

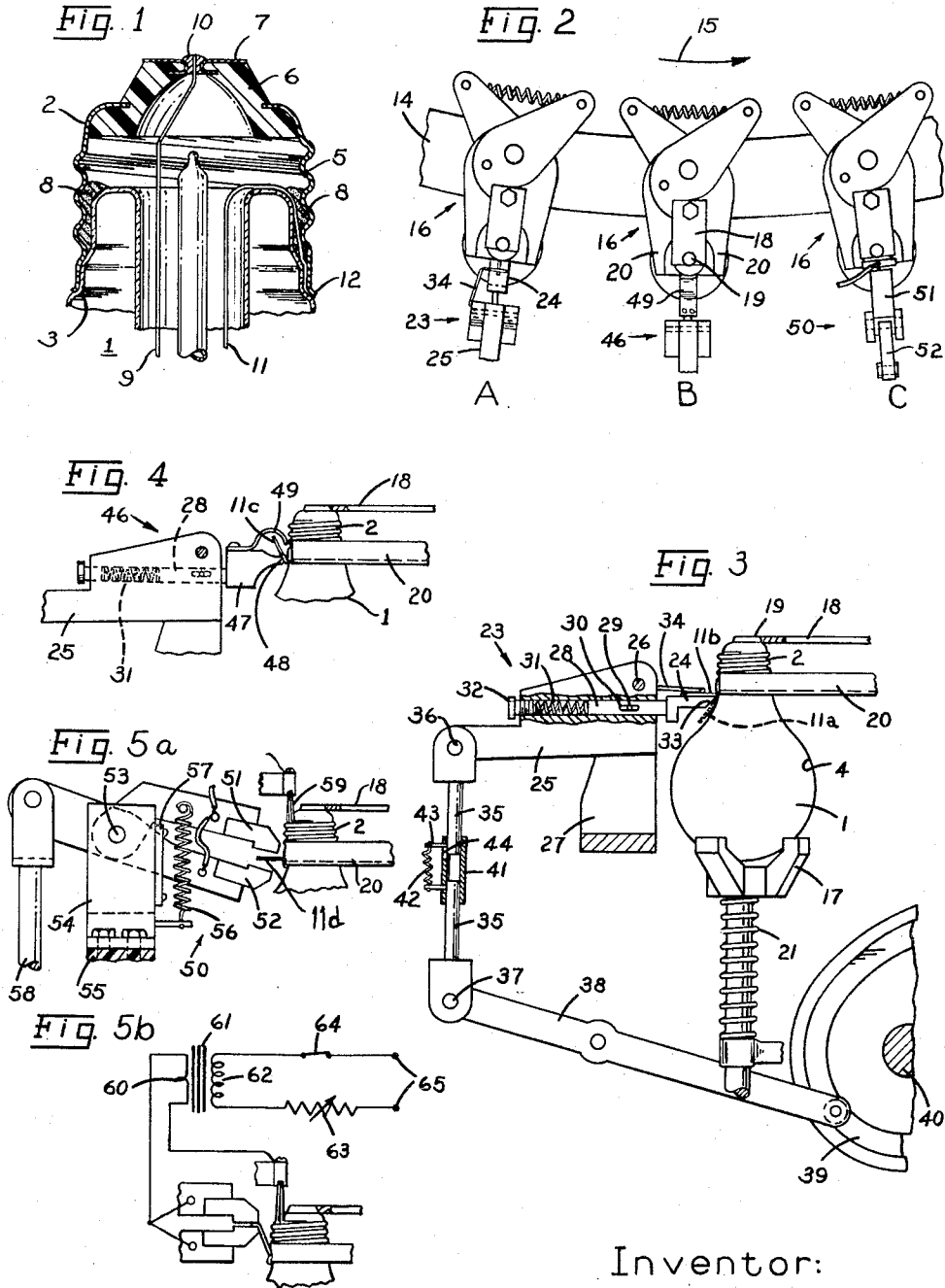
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ELECTRIC LAMP MANUFACTURE

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ELECTRIC LAMP MANUFACTURE

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5 Claims. (Cl. 219—117)

This invention relates generally to the manufacture of electric lamps and similar devices comprising a vitreous bulb having a constricted neck portion to which there is fastened a metal base for locating the lamp in a socket. The invention is more particularly concerned with a means for making a permanent electrical connection between a lead-in wire and the shell of the base which serves as a current terminal.

