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ARRANGEMENT FOR CURRENT IMPULSE RELAYS

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Fig. 1.

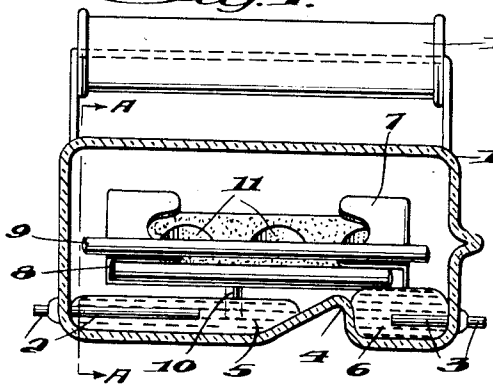


Fig. 2.

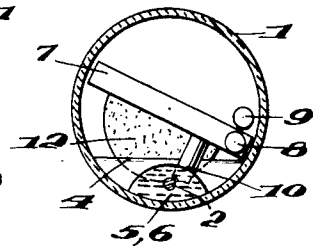


Fig. 5.

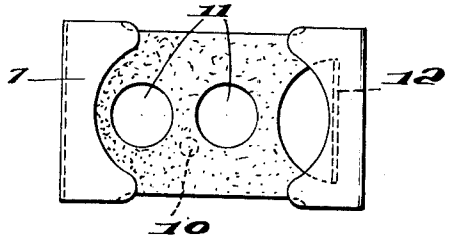


Fig. 3.

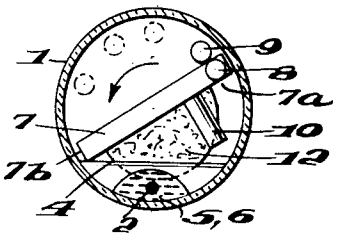


Fig. 6.

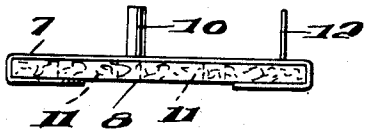
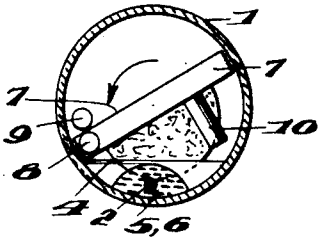


Fig. 4.



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ARRANGEMENT FOR CURRENT IMPULSE RELAYS

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6 Claims. (Cl. 200—112)

The present invention relates to an arrangement for current impulse relays preferably to the electromagnetically controlled type, having a contact-controlling member located within a tube, preferably of inorganic glass, the two closed ends of which are each provided with its contact device such as a contact fluid for example, the said contact-forming member alternately making and breaking the electric connection between the two said contact devices for the purpose of opening and closing an operating circuit connected thereto.

Devices have previously been proposed by one of us in which the contact-controlling member here referred to consists of a holder or the like of non-magnetic electrically conducting material adapted to rotate and located within a glass container the two ends of which are closed and expanded to form globes, the said holder surrounding and enclosing a magnetically influenced control bar such as an iron wire or the like which is displaceably arranged within the same and carries contact bars at its two ends which establish the electric connection between the above-mentioned contact devices in the operating position of the relay.

This construction represents a considerable improvement but after extensive investigations and test it was found that certain drawbacks still had to be overcome; for example, the mercury distillate (contact fluid) collected in the centre part of the glass container between the end globes and exercised a detrimental effect on the movement of the control bar and the exact initiation of contact for the impulse coming from the electromagnet. Moreover, it was still necessary during assembly to distribute the quantity of mercury as uniformly as possible in the two globes and periodically control this distribution; for certain forms of use the required operating output was too great so that in such cases the employment of relays had to be dispensed with; it must be possible to produce the glass container with simple and reliable mechanical means of production. The uniform distribution of the mercury distillate formed must be able to take place automatically. The rupturing capacity of the relay had to be higher than in previously known forms and the ohmic load might be at least 10 amperes alternating current. The work and investigations of the inventors led to the arrangement according to the present invention which is mainly characterized by a contact member which surrounds a control bar serving as a magneto armature, consisting, for example, of a strip of some non-magnetic electrically conducting material bent up at its short ends, the said contact member supporting a contact arm which constantly touches the contact fluid such as mercury, and stands in conductive connection with one of the electrode terminals covered by the control fluid, whilst closer to its opposite short end it carries a contact pin of a material resistant to the contact fluid and arranged close to one longitudinal edge of the strip whilst at its upper side it supports a counterweight bar which locks the contact member in the position produced by the control bar following a magnetic impulse and wipes off any contact fluid adhering to the inner wall of the glass container, the said counterweight bar, on the constrained rotation of the contact member caused by the attraction of the control bar, then being thrown along a path determined by the inner wall of the tube holder (glass container) to the opposite longitudinal edge of the contact member, whereupon the contact pin, on the magnetic impulses at the contact bar, is moved by its supporting contact member to alternately open and close the connection to the part of the contact fluid covering the other electrode terminal, this latter contact fluid being separated by a partition formed by a constricted portion in the lower wall of the glass holder from that part of the contact fluid covering the first electrode terminal, the quantities of both parts of the contact fluid being in a ratio which is not less than 3:1, the smaller part, which always lies at a higher level than the larger part, establishing the permanent connection between the aforesaid contact arm and the electrode terminal cooperating with the same for the purpose of preventing the magnetically operated control bar from falling back on the de-energisation of the magnetic field (magnetic flux) and thereby turning the contact member back to its initial position.

