June 5, 1956 F. J. HIERHOLZER, JR., ET AL 2,749,461

LAMP UNIT AND INNER MEMBER SUPPORT

Filed April 30, 1953

Fig. 10.

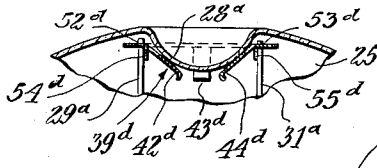


Fig. 2.

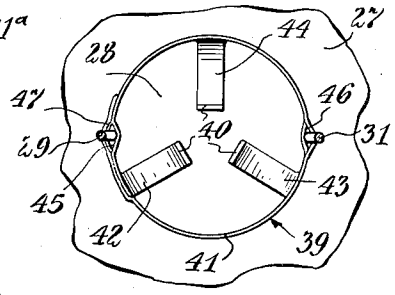


Fig. 1.

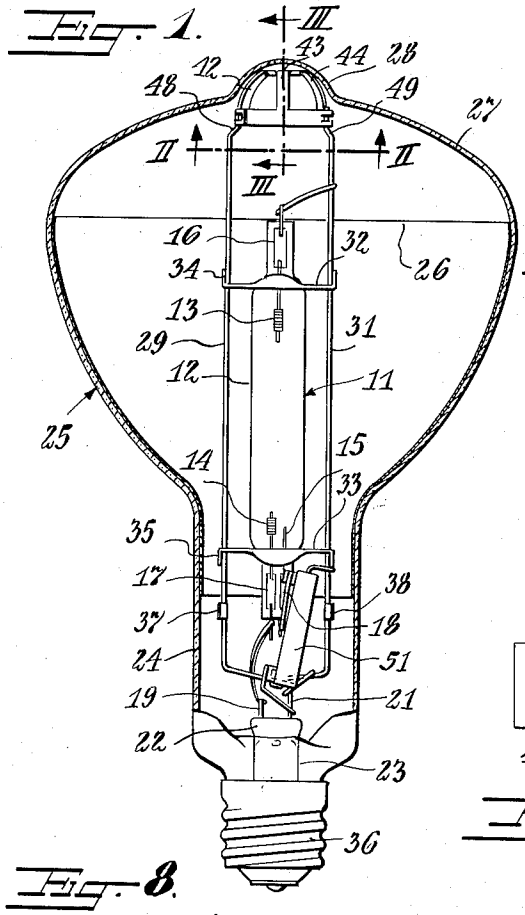


Fig. 3.

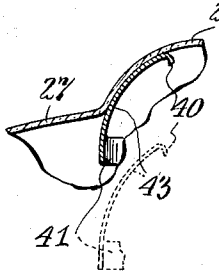


Fig. 4.

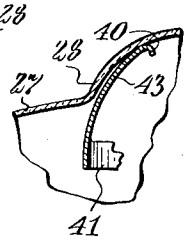


Fig. 5.

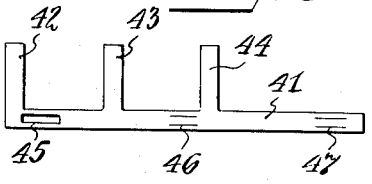


Fig. 6.

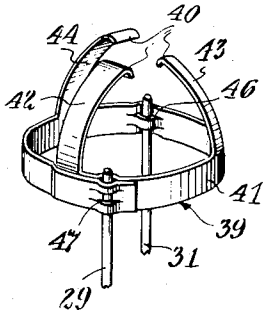


Fig. 8.

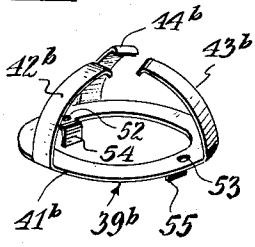
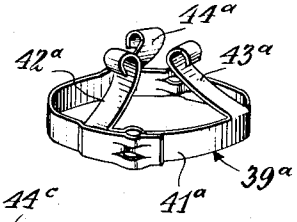


Fig. 7.



