

J. L. VAUGHN

SHOCKPROOF RELAY

Fig. 1.

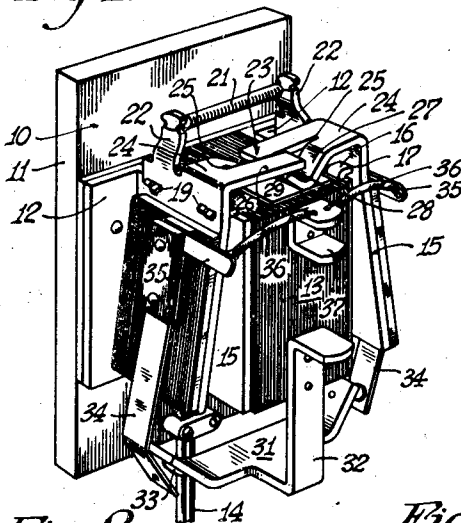


Fig. 6.

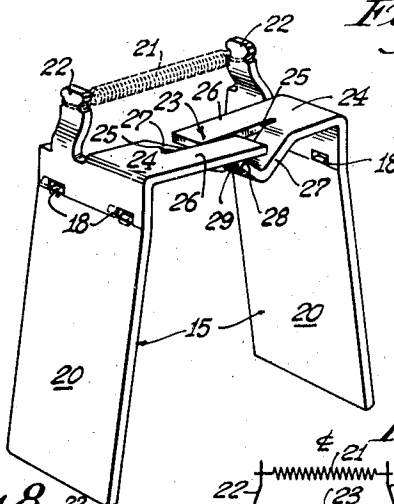


Fig. 7.

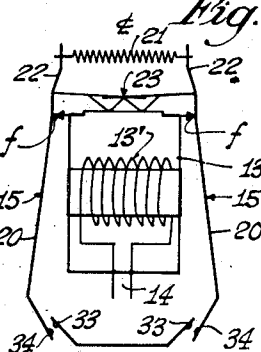


Fig. 2.

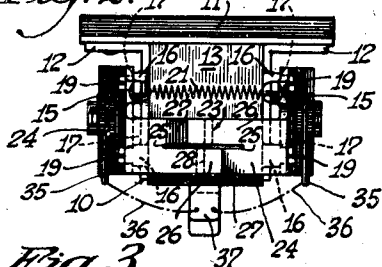


Fig. 8.

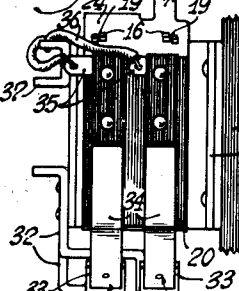


Fig. 3.

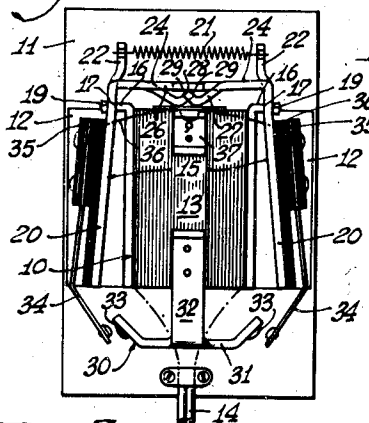


Fig. 4.

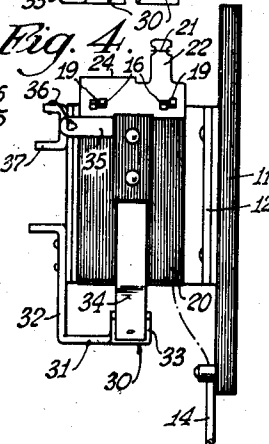


Fig. 9.

