Dec. 1, 1931. S. LOEWE 1,834,129

PENDULUM TYPE INTERRUPTER

Filed April 29, 1927

Fig. 1

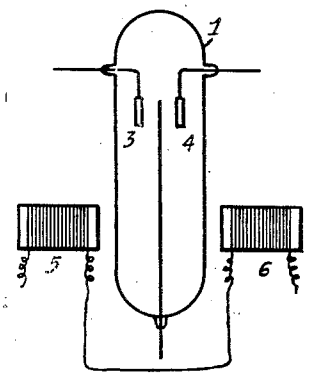


Fig. 2

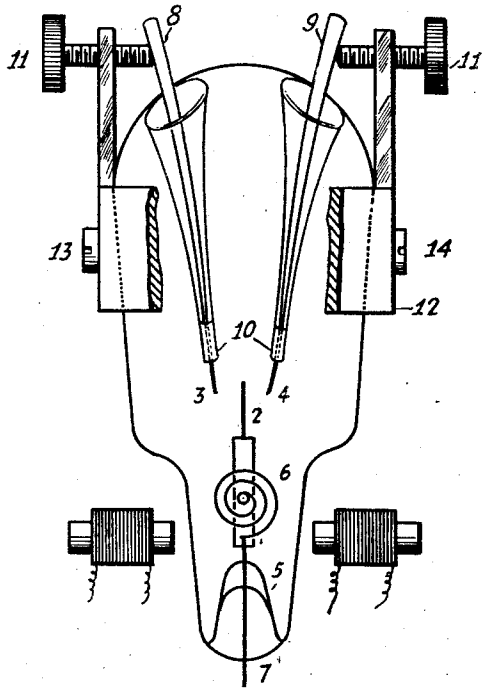
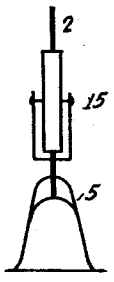


Fig. 3



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Patented Dec. 1, 1931 1,834,129

UNITED STATES PATENT OFFICE

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PENDULUM-TYPE INTERRUPTER

Application filed April 29, 1927, Serial No. 187,679, and in Germany July 19, 1926.

Pendulum rectifiers, comprising a tongue or ditton oscillating between two contacts and contacting alternately with the said two contacts, the tongue or ditton being set into vibratory motion by magnetic means, are well known.

This invention refers to this kind of a device, and consists, more particularly, in confining the contact tongue together with the working contacts, within an evacuated space.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims, the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawings in which I have indicated diagrammatically several organizations whereby my invention may be carried into effect.

I shall hereinafter describe my invention with the aid of the accompanying drawings, in which:

Figure 1 shows diagrammatically a form of my invention,

Figure 2 is a modification thereof, and,

Figure 3 is an elevation view of a contacting tongue.

The arrangement is illustrated diagrammatically in Figure 1. Inside an evacuated tube 1 is a tongue 2 together with the working contacts 3 and 4. The said tongue is caused to oscillate between the said two contacts either by electrostatic or electromagnetic means, or , if desired, by the action of mechanical forces. As to the rest, the apparatus is connected in a manner similar to pendulum rectifiers, so that it can be used for charging batteries or condensers from an alternating current network.

The tongue itself may possess a marked natural period, though it may also be free therefrom, as shall be explained later. The tongue may consist, for instance, of magnetic material (platinum jacketed wire), and it may be subjected to a reciprocal motion by the action of magnet coils 5, 6, through which are passed controlling currents. Tongue 2 may, of course, be permanently magnetized, or it may be magnetically polarized by the aid of a permanent electro-magnet in order to effect its reciprocal motion under the influence of the changing magnetic field of the coils 5 and 6.

Instead of the magnet coils, also electrostatically acting attraction plates may be used. Further, the working contacts may be made of platinum or platinum-jacketed wire, although, in the presence of a high vacuum and clean wire surfaces, it is sufficient to use base metals such as iron or nickel.

The tongue and the working contacts 3 and 4, of course, may be given a different mechanical shape; and the tongue in particular may be supported rotatably or pivotally. What is essential is that this entire contact arrangement of the pendulum interrupter be confined within an evacuated space. This arrangement has the advantage that sparking and wear of the contacts will be eliminated since the heating and plate currents required, for example, for broadcast purposes are comparatively small, indeed, they seldom attain an integral intensity over one ampere. Such currents can be made and broken by relatively light electrodes without damage being caused thereto, it being understood, of course, that the make and the break should be accomplished as far as feasible at times when the current wave of the alternating current is of but a small value.

