ELECTRIC CIRCUIT INTERRUPTING DEVICE

John Boddy, Hayes, England, assignor to Trico-Folberth Limited, Brentford, England, a British company

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1. This invention relates to a device for continuously making and breaking an electric circuit, for example, a circuit containing one or more electric lamps such as is used in a direction indicating device which may be in a vehicle or in a stationary position.

According to the Invention, the device comprises a contact-carrying member which tends to set itself in a predetermined position but is restrained from occupying this position by a conductor, or conductors, which, when connected in the electrical circuit to be interrupted, becomes heated and expands and thereby allows the contact-carrying member to move and occupy the said predetermined position.

The movement of the stressed member is used to interrupt the circuit, or short-circuit the conductor, which then cools and restores the contact-carrying member to its restrained position, whereupon the cycle of operations is repeated.

The arrangement may be such that, when no current is flowing through the conductor, a contact on the contact-carrying member is separated from a fixed contact, and, when the device is connected in the circuit, the current flows through the conductor which is thereby heated and allows the two contacts to close whereby the conductor is short-circuited. Then, if the conductor is of a suitable resistance, or a resistance is inserted in series or parallel with it, the lamp connected in circuit with the device will be alternately flashed on and off, or will be alternately brightly and dimly illuminated. Preferably, the resistance is adjustable, so that by adjusting the resistance the brightness of the lamps when dimmed, or the rate of flash may be varied.

According to a preferred construction, the stressed member consists of a strip of resilient conducting material having a slot extending at a small distance from each of its longitudinal edges so as to divide the strip into three parallel narrower strips, the ends of which are connected together. The two outer strips may then be slightly shortened, for example, by forming a transverse indentation therein, so that the central strip portion is stressed and tends to become bowed either convexly or concavely with respect to the outer strips. The central strip which carries an electric contact is then held by the conductor in a position other than that in which it tends to set itself.

In order that the invention may be easily understood and readily put into effect, a circuit interrupting device according to the invention is illustrated by way of example in the accompanying drawings, in which:

2. Figure 1 is a side elevation partly in section through the casing of the device;

3. Figure 2 is a plan of Figure 1, the casing being in section;

4. Figure 3 is a perspective view of the complete device;

5. Figure 4 is an end elevation with the end of the casing removed;

6. Figure 5 is a plan of an alternative arrangement, and

7. Figure 6 is a circuit diagram.

Referring to the drawing, the device comprises an insulating base 1, of which the centre portion of the upper surface is slightly recessed as shown at 2. A strip 3 of flexible conducting material, for example phosphor bronze, extends across the recessed portion 2.

The strip 3 is formed with two longitudinal slots 4 and 5 which extend over the greater part of the length of the strip, but terminate short of the ends of the strip. The strip 3 is thereby divided into three narrower parallel strips 3a, 3b and 3c. At one end, namely the left end in Figures 1 and 2, an ear 7 is struck up out of the strip beyond the ends of the slots, and this end of the strip is fixed to the base 1 by means of a screw 8, which passes through the hole 8 formed on striking up the ear, the head of the screw bearing against the upper surface of the end of the strip. There may be a small clearance between the head of the screw 8 and the strip which clearance may be varied by adjusting the screw 8, and it has been found in practice that the adjustment of the screw increases or decreases the force required to make and break contact, thereby altering the rate of flash. The other end of the strip 3 beyond the slots 4 and 5 rests on the unrecessed right-hand end of the base portion 1. This end of the strip 3 is covered by a plate 10 of insulating material and on this is super-imposed an arm 11 of conducting material, which extends to about the middle of the slotted portion of the strip 3.

One end of the arm 11 is bent downwardly, as shown at 12, and is secured to the base 1 by a screw 13. The bent end 12 is inclined at a small angle to the end face of the base 1, and, as has been found by experiment, adjustment of the screw 13 does not only affect the rate of make and break of contact but also the duration of the on and off periods. A further screw 16 passes through the arm 11, the plate 10 and the strip 3 and is provided with a nut 15 which bears against the bottom of a recess 16 in the underside of the base 1. This screw may serve as a terminal and
also acts to clamp the arm 11, the plate 10 and the end of the strip 3 to the base 1. The screw 14 is in electrical contact with the arm 11 but does not contact the strip 3. A further screw 17, which may also serve as a terminal, is in electrical contact with the strip 3 but not with the arm 11 and also acts to clamp the plate 10 and the end of the strip 3 to the base.

