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3,482,192

ALTERNATING RELAY

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FIG. 1

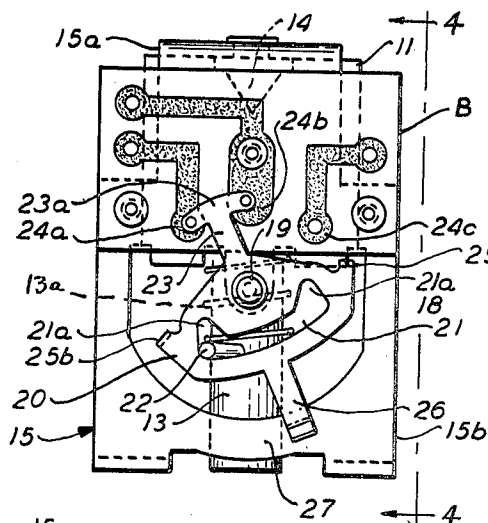


FIG. 2

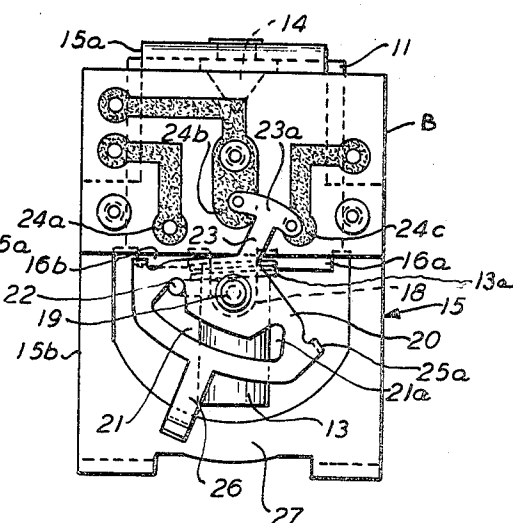


FIG. 4

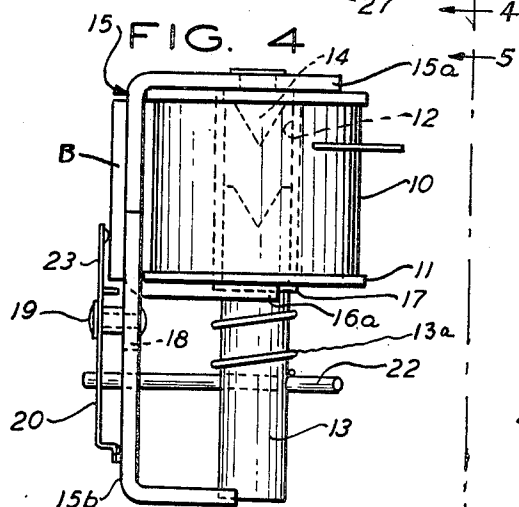


FIG. 5

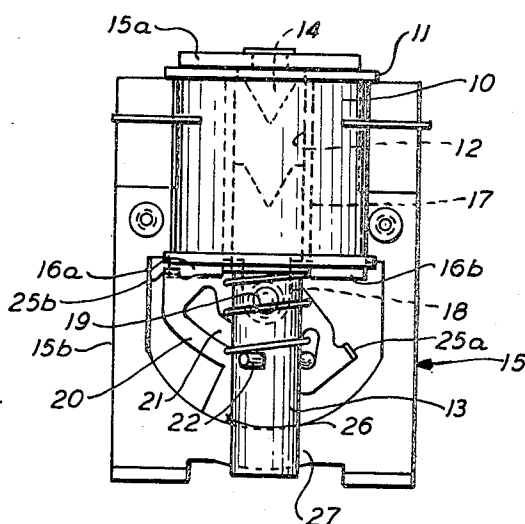
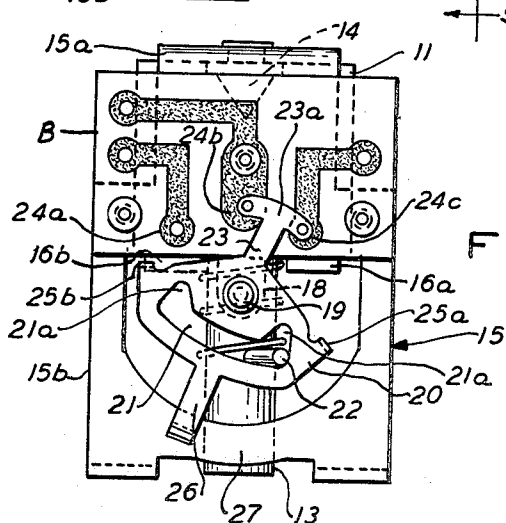