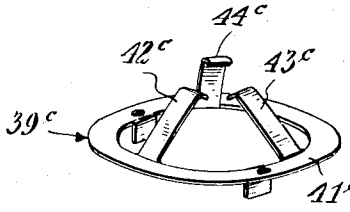


Fig. 9.

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LAMP UNIT AND INNER MEMBER SUPPORT

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3 Claims. (Cl. 313—25)

This invention relates to electric discharge devices and, more particularly, to such in which a high-pressure mercury-vapor lamp is resiliently supported inside of an outer envelope of the reflector type, whereby the radiations emitted thereby may be directed in a predetermined direction through the dome portion of said outer envelope.

The principal object of our invention, generally considered, is to provide a support for a mercury-vapor lamp in a reflector bulb and, in particular, means for resiliently supporting the outer or dome-end of the frame to which is attached the mercury-vapor lamp.

Another object of our invention is to provide a top support for a mercury vapor lamp in a reflector bulb, over which said bulb may be slipped during the mounting operation, and which slides easily into a pocket, or about a boss, in the dome of said bulb, even if the mount is not exactly centered.

A further object of our invention is to produce such a top support which tends to keep the mount centered after it is in the bulb, providing a flexible support allowing for expansion and contraction of the mount during operation, eliminating welds which might break, and being cheap to manufacture.

A still further object of our invention is to provide such a support which is connected to the frame wire above bends therein, so that it stays in place even if welds therein were to fail.

Other objects and advantages of the invention will become apparent as the description proceeds.

Referring to the drawing:

Fig. 1 is a side elevational view, with parts in axial section, of a lamp unit embodying our invention.

Fig. 2 is a transverse sectional view to an enlarged scale, on the line II—II of Fig. 1, and in the direction of the arrows.

Figs. 3 and 4 are transverse sectional views, on the line III—III of Fig. 1, in the direction of the arrows, but showing different positions during the process of placing a mount in a reflector or outer bulb.

Fig. 5 is an elevational view of the metal blank from which the resilient top support is formed.

Fig. 6 is a perspective view of such a support, attached to the ends of the lamp-supporting frame as shown in Fig. 1, but removed from the reflector bulb.

Fig. 7 is a view corresponding to Fig. 6, but showing another embodiment of the top support, removed from the wires of the frame which supports the discharge lamp.

Figs. 8 and 9 are views corresponding to Fig. 7, but showing other embodiments.

Fig. 10 is a view corresponding to the upper portion of Fig. 1, but showing a modification.

One of the problems in the development of the reflector mercury vapor lamp is the holding of the dome end of the supporting frame in place in the outer or reflector envelope. In former lamps of this character, the top support is such that the mount has to be inserted by hand. Even then, many mounts are bent during such an operation. The spring support, formerly used, also had no

tendency to center itself. If the mount is not visible to the operator, then one side of the spring support might hit the bulb wall, while the other side was still not engaged. This would bend the mount if enough pressure were put on the stem to force it upward.

Our purpose is to provide a top support, or one in the dome of the reflector envelope, which will enable the operator on the sealing machine to put the mount on the pin, and then slip the bulb over the mount. This means that the top support would slide into the top of the bulb, at a pocket or boss there provided, even if the mount is not exactly centered. It would tend to keep the mount centered after it is in the bulb, providing a flexible support to allow for expansion and contraction of the mount during operation, eliminate welds which might break, and yet provide a support which is cheap and readily manufactured.

