

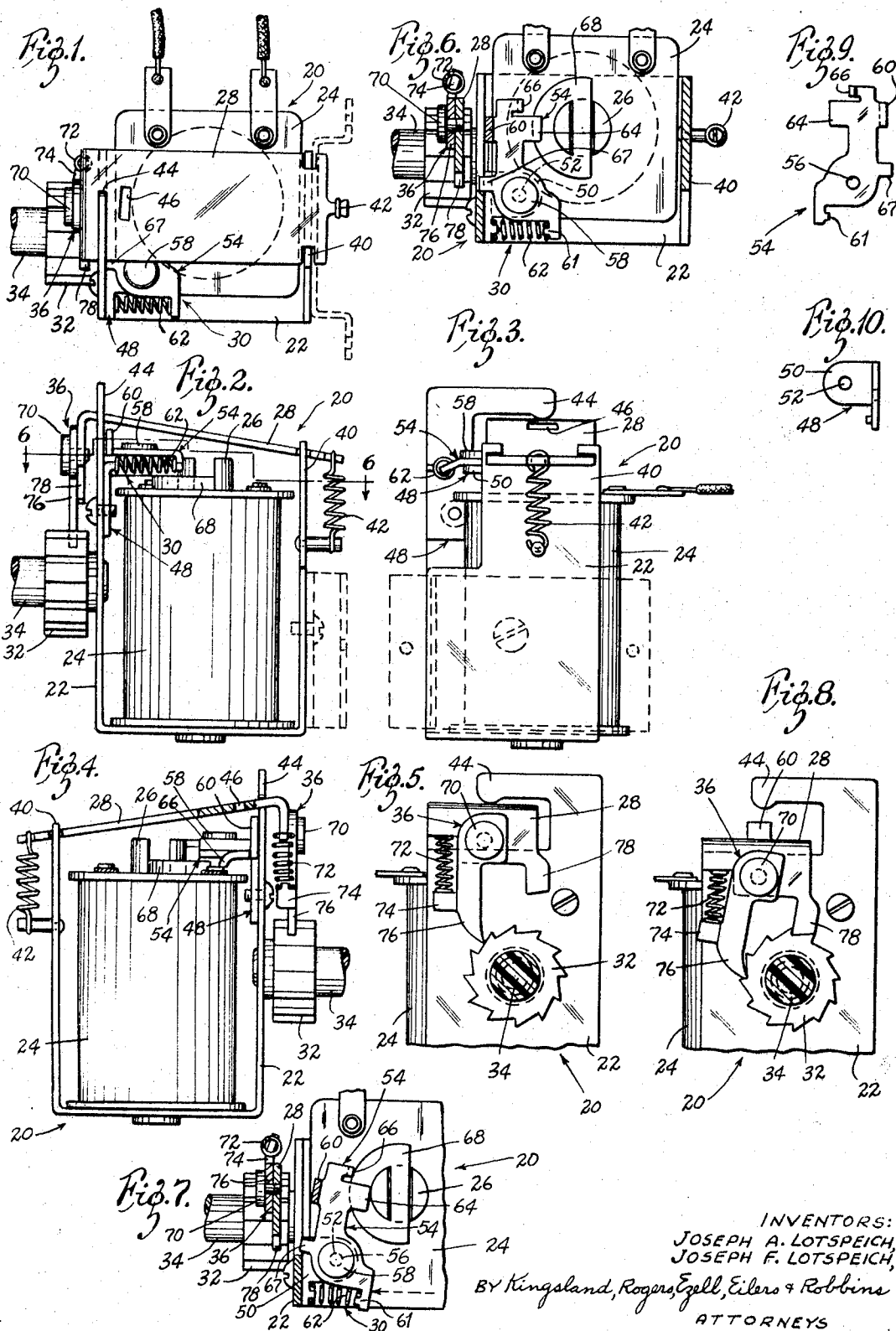
June 3, 1969

J. A. LOTSPEICH ET AL

3,448,420

SAFETY LOCK FOR ELECTRICALLY OPERATED RELAYS

Filed Oct. 22, 1965



INVENTORS:
JOSEPH A. LOTSPEICH,
JOSEPH F. LOTSPEICH,
BY Kingsland, Rogers, Ezell, Eilers & Robbins
ATTORNEYS

1

2

SAFETY LOCK FOR ELECTRICALLY OPERATED RELAYS

Joseph A. Lotspeich, Florissant, and Joseph F. Lotspeich, St. Louis, Mo., assignors to Warco Industries, Inc., St. Louis, Mo., a corporation of Missouri

Filed Oct. 22, 1965, Ser. No. 501,996

Int. Cl. H01f 7/08

U.S. Cl. 335—253

4 Claims

ABSTRACT OF THE DISCLOSURE

A relay designed to prevent premature operation due to physical shock. The relay has a spring biased latch operable only upon energization of the relay causing movement of the latch out of locking position under the armature upon operation and freeing the armature for movement. The relay is further provided with a ratchet wheel advancing mechanism, namely a contacting element driven by the armature to advance the ratchet wheel a selected distance, and a stop element is provided to limit the degree of travel of the ratchet wheel.

