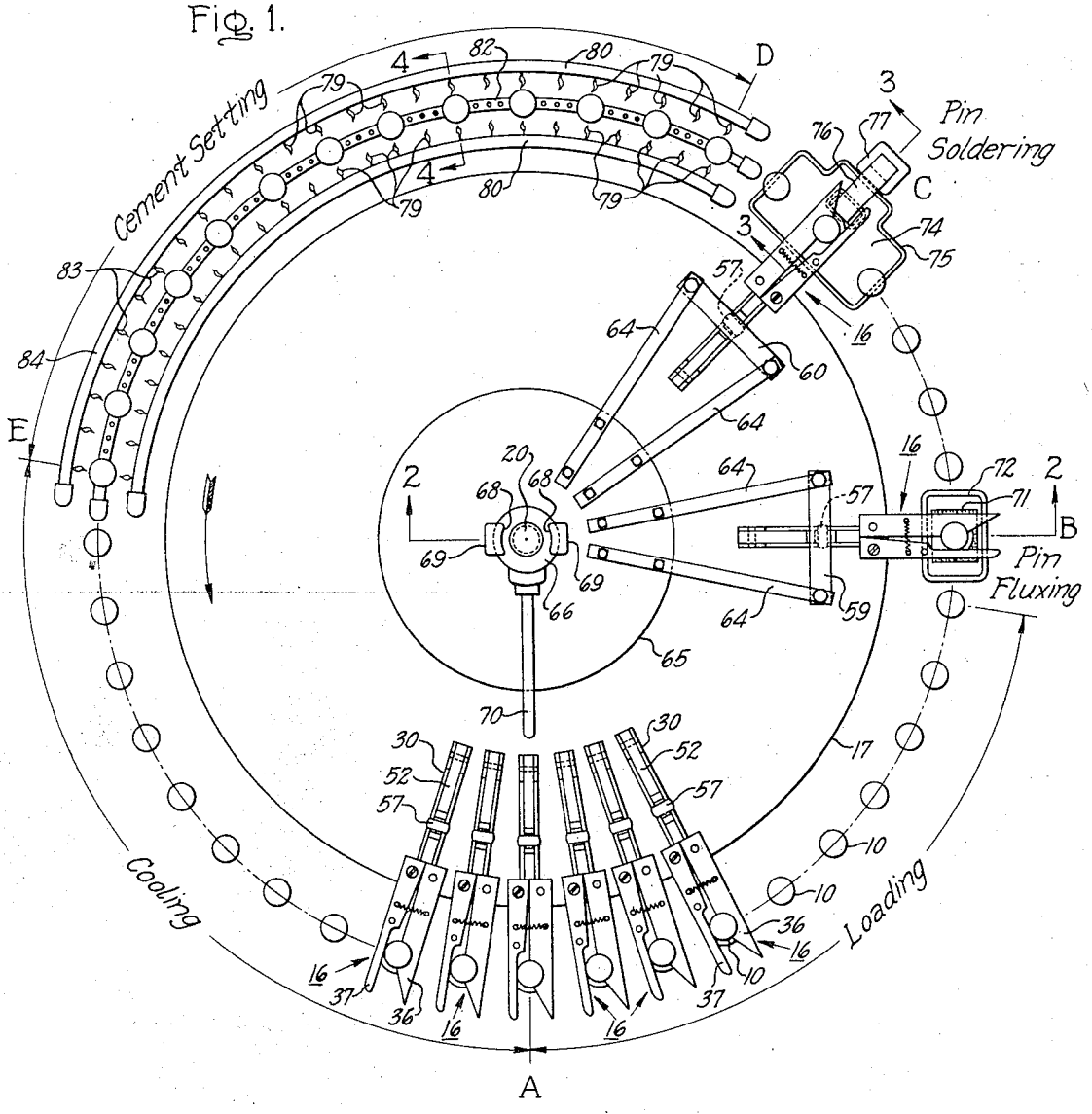
Feb. 15, 1944. C. F. DE BOLD 2,342,041

METHOD AND APPARATUS FOR BASING ELECTRICAL DEVICES

