Jan. 27, 1953 J. M. COUGHLIN 2,626,637

METHOD OF MANUFACTURING CATHODE MOUNTS

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Fig. 1.

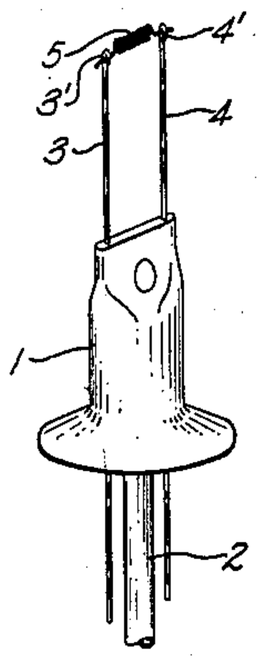


Fig. 2.

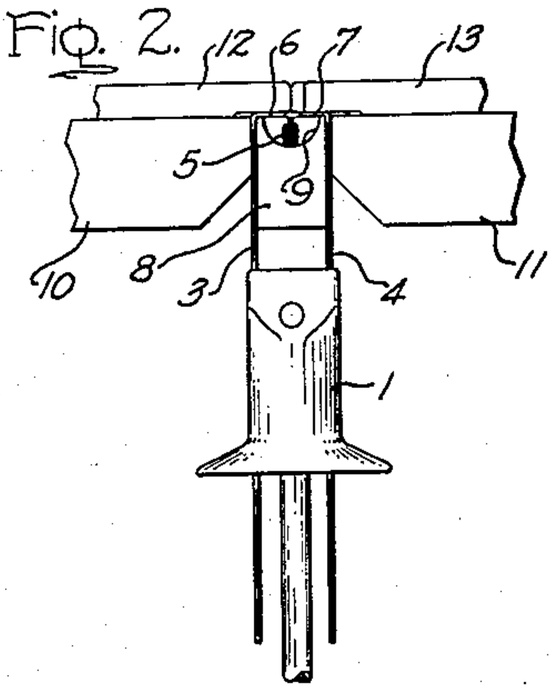


Fig. 3.

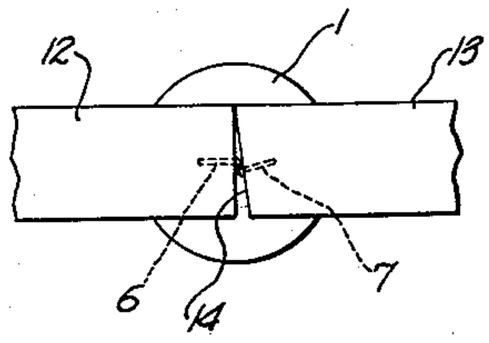


Fig. 4.

