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INCANDESCENT LAMP MOUNT AND
MANUFACTURE THEREOF

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My invention relates in general to electric incandescent lamps and to a method of manufacture thereof, and more particularly to a mount construction for such a lamp and to its manufacture.

Electric incandescent lamps of the high-wattage concentrated filament type are in common use at present as the light source for projectors, spotlights, and various other apparatus. Such lamps customarily comprise a sealed envelope or bulb into the neck end of which is sealed a mount structure comprising a supporting framework within which the lamp filament is supported, the supporting framework consisting of a pair of rigid lead-in conductors or side rods to which the filament is connected at its ends, and a pair of insulative support bridges fastened to the side conductors in positions respectively above and below the filament and carrying support hooks which engage and additionally support the filament at intermediate points thereof.

As customarily constructed, the upper and lower support bridges for the filament of such lamps are fastened to the side conductors at points thereon spaced relatively far apart and respectively above and below the filament. To minimize stretching and resultant distortion of the filament by the bridge supports caused by the expansion and contraction, during lamp operation, of those portions of the lead-in conductors intervening between the respective points of support of the bridges thereon, it has been common practice to either employ lead-in conductors having intervening portions which are formed of a highly refractory metal such as molybdenum or tungsten, for instance, and which more or less match the total expansion and contraction of the filament under the operating conditions of the lamp, or to employ a lower bridge which is slidably mounted on the conductors. Because of the relatively high cost of such molybdenum or tungsten material and the difficulty of making welds between tungsten and/or molybdenum members, it has also been the further practice to employ multi-section lead-in conductors composed of a plurality of sections, i. e., a short intermediate section of molybdenum or tungsten and the remaining end sections of any suitable ordinary and relatively inexpensive material, which are butt-welded together (usually by manual operations) to form the complete conductor, and to then form or bend such multi-section lead-in conductors to shape by means of a manually fed shaping device. However, notwithstanding the use of such multi-section conductor construction

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to economize on the molybdenum or tungsten used therein, the added welding operations necessary to form such composite conductors together with the manually controlled conductor-shaping operations required, nevertheless makes such multi-section conductors comparatively expensive.

Also, in assembling the mounts of such projection type lamps the preferred practice, as set forth in my U. S. Patent No. 2,473,919, dated June 21, 1949, is to first hold the filament and the upper bridge in assembled relation with the side conductors of the mount in a special jig designed for such purpose and to then spot-weld the upper bridge and the filament unit in place on the conductors while thus jig-held in proper relation, after which the so-formed partially completed mount structure is next assembled in proper relation with the lower bridge in another jig designed for such purpose and the lower bridge then spot-welded in place on the conductors. Such a two-stage assembly operation obviously requires double handling and assembly of the mount parts as well as added welding head adjustments, all of which serve to add to the cost of fabricating the completed lamp mount.

It is an object of my invention, therefore, to provide a lamp mount structure of the above-described general type which is of simplified and less expensive construction and which is comparatively easy and cheaper to fabricate.

Another object of my invention is to provide an improved method of making a mount structure of the above-described general type.

In the lamp mount according to the invention, the lower bridge is fastened, by extended support members, to the side conductors at points closely adjacent the points of support or connection thereto of the upper bridge and the filament ends, and the side conductors are each made of one continuous length of wire of the same material throughout, which conductors may be formed to shape by automatically operating reshaping means. All the component parts of the mount, comprising the filament, the upper and lower bridges, and the two side lead-in conductors, are then assembled and fastened together in one single assembly operation.

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

In the drawing, Fig. 1 is an elevation partly in section of an electric incandescent lamp provided with a mount structure according to the inven-

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tion, and Fig. 2 is an enlarged fragmentary perspective view of the mount structure shown in Fig. 1.

