March 10, 1959 S. GOULD 2,877,384

CONTROL UNIT

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Fig. 1

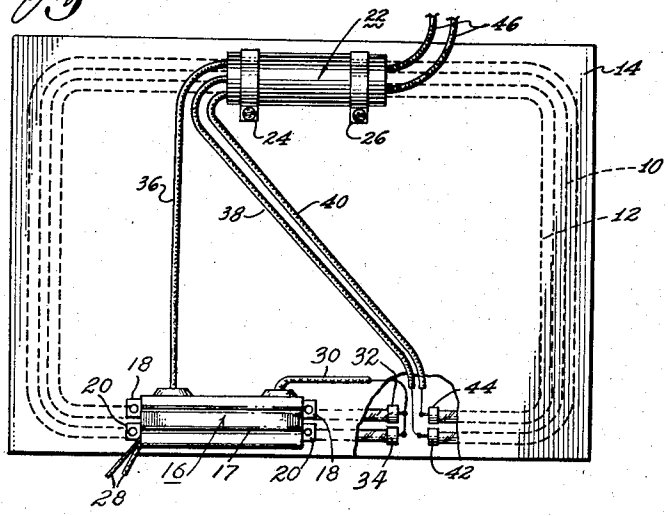
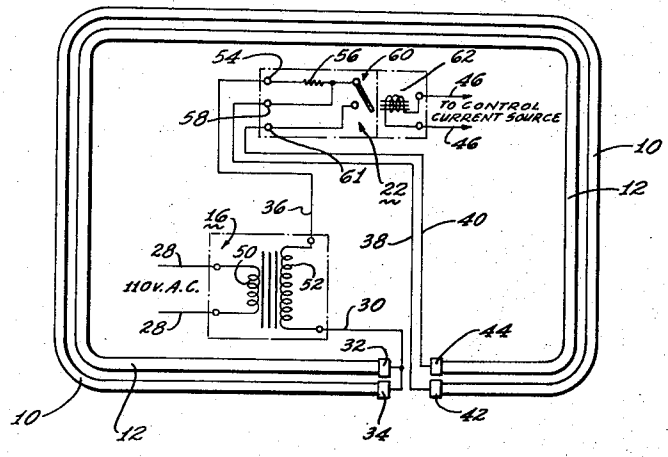


Fig. 2



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Fig. 3

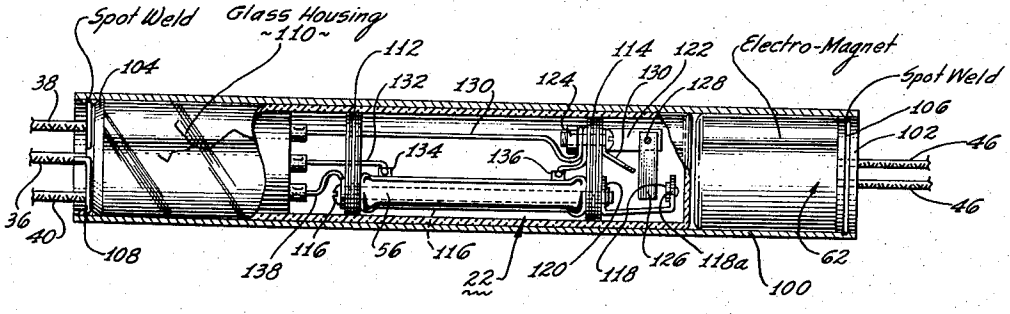
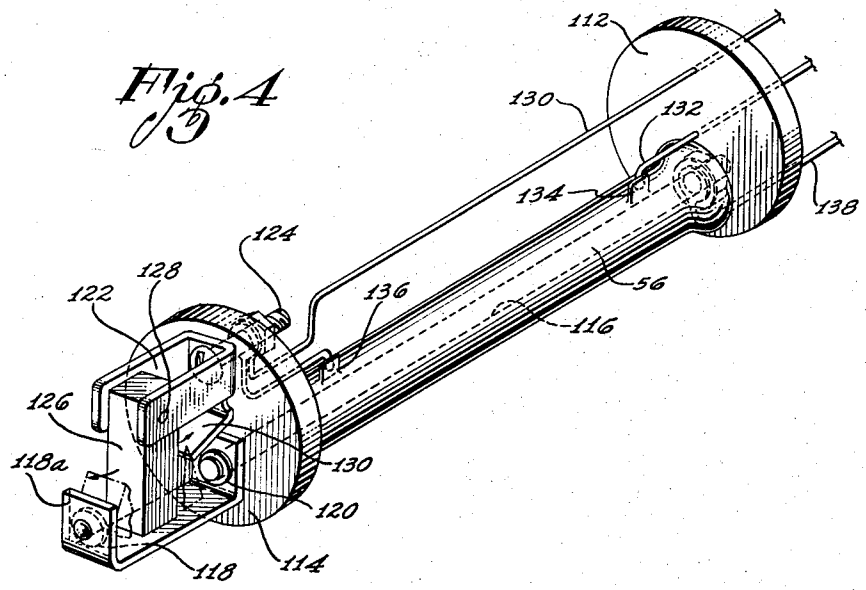


