Nov. 28, 1933. R. E. BARCLAY 1,937,137

ILLUMINATING DEVICE

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FIG. 2.

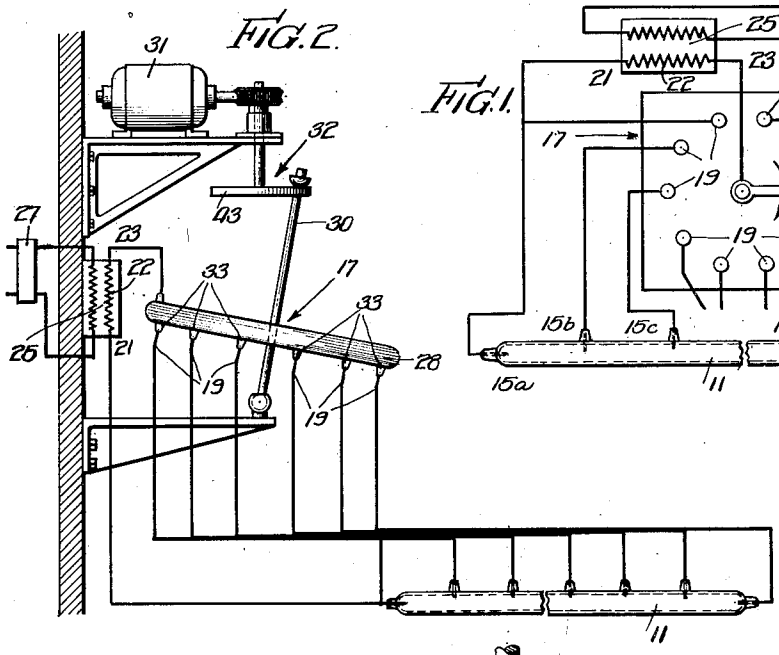

FIG. 1.

FIG. 3.