Referring to the drawing in detail, like parts being designated by like reference characters, and first considering the embodiment of Figs. 1 to 6, incl., there is disclosed a lamp **11** of the high pressure mercury-vapor type, having an elongated tubular envelope **12**, main electrodes **13** and **14**, and an auxiliary electrode **15** adjacent the main electrode **14**. Leads **16**, **17** and **18**, respectively, pass through presses in the respective ends of the envelope **12** and connect with the leads **19** and **21** which pass through the press **22** of the flare tube **23**, which seals the neck **24** of the outer or reflector envelope **25**. The bulbular portion of the envelope **25** flares from the neck **24** and is silvered, or covered with a specular of reflecting portion from said neck to the line **26**. Said bulbular portion terminates in a dome or light transmitting portion **27** which is desirably frosted and provided with an inwardly-opening relatively small pocket of depression **28** appearing as an exterior boss.

The lamp **11** is supported in the reflector envelope **25** by means of a frame formed of wires **29** and **31**, between which extend plates **32** and **33**, the intermediate portions of which are apertured and pocketed to respectively receive the presses and rounded outer ends of the envelope **12**. The ends of these members **32** and **33** are bent at right angles, as indicated at **34** and **35**, and secured to the wires **29** and **31**, as by welding or brazing.

The ends of the wires **29** and **31** in the neck portion **24**, that is, toward the base **36** to which said neck is secured, are connected to the lead-in conductor **21**. The wires **29** and **31** are centered in said neck portion by spring elements **37** and **38**, intermediate portions of which are connected to the wires **29** and **31**, respectively, and end portions of which extend outwardly to engage the inner surface of the neck.

These elements **37** and **38** may be formed of spring material, such as nickel-cobalt-aluminum-titanium alloy, containing as maximum impurities, carbon .3%, manganese .5%, iron .6%, sulfur .01%, silicon 1%, and copper .25%. The aluminum content may range from 4 to 4.7% and the titanium content from ¼ to 1%, with the balance nickel and cobalt alloyed in any proportion. Such material may be obtained from companies such as Alloy Metal Wire Co., Prospect Park, Pa., or Driver-Harris Co., Harrison, N. J. It will also be understood that other springy, non-rusting, substantially gas free materials, examples being stainless steel and Monel metal, may be substituted if desired. Such material is sufficiently springy when of a preferred thickness of about .01" and with a width of about ¼", so that it serves very well for centering and supporting the neck end of the frame.

The support and centering means for the dome or outer end of the frame desirably comprises an annular device **39**, as shown in Figs. 1 to 6, incl., which may be formed of material like or similar to that of the spring members

37 and 38. In a preferred embodiment, it may be cut from a rectangular sheet and comprises a relatively long band portion 41, from which project from one edge and in the same direction extensions or fingers 42, 43 and 44. The portion 41 is bent into circular form, illustrated most clearly in Fig. 2, the fingers 42, 43 and 44 curved to define a generally hemispherical volume, and then secured to the outer or dome ends of the wires 29 and 31 by passing said wires through apertures formed by slits 46 and 47 formed therein, as illustrated particularly in Figs. 1, 2 and 6. The band is held in circular configuration by the wire 29 passing through the portion bent out between the slits 47, while passed through the slot 45, and the wire 31 passing through the portion bent out between the slits 46. Both wires are bent in, as indicated at 48 and 49, so that this centering means will not tend to slip down thereover beyond the bent portions. That is, they maintain the position indicated in Fig. 1 because of the configuration of the wires, even if welds or other connections formed between the portion 41 and the wires should fail. The fingers desirably have their ends curved inwardly, as indicated at 40.

Current is carried to the lamp 11, from the contacts of the base 36, through leads 19 and 17 to electrode 14, through the discharge to electrode 13, through lead 16, and frame wire 31 to the lead 21. The auxiliary electrode 15 is connected to the frame wire 31 through lead 18 and resistor 51. Therefore, the current in starting first flows through lead 19, electrode 14, electrode 15, and out through resistor 51 to lead 21, initiating a glow which is then transferred as a discharge between electrodes 13 and 14.

