April 8, 1952 J. A. McDERMOTT 2,592,165

BULB CHANGER

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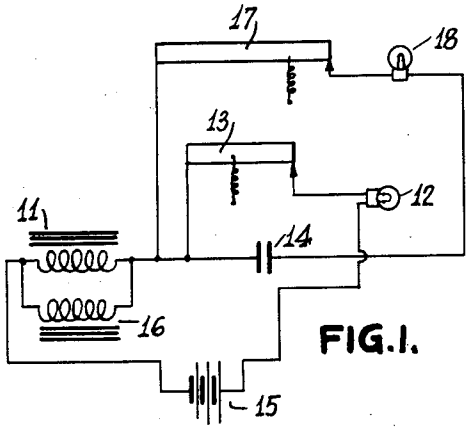


FIG.1.

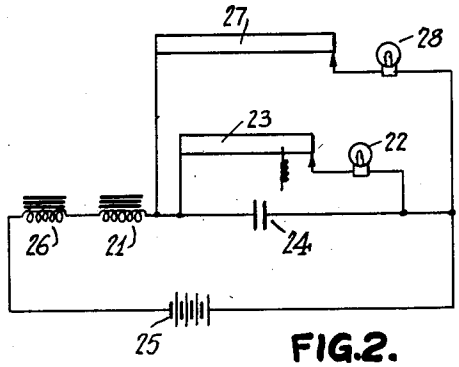


FIG.2.

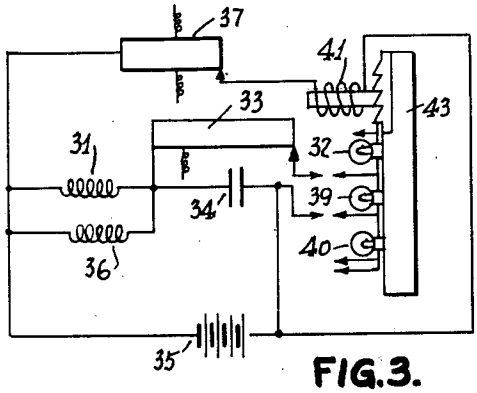


FIG.3.

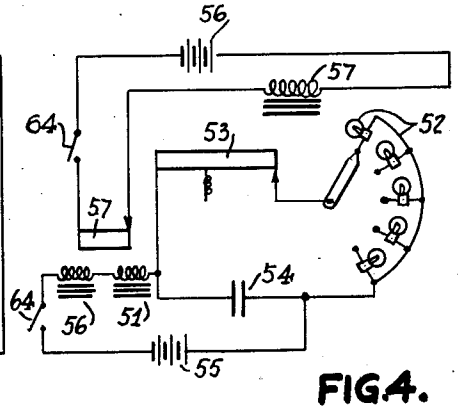


FIG.4.

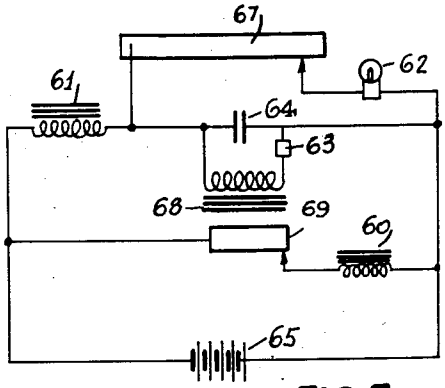


FIG.5.

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BULB CHANGER

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2 Claims. (Cl. 315—88)

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This invention relates to means to increase the reliability of signal lights which are operated on a repeating cycle.

The invention has reference to devices which employ a condenser discharge as an inherent timing medium, as well as a source of power for operating either an incandescent or a gaseous discharge lamp.

An illustration of the kind of device herein referred to may be found in U. S. Patent No. 2,221,867 owned by the present applicant, wherein a lamp is continuously flashed by the repeated charging and discharging of a condenser. With this arrangement, a relay holds a lamp circuit open until the condenser reaches a predetermined condition of charge. The decrease in the charging current causes the relay to release the armature, closing the circuit through the lamp. The condenser discharges and the cycle repeats, resulting in continuous flashing of the lamp. However, one difficulty with this arrangement is that here, as in all electrical lamps, the possibiilty of a bulb burn-out exists.

It is therefor the principal object of the present invention to reduce the probability of the failure of electrical equipment due to the burnout of bulbs or gaseous discharge tubes.