Fig. 4



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CONTROL UNIT

Samuel Gould, Culver City, Calif., assignor to GHN Neon Sign Company, Culver City, Calif., a partnership

Application May 27, 1957, Serial No. 661,734

6 Claims. (Cl. 315—183)

The invention relates to electric signs of the type usually referred to as "neon signs," and the invention more particularly relates to a control unit for such signs for causing the luminous gaseous discharge tubes utilized therein alternately to flash on and off for animation purposes.

The enhanced psychological appeal and high attention-attracting quality of flashing signs have been well established. It is, therefore, most desirable that signs employing neon tubes be controlled so as to exhibit such flashing characteristics. The prior art control systems for the most part, however, have been excessively complicated and unduly expensive.

Copending application Serial No. 582,698, which was filed on May 4, 1956 by Samuel Gould, discloses and claims a simplified and inexpensive animated display system using luminous gaseous discharge tubes such as the conventional neon tubes.

As pointed out in the copending application, difficulties have been encountered in the prior art in providing a flashing control due to the high voltages involved in present-day neon tube display systems. It is usual in such systems to employ a transformer to step the line voltage up to the higher voltage required to discharge the neon display tube. It is commercially infeasible to provide a separate transformer for each tube in the display, and therefore for individual flashing of the various neon tubes making up a display, the control operations must be carried out in the high voltage secondary circuit. This voltage, however, is usually of the order of 15,000 volts, and most fire and safety codes require that no open switching be carried out in such high voltage secondary circuits.

In the system of the copending application, a flashing control of a pair of neon tubes is provided by connecting tubes of different internal resistance across a voltage source, and by interposing a control tube in circuit with the discharge tube of the lower internal resistance. The control tube includes a movable armature within its envelope, and this armature is magnetically controlled to be moved in and out of contact with a fixed contact means. This closure of the armature with the fixed contact produces a discharge through the control tube and effectively alters its resistance from a relatively high value to a relatively low value.

When the resistance of the control tube has a relatively high value, the voltage of the source rises to a sufficiently high level to fire the high impedance neon tube and it alone glows. Then, when the resistance of the control tube is altered to a relatively low value, the low resistance neon tube fires and the voltage of the source drops below the level necessary to sustain a discharge in the high resistance tube. For the latter condition, therefore, only the low resistance tube glows.

Therefore, by an appropriate magnetic control of the control tube, individual flashing of the neon tube may be achieved by keying the secondary circuit of the transformer. However, there is no open switching of the high voltage and no fire or safety hazards. Also, the secondary circuit is never completely opened, as one or the other of the illuminous discharge tubes remains energized across it.

The present invention provides a control unit which is particularly suited for use as the control tube in the above described system of the copending application. The control unit of the invention is a rugged and compact package that is readily adapted for convenient mounting on the display in which it is to be incorporated. In addition, the control unit is simple to construct, and it uses relatively inexpensive and readily available components.