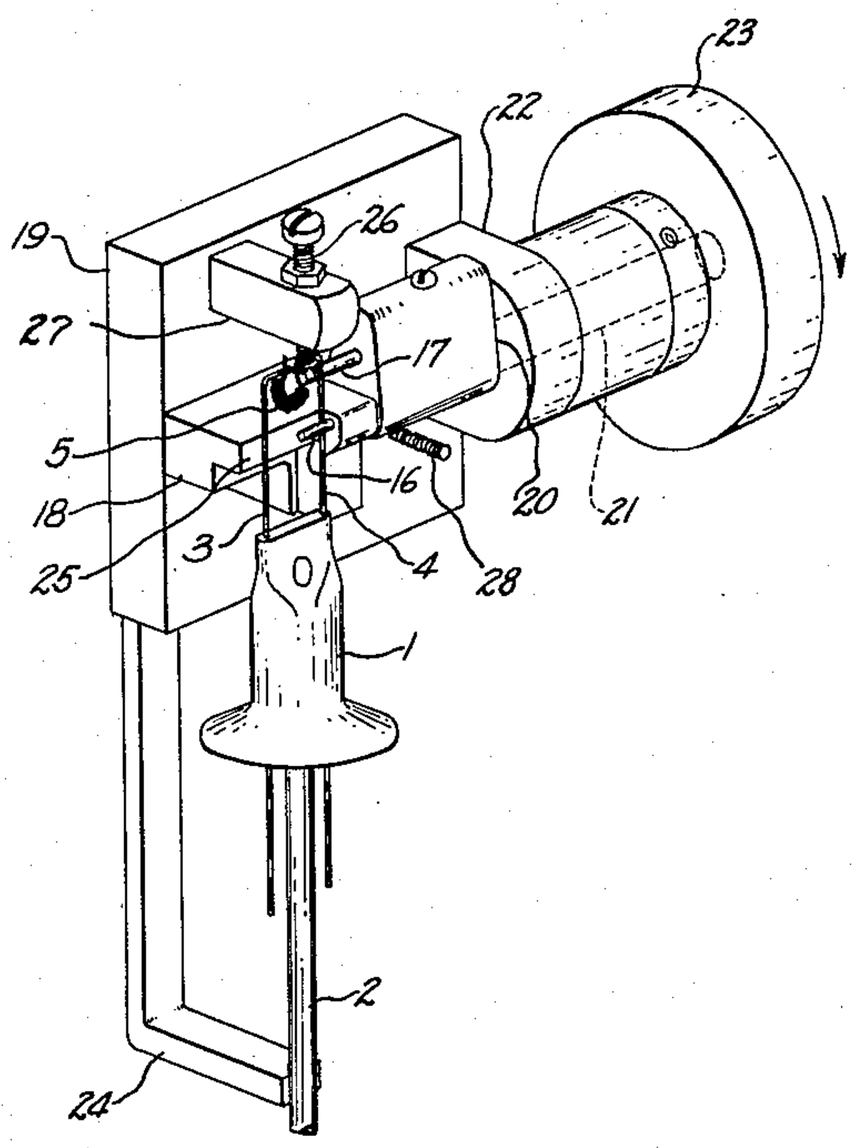


Fig. 5.

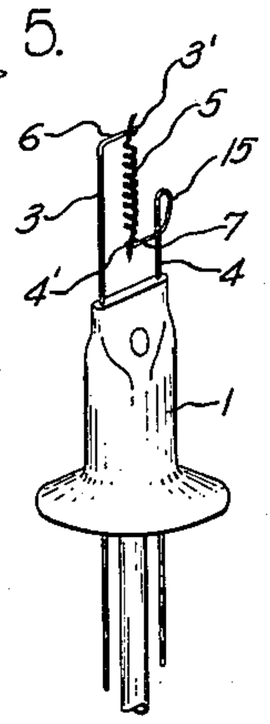
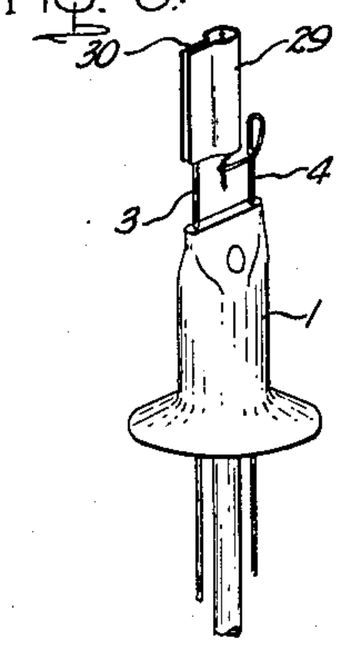


Fig. 6.



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2,626,637

METHOD OF MANUFACTURING CATHODE MOUNTS

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Application April 1, 1949, Serial No. 84,788

3 Claims. (Cl. 140—71.6)

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My invention relates to electric discharge devices, and more particularly to the manufacture of cathode mount structures therefor.

In certain electric discharge devices, such as the well-known fluorescent lamps, the cathode mount structure comprises a glass stem tube having a pair of lead-in wires extending longitudinally therefrom in substantially parallel relationship and having secured to the ends thereof a coiled filamentary cathode extending laterally or horizontally between the lead-in wires. Such mount structures are made on high-speed automatic equipment. More recently it has been proposed to employ a mount construction wherein the coiled cathode extends longitudinally or vertically of the stem. It has been proposed to manufacture such mount constructions by suitably shaping a short lead-in wire and a long lead-in wire and securing the cathode to the ends of the wires so that it extends longitudinally of the stem. However, that procedure was not suitable for large-scale production.

It is an object of my invention to provide a method of manufacturing the so-called vertical cathode mount structure which is economical and is adapted to large-scale production. It is a further object to provide a method involving reshaping of the mount structure by a sequence of steps which may be performed by hand but which peculiarly lend themselves to speedy and accurate duplication on relatively simple equipment. Further objects and advantages of my invention will appear from the following detailed description and from the drawing.

In the drawing, Fig. 1 is a perspective view of a cathode mount structure in an intermediate stage of its manufacture; Fig. 2 is a plan view showing the mount of Fig. 1 and the first of two operations involving reshaping of the lead wires of the mount in a suitable jig; Fig. 3 is an end view of the Fig. 2 arrangement; Fig. 4 is a perspective view of another jig and illustrating the second reshaping operation on the mount; and Fig. 5 is a perspective view of the reshaped mount, Fig. 6 being a similar view showing the same mount with a shield attached thereto.

In accordance with my invention I prefer to utilize a cathode mount structure of more or less conventional type having the cathode or filament mounted laterally or horizontally between the lead-in wires, and to then reshape the lead-in wires by single-plane operations which can be readily duplicated on equipment of the type illustrated.

Referring to Fig. 1, the mount shown therein

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comprises a conventional glass stem tube 1 having an exhaust tube 2 depending therefrom, and a pair of lead-in wires 3, 4 extending longitudinally therefrom in substantially parallel relationship. A coiled or coiled-coil filamentary cathode 5 extends laterally between the ends of the wires 3, 4 and is securely clamped thereto. This mount may be manufactured on automatic mount-making equipment of a type well known in the art, and is essentially like certain types of mount structures heretofore employed except that the lead-in wires 3 and 4 are longer than usual, being substantially longer than the filament or cathode 5.

