Nov. 11, 1941. A. H. LAMB 2,262,504

RELAY

Filed Dec. 26, 1940

Fig. 1.

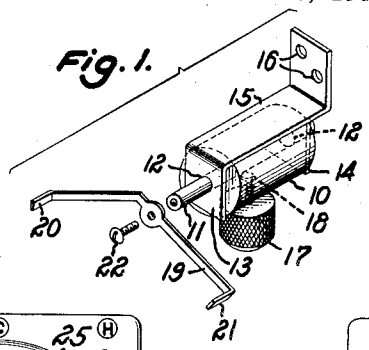


Fig. 2.

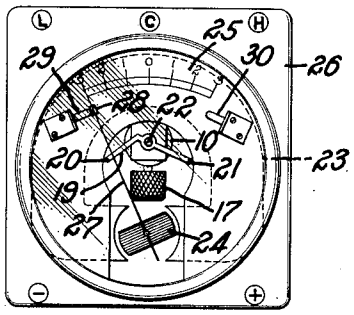


Fig. 5.

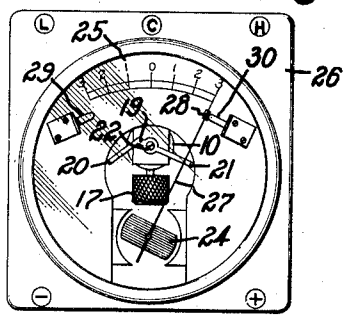


Fig. 3.

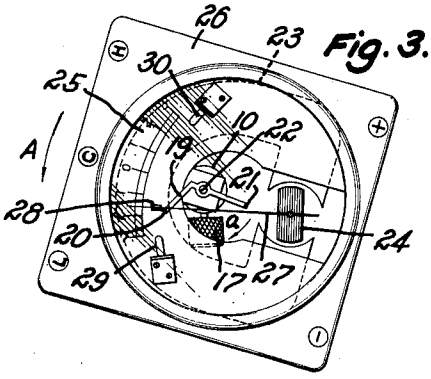


Fig. 6.

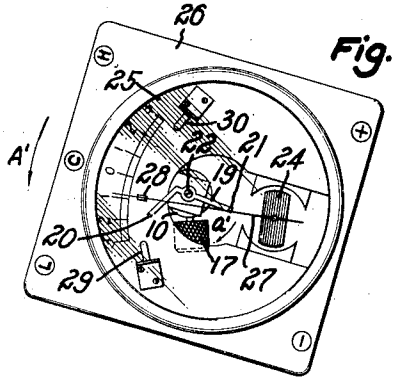


Fig. 4.

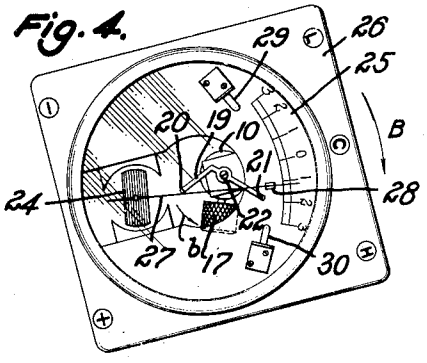
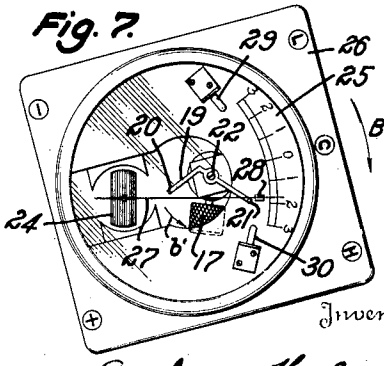


Fig. 7.



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2,262,504

RELAY

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Application December 26, 1940, Serial No. 371,755

9 Claims. (Cl. 200—110)

This invention relates to relays and particularly to sensitive relays with magnetic contacts for insuring reliable contact closures when the measured magnitude of some factor, such as current, voltage, temperature, humidity or the like, reaches a predetermined value.

The magnetic contact type of relay, as described and claimed in my prior Patents 2,014,385 and 2,014,386, comprises a highly sensitive moving system for displacing a contact arm carrying an iron contact with reference to one or a pair of relatively stationary permanent magnet contacts. The magnetic attraction supplements the force developed by the moving system to insure firm contact closures but some power, additional to the varying magnitude factor that affects the moving system, must be supplied to separate the magnetic contacts in the usual relay in which the magnetic contacts develop a force greater than that established by the moving system.

Present methods of resetting or separating magnetic type contacts consist of a mechanical finger which forces the movable contact away from the stationary contact, said finger being actuated by an electrical solenoid or a manually operated or motor-driven cam. The solenoid actuated mechanism requires a suitable source of electrical power while the cam arrangement necessitates some sort of lever construction protruding outside of the relay case. While resetting devices of these types are suitable for general relay applications, the invention herein disclosed is especially adapted for use on portable relays and in cases where the power or space required by the auxiliary power devices is not available.