Referring to the drawing, the electric incandescent lamp there illustrated, and to which the invention is particularly adapted, is of the high-wattage concentrated filament type comprising a sealed tubular glass envelope or bulb 1 into the neck end of which is sealed a mount 2 according to the invention. The mount 2 comprises a glass stem 3 which extends into the envelope 1 and is provided with a pressed seal portion 4 through which are sealed a pair of lead-in conductors 5, 5. The outer ends of the said conductors 5, 5 are connected to the shell contact 6 and end eyelet contact 7 of a conventional type lamp base 8 cemented or otherwise suitably secured to the stem end of the envelope 1. The reentrant stem 3 is further provided with an exhaust tube 9 which communicates with the interior of the envelope through an opening 10 in the stem and through which the envelope is exhausted and, if desired, filled with a suitable gas such as nitrogen, for instance. After such exhaustion and gas filling of the envelope, the exhaust tube 9 is sealed or tipped-off in the conventional manner to thereby hermetically seal the envelope.

The lead-in conductors 5, 5 are formed with relatively rigid seal portions 11, 11 which are sealed through the stem press 4 and are made of a material which more or less matches the expansion coefficient of the glass of the stem 3, for example, tungsten where a hard glass stem is used. The inner ends of the seal or press portions 11 of the conductors 5 are butt-welded, as indicated at 12, to the ends of inner lead portions 13, 13 which are also of relatively heavy and rigid character and which, in accordance with the invention, are each made of a single piece of any suitable ordinary metal, such as nickel or nickel-iron alloy for instance, which is relatively inexpensive. In the particular case illustrated, for example, the inner leads 13 are made of 50 mil diameter wire of a nickel-iron alloy containing approximately 52% nickel and 48% iron.

Inwardly of the stem press 4 the conductors 5, 5 extend into the tubular envelope 1 in spaced side-by-side relation longitudinally of the envelope and substantially in an axial plane thereof. Adjacent their lower or outermost ends, the inner lead portions 13, 13 are bent or offset outward away from each other as indicated at 14, and at their upper or innermost ends they are bent inwardly toward each other to form inturned opposed inner end portions 15, 15. The use of lead-in conductors 5, 5 as described above, having inner lead portions 13 which are formed in one piece of ordinary and relatively inexpensive material therefore materially lowers the cost of the lead-in conductors as compared to the multi-section lead-in conductors heretofore in use having molybdenum insert sections in their inner lead portions. In addition, such one-piece inner lead conductors lend themselves to fully automatic forming and bending thereof to shape, which also reduces the cost of the completed conductor.

Mounted on the lead-in conductors 5, 5 in a position lying therebetween is a filament 16 of the multi-segment type comprising a tungsten wire coiled into a number of upright sections or segments 17 which are interconnected by intermediate uncoiled U portions or bights 18, 19.

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The filament segments 17 may be disposed in any desired relation with respect to each other. For example, they may be disposed all in substantially one plane to form a so-called monoplane filament or, as shown, they may be staggered so as to lie alternately in substantially two parallel planes to form a biplane filament. As shown, the filament 16 is mounted on the conductors 5, 5 with its plane lying substantially in the plane of the said conductors.

The filament 16 is supported in place on a framework comprising the inner lead portions 13, 13 of the conductors 5, 5 and upper and lower insulative support members or bridges 20 and 21, respectively, carried by the said conductor portions 13, 13 and fastened thereacross. The ends of the filament 16 are supported and electrically connected to the inner lead portions 13, 13 by connector wires or spuds 22, 22, of molybdenum or other suitable material, which are spot-welded at one end to the inturned inner ends 15, 15 of the inner leads 13, 13 and are connected at their other ends to the filament ends by a joint or connection of the type disclosed in U. S. Patent 2,449,679 to I. H. Van Horn, the spud wire 22 being provided with a helical screw thread and being screwed into and completely through a short helically coiled filament end leg 23 which is connected to the adjacent coiled outer segment 17 of the filament by an uncoiled section or bight 24. The filament 16 is additionally supported at the bights 18, 19 thereof by the upper and lower support members or bridges 20 and 21. The upper bridge 20 comprises an insulative cross bar 25 such as a short length of glass rod or other vitreous material carrying a plurality of wire hooks 26 of suitable material, such as tungsten or molybdenum, the hook ends of which engage the upper bights 18 of the filament and the other ends of which are fused into the sides of the cross bar 25. The upper cross bar 25 is supported by wires 27 fused into its lower side near its ends and welded to the inbent inner ends 15, 15 of the inner leads 13, 13 inwardly adjacent the welded connections of the spud wires 22, 22 thereto. The lower bridge 21 likewise comprises an insulative cross bar 28 similar to the upper cross bar 25 and carrying a plurality of similar wire hooks 29, the hook ends of which engage the lower bights 19 of the filament and the other ends of which are fused into the sides of the cross bar 28.

