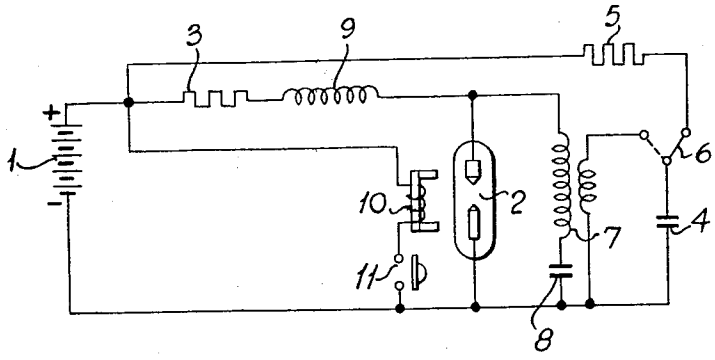
May 15, 1962 E. J. G. BEESON ETAL 3,035,207

CIRCUIT ARRANGEMENT FOR OPERATING ELECTRIC DISCHARGE LAMP

Filed Jan. 12, 1960



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United States Patent Office 3,035,207 Patented May 15, 1962

3,035,207

CIRCUIT ARRANGEMENT FOR OPERATING ELECTRIC DISCHARGE LAMP

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Filed Jan. 12, 1960, Ser. No. 1,951
Claims priority, application Great Britain Jan. 14, 1959
4 Claims. (Cl. 315—267)

This invention relates to the operation of electric discharge lamps of the gas filled type in conditions in which the discharge through the lamp is required to be intermittently interrupted. The gas filling may be supplemented with metallic vapour.

When the current flowing through a high power electric discharge lamp is required to be interrupted owing to the heavy current passing through the lamp and to the inductive nature of the current when the lamp is operated from an alternating current supply, a large circuit breaker is normally essential.

It is well-known that the arc between the electrodes is responsive to the action of a magnetic field. Indeed it is common practice to employ magnetic blow-out for suppressing the arc in direct current circuit breakers, and high pressure mercury vapor lamps required to be operated in a horizontal position have been provided with magnetic field producing devices energised by a coil through which the arc current is passed to act on and prevent bowing of the arc by convection current set up in the gas and vapour filling by the heat of the arc.

The present invention makes use of this well-known effect to provide for the interruption of the arc, whereby to enable the use of an expensive circuit breaker for the purpose of interrupting the arc current to be dispensed with.

According to the invention, there is associated with a high pressure electric discharge lamp, magnetic field producing means capable of producing a magnetic field of sufficient intensity to blow-out an arc between the electrodes of a lamp, the magnetic field producing means being provided with an energising coil connected through a control switch to a source of voltage so that the arc can be blown out by operation of the control switch, the lamp being provided with starting means for re-establishing the arc when required.

The source of voltage to which the coil of the magnetic field producing means is connected is conveniently the source which constitutes the supply for the operation of the lamp. The starting means for re-establishing the arc also requires a source of voltage which is conveniently that required for the normal operation of the lamp.

The magnetic field producing means is arranged to produce a magnetic field which is at right angles to the axis of the arc path between the electrodes, and when the magnetic field is established by passing current through the energising coil the effect of the magnetic field is to bow the arc from its normal path between the electrodes, thereby lengthening the arc. If the flux density in the magnetic field is sufficiently high, the lengthening of the arc thereby produced may be made to cause the voltage drop across the arc to exceed the voltage present between the electrodes, and the arc goes out.

Re-establishment of the arc may be effected in any convenient manner, e.g. by impressing a high voltage transient between the electrodes, the electrodes being meanwhile connected to their normal source of energising voltage. When this source is unidirectional a resistance will normally be connected between one terminal of the source and the one electrode of the lamp, and in such an arrangement the magnetic field for extinguishing the arc may be provided by connecting through a push-button, or other switch, the coil of the magnetic field producing means directly between the terminals of the source.

A typical circuit arrangement which may be employed in carrying out the invention is illustrated in the accompanying drawing.