It is another purpose of the present invention to provide such electrical equipment with means for automatically substituting a reserve bulb or tube whenever a bulb or tube in the equipment is burned out.

And still another aim of the present invention resides in the provision of a plurality of reserve bulbs so that the equipment will continue to function even in the event that more than one bulb or tube burns out.

There and other meritorious aims and advantages, which will become more fully apparent as the description hereof proceeds, are attained by the novel combination and arangement of parts, hereinafter described, and illustrated in the accompanying drawing, forming a material component of this disclosure, and in which:

Figure 1 is a schematic view of a circuit, showing the bulb changer of the present invention.

Figure 2 is a modified form of bulb changing means.

Figure 3 is still another modification of a circuit including the bulb changing device of the present invention.

Figure 4 is yet another modified circuit and bulb changing device.

Figure 5 is a still further modification of an electrical circuit and bulb changing device; and

Referring in greater detail to the drawing, and specifically to Figure 1 thereof, in the circuit illustrated, numeral 11 is the main relay coil, numeral 12 illustrates the first lamp to be used, 13 is the armature of the main relay, 14 is the condenser to be charged, 15 is a source of power

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such as a battery, 16 is the coil of a second relay, and 17 is an armature controlled by the second relay coil.

When a source of power, such as battery 15 here illustrated, is connected into the circuit, a current rushes through the relay coil 11, and the coil 16 of the second relay. Current through these relay coils effects the movement of armatures 13 and 17, so that they move in open circuit positions with respect to bulb 12 and reserve bulb 18. As condenser 14 reaches a charged condition, the current value decreases, and as a result thereof, relay 11, being the less sensitive as far as hold in value is concerned, releases its armature 13 to close a circuit from condenser 14 through lamp 12. Condenser 14 then discharges, flashing the lamp 12,

The inrush of current which results due to the tendency to recharge condenser 14, operates the armature 13 and the circuit through lamp 12 is again opened. This cycle is repeated as the condenser charges and discharges.

If however lamp 12 burns out, the cycle will change in this manner: The decrease of current as the condenser becomes charged, causes armature 13 to operate as hereabove described. If the lamp 12 burned out, the condenser 14 will not discharge, and the current will continue to decrease. When it has decreased sufficiently, armature 17 operated by the second relay coil 16, the said relay being more sensitive than relay 11, will drop out, closing the circuit through lamp 18. This cycle will repeat each time the condenser becomes charged, and the bulb 18 will flash. Replacement of the burned-out bulb 12 will cause the device to flash normally again.

Figure 2 shows an arrangement similar to that illustrated in Figure 1, except that the relay coils in Figure 2 are placed in series. In Figure 2, numeral 12 is the main relay coil, 22 shows the first lamp to be used, 23 is the armature of the main relay, 24 is the condenser to be charged, 25 is the source of power such as a battery, 26 is the coil of the second relay, 27 is the armature controlled by said second relay coil and 28 is a reserve bulb.

The resistance 24 could be used to vary the voltage across the thermal switch and hence control heat-up time. The rate and balance could also be effected by a second winding.

It may thus be seen that any number of relays may be used to control any equivalent number of bulbs. Hence the circuit shown in Figure 1 could have two or more relays in parallel, and the circuit shown in Figure 2 could have two or more relays in series. It is also possible and at times it may be desirable to put two relay coils in parallel and one or more relay coils in series. Replacement of the burned out bulb 22 will start the device flashing normally again, as is hereabove described.

The basic principle here involved is the use of relay means controlled by the condition of charge on the time and/or power condenser to switch in reserve lamps.

Figure 3 shows another variation of the same idea. It is well known that the method of replacing bulbs at an optical center is the use of a mechanical bulb changing device. One such device is shown in Figure 3 employing the arrangement outlined in connection with Figures 1 and 2. In this arrangement, the second and most sensitive relay operates a motor, spring, solenoid or any other suitable and desirable mechanical means so that a series of bulbs may be successively substituted as burn-outs occur.

In Figure 3, 31 is the main relay coil, 33 is the corresponding bulb flashing armature, 32 is the first lamp to be used, 34 is the condenser to be charged, 35 is a source of power such as a battery, 36 is the coil of a second relay, 37 is an armature controlled by relay coil 36, 39 and 40 indicate reserve bulbs, 41 is an electro-mechanical escapement latch and 43 is the holding element.

