Nov. 30, 1943. F. D. BRYANT 2,335,640

OPERATING MECHANISM FOR DISCHARGE LAMPS

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Fig. 1.

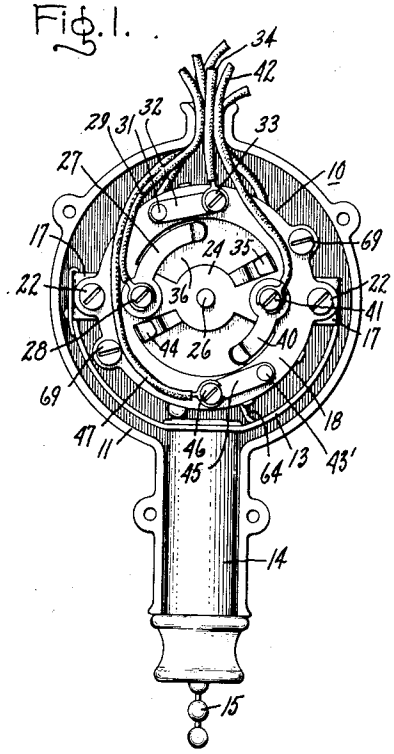


Fig. 2.

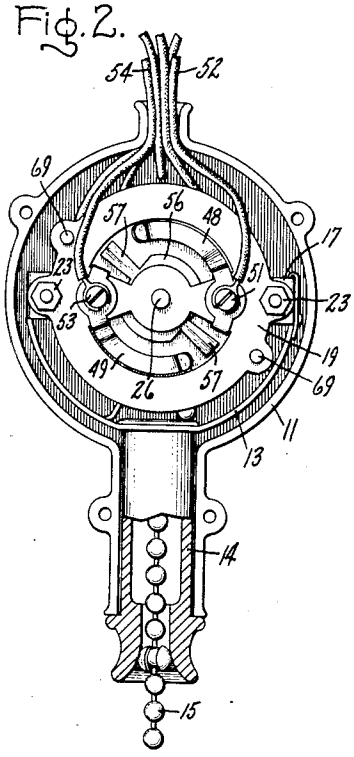


Fig. 3.

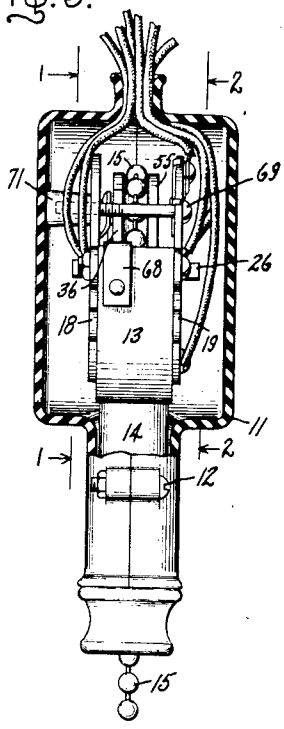


Fig. 4.

