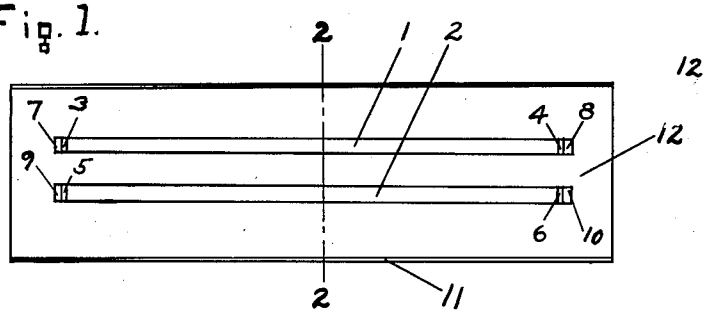
March 26, 1940. H. J. McCARTHY 2,195,114

NONSTROBOSCOPIC DISCHARGE LAMP UNIT

Filed May 6, 1939

Fig. 1.



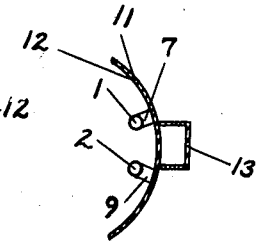


Fig. 2.

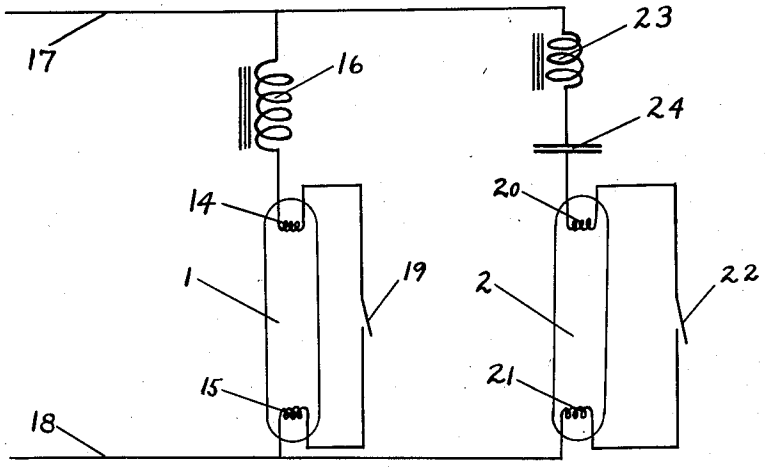


Fig. 3.

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NONSTROBOSCOPIC DISCHARGE LAMP UNIT

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Application May 6, 1939, Serial No. 272,245

1 Claim. (Cl. 176—124)

This invention relates to electric gaseous discharge lamps, and in particular to apparatus and fixtures for operating such lamps.

Discharge lamps require a current-limiting or ballasting device in series with them, and since a resistance as a current-limitor represents a large power loss, the lamps are most useful on alternating current circuits, where an essentially loss-free reactance can be used as ballast. On such circuits, however, the light from the lamp will vary over the cycle with the alternating pulses, giving a pronounced stroboscopic effect, so that rapidly moving machinery may, for example, appear stationary. For general illumination purposes, such an effect is inconvenient and dangerous. In addition, the ballasting impedance also produces a low power factor.

Accordingly, an object of the invention is to produce a discharge lamp illuminating unit in which the stroboscopic effect is absent, or greatly reduced, and the overall power factor is high.

A feature of the invention is an arrangement of apparatus by which the above objects are accomplished.

A particular feature is an arrangement of two tubular lamps in a single reflector, with the ballasting equipment mounted on the side of the reflector away from the lamp. A further feature is an inductance coil connected in series with one lamp, with an inductance coil and condenser, adjusted to have a net capacitive reactance, in series with the other lamp. Additional features are time delay starting switches across the lamp, and the arrangement of apparatus to insure that one lamp is giving light during the part of the cycle when the other lamp is out.

Figure 1 is a plan view showing the two lamps in the reflecting unit.

Figure 2 is a section in plane 2—2 of Fig. 1.

Figure 3 is a schematic diagram of the connections of the electrical apparatus used in the invention.

In Figure 1, the long tubular discharge lamps 1 and 2, having the bases 3, 4, 5, 6, are shown set in the sockets 7, 8, 9, 10, attached to the reflector 11, which may have the white enamel reflecting surface 12, near the lamps. The housing 13 on top of the reflector, carries the auxiliary equipment shown schematically in Figure 3.

In Figure 2, a cross-sectional view on plane 2—2 of Figure 1 is shown. The housing 13 to hold the apparatus shown schematically in Figure 3 is shown on top of the reflector and the sockets 7 and 9 are shown attached to the reflector. The remainder of this figure has already been explained in connection with Figure 1.

In Figure 3, the lamp 1, having the filamentary electrodes, 14, 15, is connected in series with the reactance coil 16, across the power line 17, 18, which may, for example, be of 110 or 220 volts. The switch 19 is arranged to connect the filaments directly in series for starting, and then to open the circuit between them, starting the lamp. This switch may be of the types shown in my co-pending application Serial No. 269,423, filed April 22, 1939, or may be of some other type. The lamp 2, having the filamentary electrodes 20, 21, is similarly connected to the starting switch 22, but has not only a reactance coil 23 in series, but also the condenser 24.

The circuit through inductance coil 16 and lamp 1, would, if the effective resistance of coil and lamp were neglected, have its current 90° behind the voltage of the line 17, 18. There will, however, be a voltage of about 180 volts across the inductance and of about 120 across the lamp if a 48 inch long, 1¼" diameter lamp is used on a 220 volt line at 0.42 ampere. This means that the current is actually only 65° behind the voltage.

In the circuit of lamp 2, the condenser 24 is large enough to give a net capacitive reactance, and is preferably of a size sufficient to make the phase angle between the circuits of lamps 1 and 2, about 90°. That is if lamp 1 lags in current by 65°, lamp 2 should lead by 25°, to give a difference of 90°. It might seem that inductance 23 would be superfluous and would merely have the effect of making an increase in size of condenser 24 necessary. Actually, however, the inductance is necessary to smooth out the wave form of the current through lamp 2, which would tend to oscillate if only the condenser were present. In practice, I have used an inductance such that, for a 220 line voltage, and a current of 0.42 ampere, a voltage drop of 180 volts occurs across the inductance, 450 volts across the condenser and 120 volts across the lamp. The condenser was about 2.5 microfarads.

By placing the lamps, with proper out of phase light emission, close together in a single reflector, I insure that light is emitted from almost the same point, during the complete cycle. When the light from one lamp is out, the light from the other is at its maximum. If the lamps were connected to the same circuit, but were placed any considerable distance apart, the light falling on a particular surface from one lamp might be

much less than that from the other, and their total effect would not be nonstroboscopic.

A similar failure to remedy the stroboscopic effect would occur if the lamps were arranged in a reflector which directed their light in considerably different directions, or if the color of light emitted by one lamp was not substantially the same as that emitted by the other. In the latter case, the color of light emitted would vary during the cycle.

The discharge lamps used may, of course, be of the fluorescent coated type.

What I claim is:

A high-power factor, low stroboscopic-effect lighting unit for operation from a single-phase of an alternating current line, said unit comprising: two long tubular fluorescent lamps of substantially the same color and characteristics placed side by side and close together, said lamps having thermionic electrodes; a net inductive reactance in series with one lamp and of a value such that the operating voltage of the lamp is approximately half the available circuit voltage; an inductance and a capacitance in series with the other lamp and having a net capacitive reactance such that the lamp voltage is about half the available circuit voltage.

HENRY J. McCARTHY.