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J. J. HIGGINS

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METHOD OF MOUNTING COILED FILAMENTS

Filed May 12, 1924

FIG. 1.

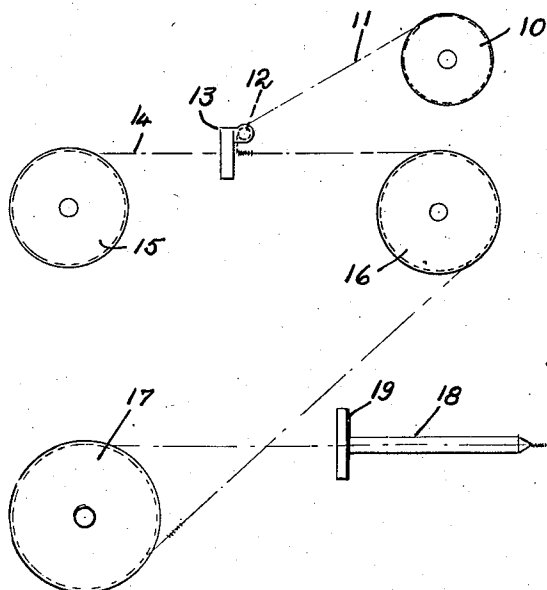


FIG. 2.

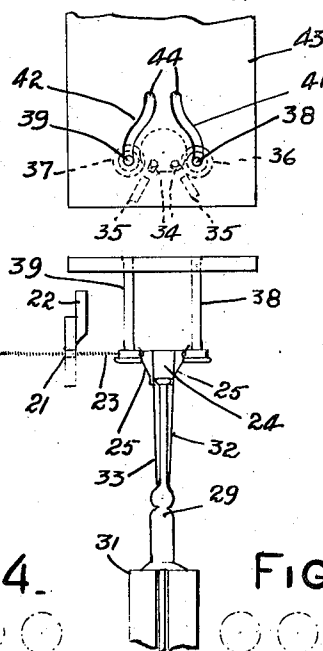


FIG. 3.

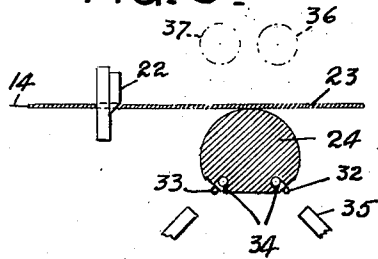


FIG. 4.

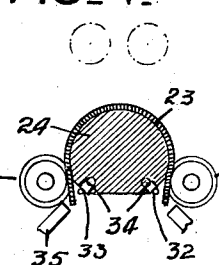


FIG. 5.

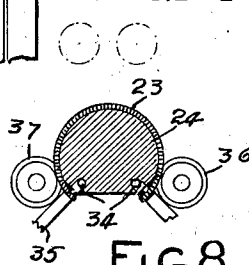


FIG. 6.

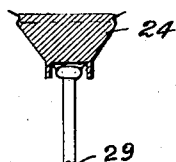


FIG. 7.

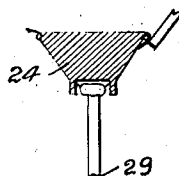
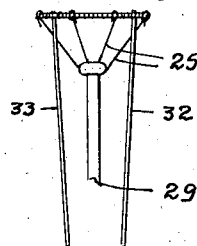


FIG. 8.



INVENTOR
JOHN J. HIGGINS

BY

J. J. Higgins
ATTORNEY

UNITED STATES PATENT OFFICE

JOHN JOSEPH HIGGINS, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO WESTINGHOUSE LAMP COMPANY, A CORPORATION OF PENNSYLVANIA

METHOD OF MOUNTING COILED FILAMENTS

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This invention relates to the art of manufacturing incandescent electric lamps and more particularly to the method of mounting lamp filaments.

5 An object of the invention is to expedite the mounting of lamp filaments during the manufacture of incandescent electric lamps.

10 A further object is to facilitate the handling and application of a filament to the supporting structure of an incandescent electric lamp.

15 A still further object of the invention is to avoid certain laborious and time consuming steps heretofore prevalent when performing mounting operations.

Other objects of the invention will be more readily apparent as the description proceeds.

20 One of the important and difficult operations included in the manufacture of incandescent electric lamps, is the application of the filament or light source medium to the lamp-stem, to constitute the internal structure of a lamp. The present invention has to do with the rapid automatic mounting of
25 such filaments and particularly with the mounting of coiled filaments; namely, filament wire wound in the form of a helix, which filament is employed in lamps of the concentrated light source type. In this type, the
30 main portion of the filament is supported by a number of loops at the ends of support wires secured in a glass portion of the stem.

