April 19, 1938. G. E. INMAN 2,114,842

CIRCUIT FOR ELECTRIC DISCHARGE DEVICES

Filed Dec. 8, 1936

Fig. 1.

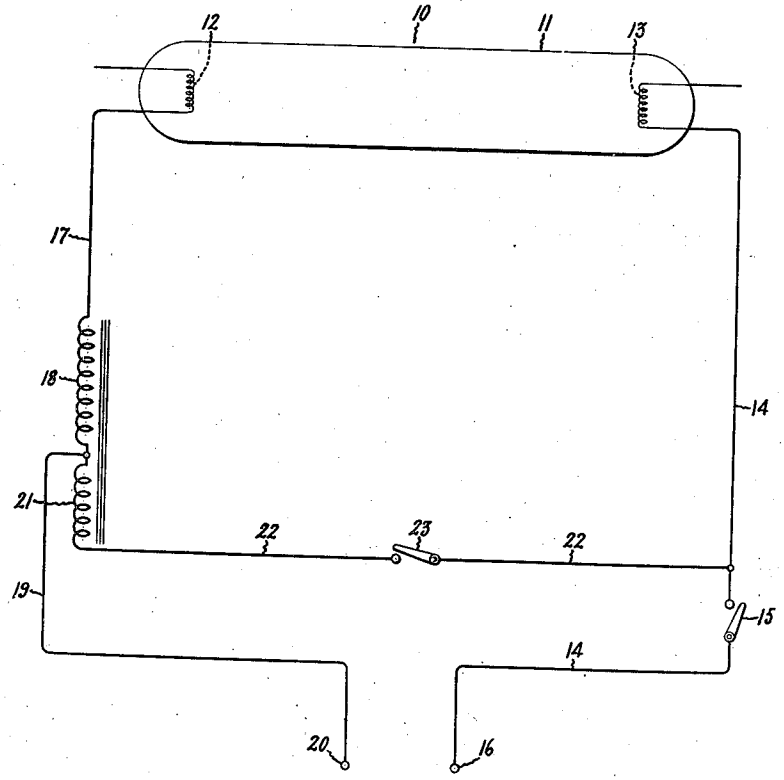
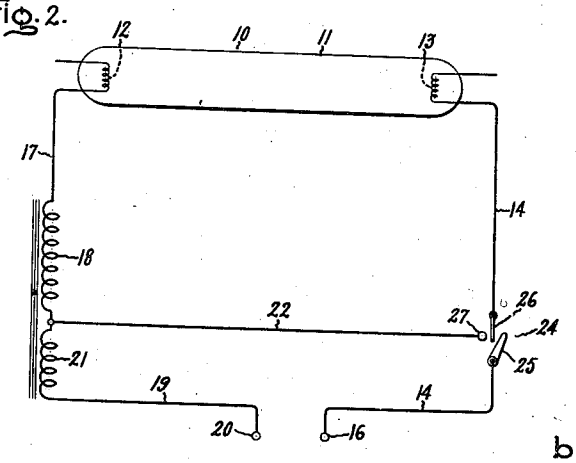


Fig. 2.



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CIRCUIT FOR ELECTRIC DISCHARGE DEVICES

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4 Claims. (Cl. 176—124)

My invention relates to electric discharge devices generally and more particularly to starting and operating circuits for such devices.

The starting voltage of gaseous electric discharge devices is usually higher than the operating voltage thereof and it is therefore necessary to employ auxiliary equipment to provide the different voltages. One of the objects of my invention is to provide a circuit which retains a low operating loss in the auxiliary equipment and yet provides certain starting. Another object is to provide a simplified circuit employing inexpensive auxiliary equipment. Another object is to provide a circuit in which the means for obtaining the higher starting voltage is combined with the means for ballasting the discharge device during operation thereof. Other objects and advantages of my invention will appear from the following description of species thereof and from the drawing.

Referring to the drawing, Fig. 1 is a diagrammatic representation of a starting and operating circuit comprising my invention, and Fig. 2 is a modification thereof.

