Nov. 28, 1939. H. J. McCARTHY 2,181,296

ELECTRIC DISCHARGE LAMP

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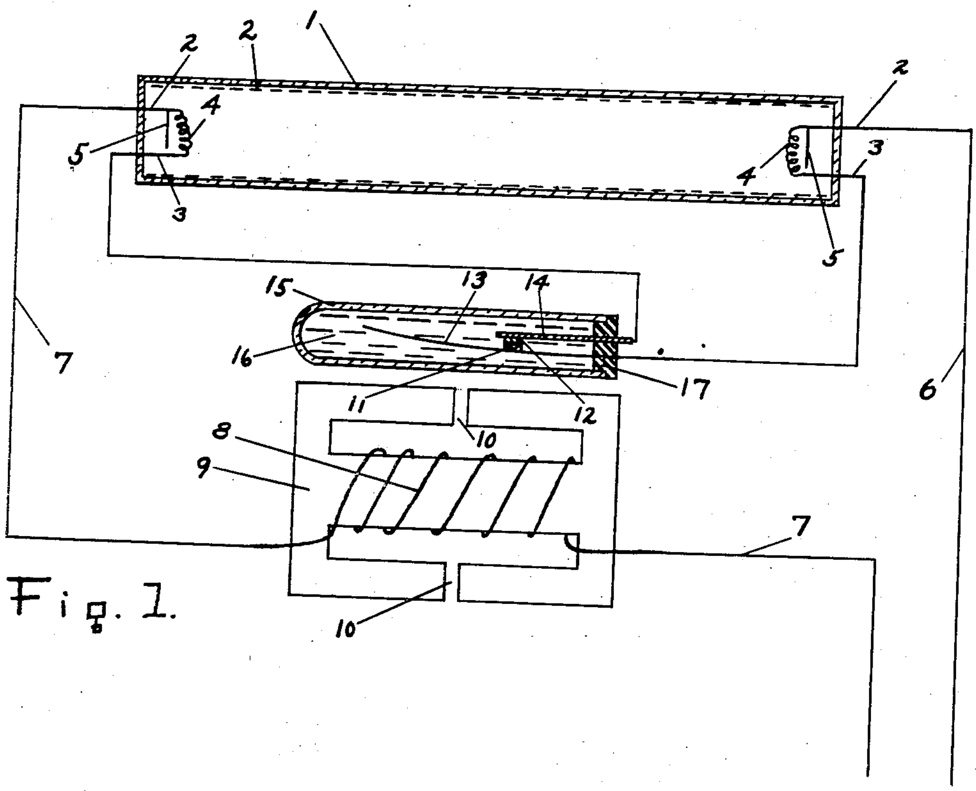

Fig. 1.

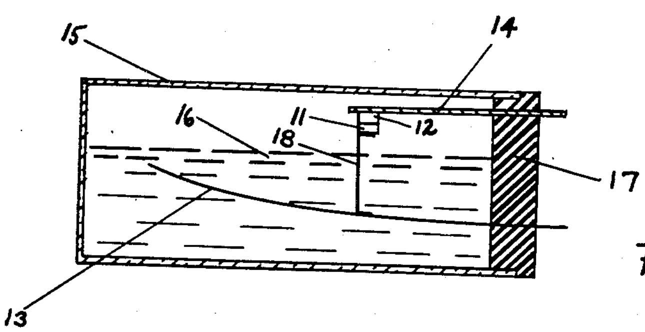

Fig. 2.

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ELECTRIC DISCHARGE LAMP

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1 Claim. (Cl. 200—97)

This invention relates to electric gaseous discharge lamps, and in particular to such lamps having thermionic cathodes, and to apparatus for starting and operating such lamps.

An object of the invention is to provide an electric gaseous discharge lamp with thermionic cathodes and with apparatus for allowing the cathodes to preheat for a definite interval before the discharge is started between them.

A feature of the invention is a reactance coil which serves the dual function of limiting the current through the lamp and of actuating the switch for preheating the cathodes. A further feature is a magnetic ribbon actuated by said coil and moving in an oil bath to retard its action, and a pair of contacts actuated by said ribbon.

