

Dec. 6, 1927.

1,651,399

H. DE F. MADDEN

AUTOMATIC SOLDERING MACHINE FOR LAMP BASES

Filed Feb. 20, 1924

3 Sheets-Sheet 1

FIG. 2.

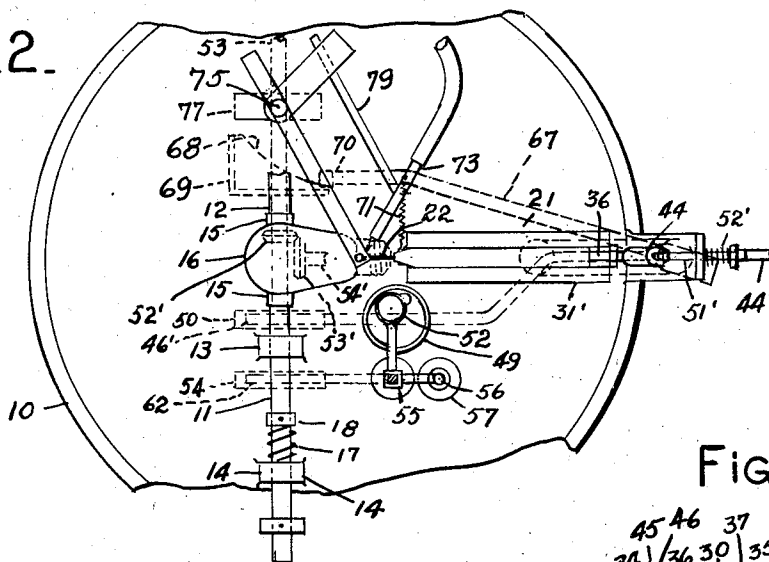


FIG. 4.

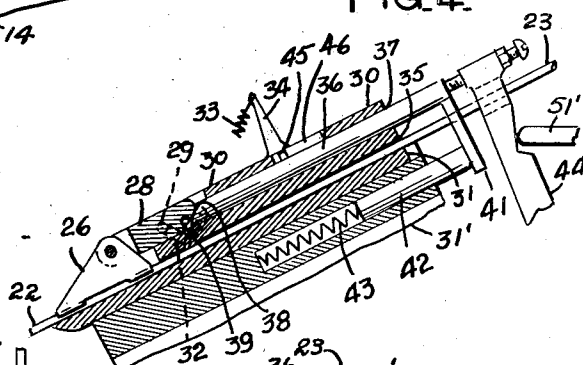


FIG. 3.

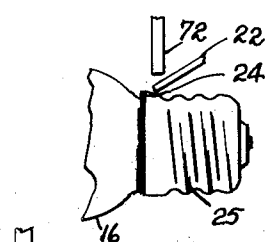
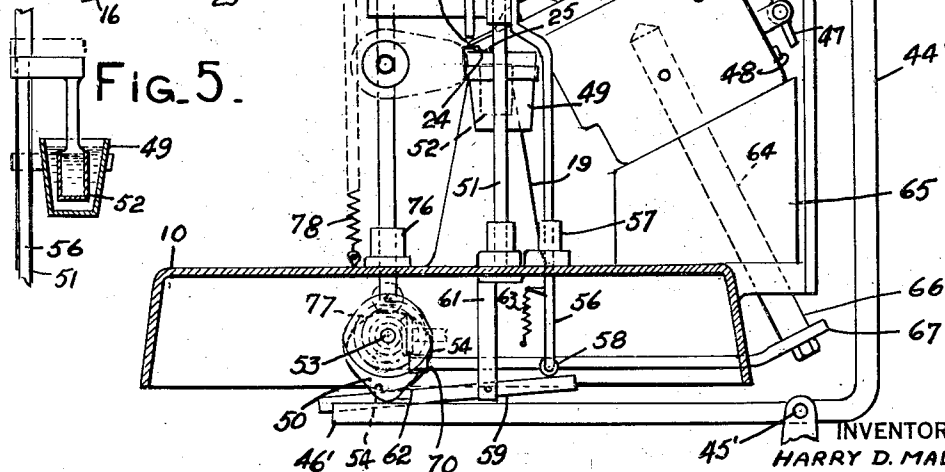


Fig. 5.



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FIG. 6.