Filed Feb. 20, 1943 3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

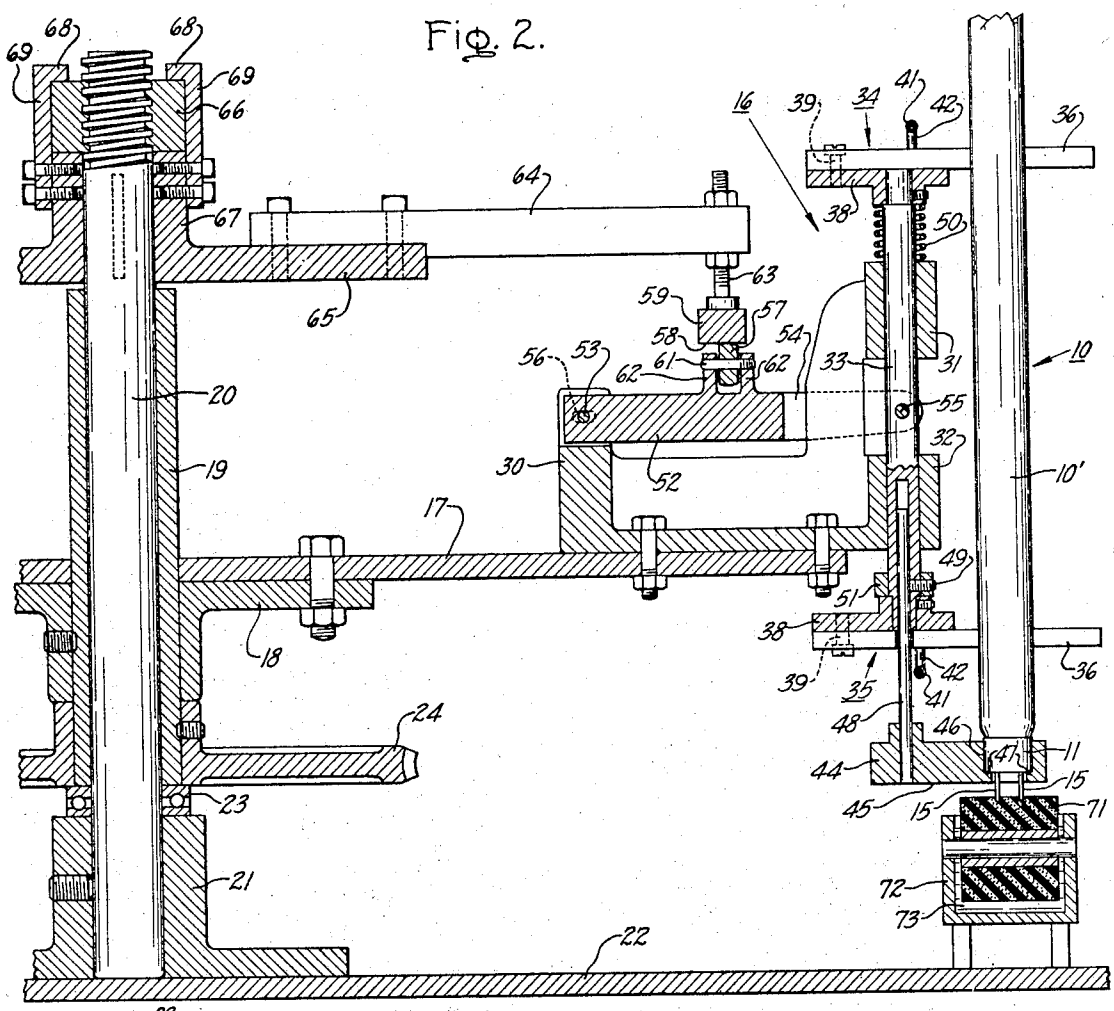


Fig. 3.