In accordance with one embodiment of the invention, the operating components of the control unit are contained in a tubular sealed envelope so that no open contact arcing occurs. The envelope may have a normal atmosphere, or it may be filled with a gas at the normal atmospheric pressure or at a reduced pressure.

A rigid suppressor resistor is supported within the tubular envelope of the embodiment referred to above. This resistor serves to reduce radio and television interference, and it also constitutes a convenient mounting and supporting means for the other components of the control unit. An electrically conductive mounting stud extends through the resistor, and this stud serves to secure a pair of insulating discs at the opposite ends of the resistor. A magnetic armature is supported on one of the insulating discs, and the armature is controlled by an external electromagnet to be pivoted in and out of contact with a fixed contact that is supported on the same disc. Suitable electrical connections extend through the other insulating disc into respective electric contact with the various components of the assembly.

The switching unit in its tubular envelope, and the external electromagnet may be conveniently supported in coaxial relation in a tubular metallic casing. This provides a unit that may be most conveniently mounted in the display system with which it is used.

In the drawings which are to be considered as merely illustrative of one embodiment of the invention:

Figure 1 is a rear view of a typical neon tube display system which incorporates the control unit of the present invention, the unit functioning to control the operation of a pair of luminous discharge tubes in the display system so that the tubes may be alternately fired to animate the display;

Figure 2 is a schematic representation of the electric connections of the control unit of Figure 1, illustrating how the control unit operates in conjunction with a voltage step-up transformer to control the energizing of a pair of luminous discharge tubes;

Figure 3 is a side view, partly in section, of the improved control unit of one embodiment of the invention, this view particularly illustrating the manner in which the various electrical components are supported within the control unit to provide a rigid and compact package with a minimum of component parts; and

Figure 4 is a perspective view of certain of the components of the control unit of Figure 3 in an assembled condition.

The display of Figure 1 includes a pair of luminous discharge lamps **10** and **12** which are mounted on a supporting panel **14**. As noted above, the view of Figure 1 is from the rear of the panel. The luminous discharge tubes **10** and **12** may be the usual neon tubes, and the term "neon tube" will be used generically in the following description to designate any well-known type of gaseous discharge illuminating tube which uses neon or other suitable gases.

The neon tubes 10 and 12 are illustrated as having a rectangular configuration in the illustrated display, and the tube 12 is shown as being adjacent the tube 10. It is evident, however, that these tubes may have any desired shape or configuration, as dictated by the effect desired to be achieved by the display.

The neon tube 12 is assumed to have a lower internal impedance than the tube 10. For that reason, the neon tube 12 may be fired at a lower voltage threshhold than the threshhold required to fire the tube 10. Also, when the tube 12 is fired it reduces the voltage of the source below the level necessary to maintain a discharge through the tube 10.

A usual voltage step-up transformer 16 is mounted in a casing 17, and this transformer is supported by means of a pair of brackets 18 and 20 at the lower edge of the panel 14 and on the rear surface of the panel.

A tubular control unit 22 which is constructed in accordance with the invention (as will be described) is also supported on the rear surface of the panel 14. This latter support is achieved by means of a pair of brackets 24 and 26; these brackets being secured to the panel by appropriate mounting screws, as are the brackets 18 and 20.

The transformer 16 has a primary winding which is connected to the usual alternating-current lines through a pair of leads 28. The transformer also has a secondary winding across which a high voltage is developed. One side of the secondary winding is connected by a lead 30 to a first electrode 32 of the neon tube 12 and to a first electrode 34 of the neon tube 10. The other side of the secondary winding is connected to the control unit 22 by means of a lead 36. A pair of leads 38 and 40 from the control unit connect respectively to a second electrode 42 of the tube 10 and to a second electrode 44 of the neon tube 12. The unit 22 also includes an electromagnet which is connected to a suitable source of uni-directional energizing current over a pair of leads 46.

