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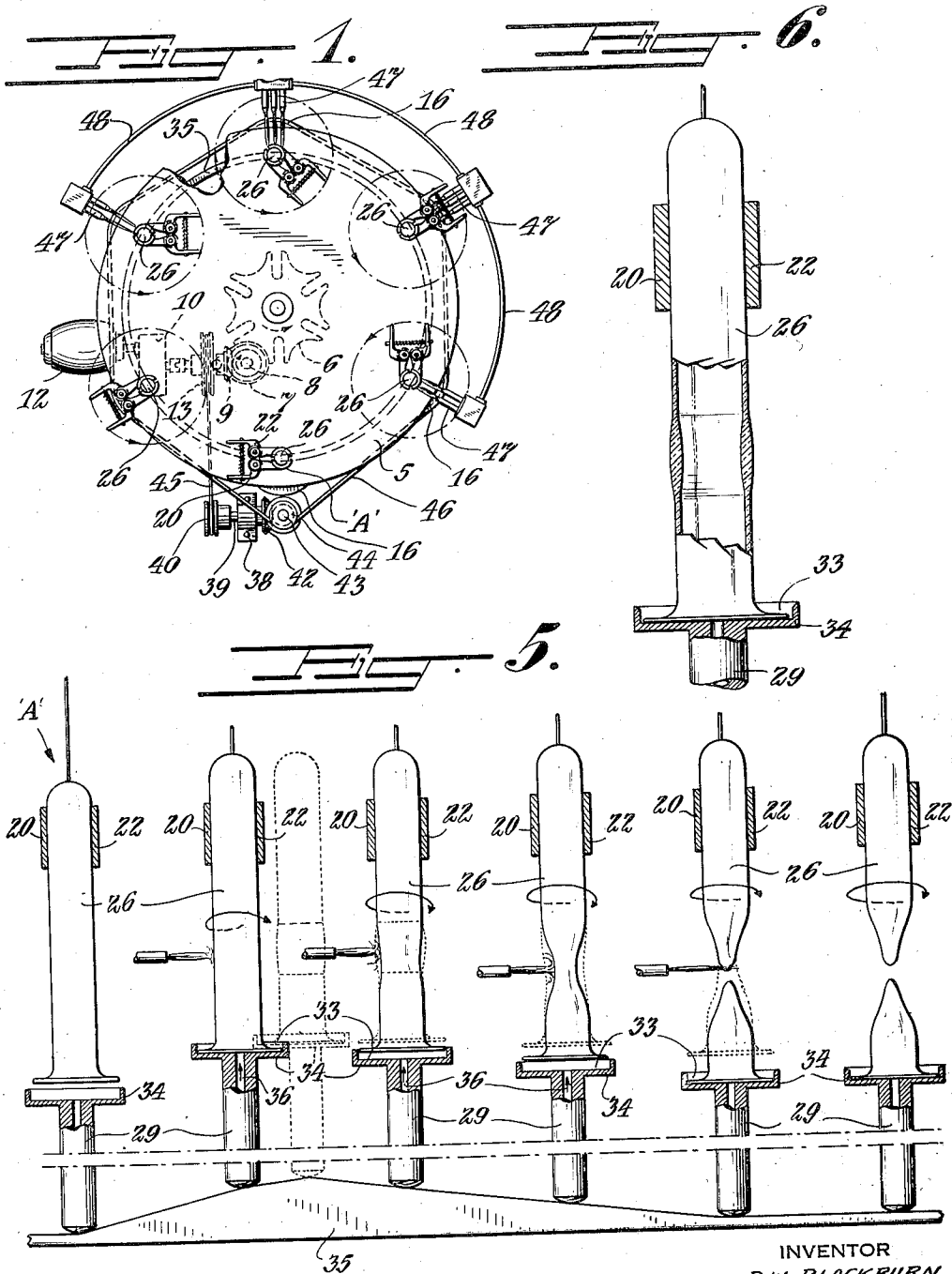
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ELECTRODE CONSTRUCTION FOR DISCHARGE LAMPS