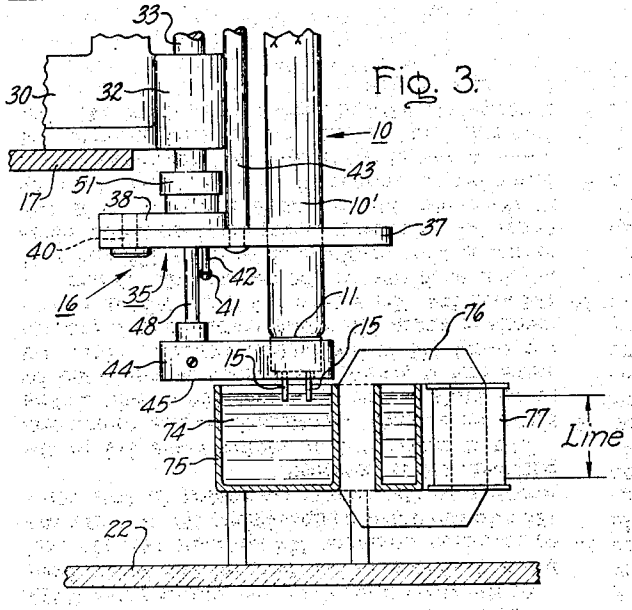
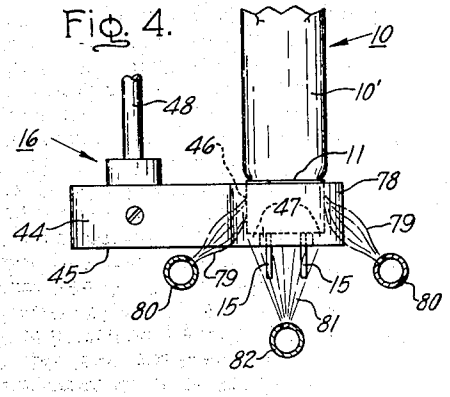


Fig. 4.



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METHOD AND APPARATUS FOR BASING ELECTRICAL DEVICES

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Fig. 5.

