

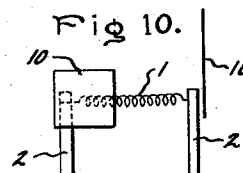
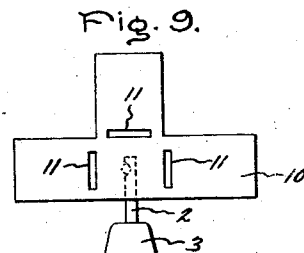
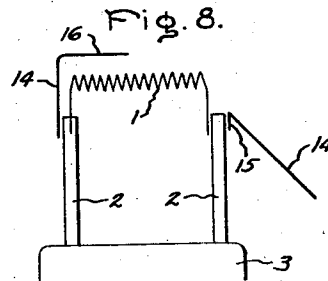
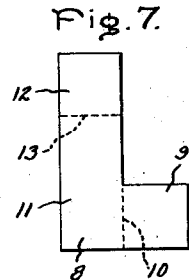
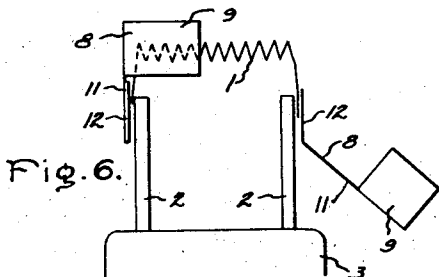
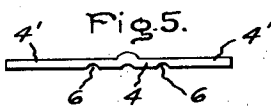
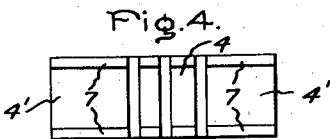
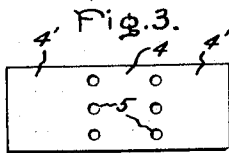
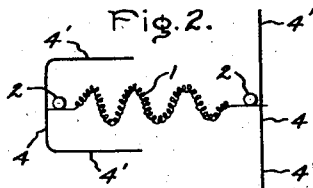
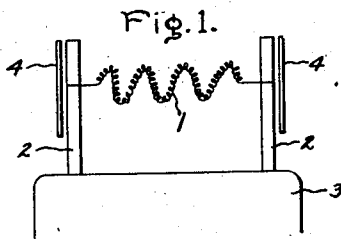
Sept. 17, 1940.

W. J. SCOTT

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ELECTRODE FOR ELECTRIC DISCHARGE DEVICES

Filed Oct. 19, 1939



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UNITED STATES PATENT OFFICE

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ELECTRODE FOR ELECTRIC DISCHARGE DEVICES

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General Electric Company, a corporation of New
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Application October 19, 1939, Serial No. 300,256
In Great Britain October 4, 1938

3 Claims. (CL 176—126)

My invention relates to electrodes for electric discharge devices and to a method of manufacturing the same. More particularly, my invention relates to an electrode for a low pressure electric discharge lamp of the type in which an alternating current positive column discharge passes between two electrodes which are in part coated with electron emissive material such as barium oxide.

In discharge lamps it is well known that the electrode should be so designed for both low and high pressure lamps so that anode and cathode functions are performed on alternate half cycles each by a suitably designed part of the electrode. Such an electrode is described in British patent specification No. 434,276.

The present invention consists in a new and improved construction for such electrodes in which a thermionically emitting filamentary cathode is partly enclosed by metal shields which perform the anode function. These metal shields or plates may be secured to the electrode leads by welding after the filament has been mounted and coated. In practice, however, this method is apt to lead to contamination and distortion of the coated filament. Another alternative is to weld the completed shields onto the electrode leads and then coat the filament. Unfortunately, some desirable types of shields make this operation impracticable because they render the filament inaccessible.

One object of my invention is to provide an improved thermionic electrode construction for an electric discharge device.

Another object of my invention is to provide a metal shield construction for thermionic electrodes which may be secured to the electrode leading-in wires while in a partly formed condition and then readily bent into its final shape and form.

Still another object of my invention is to provide an improved method of manufacturing thermionic electrodes having metal shields whereby the coated filament thereof will not become contaminated or distorted during the manufacture of the electrode.