Electrically operated relays are conventionally used in various types of coin mechanisms and other apparatus. In such mechanisms, such as for example coin operated washing machines, and the like, it has been a problem to prevent tripping of the relay by physical shock. This physical shock can sometimes be accidental or other times be purposely caused by unauthorized personnel trying to bypass the coin operated mechanism to obtain either a free cycle of the washing machine, or in the case of vending apparatus, a free article dispensed by the machine. Such shock, sometimes even occasioned by knocking the apparatus with a hammer, can cause the coin mechanism to operate without the usual insertion of the coin.

By means of this invention there has been provided a safety lock for a relay which cannot be operated by physical shock. The safety lock prevents the armature from releasing until electrical energization causes the lock to provide a free path for the armature of the relay. In conjunction with this safety lock relay, there has further been provided a ratchet wheel trip element which insures that the ratchet wheel operates one time only upon the operation of the relay. This insures that there is no more than one preselected degree of movement of the ratchet wheel for each cycle of operation of the armature.

The safety lock and electrical relay of this invention are rugged and compact, yet relatively simple. The operation is such that maintenance is minimized, but, where required, can be simply performed. Further, the safety lock relay is inexpensive and can be widely used for any type of operation requiring an armature operated type of relay that needs a safety lock mechanism to prevent premature operation by physical shock.

A special feature of the safety lock is that it employs a spring biased member or lock lever that is sprung in a direction away from the core of the relay coil so as to operate in a plane perpendicular to the axis of the coil. The lever is made of a magnetic material, which in its normal position prevents the relay armature from moving to the actuated position. The relay armature moves in a plane parallel to the axis of the relay coil. Thus, should there be any shock that might tend to move the lock lever, this shock would be in a different direction from the shock required to move the armature because of the two directions of movement of the respective elements as above described.

The above features are objects of this invention and fur-

ther objects will appear in the detailed description which follows and will be otherwise apparent to those skilled in the art.

For the purpose of illustration of this invention, there is shown in the accompanying drawings a preferred embodiment thereof. It is to be understood that these drawings are for the purpose of example only however, and that the safety lock for the relay may take different physical forms utilizing the same basic concepts of this invention. Thus, the invention is not limited to the particular form shown in the drawings, which are for the purpose of example only.

In the drawings:

FIGURE 1 is a top plan view of the relay;

FIGURE 2 is a view in elevation of the relay taken from the left side thereof;

FIGURE 3 is a view in rear elevation of the relay;

FIGURE 4 is a view in side elevation of the relay taken from the right side;

FIGURE 5 is a fragmentary view in front elevation of the relay;

FIGURE 6 is a view in section taken on the line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary view in section taken similarly to FIGURE 6, but showing the relay with the safety lock element operated;

FIGURE 8 is a view in front elevation similar to FIGURE 5, but showing the relay and safety lock operated;

FIGURE 9 is a bottom plan view of the safety lock element; and

FIGURE 10 is a bottom plan view of the safety element support bracket.

Referring to the drawings, the relay of this invention is generally designated by the reference numeral 20. As shown, it is comprised of a relay frame 22, a relay coil 24, a magnetic core 26, an armature 28, and a safety lock means 30. Also shown connected to the relay is a ratchet wheel 32 connected to a rotatable shaft 34. A ratchet wheel trip device 36 is provided to move the ratchet wheel a distance of one tooth upon each actuation of the armature.

The structure of the armature will now be more fully described. The armature is pivoted at its rear upon element 40 of the relay frame, and is tended to be rotated about the frame in a clockwise position as shown in FIGURE 2 by means of a spring 42. A front extension of the frame has an overhanging arm portion 44 positioned over the relay to act as a stop to limit the upward movement of the front of the armature. The armature is further provided with an opening 46, which receives part of the safety lock lever, as will be further described below.

A bracket 48 has a plate-like member 50, which receives the safety lock lever. An opening 52 is provided to receive a pivot pin fitting through the safety lever. The safety lever element 54 is best shown in FIGURE 9. As there shown, it has an opening 56 receiving pivot pin 58. An upstanding stop element 60 extends above the lever underneath the solid part of the armature to provide for the lock of the armature to prevent its premature operation. A stud 61 receives one end of a compression spring 62 which biases the safety lever in a counterclockwise direction as viewed from the top, i.e., as viewed in FIGURE 1. The lever is further provided with an extension 64, which is adapted to abut against the core 26 of the relay to serve as a stop. A downwardly struck flange element 66 is likewise provided, which is adapted to bear against the shading ring 68. This relationship can best be seen by viewing FIGURES 4 and 6, which will be understood are the positions of these elements before the operation of the relay.

