

Nov. 9, 1943.

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2,333,971

HOLDING MEANS FOR INSTRUMENTS

Filed Jan. 1, 1943

2 Sheets-Sheet 2

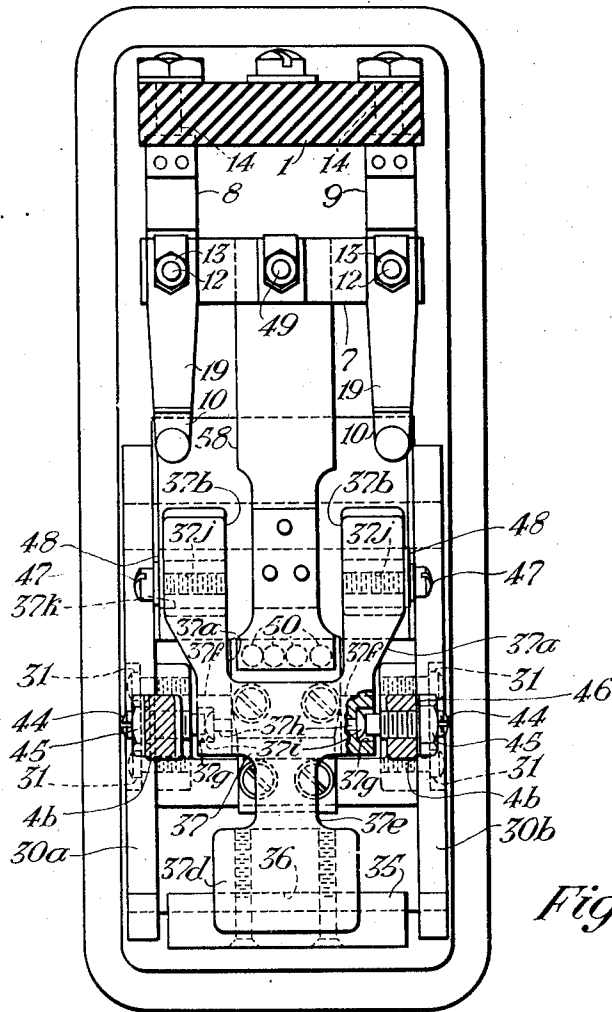


Fig. 2.

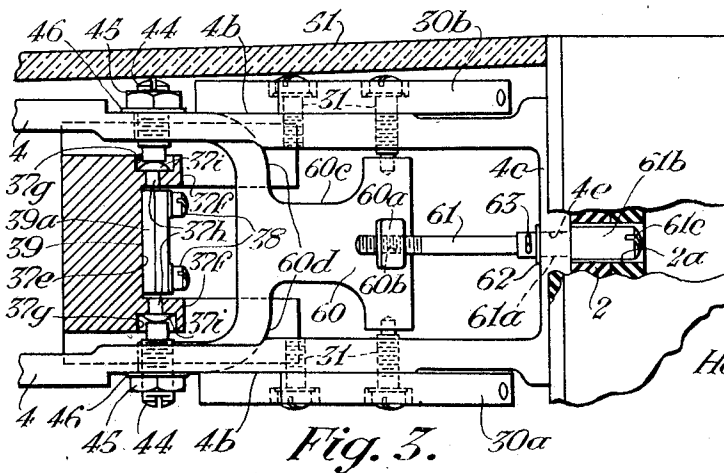


Fig. 3.

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2,333,971

HOLDING MEANS FOR INSTRUMENTS

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Application January 1, 1943, Serial No. 470,990

4 Claims. (Cl. 200—104)

My invention relates to holding means for instruments, and particularly to holding means whereby the movable member of an instrument such as an electrical relay may be effectively locked against movement during shipment or handling of the instrument to prevent damage which otherwise might result from such shipment or handling.

More particularly, my present invention relates to holding means for locking against movement the movable parts of electrical relays which are suitable for use in railway signaling systems employing for the control of signaling devices direct current which is periodically interrupted or coded at different frequencies.

One well-known form of relay of the type described employs a compound pendulum supported on a knife-edge bearing and oscillated by an electromagnet the energization of which is controlled by a contact operated by the pendulum. Endwise movement of the pendulum is prevented by screws which extend with clearance into openings formed in the opposite sides of the pendulum in axial alignment with the axis of rotation of the pendulum, and which screws cooperate at their inner ends with the rounded heads of thrust pins mounted in the inner ends of the holes. The relay is constructed for plug-in mounting on a suitable support, and the various parts are all enclosed within a suitable casing.

