

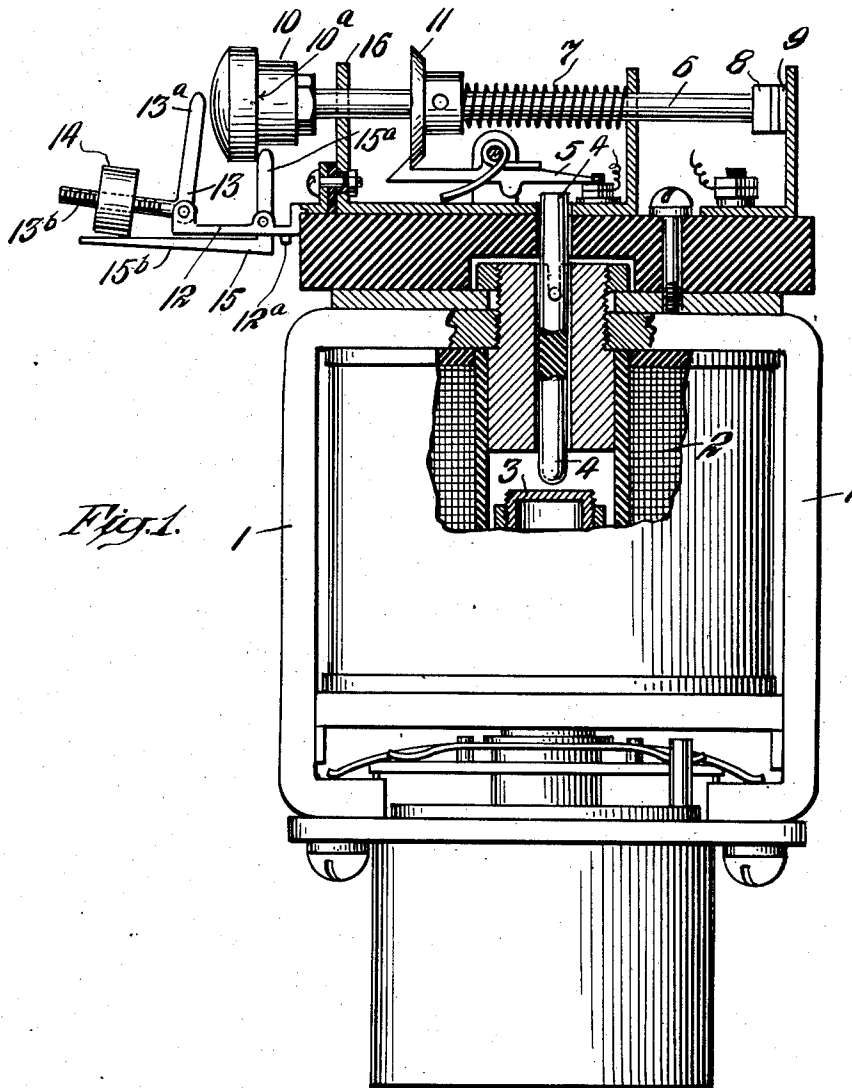
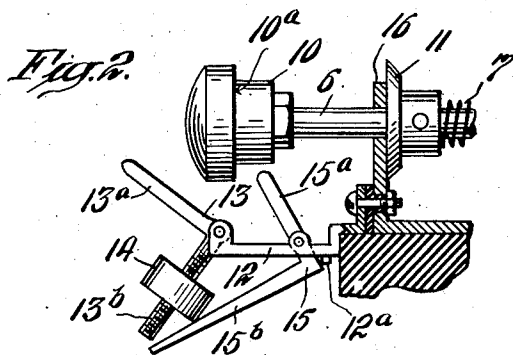
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DEVICE FOR OVERCOMING EFFECTS OF SHOCKS

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DEVICE FOR OVERCOMING EFFECTS
OF SHOCKS

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This invention relates to mechanisms, such as electric switches and the like, which are movable to different positions, such as the open and closed position of a switch, circuit breaker, relay or other devices, and restrained in one of the positions by a latch or otherwise. Such mechanisms are released by a controlled movable element which is adapted to engage and release the latch or other restraining means upon the occurrence of a certain condition or certain conditions. For example, an overload relay is adapted to attract its movable armature or plunger and release the restraining means upon the occurrence of an overload current.