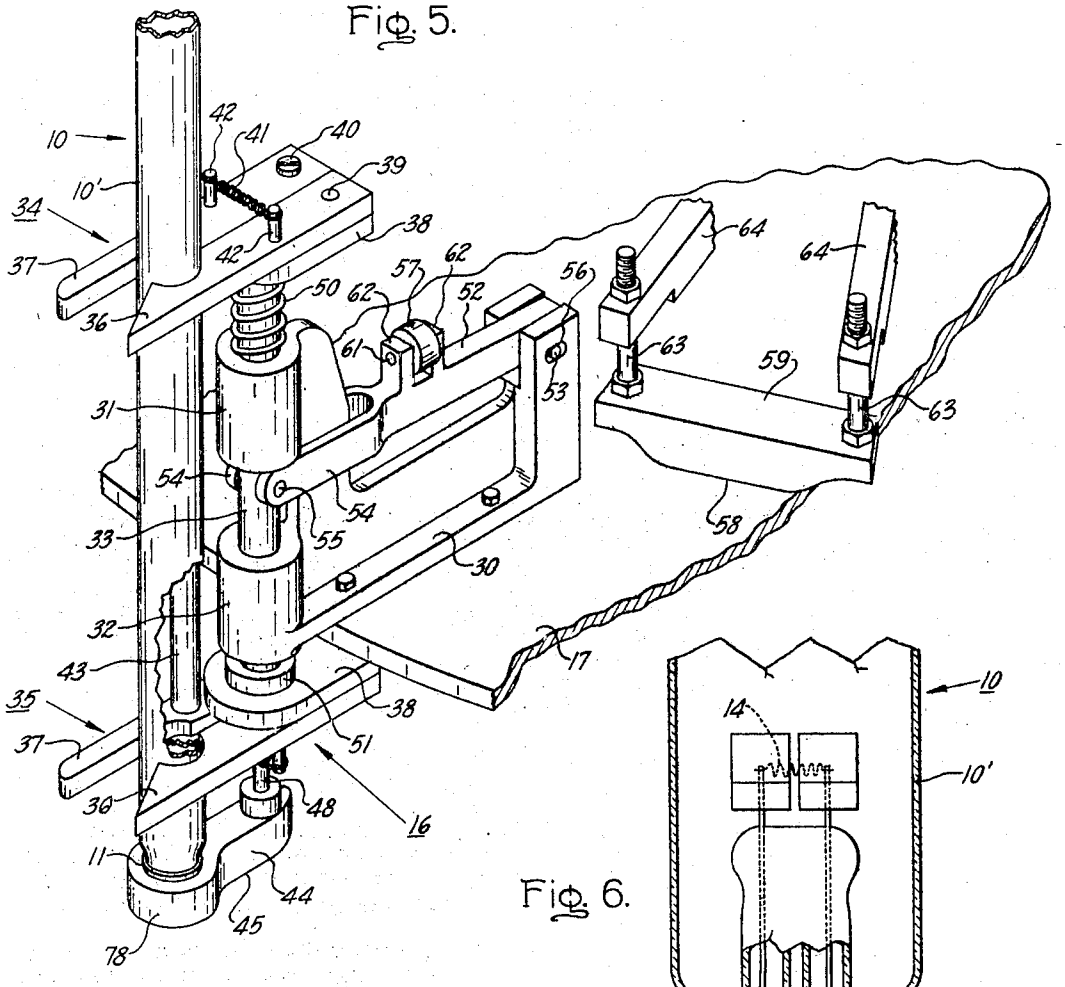


Fig. 6.

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UNITED STATES PATENT OFFICE

2,342,041

METHOD AND APPARATUS FOR BASING ELECTRICAL DEVICES

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Application February 20, 1943, Serial No. 476,591

10 Claims. (Cl. 316—27)

My invention relates in general to method and apparatus for basing electric lamps and other electrical devices of the same general character. More particularly, my invention relates to method and apparatus for basing electrical devices of the type employing a cemented base.

Electric lamps and similar electrical devices ordinarily comprise a glass envelope such as a bulb or tube to which is united a base having metallic terminals, and to the base terminals are connected conductors which lead to the filament electrode or other electrical energy translating device within the aforesaid envelope. In the case of electric discharge lamps of the well-known fluorescent type, the base is usually cemented to the lamp envelope and is provided with hollow terminal pins or prongs to which the lamp leading-in wires are secured, as by soldering.

One object of my invention is to provide a method and apparatus for securing a base to the envelope of an electrical device and for uniting the conductors of such device to the terminals of the base.

Another object of my invention is to provide a method and apparatus for basing electrical devices wherein the lead-in conductors of the device are first soldered to the base terminals after which the basing cement is then heated to set the same so as to secure the base to the envelope of the device.

Further objects and advantages of my invention will appear from the following description of a species thereof and from the accompanying drawings in which:

Fig. 1 is a diagrammatic plan view of the machine comprising my invention; Fig. 2 is a vertical section on the line 2—2 of Fig. 1; Fig. 3 is a fragmentary section on the line 3—3 of Fig. 1 with the head shown in elevation; Fig. 4 is a fragmentary section on the line 4—4 of Fig. 1 with the head shown in elevation; Fig. 5 is a perspective view of one of the heads of the machine comprising my invention; and Fig. 6 is a sectional view of one end of an electrical discharge device which has been based on a machine comprising my invention.

The function of the machine according to the invention is to base electric lamps or similar devices 10 of the type comprising a glass bulb or envelope 10' (Fig. 6) having a base 11 cemented thereto by a ring of basing cement 12. The envelope 10' is provided with one or more leading-in wires 13 which are sealed into the envelope and are connected at their inner ends to a filament or electrode 14 within the envelope. The outer ends of the lead-in wires 13 extend through and are soldered to hollow pins or prongs 15 extending from the lamp base 11. The particular machine illustrated is for basing electric discharge lamps of the well-known fluorescent type comprising an elongated glass tube or envelope 10' having a pin-type base 11 cemented to each end thereof.

Referring to the drawings, the machine there shown comprises a plurality (preferably forty) of heads 16 which are mounted at regularly spaced intervals about the periphery of a carrier or turret 17. The function of the heads 16 is to hold the unbased lamp 10 and the base 11 in proper relation while the lead-in wires 13 are soldered to the base pins 15 and while the cement 12 within the base 11 is heated so that it hardens and secures the base to the envelope 10'.