In assembling the lamp unit as shown in Fig. 1, the mount comprising the flare tube 23, the frame wires 29 and 31 supported therefrom, including the resilient neck supports 37 and 38 and the top support 39, is inserted in the reflector bulb 25, as by applying the bulb thereover. The sequence of movement is represented in Figs. 3 and 4. In other words, the resilient fingers 42, 43 and 44 approaching the pocket 28, is represented in dotted lines in Fig. 3. A subsequent position is represented in Fig. 4, where the bulb 25 engages the outer curved ends 40 of the fingers 42, 43 and 44, whereas the final position is represented in full lines in Fig. 3 where the fingers are bent to conform with the curvature with the pocket 25, thereby effecting a centering of the frame and supported lamp 11. The flare tube 23 is then sealed to the neck 24 of the bulb and the base 36 applied in accordance with conventional practice.

Fig. 7 shows a resilient support 39^a which is generally like the device 39 except that the resilient fingers 42^a, 43^a and 44^a, start from the band portion 41^a at an angle to the plane of the material thereof, rather than in said plane and instead of having their ends curved slightly inward, said ends are curved outward on radii larger than that of the curvature of the ends of the fingers of the first embodiment. The purpose of this modification is to allow for a "pull-down" during the sealing of the flare tube 23 to the neck 24 of the bulb, during which "pull-down" there is a slight withdrawal of the frame from the pocket of the reflector bulb. The modified structure of the fingers allows for a correspondingly greater resiliency, so that even after "pull-down" there is still a centering engagement in said pocket 28. However, this form is only preferred where a "pull-down" is used and such would not normally be employed in using a construction such as illustrated in Figs. 1 to 6, incl.

Fig. 8 shows a resilient support 39^b which functions like the support 39 of Fig. 6, except that it may be cut from a generally circular sheet, that is, provided with an integral annular portion 41^b, (rather than an initially straight portion bent to annular form) and outstanding or external fingers 42^b, 43^b, and 44^b which are finally bent upwardly and inwardly, to position at an angle to the plane of the ring, like the fingers 42^a, 43^a and 44^a of Fig. 7. It thus functions like the device 39, except that it is connected to the wires 29 and 31 by having them pass through apertures 52 and 53 adjacent tabs 54 and 55 which serve as portions to be welded, brazed or otherwise secured to the wires 29 and 31.

Fig. 9 shows a resilient support 39^c which is formed exactly like the support 39^b except that the fingers 42^c, 43^c and 44^c are formed internally, that is, bent from the inner periphery of the annular portion 41^c, rather than from the outer periphery of the annular potion. This means these finges are necessarily somewhat shorter than those which may be formed in accordance with the preceding embodiment and, therefore, they are straighter so that their inwardly curved ends may still engage the inner surface of the inwardly-opening pocket 28 of the lamp 25 for centering purposes.

Fig. 10 illustrates a construction, which may be considered the converse of that illustrated in Fig. 1, where the outer or reflector envelope 25^a, instead of being provided with an inwardly opening pocket or depression, is provided with an outwardly opening pocket or depression forming an inwardly projecting boss 28^a. The high pressure mercury vapor lamp, or other translation device (not shown) may be supported between wires 29^a and 31^a in a manner similar to the support of the device 11 between wires 29 and 31, as illustrated in Fig. 1.

The centering support 39^d may be like 39^c of Fig. 9, except that the fingers 42^d, 43^d and 44^d, instead of projecting outwardly or toward the dome end of the outer bulb 25^a, project inwardly toward the translation device and the other end of the outer bulb, forming a resilient cage in which the boss 28^a fits, as illustrated. As in Fig. 9, apertures 52^d and 53^d may be provided for the reception of the outer ends of the wires 29^a and 31^a, adjacent tabs 54^d and 55^d serving as portions to be welded, brazed or otherwise secured to said wires.

Although, in the present embodiment, we have shown a centering support with four fingers, one of which is not illustrated because of the view being a section through two of the fingers from which connecting tabs 54^d and 55^d are struck, yet it will be understood that such connecting tabs may be formed as in the embodiments of Figures 8 and 9, that is, offset from the fingers so as not to have to cut therefrom. Also, the number of said fingers may be three, as in the preceding embodiments, rather than four, as shown in the present embodiment. It will also be understood that the essence of the invention is not the number of fingers, as any embodiment may have three or more fingers, as is convenient or desired.