FIG. 3



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ALTERNATING RELAY

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4 Claims

ABSTRACT OF THE DISCLOSURE

A single coil alternating relay comprises a solenoid coil having a plunger and a switch rocker with a cross slot notched at the ends and engaged by a cross pin in the plunger. The plunger is weight biased to an unoperated position and is free to turn on its longitudinal axis so that the pin will fall back to the opposite end of the slot in the rocker each time the coil is deenergized. The frame of the solenoid is of a single piece construction comprising an L-shaped magnetic member of which the leg extending alongside the coil has two arms lanced over to embrace the plunger. The rocker has a contact arm for bridging pairs of contacts mounted on the frame and has a bracing arm slidably engaging the frame to place frictional restraint on the rocker and to cause the contact arm to engage the switch contacts under pressure without need for the rocker to have a hub shaft or a hub biasing spring.

An object of the invention is to provide a dependable alternating relay of very simple and economical construction.

Another object is to provide such relay wherein the switch rocker has bridging contacts to eliminate the need for any circuit connection through the frame of the solenoid.

Another object is to provide such relay wherein the switch rocker has a bracing arm slidably engaging the frame and providing an adjustable element for setting the contact pressure.

These and other objects of the invention will be apparent from the following description and the appended claims.

In the description of my invention reference is had to the accompanying drawings, of which:

FIGURE 1 is a front view of the present alternating relay showing the armature unoperated and the switch in one of its two positions;

FIGURE 2 is another front view showing the armature operated and the switch in the other of its positions;

FIGURE 3 is another front view showing the armature operated and the switch in the stated other position;

FIGURE 4 is a side view of the alternating relay as seen from the line 4—4 of FIGURE 1; and

FIGURE 5 is a back view as seen from the line 5—5 of FIGURE 4.

The present alternating relay comprises a solenoid having a coil 10 wound on a bobbin 11 as of a suitable plastic. The bobbin has an axial opening 12 in which is slidably and rotatably mounted a cylindrical plunger 13. Press fitted into one end of the opening 12 is a plunger stop 14. The plunger stop 14 is staked to one leg 15a of an L-shaped frame 15 having a side leg 15b which extends beyond the other end of the coil. Struck from the over-extending portion of the leg 15b are two arms 16a and 16b in parallel relation to the leg 15a. These arms are spaced from each other to embrace a thin-wall tubular extension 17 of the axial opening 12 of the bobbin. The frame 15, plunger stop 14 and plunger 13 are made of magnetic material to form a magnetic circuit for the coil 10.

In the blanking operation by which the arms 16 are struck from the leg 15b, there is left a central lug 18 in the plane of the leg 15b to which a pivot 19 is secured at right angles to the plunger for a switch rocker 20. The switch rocker has a central portion of a delta shape provided with a transverse slot 21 engaged by a cross pin 22 in the free end portion of the plunger 13. End notches 21a are provided in the side wall of the slot 21 nearer the coil 10. Extending from the apex of the delta is a switch arm 23 having a bridging contact 23a at the end for engaging selectively a set of three switch contacts 24a, 24b and 24c mounted insulatedly on a printed circuit board B riveted to the leg 15b. When the rocker is in one end position (FIGURE 1) determined by abutment against a stop 25a, the cross slot 21 is oblique in one direction to the plunger and the contact 23a bridges the switch contacts 24a and 24b, and when the rocker is in its other end position (FIGURE 3) cross slot 21 is oblique in the other direction to the plunger and determined by abutment against a stop 25b the contact 23a bridges the switch contacts 24b and 24c. Extending from the base of the delta is a bracing arm 26 which slidably engages an arcuate rim 27 at the end of the leg 15b spanning the width thereof. This bracing arm provides frictional restraint on the rocker to cause the plunger pin to be cammed along the slot 21 each time the plunger 13 falls back to unoperated position. Furthermore, by bending the bracing arm as with the use of a nose pliers the pressure of the bridging contact 23a against the switch contacts 24 is set without need for a pivot shaft or hub spring on the rocker.

