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C. H. HODGKINS

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DISCHARGE LAMP CIRCUIT

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Fig. 1.

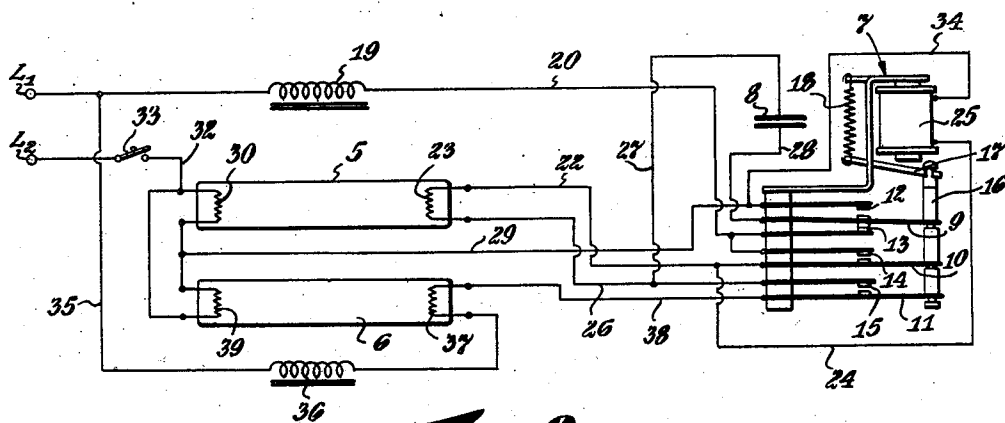


Fig. 2.

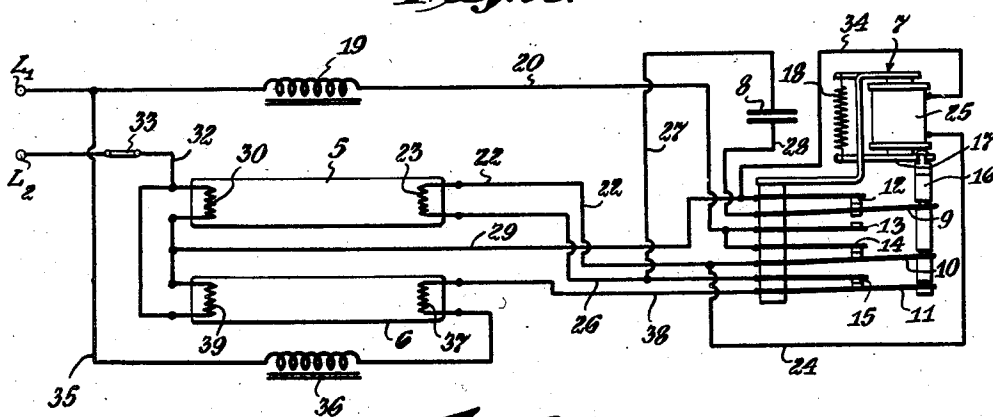
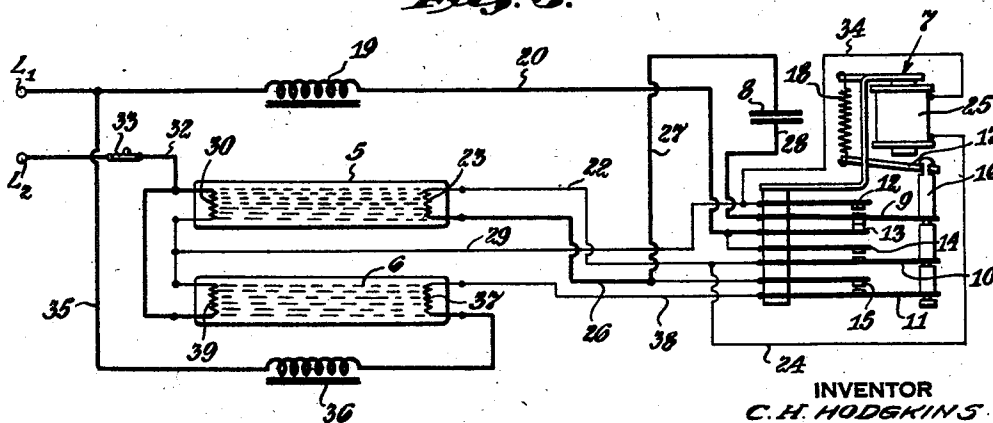


Fig. 3.