Filed Dec. 31, 1935

2 Sheets-Sheet 1



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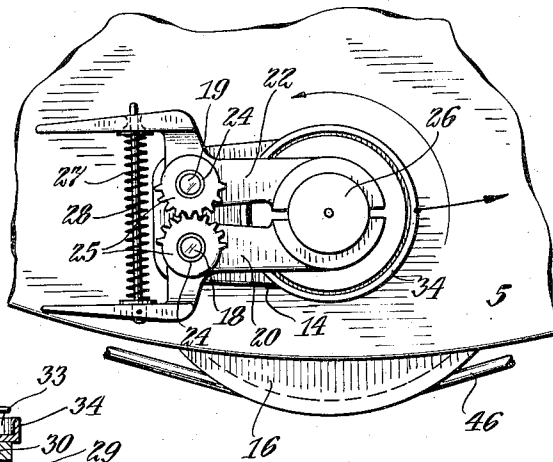
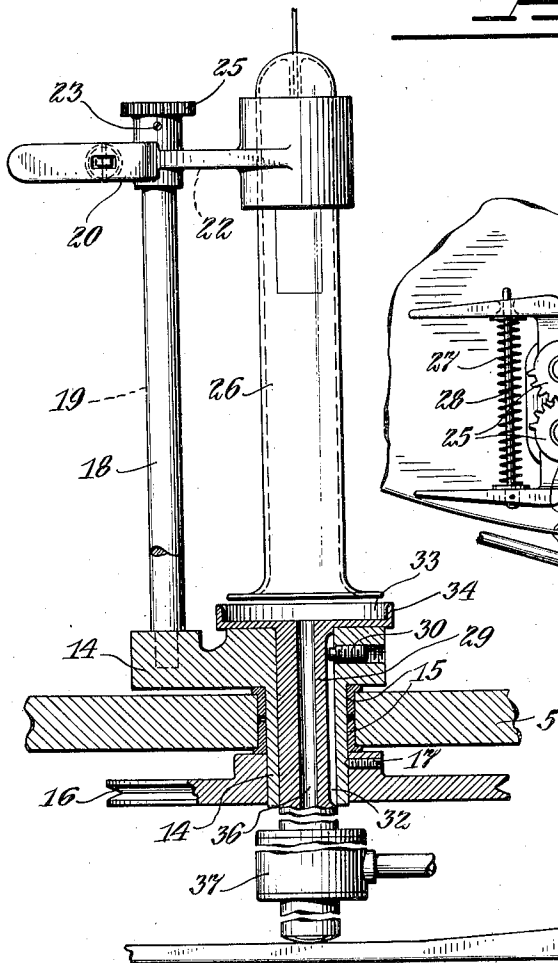
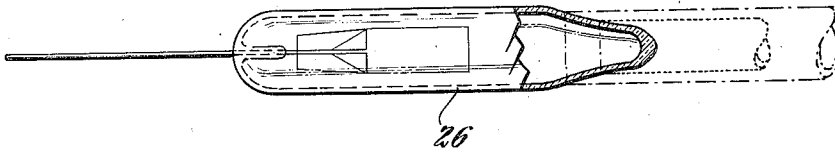
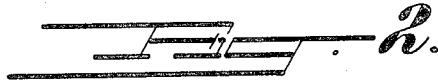
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ELECTRODE CONSTRUCTION FOR DISCHARGE LAMPS

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2 Sheets-Sheet 2



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ELECTRODE CONSTRUCTION FOR
DISCHARGE LAMPSPhilip W. Blackburn, East Orange, N. J., assignor
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8 Claims. (Cl. 176—126)

My present invention relates to electrodes and particularly to the method of constructing electrodes for discharge lamps of the type normally employed for sign lighting, the production of ultra-violet, and the like.

In this industry the advertising signs are usually constructed of various size vitreous tubing and made to conform to any desired symbol or script. The electrodes for operating the lamp are then sealed into the extremities of the tubing so that when an appropriate voltage and current is impressed across the electrodes the particular gaseous medium within the completed envelope will become ionized with an accompanying discharge having a color determinable by the rare gas or combination thereof utilized as the gaseous medium.

It is the primary object of my present invention to provide an electrode sealed to a vitreous envelope, the latter being so constructed as to be readily joined to vitreous tubing of various diameters to complete the envelope of the lamp.

Another object of my present invention is the provision of an electrode sealed into a vitreous envelope wherein one end of the latter is provided with a tapered tip or end which is substantially uniform so as to readily adapt the envelope to be fused or formed to tubing of various diameters to form a complete lamp.

Another object of my invention is the provision of an electrode sealed into a short vitreous envelope wherein an end of the latter is provided with a tapered tip or end which is substantially uniform and wherein the wall thickness of the tapered portion of the envelope is equal to that of the remaining portion of the envelope so as to render the same readily adaptable to fusing to tubing of various diameters to complete construction of the lamp.

A further object of my invention resides in the method of constructing an electrode for discharge lamps wherein the leading-in and supporting wire having an attached electrode is sealed into a vitreous envelope with the opposite end of the envelope being given a substantial uniform taper having a wall thickness equal to the remainder of the envelope so that the envelope may be readily joined by fusion to tubing of various diameters to complete the discharge lamp.