According to my invention, the lock comprises a pivoted locking lever, one arm of which is threadedly connected to a screw in such manner that rotation of the screw will rotate the lever to different positions and will hold it in any position to which it is rotated. The other arm of the lever cooperates with the pendulum in such manner that when the lever is rotated to one extreme position, the pendulum is free to oscillate about the knife-edge bearing, but that when the lever is rotated to the other extreme position, it will lift the pendulum vertically off of the knife-edge bearing to a position in which the inner ends of the centering screws move into engagement with the bottom sides of the openings in which the thrust pins are mounted. In this latter position of the pendulum it is locked against movement, and the two bearing members are separated from each other, with the result that all parts of the relay are protected from damage which might result if the heavy pendulum were allowed to swing free.

Other objects and characteristic features of my invention will become apparent as the description proceeds.

I shall describe one form of relay having applied thereto one form of holding means embodying my invention, and shall then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a vertical sectional view showing one form of relay having applied thereto one form of holding means embodying my invention. Fig. 2 is a front view of the relay shown in Fig. 1. Fig. 3 is a sectional view taken substantially on the line III—III of Fig. 1.

Similar reference characters refer to similar parts in all three views.

Referring to the drawings, the relay here shown is generally similar to the relay described and claimed in Letters Patent of the United States No. 2,300,790, granted to Robert M. Laurenson, on November 3, 1942, but the various parts of the relay have been rearranged to adapt the relay for plug-in mounting.

As here illustrated, the relay comprises a top plate 1 and a back plate 2 of suitable insulating material secured together at right angles by means of brackets 3 and 4 and screws 5 and 6. For reasons which will appear presently, the bracket 4 is preferably constructed of non-magnetic material such as brass.

A contact carrying rocker 7 of suitable insulating material is suspended from the top plate 1 for swinging movement between two extreme positions by means of two flexible strips 8 and 9, and this rocker is provided with a plurality of flexible contact fingers 10 and 11, each of which cooperates with a fixed contact member 10a or 11a to close a contact 10—10a or 11—11a according as the rocker is swung to one or the other of its extreme positions. The contact fingers are disposed in pairs and are secured to the opposite sides of the rocker within vertical grooves which maintain the fingers in the desired vertical positions, by means of studs 12 moulded into the rocker and provided at each end with a nut 13. The studs 12 also serve to secure the lower ends of the strips 8 and 9 to the rocker, thereby electrically connecting the fingers with the strips. The upper ends of the strips are secured to the heads of terminal posts 14 mounted on the top plate 1. The positions of the flexible fingers when the fingers are out of engagement with the associated fixed contact members are determined by means of stops 19 which are clamped against the outer faces of the fingers by means of the associated studs 12, and which are so adjusted by bending them that the fingers will break the con-

tacts in the desired positions in response to swinging movement of the contact carrying rocker 7.

The fixed contact members 10a and 11a are similar to the fixed contact members 18a and 18b described and claimed in Letters Patent of the United States No. 2,285,890, granted to Herman G. Blosser on June 9, 1942, for Electrical relays, and are adjustably secured to the lower ends of terminal studs 21 mounted on the top plate 1 on opposite sides of the terminal posts 14 in a manner which is similar to that described in the said Blosser patent. It is believed to be unnecessary, therefore, to describe the construction and arrangement of these fixed contact members any further herein.

The relay also comprises motor means for oscillating the rocker between its two extreme positions to alternately operate the contacts at a constant relatively low preselected frequency. As here shown, this motor means consists of an electromagnet C having pole pieces 30a and 30b secured by means of screws 31 to the opposite sides of a horizontal portion of the bracket 4 in parallel spaced relation, and connected together at one end by a core 30 surrounded by a winding 33.

The pole pieces 30a and 30b cooperate at their lower or free ends with a magnetizable armature 35 which is secured within a rectangular groove 36 formed in the lower end of a pendulum P.

The pendulum P may have any suitable form possessing within the limited space available the necessary mass to cause it to have a natural period equal to the desired code frequency, which may, for example, be 75 cycles per minute. In the form illustrated, this pendulum comprises a casting consisting of a central portion 37 provided at its opposite ends with upstanding arms 37a terminating at their upper ends in enlarged portions 37b, and with a central depending leg 37c terminating at its lower end in a foot 37d having the groove 36 referred to hereinbefore formed therein.

Secured by machine screws 38 against a machined surface 37e formed on one side of the horizontal portion 37 of the pendulum P centrally thereof is a rectangular metal plate 39, the lower edge of which is provided with an inverted V-shaped groove 39a. The apex of this groove is located at the point about which it is desired to have the pendulum oscillate, and this groove receives a knife-edge formed on a knife-edge member 40. The knife-edge member 40 is secured by means of machine screws 41 to one side of a supporting member in the form of a crosspiece 4a comprising part of the bracket 4. The metal plate 39 and knife-edge 40 together form a knife-edge bearing, and these parts are constructed of a special hardened steel to insure long life with a minimum amount of friction and wear.

