April 21, 1942. E. E. OSSWALD 2,280,539

INTERMITTENT SWITCH

Filed July 14, 1939

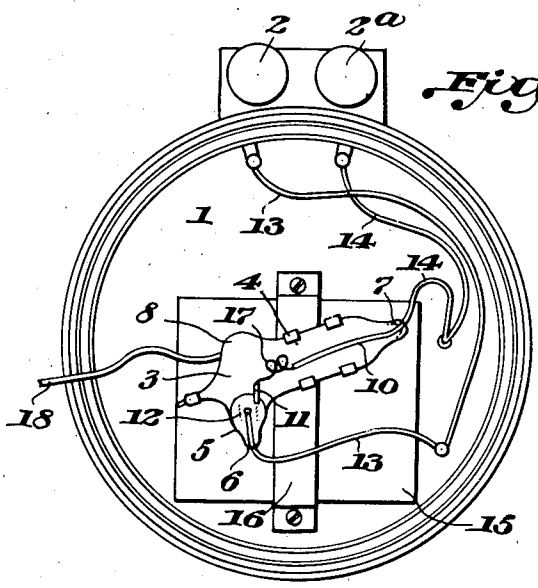


Fig. 1.

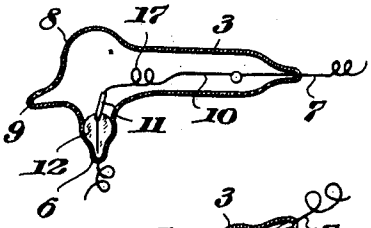


Fig. 5.

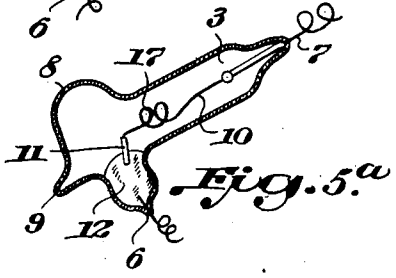


Fig. 5a.

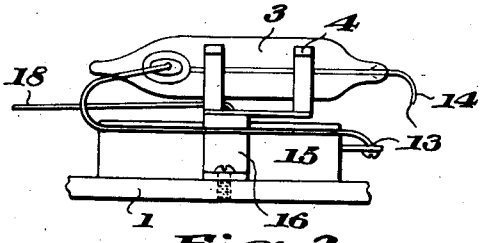


Fig. 2.

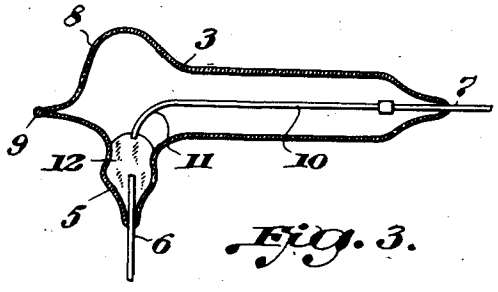


Fig. 3.

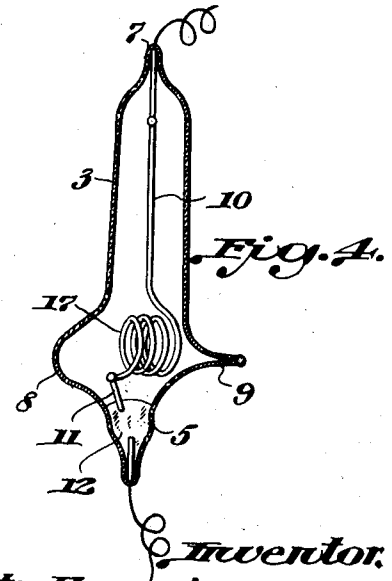


Fig. 4.

Inventor.
Ernesto Eugenio Osswald

By Young, Emery & Thomson
attys.

Patented Apr. 21, 1942

2,280,539

UNITED STATES PATENT OFFICE

2,280,539

INTERMITTENT SWITCH

Ernesto Eugenio Osswald, Buenos Aires, Argentina

Application July 14, 1939, Serial No. 284,540
In Argentina April 24, 1939

1 Claim. (Cl. 200—113)

This invention relates to intermittent switches for electrical current used for alternately closing and opening an electrical circuit and particularly relates to intermittent switches having an automatic action, which are based upon the known principle of a contacting member formed by a so-called bimetallic strip, namely, a strip made of two metals having different expansion coefficients. This strip is connected in an electrical circuit and becomes heated in accordance with Joule's law. Due to the uneven expansion to which both metals forming the strip are subjected, said strip will not extend in a straight manner, but will become bent into a curve the inner face whereof corresponds to the metal having the lower expansion coefficient.

Bimetallic strips have been extensively used in the past for automatic intermittent switches, these being based nearly in total upon the use of such strips.

The object of the present invention is to provide an improved switch of the kind described, which may be used to advantage in all such cases where it becomes necessary to interrupt an electrical current in successive periods of time, such as, for instance, in the case of electrical advertising signs, which are intended to alternately be lighted and extinguished. The device forming the subject-matter of the present invention is more efficient than the known types, inasmuch as its vital parts are sheltered against outer influence, while at the same time the possibility of the contacts melting together is effectively precluded, thus preventing the cause of fires. The invention furthermore provides simple means for adjusting the intermittent action, namely, for regulating the period of time during which the circuit is to be kept closed.