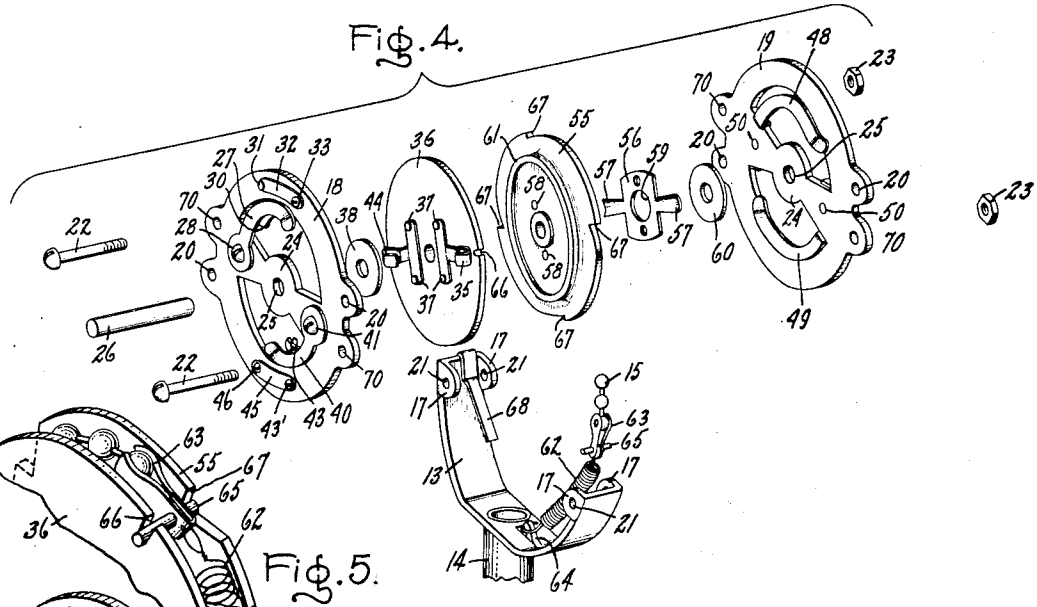
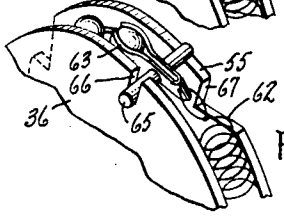


Fig. 5.

Fig. 6.



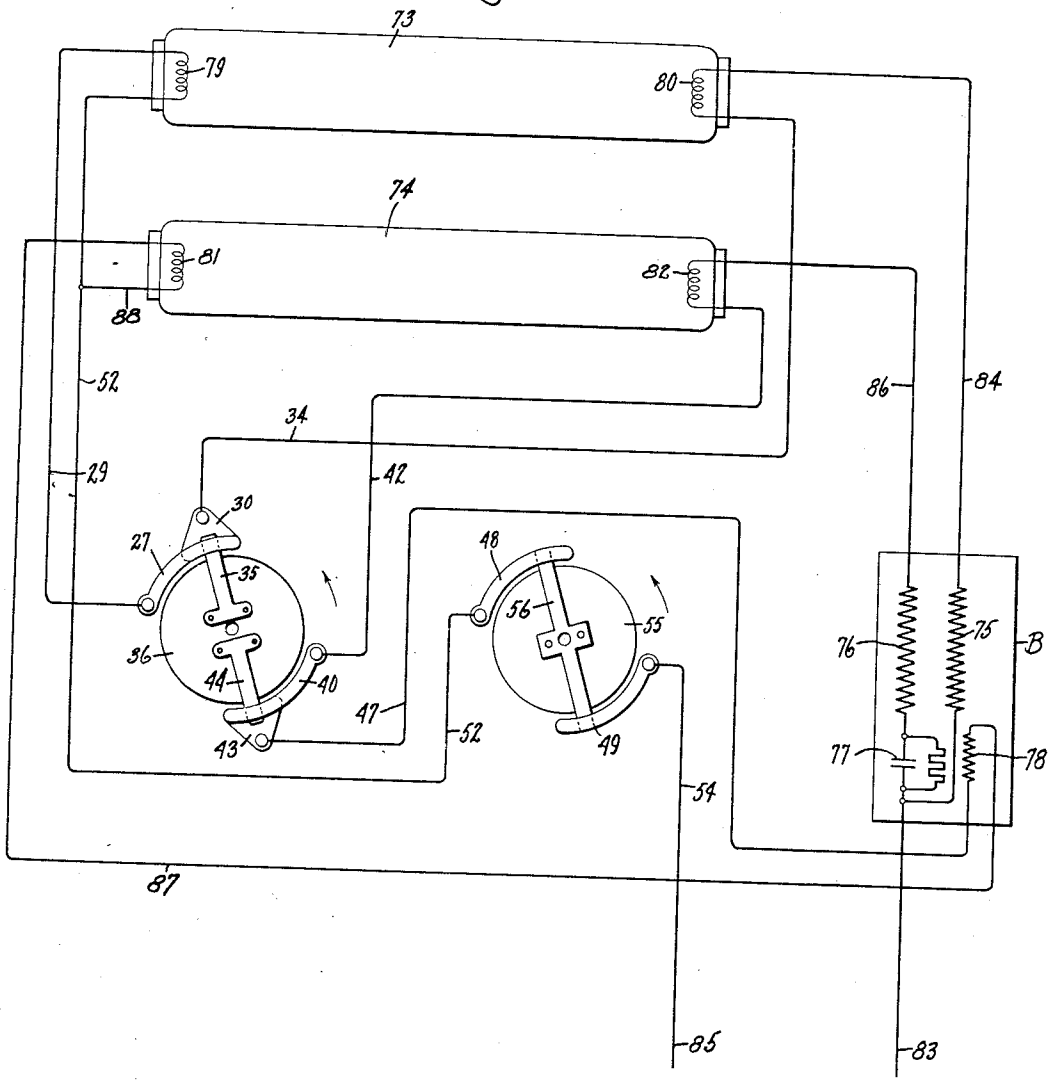
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OPERATING MECHANISM FOR DISCHARGE LAMPS

