April 14, 1964 A. T. SCHMIDT 3,129,303

BALANCED WHEEL ELECTROMAGNETIC CIRCUIT INTERRUPTER

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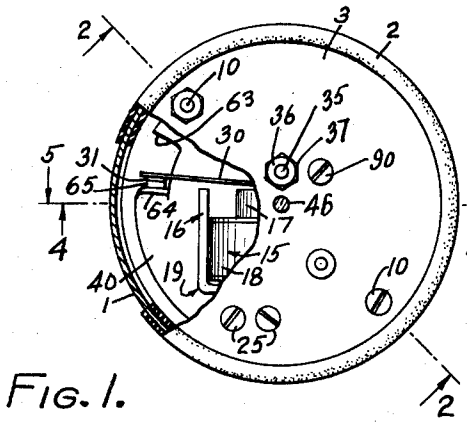


FIG. 1.

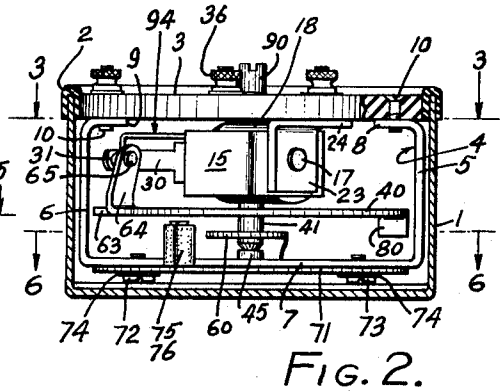


FIG. 2.

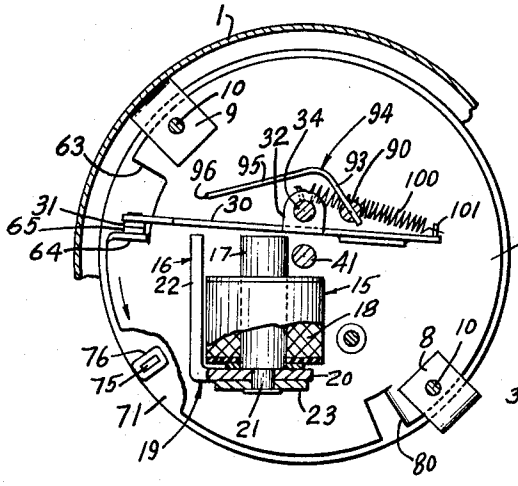


FIG. 3.

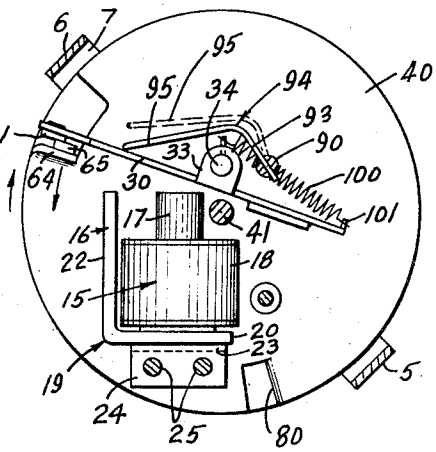


FIG. 8.

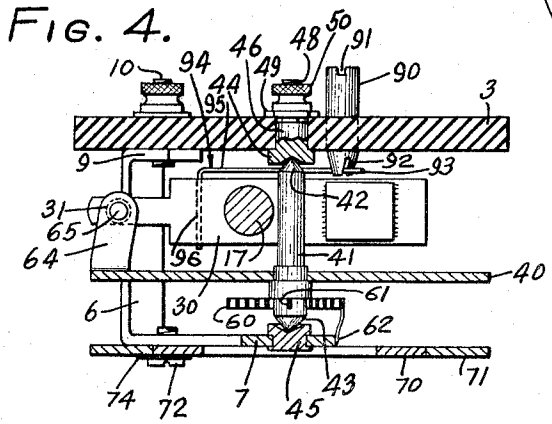


FIG. 4.

INVENTOR,
ALFRED T. SCHMIDT;
BY
Calvin Brown
ATTORNEY

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FIG. 5.