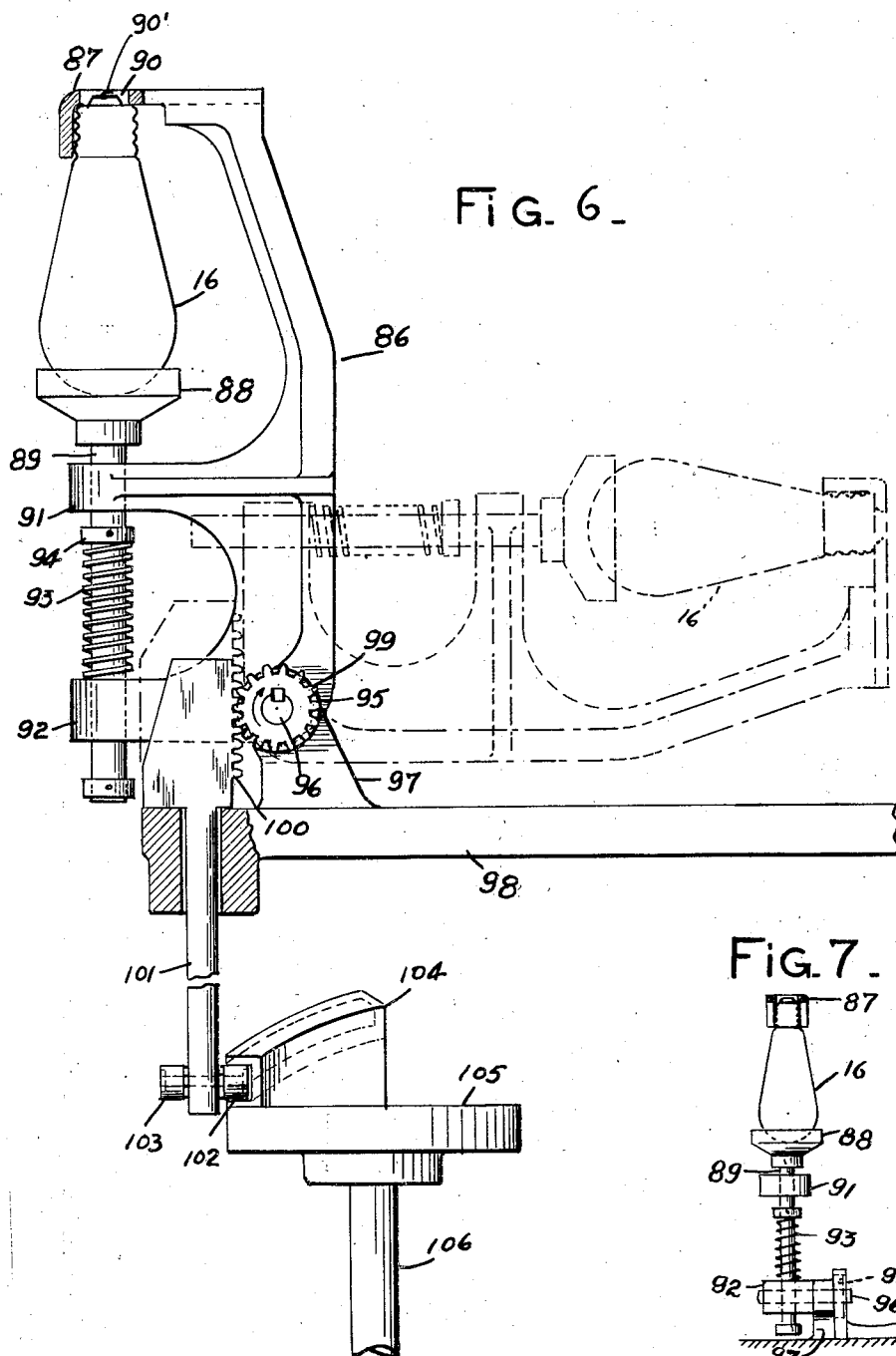
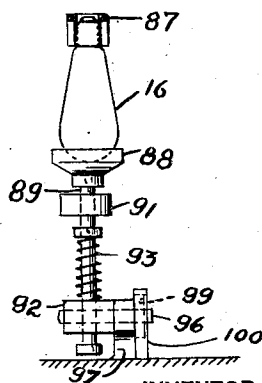


FIG. 7.