INVENTOR
C. H. HODGKINS

C. H. HODGKINS.

BY *JMG*
ATTORNEY

ATTORNEY

UNITED STATES PATENT OFFICE

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DISCHARGE LAMP CIRCUIT

Charles H. Hodgkins, Fairfield, Conn., assignor to
The Bryant Electric Company, Bridgeport,
Conn., a corporation of Connecticut

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4 Claims. (Cl. 315—103)

The present invention relates to a system for controlling and operating discharge lamps of the fluorescent type, and has particular reference to such systems wherein a plurality of fluorescent lamps are subject to a unified control so as to enable immediate starting of the lamps and at the same time minimize the stroboscopic effect normally existent in lamps of this type.

It is well known in the art to operate two fluorescent lamps in parallel and to employ a condenser in series with one of the lamps so that they are operated out of phase with each other to thereby avoid or minimize the stroboscopic effect otherwise resulting, and which also serves to correct the overall power factor of the lamps. Heretofore in such circuits a very pronounced time delay has existed between actual energization of the lamps and the initiation of a discharge therein.

It is accordingly an object of the present invention to provide a control system for discharge lamps of the fluorescent type whereby a pair of parallel connected lamps may be immediately started following initial energization, thereby eliminating the time delay formerly required.

Another object of the present invention is the provision of a system for controlling and operating discharge lamps of the fluorescent type wherein part of the auxiliary equipment is employed to cause immediate starting of the lamps following energization thereof, after which the same portion of the auxiliary equipment is employed to eliminate the stroboscopic effect and to correct the power factor.

Another object of the present invention is the provision of a system for controlling and operating discharge lamps of the fluorescent type wherein a condenser is arranged to be connected in electrical parallel with the lamps upon initial energization of the lamps to cause immediate starting thereof, and upon starting of the lamps such condenser is connected by an automatic transfer switch in series with one of the lamps so as to correct the overall power factor and minimize the stroboscopic effect of the lamps.

A further object of the present invention is the provision of a system for controlling and operating discharge lamps of the fluorescent type wherein an automatically operable transfer switch is employed to connect a condenser, which is normally in parallel with the lamps for starting purposes, in a series relation with one of the lamps to minimize the stroboscopic effect and aid in power factor correction.

Still further objects of the present invention

will become obvious to those skilled in the art by reference to the accompanying drawing wherein:

Fig. 1 is a diagrammatic view of the control system of the present invention and showing the circuit arrangement prior to energization of the lamps;

Fig. 2 is a diagrammatic view identical to Fig. 1 but showing the position of the various elements during the "starting period" of the lamps, and

Fig. 3 is another diagrammatic view identical to Fig. 1 but showing the position of the various elements during "operation" of the lamps with the actual path of current flow through the circuit being shown by the heavy lines in this figure.

Referring now to the drawing in detail, a pair of discharge lamps 5 and 6 of the fluorescent type are shown in the several figures which are connected in electrical parallel in the system so as to be operable from a source of supply L1, L2 of the customary domestic potential of approximately 115 volts. As shown in the several figures an automatic transfer switch shown generally at 7 is provided for automatically connecting a condenser 8 in electrical parallel relation with the lamps 5 and 6 during initial starting, and after the discharge has started in the lamps such transfer switch connects the condenser 8 in series relationship with one of the lamps 5 so as to impart a leading power factor thereto, while the remaining lamp 6 has a lagging power factor which thus minimizes the stroboscopic effect otherwise ensuing and at the same time improves the overall power factor of the circuit arrangement.