This arrangement according to the invention also enables the friction formerly necessary between the contact member and the inner wall of the glass container to be dispensed with, since the contact member can now be mounted on spindles when required, which according to the experience gained during the investigations, enables the controlling power to be reduced to at least half whilst retaining the power of stroke, so that a relay arrangement according to the invention can be operated with an extremely small controlling impulse (operating current) and works reliably and with certain reproduction.

Further characteristic features of the arrangement according to the invention will be seen from the following description of a form of construction shown by way of example in the accompanying drawing.

Fig. 1 shows an arrangement according to the invention in longitudinal section, Figs. 2, 3 and 4 being cross-sectional views taken along A—A of Fig. 1, whereby: Fig. 2 shows the relay device in the so-called initial position with a closed operating circuit, that is to say, the position in which the contact member connects the arrangement's contact fluid parts and the bottom contacts respectively, and the control bar is not acted on by any magnetic force, whilst the counterweight bar is in the locking position at the lower longitudinal edge of the contact member.

Fig. 3 shows the same arrangement in the position in which the contact member has been rotated to the highest open position by the magnetic action of the control bar which has been attracted, and the counterweight bar under the effect of the centrifugal force, leaves its position of contact with the contact member and is moved along the path (marked on the drawing) determined by the centrifugal force and the inner wall of the glass container, over to the contact member's opposite longitudinal edge where it locks the contact member in the position it has assumed while the control bar is still under magnetic influence, whereby the counterweight bar wipes off any contact fluid adhering to the glass walls.

Fig. 4 shows the same arrangement in the same open position as in Fig. 3 but with the contact bar which is no longer magnetized in the position for locking the contact member at the same edge, as that previously occupied by the counterweight bar (Fig. 3).

Figs. 5 and 6 show the contact member with the semicircular contact path, for example, for the smaller quantity of contact fluid and the contact pin.

Within a tubular holder **1** of inorganic glass, for example, the two ends of which are closed and provided with bottom contacts consisting of inserted electrodes **2**, **3**, covered by a contact fluid such as mercury, at the lower part of the holder a partition **4** is formed by a constriction or narrow part for separating the contact fluid into two parts **5**, **6**, the quantities of which are in a volumetric relation to one another which must not be less than 3:1 and of which the level of the lesser part **6** always lies higher than that of the greater part **5**, a strip- or leaf-shaped contact arm **12** rotatably arranged within the tubular glass holder **1** and mounted at one end of the contact member **7**, which is turned up at its two ends and consists of a non-magnetic material provided with openings **11** for reducing its weight and returning the contact fluid condensate, being in permanent connection with the said contact fluid part **6**. Close to its opposite end and one of its longitudinal edges the contact member **7** supports a contact pin **10** consisting of a material re-

sistant to the contact fluid, such as tungsten, the said contact pin **10** in the closing position of the relay arrangement (Fig. 2) for closing an operating circuit, being in connection with the larger part of the contact fluid **5**, this connection being interrupted in the so-called off position (Figs. 3 and 4). The contact member **7** is locked in a position it has assumed by a counterweight bar **9** (Figs. 2 and 4) consisting, for example, of inorganic glass or other non-magnetic dielectric material which is resistant to the contact fluid.