In accordance with the invention the lower cross bar 28, instead of being supported in place by support wires fastened to the offset side portions 30, 30 of the inner leads 13, 13 in the manner heretofore customary in the art, is supported in place by extended support members or wires 31, 31 which are of a suitable highly refractory metal such as molybdenum, and have a total expansion approximating that of the tungsten filament 16. The supports 31 are preferably in the form of molybdenum wire of a suitable diameter (25 mil diameter in the particular lamp shown) and are fused into the upper side of the lower cross bar 28 adjacent the ends thereof and extend more or less straight upward therefrom, alongside and between the filament 16 and the offset side portions 30, 30 of the inner leads 13, 13, and are welded at their upper ends to the inbent inner ends 15, 15 of the inner leads at points outwardly adjacent to the welded connections of the spud wires 22, 22 thereto. The supporting of the lower bridge 21 in the manner described above, by the use of support wires 31, 31 rigidly fastened to the upper or inner ends

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of the inner leads 13, 13 at points closely adjacent the points of support thereon of the filament connection spuds 22, 22 and the upper bridge 20, and having a total expansion substantially the same as the filament 16, insures against excessive stretching of the coiled filament segments 17 during the operation thereof such as would cause ultimate distortion and early failure of the filament.

The mount 2 is preferably jig-assembled in a manner similar to that disclosed in my U. S. Patent No. 2,473,919, all the component parts of the mount, i. e., the filament unit consisting of the filament 16 and spuds 22, 22, the stem 3 and conductors 5, and both the upper and lower bridges 20 and 21, being held in proper assembled relation with each other in a single jig similar to that shown in Figs. 18-20 of the above-mentioned Patent No. 2,473,919 while they are welded together into a unitary structure. The fact that the points of attachment or welded connections of the lower bridge 21 to the lead-in conductors 5 are located on the inbent inner ends 15 of the conductors at points closely adjacent the points of attachment or welded connections thereto of the other parts of the mount (i. e., the upper bridge 20 and the filament connection spuds 22) enables the assembly of all the component parts of the mount in one assembly operation on welding apparatus similar to that shown in Fig. 17 of my aforesaid U. S. Patent No. 2,473,919 since all the welded connections required to fasten the mount parts together are thus brought within easy reach or range of movement of the welding head of such apparatus. It will be obvious therefore that such a single assembly operation greatly simplifies and further reduces the cost of fabrication of the mount 2.

Although a preferred embodiment of my invention has been disclosed, it will be understood that the invention is not to be limited to the specific construction and arrangement of parts shown, but that modifications may be made therein without departing from the spirit and scope of the invention, as defined by the appended claims. Thus, if desired, additional side supports 32, as shown in dash-dot lines in Fig. 2, may be provided for the lower bridge 21 to prevent or limit swinging movement thereof laterally of the plane of its main supports 31. These additional supports 32 may be in the form of wire hooks, of nickel or other suitable material, spot welded to the inner leads 30 and having hooked ends 33 hooked around the main bridge support wires 31 at points adjacent their lower ends, i. e., near the cross bar 28, where the magnitude of the swing movement of the lower bridge normally would be greatest.