35 The ends of the filament are usually welded to the ends of suitably positioned leading-in wires. It has been the practice, when mounting a filament of this character, to provide the coiled filament, in sections of the proper length whereupon the operator first secures by welding, one end of the coil to a lead-in wire. The
40 operator then threads the filament into loops previously formed at the exposed ends of the support wires and then holds the other end of the filament in contact with remaining lead-in wire and welds it thereto.

45 It will be appreciated that the foregoing operation is not only tedious, but requires considerable dexterity on the part of the operator in order that the required amount of filaments be mounted in a given time. This
50 mounting operation must be performed by a

skilled operator to be maintained on a production basis in accordance with standards set by other machines or operators. The manual method of mounting, required that the operator pick up the extremely small flexible filaments with a pair of tweezers and this operation itself is indicative of the amount of labor and the degree of skill required to expeditiously perform this operation.

55 The present invention aims to provide a method by which the filament may be handled without the tedious operation which attends the selection of a portion of filament by means of an instrument such as the tweezers when filaments were mounted from short sections. Heretofore, the mechanical difficulties encountered in automatically operating machines to handle the small sections of delicate filament wire were so great that no satisfactory method had, to the applicant's knowledge, been attained.

60 The present method includes the conditioning of the filament for a mounting operation by providing the filament with a flexible core as for example by winding the filament on a thread or metallic strand of low fusing point. The filament wound on a mandrel of the above character, may then be readily handled and fed through a guide and to position with respect to a properly disposed lamp
75 stem. A section of the filament sufficient to constitute a light source, may then be severed and shaped to circular form and applied to loops at the ends of support wires of a lamp stem. The lead-in wires of the stem being so
80 arranged that they will be disposed in contact with electrodes of welding jaws after which companion jaws may travel to press the end of the filament against the lead and complete an electrical circuit, thus securing
85 the filament to the lead wire. The lamp stem may then be removed and by reason of the elasticity of the support wires and the union of the filament to the leads, the filament will be supported upon the stem.

90 It will be understood that by reason of the mandrel or core within the filament, the filament is readily mounted. The core, may remain within the filament after the same has been secured to the lamp stem. A removal
100

of the mandrel may, in the event that such mandrel is in the form of a thread, be effected by placing the filament in a hydrogen furnace or by flashing the filament in a suitable inert atmosphere. When a metallic mandrel of low fusing point is employed, the same may be removed by subjecting the filament to a sufficient high temperature which will cause the core to melt out, which temperature may not, however, be sufficiently high to affect the highly refractory material of the filament.

A method of practicing the present invention will be more clearly understood by reference to the accompanying drawing, in which, Fig. 1 is a diagrammatic arrangement of several elements for winding a filament on a mandrel and for mounting the filament upon a lamp stem;

Fig. 2 is a plan view of a portion of the device for mounting the filament;

Fig. 3 shows the relative positions of the filaments and the elements for shaping the filament prior to the application thereof to the supports of a lamp stem;

Fig. 4 shows elements for maintaining the filament adjacent the support wires;

Fig. 5 indicates welding jaws for securing the filament to the lead-in wires;

Fig. 6 is a sectional view of a block which serves to maintain the support wires in given positions;

Fig. 7 is a view of the block shown in Fig. 6 and shows other elements for holding a filament in contact therewith; and,

Fig. 8 is a fragmentary view of a lamp stem showing a filament carried on the support wires thereof.

When practicing the present invention, I may employ a spool 10 of any suitable filament wire 11. The filament 11 may be led over a roller 12 of any suitable winding head 13. The winding head may be similar to those well known in the art and adapted to wind the filament about a mandrel 14. The mandrel may comprise a thread or may be a flexible or malleable metallic material of a relatively low fusing point. The mandrel may be initially wound on a spool 15 and may pass through the winding head 13 and around a drum 16 and thence to an idler 17 and through a suitable tubular guide 18.

Suitable mechanism may be provided to reciprocate the guide 18 along the wire wound mandrel. Gripping jaws of any desirable construction may be associated with the guide 18, as, for example, in the position as indicated by the numeral 19. The jaws may operate to engage with the coiled wire and mandrel and thrust them in a rectilinear path a given distance with each movement of the guide away from the idler 17. A given portion of the mandrel having the filament wound thereon will thus be advanced with each of said movements of the guide. When the guide is operated to move a section of

the wound mandrel, the section passes through an eyelet 21 in a plate which in conjunction with a jaw 22, may constitute a cutter.

The section of the wire thrust through the eyelet, is indicated by the reference numeral 23 and will hereinafter be termed the filament, which when severed from the main length of wound mandrel, is ready for application to a lamp stem 29, suitably supported in a holder 31. When the stem is in position to receive a filament, support wires 25 of the stem will be in position with respect to a block 24 and lead-in wires 32 and 33 of the stem will be arranged with their ends adjacent to electrodes 34 in the block which cooperate with jaws 35, suitably positioned adjacent the block.

