July 28, 1931. R. G. BERTHOLD 1,816,168

GAS DISCHARGE TUBE SWITCH

Filed Oct. 15, 1926

Fig. 1

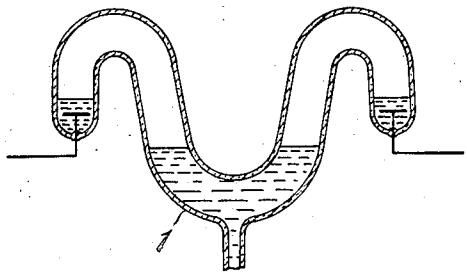


Fig2

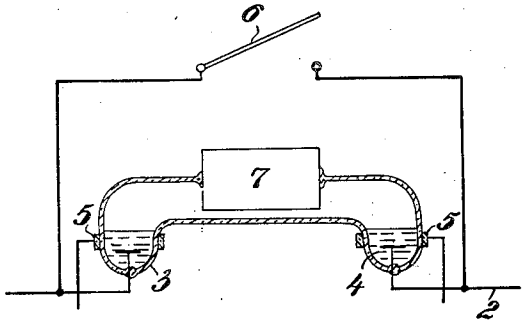
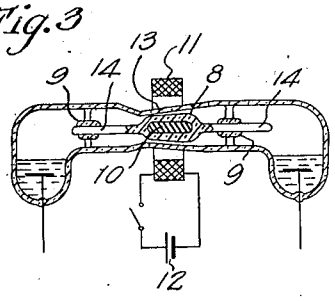


Fig. 3



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UNITED STATES PATENT OFFICE

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GAS DISCHARGE TUBE SWITCH

Application filed October 15, 1926, Serial No. 141,761, and in Germany October 16, 1925.

My invention relates to a gas discharge tube switch for interrupting or reducing the current between the electrodes of switch apparatus.

It is well known that in separating the contacts of circuit breakers, whether the break occurs in air or under oil, electric discharges occur in the form of arcs, gas or glow discharges, which lead to a heating and burning of the contacts and in the case of oil circuit breakers to the development of detrimental gases. The interruption or quenching of this discharge arc between the contacts offers considerable difficulties. It is equally difficult to interrupt in gas discharge tubes the full service current traversing the tubes.

The novel gas discharge tube switch, forming the subject matter of my invention, and by which the quenching or interruption of even very large currents can be accomplished without difficulty, is distinguished by great simplicity and reliability. According to my invention the cross-section of the discharge gap is reduced in a portion of the discharge space away from the immediate vicinity of the electrodes, the space being for instance located midway between the electrodes. To attain this end in view, a body may be located in the discharge space between the open contacts of the circuit breaker or the two electrodes of a switch tube, which preferably consists of an insulating material. In gas discharge tubes a device functioning in the manner of a cock may, for instance, be interposed between the electrodes. In the same way the arc which develops on opening an air or oil circuit breaker may be interrupted by introducing a suitable insulating body.

Some embodiments of my invention are diagrammatically illustrated in the drawings affixed hereto.

In these drawings:

Fig. 1 shows the application of my invention to a gas discharge tube and

Figs. 2 and 3 each show a modified arrangement.

Referring to Fig. 1 of the drawings, it will be seen that in a U-shaped gas discharge tube the cross-section of the discharge space may be reduced or entirely closed by introducing a blocking liquid 1, such as oil or water. When breaking circuits carrying higher voltages the cross-section of the discharge gap is preferably reduced over a length which is great in proportion to the reduced cross-section, in order to prevent excessive heating of this smaller cross-section, or a flashover. Such an arrangement is illustrated in Fig. 2 of the drawings.

Referring to this figure it will be seen that a mercury vapor discharge tube is connected in the alternating current line 2 in which the current is to be interrupted, which tube possesses mercury electrodes 3 and 4 at both ends and is equipped with ignition electrodes 5, in order to allow the alternating current to pass. The main switch 6 is connected in parallel relation to the discharge tube and is closed when the current normally flows through line 2. If it is desired to interrupt the alternating current line the ignition electrodes 5 are first excited in well known manner and then the knife switch 6 is opened. The service current then flows through the mercury vapor tube. Now the cross-section of the discharge path is contracted or narrowed by the introduction of an insulating body 7 and finally reduced to zero. The service current of the power current line diminishes in correspondence with the narrowing of the discharge cross-section so that the switch tube may finally be cut out of the circuit without any sparking.

Figure 3 of the drawings shows an arrangement in accordance with the invention, in which the connecting tube between the two electrodes is cone-shaped as indicated at 13. Within this conical portion is disposed a conical body 8 of insulating material which is slidably disposed in the direction of the tube axis. For this purpose the body is provided with rod extensions 14 which are guided in the guides 9 provided in the tube. In order to shift element 8, it contains in its interior an iron core 10 which is magnetically influenced by means of a coil

11 surrounding the cone-shaped portion of the tube. This coil can be energized from a suitable current source such as the battery 12. When the coil is energized and shifted in one or the other direction along the tube, the iron core 10 will follow and thus place the element 8 in the desired position, for instance one in which the discharge cross-section of the tube is reduced. In this manner, the discharge current through the tube can be controlled respectively entirely interrupted.

Various modifications and changes may be made without departing from the spirit and the scope of the invention, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:—

1. A switch for interrupting large electric currents comprising a gas discharge tube having two electrodes connected in circuit with the current, an insulating body, and means for introducing said body into the discharge space of said tube intermediate of said electrodes, for reducing the cross-sectional area of said space to interrupt the current.

2. A switch for interrupting large electric currents comprising a gas discharge tube having two electrodes connected in circuit with the current, a solid body of insulating material, and means for introducing said body into the discharge space of said tube intermediate of said electrodes, for reducing the cross-sectional area of said space to interrupt the current.

3. A switch for interrupting large electric currents, comprising a gas discharge tube having two electrodes connected in circuit with the current, an insulating body and means for introducing said body into the discharge space of said tube intermediate of said electrodes, said body having dimensions which restrict the cross-section of said discharge space for a length great as compared with the transverse dimensions of said intermediate discharge space.

In testimony whereof I affix my signature.

RUDOLF G. BERTHOLD.