

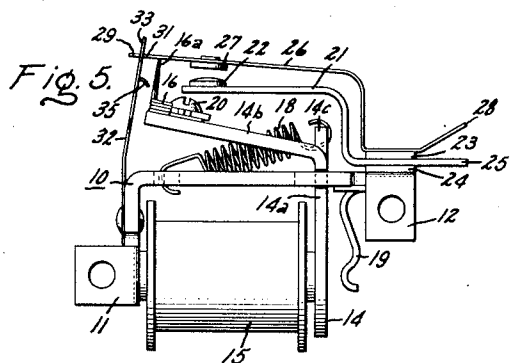
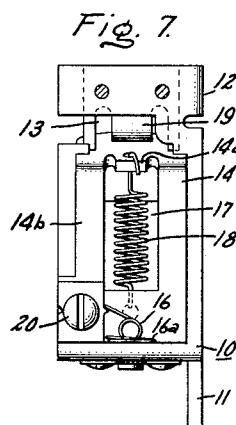
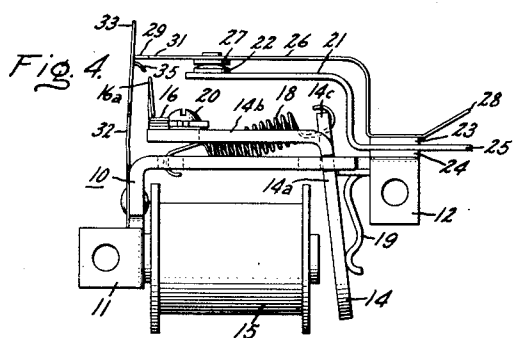
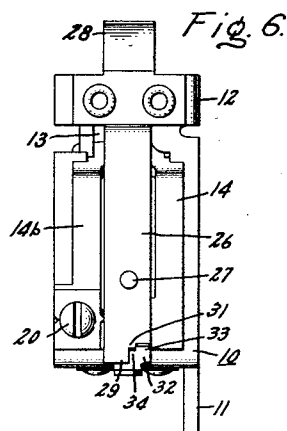
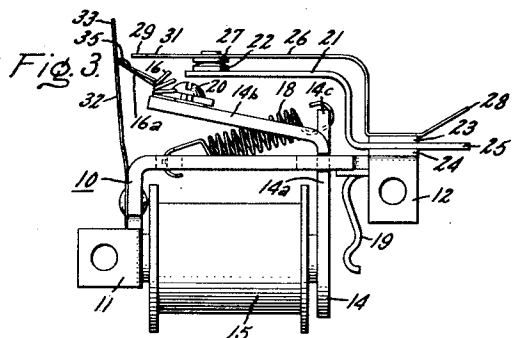
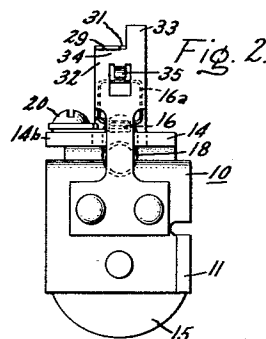
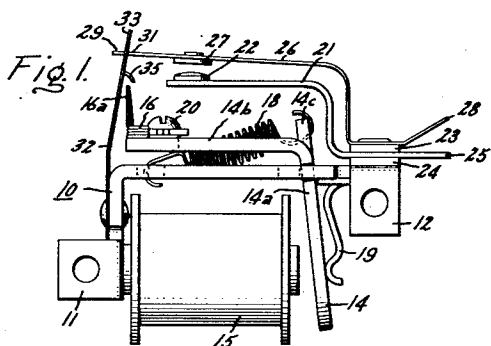
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W. P. SOMERS

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## LATCHING RELAY

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Inventor:  
William P. Somers,  
by Allen L. Snodock  
His Attorney.

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2,811,601

## LATCHING RELAY

William P. Somers, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

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6 Claims. (Cl. 200—87)

This invention relates to a relay which alternately opens and closes its contacts upon energization. More particularly, it relates to a latching relay which is operable with relatively low levels of energization.

