

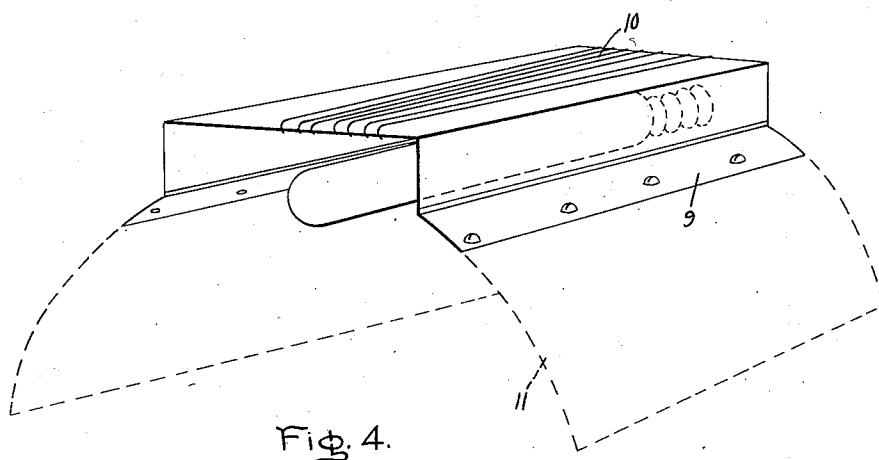
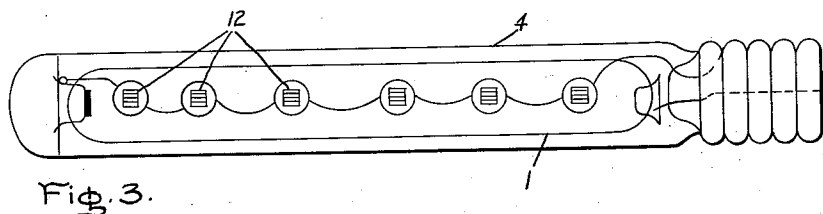
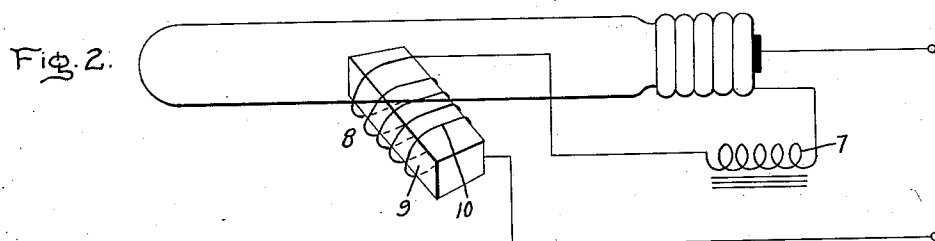
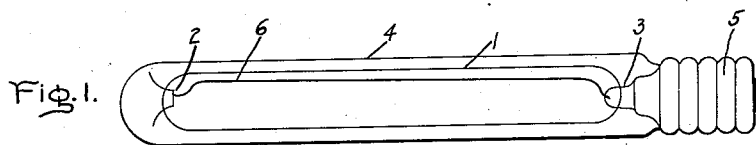
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2,030,430

ELECTRIC LAMP

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UNITED STATES PATENT OFFICE

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ELECTRIC LAMP

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1 Claim. (Cl. 176—122)

This invention relates to electric gaseous discharge lamps and more particularly to lamps of the high pressure vapour arc discharge type. Such lamps usually consist of a sealed envelope containing electrodes and a gas and/or vapour such as mercury vapour through which the discharge takes place. The envelope may be a tube of quartz or high melting point glass and may be contained in a surrounding enclosure of translucent or transparent glass, the space between the envelope and enclosure being evacuated to prevent the transfer of heat from the inner to the outer envelope. Owing to the high pressure of the vapour and the heat generated when the lamp is operating convection currents are set up which disturb the position occupied by the ionized glowing column of gas and these convection currents make it impossible to operate the lamp in any position except that in which the longitudinal axis of the envelope is substantially vertical, as in any position in which the axis is inclined more than a few degrees from the vertical the arc no longer occupies the axis of the tube but is swept against a portion of the wall of the envelope which becomes overheated and may melt or crack. In many cases it is desirable, in order to distribute the light from the lamp efficiently, to mount the lamp in a position other than vertical in a lantern or reflector.

The principal object of the present invention is to provide an improved means for operating a high pressure gaseous discharge device in a position other than with its axis vertical.

A further object of the invention is to provide an improved magnetic control means for operating a high pressure gaseous discharge device whereby the arc is prevented from being deflected against the closing envelope of the device by convection currents in the gaseous filling.

A further object of the invention is to provide a high pressure gaseous discharge device with integral magnetic control means whereby the device can be satisfactorily operated in any suitable position.

Other and further objects of the invention will appear from a consideration of the following description of the accompanying drawing in which Fig. 1 shows somewhat diagrammatically a high pressure gaseous discharge device when operating in a horizontal position. Fig. 2 shows somewhat diagrammatically a magnetic control means according to the invention applied to a high pressure gaseous discharge device, Fig. 3 illustrates a modification of the arrangement shown in Fig. 2,

and Fig. 4 a further modification of the arrangement shown in Fig. 2.