Mechanisms of this character when used in locations which are subject to mechanical shocks or jars are likely to be tripped or released by causing the movable element to be thrown against the releasing means and thereby cause an undesired tripping of the mechanism. It has been proposed to overcome this undesired action by providing an additional movable element which is normally at rest but which, under shock, would strike the restraining latch on the opposite side of the pivot of the latch from that engaged by the movable element of the mechanism and thereby prevent the latch from being tripped. However, in many cases the weight or mass of the counter-acting element required to overcome the effect of the force of the tripping element is quite considerable, resulting in considerably increasing the total weight of the parts and the space occupied.

By the present invention it is not attempted to overcome the force of the movable releasing element of the mechanism but the mechanism is restrained from movement upon the occurrence of shocks, even though the latch or other restraining means be released. This is accomplished upon the occurrence of the shock or impact by the provision of auxiliary means which will hold the mechanism in place during the shock and until reengaged by the normal restraining means.

The main object of the invention is to provide means for overcoming the effects of shocks which will be simple in character, of comparatively small weight and size and dependable in operation. Another object is to provide means which may be applied readily to various types of mechanisms without the necessity of radical change in the design of the parts and which, in some cases, may be added to existing mechanisms. Another object is to produce an auxiliary device which may be made at small cost and readily assembled. Other objects and advantages will be understood

from the following description and accompanying drawing which illustrates one embodiment of the invention applied to a relay.

Fig. 1 is a side view partly in section; and Fig. 2 is a side view partly in section showing certain of the parts when in the released position.

The particular relay shown is of the type disclosed in the Kouyoumjian Patent No. 2,308,660 granted January 19, 1943 and forms no part of the present invention. It is sufficient to explain for present purposes that it has a magnet frame 1 and an exciting winding 2 which when sufficiently energized will attract and raise a movable element 3. This then moves the rod 4 upwardly which trips the pivoted latch 5 and releases the restrained element 6. This is a contact element biased to open position by a spring 7 tending to separate its movable contact 8 from the fixed contact 9. After opening, the contacts may be reclosed manually against the pressure of the spring by the handle 10. The parts are then restrained in closed position by the latch 5 which engages a disc 11 fixed to the rod 6. Instead of closing contacts in the restrained position, the device may be arranged to open contacts in the restrained position and close them in the released position or variously control contacts in the different positions; or the controlled element may serve to actuate any mechanical means for any desired purpose. Instead of using an electromagnet for tripping the holding means, any other form of device having a movable element may be used for releasing the restrained element.

It is apparent that the movable element 3 and the rod 4 may be actuated, under mechanical shocks or jars imposed upon the device, to move upwardly with reference to their support and thereby actuate the latch to release the parts. Such an improper actuation of the releasing means would be highly undesirable because the parts should be released only when the predetermined conditions occur for such release by sufficient energization of the magnet.

Any improper movement of the restrained parts is avoided by the present invention. A supporting part 12 is secured to the device and a lever 13 is shown pivotally mounted on the support at its outer end. This lever has an arm 13a extending upwardly to bring its upper end opposite the end of the handle 10. The lever also has an arm 13b shown extending outwardly at right-angles to the arm 13a. A weight or mass 14 is adjustably mounted on the arm 13b as indicated by the threaded connection. Another lever 15 is shown pivotally mounted on the support 12 having an

upwardly extending arm 15a. Its upper end engages the inner side of a projection or rim 10a formed on the handle 10. The lever has an outwardly extending arm 15b which passes under the weight 14 and holds it in the position shown when the element 6 is restrained. The distance from the center of gravity of the mass 14 and arm 13b to pivot of the lever is less than the distance from the pivot to the end of the arm 13a where it engages the restrained element.

Fig. 1 shows the parts in the restrained position under normal conditions. When the apparatus is subjected to a mechanical shock in any direction which would cause the movable element to move upwardly and trip the latch, the same shock would cause the mass 14 to move upwardly and the arm 13a to engage the restrained element. Also by reason of the distance from the center of gravity of the mass to the pivot being less than the distance from the point of engagement of the arm 13a with the handle to the pivot, the movement of the end of the arm 13a is amplified. It thereby will engage and restrain the element 6 before it is released by the latch and hold it in the restrained position as the result of the shock. Upon the passage of the shock, or series of shocks, and the return of the movable element 4 to its normal position, the spring pressed latch 5 will reengage the rim 11 and restrain the element 6 normally. The mass 14 and lever 13b will also return to their normal positions in readiness to again function to restrain the element 6 whenever released by shocks. In some cases the movement of the engaging portion of the arm 13a with the restrained device need not be amplified with reference to the movement of the mass 14 such as when the movable tripping element has considerable free movement before tripping the latch, or in cases where the movable tripping element is retarded by a dashpot or other means.