The ratchet wheel trip element 36 is best shown in

FIGURES 5, 7 and 8. As there shown, it is held in pivotal relation with respect to the armature by means of a pivot pin 70. The trip element is held in biased relation by means of a spring 72, which connects one end of the armature with an extension 74 of a tooth moving arm 76 of the trip device. Arm 78, attached to the armature, serves as a stop member. The arm 78 defines the limited downward movement of the armature and the trip device, since when it is contacted with the top of the ratchet wheel, as shown in FIGURE 8, it serves as a stop member.

Operation

The safety relay of this invention can be used in any circuit or environment where premature operation of the relay, due to physical shock, is desired to be prevented. The compound movement of the safety lever and the armature, each being moved in perpendicular planes with respect to one another and in sequential operation, is such that accidental dislodgment prior to electrical energization of the relay is made impossible. The relay is shown with the ratchet wheel trip device for use in movement of a ratchet wheel. The ratchet wheel being connected to a shaft 34, as shown, is one that can be used for any desired operation, such as coin mechanisms for dispensing or vending usages. Thus, controlled movement is shown in the exemplary illustration where a preselected movement of the shaft is to be desired for each cycle of operation of the armature.

In the normal position of the relay, as shown in FIGURES 1 to 6, accidental operation of the armature is prevented, since the safety lever underlies it and prevents its operation. Thus, the upstanding stop element 60 of the safety lever is out of registry with the opening 46, as shown in FIGURE 4, and the armature simply cannot be moved downwardly.

When the relay is properly energized, the circuit established through the coil establishes a flux that causes the safety lever, which is made of a magnetic material, to move toward the field. Thus, as viewed in FIGURE 1, the lever will move in a clockwise position to cause the lock element 60 to move in registry with the opening 46. Simultaneously the relay itself is brought downwardly, due to the flux established through the coil, but cannot move through its full operation until the stop element 60 moves in registry with the opening 46 of the armature. When this occurs the armature is then fully operated.

As the armature is operated, the ratchet wheel trip member moves downwardly and the ratchet wheel engaging arm 76 moves against ratchet tooth to cause the ratchet wheel to move counterclockwise as viewed in FIGURES 5 and 8. As this occurs the stop arm 78, which serves as a stop member to define the limit of travel, contacts the top of the ratchet wheel and insures that the wheel is moved only the distance of one tooth in its rotation. This completes the operation of the armature.

When the coil is deenergized the armature returns to its normal position by means of the biasing spring 42. Likewise the ratchet wheel trip device will return to its normal position. Finally, the safety lever likewise will return to its normal position through the action of its biasing spring 62. A return stop element 67 is designed to engage the extension of the relay frame to limit the movement of the safety lever in its return to its normal position.

Although the relay with the safety lock feature of this invention has been described in connection with the ratchet

wheel trip device, it will be understood that the safety relay may be used alone, or in other types of circuits. The combination of the relay with the safety lock feature and the ratchet wheel trip device, however, serves very uniquely to insure proper and foolproof operation of a step-wise or selected degree of a ratchet wheel to move a shaft a selected degree upon each operation of the relay. Thus, there is provided to this combination a unique means for providing proper control and movement of a shaft.

Various changes and modifications may be made in this invention as will be readily understood by those skilled in the art. Such changes are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A relay having means for preventing premature operation due to physical shock comprising a coil means adapted to be energized, a relay armature positioned in the field of the coil and adapted to be moved when the coil means is energized, and lock means for locking the armature against movement caused by physical shock, said lock means comprising a pivotable member provided with a lock element which has a restricted movement perpendicular to the path of the armature and operates in a plane perpendicular to the axis of the coil, said member being biased to a locking position with the lock element in blocking position underneath the armature to prevent its movement prior to energization of the coil means, said member being operable upon energization of the coil means to move the lock element away from locking position with the armature to provide for the sequential operation of the armature.

2. A relay having means for preventing premature operation due to physical shock comprising a coil means adapted to be energized, a relay armature positioned in the field of the coil and adapted to be moved when the coil means is energized, and lock means for locking the armature against movement caused by physical shock, said lock means being operable by energization of the coil means to unlock the armature, and a ratchet wheel and a ratchet wheel tooth contacting and advancing element driven by the armature for advancing the ratchet wheel a selective distance.

3. The relay of claim 2 in which the ratchet wheel contacting means comprises a member connected to the armature having a ratchet wheel tooth contacting and advancing element and a stop element movable into contact with the ratchet wheel to limit the degree of travel of the ratchet wheel contacting means.

4. The relay of claim 3 in which the ratchet wheel contacting member is pivotably connected to the armature and biasing means urging the ratchet wheel tooth contacting and advancing element into engagement with the ratchet wheel.

References Cited

UNITED STATES PATENTS

1,100,134	6/1914	Jacobson	335—254 XR
1,134,534	4/1915	Hill	335—140 X
2,382,995	8/1945	Immel et al.	335—167 X
3,293,580	12/1966	Cotton	335—253

BERNARD A. GILHEANY, *Primary Examiner.*

D. M. MORGAN, *Assistant Examiner.*

U.S. Cl. X.R.

335—123