June 4, 1946. F. C. DE REAMER 2,401,555

LIGHTING SYSTEM FOR TUBULAR LAMPS AND HOLDERS FOR USE THEREIN

Filed Nov. 7, 1944

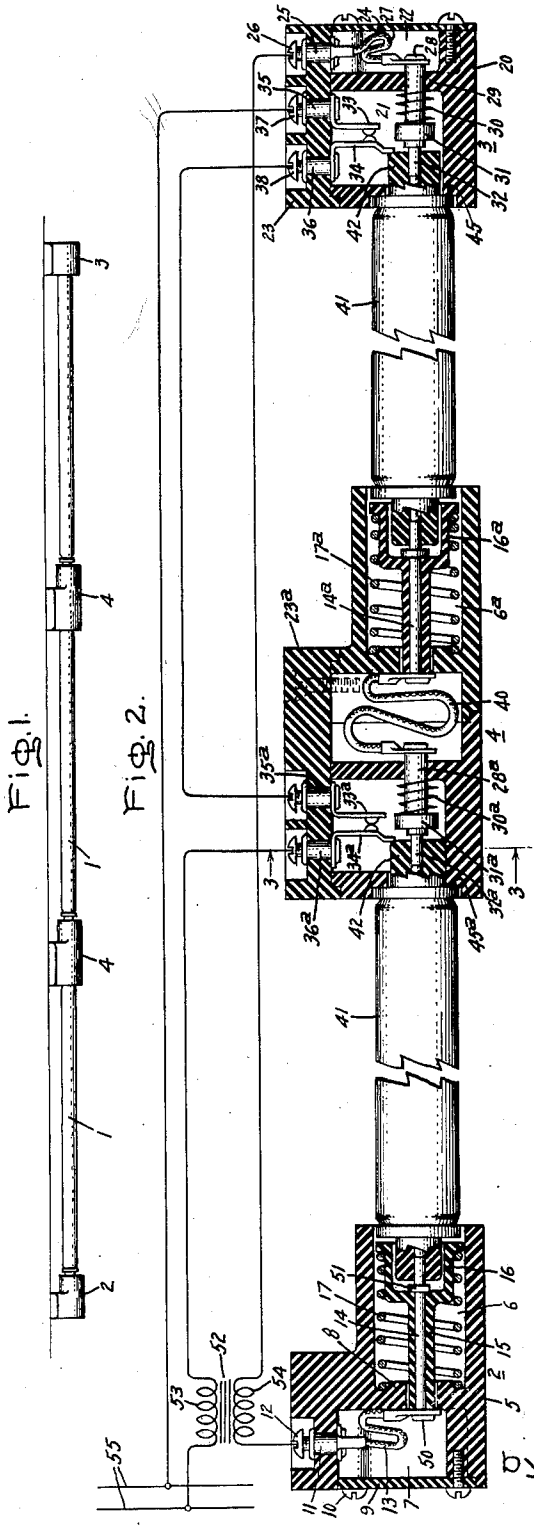


Fig. 1.

Fig. 2.

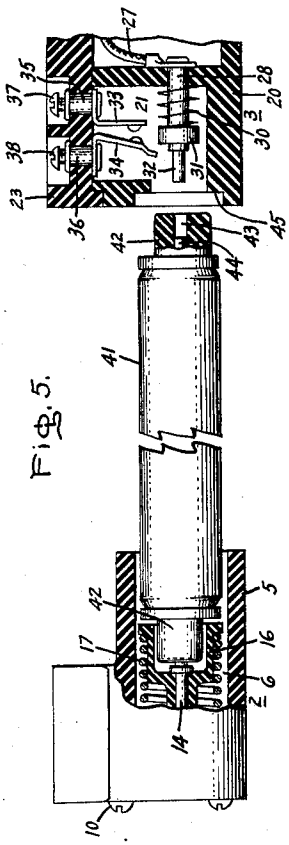


Fig. 5.

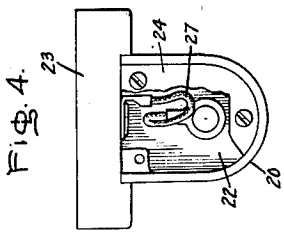


Fig. 4.

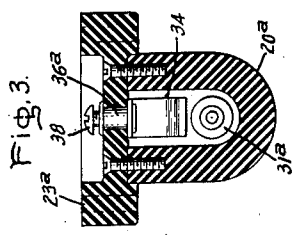


Fig. 3.