The present application is a division of my copending application Ser. No. 263,456, filed December 26, 1951, entitled "Electric Lamp" and assigned to the same assignee as the present invention, and now abandoned.

Lamps of the single-ended type are generally provided with a base comprising a metal shell and an insulated end contact or eyelet. The shell and the end contact serve as terminals for energizing the filament or electrodes within the bulb. In order to insure satisfactory operation of the lamp, permanent electrical connections must be made between the top and side lead-in wires and the end contact and shell of the base respectively. Up to the present time, the common practice, at least in the case of the usual household sizes of incandescent lamps, and also in the case of photoflash lamps, has been to solder the lead-in wires to the parts of the base. This has of course necessitated that the parts be made of readily soldered metals such as copper or brass. When it is desired to use some less expensive metals such as aluminum for the base, or at least for the base shell, soldering has generally been found unsatisfactory, both from the point of view of the quality of the product and also of the manufacturing costs. In the case of the usual sizes of incandescent lamps operating at 115 volts, such as the household types, recourse may be had to mechanical connections. However in the case of low voltage high current lamps and also in the case of photoflash lamps, mechanical connections are not always sufficiently reliable.

The objects of the invention are to provide a new and improved method for achieving satisfactory and economical welds of the lead-in wires of electric lamps to the metal parts of their bases, and to provide apparatus adapted to operate in conjunction with prior art lamp finishing machines for carrying out the method of the invention.

In accordance with the invention the weld connection of the lead-in wire to the base in an electric lamp consists of a junction formed by the fusing and intermingling of the metal of the lead-in wire and of the base alone, and without any addition of metal from an extraneous source such as a welding rod. Such a weld connection may be made by folding back the projecting portion of the lead-in wire and embedding it into the rim of the base shell in such manner as to achieve a good contact and preferably some reduction in cross section of the wire at the point of emergence. Thereafter an electric current is passed through the protruding length of wire and the base so as to fuse the wire near the point of contact and thereby weld it to the

base and sever the protruding portion. The wire is preferably maintained under tension while the current is being passed through it.

For further objects and advantages and for a better understanding of the invention, attention is now directed to the following description and accompanying drawings. The features of the invention believed to be novel will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a side section of a fragment of an electric lamp embodying the invention.

Fig. 2 is a plan view of a fragment of a prior art lamp finishing machine and of various mechanisms operating in conjunction therewith for manufacturing electric lamps in accordance with the invention.

Figs. 3 and 4 are side views of mechanisms which respectively position and embed the lead-in wire previously to the actual welding operation.

Fig. 5a is a side view of a welding apparatus located at one of the stations of the finishing machine, and Fig. 5b shows the jaws of the welding apparatus in their closed condition.

The invention will be described by reference to a medium screw base of the type generally used for household incandescent lamps and for the larger sizes of photoflash lamps. It will be understood however that the invention is equally applicable to different sizes and also to different types of bases; for instance the invention may be used with bayonet type bases wherein it is desired to effect a connection between the side lead-in wire and the straight-walled cylindrical shell of the base.

Referring to Fig. 1, there is shown a fragment of an electric lamp 1 provided with a screw base 2 which is mounted on the constricted upper neck portion 3 of the glass bulb (shown at 4 in Fig. 3). The base proper comprises a threaded metal shell 5, an insulating body or web 6, and an end contact 7 fastened to the upper surface of the web. The base is secured to the neck portion in the seal region of the bulb by means of basing cement shown at 8. The top lead-in wire 9 is threaded through the hole in the end contact or eyelet and may be soldered to it as indicated at 10. The side lead-in wire 11 is drawn out between the neck portion and the shell and is welded to the rim of the shell at 12. The weld or junction point 12 is formed by the fusing and intermingling of the metals of the lead-in wire and shell of the base without any addition of metal from an extraneous source such as a welding rod, and may be made by following the process which will now be described.