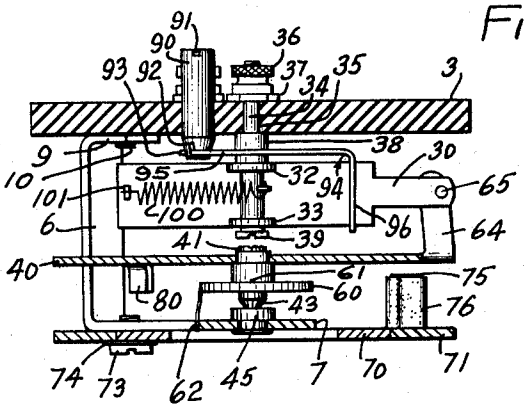
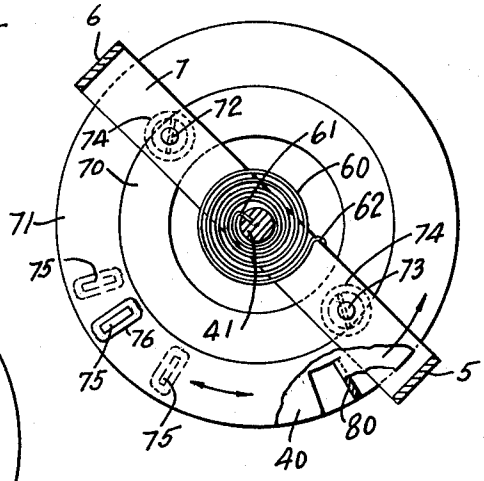


FIG. 6.



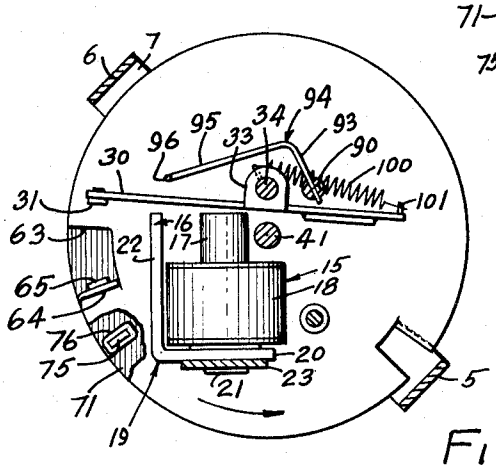


FIG. 7.

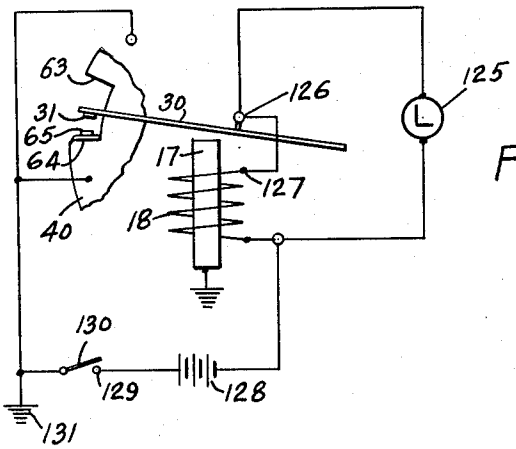


FIG. 9.

INVENTOR,
ALFRED T. SCHMIDT;
BY Calvin Brown,
ATTORNEY

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3,129,303
BALANCED WHEEL ELECTROMAGNETIC CIRCUIT INTERRUPTER

Alfred T. Schmidt, 5547 Vineland, North Hollywood, Calif.

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1 Claim. (Cl. 200—90)

The present invention relates to an electrical circuit interrupter which is adjustable as to the duration of make or break of a circuit.

While the present invention may be used to interrupt an electrical circuit to various types of devices, the invention is particularly adapted for use with flasher lights. Flasher lights are required by law on barricades. The barricades usually surround an excavation or other hazard to warn vehicle drivers or pedestrians against trespassing. As a rule, the flasher lights are attached to the barricade and the light flashes on and off over a period of time. The duration of the on and off light flashes may be very fast or slow.

The present invention has for one of its objects a circuit interrupter for a flasher light wherein the making or breaking of an electrical circuit may be regulated so that the light may be of long duration or short duration as well as regulating the duration of time between flashes of light.

Flasher light assemblies are subject to petty thievery, rough handling and breakage with resultant expense in maintaining the same. The present invention is independent of the flasher light assembly and may be installed at an obscure point not readily detected, with the interrupter of the invention controlling the flashing of a number of flash light assemblies located at different points on the barricade. Whereas the average flasher light assembly must incorporate some form of control, the present device acts as a control for the flash light assembly and thereby reduces the cost of each flash light assembly as the assembly does not require expensive apparatus incorporated therein.