A feature of my invention is the provision of a metal shield which may be first secured in place on the electrode leading-in wires in a partly formed condition, prior to the application of the electron emissive coating to the filamentary electrode, and then bent into its final shape, following such coating application, with very little danger of damage to the filamentary electrode or to the coating thereon.

According to the invention, the filament and the partly formed shields are mounted on the leading-in wires in such a way as not to interfere with the coating of the filament, which coating operation may be accomplished by well known methods such as brush application or immersion in a fluid containing the coating material. After the filament is coated, the shields are bent preferably along a line of weakness into their final form and position. This line of weakness may be conveniently produced by slots or holes along the line of bending, or by increasing the strength of the other parts by forming the same with grooves or ribs, or by forming such other parts of greater cross section.

Further objects and advantages of my invention will appear from the following description of species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a front elevation of an electrode comprising my invention illustrating the metal shields secured in position prior to the bending of the same into their final shape; Fig. 2 is a plan view of the electrode shown in Fig. 1 but with the metal shield at the left side of the figure shown bent into its final shape; Fig. 3 is a plan view of one type of metal blank employed to form the shield comprising my invention; Figs. 4 and 5 are plan and side views, respectively, of a modified type of metal blank employed to form the shield comprising my invention; Fig. 6 is a front elevation of a further modification of my invention; Fig. 7 is a plan view of the metal blank employed to form the shield illustrated in Fig. 6; Fig. 8 is a front elevation of another modification of my invention; Fig. 9 is an end elevation of still another modification of my invention, the shield being shown prior to the bending of the same into its final shape; and Fig. 10 is a front elevation of the electrode shown in Fig. 9 but with the metal shield at the left side of the figure shown bent into its final shape.

Referring to Figs. 1 and 2, the electrode according to the invention comprises a coiled coil of tungsten wire which acts as a cathode during operation of the associated discharge device. The said coil 1 is mounted on leading-in wires 2, 2 secured in a glass support or stem 3, the said leading-in wires extending substantially parallel to one another and the filament or coil 1 extending between the leading-in wires so as to lie substantially in, or symmetrically about the plane defined by said leading-in wires. Secured to each leading-in wire 2, 2, preferably by welding, is

an electrode shield 4 comprising an elongated metal plate bent into a U-shape. The said shields act as anodes during one-half cycle of the current. The shields 4 are mounted on the leading-in wires 2, 2 at points opposite the ends of the filamentary coil 1, with the open ends of the U facing and with the plane of the leg portions 4' extending parallel to the plane of the leading-in wires, as shown at the left of Fig. 2.

According to the invention, the shields 4 are first secured to the leading-in wires in the form of a substantially rectangular plate, as shown in Fig. 1 and at the right of Fig. 2, with the length of the plate extending perpendicularly to the plane of the leading-in wires. In this position of the plates, the filament 1 is readily accessible so that it can be easily coated with a suitable electron emissive material. Following the filament coating application, the ends 4' of the plates are bent towards the filament so as to form the U-shaped shields shown at the left of Fig. 2. To enable easy bending of the plates into their final U-shape, they are suitably weakened in some manner along the line of bending. Thus, as shown in Fig. 3, the plates may be perforated by forming a row of small openings or holes 5 extending along the line of bending; or as shown in Figs. 4 and 5, the plates may be indented or formed with transversely extending grooves 6 at the points at which the plates are to be bent and provided with ribs 7 to stiffen the flat portions and prevent accidental bending of the same.