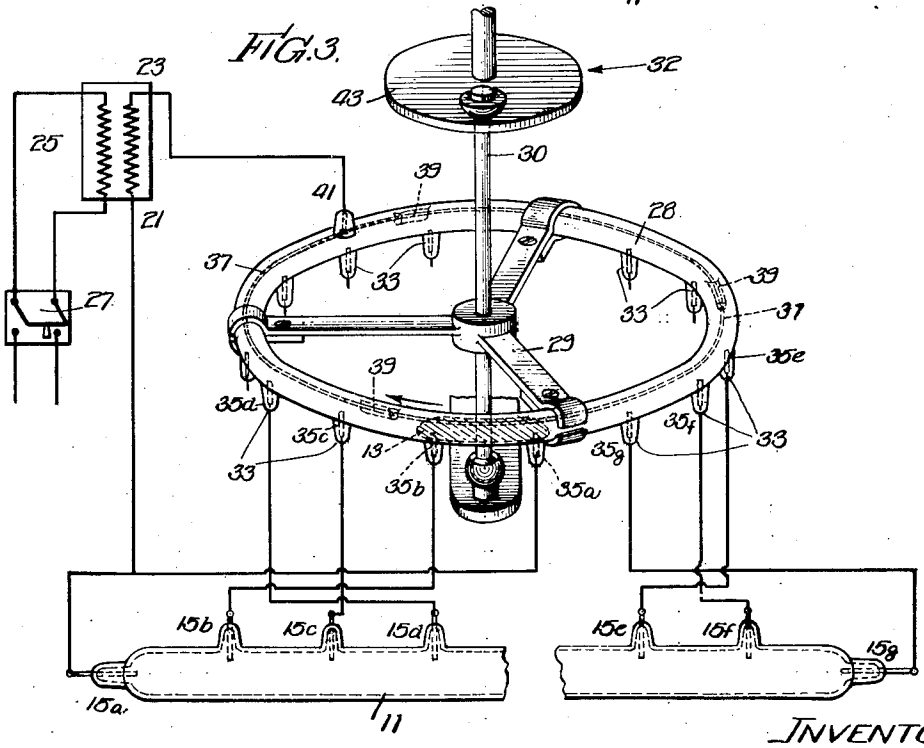

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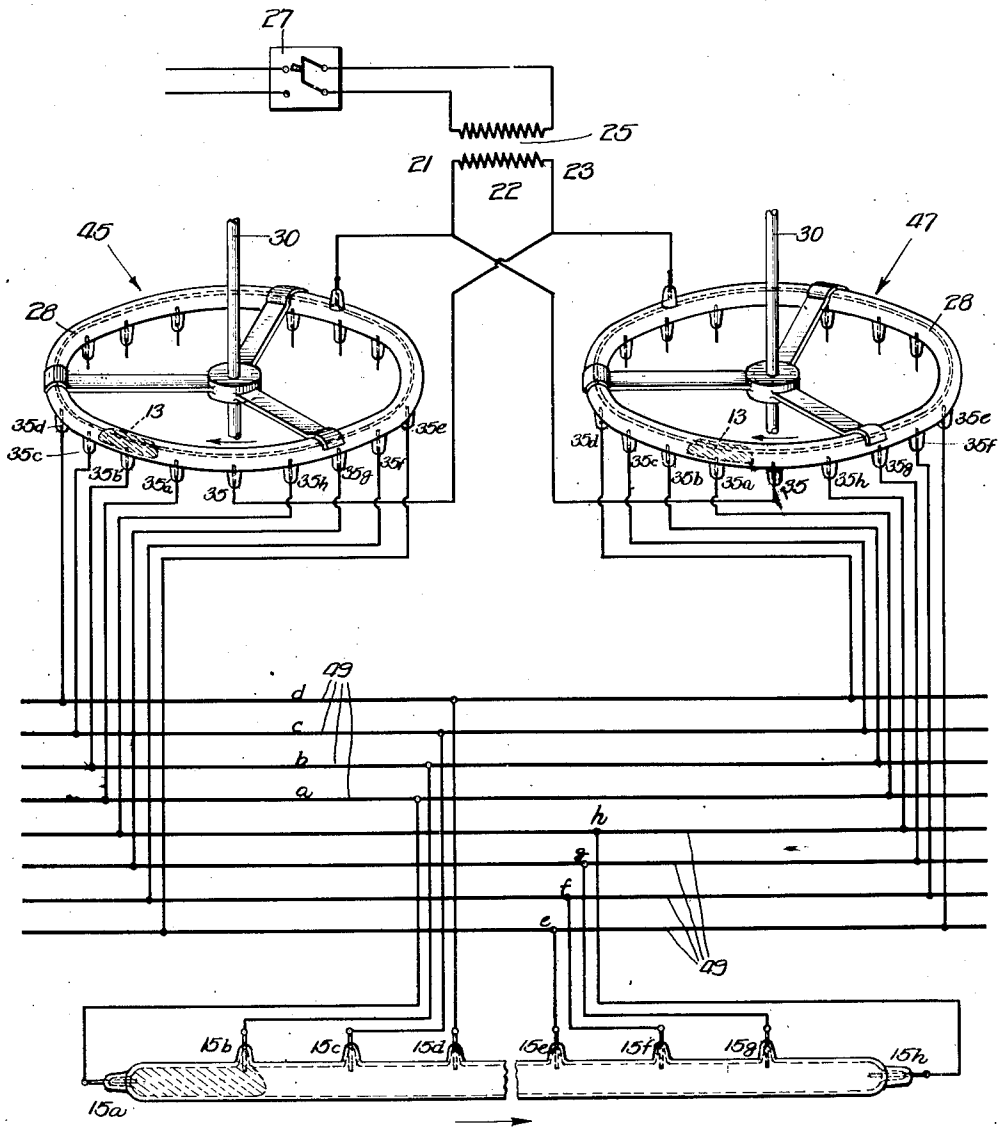
FIG. 4.



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UNITED STATES PATENT OFFICE

1,937,137

ILLUMINATING DEVICE

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2 Claims. (Cl. 177—346)

My present invention relates to electrical apparatus and has more particular reference to illuminating devices, more especially devices producing a travelling effect.

Devices of this type find wide use in display signs and illuminated advertising devices, since the moving or traveling effect of the light produces an eye-arresting effect and possesses the capacity of attracting attention to a marked degree.