Also formed on the pendulum P at its opposite side are two ears 37f (see Fig. 3) each of which is provided with an opening 37g extending therethrough. The openings 37g align axially with the axis of rotation of the pendulum P, and have pressed or otherwise secured therein thrust pins 37h provided with enlarged heads 37i disposed in the enlarged outer ends of the holes. These heads cooperate with the inner ends of screws 44 which are adjustably screwed through side members 4b comprising part of the bracket 4 and carry lock nuts 45 and washers 46 for securing them in their adjusted position. The screws 44 and pins 37h together constitute a

means for limiting endwise movement of the pendulum, and serve to keep the knife-edge bearing member in the proper relative vertically aligned longitudinal positions. The portions of the screws which extend into the enlarged outer ends of the openings 37h are somewhat smaller than the enlarged outer ends of the openings 37g to prevent frictional contact between the screws and the pendulum. The end surfaces of the screws and the heads 37i of the pins are both chromium plated to reduce friction and to insure long life with a minimum amount of wear.

The enlarged portions 37b on the upper ends of the arms 37a of the pendulum have their opposite sides flattened and are provided with tapped holes 37j for the reception of machine screws 47, whereby removable weights 48 may be attached to the pendulum to obtain frequency adjustment.

The pendulum P is operatively connected with the rocker 7 through the medium of an arm 58, the upper end of which is secured to the center of the rocker 7 by means of a bolt 49. The lower end of this arm is provided with bifurcations 58a which straddle the upper end of the metal plate 39 and cooperate with driving buttons 50 secured to the plate 39. The driving buttons are rounded, and the parts are so proportioned that oscillation of the pendulum P will cause these buttons to engage one or the other or both of the bifurcations in a point to point contact without binding in all positions of the pendulum. To prevent wear the buttons and cooperating faces of the bifurcations are preferably chromium plated and polished.

With the pendulum operatively connected with the rocker in the manner just described it will be apparent that rotation of the pendulum in one direction will cause swinging movement of the rocker in the opposite direction, and the parts are so proportioned that oscillation of the pendulum through its normal amplitude will cause movement of the rocker between its two extreme positions.

The length of the pendulum 35 is such that it is free to swing between the pole pieces 30a and 30b, and it will be seen, therefore, that energization of the winding 33 will tend to pull the armature between the pole pieces and hence will swing the rocker 7 in a clockwise direction, as viewed in Fig. 1. The energization of the winding 33 may be controlled by one set of the contacts 10—10a and 11—11a connected in series with the winding and adjusted so that both contacts are closed when the pendulum occupies its gravity biased position but that when the pendulum is swung away from this position one or the other of these contacts will become opened at a predetermined intermediate point in the stroke of the pendulum depending upon which direction the pendulum is swung.

It will be apparent that oscillation of the pendulum will cause the contacts 10—10a and 11—11a of the other set to be alternately opened and closed at the frequency of oscillation of the pendulum. These contacts may be used for coding purposes, as will be readily understood.

All of the operating parts of the relay are enclosed within a glass cover 51 which is clamped against the backplate 2 by means of screws 52 screwed into the vertical portion 4d of the bracket 4.

The pendulum P passes considerable mass, and it follows that unless some means are provided to prevent it from swinging during handling or

shipment of the relay, damage is likely to result to the knife-edge bearing, or to other parts of the relay. In accordance with my present invention, I prevent the pendulum from swinging during handling by locking means comprising a locking lever 60 in the form of a bell crank pivotally supported between the side member 4b of the horizontal lower portion of the bracket 4 by means of trunnions formed on the inner ends of the upper pair of screws 31 (see Fig. 3) which secure the pole pieces 20a and 20b of the electromagnet C to the side members 4b. The one arm 60a of the locking lever extends downwardly from the pivoted axis of the lever, and is provided with a threaded hole 60b which receives the screw threaded inner end of a locking screw 61. The locking screw 61 is formed with an enlarged shank portion 61a which extends with clearance through a hole 4e formed in a crosspiece 4c of the bracket 4, and with an enlarged head 61b which is disposed in a clearance hole 2a formed in the backplate 2. The head 61b forms a shoulder at its inner end, and endwise movement of the locking screw 61 is prevented by this shoulder and by a washer 62 disposed on the enlarged shank portion 61a of the screw 61 at the side of the crosspiece 4c opposite to the head 61b and held in place by a cotter key 63. It will be apparent that rotation of the screw 61 will rotate the lever about its pivotal axis, and to facilitate rotation of the screw 61 by a screw driver a saw kerf 61c is formed in the outer end of the head 61b. It will also be apparent that the screw 61 can be readily rotated from the outside of the case formed by the glass cover 51 and backplate 2.