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LIGHTING SYSTEM FOR TUBULAR LAMPS AND HOLDER FOR USE THEREIN

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Application November 7, 1944, Serial No. 562,363

4 Claims. (Cl. 315—193)

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The present invention relates to lighting systems for tubular lamps, such as fluorescent lamps, wherein a number of lamps are operated in a series circuit, the arrangement being such, for example, that the lamps provide a continuous line of light. Such a series requires a high voltage for its starting and operation. For example, such a system may utilize a voltage as high as 15,000 volts. In the case of an ordinary lighting circuit, the high voltage is obtained from the usual 115 volt circuit by means of a suitable transformer which has its primary connected to the lighting circuit and its secondary connected to the lamp circuit.

The object of my invention is to provide an improved system which affords a high degree of safety and improved lamp holders for use in such a system.

For a consideration of what I believe to be novel and my invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing, Fig. 1 is a side elevation showing a number of tubular lamps, three in the present instance, positioned in a series of spaced holders embodying my invention; Fig. 2 is a view similar to Fig. 1 with the lamp holders in section and on a larger scale, with the lamps broken away at their central portions and with a wiring system diagrammatically connected to the lamp holders; Fig. 3 is a transverse sectional view taken on line 3—3, Fig. 2; Fig. 4 is an end view of either of the end lamp holders, the two being alike in this respect, and Fig. 5 is a view partly in section illustrating the way in which a lamp is inserted into the lamp holders.

Referring to the drawing, 1 indicates a series of tubular lamps positioned in end holders 2 and 3 and intermediate holders 4. In Fig. 1, three lamps are illustrated so that there are two intermediate lamp holders 4.

End lamp holder 2 comprises a casing 5 of suitable insulating material having walls which define an annular recess 6 and a second recess 7 separated by a wall 8. The open side of recess 7 is closed by a cover plate 9 held in position by screws 10. In its top wall is a terminal post 11 in the outer end of which is threaded a terminal screw 12 by means of which an electrical conductor may be attached to the terminal post. The inner end of terminal post 11 is positioned in recess 7 and is connected by a flexible conductor 13 to the end of a contact pin 14. Contact pin 14 is positioned in a sleeve 15 of insulating material located in an opening in wall 8 and adapted to

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slide through such opening. Pin 14 is held in the sleeve by a head 50 at one end of the pin and a collar 51 on the pin. Located in recess 6 on the end of sleeve 15 is a cup-shaped housing 16 which surrounds and houses the other end of contact pin 14. The cup-shaped housing 16 has a flange at its free end between which and wall 8 is located a spring 17 which biases the cup-shaped member 16 and sleeve 15 to a position wherein head 50 on the end of the contact pin, which is located in recess 7, is against wall 8. Sleeve 15 can slide through the opening in wall 8 until its end engages cover plate 9.

Lamp holder 3 comprises a casing 20 having walls which define a chamber 21 and a chamber 22. The chambers 21 and 22 are open at their upper ends as viewed in Fig. 2 and are closed by a cover plate 23. The open end of chamber 22 is closed by a cover plate 24. Carried by cover plate 23 is a terminal post 25 provided with a terminal screw 26 in its outer end by means of which a lead wire may be connected to post 25. The inner end of terminal post 25 is connected by a flexible conductor 27 to one end of a contact pin 28 positioned in a wall 29 which separates chamber 21 from chamber 22. Contact pin 28 is biased to a position wherein the head at its right hand end, as shown in Fig. 2, is against wall 29 by a spring 30 located between wall 29 and a collar 31 on the pin. The end 32 of the contact pin beyond collar 31 forms a portion for engagement with a lamp contact. In chamber 21 are the stationary contact 33 and the movable contact 34 of an electric switch. Contacts 33 and 34 are connected to terminal posts 35 and 36, respectively, which are carried by cover plate 23 and are provided at their outer ends with binding screws 37 and 38 to which electrical conductors may be connected. Switch contact 34 is biased to a position away from fixed contact 33 as shown in Fig. 5, the switch being normally open when a lamp is not in position in the lamp holder.

Lamp holder 4 comprises a combination of lamp holders 2 and 3 differing from them primarily in that the contact pins instead of being connected to contact posts are connected to each other by a flexible conductor 40. Accordingly, there has been applied to the parts of lamp holder 4 reference characters the same as those applied to corresponding parts of lamp holders 2 and 3 except that the exponent a has been added. The construction of lamp holder 4 will be obvious from the explanation already given of the constructions of lamp holders 2 and 3.

Each lamp comprises a tubular envelope 41 hav-

ing attached to its ends insulating sleeves 42, each provided with an opening 43 in which is embedded a lamp terminal 44. The openings 43 are of a size to receive the ends of the contact pins 14, 14a and 28, 28a. A lamp provided with lamp ends of this type is disclosed and claimed in the application of De Reamer and Pistey, Serial No. 559,990, filed October 23, 1944.

