Dec. 15, 1931. W. DORN ET AL 1,836,654

ELECTRICAL MAKE AND BREAK APPARATUS

Filed Sept. 1, 1927

Fig. 1

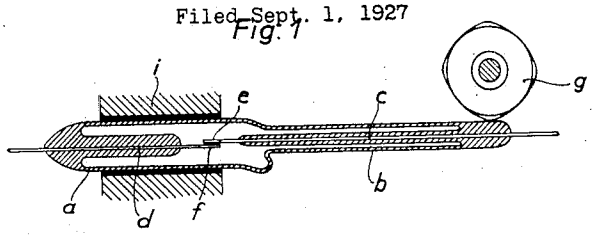


Fig. 2

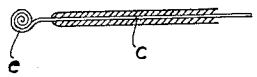


Fig. 3

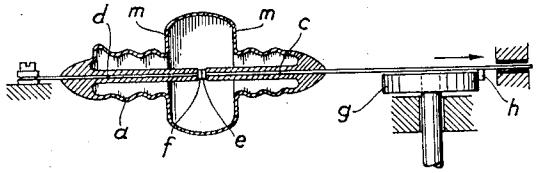


Fig. 4

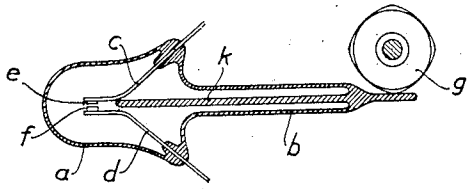
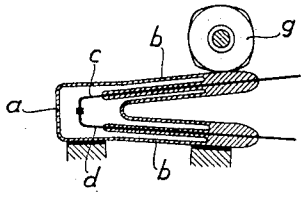


Fig. 5



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UNITED STATES PATENT OFFICE

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ELECTRICAL MAKE AND BREAK APPARATUS

Application filed September 1, 1927, Serial No. 216,938, and in Germany September 13, 1926.

The invention relates to electrical contact or make and break apparatus of that type in which the conductors are mounted in an evacuated vessel or one filled with an inert gas.

It has previously been proposed to pass the movable electrode through a membrane or diaphragm mounted in a glass vessel, in order to provide external operation of so-called vacuum contact breakers. It is however extremely difficult to obtain an airtight connection between the metallic membrane and the glass vessel and consequently the known construction has not become of any importance.

According to the present invention, the elasticity of the hermetically sealed vessel itself is used to actuate the apparatus or the like enclosed within the vessel, from without.

For this purpose, the vessel preferably of glass is constructed so that portions thereof are sufficiently elastic to allow of movement and in this way can act mechanically on the enclosed apparatus.

Several examples of the application of the invention to electrical vacuum contact breakers are shown in longitudinal section in the drawings in which:—

Figure 1 is a cross sectional view of one form of hermetically sealed vessel together with one form of means for slightly displacing portions of the vessel in order to connect or disconnect the electrical conductors.

Figure 2 is a longitudinal sectional view of the movable conductor at right angles to the view shown in Figure 1.

Figure 3 is a modified form of construction to that shown in Figures 1 and 2.

Figure 4 shows a further modified form of construction.

Figure 5 shows also a further modified form of construction.

In the construction shown in Figure 1 a hermetically sealed vessel *a*, preferably of glass but obviously of any other vitreous material possessing elasticity has a thin-walled tubular extension *b*, into which is fused a movable electrode *c*. A fixed electrode *d* is fixed into the opposite end of the glass vessel. The electrodes are preferably made of molybdenum wire, the overlapping ends forming the electrical connection. They are provided with contacts *e* and *f* which are very simply constructed by bending the ends of the wires into helices as shown in Figure 2. The glass vessel *a* is held between jaws *i*.

The extension *b* carrying the movable electrode is deflected by a cam disc *g*, the cam surfaces on which press against the extreme end of the extension *b*. On each application of pressure by the cam disc *g*, the contact *e* is raised from the contact *f* and the electric circuit is broken. It is advantageous to allow the cam disc to act on a spring member which transmits the movement to the element *b*, and not directly on the latter.