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Fig. 7.



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OPERATING MECHANISM FOR DISCHARGE LAMPS

Frank D. Bryant, Syracuse, N. Y., assignor to General Electric Company, a corporation of New York

Application July 21, 1942, Serial No. 451,698

3 Claims. (Cl. 200—5)

My invention relates to an operating mechanism for discharge lamps of the type now in commercial use, such as fluorescent lamps, and more particularly to a switch for operating the lamps.

The object of my invention is the provision of a new and improved switch mechanism for use with one or two fluorescent lamps, as required, and in which the switch mechanism is adapted for use with an ordinary pull chain socket.

In the accompanying drawings, Fig. 1 is a view of the switch mechanism looking along the line 1—1 of Fig. 3; Fig. 2 is another view of the switch mechanism looking along the line 2—2 of Fig. 3; Fig. 3 is an end view of the switch; Fig. 4 is an exploded view showing the switch elements, Figs. 5 and 6 illustrate a portion of the switch mechanism in various operating positions, and Fig. 7 is a diagrammatic view showing one way of connecting my switch into an operating circuit for a fluorescent lamp.

Referring to the drawings, the switch mechanism designated generally as 10 is housed within a casing 11 of any suitable insulating material, such as a molded plastic. As shown in Fig. 3, the casing is made in two parts held together around the mechanism by bolts 12. Within the casing is a supporting yoke 13 mounted on the end of a hollow stud 14 which receives and guides a pull chain 15 for manually operating the switch mechanism.

The two arms of the yoke 13 are each provided with integrally formed spaced projections 17 which act as supports for spaced insulating disks or rings 18 and 19. The disks are formed with openings 20 while the projections are likewise formed with openings 21 both of which receive fastening bolts 22 held in position by nuts 23. The disks 18 and 19 are formed of suitable low cost insulating material, such as sheet fiber, from which they may be punched. Each disk is formed as an annulus provided with a diametrical web 24 formed with an opening 25 for receiving a pivot or arbor 26. In mounted position, the disks 18 and 19 are spaced apart on opposite sides of the yoke, as shown in Fig. 3, and the arbor 26 extends between the members to form a pivot for the movable part of the switch mechanism to be described presently.

The web 24 of the disk 18 carries a contact member 27 in the form of a curved spring blade which extends outwardly from the web to a position adjacent the rim of the annulus. Electrical connection to the contact member is made possible through a screw 28 to which a conductor 29 is connected, as shown by Fig. 1. On the other side of the disk 18 at a point opposite the contact 27 is another contact member 30 which is fastened to the rim of the disk by a rivet 31. The contact member 30 likewise has a curved portion located adjacent the rim of the disk and together with the contact member 27 forms an electrical circuit when a conducting member is passed between them. A jumper 32 is electrically connected to the contact 30 through the rivet 31; this jumper carries a terminal screw 33 for making an electrical connection with a conductor 34. Electrical connection between the contacts 27 and 30 is effected by means of a shorting member 35 carried by a plate 36 of insulating material which, in turn, is rotatably mounted on the pivot 26.