Referring particularly to Figs. 2 and 5, it will be seen that a lamp end may be inserted into the recesses 6 and 6a, the chambers being of a diameter greater than that of the lamp. However, with respect to the end lamp holder 3 and the left hand side of the lamp holder 4, as viewed in Fig. 2, the end wall is provided with a shoulder 45 or 45a with which the end of the lamp engages. When a lamp end is in engagement with the shoulder 45 or 45a, contact pin 32 or 32a is in engagement with a lamp contact 44, and the end of sleeve 42 engages the movable contact 34 or 34a of the switch to bring the movable contact into engagement with the corresponding stationary contact.

Referring to Fig. 2, 52 indicates a transformer having a primary winding 53 and a secondary winding 54. The primary winding is connected to a source of electric energy 55 and to the contacts 33 and 34 of the end lamp holder 3 and the contacts 33a and 34a of the intermediate lamp holder 4. If additional lamp holders 4 are in the series, then the switch contacts of each of them likewise would be connected through the primary winding of the transformer to the source of power, all the switches being in series. The secondary winding 54 of the transformer is connected to the terminal posts 11 and 25 of the two end lamp holders 2 and 3. With this arrangement, it will be seen that the circuit on the primary of the transformer is not completed until all the lamps of the series have been positioned in their holders; and that the circuit of the primary is opened whenever a lamp is removed from the circuit. Also, since the lamp must be inserted in a holder which does not embody a switch before it can be inserted in a holder embodying a switch, it is not until the last lamp has been finally completely positioned in the holders that the primary circuit is closed.

The manner of inserting a lamp in the holder is illustrated in Fig. 5. The lamp 41 is first positioned in the holder 2, the one lamp terminal 44 being brought into engagement with the contact pin 14 after which the lamp is pushed to the left against the action of spring 17 as shown in Fig. 5 until it reaches a position where its other end can be brought up into line with lamp holder 3. It is then permitted to move to the right as shown in Fig. 5 to bring the other lamp contact 44 into engagement with the end 32 of pin 28 after which the lamp is permitted to seat against the shoulder 45. When seated against shoulder 45, movable switch member 34 will have been moved into engagement with fixed switch member 33 to close the primary circuit at that lamp holder. As already pointed out, the primary circuit will not be completed until the last lamp is completely positioned between its holders to close the switch contained therein.

While the invention is intended for use primarily with a number of lamps connected in series, it may of course be used in connection with a simple lamp, the installation then embodying only a lamp holder 2 and a lamp holder 3 as shown in Fig. 5.

By my invention, I provide a wiring system for a series of lamps which offers a high factor of safety since as soon as removal of any one lamp is started, the circuit is disconnected and cannot be reestablished until all lamps are in place.

Also, the lamp holders for the system are relatively simple in structure, reliable in operation, and capable of being manufactured at low cost.

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

1. In a lighting system, a pair of spaced apart lamp holders for holding and connecting in circuit a tubular lamp, lamp terminal engaging contacts in said holders, a normally open switch in one of said lamp holders which is closed by the insertion of a lamp therein, and a transformer having its secondary connected to said lamp terminal engaging contacts and its primary connected to line through said switch.

2. Means for supporting and connecting into circuit a tubular lamp having contacts at its ends comprising a pair of lamp holders between which the lamp is inserted having contacts for engagement with the lamp contacts and a switch which is closed when a lamp is inserted into the holders, and means forming parts of said lamp holders whereby a transformer may have its primary connected to line through said switch and its secondary connected to the lamp holder contacts.

3. In a lighting system for a plurality of tubular lamps operated in series, spaced apart end and intermediate lamp holders between which the lamps are positioned, lamp terminal engaging contacts in said holders, a normally open switch in one of the end lamp holders and in each intermediate lamp holder, said switches being closed by the insertion of lamps between the lamp holders, and a transformer having its secondary connected to the two end lamp holders to connect the lamps in series circuit and its primary connected to line through said switches in series.

4. In a lighting system, tubular lamp holding means comprising a pair of spaced lamp holders having spring biased axially movable contacts adapted to be engaged with lamp end contacts by endwise movement of a tubular lamp positioned between the holders, one of said holders having an opening of an area such that a lamp end may be passed through it a distance sufficient to permit the other end of the lamp to be brought up into line with the other lamp holder, said other lamp holder having stop means to limit the distance a lamp end may move into it, a normally open switch in said other lamp holder which is closed when a lamp end is positioned in such other lamp holder, said stop means being so located that a lamp can be positioned in the lamp holders only by first positioning it in the said one lamp holder and a transformer having its secondary connected to said contacts and its primary connected to a line current supply through said normally open switch.

FRANK C. DE REAMER.