In a manner to be described, the control unit 22 operates to establish a relatively high voltage across the electrodes 34 and 42 of the neon tube 10. As long as the neon tube 12 is not activated, this voltage produces a discharge through the tube 10 so that the tube 10 glows. However, the control unit intermittently introduces the voltage from the secondary of the transformer 16 across the electrodes 32 and 44 of the tube 12. This produces a discharge in the neon tube 12 and a resulting drop in the voltage below that required to sustain a discharge in the tube 10. For that reason the tube 12 alone is now energized. Therefore, by the intermittent raising of the voltage across the electrodes 32 and 34 to the level required to fire the tube 12, and by continuously applying a voltage across the electrodes 34 and 42, the desired flashing action of the neon tubes 10 and 12 is achieved.

The manner in which the control is effected is best shown by the electric circuit diagram of Figure 2. The transformer 16 includes a primary winding 50 to which the leads 28 are connected. The transformer also includes a secondary winding 52 across which the high voltage is developed. One side of the secondary winding 52 is connected by the lead 30 to the electrodes 32 and 34 of the respective tubes 12 and 10.

The other side of the secondary winding is connected by the lead 36 to an input terminal 54 of the control unit of the invention. The input terminal 54 is connected to one terminal of a suppressor resistor 56 which is included in the unit 22. The other terminal of the resistor 56 is connected to a second terminal 58 of the unit to which the lead 38 from the electrode 42 of the tube 10 is connected. This other terminal of the resistor 56 is also connected to the armature of a switch 60 which is supported within the unit 22. The fixed contact of the switch 60 is connected to a terminal 61 of the unit. The lead 40 connects the terminal 61 to the electrode 44 of the neon tube 12.

Whenever the switch 60 is opened, the electrodes 34 and 42 of the high impedance neon tube 10 are connected in series with the suppressor resistor 56 across the high voltage secondary winding of the transformer 16. The load impedance is such now that the voltage developed across the secondary winding is sufficiently high to fire the tube 10 and cause it to glow. However, the circuit to the tube 12 is now open, because the switch 60 is opened.

When the switch 60 is closed, the electrodes 32 and 44 of the tube 12 are placed across the secondary winding 52 in series with the suppressor resistor 56. The voltage across the secondary winding immediately fires the lower impedance resistor tube 12, and the resulting discharge through that tube causes the voltage across the secondary winding to be reduced to a level below that necessary to maintain a discharge in the tube 10. Therefore, during the latter condition, the tube 12 glows and the tube 10 is extinguished.

Therefore, by repeatedly opening and closing the switch 60, the tubes 10 and 12 can be alternately energized to provide the desired animated display. The switch 60 is constructed in a manner to be described to include an armature of magnetic material which is loosely pivoted to a supporting bracket. The switch is so mounted that the armature normally hangs by gravity to be out of contact with the fixed contact of the switch. An electromagnet 62 is mounted in coaxial relation with the control unit 22, and this magnet serves to draw the armature into a firm contact with the fixed contact. When the energizing coil of this magnet is repeatedly energized and de-energized, the switch 60 is therefore opened and closed to produce the flashing effect described above.

As noted, the mechanical details of the unit 22 and of the electromagnet 62 are shown in Figures 3 and 4. As shown in Figure 3, for example, the two units 22 and 62 are conveniently mounted in coaxial relation with a metal tube 100 which is appropriate for convenient mounting on a usual neon display, as described in conjunction with Figure 1. The units 22 and 62 are held within the metal tube 100, for example, by a disc 102 at one end, and by a disk 104 at the other end. These discs may conveniently be formed of an appropriate insulating material formed, for example, of a phenolic resin such as Bakelite. The disc 102 has a central aperture for receiving the leads 46 which connect to the energizing electromagnet 62. A metal ring 106 is mounted in a groove in the periphery of the disc 102 in any suitable manner, and this ring is soldered or spot welded to the internal surface of the casing 100 to hold the disc 102 within that casing. In like manner, the disc 104 has a metal ring 108 secured to its periphery, and the ring 108 is also attached to the inner surface of the metal disc 100 by soldering or spot welding.

The components which make up the switch assembly are conveniently sealed in a tubular glass envelope 110. The interior of the envelope may be at atmospheric pressure, or the internal pressure may be reduced. Also, the envelope may be filled with a suitable gas if so desired.