An object of this invention is to provide a relay of the magnetic contact type including a gravity operated mechanism by which the relay contacts may be reset by a tilting or oscillation of the relay. An object is to provide a magnetic contact type of relay including a pendulum type resetting mechanism with suitable fingers for engagement with the contact arm of the relay, whereby tilting or oscillations of the relay causes the fingers to separate contacts which have previously closed.

A further object is to provide a relay of the magnetic contact type having a pivotally mounted contact arm and two stationary contacts and a pair of fingers rotatable about an axis parallel to the axis of the contact arm, the fingers being actuated by a swinging weight to reset the relay contacts upon a tilting or oscillation of the relay.

A still further object is to provide a relay with a contact resetting mechanism as above described wherein the fingers are so formed as to prevent the pointer or contact arm from falsely contacting with the opposite magnetized contact when the relay is rapidly tilted or oscillated.

These and other objects and advantages will be apparent from the following description when taken with the accompanying drawing. It is to be expressly understood that the drawing is merely for purposes of illustration and is not to be construed as defining the limits of the invention, reference being had for this purpose to the appended claims.

In the drawing wherein like characters denote like parts in the several figures:

Fig. 1 is an exploded perspective view of a contact resetting mechanism embodying the invention;

Fig. 2 is a front elevation of a permanent magnet movable coil type relay including the resetting mechanism of Fig. 1;

Figs. 3 and 4 are views, similar to Fig. 2, showing the displacement of the contact arm or pointer by the resetting mechanism when the relay is rotated counter-clockwise, and clockwise, respectively; and

Figs. 5, 6 and 7 are views, similar to Figs. 2 to 4, respectively, but showing the resetting of the movable contact arm or pointer from the right instead of the left stationary contact.

The invention contemplates a contact resetting mechanism including a weighted member that is freely movable with respect to the relay pointer, the entire resetting mechanism being completely inclosed within the relay casing and operable through gravity and/or inertia to reset the contacts when the relay casing is oscillated or tilted.

Referring now to Fig. 1, the main section of the weighted member is a cylinder 10 of any suitable non-magnetic material, for example brass, secured to a shaft 11 that is free to rotate in holes 12 in the parallel members 13, 14 of a mounting bracket 15. Openings 16 are provided in the bracket to receive screws for securing the resetting mechanism to the base of a relay. A weight 17 is attached to the side of the cylinder 10 by a threaded extension 18 to displace the center of gravity of the assembly 10, 17 from the axis of the shaft. The size, shape and mass of the eccentric weight 17 are governed by the space available within the relay and the strength of the magnetic contacts that are to be reset. A resetting arm or flat

strip member 19 with forwardly projecting ends 20, 21 is firmly secured to the end of shaft 11 by a screw 22.

The weight 17 will establish itself along a vertical axis when the supporting shaft 11 is substantially horizontal, and will tend to retain that position upon tilting or oscillation of the bracket 15 and the structure upon which it is mounted. The resetting arm 19 thus assumes different positions with respect to any fixed reference point on a relay upon a tilting of the relay casing in which the resetting mechanism is mounted.

A permanent magnet, pivoted coil type of instrument relay including the novel resetting mechanism is shown in Fig. 2. The circuit connections for such relays are well known and, for simplicity of illustration, have been omitted from the drawing. The permanent magnet 23, the moving coil 24, and the scale plate 25 may be of any desired design and are housed within an appropriate casing 26. A pointer or contact arm 27 is fixed to the pivoted coil in the usual manner and carries a soft iron rider or contact 28 for cooperation with relatively stationary contacts 29, 30 that are small permanent magnets.

The bracket 15 is mounted on the relay base to position the axis of the shaft 11 in the central plane of the relay and parallel to the axis of the coil 24, and the resetting arm 19 is of such shape and length that the bent ends or fingers 20, 21 are outside of the path of travel of the pointer 27 when the relay is in a normal position for a measuring or control operation.

The pointer 27 is thus free for movement by the coil 24 in response to fluctuations in a small current flow that is established by or affected by some variable factor such as temperature, pressure, humidity or the like. The pointer and its iron contact 28 approach one of the permanent magnet contacts 29, 30 as the magnitude of the control factor approaches critical values at which a control action is desired, and the iron contact 28 is thus drawn to the magnet contact by magnetic attraction which, in a highly sensitive relay, is substantially greater than any contact-separating force developed by the coil 24 in response to subsequent changes in the magnitude of the control factor. The resetting mechanism of this invention is then employed to separate the engaged contacts.