The turret 17 is secured to a hubbed flange 18 (Fig. 2) which is fastened to a vertical hollow sleeve 19. The said sleeve is mounted on an upstanding central support column 20 which is secured to a bracket 21 fastened to a table or base 22. The weight of the turret 17 and the sleeve 19 is carried by a roller bearing 23 which rests on the bracket 21.

The turret 17 is rotated in a counterclockwise direction at a uniform rate of speed by a worm gear 24 fastened to the sleeve and driven by an electric motor (not shown) through suitable gear reduction mechanism (not shown). The speed of the motor and the reduction ratio of the gear reduction mechanism are so selected as to rotate the turret at the desired speed.

In the regular order of movement of the turret 17, each head 16 is carried through a loading region (positions A to B, Fig. 1) where the lamp 10 and base 11 are inserted in the head by an operator who first threads the leading-in wires 13 of the lamp 10 through the hollow pins 15 of the base 11 and then places the said base on the end of the lamp. The base 11 comprises, in this instance, a metal shell 25 (Fig. 6) fastened to discs 26 of insulating material which support the metal pins 15, and is provided with a ring of cement 12 which engages both the metal shell 25 and the reduced end portion 27 of the lamp envelope. Openings 28 at the center of the discs 26 provide clearance for the end 29 of the exhaust tube which extends beyond the end of the lamp envelope.

Each of the heads 16 is mounted on a head support bracket 30 bolted or otherwise rigidly secured to the turret 17 and provided with vertically spaced bearings 31, 32 extending beyond

the outer periphery of the turret. Each head 16 comprises a vertically reciprocatable slide rod 33 slidably mounted in and extending through the bearings 31, 32 and provided at its opposite ends with upper and lower bulb holders 34 and 35, respectively, for engaging and holding the lamp 10 in a vertical position.

Each of the bulb holders 34, 35 comprises a pair of spring-pressed clamping jaws 36, 37, i. e., a stationary jaw 36 and a movable jaw 37, which are mounted on a bracket 38 rigidly secured to the slide rod 33. The stationary jaw 36 is firmly secured to the bracket 38 as by a screw or bolt 39, while the movable jaw 37 is pivoted on a pin 40 extending from the said bracket. The two jaws 36, 37 are normally held in a closed or retracted position by a tension coil spring 41 fastened at its opposite ends to posts 42 extending from the jaws. The movable jaws 37 of the upper and lower bulb holders 34, 35 are rigidly tied or joined together by a tie rod 43 so as to move in unison when the lamp 10 is forced into and withdrawn from the mouth of the clamping jaws by the attendant at the beginning and end of the lamp basing operation.

Each head 16 is further provided with a base holder 44 disposed below the lower bulb holder 35 for holding the lamp base 11 in proper basing relation to the lamp 10 in the bulb holders 34, 35, with the terminal pins 15 of the base projecting an appreciable distance below the under side 45 of the base holder. For this purpose, the base holder 44 is provided with a vertical bore or cavity 46, in line with the lamp 10 in the holders 34, 35, to snugly receive the cylindrical shell portion 25 of the lamp base 11. The said lamp base is held in place within the cavity 46 by an annular lip 47 formed within the cavity at the lower end thereof. The said lip 47 is made of minimum vertical thickness so that the base pins 15 project an appreciable distance below the under side 45 of the base holder when the lamp base is properly seated in the well or cavity 46 so as to rest on the lip 47.

The base holder 44 is rigidly secured to a vertical support rod 48 fastened to the slide rod 33. To enable the basing of lamps with different bases having pins of different lengths, the lamp holder 44 is made vertically adjustable relative to the turret 17 and the machine table 22. For this purpose, the support rod 48 is telescoped into the slide rod 33 and the two rods fastened together by a set screw 49 (Fig. 2).