In the construction shown in Figure 3, the contacts *e* and *f* are not separated transversely of the apparatus but longitudinally thereof by means of a tension on the glass vessel, which is again effected by a cam disc *g* pressing on a pin *h* which is mounted on the outermost end of the electrode *c*. The contact breaker is secured at the other end by any suitable means. The glass vessel *a* is provided with walls *m* acting as a membrane or diaphragm, or is made like bellows, in order to obtain the necessary elasticity.

Figure 4 shows a contact breaker in which the contact *c* is operated directly by a glass or other rod *k* connected with the tubular extension. This rod *k* transmits the pressure exerted on the extension *b* by means of the cam disc *g* to the electrode *c* and thus separates the two contacts *e* and *f*. The device may be so arranged that the rod *k* presses alternately on the two electrodes *c* and *d* so that each pressure on the extension *b* results in two breaks, thus doubling the number thereof. Alternatively the rod *k* may be distorted longitudinally with its tubular portion *b* to make or break the contact between the electrodes *c* and *d*.

The contact breaker shown in Figure 5 has a glass vessel with two extensions *b* for the two electrodes *c* and *d*, arranged in the form of a V. The contact breaker is held so that the two elements *b* are actuated simultaneous-

ly by the same means *g*. The advantage of this construction is that the contact breaker is shorter.

Any other means may be used for moving the contacts, instead of the cam disc, e. g. an electro-magnet, the armature of which is connected to the glass vessel or the elastic portion thereof.

The high resistance of the vacuum acting as insulator or of a suitable gas, causes the instantaneous breaking of the electric current. As a result of this property, it is unnecessary, for example, when using the contact breaker for ignition apparatus in internal combustion engines, to use the condenser hitherto usual.

We declare that what we claim is:—

1. Electrical make and break apparatus including a hermetically sealed vessel of vitreous elastic material, a pair of contacts within said vessel, an elongated tubular extension containing one contact and actuating means to distort the tubular extension laterally in order to move the contact connected thereto thereby connecting and disconnecting the contacts.

2. Electrical make and break apparatus including a hermetically sealed vessel of vitreous elastic material, a pair of contacts within said vessel, a tubular extension containing one contact and actuating means to bend the tubular extension out of its longitudinal axis to disconnect the contacts.

3. Electrical make and break apparatus including a hermetically sealed vessel of vitreous elastic material, a pair of contacts within said vessel, a tubular extension containing one contact, a cam situated externally of the vessel and adapted to bend the tubular extension out of its longitudinal axis to disconnect the contacts.

4. Electrical make and break apparatus including a hermetically sealed vessel of a vitreous material possessing elasticity, a pair of contacts within said vessel, a pair of tubular extensions each containing one contact and actuating means to distort one tubular extension laterally to make or break the contact between the contacts.

5. Electrical make and break apparatus including a hermetically sealed vessel made of vitreous material possessing elasticity, having a relatively thin elastic portion and a relatively thick substantially rigid portion, a pair of contacts secured in said vessel, one of said contacts being secured in the said rigid portion, and actuating means for directly moving said thick rigid portion to move the contact secured thereto to connect and disconnect said contacts.

6. Electrical make and break apparatus including a hermetically sealed vessel made of vitreous material possessing elasticity, having a relatively thin elastic portion and a relatively thick substantially rigid portion, a pair of contacts secured in said vessel, one of said contacts being arranged to receive motion from said rigid portion, and actuating means for directly moving said thick rigid portion to move the contact associated therewith to connect and disconnect said contacts.

7. A circuit breaker for ignition apparatus comprising a hermetically sealed vessel of a vitreous material possessing elasticity, a pair of contacts within said vessel, a cam disk arranged to impart movement to a portion of the vessel by distortion of the vessel, and means for transmitting movement from said portion to one of said contacts.

8. Electrical make and break apparatus including a hermetically sealed vessel of a vitreous material possessing elasticity, a pair of make and break contacts within said vessel and actuating means for exerting pressure periodically and in rapid sequence on a portion of said vessel to deflect the same and thereby connect and disconnect the contacts.

9. An apparatus as in claim 8 in which the interior of the vessel is substantially free of gases capable of acting upon the material forming said vessel.

10. An apparatus as in claim 8 in which the vessel is evacuated.

11. An apparatus as in claim 8 in which the contacts are supported by conductors which pass through the walls of the vessel and the latter are fused to the conductors to make air-tight contact therewith.

In testimony whereof we have hereunto affixed our signatures.

MAX HANDKE.
WALTER DORN.