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

1. An electric lamp comprising a sealed envelope, a pair of rigid lead-in conductors sealed into said envelope and extending thereinto in spaced side-by-side relation, a filament mounted in said envelope between and connected at its ends to said conductors, and a pair of insulative support members located respectively above and below said filament and supporting it intermediate the ends thereof, said support members being fastened across said conductors with their points of attachment to respective conductors located closely adjacent each other.

2. An electric lamp comprising a sealed envelope, a pair of rigid lead-in conductors sealed into said envelope and extending thereinto in spaced

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side-by-side relation, a filament mounted in said envelope between and connected at its ends to said conductors, and a pair of insulative support members comprising upper and lower bridges located respectively above and below said filament and supporting it intermediate the ends thereof, the upper bridge being fastened across and attached to said conductors at points thereon superjacent to said filament and the lower bridge being fastened across said conductors and supported therefrom by extended refractory metal supports attached to said conductors at points closely adjacent the said points of attachment thereto of the upper bridge.

3. An electric lamp as set forth in claim 2 and having a pair of anchor members fixedly secured at one end to respective ones of said conductors and having their other ends embracing respective ones of said refractory metal supports adjacent their lower ends with a close sliding fit to permit longitudinal expansion but prevent swing movement of the said refractory metal supports in a direction normal to the plane of said conductors.

4. An electric lamp comprising a sealed envelope, a pair of rigid lead-in conductors sealed into said envelope and extending thereinto in spaced side-by-side relation, a filament mounted in said envelope between and connected at its ends to said conductors by support spuds attached to the conductors at points superjacent to the filament, and a pair of insulative support members comprising upper and lower bridges located respectively above and below said filament and supporting it intermediate the ends thereof, the upper bridge being fastened across and attached to said conductors at points closely adjacent the said points of attachment thereto of said spuds, and the lower bridge being fastened across said conductors and supported therefrom by extended highly refractory metal supports attached to said conductors at points likewise closely adjacent the said points of attachment thereto of said spuds.

5. An electric lamp comprising a sealed envelope, a pair of rigid lead-in conductors having press lead portions sealed through the wall of said envelope and one-piece inner lead portions extending into said envelope in spaced side-by-side relation, a filament mounted in said envelope between and connected at its ends to said conductors by support spuds welded to the conductors at points superjacent to the filament, an upper support bridge located above and supporting said filament intermediate its ends and welded to said conductors at points closely adjacent the welded connections thereto of said spuds, and a lower support bridge located below and also supporting said filament intermediate its ends, said lower bridge being fastened across and supported from said conductors by extended highly refractory metal supports extending upwardly from the lower bridge alongside the filament and welded to said conductors at points likewise closely adjacent the welded connections thereto of said spuds.

6. An electric lamp comprising a sealed envelope, a pair of rigid lead-in conductors having press lead portions sealed through the wall of said envelope and one-piece inner lead portions extending into said envelope in spaced side-by-side relation and terminating in turned inner end portions, a filament mounted in said envelope between the inner lead portions of said conductors and connected at its ends to the

said inturned inner end portions of said conductors, and a pair of insulative support members comprising upper and lower bridges located respectively above and below said filament and supporting it intermediate the ends thereof, the upper bridge being fastened across and attached to the said inturned inner end portions of said conductors, and the lower bridge being fastened across said conductors and supported therefrom by extended highly refractory metal supports attached to the said inturned inner end portions of said conductors.

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References Cited in the file of this patent

UNITED STATES PATENTS

	Number	Name	Date
5	1,726,480	Fehse -----	Aug. 27, 1929
	1,967,852	Wright -----	July 24, 1934
	2,434,478	Allen -----	Jan. 13, 1948
	2,449,679	Van Horn -----	Sept. 21, 1948
10	2,473,919	Stone -----	June 21, 1949