In the drawing, 10 indicates somewhat diagrammatically, a gaseous electric discharge lamp of the positive column type comprising a tubular container or envelope 11 and may be of the type shown in my application Serial No. 75,772, filed April 22, 1936. Said container 11 has a gaseous atmosphere therein, preferably a few millimeters of a rare gas, such as argon, and a small quantity of a vaporizable metal, such as mercury. The container 11 has electrodes 12 and 13 sealed therein at the ends thereof. Said electrodes may consist of a coiled or a coiled-coil filament of refractory metal, such as tungsten, having a coating of electron emitting material, such as barium oxide, thereon. The lamp 10 may, if desired, also have a starting strip consisting of a conductive material, such as graphite mixed with potassium silicate or a metallic paint, applied to the surface of the container 11 and making electrical contact with one electrode and extending along the container to a position adjacent the other electrode.

The electrode 13 is connected by a conductor 14, through a switch 15, to the terminal 16 of an alternating current source of, for example, 110 volts. The electrode 12 is connected by a conductor 17 to one end of a choke coil 18, the other end of which is connected by a conductor 19 to the other terminal 20 of the alternating current source, so that the choke coil 18 is in series with the discharge lamp 10. The said choke coil 18 is wound with a few additional turns 21 connected to the end thereof, the coil 21 being connected at its other end by a conductor 22, through a switch 23, to the conductor 14. The coil 21 is thereby connected across the line when the switch 23 is closed and constitutes the primary of a voltage step-up auto-transformer, of which the coils 18 and 21 constitute the secondary.

To start the lamp, the switch 15 is first closed and then the switch 23 is closed momentarily, thus impressing a high voltage (about 300 volts, for example, for a lamp eighteen inches long and one inch in diameter) across the lamp 10 due to the auto-transformer action of the choke 18 and its added winding 21. After the lamp has started, the switch 23 is opened, thus leaving the choke winding 18 to act as the customary ballast for the lamp. The number of added turns 21 depends, of course, upon the number of turns in the choke 18 since the ratio between the two windings determines the voltage available for starting.

In the circuit shown in Fig. 2, both the primary 21 and the secondary 18 of the auto-transformer are connected in series with the lamp 10 across the terminals 16, 20 of the current source. Both the starting and operating circuit are closed in this case by a single switch 24 comprising a movable contact 25, a resilient contact 26 and a stationary contact 27. To start the lamp, the movable contact 25 is first brought into engagement with the resilient contact 26 which is then caused to momentarily engage the stationary contact 27, thus placing the primary 21 of the transformer 18, 21 across the terminals 16, 20 of the current source through conductors 14, 22 and 19 to impress a high voltage across the lamp 10. After the lamp has started, the resilient contact 26 is disengaged from the stationary contact 27 but remains in engagement with the movable contact 25, thus leaving the primary 21 and secondary 18 of the transformer in series with the lamp 10 to act as the ballast therefor. In some cases it is desirable to increase the amount of iron over that which is used in ordinary chokes and, if the starting current runs too high, it may be lowered by employing a magnetic shunt.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A starting and operating circuit for a gaseous electric discharge device having electrodes sealed therein comprising a current source, a voltage step-up transformer, at least a portion of said transformer being continuously connected in series with said device across the terminals of

said current source throughout the starting and operation of said device, and means to temporarily connect the primary of said transformer across the terminals of said current source to impress a high voltage across said device during the starting period, said portion of said transformer in series with the device serving as a ballast therefor during the operation thereof.

2. A starting and operating circuit for a gaseous electric discharge device having electrodes sealed therein comprising a current source, a voltage step-up transformer having its secondary continuously connected in series with said device across the terminals of said current source throughout the starting and operation of said device, and means to temporarily connect the primary of said transformer across the terminals of said current source to impress a high voltage across said device during the starting period, said secondary serving as a ballast for the device during operation thereof.

3. A starting and operating circuit for a gaseous electric discharge device having electrodes sealed therein comprising a current source, a choke coil continuously connected in series with said device across the terminals of said current source throughout the starting and operation of said device, said choke coil having additional windings connected to one end thereof, and means to temporarily connect said additional windings across the terminals of said current source thereby constituting said choke coil and its additional windings a voltage step-up auto-transformer to impress a high voltage across said device during the starting period, said choke coil serving as a ballast for the device during operation thereof.

4. A starting and operating circuit for a gaseous electric discharge device having electrodes sealed therein comprising a current source, a voltage step-up auto-transformer connected in series with said device across the terminals of said current source, and means to temporarily connect the primary of said transformer across the terminals of said current source to impress a high voltage across said device during the starting period, the whole of said transformer serving as a ballast for the device during operation thereof.

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