A pair of insulating discs 112 and 114 are positioned within the envelope 110, and these discs are spaced axially within the envelope and extend across its interior. The resistor 56 is formed in a usual rigid elongated casing, and an electrically conductive screw or stud 116 extends longitudinally through the casing of the resistor 56 and through the discs 112 and 114, the screw being out of electrical contact with the resistor 56.

The screw 116 serves to hold the insulating discs 112 and 114 in a rigid assembled condition on the ends of the resistor casing, and the screw also serves as an electric connection to a fixed switch contact 118. The contact 118 is mounted on the disc 114, and it is held on the disc by a nut 120 which is threaded to the screw 116.

A U-shaped electrically conductive supporting bracket

122 is also mounted on the disc 114. This supporting bracket is mounted on the disc by means of an appropriate mounting screw 124 which extends through the disc. An armature 126 of magnetic material, such as soft iron, is pivotally mounted to the bracket 122 by means of a pivot pin 128. The bracket 122 has a tongue portion 130 which limits the angular motion of the armature 126 in one direction and holds the armature out of contact with the fixed contact 118. The fixed contact 118 has a bent-over end portion 118*a* which limits the angular motion of the armature 126 in the opposite direction.

The unit 22 is supported on the display in the position shown in Figure 3 so that the armature 126 hangs down by gravity against the tongue 130. Then, when the electromagnet 62 is energized, the armature 126 swings in the direction of the electromagnet against the bent-over portion 118*a* of the fixed contact 118. In this manner, the armature 126 makes selective contact with the fixed contact 118.

The disc 104 has three spaced holes extending through it, and these holes receive the respective leads 36, 38 and 40 referred to above. These leads extend into the tubular envelope 22 through the left hand end portion of the envelope in Figure 3. This end portion of the envelope may conveniently be filled with an appropriate potting compound for filling the envelope and for serving as a supporting medium for the leads.

A first relatively rigid electrical lead 130 is connected to the lead 38, and the lead 130 extends through the disc 112 into electrical connection with the screw 124. The screw 124, in turn, is electrically connected to the electrically conductive bracket 122, and the bracket is connected to the armature 126. A second relatively rigid electric lead 132 extends through the disc 112 and is connected to the lead 36. This second lead 132 is connected to one of the terminals 134 of the resistor 56, the other terminal 136 of the resistor 56 being connected to the screw 124 with the electrical connection 130. A third relatively rigid electrical lead 138 is connected to the screw 116, this third electrical lead extending from the lead 40 and the screw 116 serving to connect this connection to the fixed contact 118.

In the manner described above, all the operating components of the unit 22 are rigidly assembled, and the assembly is securely supported within the envelope 22 by the leads 130, 132 and 138. This support and assemblage is achieved by means of a minimum of component parts, and the unit results in a compact and relatively inexpensive package.

What is claimed is:

1. In an animated electric display system and the like which includes, a source of electric energy, a first luminous discharge lamp of relatively high impedance having first and second electrodes, and a second luminous discharge lamp of relatively low impedance having first and second electrodes, the first electrodes of both of the lamps being connected to one side of the source; a control unit for the display system including in combination: an enclosing envelope of tubular configuration, first and second disc-like insulating members extending across the interior of the envelope and spaced from one another within the envelope, a rigid elongated resistance member interposed between said insulating members, an electrically conductive stud extending through said resistance member to secure said insulating members to the opposite ends thereof, a fixed contact member supported on one of said insulating members in electrical contact with said stud, a movable armature of magnetic material supported on said one of said insulating members and connected to one terminal of said resistance, electrical leads for respective connection to the other side of the source and to the respective second electrodes of the first and second discharge lamps extending through the other of said insulating members and respectively connected to the other terminal of said resistance and to said armature and to said stud, and electromagnetic means external of said envelope for controllably moving said armature with respect to said fixed contact.