This device operates as follows: Under normal conditions, the decrease of the charging current causes armature 33 to drop out because the relay with armature 32 is the least sensitive, flashing bulb 32 as in the circuits shown in Figures 1 and 2. However, if the connected lamp 32 fails, the current through the relay coil continues to decrease and armature 37 drops out. Movement of armature 37 closes a circuit through an electro-mechanical escapement latch such as 41, resulting in movement of element 43 holding replacement bulbs. A new bulb 39 drops into place, and the condenser is discharged, thus causing the repetitive flashing of the bulb.

If the optical position of the lamp is not important, a multiplicity of lamps may be connected in succession. This arrangement is shown in Figure 4, wherein numeral 51 indicates the main relay coil, 52 indicates a plurality of bulbs, 53 is the armature of relay coil 51, numeral 54 represents the condenser to be charged, 55 is a source of power such as a battery, 56 is the coil of a second relay, and 57 represents an armature controlled by it.

In operation, when the double pole switch 64 is closed, the rush of current into the condenser 54 energizes the coils of relays 51 and 56, which operate their respective armatures 53 and 57, opening their circuits. As the condenser becomes charged, the current decreases and, since relay coil 51 is the sensitive, armature 53 drops out, closing its circuit, permitting the discharge of condenser 54 through bulb 52. As in the previous disclosures, the operation is repetitive. Should however the bulb burn out, the charging current into the condenser will continue to decrease until the relay 56, which is the most sensitive, has its armature 57 drop out, closing on a circuit through auxiliary battery 66. The resulting current operates a rotary magnetic switch having coils 67 and an armature 68, so that reserve bulb 52 would be connected across condenser 54. The discharge of condenser 54 causes the energizing of coils 51 and 56 and the repetition of the normal flashing cycle.

The principles shown are not limited to the particular form of circuit hereabove illustrated. Whenever the charging and discharging of a condenser is used to flash a lamp, the principle herein described is applied, namely the condition of the condenser current and/or voltage being the controlling factor in the timing cycle. Whenever the cycle becomes longer than normal, due to bulb failure, or the failure of any other operating device to discharge the condenser, the operation of a second relay of different selectivity permits automatic substitution for the defective element. Thus in Figure 5 the numeral 61 is the coil of a relay, the armature of which is shown at 67. When battery 65 is connected, current rushes into condenser 64 energizing coil 61 to open the lamp circuit 62 by movement of armature 67. The flasher operation is cyclic as hereabove described so that, if bulb 62 burns out, armature 67 closes the lamp circuit, but condenser 64 does not discharge. The condenser voltage continues to rise and when it reaches a predetermined value, it actuates relay coil 68, moving armature 69 to close a circuit through a bulb changing mechanism 60 either of the type previously described, or of any other suitable and desirable nature. A gaseous discharge tube 63 the purpose of which it is to break down at a predetermined voltage, may be added to prevent loss of power during normal operation.

Thus there has been illustrated and described a bulb replacing arrangement in the principal form of its embodiment and in several modifications. It is to be understood that this disclosure is to be regarded as illustrative and descriptive only of the best known forms of the present invention, and not as limitative or restrictive to the exact details shown, applicant reserving the right to make such changes and alterations in the construction as may come within the scope of the appended claims without thereby departing from the spirit or the scope of the present invention.

Having thus described the invention, what is claimed as new and desired to secure by Letters Patent, is:

1. In a bulb changing device to be used in connection with a lamp flashing circuit, relay means to successively switch in reserve bulbs as bulbs are burned out, said circuit including a condenser and means for charging it during the lamp "off" of the flashing cycle and discharging it on each flash, said relay means controllable by the current into said condenser, said relay operable when the charging current into said condenser drops below the minimum established by the normal time of repetition of the flash and the simultaneous discharge of the condenser.

2. In a bulb changing mechanism associated with a lamp flashing circuit, relay means to successively switch in reserve bulbs when the operating bulb burns out, said circuit including a condenser and means for charging said condenser during the lamp "off" part of the flasher cycle and discharging it on each flash, said relay means controllable by the voltage across said condenser, said circuit being so selective as to operate when the condenser voltage increases above the maximum established by the normal time of repetition of the flash and the simultaneous discharge of said condenser.

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