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CIRCULAR ELECTRIC LAMP
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This invention relates to lamps of a type comprising long envelopes formed in a bent and more or less nearly closed configuration—a tubular vitreous envelope bent to a circular outline being a representative and very desirable form. For convenience, the general type of lamp here involved may be generically referred to as "circular," though it is to be understood that this invention naturally includes lamps whose tubular envelopes are bent to polygonal, oval, or other closed configurations. While the means of translation employed in such a circular lamp for converting electrical energy into useful radiation may be of any kind desired, electrical discharge means are particularly suitable, and especially fluorescent tubes of the usual positive column type. For domestic lighting, a circular fluorescent lamp is very generally more desirable than the long, straight tubes now in common use; e.g., its relative compactness adapts it for installation under the shades of ordinary table lamps and floor lamps, where even low wattage straight tubular lamps would be impracticable. The advantage will readily be appreciated when it is considered that a 30-watt fluorescent tube 36 inches long makes a circular lamp such as here illustrated having an over-all diameter of only about 12½ inches.

Instead of attempting to fabricate an endless tube forming a closed figure or circle, it is preferred to construct the lamp with a tubular envelope having closed ends and curved or bent in a suitable closed configuration, so that these ends lie adjacent and more or less nearly opposite one another. This allows the current connections for the translation means in the tube to be brought out to its exterior at the ends of the tube, and preferably through its end walls. It also allows of constructing and sealing in the tube ends very much as in the manufacture of ordinary straight fluorescent tubes, using the same cathode mounts as for straight tubes. Indeed, it is even possible to virtually completely manufacture the fluorescent lamp as a straight tube, only heating and bending it to the desired final configuration just before exhaust, charging with working substance and starting gas, and sealing off, etc. Methods of bending that may be used for this purpose are described in United States Patents No. 1,534,685, April 21, 1925; Claude and de Beaufort; and No. 2,080,899, May 18, 1937, Piranl and Fehse. Prior to exhaust of the fluorescent tube, air may be blown into it during bending through an exhaust tubulation forming part of one of its cathode mounts; and if desired, it may be provided with such tubulations at both ends, to afford hand holds for the bending operation.

Instead of separately forming the envelope ends with bases such as commonly used on straight fluorescent tubes, I provide a common base structure for the juxtaposed envelope ends, equipped with contact terminals for connection to their current connections or leads. These contact terminals may be arranged for access sideways of the base and of the circular lamp, preferably from the inner side of the lamp tube circle. The common base structure may substantially close the gap between the envelope ends and across the current leads of the latter where they come out of the envelope and are connected to the contact terminals, and may interconnect or even surround the envelope ends themselves. Thus the base may completely close the figure of the lamp.

The general structure of the lamp and base is disclosed and claimed in application Serial No. 415,594, Ward Harrison, of even date, and now Patent No. 2,339,186, granted January 11, 1944.

In accordance with my invention, I preferably provide for mounting a starting switch (and other accessories, if desired) in the common base for the juxtaposed tube ends. But aside from this new arrangement of the starting switch, I have devised a novel type and form of base construction, that can be designed to afford important advantages—such as simplicity of construction, involving only a few parts; easy manufacture and assembly of the parts, and easy application of the base to a lamp; ease of access to the starting switch or other parts housed in the base, when required; compactness and pleasing appearance; adaptability of a standard base to accommodate wide variations in the gap or space between the tube ends, and also to considerable variations in the angular relations of these ends.

Various other features and advantages of the invention will appear from the following description of species or forms of embodiment, and from the drawings.

In the drawing, Fig. 1 is a tilted or perspective view of a circular lamp conveniently embodying my invention; Fig. 2 is a fragmentary tilted view of the lamp base and the associated ends of the lamp envelope, an end of the base and a portion of the envelope being shown in vertical mid-section; and Fig. 3 is an exploded tilted view of the parts of the base.

In Figs. 1 and 2, there is shown a positive column fluorescent lamp comprising a glass tube en-
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The light source or lamp housing 18 is provided with a circular outline and having plane ends 11, 11 spaced apart a short distance, though directed toward one another. The approximation of the tube ends 11, 11 to true axial alignment will, of course, depend on the technical variation reached in forming the envelope 10 and the curved nature of the surface of the envelope 10. As shown in Fig. 2, the tube ends 11, 11 comprise a rectangular shaft 12, 12 of glass stem and glass type, sealed in as usual, and those ends are accordingly somewhat reduced in size at 13.