A further object of the invention is to provide a switch with the proper time delay to allow preheating of the cathodes.

Other objects and advantages of the invention will be apparent fom the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a schematic drawing of the circuit and device of the invention; and

Figure 2 is a drawing of another type of switch according to the invention.

In Figure 1, the lamp envelope 1 is preferably of glass, and may be coated on its interior surface, if desired, by the coating 2 of luminescent material. Lead-in wires 2, 3, are sealed through each end of the envelope 1, to support an electrode 4 at each end of the envelope. This electrode may comprise a coiled-coil of tungsten wire coated with one or more of the alkaline earth oxides, and may have the straight wire 5, connected to one end of the coil and extending alongside the coil and toward the other end of it.

The lead-in wire 2, at one end of the lamp, may be connected directly to one terminal of the electrical supply line from which the lamp is operated by the wire 6, while the lead-in 2, at the other end of the lamp, is connected to the other terminal of the supply line by the wire 7, a reactance coil 8, being connected in series with that wire to limit the lamp current acting as a ballast impedance. The coil 8 is preferably of copper wire, properly insulated, and is wound around the closed core 9 of suitable iron laminations. The core 9 has the air gaps 10 in each of its outside legs.

The lead-in wires 3 at each end of the lamp envelope 1 are connected together through the contacts 11, 12 which are arranged to be normally closed. One of these contacts is mounted on the thin steel ribbon 13, which is of spring material, and which is flexed to normally press contact 11, against contact 12, supported by the relatively fixed piece 14, keeping the circuit closed. The insulating chamber 15 is placed around the pieces 13, 14 and contains oil 16, to properly damp the motion of the ribbon 13, in order to secure a slow-acting device. The chamber 15 may be sealed by the insulating piece 17, and clamped to the iron core 9, or supported in position near it as shown.

In Figure 2 is shown a modification of the invention in which the ribbon 13 moves in oil but in which the contacts 11, 12 are kept out of the oil. This is sometimes advantageous, since a bubble may form at each break of the contact when the contacts are in oil. Strip 18 joins contact 11 to ribbon 13.

In operation the leads 7 and 6 are connected to the electrical supply line, having a voltage, for example, of 110 volts. Current will flow through the choke coil 8 and the electrodes 4, the contacts 11, 12 being normally closed. The electrodes 4 will begin to heat up, but no discharge will occur between them since there will be no voltage between them while the contacts 11, 12 are closed. If the voltage across the lead-in wires 2, 3 is slightly above the excitation voltage of the gas in the envelope 1, a small discharge will occur between an end of the filament coil 4, and the extending wire 5, connected to the other end of the filament, thus ionizing the gas in the immediate neighborhood of the coil.

In the meantime, as soon as current began to flow through the coil 8, a magnetic field was created around the air gaps 10. The magnetic ribbon 13 begins to move downward toward the gap 10. Because of the resistance offered by the oil, the ribbon will move very slowly; the free end will gradually move down first, to be followed eventually by the part containing the contact 11. By using a heavy enough oil, and a thin enough ribbon, the moment of breaking of the contacts 11, 12 can be delayed until the filaments 4 have become heated to their proper temperature and until a small discharge occurs between the filament 4 and the wire 5. Conditions are then proper for starting the discharge, and the contacts open quickly, producing a considerable voltage surge across the path between electrodes 4, because of the inductance 8, and starting the discharge.

The thin iron ribbon 13 may be light enough to be unstable in air, but will be stable enough in the oil, which has a damping effect.

What I claim is:

A delayed-action electric switch comprising a coil of electrically conducting wire, an iron core extending through said coil, a thin wide ribbon of magnetic spring material placed in position to be attracted by the magnetic field produced by current flow through the coil, a bath of oil in which said ribbon is immersed, an electrical contact carried by said ribbon, and a relatively fixed contact held against the first contact when no current flows through the coil, the oil being sufficiently heavy to retard the motion of the ribbon.

HENRY J. McCARTHY.