June 4, 1940. H. M. BASCOM 2,203,321

SWITCHING DEVICE

Filed Sept. 27, 1939

FIG. 1

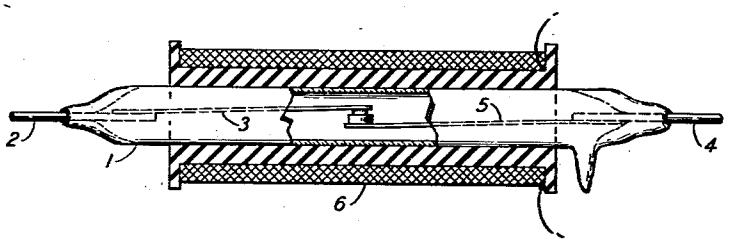
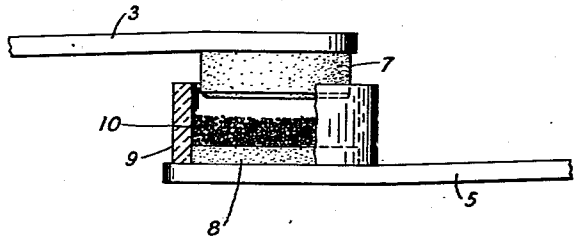


FIG. 2



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SWITCHING DEVICE

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7 Claims. (Cl. 200—87)

This invention relates to switching devices and particularly to devices for controlling electrical connections.

An object is to simplify such devices and to increase the reliability of operation thereof in establishing of connections.

Heretofore circuit controlling devices have been used comprising an evacuated vessel containing circuit making contacts of magnetic material and a coil outside of said vessel for energizing said contacts to control electrical circuits, such as the one disclosed in the copending application of W. B. Ellwood, Serial No. 198,629, filed November 29, 1938. Circuit controlling devices have also been provided in which contact elements are placed one above the other and a chamber is formed between them in which comminuted material is placed to partly fill the gap between the contact elements. This material is responsive to the excitation of a surrounding coil when energized for bridging the gap to close an electrical connection between the contact elements. A device of this kind is disclosed in my Patent 1,868,559 of July 26, 1932.

It is a feature of the present invention to provide a circuit controlling device comprising a gas-tight vessel in which two flexible reeds of magnetic material are inserted. These reeds are provided with contact elements arranged to form a partially enclosed chamber, a portion of which holds a comminuted magnetic material. A coil is provided outside of the vessel for flexing said reeds toward each other to reduce the chamber and to cause said magnetic material to bridge the contact elements to establish an electrical connection between the reeds when the coil is energized. The vessel may contain an inert gas or may be evacuated to prevent corrosion of the contact elements. One of the advantages of this invention over the prior art is that the contact making and contact breaking operations are extremely quick and reliable. That is, in the making of a connection the air-gap between the contacts is reduced by the flexing of the reeds toward each other and thus permits the comminuted material to quickly form a bridging connection and similarly in the opening of a connection the air-gap is increased by the flexing of the reeds away from each other and thus permits the bridging connection to be quickly broken and the comminuted material to readily settle at the bottom of the chamber.

While an air-tight vessel is the preferred container for the flexible reeds it is evident that any container not air-tight may readily be used.

The invention has been illustrated in the accompanying drawing in which:

Fig. 1 shows an air-tight vessel partly in section showing contact elements and a coil surrounding it in section embodying the applicant's invention; and

Fig. 2 shows the construction of the contact making elements at the point where a connection between them may be made.

Referring now to the drawing, 1 is an air-tight vessel that may be made from glass. At the left end of this vessel is a sealed-in terminal 2 to which is welded a flexible reed 3 of magnetic material. At the other end of this vessel is a sealed-in terminal 4 to which another reed 5 of magnetic material is welded. Surrounding this vessel is a coil 6 for the energizing of the contact making elements. In Fig. 2 the point where the connection between the two reeds 3 and 5 is made is illustrated in an enlarged view partly in section to show the detailed construction thereof. To reed 3 is welded a circular button 7 which may be of the same material and which may be gold-plated and to reed 5 is welded a button 8 surrounded by a sleeve 9 forming a cup in which a comminuted magnetic material 10 is placed to partly fill this cup. This comminuted material may consist of Permalloy dust and the inside surface of the cup may be gold-plated. The button 8 and sleeve 9 may consist of magnetic material. The button 7 normally extends into the cup but does not touch the comminuted material 10.