The base portion of the shorting member 35 is fastened to the plate 36 in any suitable manner, as by rivets 37 while that portion of the member which engages the contacts is offset from the plate and is reversely bent to U-shape so that it easily passes between the contact members 27 and 30 and makes contact with each blade to complete an electrical circuit therethrough. A washer 38 of insulating material separates the plate 36 from the disk 18 and prevents binding so that the plate rotates easily.

The web 24 of the disk 18 also carries a contact member 40 diametrically opposite the contact 27. The contact 40 is formed as a curved spring blade, the same as the contact 27, and extends outwardly from the web to a position adjacent the rim of the annulus; it carries a terminal screw 41 to which an electrical connection is made as by a conductor 42. An additional spring blade contact 43 is carried by the disk 18 on the side opposite the contact 40. The contacts 40 and 43 are adapted to be bridged by a shorting member 44 carried by the rotatable plate 36. In all respects, the shorting member 44 corresponds to the previously mentioned shorting member 35 and is similarly mounted on the plate. However, it is insulated from the shorting member 35 by a portion of the supporting plate 36. Contact member 43 is fastened to the rim of the disk by a rivet 43' which likewise holds in position a conducting jumper 45 carrying a terminal screw 46. A conductor 47 provides an electrical connection with the terminal screw.

The other disk 19 is likewise provided with contact members comprising spaced spring blades 48 and 49. Each blade is secured to the web 24 in any suitable manner, as by a rivet 50 and is curved outwardly to a point adjacent the rim of the disk. The contact blades 48 and 49 are located diametrically opposite each other on the

same side of the disk. As shown by Fig. 2, the contact 48 carries a terminal screw 51 for receiving a conductor 52 while the contact 49 likewise carries a terminal screw 53 to which a conductor 54 is connected.

Mounted for rotation on pivot 26 is a carrier or disk 55 of insulating material which carries a contact or shorting member 56 adapted to engage the fixed contact blades 48 and 49 for establishing a circuit therebetween. To this end, the shorting member is provided with opposed arms 57 which ride over the surfaces of the fixed contact members as the carrier is rotated. The shorting member is secured to the carrier in any suitable manner, as by rivets 58 and the center portion is hollowed out, as indicated at 59 so that it is electrically insulated from the pivot 26. A washer 60 of insulating material is disposed between the disk 19 and the rotatable carrier 55 so that the latter rotates freely.

The disks 18 and 19 are mounted on the yoke 13 in the manner already described and the carrier 55 and plate 36 are mounted for rotation between them with the contacts on the rotatable members cooperating with the corresponding fixed contacts carried by the disks. Both the plate 36 and carrier 55 are provided with an annular flange 61 which, when these elements are assembled together, provides a trough or raceway for the pull chain 15 of the operating mechanism now to be described.

As shown in Figs. 3 and 5, the pull chain 15 extends around the perimeters of the plate 36 and carrier 55 and is connected to one end of a coiled spring 62 by a link 63. At its other end, the spring is secured to a clip 64 struck up from the yoke 13. A pin 65 is carried by the link and, in assembled position, is seated in a groove or opening 66 formed in the edge of the plate 36. The pin is also adapted to cooperate with one-way cam surfaces 67 formed at spaced points around the perimeter of the disk or carrier 55 and constituting a means to form a ratchet connection with the pin 65. In the instant case, four of such cam surfaces are provided corresponding to four positions of the shorting member 57 two of which correspond to the "off" and "on" positions of the switch, respectively.