By reference to the several figures, it will be noted that the transfer switch 7 is provided with a plurality of contacts 9, 10, 11, 12, 13, 14, and 15, with the contacts 9, 10, and 11 being movable by a switch rod or the like 16 connected to the armature 17 of the transfer switch with such armature, together with the switch rod 16, biased downwardly by a coil spring 18 aided by gravity. Since, as before mentioned, the figures of the drawing are identical except for the position of the transfer switch 7 under starting and operating conditions, the system will be thus described.

Referring, therefore, more particularly to Fig. 2 showing the arrangement of the circuit under starting conditions, it will be noted that an inductance element 19 is provided which is arranged in series with the fluorescent lamp 5 by having one of its ends connected to one side of the source of supply L1 while the other end is connected by a conductor 20 to the switch contacts 13 and 14. Inasmuch as switch contact 13

is open at "start" and contact 14 in engagement with contact 10, one side of the line L1 is accordingly connected by a conductor 22 to one end of the filamentary electrode 23 of the lamp 5 and by means of a conductor 24 to one end of the magnetic winding 25 of the transfer switch 7. From the other side of the filamentary electrode 23 a conductor 26 extends to the contact 15 of the transfer switch 7 and from a juncture in the conductor 26, a conductor 27 extends to one side of the condenser 8. The opposite side or plate of the condenser 8 is connected by a conductor 28 to contact 9 of the transfer switch, which in the "start" position is in engagement with contact 12, and this latter contact is connected by a conductor 29 to one end of the filamentary electrode 30 of the lamp 5. The circuit is then completed from the opposite end of the filamentary electrode 30 to the opposite side of the source of supply L2 through conductor 32 and "closed" operating switch 33. The opposite end of the magnetic winding 25 is connected to the conductor 29 by means of a conductor 34 which thus connects this magnetic winding 25, as well as the condenser 8, in electrical parallel relation with the discharge lamp 5.

In addition, the lamp 6 is also connected to the source of supply L1—L2 in electrical parallel with the discharge lamp 5. Such circuit extends from one side of the source of supply L through a conductor 35 and an inductance element 36, to one end of the filamentary electrode 37 of the lamp 6, thence from the other end of such electrode through a conductor 38, closed contacts 11 and 15, conductors 26 and 27 to the condenser 8, from the opposite side of this condenser through conductor 28, closed contacts 9 and 12, through conductor 29 to one end of filamentary electrode 39 of the discharge lamp 6; and since the other end of this latter electrode is connected to the conductor 32, the circuit is completed through the "closed" switch 33 to the opposite side of the supply source L2.

Accordingly, upon closure of switch 33, the full voltage of the source of supply L1, L2 is immediately applied to the magnetic winding 25 of the transfer switch 7, resulting in attraction of its armature with raising of rod 16 so as to position the various contacts in the manner as shown in Fig. 2. This immediately completes a series heating circuit for the filamentary electrodes 23—30 of the discharge lamp 5 as well as a similar circuit for the filamentary electrodes 37—39 of the discharge lamp 6 which rapidly heats all of the filamentary electrodes to an electron emitting temperature. At the same time that the electrodes are being heated, the condenser 8, which is in electrical parallel with the lamps 5 and 6 (although included in the series heating circuit for the filamentary electrodes thereof), accumulates a charge and upon discharge thereof across the heated electrodes 23—30 and 37—39, this discharge voltage augments the voltage of the supply source sufficiently to initiate a discharge in the lamps 5 and 6.

Upon the initiation of this discharge, the voltage drop across the lamps 5 and 6 is such that the voltage impressed upon the magnetic winding 25 of the transfer switch 7 is insufficient to retain the armature in its attracted position, with the result that the spring 18, aided by gravity causes the rod 16 to drop to the position as shown in Fig. 3. Such movement accordingly alters the relationship of the various contacts to place them in "operating" position and specifically connects

the condenser 8 in electrical series relationship with the discharge lamp 5 to give it a leading power factor, while that of lamp 6 has a lagging power factor to thus neutralize the stroboscopic effect and at the same time correct the overall power factor of the circuit.