The invention has been illustrated by way of example in the accompany drawing, in which:

Figure 1 is a top view of the switch with the protecting cover removed;

Figure 2 is a side view of the active parts of the switch;

Figure 3 is a special embodiment of the switch bulb;

Figure 4 is a further special embodiment of the switch bulb;

Figures 5 and 5*a* show, respectively, two alternate positions of the switch bulb to represent by way of example the possibility of controlling the intermittence.

The switching device according to the invention is arranged conveniently within a protecting enclosure, such as, for instance, a round box 1, as shown in Figure 1, or in one of any other convenient or desired form. The enclosure carries a pair of binding posts 2, 2*a*, by which the switch may be connected in series in the circuit to be alternately interrupted, such as for instance, one of a luminous electric advertising sign.

The switching device proper consists of a glass bulb 3, arranged in a tilting mounting 4 to assume any suitable inclined position during use. This glass bulb 3 is provided at one side thereof with a small lateral projection or pocket 5 in which a contact wire 6 is inserted by fusion, while the other end, which is also closed by fusion, carries a second contact wire 7 leading to the interior of the bulb. Another lateral projection or pocket is provided at 8 opposite the projection 5 and one end of the bulb has the usual tubular evacuating stem 9 used for pumping out the air, and sealed by fusion after having removed the air contents. The contact wire 7 carries, within the bulb 3, a narrow bimetallic strip 10, the free end whereof terminates in a contacting point 11, which reaches into the lateral pocket 5 of the bulb 3, which forms a mercury well containing a drop of mercury 12, which at an inclined position of the bulb in such manner that said lateral projection 5 is placed at a lower level than the opposed end, will cover the inserted contact wire 6 and also the contacting point 11 fastened to the end of the bimetallic strip 10. In this position, the switch constitutes a bridge for the passage of electrical current through the lead 7, the bimetallic strip 10, the contacting point 11, the mercury 12, and the contact lead 6. Upon the passage of current through the bimetallic strip, the latter will curve towards the side having the metal with a lesser thermal expansion coefficient upwardly. Due to such curvature and to the corresponding arrangement of the bimetallic strip, the latter will finally raise the contacting point 11 out of the mercury drop and thus interrupt the current. While the heat is being carried away by the neighboring parts and dissipated through radiation, the bimetallic strip will straighten out again dip into the mercury well and thus close the current anew, and so on ad infinitum. The projection 8 of the glass bulb opposite the mercury well serves the purpose to collect and cool down the mercury vapor which is formed by the heating. The vapor will condense against the wall of the pocket and finally collect at the lowest portion of the glass bulb. The bulb is arranged in a tilting mount 4, to be adjusted in a larger or smaller angle of inclina-

tion with regard to the horizontal, to displace the mercury in the pocket **5** with regard to the contacting end of the bimetal strip and consequently adjust the degree of an immersion of the contacting point **11** into the mercury. The deeper the immersion of the contacting point, the longer it will take to interrupt the current, as the bimetallic strip **10** requires a longer contact period to effect a motion of the corresponding wide reach. The period of time during which the switch stays in the "on" position will thus be longer (see Figures 5, 5*a*). The leads **6**, **7** are connected each one, respectively, with one of the cables **13** and **14**, leading to the binding posts **2**, **2***a*. In parallel with the switch proper may be connected a capacity **15**, which is to be recommended in case the current to be interrupted is direct current, in order to prevent the formation of arcs, such as occur during the opening of the circuit. A strap fastening **16** is used to hold the whole assembly against the base of the box **1**. The lever **18** is used to adjust the position of the bulb in the desired tilting angle.

In order to increase the efficiency of the bimetallic strip **10** with regard to the extent of the motion, the strip may be made, as can be observed in Figure 1, with spirals or volutes **17**, which, by increasing the length of the strip, lengthens also the path made by the expansion of the metal and consequently, the motion caused thereby. Figure 4 shows a modified form of the bulb, which is especially efficient due to its good regulating qualities. This bulb is essentially rectilinear in shape and is especially suited to be used in an upright position. The lower portion carries the projection **5** for the mercury **12**; the bimetallic strip provided with a spiral or volute **17**, as well as with a contacting point **11**, includes a portion bent at an angle near its lower extreme portion, permitting the contacting point **11** to become immersed in the mercury and to be alternately lifted out therefrom upon heating of the strip **10**, **17**. The maximum duration of immersion of the point **11** in the mercury **12** and consequently the maximum duration of the contact period is attained in the upright position of the bulb; on tilting same, the mercury runs off laterally, the immersion of the contact point goes thereby to a smaller depth and consequently the "on"-period will last for a shorter time.

Having now particularly ascertained and described the nature of my said invention and the manner in which the same is to be carried into practice, I hereby declare that what I claim to be of my exclusive right and invention is:

An intermittent current switch of the bimetal strip contact type, comprising a sealed glass bulb having a mercury well at one point thereof, a bimetal strip fastened at one end in the wall of the bulb and having its free end dipping into the mercury well, said strip being formed of metals having different thermal expansion coefficients whereby upon becoming heated by the passage of an electrical current therethrough the metals will unequally expand causing the bimetal strip to warp to displace the free end thereof out of said mercury well and break the circuit, said bulb being of tubular shape and placed in a substantially horizontal or inclined position, having near one end two lateral opposed projections or pockets, one of them being directed downwardly to constitute the mercury well, whereas the other, arranged above said mercury well, serves as a dome for receiving and condensing mercury vapors rising from said well.

ERNESTO EUGENIO OSSWALD.