The slide rod 33 together with the associated bulb holders 34, 35 and base holder 44, are held in a normally raised position by the action of a compression coil spring 50 which surrounds the slide rod and bears at one end against the upper clamping jaw bracket 38 and at the other end against the upper slide rod bearing 31. The upward movement of the slide rod 33 is limited by suitable stop means which may comprise a collar 51 fastened to the slide rod 33, at a point immediately below the lower slide rod bearing 32, as by the set screw 49. The said collar 51 strikes against the under side of the lower slide rod bearing 32, upon upward movement of the slide rod, to thereby limit such upward movement of the slide rod.

Downward movement of the slide rod 33 and its associated holders 34, 35 and 44, is imparted thereto by a laterally extending lever 52 pivoted at its inner end to the head support bracket 30, the lever being provided with a pivot pin 53 which extends into a bearing 56 in the head support bracket 30. The outer end of the lever 52 is forked to provide two horizontally-spaced arms 54 which straddle the slide rod 33, and are pivotally connected thereto by a pin 55, at a point intermediate the two slide rod bearings 31, 32. To enable the forked outer end of the lever 52 to move in a true vertical line so as to follow the vertical reciprocating movement of the slide rod 33 in the bearings 31, 32, the bearing 56, for the lever pivot pin 53 at the inner end of lever 52, is in the form of a horizontally-elongated slot (Fig. 2) so as to permit a limited amount of horizontal sliding movement of the lever pivot pin 53 in the said bearing 56.

On its upper side, at a point intermediate its ends, the actuating lever 52 is provided with a roller 57 for engagement with the under side or cam surfaces 58 of stationary cams 59 and 60 located at positions B and C respectively (Fig. 1) of the head 16 as it travels around the machine. The roller 57 is rotatably mounted on a shaft 61 extending radially of the turret 17 and supported in a pair of upstanding lugs 62 on the lever 52, the roller being mounted on the shaft 61 between the said lugs 62. The cams 59, 60 are fastened, as by bolts 63, to laterally-extending arms 64 bolted or otherwise rigidly secured to a flange or disc 65 which is keyed to the central support column 20 so as to be vertically adjustable thereon. The said disc 65 is carried by a nut 66 threaded onto the upper end of the support column 20, the nut 66 being mounted in a housing formed by the upper end of a hub 67 on said disc and the inturned overhanging leg portions 68 of a pair of L-shaped lugs or straps 69 bolted to the said hub 67 at diametrically opposite points thereof. The housing so formed by the hub 67 and straps 69 serve to hold the nut 66 against vertical movement relative to the disc 65 while permitting free rotation of the nut on the threaded portion of the support column 20.

A hand lever 70 (Fig. 1) secured to the nut 66 enables the manual rotation of the nut by the operator. The upward or downward movement of the said nut, in response to the rotation thereof on the threaded portion of the support column 20, causes the disc 65 and its associated cams 59, 60 to likewise move upward or downward so as to adjust the vertical position of the said cams relative to the rollers 57 on the various head actuating levers 52. This adjustment arrangement for cams 59, 60 thus provides a ready control over the extent of downward movement of the head slide rod 33, the holders 34, 35 and 44, and the lamp 10 and base 11 held therein.

In accordance with the invention, the lamp leading-in wires 13 are first soldered to the base pins 15 after which the basing cement 12 is heated to set the same so as to firmly secure the base 11 to the lamp envelope 10'. This order of basing operations is essential to the production of a clean and effective soldering of the lamp leading-in wires 13 to the base pins 15, for with the operations reversed, the hot basing cement flows down into the hollow base pins and forms a deposit thereon and on the leading-in wires which then interferes with the soldering of the said wires to the base pins and results in high "shrinkage" for the basing operation.

Accordingly, after the lamp 10 and base 11 have been properly assembled and positioned in one of the heads 16, the turret 17 then carries the head to position B (Fig. 1) where the head slide assembly, comprising the slide rod 33 and the holders 34, 35 and 44, is moved downwardly

so as to lower the base pins 15 into engagement with a fluxing roller 71 (Figs. 1–2) which applies a coating of flux to the end portions of the said pins and the leading-in wires 13. The downward movement of the head slide assembly is effected by the engagement of the cam 59 with the roller 57 on lever 52 as the head approaches position B, the cam depressing the roller so as to cause the lever 52 to pivot on its pivot pin 53 and move the slide rod 33 downwardly against the resistance of the spring 50. The fluxing roller 71 is rotatably mounted in a flux pot 72 located at position B and fastened to the machine table 22. The flux pot 72 is filled with a suitable flux material or solution 73 within which the roller 71 is partly submerged. The roller 71 is made of any suitable material, such as sponge rubber, which is capable of carrying and transferring the flux material 73 to the base pins 15. If desired, the flux roller 71 may be omitted and the base pins 15 lowered directly into the bath of flux material 73 in the flux pot.