The operation of the connection of this contacting device is as follows: When the coil 6 is energized, magnetic lines of flux will cause the reeds 3 and 5 to be partially drawn towards each other thus sinking the button 7 further into the cup to reduce the air-gap and the comminuted material will be drawn upwards a comparatively short distance to quickly bridge the buttons 7 and 8 and form an electrical connection between the reeds 3 and 5. The vessel 1 may be evacuated or contain any suitable inert gas such as helium, argon or any other non-corrosive gas. When the coil 6 is deenergized, the reeds 3 and 5 separate from each other to increase the air-gap and the bridge formed by the comminuted material is quickly severed to break the electrical connection between the reeds. Thus the accuracy and speed with which the applicant's contact making device functions depends on the fact that the comminuted material forms part of the electrical connection between the two reeds and that the reeds are flexed toward each other

when electrical connection is established and away from each other when electrical connection is broken.

What is claimed is:

1. In a circuit controlling device, a gas-tight vessel, two flexible reeds of magnetic material in said vessel, contact elements on said reeds arranged to form a partially closed chamber, a comminuted magnetic material in a portion of said chamber, and a coil outside said vessel for flexing said reeds towards each other to reduce said chamber and for causing said comminuted material to bridge the contact elements to establish an electrical connection between said reeds when said coil is energized.

2. In a circuit controlling device, a gas-tight vessel, two resilient reeds of magnetic material in said vessel, a contact element on one reed and a contact element on the other reeds, said elements being so shaped and related to each other as to form a compartment but with a gap between the contact elements, a comminuted magnetic material in a portion of said compartment, and a coil outside of said vessel for flexing said reeds to reduce said gap and for causing said comminuted material to bridge said contact elements and establish an electrical circuit across said reeds when said coil is energized.

3. In a circuit controlling device, a gas-tight vessel, two flexible reeds of magnetic material secured in said vessel, a flat contact at the free end of one reed, a cup-shaped contact at the free end of the other reed, Permalloy dust in said cup-shaped contact, a coil outside said vessel, said reeds, flat contact and cup-shaped contact being so arranged that when said coil is energized said reeds are flexed towards each other to permit the flat contact to enter the cup-shaped contact and the Permalloy dust to establish an electrical circuit between the reeds by bridging the gap between the flat contacts of the cup-shaped contact.

4. In a circuit controlling device, a gas-tight vessel, two flexible reeds of magnetic material in said vessel, a flat contact on one reed and a cup-shaped contact on the other reed, a comminuted magnetic material in said cup-shaped contact, a coil for flexing said reeds to move said contacts in closer proximity to each other and for magnetizing said comminuted material to form a bridge across said contacts to establish an electrical connection between said reeds when said coil is energized.

5. In a circuit controlling device, a gas-tight vessel, an inert gas in said vessel, two flexible reeds of pure iron in said vessel, a gold-plated flat contact on one reed and a gold-plated cup-shaped contact on the other reed, said flat contact being partially inserted in said cup-shaped contact but not in electrical connection therewith, Permalloy dust in said cup-shaped contact not in electrical connection with said flat contact, a coil outside said vessel for energizing said reeds, the contacts and the Permalloy dust to cause said reeds to flex towards each other without having the contacts engaging each other and to cause said Permalloy dust to form connecting bridges between the contacts for the establishing of electrical current closing connections between said reeds.

6. In a circuit controlling device, a housing vessel, two flexible reeds of non-magnetic material in said vessel, contact elements on said reeds arranged to form a partially closed chamber, a comminuted magnetic material in a portion of said chamber and a coil outside the vessel for flexing said reeds towards each other to reduce said chamber and for causing said comminuted material to bridge the contact elements to establish an electrical connection between said reeds when said coil is energized.

7. In a circuit controlling device, a container, two flexible reeds of magnetic material in said container, contact elements on said reeds arranged to form a partially closed chamber, a comminuted material in a portion of said chamber and a coil outside said container for tensioning said reeds by flexing them towards each other to reduce said chamber to cause said comminuted material to quickly bridge the contact elements to establish an electrical connection between said reeds when said coil is energized and to cause said bridge to open quickly when the coil is deenergized by having the reeds flexed under their own tension away from each other and cause the comminuted material to quickly settle at the bottom of the chamber.

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