The ear 7 is connected by a wire 16 which passes round an insulator 19 mounted on an ear 18 which is struck up out of the material of the arm 11. The wire 18 is connected under tension between the ear 18 and the insulator 19, whereby the centre strip 3a is stressed to a greater extent than the outer strip 3b and 3c. The ear 7 is preferably of thinner gauge material than the ear 20, so as to ensure that it is the ear 7 which is movable under the influence of the wire.

The wire 16 is connected in series with a resistance 21 which is electrically connected to the screw 14 and may be readily adjusted to suit the circuit in which the device is to be connected.

The arm 11 and the part 3c of the strip 3 carry current, and so get hot owing to the stress in the strip 3a but are spaced a short distance apart when the wire 18 is under tension. The device is enclosed in a case 24 having a clamp 25 by which it may be secured in position. As shown in Figure 5, a handle 31 by which the resistance 21 may be adjusted protrudes through a slot in the casing.

In the modification shown in Figure 6, instead of the strip 3 there is used a disc from which two segments are cut out, so as to leave a central strip 29 joined to an annular part 34 which is secured by means of screws 35 to the base. In other respects the arrangement is similar to that previously described.

The device is connected in the circuit to be interrupted in the manner shown in Figure 6. A source of current 28 is connected to the terminal 14 which is in electrical connection with the arm 11 and the wire 18, or, as shown in Figures 1 and 2, may be connected to a lead 27 to the screw 18 which is in contact with the arm 11. A lead 20 of wire is taken from the screw 18, or from the terminal 14, both of which are in electrical contact with the strip 3, to the lamp or lamps to be flashed. As shown in Figure 6, the lead 28 is taken to a double-throw switch 30, so that for extended a lamp, or lamps 29 on either side of a vehicle can be flashed on and off.

In operation, when the current is switched on, it first flows through the wire 18, resistance 21, the strip 3a and the lamps 29, which may be dimly illuminated or unilluminated depending on the resistance 21; so that the wire becomes heated. As soon as this happens the stress on the strip 3a is relaxed and the strip 3a flexes and establishes contact between the contacts 22 and 23 whereby the wire 18 and resistance 21 are short-circuited and the lamp is directly connected to the source of current and are brightly illuminated. The wire then cools, the strip 3a assumes its former position and breaks the connection between the contacts 22 and 33, so that the lamp is again connected in series with the wire 18 and resistance 21, and the cycle of operation is repeated.

The resistance 21 can also be used for adjusting the rate of flash. Thus, by adjusting the resistance, the rate of flash may be varied when the lead in the circuit remains the same; or the rate of flash may be kept constant when the lead varies.

In some cases, the strips 3b and 3c may be slightly shortened, as by forming an indentation in each of them in order to increase the stress on the strip 3a, or, alternatively, the centre strip 3a may be stretched relatively to the strips 3b and 3c.

Various modifications may be made. The contact-carrying member or strip 3a may be metallic, but it is preferred to make it of a material, such as phosphor-bronze, which is not affected to any considerable extent by variations in temperature.

Obviously, instead of a single strip 3a, a number of such strips could be provided by increasing the number of slots, and each strip could carry a contact.

A tension spring or other elastic material may be connected between the ear 7 and, for example, a rotatable shaft, so that the part 3c is stressed both by the spring and by the wire thus providing further means of adjustment. The adjustable resistance 21 is then no longer necessary.

The distance by which the contact 23 is spaced from the strip 3a and, therefore, by which the wire 18 is spaced when heated, may be adjusted by means, for example, of a screw which is screwed into the bottom of the base 1 and bears against the strip 3a, thus giving another means of adjustment for the rate of make and break.

In the constructions above described, the contact-carrying members are in the form of substantially flat plates or discs. The invention is not restricted thereto and the contact-carrying member may be bent, for example, into U-shape, or into stepped form.

The device is not limited in its application to the flashing on and off of electric lamps, and the variation in the flow of current, produced may be used for other purposes. For example, the device may be used in conjunction with a solenoid coil of a vehicle direction indicator not only to flash the lamp in the indicator but also to continuously raise and lower the arm above and below the outstretched or indicating position.

I claim:

1. An electric circuit interrupting device comprising a base, a strip of resilient conducting material mounted at its ends on said base, means integral with and interconnecting the ends of said strip urging said strip to occupy a predetermined position, a conductor attached to said strip by which said strip is restrained from occupying said position, and a fixed contact with which said strip engages when said conductor is heated by the passage of current.

2. An electric circuit interrupting device as claimed in claim 1, in which said strip and said integral means are formed by cutting two longitudinal slots in a piece of sheet material, so as to form three strips the ends of which are connected together.

3. An electric circuit interrupting device as claimed in claim 1, in which said strip and said integral means are formed by cutting two segments from a disc of sheet material, so as to form an annulus with a diametral strip connected thereto.