The current connections or leads 4, 4 for the condenser 36 extend to the exterior of the envelope 10 at its ends 11, 11, through the stems of the mounts 12, 12, which form the Ends of the envelope. An internal coating of phosphor on the tube walls is indicated 17, and a supply of mercury is indicated by a dotted line. In practice, the envelope 10 will also include a low pressure atmosphere of starting gas, such as argon or a pressure of several millimeters of mercury.

The base base structure 20 common to the adjacent envelope ends 11, 11 is shown in Figs. 1, 2, and 3, comprising the coronavirus plane 21, with the position of the terminals 21, 21 opposite the pins 16 in Fig. 1, and combined with the insulated NW 20 inward from the inner ends of the base. The base 20 is shown with an insulating transparent post 23 around the connecting pins 16. The base 20 is hollow to engage the adjacent lamp ends 11, 11, and may include a transparent or translucent lamp 10, as desired.

As shown here, the base 20 comprises an inner part 21a, engaging the inner sides of the adjacent envelope ends 11, 11, and an outer part 21b in the form of an insulatingly split shell that engages and occludes the outer sides of the envelope ends 11, 11, and is detachably secured to the inner part 21a. The parts 21a, 21b may be of any suitable material, such as a molded plastic sheet for the inner part 21a and sheet metal or other sheet material for the outer part 21b. One of the tube ends 11, 11, preferably the inner end 11, is of substantial depth or thickness outside of the lamp tube 10, carries the control terminal pins 21a, 21b at its own Inner side, and is made hollow to serve as a housing for lamp components, here shown as a starting switch 35 and glow discharge type such as that shown in the publication cited. L. E. Peters filed July 1, 1941, and a capacitor or condenser 36 intended to prevent radio interference. In the present instance, the part 25 consists of a molded sheet of transparent or translucent plastic with cut recess 47 open into the space between the tube ends 11, 11 for accommodating the condenser. The use of light-transmitting material in the exposed bottom wall of the recess 47 allows the light from the switch 35 to be observed; but of course various insulating material may be used for the whole part 25 and the entire surface of the cover 23 is a cover of sheet metal or other suitably semi-material or the like made into a plate, and is also hollowed or embossed outward from the center of curvature of the lamp sides 11, 11, and embraces the other parts 25 at its outer sides, forming with the envelope ends 11, 11 and engaging them at their outer sides.

The parts 25 may be of light-transmitting character (transparent or translucent) to let the light from the lamp ends 11, 11 or from the glow switch 35 shine through, the liner 20 being omitted or made transparent or translucent. The margins of the cover part 25 that overlap the edges of the parts 25 may be secured thereon by fasteners 33, 33 as shown in the drawings through the ends of the parts 25 and of the cover 26. As here shown, the cover 26 is provided with a flexible insulating liner 39, of fiber or asbestos, for example, that surrounds or envelops the parts between the tube ends 11, 11, and even overlaps the latter.

As shown in Figs. 2 and 3, the ends of the part 25 that engage against the inner sides of the circular envelope ends 11, 11 are hollowed about axes approximately coincident with the axes of the tubular envelope ends 11, 11, so as to seat properly on the envelope ends; but these hollowed sealing surfaces 42, 42 of this part 25 diverge inward from the tube ends. Similarly, the sheet metal of the cover 26 is embossed outward between its end edges that engage and fit against the outer sides of the tube ends 11, 11, in such a way as to diverge outward from the tube ends. This equality of contact end of the base 20 with respect to its end openings that accommodate or engage around the tube ends 11, 11 takes care of a considerable range of variation in the angular relation of these adjacent tube ends in different lamps; while the length of the base 20 axially of the tube ends takes care of considerable variation of the distance apart of these ends. As shown in Figs. 2 and 3, the holes 44, 44 in the part 25 for the fasteners 33, 33 are elongated crosswise of the tube ends 11, 11 to allow adjustment of the parts 25, 25 relative to each other to take care of variations of size or of relative direction of the tube ends.