Travelling light effects heretofore produced by using incandescent lamps as the illuminating medium have been of limited effectiveness because the physical limitations which prevent close mounting of the lamps cause the continuity of the light flow to be broken, which of course impairs any traveling effect which may be accomplished. One of the important objects of my present invention is to provide novel means for utilizing luminescent elements of the electrical discharge type in producing a travelling light effect whereby the disadvantages of incandescent lamps may be eliminated and more attractive results obtained.

Another important object of my present invention is to provide switch mechanism particularly adapted for handling the high tension currents used in the operation of electrical discharge units.

Another important object of my invention is to provide means for progressively switching into operation sections of a luminescent element or sign without interrupting the power circuit.

Another important object of my present invention is to provide a mercury switch for use in progressively switching luminous units into an electrical circuit, whereby to obtain a travelling effect with said luminous units.

Still another object of my present invention is to provide a circuit-changing device adapted for progressively actuating sections of electrical discharge illuminating devices.

Still another important object of my present invention is to provide a tiltable mercury switch for the purpose described.

A still further object of my present invention is to provide a novel electrical discharge unit having portions capable of being progressively and alternately illuminated, whereby travelling light effects may be produced.

Yet another important object of my present invention resides in providing a control circuit for an illuminated display device and including continuously operating means for changing the circuit to provide for a travelling light effect in the display device without breaking the power circuit.

Numerous other objects and advantages of the invention will be more fully understood as the invention is understood from the following description which, taken in connection with the accompanying drawings, discloses a preferred embodiment of the invention.

Referring to the drawings:

Figure 1 is a diagrammatic representation illustrating devices and control circuits for accomplishing the travelling light effect in accordance with the teachings of my present invention, and including a continuously operable circuit changer.

Figure 2 illustrates a modified arrangement of the apparatus illustrated in Figure 1, wherein the continuously operating circuit changer is shown as a mercury switch of novel construction; and

Figures 3 and 4 are enlarged views illustrating the apparatus embodying my present invention and preferred applications thereof in the production of travelling light effects.

To illustrate my invention I have shown on the drawings a luminescent element 11 and control apparatus for progressively illuminating portions of the element 11 in order to obtain therein travelling light effects.

The luminous element 11 may consist of a series of individual lamps arranged in a series circuit with taps taken between adjacent lamps at short intervals in the series circuit, but I prefer to form the element 11 as a single gas-filled, electrical discharge arc tube with electrodes 15 set into the discharge tube at spaced intervals throughout its length.

I obtain my novel travelling effects in the luminescent element 11 by means of control apparatus which includes a switch 17 having a plurality of contacts 19, which correspond with and are electrically connected to the electrodes 15 in the side walls of the luminescent element 11. The electrodes and contacts will hereinafter be interdistinguished by alphabetical indices. The electrode 15*a* at one end of the luminescent element is or may be connected to one side 21 of the secondary winding 22 of a transformer 25, the primary winding of which is connected through switching apparatus 27 to a suitable source of electrical power, preferably power having a tension of 110 volts, so that the device of my present invention may be operated from the ordinary commercial or house-lighting electrical circuit. The transformer 25 is of the type in which the secondary may be short circuited without danger

and preferably has a ratio such that the secondary winding will produce power at sufficient voltage to illuminate the element 11. The opposite end 23 of the secondary winding 22 will hereinafter be referred to as the positive or high side or end to distinguish it from the other side 21, which will be called the negative or low side. The high side 23 of the transformer secondary is connected to a continuously movable selector element 26 of the switch 17, which provides means for progressively making a connection between the side 23 of the secondary winding and the contacts 19 of the switch so as to progressively increase the length of the luminescent element 11, which is in circuit with the transformer secondary.

