Feb. 7, 1939. W. J. BRADLEY ET AL 2,146,498

AUTOMATIC CIRCUIT OPENING DEVICE

Filed May 19, 1937

Fig. 1

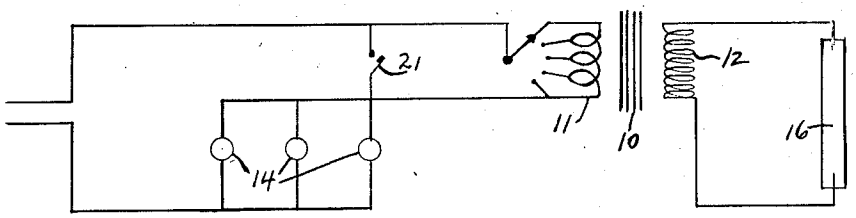


Fig. 2

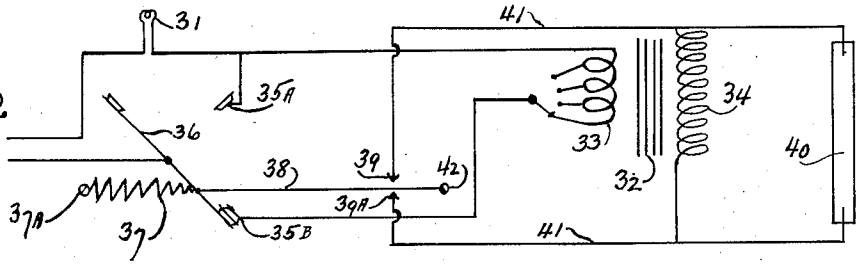


Fig. 3

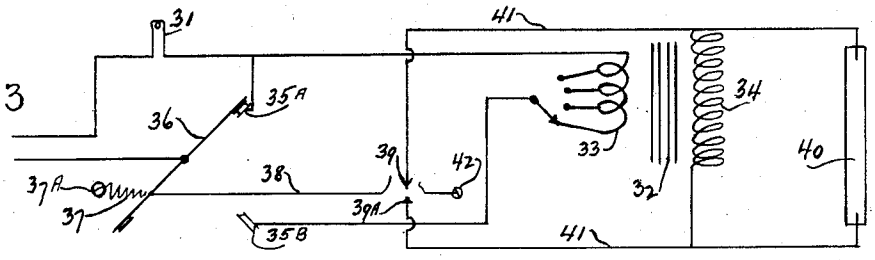
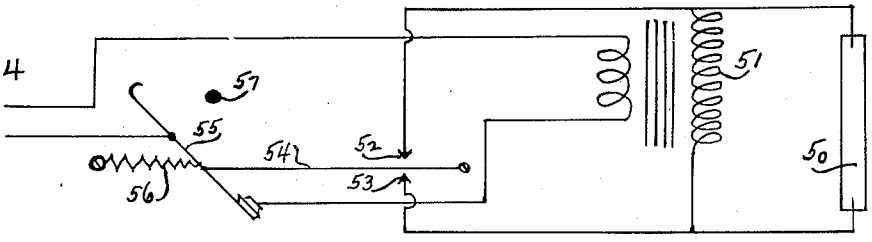


Fig. 4



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AUTOMATIC CIRCUIT OPENING DEVICE

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2 Claims. (Cl. 176—124)

Our invention relates to an illuminating device and has particular reference to a new and novel electrical circuit for operating a positive column luminous tube.

An object of the invention is to devise a new and novel lighting device utilizing a positive column luminous tube.

Another object of the invention is to produce an illuminating device having an electrical resistance, which may be an incandescent lamp, heating element, or a resistance for any other purpose, connected in series with the primary winding of the transformer and to the secondary winding of the transformer a positive column luminous tube is connected for illuminating purposes.

