July 26, 1932. H. M. BASCOM 1,868,559

RELAY

Filed June 17, 1930

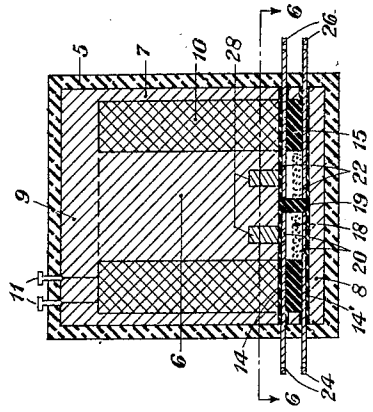


Fig. 5

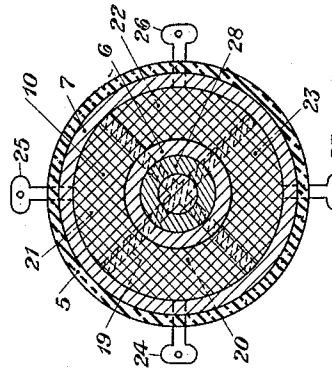


Fig. 6

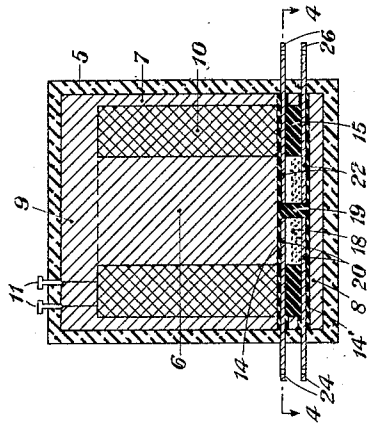


Fig. 3

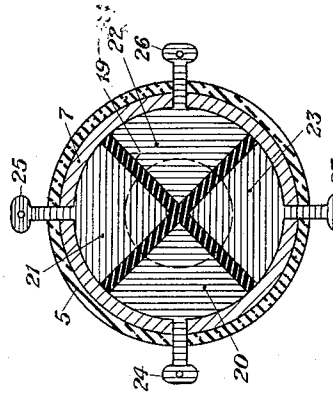


Fig. 4

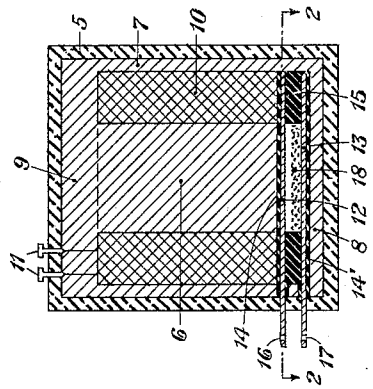


Fig. 1

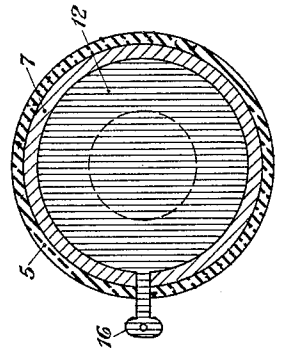


Fig. 2

INVENTOR

H. M. Bascom

BY J. E. Folk

ATTORNEY

Patented July 26, 1932 1,868,559

UNITED STATES PATENT OFFICE

HENRY M. BASCOM, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

RELAY

Application filed June 17, 1930. Serial No. 461,756.

This invention relates to electromagnetic devices, and more particularly to such devices which are commonly termed relays.

It is one of the objects of this invention to provide an improved type of relay which is simple and compact of construction.

Another object is to provide a relay with multi pairs of contacts for controlling a plurality of circuits.

Another object of the invention is to provide a relay with contact elements which are relatively unaffected by vibration and free from the accumulation of dirt.

A further object is to provide for greater reliability in the functioning of the contact elements.

The novel features which are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and method of operation, together with other objects and advantages thereof, will be further explained in the following detailed description, having reference to the accompanying drawing consisting of the following figures:

Figure 1 is a side elevation in section of the improved device provided with a single contact chamber;

Fig. 2 is a view on a line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing the device provided with a plurality of contact chambers;

Fig. 4 is a view taken on the line 4—4 of Fig. 3;

Fig. 5 is an elevation showing another modification of the invention; and

Fig. 6 is a view taken on the line 6—6 of Fig. 5.

