

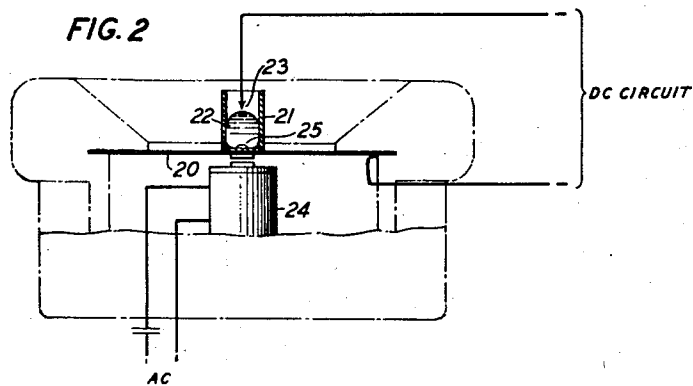
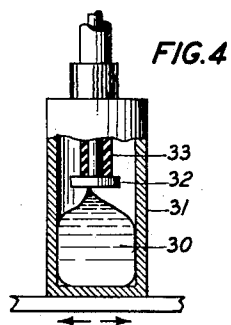
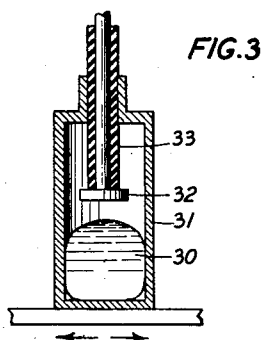
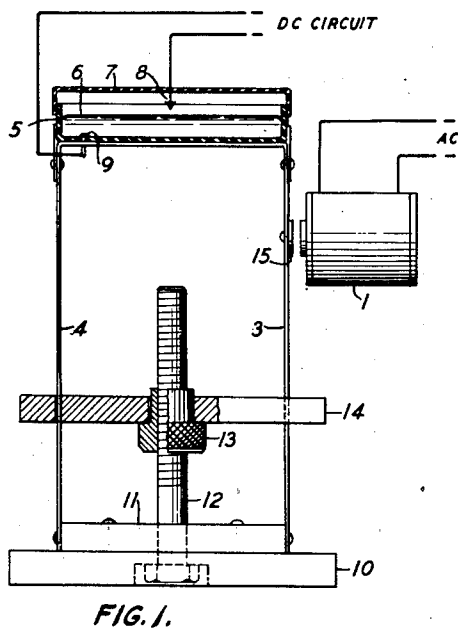
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RELAY

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RELAY

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4 Claims. (Cl. 200—91)

This invention relates to electromagnetic devices and has for its object to provide devices which will respond more accurately to alternating current.

5 An alternating current relay may be defined as a device such that when one or more sinusoidal electromotive forces are applied at the electrical terminals of an electromechanical network an electrical contact is made by two mechanical members for stated intervals of time. From this statement it follows that somewhere in the system the alternating motion or forces (electrical, magnetic or mechanical) must be rectified.

10 It has been found experimentally that when a mass of mercury having a free surface is vibrated, the configuration of the free surface is altered. The whole free surface or a portion thereof receives a steady upward displacement. The cause for this phenomena appears to be a vertical flow in the mercury which is set into existence by the applied vibration. Hence, though the mass of mercury is in vibration, yet a portion of it receives a steady vertical displacement. This amounts to a rectification of the alternating motion of the mercury and may be used to close a contact by providing a fixed electrode.

15 In accordance with the present invention, therefore, the action of rectification is achieved by the use of a vibrating mass of mercury as a contact member.

20 More specifically, the armature of an alternating current relay may include a container of suitable size, shape and material to contain a mass of mercury which, vibrating in response to alternating current applied to the relay winding, alters its configuration to make contact with a suitably located electrode.

25 The invention also contemplates the use of a small mass of mercury of the order of a drop enclosed with the corresponding electrode in a capsule to be used as a contact element for alternating current relays.