The operation and manner of action of the arrangement according to the invention is substantially as follows:

In the initial position shown in Fig. 2, in which a connected operating circuit (not shown in the drawing) is closed through the contact member **7** and its contact arm **12** and the contact pin **10** each of which is in contact with its quantity of contact fluid (mercury) **5**, **6**, the control bar **8** is actuated by any magnetic impulse from an electromagnet **13**. The counterweight bar **9** locks the contact member **7** in the position it has assumed. As soon as an electromagnetic impulse actuates the control bar **8** the latter is immediately attracted by the magnetic field and raises the edge of the contact member **7** at which the control bar **8** and counterweight bar **9** are located with a rapid upward movement whereby owing to the rotation of the contact member **7** determined by the wall of the gas holder **1** surrounding it, around its longitudinal axis, the contact of the contact **10** with the part of the contact fluid **5** is rapidly removed whilst the contact arm **12** executes a rotary movement corresponding to that of the contact member **7** while maintaining connection with the part of the contact fluid **6**; at the same time the counterweight bar **9** is thrown along the path determined by the centrifugal force and the inner wall of the glass holder **1** along the surface of the latter wall whereby the said counterweight bar **9** wipes off or carries with it any contact fluid adhering to this wall surface (Fig. 3) and drops down on the contact member's **7** opposite, and now lower, longitudinal edge where it locks the contact member **7** in the open position it has now assumed (Fig. 4) so that the control bar **8**, which on the cessation of the magnetic impulse effect caused by the interrupting of the operating current drops down under its own weight, must follow the path determined by the bent-up ends of the contact member **7** and cannot, in its falling or sliding movement, press down the longitudinal edge *7a* of the contact member **7** which is in a higher position than edge *7b*, and thus turn the latter back to the position for again closing the operating circuit (Fig. 2), the working circuit. Instead, the control bar **8** slides down to the longitudinal edge of the contact member **7** loaded by the counterweight **9** and thus locks the former in the open position it has assumed (Fig. 4).

On receiving a new magnetic impulse the procedure described is repeated in the reverse direction whereby an operating circuit connected up is immediately closed (Fig. 2). Any contact fluid carried along by the counterweight bar **9** runs back to the respective contact fluid parts **5** and **6** through the holes **11** provided in the contact member **7**. Any contact fluid distilled over to the contact fluid part **6** runs back automatically to the mercury part (contact fluid part) **5**.

The invention is not limited of course, to the form of construction described here and illustrated in the drawing, but can be modified in various ways as regards to details without departing from the basic inventive principle or exceeding its scope. The arrangement need not be enclosed in an evacuated vessel; the rotary movement of the contact member **7** may be transmitted to previously known current controlling devices such as one or more rotary mercury tubes, switches which are not of the contact-liquid type and the like; in place of holes **11** slots or grooves may be provided for the contact member **7** which latter may have another form; the same may also constitute a container for the control bar **8**. The counterweight bar **9** may consist of a number of bars, balls or the like. In place of the constriction **4** in the wall of the glass holder **1** a partition, a dam or the like may be provided. The contact member **7** may be supported on spindles; two or more contact members **7** may be combined in one unit.

We claim:

1. A current impulse relay comprising, a closed tubular container, contact means in each end of said container, a non-magnetic electrically conducting contact member rotatably mounted in said tubular container, said member being elongated in transverse cross-section and displaceably containing an axially disposed magnetically actuated control bar, electromagnetic means operable upon energization to move said control bar within said contact member and rotate said member to an "open" position, said control bar upon de-energization of said electromagnetic means moving within said member to an opposite position preparatory to again rotating said member in a reverse direction to a "closed" position, a first contact element permanently connecting said member to said contact means at one end of said container, a second contact element connecting said member to said contact means at the other end of said container only when said container is in "closed" position, and a counterbalance for locking said container in "open" and "closed" positions after movement of said rod within said container.

2. An arrangement according to claim 1 in which said contact means comprise an electrically conducting fluid and said contact member is provided with openings to permit drainage of said fluid therethrough.

3. An arrangement according to claim 1 in which said counterbalance comprises a plurality of units.

4. An arrangement according to claim 1 in which said contact means comprises an electrically conducting fluid located in the bottom of said container, and an insulating material forming a partition to divide said fluid into two parts.

5. An arrangement according to claim 4 in which said container and partition are integral and formed of glass.

6. An arrangement according to claim 1 in which said contact member is mounted to said container on spindles.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,545,669	Meyer	Mar. 20, 1951

FOREIGN PATENTS

Number	Country	Date
120,958	Sweden	Feb. 24, 1948
137,261	Great Britain	Jan. 8, 1920