Initially, one of the cam surfaces 67 will be in alignment with the groove 67, as shown in Fig. 5, and the pin 65 will be seated therein. The contacts 35 and 44 will be in alignment with the arms 57 of the shorting contact 56. This means that a pull on chain 15 against the action of spring 62 will rotate the plate and carrier through an angle of 90° so that the contacts 35 and 44 are moved to position between the fixed contacts on disk 18 and simultaneously the arms 57 engage the fixed contacts 48 and 49 on disk 19. Rotation of the elements in a counterclockwise direction, in the showings of Figs. 4 and 5 is limited by engagement of the offset contact 35 with the edge of the web 24 of the disk 18. Upon release of the pull chain, the spring 62 will move certain of the elements in the opposite direction. Since the pin 65 remains in groove 66, the plate 36 will be returned to its original position but as for the carrier 55, the pin will slide off the one-way cam surfaces onto the perimeter of the carrier, as shown by Fig. 6, and will be returned for engagement with the next succeeding cam surface 67. During this operation, return movement of the carrier 55 is prevented by a spring blade 68 mounted on the yoke and which engages an appropriate one of the cam surfaces 67. The operation just described means that upon continued pulls on the chain, the plate 36 and its associated contacts are moved to circuit closing position and then released to initial open position but that the carrier 55 and shorting contact 56 are moved in step-by-step movement to open and closed position, alternately.

As shown by Figs. 3 and 4, the assembled switch mechanism is held in position in the housing 11 by bolts 69 extending through opening 70 in the disks 18 and 19 and threaded to bosses 71 upstanding from a wall of the housing. One manner in which the switch may be connected into an operating circuit for fluorescent lamps will now be described.

Referring to Fig. 7, I have shown two fluorescent lamps 73 and 74 operatively connected in circuit with my switch and with a ballast B of a type now available commercially. The ballast is provided with a reactor 75 having a lagging power factor connected to lamp 73 while a second reactor 76 having a leading power factor, due to the capacitor 77, is connected to the other lamp 74. A compensator 78 in the form of a reactor adds inductance to the heating circuit of the second lamp to insure quick starting. The ballast just described forms no part of my invention since, as aforementioned, it is of a type now commercially available. Flourescent lamp 73 is provided with heating filaments 79 and 80 at opposite ends thereof while the lamp 74 is likewise provided with spaced filaments 81 and 82. The manner in which the switch operates to start the lamps will now be described, it being noted that in the diagrammatic showing of Fig. 7 the switch is in "start" position with the contacts on the rotatable members 36 and 55 in engagement with the corresponding fixed contacts carried by the disks 18 and 19.

When the chain 15 has been pulled downwardly to move the contacts on the rotatable member to circuit closing position, current flows from one side 83 of an alternating current supply line to the reactors 75 and 76 of the ballast. Current from reactor 75 flows through conductor 84 to filament 80 at one end of the lamp 73, then by conductor 34 to fixed contact 30, through contact 35 on the rotatable carrier 36 to fixed contact 27, then by conductor 29 to the filament 79 at the other end of the lamp, then by conductor 52, fixed contact 48, movable shorting member 56, fixed contact 49 and conductor 54 to the other side 85 of the supply line. Simultaneously, current flows from reactor 76 by a conductor 86 to filament 82 at one end of the lamp 74, then by conductor 42 to fixed contact 40 through movable contact 44, fixed contact 43, conductor 47 to the compensator 78, then by a conductor 87 to filament 81 at the other end of the lamp, by conductor 88 to conductor 52 and then through fixed contact 48, shorting member 56, fixed contact 49 and conductor 54 to the other side 85 of the supply line.