According to one embodiment of the invention the current supplied through the gaseous discharge device is caused to energize a winding surrounding a magnetic circuit, the lines of force due to which are so directed with respect to the arc discharge within the device as to counteract the tendency of the arc to be deflected by convection currents set up in the gaseous filling due to the heating effect of the arc.

Referring to Fig. 1 we have shown an arc discharge device comprising an inner envelope 1 containing electrodes 2 and 3 which is supported within an outer heat conserving envelope 4 to which is attached the customary screw base 5 comprising contacts to which the electrodes 2 and 3 are respectively connected. The electrodes 2 and 3 may be of the unheated type and the composition of the filling of gas within the envelope 1 is then such that the discharge will occur between the electrodes when a suitable potential is applied therebetween. Preferably although not necessarily the filling may consist of a gas such as argon at a low pressure sufficient to cause a glow discharge to occur between the electrodes 2 and 3 when the operating voltage is applied thereto. The envelope 1 may also contain a quantity of mercury such that after a glow discharge has been in operation for a predetermined time the mercury is all vaporized causing the pressure within the envelope to rise to a pressure of the order of atmospheric. At such time the glow discharge initiated in argon is converted into an arc discharge in the mercury vapour. In order to prevent loss of heat from the inner envelope 1 the space between inner and outer envelopes is preferably evacuated.

Due to the presence of the relatively high pressure gaseous atmosphere and to the heat of the arc during operation, convection currents are set up which tend to deflect the arc shown at 6 when the lamp is operated in the horizontal position illustrated until the arc is running near the upper part of the wall of the envelope 1 as indicated. In view of the fact that the envelope is usually made of glass or like translucent material, the uneven heating thereby set up produces strain in the glass which may eventually cause the fracture of the latter with the resultant failure of the discharge device.

According to the invention we therefore have devised means for counteracting the tendency of the arc to be deflected by the convection currents set up in the gas filling. It is well known that an

arc can be deflected by means of a magnetic field and we accordingly make use of a magnetic field for counteracting the deflection of the arc and thereby maintaining the arc in substantially an axial position within the envelope 1. By this means the uneven heating of the envelope is avoided.

High pressure metal vapour lamps are usually operated from an alternating current supply and usually have a stabilizing inductance or choke connected in series with them. If a permanent magnetic field or an uncontrolled alternating current magnet is used to deflect the arc undesirable effects are introduced as with both these arrangements the arc is deflected both ways because as the lamp is operating on alternating current the arc flows first in one direction and then in the other. To utilize a magnetic field therefore to obtain stabilization of the position of the arc it is necessary to use an alternating current field which is in the correct phase relationship with the current flowing in the lamp. Such a field may be applied in practice from a solenoid constituted by winding a suitable number of turns of wire on an iron core which can be mounted in such a position that the lines of force cut the lines of force produced by the arc current in a suitable manner. The solenoid may be connected in parallel with the device and choke.

In practice, however, we prefer to use a magnetic coil which is connected in series with the device and stabilizing choke as indicated in Fig. 2 of the drawing, in which the stabilizing choke is indicated at 7 and the magnetic arc control device at 8, as with such an arrangement there is only a negligible loss of energy since the inductance of the magnetic control coil may form part of the necessary stabilizing inductance of the circuit and correct phase relationship is ensured. The magnetic field is in this case provided by an iron core 9 having the necessary series turns 10 wound upon it. The core is mounted at a suitable distance from the axis of the device as to produce the required deflection of the arc.

As shown in the modification illustrated in Fig. 4, the magnetic core 9 on which the coil 10 is wound may comprise a sheet of magnetic material

such as iron bent into the shape of a U with its downwardly extending arms arranged on either side of the device so that the magnetic field cuts the axis of the device and is distributed therealong. In this arrangement the magnetic control device may form part of the enclosing lantern for the discharge device, a part of the lantern being indicated by dotted lines at 11. This part should, of course, be of non-magnetic material and may be of sheet aluminium for example.

In the arrangement indicated in Fig. 3, we have shown in place of a single solenoid, a plurality of small solenoids 12, connected in series with one another and in series with the arc, these solenoids being mounted between the outer enclosure 4 and the inner envelope 1. A readily replaceable unit consisting of the discharge device in combination with the magnetic control means is thereby provided.

While we have described various embodiments of the invention, it is to be understood that we do not restrict ourselves to these embodiments but that various other embodiments of the invention are possible involving modifications of the described embodiments which we aim to cover by the appended claim.

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

In combination, a gaseous discharge device comprising a tubular envelope, electrodes within said envelope, a vaporizable material within said envelope in an amount just sufficient to generate a pressure of the order of atmospheric when entirely vaporized, a surrounding enclosure for said envelope, means for producing an arc discharge between said electrodes said envelope being located during operation in a position with its axis inclined to the vertical, and magnetic control means located in the space between said envelope and enclosure and energized by the discharge current for counteracting the tendency of the arc to be deflected from an axial position within said envelope by convection currents set up in said filling by the heat of the arc.

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