As the head 16 carrying the lamp 10 and base 11 leaves position B, the roller 57 on the head actuating lever 52 rides off the end of cam 59 whereupon the spring 50 returns the slide rod 33, together with the associated holders 34, 35 and 44 and the lamp 10 and base 11, to its normally raised position. The continued rotation of the turret 17 then carries the head 16 to position C (Fig. 1) where the action of cam 60 on the roller 57 of lever 52 again moves the head slide assembly and the lamp 10 and base 11 downwardly, in the same manner as at position B, to thereby lower the base pins 15 into a bath of molten solder 74 (Figs. 1 and 3) so as to effect the soldering of the leading-in wires 13 to the said base pins. The molten solder 74 is contained in a solder pot 75 located at position C and fastened to the machine table 22. The solder is heated to a molten condition by suitable means such as by gas flames, or by electrical means as shown, in which latter case the bath of solder 74 may itself form the secondary of a transformer 76, the primary 77 of which is connected to a suitable source of electrical current. As shown in Fig. 3, the transformer 76 is supported by the solder pot 75.

Upon leaving position C, the head slide assembly and associated lamp 10 and base 11 are again returned to their normally raised position by the disengagement of the roller 57 with the cam 60, such disengagement allowing the spring 50 to raise the slide rod 33. The continued rotation of the turret 17 then carries the head 16 through the region from positions D to E (Fig. 1) where the base housing portion 78 (Fig. 4–5) of the base holder 44 is continuously heated by suitable gas fires 79 directed thereagainst, so as to heat and bake or set the basing cement 12 within the lamp base 11. This setting of the base cement 12 then completes the attachment of the base to the lamp envelope 10'. The heat is supplied to the base cement 12 primarily by conduction from the base holder 44 to the base shell 26 and thence to the basing cement. The gas fires 79 emanate from burners in the form of pipes or conduits 80 provided with burner openings at regularly spaced intervals therealong and connected to a source of gas supply. The pipes are curved to conform to the path of travel of the head 16 and are spaced apart radially of the turret 17 in such a manner that the housing portion 78 of the base holder 44 travels more or less between the said burner pipes 80 as the head 16 travels through the cement setting region from positions D to E, as shown in Fig. 1.

To prevent the heat attending the cement setting operation from melting and destroying the soldered connection between the base pins 15 and the leading-in wires 13, the said base pins are continuously cooled by suitable means, such as by air jets 81 directed thereagainst from below during the course of travel of the head 16 from positions D to E. The air jets 81 emanate from a pipe 82 provided with air jet openings at regularly spaced intervals therealong and connected to a source of compressed air.

From position E, the heads are finally carried by the turret 17 through a cooling region (positions E to A, Fig. 1) and back to the first or loading position A where the finished or based lamp is removed from the head 16 by the operator and another unbased lamp 10 and base 11 mounted in position within the head.

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

1. Apparatus for basing an electric device comprising a carrier provided with a head for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom, and conductors extending from said envelope to the outer end portions of said terminal pins, said head being vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said head, and means for moving said head downwardly to lower said terminal pins and conductors into the said molten solder.

2. Apparatus for basing an electric device comprising a carrier provided with a head for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom, and conductors extending from said envelope to the outer end portions of said terminal pins, said head being vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly, means for advancing said carrier, means adjacent the path of travel of said heads for applying flux to the contiguous portions of said terminal pins and conductors, a container for molten solder disposed adjacent the path of travel of said head, and means for moving said head downwardly to lower said terminal pins and conductors into the said molten solder.