Still further objects of my invention will become obvious to those skilled in the art by reference to the accompanying drawings wherein:

Figure 1 is a top plan view of a portion of a machine which may be employed in carrying out

the various steps of the method for producing my novel electrode and having parts of the machine broken away to better illustrate the same.

Fig. 2 is a side view partly in cross-section of my completed electrode showing its ready adaptability to tubing of various diameters.

Fig. 3 is an elevational view on an enlarged scale and partly in section of a portion of the machine shown in Fig. 1.

Fig. 4 is a plan view on an enlarged scale of the portion of the machine shown in Fig. 3.

Fig. 5 is a schematic view showing the various stages of my novel electrode during the several steps of its production, and

Fig. 6 is an elevational view on an enlarged scale of the third step of my method depicting one particular stage in the production of my electrode.

Referring now to the drawings in detail I have shown in Fig. 1 a machine which may be employed to carry out the method of my present invention. Such machine as shown is well known in the art of lamp manufacture and has been utilized for a great number of years. As the same per se forms no part of my invention it is believed unnecessary that its construction be set forth in toto. Briefly it comprises a table 5 which is intermittently rotated by means of a Geneva drive or the like. This particular drive, as is well known, consists of a gear in the nature of a sprocket 6 adapted to be successively engaged by a pin carried by a cam 7. The cam is in turn rigidly affixed to a short shaft 8 which is rotated through a bevel gear arrangement 9 and reduction gearing 10 by an electric motor 12. Also rigidly affixed to the shaft extending from the reduction gearing 10 to the bevel gears 9 is a pulley 13 for a purpose to be hereinafter referred to.

Mounted upon the table adjacent the periphery at points equi-distant from each other are a plurality of members, such as shown more clearly in Figs. 3 and 4. These members comprise a hollow shaft 14, passing through a suitable bearing 15 provided in the rotating table top 5, and having a pulley 16 or the like rigidly secured thereto, such as by a set screw 17, below the table. Above the table top the shaft 14 is in the form of an eccentric collar and vertically mounted upon this collar portion are a pair of stationary shafts 18 and 19, which carry at their upper extremities a pair of cooperating clamps 20 and 22 rigidly secured, by means of a set screw 23, to a bushing 24 loosely mounted upon the respective shafts 18 and 19.

In order to cause simultaneous rotation of the

clamps 20 and 22 about the shafts 18 and 19 each of the respective clamps are provided with gear segment portions 25 meshing with each other. The jaws of the clamps are so disposed that when an envelope portion 26 is placed therebetween it is concentrically positioned with respect to the axis of the shaft 14 and such jaws are maintained in firm engagement with the envelope through the biasing action of a spring 27 positioned on a rod or bolt 28 between the handle portions of the clamps.

A further shaft 29 is concentrically disposed interiorly of the hollow shaft 14 and is arranged to rotate with this latter shaft through the medium of a set screw or dowel pin 30 extending through the shaft 14 and extending into a longitudinal slot 32 provided in the slot 29. Consequently while the two shafts rotate in unison the inner shaft 29 is movable up and down relative to the shaft 14 as viewed in Fig. 3. In order to impart such movement to the shaft 29 so that a recess 33 carried by the upper flanged end 34 thereof contacts and forms a rest for the lower end of the electrode envelope portion 26 the lower end of the shaft 29 is arranged to contact a circular track in the form of a cam 35 provided on the machine below the table top 5 as can be seen in Figs. 1, 3 and 5. Also the shaft 29 is provided with a longitudinal passageway 36 extending from a suitable stuffing box or the like 37 to enable the introduction of an inert gas, such as nitrogen or hydrogen, into the envelope for a purpose to be hereinafter described.

By reference again more particularly to Fig. 1 it will be noted the machine is provided with a bracket 38 having a short shaft 39 journaled thereto which shaft is provided with a pulley 40 at one end and is connected through bevel gearing 42 to a short vertical shaft 43 having a pulley 44 secured thereto. A suitable chain or belt 45 interconnects the pulley 40 with the pulley 13 so that the pulley 44 is thus rotated by the electric motor 12. Likewise a similar belt 46 extends around the pulley 44 and each of the pulleys 16 carried by the respective shafts 14 except in one position of the machine which is the initial or starting position identified by "A" in Fig. 1. Adjacent four of the six positions assumed by the electrode during its production are a series of burners 47 which are connected by suitable conduits 48 to a suitable source of illuminating gas mixed with oxygen or the like to project a hot flame upon the envelope.