A further object of the present invention is the provision of a circuit interrupter of simple construction, which will operate in any position, not subject to breakage under normal use, which is accurate as to timing of circuit interruptions, of few parts, and which is generally superior to devices now known to the inventor.

A further object of the invention is to provide a circuit interrupter which is rugged, wherein short circuiting of the electrical circuits is not likely to injure the mechanism, and which will operate satisfactorily under various temperatures incurred in inclement weather.

With the above mentioned, and other objects in view, the invention consists in the novel and useful provision, formation, construction, and relative arrangement of parts, members and features, all as shown in one embodiment in the accompanying drawings, described generally, and more particularly pointed out in the claim.

In the drawings:

FIGURE 1 is a fragmentary, partially sectional top plan view of the circuit interrupter;

FIGURE 2 is a sectional view, on a slightly enlarged scale taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary, sectional view on the line 3—3 of FIGURE 2, and on an enlarged scale;

FIGURE 4 is a fragmentary sectional view on the line 4—4 of FIGURE 1, on an enlarged scale and looking in the direction of the arrows;

FIGURE 5 is a fragmentary cross sectional view on the line 5—5 of FIGURE 1, on an enlarged scale and looking in the direction of the arrows;

FIGURE 6 is a fragmentary sectional view on the line 6—6 of FIGURE 2, and on an enlarged scale;

FIGURE 7 is a fragmentary partially sectional view, similar to FIGURES 3 and 8, certain elements being in changed relationship;

FIGURE 8 is a sectional view similar to FIGURE 7, certain elements in changed relationship; and,

FIGURE 9 is a diagram of an electrical circuit for the interrupter and flasher light.

Referring now to the drawings, and specifically to FIGURE 2, the mechanism of the circuit interrupter is enclosed within a housing 1, the housing having an open end, the rim of which carries a U-shaped gasket 2. A transparent face plate 3 fits tightly within the encircling gasket 2 and in the present instant both the housing and face plate are circular. Adapted to be secured to the inner surface of the transparent face plate 3 is a frame 4. This frame is of strap material and has two parallel legs 5 and 6 which join a base piece 7. The upper ends of the legs 5 and 6 are bent inwardly to provide lugs 8 and 9 which are secured to the bottom surface of the face plate by means of screws designated generally as 10. The frame 4 and the transparent face plate carry all of the remaining elements of the circuit interrupter.

An electromagnet 15 has a horseshoe magnet 16 formed in two parts, of which 17 is the core for the coil 18 while core 19 is of angular form, the leg 20 being secured to core 17 by the means 21. The means 21 comprises a reduced diameter portion extending from the bottom of the core 17 and passed through the leg 20, followed by flanging the means 21. The opposite leg 22 parallels the side of the coil 18 and ends substantially at the height of the end of the core 17 to provide for north and south poles. One leg 23 of a bracket is carried by the means 21, the bracket having a pair of legs in substantially right angular relationship, with the leg 24 secured to the face plate by means of screws or similar means designated generally as 25. Assuming the position shown in FIGURES 2 and 3 for the electromagnet, the pole pieces thereof lie in a horizontal plane.

The magnetic flux of the two pole pieces is completed by an armature 30 spaced slightly from the ends of said pole pieces. The armature is of the balanced type. The armature is made from magnetic material and one end thereof carries a contact 31. Substantially intermediate the length of the armature and extending at right angles thereto, are a pair of lugs 32 and 33, see FIGURE 5. Passed through aligned openings in said lugs is a pivot pin 34. One end of the pivot pin is passed through a bore 35 in plate 3, this end being threaded to carry a nut 36 and washer 37. A shoulder 38 surrounds the pivot pin between the plate 3 and lug 32, while the lower end of the pivot pin has a threaded bore to receive a screw 39. In this manner the pivot pin is held in position. The arrangement is such that the armature swings freely on the pivot pin and both sides of the armature are balanced as to weight to the end that there is no tendency for the armature to move about the pivot pin. In other words, the armature is gravity balanced about the pivot pin.