3. Apparatus for basing an electric device comprising a carrier provided with a head for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom and containing a quantity of basing cement, and conductors extending from said envelope to the outer end portions of said terminal pins, said head being vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly and the basing cement in engagement with said envelope, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said head, means for moving said head downwardly to lower said terminal pins and conductors into the said molten solder, and means for subsequently heating and setting said basing cement to thereby fasten the base to the envelope.

4. Apparatus for basing an electric device comprising a carrier provided with a head for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom

and containing a quantity of basing cement, and conductors extending from said envelope to the outer end portions of said terminal pins, said head being vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly and the basing cement in engagement with said envelope, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said head, means for moving said head downwardly to lower said terminal pins and conductors into the said molten solder, means for subsequently heating and setting said basing cement to thereby fasten the base to the envelope, and means for continuously cooling said pins during the heating of said basing cement to thereby prevent melting of the soldered connection between the said pins and conductors.

5. Apparatus for basing electric devices comprising a carrier provided with a plurality of heads each for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom, and conductors extending from said envelope to the outer end portions of said terminal pins, each of said heads comprising a slide assembly vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said heads, and means comprising a stationary cam successively co-operating with said slide assemblies for moving said slide assemblies downwardly to lower said terminal pins and conductors into the said molten solder.

6. Apparatus for basing an electric device comprising a carrier provided with a plurality of heads for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom, and conductors extending from said envelope to the outer end portions of said terminal pins, a support bracket for each of said heads secured to said carrier, each of said heads comprising a slide assembly slidably mounted on said support bracket for vertical movement relative thereto, and a lever pivoted on said support bracket and pivotally connected to said slide assembly, said slide assembly being provided with holder means for supporting said base in position with the pins thereof extending downwardly, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said heads, and means comprising a stationary cam successively cooperating with the said levers for moving said slide assemblies downwardly to lower said terminal pins and conductors into the said molten solder.

7. Apparatus for basing an electric device comprising a carrier provided with a plurality of heads for supporting an assembly comprising a glass envelope, a base having terminal pins projecting therefrom, and conductors extending from said envelope to the outer end portions of said terminal pins, a support bracket for each of said heads secured to said carrier, each of said heads comprising a slide assembly slidably mounted on said support bracket for vertical movement relative thereto, and a lever pivotally connected at one end to the said support bracket and at its other end to the said slide assembly, said slide assembly being provided with holder means for supporting said base in position with the pins thereof extending downwardly, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said heads, and means comprising a stationary cam successively engaging said levers at a point intermediate the ends thereof for moving said slide assemblies downwardly to lower said terminal pins and conductors into the said molten solder.

8. The method of basing an electrical device comprising a glass envelope having conductors extending therefrom and a base provided with terminal pins and a quantity of basing cement, which method comprises mounting the base in position on said envelope with the basing cement in engagement with said envelope and with the said conductors disposed contiguous to said terminal pins, soldering said conductors to said terminal pins, and subsequently heating and setting said basing cement.

9. The method of basing an electrical device comprising a glass envelope having conductors extending therefrom and a base provided with hollow open-ended terminal pins and a quantity of basing cement, which method comprises threading said conductors through the hollow terminal pins and mounting the base in position on said envelope with the basing cement in engagement with said envelope, soldering said conductors to said terminal pins, and subsequently heating and setting the basing cement.

10. Apparatus for basing an electric device comprising a carrier provided with a head for supporting an assembly comprising a glass envelope, a base comprising a metal shell having terminal pins projecting therefrom and containing a quantity of basing cement, and conductors extending from said envelope to the outer end portions of said terminal pins, said head being vertically movable on said carrier and provided with holder means for supporting said base in position with the pins thereof extending downwardly and the basing cement in engagement with said envelope, said holder comprising a metal housing portion having a cavity therein shaped to closely enclose the shell portion of said base with the pins protruding downwardly beyond the said housing portion, means for advancing said carrier, a container for molten solder disposed adjacent the path of travel of said head, means for moving said head downwardly to lower said terminal pins and conductors into the said molten solder, and means for subsequently heating the said housing portion of the holder to thereby heat the enclosed base shell by conduction and set the cement therein.

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