Relays which alternately open and close their contacts upon being energized have been available for a number of years. Generally, the armatures of such relays repeat the same motion upon each energization of the relay and the change in setting of the contacts is accomplished by a mechanical tripping arrangement. For this reason, such relays are frequently referred to as "latching" or "impulse" relays. The friction in the latching mechanism has necessitated fairly powerful armature action, and the latching relays available on the market have been rather large and expensive as well as complicated.

It is an object of the present invention to provide a latching relay which is small and compact with very little friction in the latching mechanism whereby the relay is operable with a low level of energization.

Other objects of the invention will appear from the following specification when considered in conjunction with the annexed drawing in which Fig. 1 shows the relay of this invention in a contacts open position; Fig. 2 is an end view of the relay illustrated in Fig. 1; Fig. 3 is a view similar to Fig. 1 except that the relay coil has been energized and the contacts have closed; Fig. 4 illustrates the position of the elements a moment after the relay has been de-energized and the armature has returned from the position shown in Fig. 3; Fig. 5 shows the relay with the contacts in open position after the coil has again been energized when the elements were in the position illustrated in Fig. 4; Fig. 6 is a top plan view of the relay shown in Fig. 4; and Fig. 7 is a sectional plan view of the relay with the contacts and latching member removed.

Briefly stated, in accordance with one of its embodiments, this invention is directed to a latching relay comprising a frame, an electromagnetic coil mounted upon the frame, an armature pivotally mounted upon the frame, a detent mounted upon the armature, a fixed contact member, a movable contact member biased to make engagement with the fixed contact member, and a movable latching member biased to make engagement with the movable contact member, the latching member and the movable contact member having cooperating stepped ends and the latching member having a catch engageable by the detent whereby in a first position the stepped portion of the latching member holds the movable contact member out of engagement with the fixed contact member and the stepped portion of the movable contact member positions the latching member with the catch engageable by the detent to move the latching member out of engagement with the movable contact member to enable the movable contact member to assume a second position in engagement with the fixed contact member in which second position the tip of the movable contact member engages the latching member when the contacts are closed to hold the catch out of the path of travel of the detent thereby enabling the detent to engage

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the movable contact member and move it out of engagement with the latching member to restore the latching member and the movable contact member to their first positions.

The relay has a base or frame 10 which may be composed of metal and which has a pair of mounting tabs 11 and 12 as well as a lanced portion 13 (Fig. 7) adapted for the pivotal mounting of an L-shaped armature 14. The armature 14 has one leg portion 14a positioned so as to be attracted by an electromagnetic coil 15 mounted upon the base or frame 10 and another leg portion 14b upon the end of which a screw 20 maintains a spring detent 16 having a terminal portion 16a of rectangular configuration which engages a catch in a manner to be described hereinafter. The armature 14 has a latching 17 (Fig. 7) through which extends a biasing spring 18 anchored between the frame 10 and a spur 14c of the armature 14. The spring 18 biases the armature 14 against a stop member 19 which the armature engages when the coil 15 is not energized; thus the path of travel of the armature 14 is between the coil 15 and the stop member 19.

A fixed contact member 21 having a contact disk 22 is mounted on the frame 10 between a pair of insulating pads 23 and 24, the outer end of the contact 21 constituting a terminal 25 for connecting a circuit which is to be controlled. A movable contact 26 having a contacting disk 27 and terminal portion 28 is mounted on the outside of the insulating pad 23. While the contact 26 could be pivotally mounted and spring biased to achieve movement, it is simpler to make it of a resilient material which is self-biasing. As shown in Figs. 3 and 4, the member 26 is biased toward the fixed contact 21.

The tip of the contact 26 opposite the terminal 28 is stepped so as to have an extending tip 29 and a setback portion 31. The purpose of this stepped construction is to enable a latching member 32, which also has an extending tip portion 33 and stepped setback portion 34, to complement the stepped portions of the contact 26 and to cooperate therewith in effecting the latching movement of this invention.

The latching element 32, which is biased in the direction of the contact 26, has a catch 35 engageable by the rectangular end 16a of the detent spring 16 to effect movement of the latching member 32 as illustrated in Fig. 3. The cooperating position of the stepped ends of the members 26 and 32 is best shown in Fig. 2. As in the case of the movable contact 26, the latching member 32 could be pivotally mounted and spring biased toward the contact member 26 but it is simpler to construct the member of a resilient material which is self-biasing. Similarly, the spring detent 16 could be a rigid member but it has been found to have more positive action if it is displaceable in the direction of the position illustrated in Fig. 3.