Although preferred embodiments of our invention have been described, it will be understood that modification may be made within the scope of the invention. It will also be understood that although we have shown such resilient supporting means for a high-pressure mercury-vapor discharge lamp, it will be understood that the same supporting means may be employed for holding other electrical translation devices in place in an outer bulb, whether said bulb is provided with a reflecting surface or not. It will also be understood that as an alternative, the device 39^d of Fig. 10 may be like that of one of Figs. 6, 7 and 8, with the fingers appropriately bent the other way to provide for the desired nesting relationship with the boss 28^a.

We claim:

1. A lamp unit comprising, in combination, an electric discharge device, an envelope enclosing said device and comprising dome and neck portions, an inwardly opening central pocket in said dome portion, a flare tube closing said neck portion, a frame holding said device in said envelope, the neck end of said frame being connected to said flare tube, transversely extending spring elements centering said frame in said neck portion, means comprising an annular portion connected to the dome end of said frame, and a plurality of fingers extending from said annular portion, into and engaging the inner surface of said pocket, for centering purposes, and said fingers being

placed under compression upon insertion of said discharge device in said outer envelope so as to enable longitudinal movement of said discharge device during operation due to expansion and contraction of said frame without deviation of said discharge device from its longitudinal axis in said outer envelope.

2. A lamp unit comprising, in combination, an electric discharge device having an elongated tubular envelope, the ends of said envelope being rounded, an outer envelope enclosing said device and comprising dome and neck portions, an inwardly opening central pocket in said dome portion, that portion of said outer envelope portion adjacent said neck portion being coated with reflecting material for directing light from said discharge device axially thereof, a flare tube closing said neck portion, a frame holding said discharge device in said outer envelope, said frame comprising spaced parallel wires, cross members extending between and connecting said wires, said cross members having pockets receiving the rounded ends of said discharge device envelope, said wires being supported from said flare tube at one end and from the dome of said outer bulb at the other end, said dome supporting means comprising an annular portion, means connecting the dome ends of said wires to said annular portion, said wires adjacent their points of connection being offset inwardly to provide shoulders on which rest said annular portion, and fingers extending from said annular portion into said pocket and resiliently engaging the inner surface of the same for centering purposes, and said fingers being placed under compression upon insertion of said discharge device in said outer envelope so as to enable longitudinal movement of said discharge device during operation due to expansion and contraction of said frame without deviation of said discharge device from its longitudinal axis in said outer envelope.

3. A lamp unit comprising, in combination, an electric discharge device having an elongated tubular envelope, the ends of said envelope being rounded, an outer envelope enclosing said device and comprising dome and neck portions, an inwardly opening central pocket in said

dome portion, that portion of said outer envelope portion adjacent said neck portion being coated with reflecting material for directing light from said discharge device axially thereof, a flare tube closing said neck portion, a frame holding said discharge device in said outer envelope, said frame comprising spaced parallel wires, cross members extending between and connecting said wires, said cross members having pockets receiving the rounded ends of said discharge device envelope, said wires being supported from said flare tube at one end and from the dome of said outer bulb at the other end, spring elements intermediate portions of which are secured to parts of said wires in said neck portion, the ends of said spring elements engaging the inner surface of said neck for centering purposes, said dome supporting means comprising an annular portion, means connecting the dome ends of said wires to said annular portion, said wires adjacent their points of connection being offset inwardly to provide shoulders on which rest said annular portion, and fingers extending from said annular portion into said pocket and resiliently engaging the inner surface of the same for centering purposes, and said fingers being placed under compression upon insertion of said discharge device in said outer envelope so as to enable longitudinal movement of said discharge device during operation due to expansion and contraction of said frame without deviation of said discharge device from its longitudinal axis in said outer envelope.

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