As shown in Figs. 1, 2, and 3, two of the current connections or leads 14, 14 of the cathodes in the tube ends 11, 11 are connected to the contact terminals 21, 21. The contact terminals 21, 21 are hollow posts or pins molded into the wall of plastic at the bottom of the recess 37, and thus extending into the interior of the base 20, and the leads 14, 14 are brought down through them and soldered fast in them, thus holding the part 25 to the part 35, 35 (as shown in Fig. 2) before the cover 26 is put in place. The contact terminals 21, 21 may be connected across an a. c. power line P through the usual control switch 8 and choke coil C, which may also serve as a starting inductance, all as diagrammatically indicated in Fig. 2. The other two current connections or leads 14, 14 are shown as connected together through the starting glow-switch 35, in parallel with the condenser 36, these parts 35, 36 being conveniently placed in the hollow part 25 and connected as described after the contact terminals 21, 21 have been connected to the other leads 14, 14. For this purpose, a connector device or structure 40 is shown in the space between the tube ends 11, 11 at the side thereof adjacent the cover part 26, consisting of an insulating disc with hollow connector posts 41, 41 upstanding therefrom at its outer side and provided with peripheral grooved heads 42, 42, which are readily accessible when the cover 26 is removed.

As shown in Fig. 3. After the parts 35, 36 have been put in place, the connector 40 may be placed over them with their leads extending up through the posts 41, 41, and then the proper leads 14, 14 may be wrapped around the heads 42, 42, and the latter soldered to all the leads. It then only remains to
An electric lamp comprising a tubular vitreous envelope having electric energy translation means therein, for converting electric energy into radiation, and formed to a bent substantially closed configuration, with its ends adjacent and directed toward one another, and having current connections for said translation means extending to its exterior at its ends; a common base for the adjacent envelope ends provided with contact terminals for connection to their said current connections; and automatic starting switch means in said base for controlling the connection of the aforesaid current connections to said contact terminals.

2. An electric lamp comprising a tubular vitreous envelope having electric energy translation means therein, for converting electric energy into radiation, and formed to a bent substantially closed configuration, with its ends adjacent and directed toward one another, and having current connections for said translation means extending to its exterior at its ends; a common base for the adjacent envelope ends provided with contact terminals for connection to their said current connections; and automatic starting switch means in said base for controlling the connection of the aforesaid current connections to said contact terminals.

3. An electric lamp comprising a tubular vitreous envelope having electric energy translation means therein, for converting electric energy into radiation, and formed to a bent substantially closed configuration, with its ends adjacent and directed toward one another, and having current connections for said translation means extending to its exterior at its ends; a common base for the adjacent envelope ends provided with contact terminals accessible, for connection, sidewise thereof, and also having an internal recess; and automatic starting switch means in said recess for controlling the connection of the aforesaid current connections to said contact terminals.

4. An electric lamp comprising a tubular vitreous envelope having electric energy translation means therein, for converting electric energy into radiation, and formed to a bent substantially closed configuration, with its ends adjacent and directed toward one another, and having current connections for said translation means extending to its exterior at its ends; a common base for the opposed envelope ends; and a cover of sheet material having said inner base portion lying at the inner sides of the opposed envelope ends and open to the space between said ends, and detachably secured together, contact terminals for connection to the aforesaid current connections mounted on one of said base parts; and automatic starting switch means accommodated in one of said base parts; and controlling the connection of the aforesaid current connections to said contact terminals.

5. An electric lamp comprising a tubular vitreous envelope having electric energy translation means therein, for converting electric energy into radiation, and formed to a bent substantially closed configuration, with its ends adjacent and directed toward one another, and having current connections for said translation means extending to its exterior at its ends; a cover of sheet material having said inner base portion lying at the inner sides of the opposed envelope ends and open to the space between said ends, and detachably secured together, contact terminals for connection to the aforesaid current connections mounted on one of said base parts; and automatic starting switch means accommodated in one of said base parts; and controlling the connection of the aforesaid current connections to said contact terminals.
material in the space between the split sides of said shell, contact terminals at the exterior of said block member electrically connected to said lead-in conductors, and means securing said shell and said block member to the ends of said envelope, the said base structure enclosing only a short length of each end of the envelope so that it constitutes but a minor portion of the peripheral surface of the closed configuration.

11. An electric lamp comprising a tubular envelope bent to a substantially closed circular configuration with its ends directed toward each other and having lead-in conductors extending outwardly from said ends into the space therebetween, and a base structure comprising a block member of insulating material bridging the gap between said ends of the envelope and carrying contact members at its exterior, and a longitudinally split shell of sheet material surrounding the said ends of the envelope and the space therebetween to complete the closed configuration of the lamp, means clamping said block member and shell together and to the ends of the envelope, the said lead-in conductors being electrically connected to said contact members through the interior of the shell, the said base structure enclosing only a short length of each end of the envelope so that it constitutes but a minor portion of the peripheral surface of the closed configuration.

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