Referring to the drawing, the casing 5 for the improved device therein illustrated is shown as being of substantially cylindrical form. This casing may be composed of any suitable non-magnetic material, and while it is shown and described as being of a particular shape, it will be understood that it may be of a different formation. The casing completely encloses the various elements of the relay, which will be later described, and may be substantially air-tight to prevent the entrance of dirt or other foreign matter. A core having suitable magnetic properties, such, for instance, as permalloy, is provided for the relay. This core comprises a central cylindrical portion 6, a spaced outer circular portion 7, which is concentric thereto, and a bottom circular portion 8. A top circular portion 9 forms a cap for the other elements of the core. A coil 10 is wound about the central portion 6 of the core, and occupies the space between the core elements 6 and 7. The ends of the winding of the coil 10 are connected to terminals 11 carried by the casing 5. These terminals furnish connection points for the conductors of a circuit by which the relay is energized.

A chamber is provided between the base portion 8 of the core and the bottoms of the portion 6 of the core and the coil 10. In Figs. 1 and 2, contact plates 12 and 13, which may be substantially flat and circular in form, are mounted in a parallel position with respect to each other within this chamber. A disk 14 of insulation is provided between the plate 12 and the bottoms of the portion 6 of the core and the winding 10; and a second disk 14′ of insulation is provided between the bottom plate 13 and portion 8 of the core. The contact plates 12 and 13 are insulated from each other by a washer 15 which is positioned in the chambers previously mentioned. The contact plates 12 and 13 in Fig. 1 are provided with terminals 16 and 17, respectively. These terminals are connected with the contact plates by extensions which pass through openings provided in the portion 7 of the core and in the wall of the casing 5. The extensions to the terminals are properly insulated from the core, and the terminals furnish connection points for the conductors of a control circuit.

In Figs. 1 and 2, comminuted material 18 is provided in the chamber at the bottom of the casing within the washer 15 previously referred to. In Figs. 3 to 6, inclusive, this chamber is divided into four compartments by an insulating member 19 which is provided with four radial arms. The member 19 may be integral with the washer 15. In Figs. 3 to 6, inclusive, there are four pairs of seg-

mental contact plates 20, 21, 22 and 23 provided. Each of the pairs of contact plates is positioned in a compartment between the radial arms of the member 19, and pairs of terminals 24, 25, 26 and 27 are provided for the contact plates. Each pair of terminals furnishes connection points for the conductors of control circuits. The material 18 may be composed of any suitable magnetic dust, for instance, permalloy dust. Owing to its high initial permeability and low coercive force, permalloy dust should render the relay relatively sensitive in operation. The dust may be plated with gold, or other suitable metal, if desired, to obtain a contact of comparatively low resistance. Upon the excitation of the coil 10, a magnetic field is caused to traverse the central and outer sections of the core, and is closed through the material 18 in the chamber or chambers. The comminuted material contained in the chamber or chambers is attracted upwardly in the path of the flux and is held between the single pair of contact plates 12 and 13 in Figs. 1 and 2, and between the multi pairs of contact plates 20, 21, 22 and 23 in Figs. 3 to 6, inclusive. In this position said material acts as a conductor and bridges the gap between said contact plates, closing the external or control circuits over the conductors connected to the pair of terminals 17 and 18 in Figs. 1 and 2, and the multi pairs of terminals 24 to 27 in Figs. 3 to 6. To obtain a slow operate feature of the relay the comminuted material may be immersed in oil. When the excitation of the coil ceases, the comminuted material falls from the upper contact plates and opens the external circuits.

Figs. 1, 2 and 3, 4 are adapted to be connected to a source of direct current. Figs. 1 and 2 are provided with a pair of contacts to which the conductors of one control circuit are connected. Figs. 3 and 4 are provided with multi pairs of contacts, and each pair is connected to a control circuit.

Figs. 5 and 6 disclose a modification of the relay shown in Figs. 3 and 4. The relay shown in Figs. 5 and 6 is similar in construction and operation to the relay illustrated in Figs. 3 and 4, but is adapted to be used with alternating current. The portion 6 of the core in Figs. 5 and 6 is provided with a shading ring 28 which is shown as positioned in circular openings provided in the portions 6. The shading ring may be composed of copper or any other good conducting material which has no appreciable resistance, and is suitably insulated from the core and from the pairs of contact plates 20, 21, 22, and 23. The ring lies in a coaxial position with respect to the portion 6 of the core and the pairs of contact plates. The ring 28 is included in the cross-section of the magnetic circuit. When a change of flux occurs in the magnetic circuit, current is generated in the ring in such a direction that it opposes and delays a corresponding change in the flux which it interlinks. In this way a continuous flux is insured through some portion of the air gap and a constant attraction of the comminuted material is maintained somewhere between each of the pairs of contact plates 20, 21, 22, and 23 when the coil is excited by alternating current.