This can be readily appreciated from Fig. 3 wherein the operating circuit for the lagging power factor lamp 6 is shown extending from one side of the supply source L1 through conductor 35 and inductance element 36 to the electrode 37 of lamp 6 and thence through the ensuing discharge to the electrode 39 and back to the other side of the supply source L2 by means of conductor 32 and switch 33. Similarly the operating circuit for the leading power factor lamp 5 extends from one side of the supply source L1 through inductance 19, conductor 20, "closed" contacts 13—9 of the transfer switch 7, conductor 28 to one side of condenser 8 and from the other side, by means of conductors 27 and 26, to the electrode 23 of the lamp 5, and thence through the ensuing discharge to the electrode 30 and back to the opposite side of the supply source L2 through conductor 32 and switch 33.

From the foregoing it thus becomes obvious to one skilled in the art that a system for controlling and operating discharge lamps particularly of the fluorescent type is herein provided so that a pair of such lamps can be immediately started with a minimum of time delay, and once started the system operates so that the stroboscopic effect otherwise ensuing is minimized. This is accomplished by employing a condenser which is connected in electrical parallel with the lamps during starting, and by the automatic operation of a transfer switch, such condenser is connected in series relationship with one of the lamps during operation.

Although one specific embodiment of the present invention has been herein shown and described, it is to be understood that other modifications thereof may be made without departing from the spirit and scope of the appended claims.

I claim:

1. A system for starting and operating a pair of discharge lamps comprising a source of electrical energy, switch means operable at will to cause closure of an electric circuit from said source to said lamps, energy storage means included in the circuit with said source and said lamps upon closure of said switch means, and a relay having a winding energizable by closure of said switch means and provided with a plurality of contacts operable to connect said energy storage means in electrical parallel with said lamps to facilitate the initiation of a discharge therein and automatically operable to thereafter cause other of its contacts to connect said energy storage means in series with one of said lamps to minimize the stroboscopic effect and improve the overall power factor of said system.

2. A system for starting and operating a pair of discharge lamps comprising an energizing circuit, a switch operable by an operator for closing said circuit, a condenser adapted to be connected to said energizing circuit, and a relay connected to said circuit upon closure of said switch and initially operable to connect said condenser in said energizing circuit in electrical parallel relation with said lamps to facilitate starting of a discharge therein, and said relay being automatically operable upon initiation of the discharge in said lamps to connect said condenser in series relation with one of said lamps to minimize the

stroboscopic effect and improve the overall power factor of said system.

3. A system for starting and operating a pair of discharge lamps comprising a source of electrical energy, switch means operable at will to cause energization of said lamps from said source, energy storage means adapted to be connected to said source and to said lamps, a relay connected to said source upon operation of said switch means, and contact connections operable by said relay upon energization thereof to sequentially connect said energy storage means in electrical parallel relation with said lamps to facilitate the initiation of a discharge therein and for thereafter connecting said energy storage means in series with one of said lamps during the continuance of a discharge in said lamps to minimize the stroboscopic effect with attendant overall power factor correction.

4. A system for starting and operating a pair of discharge lamps comprising a source of electrical energy, switch means operable at will to cause energization of said lamps from said source, energy storage means adapted to be connected to said source and to said lamps, and a relay provided with a plurality of contacts and having a magnetic winding connectable in electrical parallel with said lamps upon closure of said switch means and energizable by the full voltage of said source to cause some of said contacts to connect said energy storage means in electrical parallel with said lamps to facilitate the initiation of a discharge therein, and said relay being thereafter operable upon the application of lamp voltage to said magnetic winding following initiation of the discharge in said lamps to connect said energy storage means in series with one of said lamps for the purpose of minimizing the stroboscopic effect and improving the overall power factor of said system.

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CHARLES H. HODGKINS.