2. In an animated electric display system and the like which includes, a source of electric energy, a first luminous discharge lamp of relatively high impedance having first and second electrodes, and a second luminous discharge lamp of relatively low impedance having first and second electrodes, the first electrodes of both of the lamps being connected to one side of the source; a control unit for the display system including in combination: an enclosing envelope of tubular configuration, first and second disc-like insulating members spaced from one another within said envelope, an elongated rigid resistance member interposed between said disc-like members and having first and second terminals, an electrically conductive stud extending through said resistance member and said disc-like members, a fixed contact member supported on said first disc-like member by said stud at electric contact with said stud, a U-shaped electrically conductive member supported on said first disc-shaped member, an armature of magnetic material pivotally mounted on said U-shaped member in electric contact therewith, said U shaped member having a tongue portion for defining a first limiting angular position of said armature and said fixed contact defining a second limiting angular position thereof, a first electric lead for connection to the second electrode of the second discharge lamp connected to said stud, a second electric lead for connection to the second electrode of the first discharge lamp connected to said first terminal of said resistance and to said U-shaped member, a third electric lead for connection to the other side of the source connected to said second terminal of said resistance, and electromagnet means disposed external of said envelope adjacent said armature and adapted to be energized to move said armature from one to the other angular limiting position.

3. A control unit for an animated electric display system and the like including: an enclosing envelope of tubular configuration, first and second disc-like insulating members extending across the interior of the envelope and axially spaced from one another within the envelope, a rigid elongated resistance member interposed between said insulating members, an electrically conductive stud extending through said resistance member but out of electrical contact therewith to secure said insulating members to the opposite ends of said resistance member, a fixed contact member supported on one of said insulating members in electrical contact with said stud, a movable armature of magnetic material supported on said one of said insulating members and connected to one terminal of said resistance, and individual electrical leads extending through the other of said insulating members and connected respectively to the other terminal of said resistance member and to said armature and to said stud.

4. A control unit for an animated electric display system and the like including: an enclosing envelope, first and second disc-like insulating members spaced from one another within said envelope, an elongated rigid resistance member interposed between disc-like members and having first and second terminals, an electrically conductive stud extending through said resistance member but out of electrical contact therewith and through said disc-like members, a fixed contact member supported on said first disc-like member by said stud in electric contact with said stud, a U-shaped electrically conductive member supported on said first disc-shaped member and electrically connected to said first terminal of said resistance, an armature of magnetic material pivotally mounted on said U-shaped member in electric contact therewith, said U-shaped member having a tongue portion for defining a first limiting angular position of said armature and said fixed contact defining a

second limiting angular position thereof, and individual electrical leads extending through said second disc-like member into respective electric contact with said stud and with said first terminal of said resistance member and with said second terminal of said resistance member.

5. In an animated electric display system and the like which includes, a source of electric energy, a first luminous discharge lamp of relatively high impedance having first and second electrodes, and a second luminous discharge lamp of relatively low impedance having first and second electrodes, the first electrodes of both of the discharge lamps being connected to one side of the source; a control unit for the display system including in combination; first and second flat insulating members, a rigid elongated electrical circuit element having a first terminal and a second terminal and interposed between said insulating members, an electrically conductive stud extending through said electrical circuit element out of contact therewith to secure said insulating members to the opposite ends of said circuit element, a fixed switch contact supported on one of said insulating members in electrical contact with said stud, a second switch contact supported on said one of said insulating members and connected to the first terminal of said electrical circuit element, electrical leads extending through the other of said insulating members for respective connection to the other side of the source and to the respective second electrodes of the first and second discharge lamps and respectively connected to the second terminal of the circuit element and to said second switch contact and to said stud, and means for controllably moving said switch contacts for selective engagement with one another.

6. A control unit for an animated electric display system and the like including: first and second flat insulating members, a rigid elongated electrical circuit element interposed between said insulating members and having a first terminal and a second terminal, an electrically conductive stud extending through said circuit element out of electrical contact therewith to secure said insulating members to the opposite ends of said circuit element, a first switch contact supported on one of said insulating members in electrical contact with said stud, a second switch contact supported on said one of said insulating members and connected to one of the terminals of the circuit element, and individual electrical leads extending through the other of the insulating members and connected respectively to the other terminal of the circuit element and to the second switch contact and to the first switch contact.

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