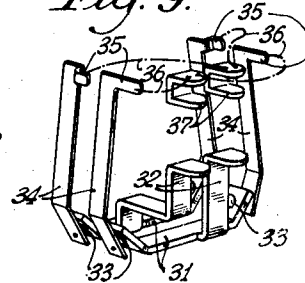
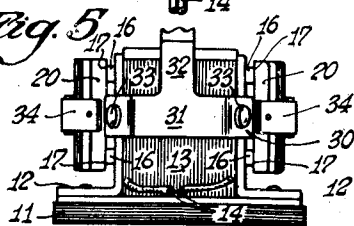


Fig. 5



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UNITED STATES PATENT OFFICE

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SHOCKPROOF RELAY

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Application April 3, 1942, Serial No. 437,475

7 Claims. (Cl. 175-337)

This invention relates to certain improvements in relay switches and has as its principal object the provision of a shock-proof relay which will be simple in construction, economical in manufacture and highly efficient in use.

Another object of this invention is the provision in a relay switch, of a balanced armature arrangement which will assure contact only upon operation of the relay means in the intended manner.

A further object of this invention is the provision of a momentum-resisting relay switch by which gravitational forces or the like are counteracted by a balanced armature arrangement.

Other objects and novel aspects of my invention reside in the arrangement of parts and will become more apparent as the description proceeds in view of the drawing, in which:

Fig. 1 is a perspective view of a relay switch means embodying my invention;

Fig. 2 is a top plan view of the same;

Fig. 3 is a front elevational view of the same;

Fig. 4 is a side elevational view of the same as seen from the right in Fig. 3;

Fig. 5 is a bottom view, looking up from below in Fig. 3;

Fig. 6 is a perspective view of a pair of balanced armatures embodied in my invention;

Fig. 7 is a diagrammatic illustration of the principle involved in the invention;

Fig. 8 is a fragmentary side elevational view similar to Fig. 4 and showing a modified arrangement of contact switches; and

Fig. 9 is a skeletonized perspective view further illustrating the modified arrangement of contact switches shown in Fig. 8.

Relay switches such as the type herein disclosed have varied uses and adaptations. They are used extensively on moving objects such as machine parts, railroad trains, automobiles and aircraft. In high-speed objects it is essential that a relay means maintain its normal condition at all times other than when it is intentionally caused to operate to perform an intended function.

The present disclosure contemplates a relay structure which is absolutely jar-proof and adapted to maintain a normal condition except when energized in the usual course of operation.

Referring to the drawing, a relay device is generally indicated at 10 and includes a fibre mounting panel 11 upon which is arranged a pair of angle clips 12 spaced from each other to embrace a coil housing 13 centrally on the panel 11. A suitable electrical conductor 14 having one end connected to a source of electric energy and

means for controlling the flow of current therefrom (not shown) has its two leads connected to an electromagnetic coil 13' arranged in the housing 13.

A pair of armatures 15 are arranged for rocking movement adjacent the coil 13'. Means for mounting the armatures as aforesaid comprise a pair of lugs 16 bent outwardly from the upper end of the extended portions of the angle clips. These lugs 16 are reduced in width near their ends to provide shoulders 17, the reduced ends of the lugs extending through rectangular openings 18 formed in the armature 15. The reduced ends of the lugs 16 are split as at 19 and are peened alternately up and down to secure the armature 15 adjacent the shoulders 17 which provide a fulcrum *f* upon which the armatures rock.

The armatures 15 are spaced equidistant from a vertical center-line extending through the coil housing 13 and each provide a magnetically attractable portion 20 beneath the fulcrum point *f*. The portions 20 are normally urged away from the coil by means of a spring 21 which is stretched between upwardly extending posts 22 formed on the armatures 15 a substantial distance above the fulcrum point *f*.