The other arm 60c of the locking lever extends toward the pendulum P and is provided at the end nearest the pendulum with bifurcations 60d the free ends of which underlie the enlarged upper portion 37b of the pendulum P directly above the pivotal axis of the pendulum. The free ends of the bifurcations 60d are formed with inverted V-shaped portions 60e which cooperate with inverted V-shaped notches 37k formed in the underside of the enlarged upper portions 37b of the pendulum.

With the lock constructed in the manner described when it is desired to handle or ship the relay, the locking screw 61 is rotated in the direction to raise the arm 60b of the locking lever. This rotation causes the inverted V-shaped portion 60e of the lever 60 to enter the notches 37k in the pendulum, and is continued until the pendulum is lifted vertically to the position in which the inner ends of the screws 44 move into engagement with the bottom sides of the enlarged portions of the openings 37g in the lugs 37f of the pendulum. In this position of the pendulum, it is locked against movement, and the two bearing members are separated from each other, and it will be seen therefore that all parts of the relay will then be protected from any damage which might result if the pendulum were free to move.

When the pendulum has been locked in place for handling or shipment and it is subsequently desired to put the relay in service, the screw 61 is rotated until the bifurcations are lowered into engagement with the side members 4b of the bracket 4, as shown in the drawings and is then rotated a sufficient additional amount in the same direction to develop tension in the threads of the screw. With the parts in these positions, the relay is free to operate in the intended manner. The tension on the locking screw serves to in-

sure that the locking lever will not move away from its unlocked position due to vibration and thus interfere with the normal operation of the relay.

One advantage of holding means embodying my invention is that it provides a simple and effective method for protecting the relay parts during shipment.

Although I have herein shown and described only one form of relay having applied thereto one form of holding means embodying my 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 my invention.

Having thus described my invention, what I claim is:

1. In combination, an instrument having a fixed part and a movable part, said movable part being supported on a knife-edge bearing and being provided in its opposite sides with openings, screws extending into said openings and normally out of contact with the sides of said openings, means for at times locking said movable part against movement including a pivoted lever effective when rotated to one position to cause said screws to engage said movable part at the sides of said openings, the parts being so proportioned that when said screws are engaging said openings the knife-edge of said bearing will be out of contact with the remainder of the bearing, and means for rotating said lever to and locking it in said one position.

2. In combination, an instrument having a fixed part and a movable part, said movable part being supported to oscillate by means of a knife-edge bearing, openings provided in said movable part on opposite sides of said bearing in axial alignment with the axis about which said movable part oscillates, end thrust pins mounted in said openings and cooperating with screws extending with clearance into said openings to limit the movement of said pendulum along its axis of oscillation, and means for at times securing said movable part in a fixed position comprising a pivoted bell crank lever, means cooperating with one arm of said lever for rotating it to different positions, and means on the other arm of said lever cooperating with said movable part when said lever is rotated to one position to move said movable part to a position in which said screws engage said movable part at said openings, the parts being so proportioned that when said screws are engaging said openings the knife-edge of said bearing will be out of contact with the remainder of the bearing.

3. An electrical relay comprising a pendulum pivotally supported by means of a knife-edge bearing, openings provided in said pendulum on opposite sides of said bearing in axial alignment with the axis about which said pendulum oscillates, end thrust pins disposed in said openings, screws adjustably mounted in axial alignment with said openings in a fixed support and extending into said openings with clearance and cooperating with said pins to limit lateral movement of said pendulum about its axis of oscillation, means for oscillating said pendulum, and means for at times securing said pendulum in a fixed position comprising a pivoted bell crank lever, a rotatable screw mounted against axial movement in said support and screwed into one arm of said bell crank lever for rotating said bell crank lever about its pivotal axis, the other arm

of said bell crank lever being provided with means effective when the lever is rotated to one position to lift said pendulum off of the knife of said knife-edge bearing to a position in which said first mentioned screws engage the lower sides of said openings.

4. A relay comprising a top plate and a backplate secured together at right angles by means of brackets, a rocker suspended from said top plate, a pendulum supported in one of said brackets below said rocker and operatively connected with said rocker in such manner that oscillation of said pendulum will oscillate said rocker, contacts operated by said rocker, an armature secured to said pendulum, an electromagnet secured to said bracket and cooperating with said armature for oscillating said pendulum, openings formed in said pendulum on op-

posite sides of said bearing, adjustable screws extending with clearance into said openings and cooperating with means disposed in said openings to limit lateral movement of said pendulum, enlarged portions on said pendulum above said openings provided on their undersides with inverted V-shaped notches, a bell crank lever pivotally supported on said bracket and having one arm bifurcated and provided with inverted V-shaped portions which cooperate with said notches to raise said pendulum to the position in which said screws engage the bottoms of said openings when said lever is rotated to one position, and a screw extending through an opening in said backplate and screwed through the other arm of said lever for rotating said lever to and away from said one position.

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