The lamp manufacturing process in accordance with the invention is readily carried out commercially through the use of the mechanisms shown in Figs. 2 to 5 and located at stations A, B and C of a prior art lamp finishing machine. Such a machine is disclosed for instance in U. S. Patent 1,708,756 Fagan and comprises a real or turret, whereof a fragment is shown at 14, and suitable driving means (not shown in the drawing) for intermittently rotating the turret in a counterclockwise direction as indicated by the curved arrow 15. The movement of the turret advances a bulb to successive work stations for each indexing operation. Lamp holders or heads 16 are fastened to the turret around its periphery. Each holder comprises a resiliently mounted bulb cup 17 for engaging the lower end of the bulb, an upper plate 18 having a cavity or recess 19 for receiving the end contact of the base, and a pair of spring biased holding jaws 20 which engage opposite sides of the base shell. The lamp is held firmly and the base is pressed against the bulb neck by reason of the upward pressure exerted on the bulb by spring 21 through bulb cup 17. The jaws 20 assist in seating the base squarely on the neck of the bulb. It will be

understood that in between the indexing movements, the bulbs are held stationary at the work stations.

A lamp 1 arrives at station A with a base 2 mounted on its constricted upper portion or neck and with the side lead-in wire 11 drawn out between the neck of the bulb and the shell of the base, as shown at 11a in Fig. 3. The protruding portion of the wire lies close to the bulb wall and points downward with respect to the vertical axis of the lamp. The function of the mechanism 23 located at station A is to position the side lead-in wire by bending it up so that the protruding portion is bent sharply at the rim of the shell and points radially outward. The positioning mechanism comprises a finger 24 which pivots with a lever 25 hinged at 26 onto a standard 27 which is suitably fastened to a frame member of the machine. The finger 24 is carried on a plunger or rod 28 arranged to slide within a channel in lever 25 between limits determined by a stop pin 29 and its cooperating slot 30. The finger is urged towards the bulb by a spring 31 compressed between the inward end of plunger 28 and an adjusting screw 32. Finger 24 thereby resiliently engages the side wall of the bulb and by reason of the sharp angle at 33 on its leading edge, lifts the side lead-in wire away from the bulb wall and raises it up against a wire stop 34 fixed to the standard 27.

The pivoting of lever 25 is achieved through connecting rod 35 hinged at 36 to the lever, and at 37 to a rocker arm 38 actuated through a cam 39 fast on a shaft 40. It will be understood that shaft 40 is driven at a fixed speed ratio from the driving means for the turret and is synchronized to pivot lever 25 up to the position shown, and down again, during a suitable time interval of the indexing cycle of the machine. Connecting rod 35 is in two parts which are linked together through a sleeve 41 and a tension spring 42. This arrangement allows a lost motion through limits determined by pin 43 and its cooperating slot 44, and permits over-travel of the rocker arm when the edge of finger 24 abuts against the rim of the base shell. The mechanism has been illustrated in its actuated condition with finger 24 at the upper limit of its pivotal movement. The protruding portion of the side lead-in wire is shown at 11a in dotted outline corresponding to its initial position, and at 11b in solid outline for its final position.