Under normal circumstances the two armatures 15 would be free to rock independently of each other on their respective fulcrums. However, in the present arrangement, means 23 is provided for interlocking the two armatures for balanced action relative to each other. The means 23 comprises a lateral extension 24 formed integrally with each armature 15 and bent inwardly to cross the vertical center line of the relay. The extensions 24 are split centrally as at 25 with respect to their length to provide two legs 26 and 27, the latter of which is bent downwardly at an oblique angle with respect to the other leg 26. The lower end of the leg 27 is turned back upwardly adjacent its end so as to dispose the upper ridge 28 of the leading edge 29 in a plane aligned with the underside of the adjacent or straight leg 26 and at a point substantially traversing a vertical center line struck through the coil.

Referring to Figs. 3 and 6 it will be noted that the two armatures, when assembled on their respective fulcrums *f*, are arranged with the alternately bent and straight legs 27-26 interrelated so that the straight leg 26 of each overlies the bent leg 27 of the other. By this arrangement the bottom of the legs 27 bears against the top surface of the coil housing 13 and forms a stop

means for limiting the outward movement of the portions 20 by action of the spring 21.

Relay switches 30 are adapted to be operated upon energization of the coil 13'. These switches 30 include a fixed contact 31 in the form of a bracket 32 insulated from and carried by the coil housing 13 and providing a binding post for circuit connection to any system with which the relay switch 30 is to be associated. The bracket 32 has a T formation at its lower end, which T formation lies in a horizontal plane to present two obliquely projecting contact points 33. The switches 30 further include movable contacts 34 adapted to move toward and away from the contact points 33. These movable contacts 34 are carried by the armatures 15, there being preferably one on each armature. The contacts 34 are suitably insulated from the armature itself and have lead portions 35 adapted to be soldered to a flexible cable 36 which in turn is attached to a fixed binding post 37 carried by the coil housing 13. The binding post 37 is likewise provided for connection to a circuit with which the relay switch is to be associated. The switch means 30 just explained, provides a dual contact switch which will have a high voltage capacity and which will assure a firm and definite contact between elements 34 and points 33.

A number of such switches may be employed on the armatures 15 as, for instance, in the manner shown in Figs. 8 and 9, whereby several different circuits may be set up upon one operation of the armatures 15, the main object of the present invention being to maintain equal loads on the respective armatures so that they will maintain an equilibrium with respect to each other.

An example of one advantage of the present relay structure would be in airplanes wherein an object is carried beneath the plane for release instantaneously upon the operation of a hand-controlled lever. The dual contact arrangement assures such instantaneous operation as well as positive contact. In such use it is possible that a power dive may be necessitated and upon coming out of such power dive the momentum of the plane increases the force of gravity upon anything carried in the plane, including spring-retained armatures on relay means used as aforesaid. With the structure herein disclosed the interlocked armatures 15 are balanced such that the interfitting extensions 24 counteract any increased gravitational force imparted on the extended portions 20 and thus prevent accidental or unintentional operation of the relay means. It is also known that sharp banking of a plane causes an excessive centrifugal force, which force when acting on an ordinary relay armature may cause the contact carried thereby to engage its companion contact. For example, assume the force as acting upon the left armature (Fig. 3) to urge the latter toward the coil 13'. That same force is likewise acting upon the right armature, but the force on the right armature tends to urge the latter away from the coil 13'. The left and right armatures being interrelated by the interfitting legs 26-27 causes the force on the right armature to counteract the force on the left armature, the one overcoming the other with a result that neither armature moves and no accidental operation of the switches 30 takes place.

In theory the two armatures are peened to the lugs 16 for rockable movement relative to a centrally disposed coil housing. Each of the armatures proper carry a load in the form of the movable switch contact 34 which may be increased in

number as shown. The spring means 21 is calculated to overcome the normal weight of the armature and its load while the interlocking extensions 24 act as a cantilever tending to balance the armatures and their loads as counteracted by the spring.