Positioned between the electromagnet, and the base 7 of the frame 4 is a non-magnetic balanced disk or pendulum 40. The pendulum 40 is centrally mounted on an arbor 41, FIGURE 4, the arbor having pivot ends 42 and 43 carried in bearings 44 and 45. Bearing 45 is secured to the base 7 of the frame 4 while bearing 44 is secured to the face plate 3. The bearing 44 is shouldered and has a reduced diameter elongated shank 46 passed through a bore in the face plate, portion 46 being screw threaded at 48 to carry a pair of nuts 49 and 50 with the face plate being interposed between the shoulder and nuts whereby the bearing may be held to said face plate. Surrounding the arbor 41 is a spiral spring 60. One end of the spring is secured to the arbor, as shown at 61 in FIGURE 6, while the opposite end is secured to the base 7 of the

frame 4 as shown at 62. The spiral spring tends at all times to rotate the balanced disk or pendulum clockwise viewing FIGURE 1. The balanced disk or pendulum is notched in such a manner along one edge at 63 to provide an upstanding lug 64 in substantially right angular relationship to the disk and which lug carries a contact 65 adapted to engage the contact 31 of the armature 30, see FIGURES 3, 4, and 7.

Immediately below the base 7 of the frame 4 are a pair of concentric flat rings 70 and 71 comprising an inner and outer ring, both of which lie in the same plane. A pair of spaced apart screws 72 and 73 are passed through transverse bores in the inner ring 70 and into threaded engagement with the base 7 of the frame 4. Washers designated generally as 74 are carried by the screws, which washers bridge the two rings 70 and 71 at the line of separation therebetween. Thus when the screws 72 and 73 are tightened, the washers prevent relative turning movement between the two rings, but when the screws are loosened the outer ring 71 may be rotated relative to the inner ring 70. The outer ring 71 carries a stop member 75 rising in substantially right angular relationship to the top of the outer ring 71. This stop member may comprise a lug or post fastened to the top surface of ring 71 and surrounded by rubber or other material, as shown in FIGURE 6 at 76. This stop acts in conjunction with a lug 80 depending from the balanced disk or pendulum, as shown in FIGURES 3 and 5, the edge of the pendulum being notched or cut and the metal bent downwardly to provide the lug 80. The lug 80 is adapted to strike the stop 75 and limit rotation of the balanced disk or pendulum when rotated in either clockwise or counterclockwise direction.

An adjusting pin 90 is passed through a transverse bore in the face plate, having frictional engagement with the plate, which pin is provided at its outer end with a kerf 91 while the opposite end thereof is provided with a transverse groove 92. Groove 92 receives one leg 93 of a flexible arm 94. The flexible arm includes a further leg 95 in substantially obtuse angular relationship to leg 93, leg 95 being provided with a depending leg 96 in substantially right angular relationship to leg 95. Leg 96 is in position to engage the armature 30, during clockwise movement of the armature about its pivot. The pin 90 may be turned by a suitable tool to adjust the position of the flexible arm.

A helical coil spring 100 has one end secured to the pivot pin 34 while the opposite end is secured to the armature at 101. In the position shown for the parts in FIGURE 3, the spring 100 is unloaded being neither in compression or tension.

The operation, uses and advantages of the invention are as follows.

A circuit diagram is shown in FIGURE 9 wherein the flasher light is shown at 125, one terminal of which is in circuit with the armature at 126, the armature being connected to one terminal 127 of the coil 18, the other terminal of the coil being in circuit with the other terminal of the flasher light 125 and with a source of potential at 128. One post of the source of potential 128 leads to a terminal 129 of a switch, the switch arm 130 being grounded at 131 and ground connection is made with the balanced disk or pendulum 40 and with the frame 4. Thus when the coil 18 is energized, the magnetic flux draws the armature towards the cores 17 and 19, the switch at 129 and 130 being closed and when the contact points of the armature and of the balanced disk engage, the flasher light will be illuminated for a given time duration as preselected by the operator.