The alternating relay is mounted in an upside-down position as shown in the figures so that when the coil is not energized the plunger will fall down by its own weight causing the cross pin 22 to be cammed to the lowermost end of the slot 21 in position directly below the respective notch 21a. In this end position of the switch rocker shown in FIGURE 1 the bridging contact 23a will interconnect the switch contacts 24a and 24b. When the coil is energized the plunger is propelled upwardly against a cushioning spring 13a causing the cross pin 22 to engage the lowermost one of the notches 21a and to shift the switch rocker to its other end position (FIGURE 2) wherein the contact 23a will bridge the switch contacts 24b and 24c. By this turning of the switch rocker the other end of the slot 21a is moved to the lowermost position. Furthermore, by reason of the frictional restraint placed on the switch rocker by the bracing arm 26 the cross pin 22 of the plunger is cammed along the slot to this other end thereof without incurring any shifting movement of the switch rocker as shown in FIGURE 3. Accordingly, when the coil is next energized the cross pin 22 will engage the notch 21a at this other end of the slot 21 to cause the switch rocker to be shifted back to its former position. Thus, by successive energizations of the coil of the solenoid the switch rocker is shifted back and forth between its two end positions to connect alternately the central switch contact 24b with the end switch contacts 24a and 24c. This operation of the relay is very dependable and is achieved with a solenoid having a one-piece frame which cooperates with the plunger to provide a magnetic circuit for the relay and which serves also as the support for the switch rocker and switch contacts.

I claim:

1. An alternating relay comprising a solenoid having a coil and a plunger therein mounted for longitudinal movement and for free pivotal movement about its longitudinal axis, said plunger being biased to unoperated position, a cross arm on a free end portion of said plunger, a frame for said coil, a switch rocker pivoted to said frame on an axis transverse to said plunger, a plurality of switch contacts mounted on said frame in arcuate arrangement about

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the pivot axis of said rocker, a contact arm on said rocker for selectively engaging said switch contacts, said rocker having a transverse slot engaged by said arm which is oblique in one direction or the other to the longitudinal axis of said plunger respectively as the rocker is in one or the other of its said end positions, and notches at the ends of said slot alternately engaged by said cross arm to drive said rocker back and forth as said coil is successively energized, said plunger being returned to unoperated position by said biasing thereof each time said coil is deenergized and said rocker being frictionally restrained to cause said plunger to be turned by camming engagement of said cross arm with said slot as said plunger is returned until the cross arm is in position to engage the lower one of said notches whereby to drive said rocker to the other of its end positions when said coil is next energized.

2. The alternating relay set forth in claim 1 wherein said rocker has a spring arm opposite said contact arm in sliding engagement with said frame for providing said frictional restraint on said rocker and for biasing said rocker on its pivot axis to provide pressure between said contact arm and said switch contacts.

3. The alternating relay set forth in claim 1 wherein said coil has a plunger stop at one end and said frame is

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an L-shaped member of magnetic material having one leg secured to said plunger stop and a second leg alongside said coil and extending therebeyond, the extending portion of said second leg having two arms lanced therefrom in parallel relation to said one leg and embracing said plunger to provide a magnetic circuit for said coil via said plunger, frame and plunger stop.

4. The alternating relay set forth in claim 3 wherein the portion of said second leg slidably engaged by said spring arm is an arcuate rim spanning the width of said second leg.

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