In producing my electrode the leading-in and supporting wire having the electrode secured thereto is first sealed into one end of a short tube of vitreous material having its open end flared to form a seat. After this step is performed, in any suitable manner as is well known to the art, the operator after starting the electric motor 12 compresses the handle portion of the clamp 20 and 22 to open the jaws and inserts the envelope section 26 so that the end thereof is slightly above the head 34 of shaft 29 or it may be in contact therewith.

Moreover, as before stated, the shaft 14 will be stationary in this initial position "A" so that the clamps 20 and 22 may be readily operated due to the fact that the belt 46 is not now in contact with the pulley 16 carried by the shaft 14.

Upon rotation of the table top 5 in a counterclockwise direction, as shown in Fig. 1, the unit carrying the envelope section 26 is then moved to the second position by the operation of the Geneva drive due to the engagement of the pin

carried by the cam 7 engaging the slots in the sprocket gear 6. During movement of the envelope from the initial or starting position "A" to the second position the shaft 29 will ride along the track or cam 35 thus raising the shaft 29, together with its head 34 until the head 34 contacts the flanged portion of the envelope to fix the length of the electrode even if the same were in contact with each other in the initial position by sliding the envelope in the jaws 20 and 22.

At the same time the envelope is disposed adjacent the first set of burners 47 so as to heat the same and the pulley 16 is now engaged by the belt 46 so that the unit is rotated in a counterclockwise position to uniformly heat the envelope. The machine is then automatically indexed to the next position, a new electrode having been inserted in the initial position A of the machine, thus disposing the new envelope section in the second position and the first envelope section in the third position.

In passing from the second to the third position and after having been heated the shaft 29 passes over the highest point of the circular track or cam 35 with the result, as shown in the dotted lines in Fig. 5 and more particularly in Fig. 6, that the envelope section is collapsed to increase the wall thickness thereof at a definite location constituting the heated area after which the envelope is again heated upon coming to rest at the third position.

However, in this position the head 34 of the shaft 29 is now receding and no longer contacts the envelope section. Again the envelope is subjected to the burners and due to the weight of the flared end of the envelope the same begins to draw away. The machine is then indexed automatically, as before stated, to the fourth position, where it is again heated by the burners 47 to a still higher temperature with additional dawning of the envelope due to gravitation of the flared end.

After a short period of heating in this fourth position the machine is then again indexed to the fifth position where the envelope is again subjected to the burners 47 which in this particular position causes the envelope section to receive its greatest concentrated heating and as the head 34 of the shaft 29 has now completely receded the flared end of the envelope will completely draw away from the remaining portion forming a sealed end. Also while I have shown the envelope section 26 provided with a flared end to increase the weight thereof so that it will draw by gravitation it is not essential provided the finally severed portion or cullet is of sufficient weight to accomplish the drawing. Further indexing of the machine moves the envelope section to the sixth position, which is merely a cooling one and upon further movement of the machine to the initial position the operator removes the completed electrode from the clamps 20 and 22 prior to inserting a new section therein. Due to the engagement of the belt with the pulleys 46 carried by the respective shafts 14 the clamps, together with the electrode section, rotates in a counterclockwise direction in all positions except the initial inserting and removal position.

Consequently flames from the burners 47 in four of the six positions uniformly distributes the heat over the envelope. Inasmuch as the envelope section, after being initially heated, is collapsed to increase the wall thickness thereof prior to additional heating, and the drawing operation

follows upon still further heating without the flared end being supported, there results a drawing of the open end of the electrode which produces a substantially uniform tapered end wherein the wall thickness of the taper is equal to that of the remainder of the envelope. It should also be noted that prior to sealing off of the envelope section an inert gas, as before noted, is introduced therein, the sole function of which is to prevent oxidation of the metallic electrode due to any residual air within the envelope prior to fusion thereof to suitable tubing for completion of the finished product. During heating of the envelope section in its several positions as explained the introduction of this inert gas under pressure drives out the air which is still further exhausted upon expansion of the gas so that any oxygen remaining is of an inappreciable quantity.

By the production of the envelope section having a substantially uniform tapered end with the wall thickness thereof being equal to the remainder of the envelope the finished section, as shown in Fig. 2 is rendered readily adaptable by fusion to tubing of various diameters. Thus, regardless of the tubing diameter and its particular symbol or script, my novel electrode may be readily fused thereto and the entire discharge lamp evacuated. Any desired gaseous medium may be then introduced in the lamp prior to sealing off rendering the lamp ready for operation upon the application of a suitable voltage and current to the electrodes.