A practical form of construction of a vacuum pendulum rectifier according to the invention is shown in Figure 2, where the actuation and control of the tongue is effected magnetically, but the adjustment of the contacts, mechanically. The tongue 2 consists of a small magnet keeper which is pivotally supported upon the sealed-in foot or stem 5 in wire eyes, being bent bearing-fashion. The contact supply is effected through the spiral 6 to the magnets carrying the contact tongue.

From the spiral, a lead-in 7 is brought through the stem or foot. The working contacts are mounted on heavier supply electrodes 8 and 9 which are fitted in elongated inwardly extending cuffs or appendages of tapered form provided in the glass bulb, and which are hermetically sealed at their ends.

Long seals of this kind allow a certain amount of elasticity, and, inside certain limits, an adjustment of distance between contacts 3, 4 and tongue 2. In the form of construction shown by way of example in the drawings, pressure screws 11 are provided which are secured on an insulating clip secured on the glass bulb by means of conducting arms which also carry the terminals 13 and 14.

Figure 3, in which the glass bulb has been omitted, shows a lateral view of the mode of holding the magnet piece carrying the tongue or keeper 2 in the eyelets 15 bent bearing-fashion and shown diagrammatically on a somewhat enlarged scale. This bearing in turn is supported by the fused-in stem. In Figure 3, the supply spiral 6 and the seal corresponding thereto (7) have been omitted for the sake of greater clearness.

As pointed out above, control or actuation of the tongue 2 can be effected also mechanically. For this purpose, similarly as shown in the embodiment Figure 2 for electrodes 3 and 4 it is hermetically sealed in the glass bulb with the interposition of a long springy glass bridge or strip piece, being set into vibrations from the outside either mechanically or electrostatically. Then only the three contact parts proper will be inside the evacuated space, whereas all other mechanical devices for adjustment of the contacts and to move the tongue are disposed outside the evacuated space. The disposition of the pendulum rectifier inside an evacuated space offers the special advantage that in a case where the contacts have been properly adjusted with relation to the phase of the alternating current, automatic extinction of the discharges will nevertheless occur as soon as the contacts are separated. No short-circuiting by arcing is liable to happen. An arc, even if struck in vacuo, would be spontaneously extinguished at the instant when the current passes through its minimum value, whereas in the open air, the ensuing ionization would persist, and this would be conducive to short-circuits.

Nothing is changed in the essential features of the invention, if only a unilaterally-acting contact is used in the evacuated space, as for example, when rectification of only one-half of the alternating current is intended. Furthermore, while I have indicated and described several systems for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organizations shown and described, but that many modifications may be made without departing from the scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In combination, in a circuit interrupter, an evacuated vessel, a vibratory member in said vessel, one or more contacts mounted within yieldable extensions of said evacuated vessel, said extensions depending into said vessel, means for vibrating said member, and means for adjusting one or more of said contacts.

2. In combination, in a circuit interrupter, an evacuated vessel, a vibratory member pivotally mounted within said evacuated vessel, one or more contacts mounted within yieldable, elongated, extensions provided within the vessel, means for actuating said member, and means for adjusting said contacts externally of said vessel.

3. In combination, in a circuit interrupter, an evacuated vessel, a vibratory member mounted within said evacuated vessel, one or more contacts mounted within yieldable elements provided on the vessel, means for actuating said member, said yieldable elements depending from the vessel into the interior thereof adjacent said member, and means for adjusting said contacts.

4. A pair of contacts mounted on elongated portions of the wall of an evacuated vessel and means for adjusting said contacts by deflecting said elongated portions of the wall.

5. In apparatus of the character described, an evacuated vessel, an elongated member attached to the wall of the vessel and having an electrical contact thereon within the evacuated space of said vessel, and mechanical means external of said vessel for deflecting said elongated member thereby changing the position of said contact within said evacuated vessel.

6. In apparatus of the character described, an evacuated vessel, a pivotally mounted member therein, electromagnetic means external of said vessel for oscillating said pivotally mounted member, a contact on said member, other contacts cooperating with said pivotally mounted member mounted on elongated extensions formed from the wall of said evacuated vessel and mechanical means, external of said vessel for deflecting said elongated members.

7. An evacuated vessel, an elongated member yieldably attached to the wall of the vessel and depending therefrom, a vibratory member mounted pivotally within the evacuated space of said vessel, an electrical contact affixed to said elongated member and disposed adjacent said vibratory member, and means mechanically associated with said elongated member for adjusting, at will, said contact relative to said vibratory member.

8. In a pendulum rectifier including a vibratory member, an evacuated vessel containing said vibratory member, said vessel being provided with elongated extensions depending into the evacuated space of said vessel adjacent said vibratory member, and contacts associated with the extensions.

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