To reduce oxidation or arcing, an inert gas, such as nitrogen, may be introduced into the contact chambers of the structures shown in the various figures.

In the operation of the improved devices, the electromagnetic structures are energized by an electric current. This causes an excitation of the coil which in turn causes the magnetic dust contained in the chambers to bridge the gap between each pair of parallel contact plates, and close a circuit over the conductors connected to each pair of contact plate terminals.

What is claimed is:

1. A unitary relay structure comprising a core and a coil associated therewith, parallel contact elements spaced one above the other and having a gap therebetween, said contact elements forming the terminals of an electrical circuit, and comminuted material responsive to the excitation of the coil for closing the gap between said contact elements.

2. A unitary relay structure comprising a core and a coil associated therewith, two parallel contact elements spaced one above the other and having a gap therebetween, comminuted material responsive to the excitation of the coil for closing the gap between said contact elements, and a casing for enclosing all of the structure of the relay.

3. A relay comprising a core and a coil associated therewith, a plurality of pairs of contact elements for the relay, each pair having a gap therebetween, comminuted material resting on one of the elements of each pair and becoming responsive to the excitation of the coil for closing the gap between both of the elements of each of the pairs, and terminals associated with each pair of contact elements.

4. A relay comprising a core and a coil associated therewith, a plurality of pairs of contact elements for the relay, each pair of the contact elements being in a compartment and having a gap therebetween, comminuted material in each of the compartments resting on one of the elements of each pair and responsive to the excitation of the coil for completely closing the gaps between all of the pairs of contact elements, and a casing for enclosing all of the elements of the relay.

5. A relay comprising a core and a coil associated therewith, a plurality of pairs of contact elements, each pair of contacts

having a gap therebetween, comminuted material resting on one of the elements of each of the pairs and responsive to the excitation of the coil for completely closing the gaps between each pair of contact elements, and means associated with said core for insuring constant attraction of a portion of said material in each gap upon excitation of the coil by alternating current.

6. A unitary relay structure comprising a core having an outer casing and a central extension, a coil positioned between said casing and central extension, a plurality of pairs of contact elements arranged in parallel position with respect to each other and having equal gaps therebetween, comminuted material between the contact elements of each pair and resting on one of said elements and responsive to the excitation of the coil for completely closing the gap between said contact elements, and a housing for enclosing the elements of said relay.

7. A unitary relay structure comprising a core and a coil, a pair of parallel contact elements having a gap therebetween, means enclosing said contact elements to form a chamber resting on one of said elements and spaced from the other, and comminuted material in said chamber responsive to the excitation of the coil for closing the gap between both of said contact elements.

8. A unitary relay structure comprising a coil having a gap in its magnetic circuit, separated contacts in said gap, and comminuted material in said gap resting on one of said contacts and spaced from the other of said contacts, said comminuted material being movable in response to the excitation of said coil to completely bridge the separation between said contacts.

9. A relay comprising a core and a coil, a plurality of pairs of contact elements having a common gap between the elements of each pair, means enclosing said contact elements to form a chamber, comminuted material in said chamber resting on one of the elements of each pair and responsive to the excitation of the coil for completely closing the gap between said contact elements, and means associated with said core for insuring the constant attraction of a portion of said material in the gap upon excitation of the coil by alternating current.

10. A relay comprising a core and a coil, said core having a gap in its magnetic circuit, a plurality of pairs of separated contact elements in said gap, comminuted material in said gap resting on one of the elements of each pair and movable in response to the excitation of said coil to completely bridge the separation between said contact elements, and means associated with said core to cause the attraction of a portion of said comminuted material to permanently bridge a portion of the gap upon excitation of the coil by alternating current.

11. A relay comprising a core and a coil, a pair of contact elements having a gap therebetween, means enclosing said contact elements to form a chamber, comminuted material in said chamber resting on one of said elements and spaced from the other and responsive to the excitation of the coil for completely closing the gap between said contact elements, and an inert gas in said chamber.

12. A relay comprising a core and a coil, a pair of contact elements having a gap therebetween, means enclosing said contact elements to form a chamber, comminuted material in said chamber resting on one of said elements and spaced from the other and responsive to the excitation of the coil for completely closing the gap between said contact elements, and gas in said chamber to prevent oxidation and arcing.

In testimony whereof, I have signed my name to this specification this 13th day of June, 1930.

HENRY M. BASCOM.