Moreover, while I have shown and described a machine well known in the art for carrying out the various steps of my method, any other type of machine may be just as readily employed and as a matter of fact, the various steps may be performed by hand if necessary, although in the interest of economy and efficiency it is preferable that the entire operation be automatic.

Also in connection with some of the steps of my herein described method I have referred to the operation as being a drawing of the envelope which is due to the gravitation of the flared envelope end. It should be borne in mind, however, that in lieu of depending entirely upon gravitation the end may be drawn by grasping the flared end, if desired, which would perhaps hasten this particular operation. Nevertheless, I find it preferable, as well as economical, to permit the drawing operation to be performed by gravitation in the manner explained as this appears to produce a more uniform taper and to also maintain the wall thickness thereof equal to the remainder of the envelope. Consequently throughout my claims I will refer to this particular step as a drawing of the envelope, which it is understood is to include this step whether performed by gravity or by an actual grasping and pulling of the flared envelope end.

It thus becomes obvious to those skilled in the art that I have provided an electrode for discharge lamps wherein the electrode is sealed to a short section of a vitreous envelope and provided with a uniform tapered end so as to render the same readily adaptable by fusion to vitreous tubing of various diameters to complete the envelope of the lamp.

Although I have shown and described one particular apparatus for performing the method of producing my novel electrode I do not desire to be limited thereto, as the product may be produced in other diverse manners and the method may

likewise be performed in other ways than by the specific machine illustrated, without departing from the spirit and scope of the appended claims.

What is claimed:

1. The method of producing electrodes for discharge devices which consists in sealing a leading-in and supporting wire with an attached electrode to a vitreous tubing, slowly heating the tubing a short distance from its open end, collapsing the tubing to increase the wall thickness at the heated area, and drawing the tubing to a closed uniform tapered end.

2. The method of producing electrodes for discharge devices which consists in rigidly holding a tubing having a leading-in and supporting-wire with an attached electrode sealed in one end, slowly heating the tubing at a preselected distance from its opposite open end, collapsing the tubing upon its being heated to the softening point to increase the wall thickness thereof at a definite location, and drawing the tubing to a closed uniform tapered end having a wall thickness equal to the remaining portion of the tubing.

3. The method of producing electrodes for discharge devices which consists in rigidly holding a tubing having a leading-in and supporting wire with an attached electrode sealed in one end, slowly heating the tubing at a preselected distance from its opposite open end, collapsing the tubing upon its being heated to the softening point to increase the wall thickness thereof at a definite location, drawing the tubing to a closed uniform tapered end having a wall thickness equal to the remaining portion of the tubing, and severing the excess tubing prior to cooling.

4. The method of producing electrodes for discharge devices which consists in rigidly holding a tubing having a leading-in and supporting wire with an attached electrode sealed in one end, slowly heating the tubing at a preselected distance from its opposite open end, introducing an inert gas into the tubing during heating to exhaust the air for precluding oxidation of the electrode, collapsing the tubing upon its being heated to the softening point to increase the wall thickness thereof at a definite location, drawing the tubing to a closed uniform tapered end having a wall thickness equal to the remaining portion of the tubing, and severing the excess tubing prior to cooling.

5. A device of the character described comprising a vitreous envelope, a leading-in and supporting wire sealed to one end of said envelope, an electrode carried by said leading-in and supporting wire interiorly of said envelope, and a tapered end provided on said envelope opposite to said leading-in wire having a uniform wall thickness equal to the remaining portion of said envelope.

6. A device of the character described comprising a vitreous envelope, a leading in and supporting wire sealed to one end of said envelope, an electrode carried by said leading-in and supporting wire interiorly of said envelope, and a drawn tapered end on said envelope opposite to said leading-in wire having a uniform wall thickness equal to the remaining portion of said envelope.

7. A device of the character described comprising a vitreous envelope, a leading-in and supporting wire sealed to one end of said envelope, an electrode carried by said leading in and supporting wire interiorly of said envelope, and a tapered end on said envelope opposite to said leading-in wire having a uniform wall thickness equal to the remaining portion of said envelope to render the

same readily fusible to envelope tubing of various diameters.

8. A device of the character described comprising a vitreous envelope, a leading-in and supporting wire sealed to one end of said envelope, an
5 electrode carried by said leading-in and supporting wire interiorly of said envelope, an inert gas

in said envelope to prevent oxidation of said electrode, and a tapered end on said envelope opposite to said leading-in wire having a uniform wall thickness equal to the remaining portion of said envelope to render the same readily fusible
5 to envelope tubing of various diameters.

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