The arrangement illustrated uses a source **1** of direct voltage for operating the discharge lamp **2**. The source **1** is connected to the electrodes of the lamp by way of a resistance **3** connected in the positive lead. For starting the discharge a capacitor **4**, charged from the source **1** by way of resistor **5** and a switch **6**, is discharged through the primary winding of a step-up high-frequency transformer **7**, the secondary winding of which is connected, by way of capacitor **8**, between the electrodes of the lamp. A high frequency choke **9** is provided to prevent the oscillations produced from being short-circuited through the source **1**.

In order to interrupt the discharge through the lamp, a magnetic field of sufficient intensity to blow-out the arc is produced by energisation of a magnetic-field producing device **10** from the source through a switch **11**. The magnetic-field producing device is conventionally shown and it should be understood that the direction of the field produced thereby is such as to bow the arc between the electrodes and lengthen it to an extent sufficient to cause the voltage drop across the arc to exceed that present between the electrodes.

The advantage of using this magnetic blow out of the arc to break the current in the lamp circuit is to eliminate any mechanical series switch or the oxidation of the contacts of the contactor or switch, since these are now replaced by an arc being extinguished in an inert atmosphere. Furthermore, a switch, contactor, or circuit-breaker is susceptible to the effect of gravity, while a magnetic field is not. The arrangement of the invention may thus be employed in airborne equipment, where a high value of G may be experienced, without its operation being affected.

While the illustrated embodiment of the invention utilises direct voltage for its operation, the arrangement may be modified to use an A.C. supply, if desired, an alternating current supplied to the device **10** being satisfactory for blowing out the arc if a sufficiently high flux density is employed.

What we claim is:

1. In combination, an electric discharge lamp comprising a sealed envelope containing an ionizable medium and having spaced electrodes defining a normal arc path and between which an arc discharge is adapted to take place when operating voltage is applied between said electrodes, a magnetic core, an energizing coil on said core, said core being located adjacent to said envelope and arranged to produce a magnetic field at right angles to the axis of the arc path between said electrodes sufficient to bow said arc discharge from said arc path to produce a potential drop across said arc greater than the operating voltage applied thereto and thereby interrupt said arc discharge, means including a control switch for energizing said coil, and starting means for the re-establishment of said arc on opening of said control switch.

2. The combination as claimed in claim 1, in which said starting means comprises means for impressing a transient of high voltage between said electrodes separately of the operating voltage.

3. In combination, an electric discharge lamp comprising a sealed envelope containing an ionizable medium and having spaced electrodes between which an arc discharge is adapted to take place when a source of operating voltage is connected between said electrodes, a magnetic core,

an energizing coil on said core, said core being located adjacent to said envelope and arranged to produce a magnetic field at right angles to the axis of the arc path between said electrodes sufficient to bow said arc discharge from said arc path to produce a potential drop across said arc greater than the operating voltage applied thereto and thereby interrupt said arc discharge, means including a control switch connected to said coil to control the energization of said coil from the same source as that for energizing said lamp electrodes, and starting means for the re-establishment of said arc on opening of said control switch.

4. In combination, an electric discharge lamp comprising a sealed envelope containing an ionizable medium and having spaced electrodes defining a normal arc path and between which an arc discharge is adapted to take place, a source of direct current voltage connected between said electrodes, a magnetic core, an energizing coil on said core, said core being located adjacent to said envelope and arranged to produce a magnetic field at right angles to the axis of the arc path between said electrodes sufficient to bow said arc discharge from said arc path to produce a potential drop across said arc greater than the operating voltage applied thereto and thereby interrupt said arc discharge, a control switch connected between said source and said coil to control the energization of said coil from said source, a first capacitor, a step-up frequency transformer having primary and secondary winding portions, switching means for selectively connecting said capacitor to said source and to the primary winding of said transformer, a second capacitor, the secondary winding of said transformer being connected through said second capacitor between said electrodes whereby to impress between said electrodes a transient high voltage for re-establishing an arc between said electrodes upon discharge of said first capacitor by connection thereof to said primary winding through said switching means, and a high frequency choke connected between said source and said electrodes to prevent said transient high voltage from passing through said source.

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