Assuming that the contral factor varied in such sense and magnitude that the pointer 27 moved counter-clockwise to effect a closure of the contacts 28, 29, the relay may be reset by tilting the entire assembly in either direction from the normal vertical position shown in Fig. 2. The weighted member 10, 17 tends to retain its normal position by gravity and inertia during this manipulation, and the relative movement of the resetting mechanism with respect to the relay is therefore in a direction opposite to that imparted to the relay casing. Tilting the relay in the direction indicated by arrow A in Fig. 3 results in an apparent clockwise rotation of the resetting mechanism, as indicated by the arrow *a*, which brings the end 20 of arm 19 against the outer end of the pointer 27 to separate the contacts. The force exerted upon the pointer 27 by the resetting arm must be sufficient to carry the soft iron contact 28 outside the effective magnetic field of the contact 29 to avoid an immediate reclosure of the contacts when the relay is restored to vertical position. A clockwise tilting of the relay casing, as indicated by arrow B of Fig. 4, results in a relative movement of the resetting mechanism in the direction shown by arrow *b*, and carries the end 20 of arm 19 into engagement with an intermediate section of the pointer 27 to separate the contacts.

Similar tiltings of the relay will bring the other end 21 of the resetting arm into operation to separate the movable contact 28 from the other stationary contact 30, Fig. 5, and the positions assumed by the movable parts upon a tilting of the relay in opposite directions are shown in Figs. 6 and 7, respectively. In these views, the arrows A', B' indicate the direction of tilting of the relay assembly and the arrows *a'*, *b'* indicate the resulting movement of the resetting mechanism with respect to the relay pointer.

The resetting operation may be due to gravity alone when the weighted member is of sufficient mass and the relay is slowly tilted, to the combined action of gravity and inertia when the relay is rapidly tilted or oscillated, or to inertia alone when the relay is positioned horizontally and rapidly oscillated. Rapid oscillation may impart a relatively high velocity to the pointer 27 as it is separated from a magnet contact by one end of the resetting arm, but the other end of the arm moves inwardly to form a stop that prevents a false engagement of the pointer with the other magnet contact. Damage to the pointer is avoided by providing stops in the path of the weight 17 to prevent the ends 20, 21 of arm 19 from engaging the pointer simultaneously. As shown in Fig. 3, the bracket 15 is preferably so positioned that the magnet 23 serves as the stop mechanism for limiting the angular movement of the resetting mechanism.

The illustrated construction is a preferred embodiment of the invention but the pivotal axis of the resetting system can be at right angles to the axis of the coil when the resetting arm is appropriately designed, or the weighted member may be supported for sliding on a rod or wire and normally retained in inoperative position by gravity or light springs. These and other modifications that may occur to those familiar with the design of instrument type relays fall within the spirit of my invention as set forth in the following claims.

I claim:

1. In a relay, the combination with a moving system for displacing a pointer with reference to a relatively stationary contact, and a contact on the pointer, both contacts being of magnetic material and one being a permanent magnet, of means for separating said contacts upon an engagement thereof; said resetting means comprising a weighted member, a support on which said weighted member is freely movable upon tilting or oscillation of the relay, and means operable by movement of said weighted member on its support to force said pointer away from said stationary contact.

2. In a relay, the combination with a moving system for displacing a pointer angularly with reference to a relatively stationary contact, and a contact on said pointer, both contacts being of magnetic material and one contact being magnetized, of means for separating said contacts upon an engagement thereof; said resetting means comprising a weighted member, means pivotally supporting said weighted member for oscillatory motion, and means operable by said weighted member upon tilting of the relay to move said pointer and its contact away from the stationary contact.

3. In a relay, the invention as claimed in claim

2, wherein said supporting means supports said weighted member for oscillatory movement about an axis parallel to the axis of said pointer.

4. In a relay, the invention as claimed in claim 2, wherein said means operable by the weighted member comprises an arm secured to the weighted member, said arm terminating in an end bent to engage the pointer.

5. In a relay, the combination with a moving system for displacing a pointer with reference to a magnetized contact, a contact of magnetic material on said pointer, and a base supporting said moving system and magnetized contact, of a mounting bracket secured to said base, a weighted member eccentrically mounted on said bracket for free oscillatory movement in response to gravity, and an arm secured to said weighted member for engagement with said pointer upon tilting or oscillation of the relay base.

6. In a relay, the combination with a moving system for displacing a pointer angularly between two spaced and magnetized contacts, a contact of magnetic material on said pointer, and a base supporting said moving system and said contacts, of a weighted member, means supporting said weighted member for free oscillatory movement by its inertia or gravity upon oscillation or tilting of the relay base, and a double-armed member secured to said weighted member and having ends spaced outside the path of movement of said pointer when said relay is in normal operating position, said ends of the double-armed member being movable into engagement with the pointer to separate the magnetic contacts upon tilting or oscillation of the relay.

7. In a relay, the invention as claimed in claim 6, in combination with stop means limiting the oscillatory movement of said weighted member to prevent simultaneous engagement of said pointer by both ends of said double-armed member.

8. Resetting mechanism for a relay of the magnetic contact type, said mechanism comprising a bracket for attachment to a relay base, a weighted member supported on said bracket for free movement in response to oscillation or tilting of the bracket, and a contact-separating member secured to the weighted member.

9. Resetting mechanism as claimed in claim 8, wherein said contact-separating member is a double-armed member with ends movable into engagement with the relay pointer upon oscillation or tilting of said bracket.

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