Another object of this invention is to provide a safe and practical device and method of illuminating gaseous filled tubes, in conjunction with and simultaneously with the operation of an incandescent lamp or lamps or other power limiting means, with no greater consumption of current than is normally consumed by said incandescent lamp or lamps or other power limiting means when operated independently of this combination, and without any perceptible decrease in the illuminosity of said incandescent lamp or lamps or in the efficiency of the power limiting means when used in this combination.

Another object of this invention is to provide an automatic means of protecting the unit that provides the voltage required for the operation of the gaseous filled tubes or other limiting means, from harm or destruction due to failure of the high voltage circuit or appurtenance, to operate properly.

Another object of this invention is to provide means for automatically eliminating what is termed the "feed-back" of high voltage from the secondary side of a transformer unit, to the primary or low voltage side of said transformer unit.

Another object of our invention is to provide a means of automatically eliminating the operation of the high voltage circuit employed in this and similar combinations and also the unit employed to produce said high voltage, permitting of the continued operation of the incandescent lamp or lamps or other power limiting means, if so desired.

Another object of this invention is to provide a means for automatically rendering inoperative a high voltage circuit, when the operating requirements of the high voltage circuit exceeds the capacity or ability of the unit supplying said high voltage circuit.

Other objects of the invention will be more apparent from the following description taken in connection with the accompanying drawing which shows an example of the invention, in which:

Figure 1 is a diagrammatic view of one embodiment of our invention, showing a luminous tube connecting with a transformer, a power limiting means and a switch, comprising our combination.

Figure 2 is a diagram of a circuit embodying our invention and having means for automatically opening the circuit through the primary of a transformer when the secondary circuit is not operating properly, the circuit through the primary being shown closed through the primary circuit including power limiting means.

Figure 3 is a diagram similar to Figure 2 with the primary of the transformer opened by said automatic means.

Figure 4 is a diagram of an electrical circuit having means for automatically opening the primary circuit through a transformer when the secondary circuit is not operating properly, there being no power limiting means in the primary circuit.

Referring to Figure 1, there is shown a form of the invention in which the primary circuit is closed through the power limiting means 14 and the primary 11 of the transformer 10, by means of a switch 21. By closing switch 21 the primary circuit is closed through the power limiting means 14 and short circuiting the primary coil 11 of the transformer 10. The secondary 12 of the transformer is coupled to the transformer 10 in the regular manner and also attached to the ends of the load 16.

Referring to Figure 2, there is shown a form of the invention in which the primary circuit of the transformer is closed through the power limiting means 31 and the primary coil 33 of the transformer.

Referring to Figure 3, there is shown a form of the invention in which the primary circuit of the transformer is automatically closed through the power limiting means and opened through the transformer primary. This is automatically done when the secondary circuit is overloaded or fails to operate properly, due for example to breakage or damage to the gas filled tube. In Figure 2 and Figure 3 there is shown an electrical circuit which includes an incandescent lamp 31 or a plurality of incandescent lamps or other power limiting means and the primary 33 of a transformer having a laminated core 32. The circuit also includes

a double armed switch 36 which closes the circuit through the primary 33 when in contact with terminal 35b and opens the circuit through the primary 33 when in contact with a terminal 35a. When the switch contacts terminal 35a, the circuit will be closed through the power limiting means 31. A tension spring 37 attached to a lug 37a tends constantly to urge the switch 36 into engagement with terminal 35a.

The switch 36 is maintained in engagement with terminal 35b by means of a strand 38 which is attached to the switch 36 and to lug 42. The strand 38 is made of a material readily destructible and severed by an electric arc, such a material being a gut string as used on a violin or strands of silk thread.

The secondary 34 of the transformer has connected thereto a load 40, which may be a gas filled electric discharge device such as a neon sign or other load. Also, connected to the terminals of the secondary 34 are leads 41 to terminals 39 and 39a of a spark gap, the strand 38 being positioned between the terminals 39 and 39a.