4. An electric circuit interrupting device comprising a base, a contact-carrying member tending to set itself in a predetermined position, said contact-carrying member comprising a strip of resilient material mounted at its ends on said base, means integral with and interconnecting the ends of said strip urging said strip to occupy said position, a conductor with which said mem-
member is restrained from occupying said position, an adjustable resistance in series with said conductor, and a fixed contact with the contact member being engaged when said conductor is heated by the passage of current.

5. An electric circuit interrupting device comprising a base, a contact-carrying member tending to set itself in a predetermined position, said contact-carrying member comprising a strip of resilient material mounted at its ends on said base, means integral with and interconnecting the ends of said strip urging said strip to occupy said position, a conductor with which said member is restrained from occupying said position, an adjustable resistance in circuit with said conductor and adapted to vary the combined resistance of said conductor and said resistance, and a fixed contact with which the contact member engages when said conductor is heated by the passage of current.

6. An electric circuit interrupting device comprising a contact member tending to set itself in a predetermined position, said conductor member comprising a strip of resilient conducting material integral with said conductor and with which said member is restrained from occupying said position, a flexible contact arm with which said contact member makes a contact when said conductor is heated by the passage of current, and means for adjusting the position in which said contact member is held by said conductor comprising an adjustable clamp member at one end of said strip and an adjustable anchor for said conductor on said contact arm.

7. An electric circuit interrupting device comprising a base, a strip of resilient conducting material mounted at its ends on said base and having two longitudinal slots dividing said strip into two portions and with which said member is restrained from occupying said position, a conductor attached to one end of the central portion of said strip and with which said conductor is heated by the passage of current, and means for interconnecting the ends of said strip urging said strip to occupy said position, a conductor with which said member is restrained from occupying said position, an adjustable resistance in series with said conductor, and a fixed contact with which the contact member is engaged when said conductor is heated by the passage of current.

8. An electric circuit interrupting device as claimed in claim 7, in which the two outer strips are shortened relatively to the central strip.

9. An electric circuit interrupting device comprising a base, a contact-carrying member tending to set itself in a predetermined position, said contact-carrying member comprising a strip of resilient material mounted at its ends on said base, means integral with and interconnecting the ends of said strip urging said strip to occupy said position, a conductor with which said member is restrained from occupying said position, an adjustable resistance in parallel with said conductor and adapted to vary the combined resistance of said conductor and said resistance, and a fixed contact with which the contact member engages when said conductor is heated by the passage of current.

10. An electric circuit interrupting device comprising a base, a contact-carrying member of resilient metal comprising a strip having two longitudinal slots dividing said strip into a contact strip and a pair of frame strips the ends of which are connected together, an ear struck from said contactor element in one end portion thereof, and an insulating plate superimposed on the opposite end portion of said contactor element, a flexible contact arm superimposed on said plate and extending therefrom to approximately the center of said contactor strip, said arm and said contactor strip having a normal set in contact with each other, an adjustable screw securing said contactor element to said base through the bore provided by striking said arm from said contactor element, means securing said arm and said plate and said contactor element in superposed relation on said base, said arm having an extension overlapping the end sides of said base and said base having a normal set at a small angle to said side of said base, an ear struck from said arm and extending approximately in alignment with and oppositely to the direction of said extension and mounting an insulator, an adjustable screw mounted in said side of said base and extending through a hole in said extension and having its head overlapping said extension, and a thermally responsive resistance wire stretched from the contactor element ear to said insulating strip and the insulator and held at normal temperatures and arranged to hold said contactor strip clear of said arm when under such tension.

11. An electric circuit interrupting device comprising an insulating base, a contactor element of resilient metal comprising a contactor strip and a pair of frame strips integral with and interconnecting the ends of said contactor strip, an ear extending from said contactor element in one end portion thereof adjacent one end of said contactor strip, an insulating plate superimposed on the opposite end portion of said contactor element, a flexible contact arm superimposed on said plate and extending therefrom to approximately the center of said contactor strip, said arm and said contactor strip having a normal set in contact with each other, means adjacent said ear of said contactor element securing said contactor element to said base, means securing said arm and said plate and said contactor element in superposed relation on said base, said arm having an extension overlapping the end sides of said plate base and having a normal set at a small angle to said side of said base, an ear struck from said arm and extending approximately in alignment with and oppositely to the direction of said extension and mounting an insulator, an adjustable screw mounted in said side of said base and extending through a hole in said extension and having its head overlapping said extension, and a thermally responsive resistance wire stretched from the contactor element ear to said insulating strip and the insulator and held at normal temperatures and arranged to hold said contactor strip clear of said arm when under such tension.

JOHN BODDY.

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