The lamp is next indexed into station B of the machine where the side lead-in wire is operated upon by an embedding mechanism 46 shown in greater detail in Fig. 4. In order to insure that the weld is properly made, it is desirable that the wire be embedded into the edge of the shell and also reduced in cross section at that point. The operation is performed by means of a wiper 47 carried on the end of a plunger or rod 28 which is urged against the base by a spring 31 and supported in a pivotally hinged lever 25, as in mechanism 23 of Fig. 3. Except for the wiper or finger carried by the plunger, mechanism 46 is similar to mechanism 23 and the remaining elements necessary to insure its operation have been omitted from the drawing. Wiper 47 is provided with a rounded lip or edge 48 which engages the side lead-in wire and presses it into the rim or edge of the shell 5 of the base during the upward movement or stroke of the wiper, as shown at 11c in Fig. 4. As a result of the frictional engagement between the wiper and the wire, the wire is necked or reduced in cross section at the point where it is pressed into the rim of the shell. A curved blade 49 on the top surface of the wiper engages the wire on the return or downward stroke of the wiper and brings it back into the horizontal position shown at 11d in Fig. 5a.

The lamp is next indexed into station C where it is operated upon by welding mechanism 50 illustrated in Fig. 5. This mechanism is designed to place the wire under tension at the same time as a current is passed through it for welding it to the rim of the base. The mechanism comprises a pair of jaws 51 and 52, hinged at 53 upon a pedestal 54 fastened to an insulating plate 55 supported by a frame member of the machine. The upper

jaw 51 is pulled down by a spring 56, the extent of its pivoting being limited by a stop 57 affixed to the pedestal. The lower jaw 52 is actuated by a connecting rod 58 generally similar to connecting rod 35 described earlier with reference to Fig. 3. The connecting rod in this mechanism is preferably made of a nonconductive material or contains an insulating portion to insulate the jaws electrically from the frame of the machine. It will be understood that the connecting rod is driven through the usual rocker arm and cam, the cam being driven in synchronism with the driving means of the turret so as to actuate the jaws at a suitable interval during the indexing cycle of the machine.

In operation, the turret indexes the bulb into the station C and the projecting portion 11d of the side lead-in wire becomes positioned between the open jaws. The operation of the cam and connecting rod causes the lower jaw 52 to pivot up and contact the upper jaw 51, at which moment the projecting portion 11d of the lead is gripped. The jaws are now biased together by the force of spring 56 and move upward as a unit thereby tensioning the projecting portion of the lead-in. The tension is less than that required to break off the wire against the side of the base shell. The connecting rod may be provided with a sleeve and tension spring together with a lost motion slot and pin device as illustrated at 41 to 44 in Fig. 3, in order to allow overtravel of the connecting rod and to limit the tension exerted on the wire.

The welding circuit is completed through the jaws 51 and 52 which grip the side lead-in wire, and through a stationary brush 59 which engages the side of the base. Either alternating or direct current may be utilized for the welding current; I have found alternating current entirely satisfactory and prefer to use it because of its greater availability. The jaws 51, 52 and the stationary brush 59 are connected across the output terminals of the secondary winding 60 of a step down transformer 61 to complete the welding circuit. The primary 62 is connected in series with a current control rheostat 63 and a switch 64 across the usual 115 volt 60 cycle supply at terminals 65. Switch 64 may be mechanically interlocked with connecting rod 58 and arranged to close after the jaws have gripped and tensioned the lead-in wire, as indicated in Fig. 5b. By way of illustration transformer 61 may have a 115 volt primary, a 23 volt secondary, and a 750 volt-ampere capacity.

In accordance with the invention, the welding of the wire to the rim of the shell is made by passing an electric current of suitable intensity directly through the lead-in wire and the base of the lamp. It is possible to do this with a relatively low voltage and low wattage source which does not cause overheating of the adjacent glass or excessive vaporization of metal and condensation thereof onto the glass because the lead-in wire has previously been embedded into the edge of the shell so that a relatively low resistance contact is already present. The tensioning of the lead-in wire also assures a low resistance contact. By reason of the fact that the lead-in wire has been reduced in cross section in the region where it is embedded into the rim of the shell and for a short distance past that point, the resistance of the wire is relatively high at a point immediately beyond the contact to the shell. Accordingly the welding current causes a more intense generation of heat at the reduced cross section and the wire fuses and separates there, the part adjacent the shell fusing into it to constitute the weld, and the outer portion of the wire remaining between the contact jaws until released when the jaws subsequently open. A jet of air may be used to blow the wire portion out from between the jaws if desired.