30 The invention will be more clearly understood from a consideration of the following description in connection with the drawing in which:

35 Fig. 1 shows a simple form of relay employing a relatively large mass of mercury;

40 Fig. 2 shows a relay employing a drop of mercury mounted on a watchcase receiver diaphragm; while

45 Fig. 3 shows an improved mounting for a drop of mercury while at rest;

50 Fig. 4 shows the same mounting while in motion.

55 Referring first to Fig. 1, the relay shown in-

cludes a coil 1 excited by an alternating current. Mounted on a pair of flexible springs 3 and 4 is a tank or box 5 in which may be placed a mass of mercury 6. The dimensions of this box and the depth of the mercury therein are chosen so that the pool surface itself is in resonance at the desired frequency. The cover 7 serves both to protect the surface of the mercury and as a mounting for the terminal 8. Springs 3 and 4 are held in place in the base 10 by means of a mounting plate 11. Passing through the base 10 and mounting plate 11 is a screw 12 on which is secured a nut 13 acting as a support for the clamping strip 14. A pole-piece 15 on spring 3 serves as an armature for the coil 1. When vibrated by the coil 1 the free surface of the mercury rises in the box 5 making contact with the terminal 8. Thereby the direct current circuit between the terminal 8 and the terminal 9 immersed in the mass of mercury remains closed as long as the alternating current is applied.

25 In order to make the instrument responsive to the desired frequency component of the input current, the mass of mercury may be varied in size and the clamping strip 14 may be adjusted to vary the stiffness of springs 3 and 4 and thereby mechanically tune the assembled structure to the desired frequency.

30 In Fig. 2, a watchcase type of receiver is used for vibrating the mercury contact. Mounted on the center of the diaphragm 20 is a cup 21 in which is a drop of mercury 22. Above the drop of mercury 22 is supported in any desired manner a terminal 23 forming one side of the output circuit, the other side terminating by way of the diaphragm 20 and screw 25 at the drop of mercury 22. The diaphragm is vibrated by the coil 24 in response to energization by alternating current. This vibratory motion causes the drop of mercury 22 to assume an elongated form making contact with the terminal 23 and completing the output circuit as long as the vibrations continue.

35 A convenient form in which the vibrating mercury contact may be embodied is shown in Figs. 3 and 4. The drop of mercury 30 is inserted in a soft iron capsule 31. The stationary terminal 32 encased in an insulating sleeve 33 is held in position in the opening of the capsule which is then closed by a suitable metal forming operation around the stationary terminal, thereby fastening it in place and at the same time protecting the mercury drop from oxidation or spilling. This terminal arrangement may be mounted on a diaphragm in the manner shown in Fig. 2 or may be mounted on an armature to be vibrated

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in the direction of the arrows as indicated in Figs. 3 and 4. When vibrated in either manner, the mercury assumes a pear shape as shown in Fig. 4 completing the output circuit.

5 What is claimed is:

1. In an electromagnetic device, an operating magnet energizable by alternating current, an armature for said device, a container oscillatable by said armature along a rectilinear path in response to said energization, a mass of mercury in said container restricted in cross-section by the walls of said container, the size of said container being such as to render the free surface of said mercury resonant to the energizing current, and an adjustable contact with which said mercury makes contact by its distortion at right angles to said direction of oscillation.

2. In an electromagnetic device, an operating magnet energizable by alternating current, a box having a pool of mercury therein, a pair of reed supports for said box, the size of said box and the length of said supports being proportioned to render the surface of said pool of mercury resonant to the energizing current, an armature secured to one of said supports and responsive to the energization of said magnet for oscillating said pool of mercury along a rectilinear path and an adjustable contact with which said mercury

makes contact when distorted in a vertical direction due to said oscillation.

3. In an electromagnetic device, an operating magnet energizable by alternating current, a box having a pool of mercury therein, a pair of reed supports for said box, means for tuning said reed supports, the size of said box and the length of said supports being proportioned to render the surface of said pool of mercury resonant to the energizing current, an armature secured to one of said supports and responsive to the energization of said magnet for oscillating said pool of mercury along a rectilinear path and an adjustable contact with which said mercury makes contact when distorted in a vertical direction due to said oscillation.

4. In an electromagnetic device, a diaphragm, a cup mounted on said diaphragm, a body of mercury in said cup having a restricted free surface, means to vibrate said diaphragm in response to alternating current to vibrate said body of mercury in a straight line path causing its displacement, the free surface of said mercury being resonant to the said alternating current, and an adjustable contact with which said mercury makes contact when displaced due to said vibration.

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