The jaws 35 may be arranged to move into contact and press the positioned filament ends against the lead-in wire at the same time closing a circuit to fuse the lead-in wire to the filament. The filament may be brought to position for the fusing operation by any suitable means such as rollers 36 and 37 which are indicated as secured to shafts 38 and 39 and movable therewith. The shafts are shown as extending through slots 41 and 42 in a plate 43 and may move to the ends 44 of the slots while the filament 23 is positioned adjacent to the block 24 as shown in Fig. 3, at which time the jaw 22 may operate to sever a section of the filament wound mandrel to provide the filament 23.

The rollers 36 and 37 may then be moved to carry the filament around the block 24 as shown in Fig. 4 to bring ends of the filament in position to be welded to the lead-in wires 32 and 33. The welding jaws 35 may then be moved to bring the filament in contact with the lead-in wires for the welding operation. The rollers 36 and 37 may be moved away from the filament and the stem removed carrying the filament which is resiliently retained by reason of the looped portions of the support wire and by the union of the leads to the filament.

After the filament or filament wound mandrel has been mounted, it is, of course, desirable to remove the mandrel. This may be accomplished in various ways. It has been found that a preferable method is to place the filament in a hydrogen furnace, thereby heating the mandrel sufficiently to burn or melt the same from within the coil, thus leaving the usual helical filament for the passage of electrical energy when embodied in a lamp. If desired, the mandrel may be removed by passing a current through the filament to heat the same to a suitable temperature.

When required, the ends of the support wires 25 may be bent around the filament by means of any suitable tool, such as the member 38 indicated in Fig. 7. Any suitable means

may, however, be used to bend the supports about the filament to more positively secure the same to the stem.

The present invention accomplishes an important step in the manufacture of incandescent electric lamps. It will be appreciated that by reason of the manner of mounting the filament, the rate of production is greatly increased. By reason of the mandrel within the filament, sufficient tensile strength is obtained to permit the feeding of the filament through the various operations necessary to automatic mounting without putting detrimental strain upon the coil or accidentally displacing a portion or turns of the coils through mechanical manipulation or abrasion.

Although an apparatus for practicing the invention is herein shown and described, it is to be understood that various modifications may be made therein and such modifications which come within the scope of the appended claims may be considered as within the spirit of the invention.

What is claimed is:

1. The method of mounting a lamp filament which comprises winding the filament on a mandrel, securing the filament to a lamp stem and removing the mandrel.

2. The method of mounting a lamp filament which comprises winding the filament on a flexible mandrel, attaching the filament to a lamp stem and removing the mandrel.

3. The method of mounting a lamp filament which comprises winding the filament on a mandrel of relatively low fusing point, securing the filament to a lamp stem and removing the mandrel.

4. The method of mounting a lamp filament which comprises winding a filament on a mandrel of low fusing point, securing the filament to a lamp stem and heating the filament to remove the mandrel therefrom.

5. The method of mounting a lamp filament which comprises winding a filament on a core of low fusing point, securing the filament to a lamp stem and heating the filament in an inert atmosphere to melt the core therefrom.

6. The method of mounting a lamp filament which comprises winding a filament on a mandrel of low fusing point, securing the filament to a lamp stem and disposing the filament in a furnace to melt the mandrel therefrom.

7. The method of mounting a lamp filament wound on a mandrel of low fusing point, which comprises securing the filament to a lamp stem and heating the filament to melt out the mandrel.

8. The method of mounting a lamp filament wound on a flexible fusible mandrel comprising attaching the filament to a lamp stem and heating said filament in an inert

environment to a temperature sufficient to melt said mandrel from the filament.

9. The method of mounting a lamp filament which comprises supporting a lamp stem having leading-in wires and support wires projecting therefrom, feeding a section of filament wire in the direction of its longitudinal axis to position adjacent to the ends of said support wires, bending the ends of the support wires around the filament and in securing the ends of said section of filament to said leading-in wires.

10. The method of mounting a lamp filament wound on a flexible mandrel which comprises supporting a lamp stem having loops in the support-wires thereof, positioning a section of the filament wound mandrel in said loops and securing the ends of said filament while on said mandrel to lead-in wires of said stem, and removing said mandrel from the filament.

11. The method of mounting a lamp filament which comprises supporting a stem having leading-in wires and support wires incorporated therewith, moving a filament of indefinite length in the direction of its longitudinal axis through a given path, to position a section of the filament in close proximity to said stem, severing a section of the filament, moving and shaping the severed section to position adjacent to the ends of said support wires, bending the said ends about the filament and securing the ends of the section of filament to the leading-in wires of the stem.