Figs. 3 and 4 show the first step in the reshaping of the mount wherein the upper ends 6 and 7 of both leads 3 and 4, respectively, are bent toward the center. To avoid the two leads from hitting each other, the end 6 is bent directly toward center while the end 7 is bent far enough off center so as not to clash with the end 6. During this operation the filament or cathode 5 is bowed, as shown more clearly in Fig. 4.

The reshaping of the upper ends of the leads may be performed with the aid of a jig whose forming elements are shown in Figs. 2 and 3 and comprise a stationary anvil 8 having its end recessed at 9 to permit the filament 5 to bow out. The mount is placed with its leads 3 and 4 on opposite sides of the anvil 8 and clamped thereagainst by hold-down jaws 10 and 11 with the ends 6 and 7 of the leads projecting beyond the indented end 9 of the anvil. The ends 6 and 7 of the leads are then bent over the end of the anvil 8 by forming jaws 12 and 13 which move with, and then slide along, the jaws 10 and 11. One of the jaws (13) has its face 14 (Fig. 3) formed at a slight angle so as to bend the lead end 7 to one side as shown in Fig. 3.

In the next operation, illustrated in Figs. 4 and 5, the lead wire 4 is bent in a plane at right angles to the plane of bending in the first step (Figs. 2 and 3). The lead 4 is bent into a loop 15 (Fig. 5) of nearly 180° so that the cathode clamp 4' is aligned directly below the upper cathode clamp 3', and the cathode 5 is located substantially along the axis of the stem 1. The spacing or final length of the cathode between the lead wire ends 6 and 7 is predetermined by the point at which the bend 15 is made, which point is between the bent end 7 and the upper end of the stem 1.

The formation of the bend or loop 15 may be carried out on apparatus such as that shown in Fig. 4, the lead 4 being bent around a stationary

pin 16 by a pin 17 which is revolved about the pin 16. The pin 16 is carried by a support block 18 mounted on a base plate 19. The pin 17 is carried by an arm member 20 at one end of a shaft 21 mounted in a boss 22 on base plate 19 and having a knob 23 attached to its other end. The mount is supported by engagement of its exhaust tube 2 with the notched end of a bracket 24 extending from base plate 19, and by engagement of the leads 3 and 4 with the surface 25 of support block 18, the lead 4 being disposed between the said surface 25 and the pin 16 which is spaced from said surface 25 by a distance only slightly greater than the diameter of the lead wire 4. The point at which the lead 4 is bent or curled is determined by engagement of the bent upper end (7) of lead 4 with the end of a stop screw 26 mounted in a stud 27 extending from base plate 19. The lead 4 is curled around pin 16 by rotation of the knob 23 in the direction of the arrow to thereby rotate the pin 17 about the pin 16 until the arm member 20 strikes a stop screw 28 extending from the base plate 19, thereby forming in lead 4 the loop 15 shown in Fig. 5 and bringing the cathode filament 5 into alignment with the stem 1.

If desired, a split cylindrical shield 29 (Fig. 6) may be secured around the cathode 5 by welding tabs 30 extending from said shield to opposite sides of the lead wire 3.

The cathode 5, which is preferably of tungsten wire, may be provided at any one of several stages with a coating of electron emissive material such as a suspension of alkaline earth carbonates in a suitable binder. For example, the emission mixture may be applied to the cathode 5 when the mount is in the form shown in Fig. 1, that is, prior to the reshaping of the lead-in wires 3 and 4. Alternatively, the emission mixture may be applied to the cathode 5 after reshaping of the mount into the form shown in Fig. 5.

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

1. The method of manufacturing a cathode mount which comprises securing a coiled filament at its ends to and laterally between a pair of substantially parallel lead-in wires extending longitudinally and substantially equal distances from a supporting stem, and then deforming at least one of said lead-in wires to bring said filament at least approximately into longitudinal alignment with said stem by preliminarily bending an end portion of one lead-in wire toward the other lead-in wire and substantially within the plane defined by said lead-in wires, and then bending a portion of said lead-in wire back upon itself in a plane substantially normal to the plane defined by the parallel lead-in wires.

2. The method of manufacturing a cathode mount which comprises securing a coiled filament at its ends to and laterally between a pair of substantially parallel lead-in wires extending longitudinally and substantially equal distances from a supporting stem, and then deforming said lead-in wires to bring said filament at least approximately into longitudinal alignment with said stem by first bending the end of one lead-in wire toward the other and substantially in the plane defined by said lead-in wires and then bending an end portion of the other lead-in wire back upon itself in a plane substantially normal to the plane defined by the parallel lead-in wires.

3. The method of manufacturing a cathode mount which comprises securing a coiled filament at its ends to and laterally between a pair of substantially parallel lead-in wires extending longitudinally and substantially equal distances from a supporting stem, and then deforming said lead-in wires to bring said filament at least approximately into longitudinal alignment with said stem by first bending the ends of the lead-in wires toward each other and substantially in the plane defined by said lead-in wires whereby said filament assumes a bowed form and then bending one of them back upon itself at a point therealong intermediate its bent end and the stem and in a plane substantially normal to the plane defined by the parallel lead-in wires whereby to cause said filament to extend substantially parallel to and between said lead-in wires.

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