In operation, when the load 40 is damaged and fails to operate, or the load 40 is greater than the capacity of the secondary 34, there will be between the terminals 39 and 39a an electric arc which rapidly destroys the strand 38 and releases the switch 36 to allow the spring 37 to force the switch 36 into engagement with the terminal 35a. (See Fig. 3.) It is, therefore, seen that the circuit is automatically opened in the primary circuit 33 of the transformer and the circuit through the power limiting means 31 is maintained closed. When the power limiting means 31 consists of a plurality of incandescent lamps such as for illuminating the interior of a store, it will be seen that a failure of a neon sign on the outside of the store will have no effect upon the illumination of the interior of the store.

The primary 33 of the transformer is shown to have a plurality of taps so that the primary circuit can be conveniently adjusted to accommodate power limiting means 31 of various characteristics and capacities.

In Figure 4 is shown the usual circuit for operating a vapor electric discharge device such as a neon tube, the circuit including no power limiting means in the primary of the transformer.

In accordance with the form of the invention shown in Figure 4, upon failure of the load 50 across the secondary 51 of the transformer, an arc is produced between terminals 52 and 53 to destroy a strand 54 to release a single pole switch 55 and allow the latter to be drawn back by a tension spring 56 into engagement with a stop 57. In this circuit, when the load 50 is too great or the secondary does not operate properly, the primary circuit is automatically opened and there is no closing of a circuit through power limiting means as described in connection with Figures 2 and 3.

Referring to Figures 1, 2 and 3 it will be noted that a power limiting means is employed in series with one of the ends of the primary of the transformer, the other end being connected direct to the power supply main. One or more power limiting means 14 may be used, as shown in Figure 1, in which case the lamps are preferably connected in parallel with respect to each other. The secondary winding 12 or 34 of the transformer is coupled in the usual way with the primary winding 11 or 33 and is connected to terminals of load 16 or 40.

The primary winding 33 of the transformer 11 as shown in Figures 1, 2 and 3, preferably has a relative low impedance so that an incandescent lamp or lamps in series therewith are not dimmed to any substantial degree. In order to accomplish this it has been found to work satisfactorily with 50 to 80 turns of 18 gauge wire when used with a single 150 watt incandescent lamp in series therewith. The secondary winding of the transformer has been found satisfactory with 25,000 turns of 40 gauge wire. The ratio of turns is about 1 in the primary to 400 turns in the secondary. In order to avoid dimming of the incandescent lamp used in the primary circuit of the transformer it has been found that a tapped primary which permits of a choice of number of turns to be used in the primary works satisfactorily in respect to the dimming effect. If the load or current to be carried by the primary is relatively high, then the turns on the primary winding employed are relatively low and the size of the wire is increased. The effective voltage across the incandescent lamp 14 or 31, used here as a power limiting means, will not be reduced sufficiently to effect to any noticeable or material extent the degree of luminosity radiated by the lamp or lamps 14 or 31.

Various modifications will occur to those skilled in the art, as to the configuration, composition and disposition of the component elements going to make up the invention as a whole, as well as in the selective combination or application of the respective elements, and no limitation is intended by the phraseology of the foregoing description or illustrations in the accompanying drawing.

What we claim is:

1. In an electrical circuit for operating a gas filled electric discharge device, a transformer, a power limiting means in series with the primary of the transformer, a gas filled electric discharge device connected to the terminals of the secondary of the transformer, a switch for closing the circuit through the primary, means for holding the switch in a closed position, means for automatically releasing said switch to open the primary circuit and to complete a circuit through the power limiting means when the secondary circuit of the transformer becomes overloaded or fails to operate properly.

2. In an electrical circuit for operating a gas filled electric discharge device, a transformer, a power limiting means in series with the primary of the transformer, a gas filled electric discharge device connected to the terminals of the secondary of the transformer, a double armed switch, a strand of destructible material for holding the switch in a position to close the circuit through the primary, a tension spring for moving the switch to open the primary circuit and close a circuit through the power limiting means when said strand is destroyed, and terminals connected to the terminals of the secondary of the transformer to produce an electric arc to destroy said strand when the secondary becomes overloaded or fails to operate properly.

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