In the forms of the invention described above, each shield is of U-shape and has two legs 4', one on each side of the filament 1. However, if desired, each shield may be provided with only one leg, as shown in Figs. 6 and 7. In this modification, each shield 8 is made from a substantially L-shaped plate (Fig. 7) which is bent into the form shown at the right of Fig. 6 prior to the welding of the plate to the leading-in wire 2. To form the L-shaped plate into the shape shown at the right of Fig. 6, the short leg or tab portion 9 is bent along the line 10 at right angles to the main leg portion 11, while the end portion 12 of the main leg 11 is bent over a slight amount (about 45° or so) along the line 13, the tab 9 and end portion 12 being bent to the same side of the main portion 11. The so-formed shields are then welded to the leading-in wires 2 in positions similar to that shown at the right of Fig. 6, the end portion 12 being welded to the leading-in wire 2 at a point such that when the remainder of the shield is bent into its final position, the tab portion 9 will be located in correct relation to the filament 1. With the shields 8 in their preliminary assembled position, the filament 1 is readily accessible so that it can be easily coated with a layer of electron emissive material. After the application of the coating to the filament, the body portion 11 of each shield is bent around to its final position, as indicated at the left of Fig. 6. To facilitate the bending of the shields 8, they may be suitably weakened at the bending points, as described previously.

Instead of having the leg portions of the shields which act as the shield proper disposed in planes parallel to the plane of the leading-in wires 2, 2, they may be arranged at right angles to such plane, as indicated in Fig. 8. In this case rectangular plates 14, having one end 15 bent back to form an acute angle of 45° or thereabouts with the plate proper, are secured to the opposite lead-

ing-in wires 2 by welding the said bent end portions 15 thereto. The plates 14 are secured to the leading-in wires so as to lie in planes at right angles to the plane of the leading-in wires with their lengths in alignment with such wires (as shown at the right of Fig. 8). The filament 1, being readily accessible with the shields 14 in such preliminary assembled position, is then coated with electron emissive material, after which the shields are bent to their final shape as indicated at the left of Fig. 8. As there shown, the free end of each shield is bent at right angles to the body of the shield to thereby form the portions 16 extending over the top of the filament and serving as the shield proper. As before, the shields 14 may be suitably weakened along the line of bending in order to facilitate the bending of the same.

In the modification illustrated in Figs. 9 and 10, each shield 10 is made from a substantially T-shaped plate (Fig. 9) suitably weakened at the points 11, such as by forming transversely extending slots therein, so that each leg of the plate may be readily bent at such points. The T-shaped plates are secured to the leading-in wires 2, 2 in the position indicated in Fig. 9 and at the right of Fig. 10, i. e., in an inverted position at right angles to the plane of the leading-in wires and in substantial longitudinal alignment with such wires. In such position, they permit ready access to the filament 1 so that the latter may be coated with electron emissive material. Following such coating operation, the three legs of the T-shaped plate are bent towards the filament to a position substantially at right angles to the body portion of the plate, as shown at the left of Fig. 10. In this position, the three legs of the T-shaped plate enclose the adjacent end portion of the filament on three sides, i. e., the top and the two sides of the filament, and form the shield proper for the same.

The constructions described hereinabove are merely given as examples, and it will be understood that various modifications of the same may be made without departing from the spirit and scope of the invention.

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

1. A method of manufacturing a thermionic electrode which comprises securing a filamentary coil to a pair of leading-in wires, securing a partly formed metal shield to said leading-in wires so as to occupy a position removed from said filamentary coil, coating said filamentary coil with electron emissive material, and then subsequently bending said shield into its final shape.

2. A method of manufacturing a thermionic electrode which comprises securing a filamentary coil to a pair of leading-in wires, securing a pair of partly formed metal shields to said leading-in wire so as to occupy a position removed from said filamentary coil, said shields being formed with sections of reduced cross-section to facilitate bending of said shields to their final shape, coating said filamentary coil with electron emissive material, and then subsequently bending said shields to their final shape.

3. A method of manufacturing a thermionic electrode which comprises securing a filamentary coil to a pair of substantially parallel leading-in wires so as to bridge the same, securing a pair of rectangular plates to said leading-in wires at points opposite the ends of said filamentary coil and in substantially symmetrical relation thereto

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5 with the length of said plates arranged perpendicularly to the plane of said leading-in wires and the planes of said plates arranged substantially parallel to said leading-in wires, said plates being formed with transverse sections of reduced cross-section at points on opposite sides of their transverse center line, coating said filamentary

coil with electron emissive material, and then subsequently bending said plates towards said filamentary coil at said sections of reduced cross-section to thereby form U-shaped shields each partially enclosing the adjacent end of said filamentary coil. 5

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