The switch 17, as shown in Figure 1 comprises a mechanical switch which in its simplest form, as illustrated, comprises a base in which the contacts 19 are arranged circularly and in spaced relationship in position to be successively contacted by the sliding contact 26 mounted on the end of a continuously rotatable arm, which arm in turn is carried by a shaft or axle concentrically mounted in the base with respect to the circularly arranged contacts 19. The shaft or axle and arm may be connected to any suitable driving means whereby to impart circular rotary movement to the sliding contact 26. The sliding contact 26 is of sufficient length to engage two adjacent contacts 19 so that the member 26 will at all times be in contact with at least one of the contacts 19 to the end that the secondary circuit of the transformer 25 will at all times be a closed circuit. While the mechanical switch illustrated in Figure 1 has the advantage of cheapness, I prefer to employ a mercury switch of the type shown at 28 in Figures 2, 3 and 4 of the drawings. This switch 27 comprises a curved, tubular member 28, which may conveniently be made of glass stock similar to that which is employed in the production of the luminescent element 11. This tubular member is sealed to provide an annular closed channel containing a globule of mercury 13 which fills the bore of the tube, and which is free to travel in the tube. The globule of mercury thus corresponds with the movable selector element 26 of the mechanical switch of Figure 1. The tube may be supported in any convenient manner, as by the bracket 29, and is mounted to gyrate about a vertical axis so that the tube may be tipped in order to cause the mercury to travel continuously therein. The gyration may be accomplished by forming the bracket 29 with an axle 30 and by pivoting one end of the axle in a stationary socket while rotating the other end of the axle on a circle as by means of the motor 31 and associated mechanism 32.

The tube 28 is provided with a plurality of pockets 33 spaced at intervals along its under side, said pockets extending completely around the annulus. Every pocket contains an electrode 35 which extends into the tube to form a terminal therein so that the column of mercury, in travelling in the tube, will progressively engage the several electrodes in the pockets 33. The several electrodes 35 for the sake of clarity of exposition, are hereinafter also interdistinguished by alphabetical indices. The tube is also provided with an elongated contact 37 which extends in the upper portion of the tube above the electrodes 35. This elongated electrode may be supported in position in the tube by being embedded in projections 39 formed on the inner wall of the tube or in any convenient manner and has an extension 41 extending out through the wall of the tube, whereby to form a connection with the negative end 23 of the transformer secondary. The electrode 37 provides a running contact whereby the mercury column 13 will be connected to the negative side of the transformer at all times during its travel in the tube. The tube support is also provided with a disc 43 and a co-operating mechanism, whereby the tube may be gyrated about the axle 30 and tilted in order to permit the mercury to move along in the tube under the influence of gravity and to progressively engage and uncover the electrode 35.

Each of the electrodes 35 is connected to its corresponding contact 19 outside of the tube and hence to a corresponding electrode 15 of the element 11. Any one of the electrodes 15 is or may be connected to the low side of the transformer secondary (for the sake of easy description 15 is shown so connected), and the high side of the transformer being connected to the mercury globule through the running contact 37, as the globule travels in the annular switch, the power of the transformer will be applied progressively between the contact 15*a* and the other electrodes 15 in turn. Successive sections of the element 11 will thus be illuminated.

During the instant while the transformer is short-circuited, the element 11 will of course be dark. It should be noted also that the moving contact element of the switch (the mercury column in Figure 3, the slide contact 26 in Figure 1) is long enough to engage two adjacent electrodes 35 so that the succeeding electrode is contacted before the previously contacted electrode is uncovered. In other words the secondary circuit of the transformer is never actually broken, even when the circuit is changed to light up a different part of the element 11.

One of the important advantages of the arrangement which I have just described resides in the fact that the secondary circuit of the transformer is not at any time an open circuit, so that destructive sparking, which always occurs when a secondary circuit is opened while loaded, is absolutely prevented.

In Fig. 1, if the switch is operated in an anticlockwise direction, it will be obvious that the luminous element 11 will be progressively illuminated, commencing from the left hand end viewing the drawings and proceeding toward the right hand end. If the switch motion is reversed as indicated by the arrow, the illumination will retreat in the tube from the right hand end to the left hand end so there will be a reversal of the travelling light effect. In Fig. 3, the same effects are obtained by switch movements reverse to that of Fig. 1. By employing the control system illustrated in Figure 4 of the drawings, wherein two switches are employed for changing the secondary circuit of the transformer through the luminescent element 11, I am able to produce another travelling light effect, wherein a streak of light may be caused to travel along the luminescent element instead of merely starting at one end and growing longer until the entire element is lighted as is the case in the system illustrated in Figures 2 and 3.