I have found that the welding of the side lead-in wire of electric lamps in accordance with my invention is highly advantageous not only for low voltage high current lamps, but also for high temperature operating lamps. For instance, many of the larger sizes of incandescent

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lamps operate at temperatures such that reliance could not be placed upon soldered contacts in the base. It may be used with any of the usual combinations of metals for the base shell and the side lead-in wire, for instance brass, aluminum or steel for the shell, and copper, iron or nickel alloys for the wire. The improved method of welding in accordance with my invention can then be used in lieu of prior art welding methods to produce a lamp wherein the weld junction contains solely intermingled metals from the lead-in wire and from the base. I have found that such weld junctions have a resistance which is unappreciable with respect to the total resistance of the lead-in wires and are not subject to deterioration or loosening from the usual causes.

Whereas I have described a number of mechanisms which I have found suitable for carrying out the welding process in accordance with my invention, it will be understood that other mechanisms may be utilized to achieve the same result. Accordingly, the scope of the invention is to be determined by the appended claims.

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

1. The method of welding a lead-in wire to a metal part of the base of an electric lamp which comprises the steps of embedding the wire into the edge of the part and with a length thereof projecting beyond the part, and holding the wire under tension while passing an electric current through said length of wire and the part, the current being of sufficient magnitude to sever the wire and fuse it to the part.

2. The method of welding the side lead-in wire to the metal shell of the base in an electric lamp including a vitreous bulb and a base fastened thereto, which comprises the steps of wiping a portion of a projecting length of the wire against the rim of the shell with sufficient force to embed it in the shell and reduce its cross section, and holding the wire under tension while passing an electric current through said length of wire and the shell, the current being of sufficient magnitude to sever the wire at the reduced cross section and fuse it to the shell.

3. The method of welding the side lead-in wire to the shell of the base in an electric lamp including a vitreous bulb having a constricted neck portion and a base including a metal shell fitting over said neck portion and wherein the side lead-in wire is drawn out between the

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neck portion and the shell, which comprises the steps of wiping a portion of a projecting length of the wire against the rim of the shell with sufficient force to embed it in the shell and reduce its cross section, tensioning said length, and passing an electric current through said length and the shell while maintaining said wire under tension, the current being of sufficient magnitude to sever the wire at the reduced cross section and fuse it to the shell.

4. Lamp manufacturing apparatus comprising means for indexing a bulb with a base fitted thereon to successive work stations, means located at a station for wiping a lead-in wire, protruding from said bulb, into the rim of the base, contacting jaws located at another station for gripping and tensioning the wire, and means for passing a current through the wire and the base while said jaws continue to grip and tension the wire in order to weld the wire to the base at its rim.

5. In a machine of the class described, the combination of holder means for supporting a glass bulb having a metallic base fitted on its upper end with a lead wire clamped between said bulb and base and extending laterally outward therefrom, means to carry said holder means to a plurality of stations, wiper means at one station comprising a finger member and means for moving said finger member toward said holder and into wiping engagement with the lead wire at the rim of the said base with sufficient force to embed the wire into the said rim, and welding means at another station comprising a pair of contact jaws, means for closing said jaws upon said wire and moving them bodily upward with a yielding force to tension the wire, and means for passing a welding current through said wire and base, while said jaws continue to grip and tension the wire, to fuse the wire to the rim of the base and sever it thereat.

References Cited in the file of this patent

UNITED STATES PATENTS

1,613,957	Madden	Jan. 11, 1927
2,137,181	Quackenbush	Nov. 15, 1938
2,606,268	Pityo	Aug. 5, 1952
2,708,702	Albrecht	May 17, 1955

FOREIGN PATENTS

558,472	Great Britain	Jan. 6, 1944
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