12. The method of mounting a lamp filament wound on a flexible mandrel of relatively low fusing point which comprises moving a length of filament wound mandrel through a given path, to position a section thereof in close proximity to a lamp stem having loops in the support wires thereof, severing a section from the filament wound mandrel, shaping and moving said section to occupy said loops, securing the ends of the severed filament to the ends of lead-in wires of said stem, and heating said mandrel to remove the same from the filament.

13. A step in the method of mounting a lamp filament which comprises supporting a stem having leading-in wires and support wires incorporated therewith, moving a filament of indefinite length in the direction of its longitudinal axis to a position in proximity to the supports of said stem, severing a section from said filament and moving and shaping said section to dispose the same in contact with said support wires and bending the ends of said support wires about the filament.

14. The method of mounting a lamp filament which comprises winding a filament wire on a mandrel, moving a length of filament wound mandrel through a given path, to position a section thereof in close proximity

imity to a lamp stem having bent portions in the support wires thereof, severing a section from the filament wound mandrel, shaping and moving said section to occupy said bent portions, bending the ends of the support wires about the filament, and securing the ends of the severed filament to the ends of lead-in wires of said stem.

15. The method of mounting a lamp filament which comprises winding a filament wire on a mandrel of a relatively low fusing point, moving a length of filament wound mandrel through a given path, to position a section thereof in close proximity to a lamp stem having loops in the support wires thereof, severing a section from the filament wound mandrel, shaping and moving said section to occupy said loops, securing the ends of the filament portion of said section to the ends of lead-in wires of said stem and heating said mandrel to remove the same from the filament.

16. The method of mounting a lamp filament which comprises winding a filament wire on a mandrel of relatively low fusing point, moving a length of filament wound mandrel through a given path, to position a section thereof in close proximity to a lamp stem having loops in the support wires thereof, severing a section from the filament wound mandrel, shaping and moving said section to occupy said loops, securing the ends of the filament portion of said section to the ends of lead-in wires of said stem and removing the mandrel from the filament.

17. The method of mounting a lamp filament which comprises winding a filament wire on a mandrel of relatively low fusing point, moving a length of filament wound mandrel through a given path, to position a section thereof in close proximity to a lamp stem having loops in the support wires thereof, severing a section from the filament wound mandrel, shaping and moving said section to occupy said loops, securing the ends of the severed filament to the ends of lead-in wires of said stem and bending the ends of said supports about the filament and removing the mandrel from the filament.

18. A step in the method of manufacturing an incandescent electric lamp which comprises supporting a lamp stem having leading-in wires and support wires incorporated therewith, winding a filament wire to produce a helix, moving the helically wound wire a given distance so as to position a section thereof of a predetermined length adjacent to the ends of said support wires, severing said section, bending the ends of the support wires around the section and securing the ends of said section to said leading-in wires.

19. A step in the method of manufacturing an incandescent electric lamp which comprises supporting a lamp stem having leading-in wires and support wires with their

ends bent to receive a filament, winding a continuous length of filament wire to produce a coiled filament, moving the coiled filament a predetermined distance to position a section thereof adjacent to the bent ends of said supports, severing a given length of said filament section and securing the ends of said section to said leading-in wires.

20. A step in the method of manufacturing an incandescent electric lamp which comprises supporting a lamp stem having leading-in wires and support wires with their ends bent to receive a filament, winding a filament wire to produce a coiled filament, feeding the coiled filament to position a given length of filament thereof adjacent to the bent ends of said supports, severing said length, securing the ends of said length to said leading-in wires and securing the leading-in wires to the ends of said length of filament.

21. Apparatus for mounting a lamp filament upon a lamp stem having support wires and leading-in conductors which comprises feeding mechanism which moves a given length of filament from a supply of filament wire into a position in proximity to the ends of the support wires, mechanism which moves said length of filament into engagement with the ends of said support wires and mechanism for securing the ends of the filament to leading-in conductors upon said lamp stem.

22. Apparatus for mounting a lamp filament upon a lamp stem having support wires and leading-in conductors which comprises feeding mechanism which moves a given length of filament from a supply of filament wire into a position in proximity to the ends of the support wires, mechanism which moves said length of filament into engagement with the ends of said support wires and means for welding the ends of the filament to leading-in conductors upon said lamp stem.

23. The method of manufacturing and mounting coiled filaments for incandescent lamps and similar devices which consists in coiling the filament upon a mandrel wire, uniting the end of the filament to the conductive supports of a mount and afterwards removing the mandrel.

In testimony whereof, I have hereunto subscribed my name this 10th day of May, 1924.

JOHN JOSEPH HIGGINS.