It is therefore seen that I have provided a balanced armature for relay switch means, which armatures are so interrelated that any sudden jarring tending to swing one armature in one direction is counteracted by the companion armature such that the two armatures are equalized and hence both remain in normal or unoperated condition.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a relay structure a centrally arranged coil, a pair of armatures rockably supported symmetrically with respect to said coil, means supporting said armatures for rockable movement, spring means normally urging said armatures away from said coil, and means on said armatures for interlocking the latter for balanced action relative to each other, said means comprising an extension on each of said armatures and formed to provide a pair of alternately straight and bent legs with the bent legs of each disposed beneath the straight leg of the other.

2. In a relay structure comprising a centrally disposed coil and a pair of armatures rockably supported adjacent said coil on each side thereof, each armature having a portion thereof arranged to be attracted toward said coil when the latter is energized and means for urging said portions of the armatures away from said coils, the combination of means for interlocking said armatures for balanced action relative to each other, said means comprising an extension on each of said armatures and formed to provide a pair of alternately straight and bent legs with the bent legs of each disposed beneath the straight leg of the other.

3. In a device of the class described, a coil, an armature rockably supported on each side of the coil, fulcrum means on said coil for supporting said armatures as aforesaid with a magnetically attractable portion thereof arranged adjacent said coil, an arm on said armatures and extending in a direction away from said fulcrum on the side thereof opposite said magnetically attractable portion, spring means arranged between said arms and adapted to urge said magnetically attractable portions away from said coil, and means for interlocking said armatures for balanced action, said means comprising a part of said armature adjacent said arms and bent to extend over said coil, said part being formed to provide alternate bent and straight legs, said bent legs of each armature having an upturned end portion adapted to engage the underside of the straight leg of the other armature at a point substantially central with respect to a vertical axis through said coil.

4. A relay structure having a centrally dis-

posed coil housing providing a fulcrum on each side thereof adjacent its upper end, an armature arranged on each of said fulcrums for rockable movement, an arm portion extending from said armature at a point above said fulcrum, spring means stretched between said arm portion to urge said armatures in a direction away from said coil, the provision of a means for interconnecting said armatures for joint movement, said means comprising a lateral extension on each of said armatures adjacent said arm portions and overlying said coil, a pair of alternately bent and straight legs on said lateral extension, said bent legs bearing against the top of said coil housing to limit movement of said armatures by said spring means, and means on said bent legs of each armature engaging the under side of the straight leg of the opposite armature to interlock said armatures for unitary movement.

5. A balanced armature for relay structures including a pair of armature members fulcrumed for swinging movement relative to a centrally located electromagnetic coil, the provision of interlocking means for said armatures, said means comprising, in combination, a lateral extension on said armatures adapted to overlie said electromagnetic coil, leg means on said lateral extension, oppositely disposed leg means being alternately bent and straight, said bent leg means being turned upwardly to dispose the upper ridge of its free end in a plane to engage the underside of the oppositely disposed leg means at a point aligned with the vertical axis of said electromagnetic coil.

6. A balanced armature structures for a relay switch including a coil a pair of interlocked armatures arranged to embrace said coil and adapted to swing in unison with each other
5 spring means normally disposed to hold said armatures away from said coil, means for interlocking said armatures for unitary movement, said means comprising inwardly bent cantilever portions overlying said coil, said cantilever portions formed to provide alternate bent and
10 straight legs, said bent legs engaging said coil to limit movement of its respective armature in one direction, and upturned end portions on said bent legs providing a ridge along one edge thereof, said ridge being disposed in a plane to engage
15 the underside of the straight leg portion on the opposite cantilever portion and centrally with respect to the distance between the two armatures.

20 7. In a relay, a coil, a pair of armatures rockably supported on said coil equidistant from a center line struck therethrough, means supporting said armatures for rockable movement, means normally urging said armatures away from said
25 coil, said armatures each having a portion thereof extending toward the other of said armatures and being split to provide a normally straight portion and an alternate downturned portion adapted to be disposed beneath the normally
30 straight portion of the opposite one of said armatures for interlocking the armatures for simultaneous movement.

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