

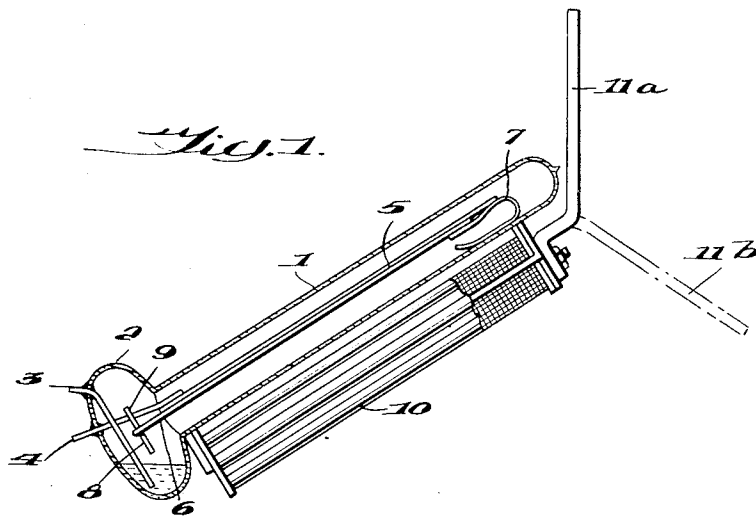
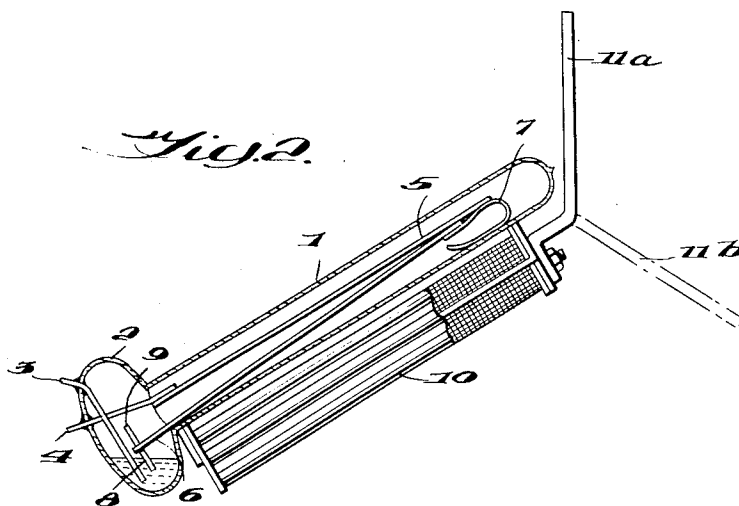
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ELECTRIC RELAY

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ELECTRIC RELAY

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The present invention relates to an electromagnetic relay having a contact-acting member arranged in a tubular container, preferably of inorganic glass, the two ends of which are closed, and provided with sealed-in electrodes, the said contact-acting member being adapted to close and/or open an operating circuit or relay output-circuit, connected to the relay electrodes, through a contact device preferably of the contact-fluid type such as mercury.

Hitherto known relays of a similar type possess the inherent disadvantage amongst others that the contact fluid, which is usually distributed in two so-called contact nipples or bulbs, is very unevenly distributed even after very small changes in the position of the relay so that the current supply to a connected operating circuit will no longer function with the necessary reliability; furthermore, a relatively high closing value is required for the primary control current to ensure reliable operation.

These and other disadvantages are eliminated in a relay according to the invention whilst additional advantages are gained. The electromagnetic relay according to the invention is mainly characterized by that the contact-acting member consists of two or more strips of an electrically conducting material of which the one of a pair, which serves as a movable magnet armature, is provided at its one free end with a contact pin and is resiliently connected at its other end to the second of the two strips, the other end of the latter being rigidly connected to one of the electrodes arranged in a tubular container of inorganic glass, for example, enclosing the contact-acting device, the other electrode being in permanent contact with the contact fluid such as mercury placed in one end of the container, for example expanded to form of a bulb or the like. The relay device according to the invention is reliable in operation and is only dependent upon its position for its accurate functioning insofar as the contact fluid must be present in the one expanded end of the container; moreover, the closing value of the control current or relay input-circuit is appreciably less than in all hitherto known types of magnetic relays; finally, the relay device according to the invention is extremely simple and therefore very reliable in operation whilst at the same time it is easy and cheap to construct. In addition, the actual relay device, that is to say, the container with the contact-acting member, can be easily exchanged.