Fig. 2 shows the parts in the released position, the spring 7 forcing the rod 6 to the left against a stop such as the portion 15 engaged by the projection 11. In case the device has been properly released, it should, of course, not be reset upon the occurrence of any shock that would cause the mass 14 to actuate the rod 6 to the closed position. Referring to Fig. 2, the tripping of the latch upon the occurrence of an overload current for example, will cause the rod 6 and handle 10 to be moved by the spring 7 to the position shown in Fig. 2. This movement permits the lever 15 to move counter-clockwise on its pivot until the lever engages a stop 12a on the support 12. It thereby enables the mass 14 to fall and then be retained by the arm 15b in the position shown in Fig. 2. The arm 13a is thus permitted to move away from the handle 10 as the handle moves to the released position. If a shock occurs in this position of the parts which would tend to throw the mass 14 upwardly, the arm 13a would strike against the lower edge of the handle 10 and not exert a sufficient force in a direction to actuate the switch to the closed position. The improvement thus avoids improper closure of the switch under shocks when open. When the switch is closed manually, the projection 10a of the handle will engage the arm 15a and restore the parts to the position shown in Fig. 1 for protection against improper opening of the switch when subjected to shocks.

The parts may be variously arranged in their relationship to each other for attaining the objects of the invention and adapted to various types of apparatus for automatically restraining

a released part or parts in their desired position when subjected to mechanical shocks or jars. Although a particular embodiment of the invention has been described, it will be understood that various modifications may be made for adaptation to particular requirements without departing from the scope of the invention.

I claim:

1. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, and means for maintaining said device in the restrained position against such biased movement when released by said element under the effects of shock until the passage of the shock.

2. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, and a mass movable under shock for exerting a force on the restrained device for maintaining the device in the restrained position against such biased movement when released by said movable element under the effects of shock until the passage of the shock.

3. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, a movable element adapted to engage said device, and a mass movable under shock for exerting a force on said last named element for maintaining the device in the restrained position against such biased movement when released by said first named element under the effects of shock until the passage of the shock.

4. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, and a pivoted lever having arms at an angle to each other, one of said arms being adapted to engage and restrain said device, the other of said arms having a mass movable under shock for exerting a force on said first named arm for maintaining said device in the restrained position against such biased movement when released by said element under the effects of shock until the passage of the shock.

5. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, and a pivoted lever having arms at an angle to each other, one of said arms being adapted to engage and restrain said device, the other of said arms having a mass movable under shock for exerting a force on said first named arm for maintaining said device in the restrained position against such biased movement when released by said element under the effects of shock until the passage of the shock, the distance from the center of gravity of said mass to the

pivot of the lever being less than the distance from said pivot to the engaging portion of said engaging arm.

6. The combination of a restrained device biased to move upon being released, an element movable independently of the restrained device for releasing said restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, a pivoted lever having arms at an angle to each other, one of said arms being adapted to engage and restrain said device the other of said arms having a mass movable under shock for exerting a force on said first named arm for maintaining said device in the restrained position against such biased movement when released by said element under the effects of shock until the passage of the shock, and means engaged by said restrained device for holding said lever in a position to be effective in its maintaining action when said device is restrained and for releasing said lever from said position when said device is moved to its unrestrained position.

7. The combination of a restrained device, an element movable independently of the restrained device for releasing the restrained device, said element being subject to movement by mechanical shocks, means for actuating said element for releasing said restrained device, a pivoted lever having arms at an angle to each other, one of said arms being adapted to engage and restrain said device, the other of said arms having a mass movable under shock for exerting a force on said first named arm for maintaining the device in the restrained position when released by said element under the effects of shock until the passage of the shock, and a second pivoted lever engaged by said restrained device for holding said first named lever in a position to be effective in its maintaining action when said device is restrained and for holding said first named lever in a position to be ineffective in its maintaining action when said device is moved to its unrestrained position.

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