The position shown in FIGURE 3 for the parts is assumed and the contacts 31 and 65 are closed. When the switch is thrown, the cores 17 and 19 of the electromagnet draw the armature 30 towards the cores. This sudden movement of the armature swings the balanced disk or pendulum 40 counterclockwise viewing FIGURE 3. The balanced disk or pendulum will rotate a given degree, 360° more or less, followed by the spiral spring 60 rotating the balanced disk or pendulum clockwise. The degree of clockwise movement of the balanced disk or pendulum is regulated by the stop 75 and its engagement with the lug 80. The position of the stop may be regulated by loosening the screws 72 and 73 to allow rotation of the outermost ring 71 relative to the fixed ring 70. After adjustment, the screws 72 and 73 again lock the two rings against movement. Thus the balanced disk or pendulum will rotate clockwise a given degree of arc, being stopped by the position of the stop 75 relative to the lug 80, which lug, during rotation of the balanced disk or pendulum, will be in the path of movement of the lug. As the balanced disk or pendulum rotates clockwise, the contact 65 thereof will engage the contact 31 of the armature. The armature, as previously set forth, is balanced as to weight on both sides of the pivot pin 34. Furthermore, the spring 100 which, in the position of FIGURE 3, is neither in compression or tension, will be brought into tension when the contact 65 strikes contact 31 to carry the armature a given degree of arc clockwise about its pivot pin 34. During engagement of the contacts 31 and 65, the flasher light 125 will be illuminated. The duration of illumination or periodicity is regulated by the flexible wire arm, 94. This flexible arm is turned by the operator to a given position by manipulating the pin 90 to swing the flexible arm either clockwise or counterclockwise for engagement of the end 96 thereof with the armature. This is illustrated in FIGURE 8, the flexible arm being shown in full lines with dotted lines to indicate movement of the arm upon contact with the armature. The flexible arm will stop movement of the armature and of the balanced disk or pendulum at a certain degree of arc. The two contacts 31 and 65 remain closed so that the energizing of the lamp is for a given duration depending upon the setting of the flexible arm. Counterclockwise movement of the armature and the balanced disk or pendulum will then follow under the influence of the flexible arm 94 and the spring 100 which is now under tension. The balanced disk or pendulum will continue to rotate counterclockwise a given degree of arc which breaks the contacts 31 and 65. Upon stoppage of rotation counterclockwise of the balanced disk or pendulum the pendulum again rotates clockwise under influence of the spiral spring 60 to bring the contacts 31 and 65 into engagement to again cause the flasher light to glow. The spring 100 controls the armature so that if the armature attempts to be in a position which would engage the ends of the pole or core pieces 17 and 19, the spring 100, upon breaking of the contacts 31 and 65, will move the armature to the position shown in FIGURE 7. If the armature 30 was in contact with the ends of the pole pieces, the device would not function. Hence it is important to locate the pivot pin 34 at one side of or eccentric to the cores 17 and 19. The armature position is such as to be close to the end of core 17 and held at an angle to the end of core 19 by spring 100. Close spacing is essential in order to take advantage of maximum magnetic flux density.

By turning the flexible arm 94 inwardly so that it is opposite the armature, the flexible arm, immediately upon the contacts 31 and 65 engaging, will be moved a short distance of arc followed by counterclockwise movement of the balanced disk or pendulum to break the contacts 31 and 65 which limits the duration of flow of current to the flasher light. The adjustment of the stop 75 relative to the lug 80 likewise limits the rotative movement of the balanced disk or pendulum so that by combination of adjustments, the flash of light may be very rapid or of long duration.

The present circuit interrupter has been found in actual practice to be fool proof and to operate in any position. The device will interrupt the circuit to a multiple series of flasher lights or will operate other devices wherein

the current thereto is to be interrupted. Furthermore, the flash light does not flicker but is steady as to light emanation.

I claim:

An electric circuit interrupter, as disclosed, including: an electro magnet, an armature positioned adjacent the pole piece of said electro magnet, means pivotally mounting the armature, the armature being balanced on each side of the pivotal mounting means, one end of said armature provided with an electrical contact, a balanced disk positioned at one side of the electro magnet, means axially mounting the balanced disk for rotation, the disk provided with an electrical contact adapted to engage the electrical contact of the armature during rotation of the disk, a circuit including the electro magnet, the two contacts for making the circuit through the electro magnet to attract the armature towards the pole piece and induce rotation of the balanced disk to separate the two contacts and break the electrical circuit to the electro magnet,

a pair of concentric rings both of which lie in the same plane and are positioned at one side of the balanced disk, the inner of said rings being held against movement and the outer ring being movable relative to the inner ring, a lug depending from the balanced disk and means carried by the movable ring in the path of movement of the lug of the balanced disk for adjustably limiting rotation of the balanced disk in one direction.

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