasmuch as the vibration will take place along the length of the contact-carrying member, the principle involved being the same as when a ball is hit by a ball bat at the very extreme end, the ball will not be driven very far, and the bat itself is caused to vibrate, which is manifested when it stings the hands of the batter, in other words, the shock or vibration due to the impact is transmitted up the bat to the hands of the batter.

Since certain changes may be made in the above construction, and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a switch, in combination, a movable contact member, a movable shock-absorbing mass mounted independently of the contact member, and means for maintaining the shock-absorbing mass in position to absorb momentum imparted to the contact member.

2. A switch comprising, in combination, a movable contact member, a contact member disposed to receive the movable contact member, a rigid energy-absorbing mass disposed to absorb energy imparted to the receiving contact member by the movable contact member when they are actuated into engagement.

3. A circuit-controlling device comprising a movable contact-carrying member, resilient means urging said member toward its open-circuit position and electromagnetic means for urging it toward its circuit-closing position, a stationary contact-carrying member and an energy-absorbing member therefor, means for so resiliently supporting said latter member as to absorb the energy transmitted thereto when the movable contact-carrying member is projected into engagement with the stationary contact member to reduce the vibratory action between the two and also reduce the effect of the impact.

4. In a circuit-controlling device comprising a pivotally and resiliently mounted stationary contact-carrying member, an energy-absorbing member also pivotally and resiliently mounted and associated with said stationary contact-carrying member, a pivotally supported movable contact-carrying member disposed to engage said stationary contact-carrying member, resilient means and electro-magnetic means for urging said mov-

able contact-carrying member into different positions.

5. In a switching device, in combination, a movable contact member, means for actuating the contact member, a receiving contact member disposed to be engaged by the movable contact member and a substantially rigid shock-receiving mass, mounted independently of the receiving contact member, said mass and receiving contact member being movable and disposed to cooperate in absorbing the momentum of the movable contact member when the contact members are actuated into engagement.

6. In a switch, in combination, a movable contact member, a shock-absorbing mass disposed to absorb the momentum of the contact member when caused to move by an applied force, and resilient means disposed in the line of movement of the contact member to cooperate with the shock-absorbing mass.

In testimony whereof, I have hereunto subscribed my name this 31st day of March 1927.

HAROLD E. WHITE.