It should be manifest that the arrangement is such that as long as the chain 15 is held in pulled-down position, current will flow through the electrodes of both fluorescent lamps in the manner just described to preheat them. Usually, this preheating time is on the order of one to five seconds and the chain should be held pulled down for this period of time. Upon release of the operating chain 15, the carrier 55 and shorting member 56 will remain in circuit closing position but the plate 36 and contacts 35 and 45 will be returned to their initial open position

so that the circuits through the fixed contacts 27—30 and 40—43, respectively, will be opened. This opens the circuits across the filaments of the lamps so that the reactors 75 and 76 provide an inductive kick causing a glow discharge to strike between the filaments of each lamp, lighting the lamp. When this occurs, the circuit through the operating mechanism is as follows.

Current flows from reactor 75 through conductor 84 to the filament 80 across the glow discharge in lamp 73 to filament 79, then by conductor 52, contact 48, shorting member 56, contact 49 and conductor 54 to the other side of the supply line. Simultaneously, current flows from reactor 76 through conductor 86 to filament 82, then across the glow discharge in lamp 74 to filament 81, conductor 88, conductor 52, contact 48, shorting member 56, contact 49 and conductor 54 to the other side of the supply line.

When it is desired to turn off the lamps, the operating chain 15 is again pulled downwardly so that the pin 65 engaging in the next succeeding cam surface 67 moves the shorting member 56 to circuit opening position between the contacts 48 and 49. Even though the rotatable contact members 35 and 44 engage the corresponding fixed contacts on the disk 18, with this operation of the mechanism, the filaments will not be heated due to the fact that shorting switch member 56 in the supply line has been moved to circuit open position. After the lamps have been turned off, they may again be turned on simply by holding down the pull chain 15 for the required period of time to effect preheating of the lamp filaments. It will thus be apparent that the fluorescent lamps may be turned on and off by a simple operation of the pull chain 15 which operates the switch mechanism in sequence to "on" and "off" positions. When the switch is pulled on, it is only necessary to hold the pull chain down for a few seconds to effect preheating of the lamp filaments. Should the lamps not light on the first operation of the switch mechanism, the mechanism may be quickly moved through the "off" position by a quick pull on the chain 15 so that the next pull will again place the mechanism in position to start the lamps.

While I have illustrated my switch as being used with two fluorescent lamps, it should be manifest that the switch will operate equally as well with only a single fluorescent lamp simply by omitting the connections to one of the pairs of contacts 27—30 or 40—43. The mechanism is of a type which is well adapted for use in ordinary pull chain sockets such as are used to a considerable extent in floor lamps.

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

1. A switch mechanism comprising an insulating casing, two axially spaced insulating plates with contacts thereon secured in the casing, a first and a second disk with shorting members thereon for cooperation with said contacts being rotatably supported between the insulating plates and forming a raceway between them, and means for rotating the disks to effect electrical connection between the contacts and the respective shorting members comprising a pullchain engaging the raceway, a spring connecting the chain to the casing, a pin fastened to the chain and means on the first disk forming a positive drive between the pin and the first disk and means on the second disk forming a ratchet connection between the pin and the second disk to rotate both disks upon pulling of the chain and to cause return of the first disk to its initial position upon subsequent release of the chain.

2. A switch for operating a discharge lamp having spaced filaments comprising an insulating casing, first and second pairs of contacts secured to the casing, first and second disks each with a shorting member thereon for cooperation with the respective pairs of contacts, the first disk having an opening, the second disk having circumferentially spaced cam surfaces, spring means for biasing the first disk into a fixed angular position, and means for rotating both disks against said biasing spring to establish connection between the pairs of contacts and the respective shorting members and subsequently to cause the first disk to return to its original position by action of the spring, said means including a pin projecting through said opening and engaging said cam surfaces.

3. A switch mechanism comprising a casing, first and second pairs of contacts secured to the casing, first and second disks with shorting members thereon for cooperation with the respective pairs of contacts, means rotatably supporting the disks within the casing, said disks having adjacent flanged portions forming a raceway, and means for rotating both disks and subsequently causing one of them to return to its initial angular position comprising a spring with a pullchain connected to the casing, a pin secured to the chain, positive connecting means between the pin and the first disk and ratchet connecting means between the pin and the second disk.

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