In Figure 4 of the drawings power for actuating the primary winding of the transformer 25 is obtained from any suitable source by means of connections through the control switch 27. The luminescent element 11 is provided with the

spaced connections 15, each of which is connected to one of a series of bus wires 49, which wires in the drawings are interdistinguished by alphabetical indices *a*—*h*. Two switches 45 and 47 are employed and the travelling contact elements 13 of these switches are connected one to the low end 21 of the secondary 22 of the transformer 25 and the other to the high end 23 of the secondary.

In the illustrated embodiment, the movable member of the switch 45 is connected to the end 21 of the secondary, while the movable element of the switch 47 is connected to the end 23 of the secondary. The switches 45 and 47 have the usual contacts which in the present instance are labelled 35, 35*a*, 35*b*, etc., to 35*h*. The terminal 35 of the switch 45 is connected to the high end 23 of the transformer secondary while the corresponding terminal 35 of the switch 47 is connected to the low end 21, the remaining terminals of both switches being connected to their corresponding bus wires 49. In operation, one of the switches 45 is rotated slightly in advance of the other so that the moving contact of one switch will engage a given contact 35 slightly in advance of the engagement of the corresponding contact of the other switch by its travelling member.

For example, if the switch 45 is actuated slightly in advance of the switch 47 and both are operated to cause the travelling element 13 to move in the direction illustrated by the arrows in Figure 4, the moving element 13 of the switch 45 will engage contact 35*b* of switch 45, while the travelling element 13 of the switch 47 will engage the contact 35*a* of the switch 47. This will cause the transformer secondary circuit to be completed through that section of the element lying between the contacts 15*a* and 15*b* of the luminescent element. A moment later when the shifting contact of the switch 45 connects with the terminal 35*c* and releases terminal 35*b*, the moving contact of the switch 47 will engage the terminal 35*b* of the switch 47 releasing terminal 35*a* and the secondary circuit will then be directed between that portion of the luminescent element lying between the contacts 15*b* and 15*c*. Similarly the streak of light equal to the distance between adjacent terminals 15 will travel the length of the luminescent element in the direction illustrated by the arrow in Figure 4. A streak of light having length equal to any multiple of the distance between adjacent terminals 15 may be accomplished by further advancing or retarding one or other of the switches 45—47.

Reversing the direction of movement of the movable contact member will cause the streak of light to pass in the opposite direction along the luminescent element. When the travelling element 13 of either switch engages the terminal 35 thereof, which said terminal is connected with the transformer secondary, a short-circuit will be created so that none of the power will pass through the luminescent element. This is not absolutely essential since the terminal 35 could be connected with a terminal 15 of the luminescent element. However, in such a case the luminescent element would be lighted up throughout its full length immediately after the streak of light reaches the right hand end of the luminescent element in travelling as described heretofore. If such an effect is desired the terminals 35 of the switches should be connected one with the initial terminal 15*a* and one with the final terminal 15*h* of the luminescent tube.

It is obvious that numerous other connections and systems may be employed in connecting the switches of my invention for the creation of travelling light effects and I wish it understood that the specific connections which I have heretofore illustrated and described are not intended to limit the application of my invention, but have been demonstrated and explained merely for the purpose of making plain the features of my invention.

It is obvious that if desirable, the luminescent element may be formed as a series of individual elements, tape being taken to the switch contacts 61 from intermediate adjacent elements. It is obvious also that numerous changes may be made in the form, construction and arrangement of the several parts of the device heretofore illustrated and described, without departing from the spirit or scope of my invention or sacrificing any of its attendant advantages, the forms hereinbefore described being preferred embodiments for the purpose of illustrating my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with an electrical power source of an elongated gaseous discharge tube having spaced terminals whereby to form a connection with the discharge tube at various points in the length thereof, connection means associated with one side of the source for selectively connecting said side to said terminals, additional connection means associated with the other side of the source for selectively connecting said other side to the terminals, and means for selectively changing the connection of both of said means.

2. The combination as set forth in claim 1, in which the circuit making and connection changing means operates to connect the opposed sides of the power source to different terminals at a given instant during the operation of the system.

ROBERT E. BARCLAY.