The operation of the relay will now be described with particular reference to Figs. 1-5. In Fig. 1 the contacts are open and the coil is not energized. In this position, the setback surface 34 of the latching element 32 is engaging the extending tip portion 29 of the contact 26 to hold it out of engagement with the contact 21. When the coil 15 is energized, the armature assumes the position illustrated in Fig. 3 and the tip of the detent 16 engages the catch 35 to force the latching member 32 out of engagement with the movable contact 26 whereby the bias of the contact brings it into engagement with the fixed contact 21. When the coil 15 is de-energized, the biasing spring 18 restores the armature 14 to the positions illustrated in Figs. 1 and 4. Since the movable contact 26 is now engaged with the fixed contact 21, the latching member 32 engages the tip 29 of the movable contact 26 and the catch 35 is thereby out of the path of travel

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of the tip 16a of the detent spring 16. The contact disks 22 and 27 therefore remain in engagement.

When the coil 15 is again energized, the armature 14 assumes the position shown in Figs. 3 and 5. This time, however, the detent spring 16 does not engage the catch 35 but, instead, engages the movable contact member 26 to open the contacts. The tip 29 of the movable contact 26 thereupon rises above the setback 34 of the latching member 32, and the latching member, therefore, moves toward the movable contact 26 until its tip portion 33 engages the setback 31 of the movable contact 26. The relay is thereafter restored to the position illustrated in Fig. 1 upon de-energization of the coil 15.

While the invention has been described with particular reference to the embodiment illustrated, it is obvious that there are many possible variations which would still come within the true spirit of the invention. Therefore, the invention is limited only as may be made necessary by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electromagnetic relay comprising a frame, an electromagnetic coil mounted upon said frame, an armature pivotally mounted upon said frame, a detent mounted upon said armature, a fixed contact member, a movable contact member biased to make engagement with said fixed contact member, and a movable latching member biased to make engagement with said movable contact member, said latching member and said movable contact member having cooperating stepped ends and said latching member having a catch engageable by said detent whereby in a first position the stepped portion of said latching member holds said movable contact member out of engagement with said fixed contact member and the stepped portion of said movable contact member positions said latching member with the catch engageable by said detent to move said latching member out of engagement with said movable contact member to enable said movable contact member to assume a second position in engagement with said fixed contact member in which second position the tip of said movable contact member engages said latching member when said contacts are closed to hold the catch out of the path of travel of said detent thereby enabling said detent to engage said movable contact member and move it out of engagement with said latching member to restore said latching member and said movable contact member to said first position.

2. An electromagnetic relay as claimed in claim 1 wherein the armature is an L-shaped member and the detent is mounted at one end thereof.

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3. An electromagnetic relay as claimed in claim 1 wherein the movable contact member and the latching member are composed of resilient material which biases them in the direction of each other.

4. A latching relay comprising a frame, an electromagnetic coil mounted upon said frame, an L-shaped armature pivotally mounted on said frame, said armature being pivoted near the center thereof and having one end positioned to be attracted by said electromagnetic coil upon energization thereof, a detent spring mounted upon the other end of said armature, said detent spring being movable through an arc upon energization of said electromagnetic coil, a fixed contact member, a movable contact member biased to make engagement with said fixed contact member, and a movable latching member biased to make engagement with said movable contact member, said latching member and said movable contact member having cooperating stepped ends and said latching member having a catch engageable by said detent whereby in a first position the stepped portion of said latching member holds said movable contact member out of engagement with said fixed contact member and the stepped portion of said movable contact member positions said latching member with the catch engageable by said detent to move said latching member out of engagement with said movable contact member to enable said movable contact member to assume a second position in engagement with said fixed contact member in which second position the tip of said movable contact member engages said latching member when said contacts are closed to hold the catch out of the path of travel of said detent thereby enabling said detent to engage said movable contact member and move it out of engagement with said latching member to restore said latching member and said movable contact member to said first position.

5. A latching relay as claimed in claim 4 wherein the spring detent consists of a helix terminating in a catch-engaging portion of rectangular configuration.

6. A latching relay as claimed in claim 4 wherein the armature is spring-biased to a de-energized position.

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