Further characteristics of the device according to the invention will be apparent from the following description of one form of construction illustrated in the accompanying drawing wherein:

Fig. 1 is a view partly in section showing the switch in open position and

Fig. 2 is a view similar to Fig. 1 showing the switch in closed position.

Within a tubular container 1 closed at both ends and preferably of inorganic glass, that is to say, a glass body, one end of which is expanded to form a bulb 2 or the like containing a contact fluid such as mercury and provided with sealed-in electrodes 3 and 4, a contact-acting

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member is arranged consisting, for example, of two strips of an electrically conducting material 5 and 6 which are resiliently connected to one another at their one end by means of a leaf spring 7, a spiral spring or the like which spring device at the same time hold the free end of the contact-acting member in a given position within the container 1; the one strip 5 is rigidly connected at its other end to a sealed-in electrode 4 according to the form of construction shown; the second strip 6 serving as a movable magnetic armature and consisting of magnetizable material, supports at its free end contact pins 8, 9, the latter of which permits the relay after rotating about its longitudinal axis, approximately 180°, for example, to serve as a circuit-breaking relay. An electromagnet 10 is mounted on the container 1, the entire relay device being supported by a holder 11 or the like, around which the relay can turn as shown in the drawing, in which 11b indicates the position assumed after rotating approximately 180° from the position 11a.

The method of operation is substantially as follows: In the open-circuit position shown in the drawing the electromagnet 10 is currentless and the contact-acting member's armature, the strip 6 with the help of the spring 7, holds the contact pin 8 raised above the mercury in the bulb 2, the electrode 3 being in permanent contact with the said mercury. When the electromagnet 10 is placed under current by the closure of the control circuit or the input circuit, the magnet attraction acting on the strip 6 overcomes the force of the spring 7 whereupon the free end of the strip 6 is drawn to the magnet 10 or into its field of force and the contact pin 8 makes connection with the mercury and establishes an electrically conducting connection between the sealed-in electrodes 3, 4, thereby instantaneously closing an operating circuit connected thereto. This position, the operating position, is maintained as long as the electromagnet 10 is under current. When the electromagnet 10 again becomes currentless in consequence of a change of current in the control- or input circuit, its closing power ceases or is overcome by the pull-off power of the spring 7 whereupon the strip 6 returns to its initial position and the contact pin 8 is raised from its position of contact with the mercury and the operating current or the relay output circuit is instantaneously broken again.

When the relay device is rotated about its longitudinal axis approximately 180° the arrangement operates in the reverse direction; in this position the contact pin 9 is in permanent connection with the mercury in the relay's position of rest in which the electromagnet 10 is currentless and the operating- or relay output circuit is closed. If the control- or input circuit is closed, the electromagnet 10 will be placed under current whereupon its attractive closing power to the strip 6 overcomes the counteracting force of the spring and the operating current is instantaneously interrupted. When the electromagnet 10 again becomes currentless, the spring 7 once more returns the strip to its initial position in which the contact pin 9 again comes into contact with the mercury and the operating current is again switched in.

The invention is not limited to the form of construction described here and illustrated in the drawing, but may be modified in various ways with regard to its details without departing from the basic inventive principle or exceeding its scope.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. An electromagnetic relay comprising, a sealed tubular container, a mercury well formed of the walls of the container and located at one end of said container, said container being adapted to lie at an acute angle with respect to the horizontal with said mercury well located at the lowered end; a pool of mercury contained in said

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well, a first electrode sealed in a wall of said container, a second electrode sealed in a wall of said container, in contact with said mercury pool, two strips of material resiliently connected together at the ends remote from the mercury well, said strip extending substantially the length of the tube; one of said strips being stationary, and connected to said fixed electrode, the other strip forming an armature and being of magnetic material and resilient and capable of being bent to enable the end of the strip remote from the connected end to touch said mercury pool so as to make electric contact therewith, the end of the strip making contact with the mercury being equipped with a contact pin; an electromagnet extending along said container and capable when energized of attracting the resilient strip whereby, when said resilient strip is drawn into contact with said mercury pool by said electromagnet, a closed path for electricity through said relay is formed.

2. The apparatus as defined in claim 1 in which provision is made for both normally-open and normally-

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closed contact operations, said container being rotatable about its longitudinal axis so as to bring the contact pin into contact with said mercury pool while said electromagnet is de-energized, whereby the path for electricity through the relay can be broken upon energization of said electromagnet.

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