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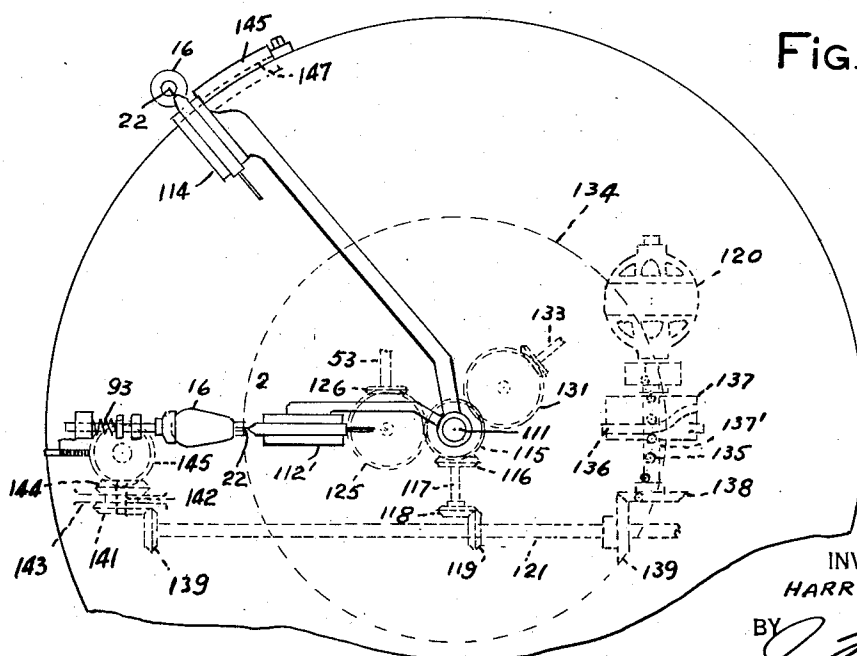
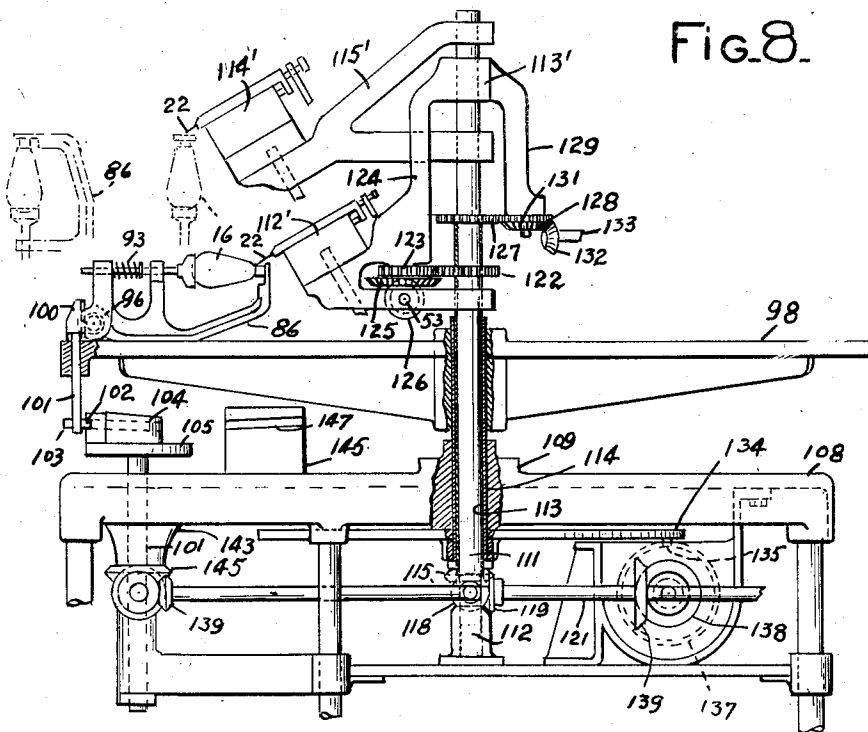
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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AUTOMATIC SOLDERING MACHINE FOR LAMP BASES.

Application filed February 20, 1924. Serial No. 694,176.

The present invention relates to the manufacture of incandescent electric lamps and more particularly to a machine for securing leading-in wires to the bases of such lamps.

5 An object of the invention is to provide a simple and automatic mechanism for soldering the leading-in wires to metallic bases of lamps.

10 Another object of the invention is to provide means for supporting a lamp and automatically changing the position of the supported lamp.

15 A further object of the invention is to provide coordinating machine elements for receiving lamps, positioning the lamps in operative relation to soldering mechanism and in actuating said mechanism to solder leading-in wire to the base portion of the lamp.

20 Other objects and advantages will be apparent as the description proceeds.

25 The manufacture of incandescent electric lamps includes one or more soldering operations to electrically connect the leading-in wires or conductors of a lamp with the metallic portion of the base, to permit a flow of electrical current when a lamp is screwed or otherwise inserted into the socket of a lighting circuit.

30 The lamps as generally constructed have one of the leading-in wires thereof secured to a contact member which is insulated from the shell or metallic base. This insulated contact member is generally positioned at the lower end of the base and disposed axially thereof. The other leading-in wire is usually soldered or otherwise secured to the threaded portion of the lamp; that is, upon the periphery of the base and to distinguish the union of this wire from the axially disposed connection, it may be termed a "peripheral contact".

35 The present invention provides a machine for automatically soldering both the axially and peripherally disposed conductors.

40 Heretofore the above mentioned conductors were connected to the base by manual operations and a considerable amount of time and skill was required to satisfactorily perform these operations.

45 The present machine comprises means for supporting a lamp in the proper relation to

mechanism for feeding solder adjacent to a leading-in wire of a lamp. The solder-feeding mechanism is so arranged that previous to its disposition adjacent to a leading-in wire, the end of solder is dipped into a flux carried in a suitably disposed receptacle. When the solder is positioned over the leading-in wire, a soldering iron which may be heated by a gas flame, is moved into contact with the solder causing a drop thereof to fuse and connect the leading-in wire to the base, after which the soldering iron is removed and the lamp may be replaced by another for a repetition of the foregoing operations.

50 A machine embodying my invention may be of the conveyor-type which moves a lamp to a plurality of positions for various operations thereon or as a stationary machine, in which a lamp may be positioned in and removed from a single holder by an operator.

55 A conveyor-type of machine may include a plurality of holders adapted to be moved in operative relation to soldering mechanism, for example, the lamp may be positioned to have the axially disposed conductor soldered to the base and may then be moved to operative relation with another soldering mechanism and automatically positioned to have the peripherally disposed leading-in conductor soldered to the base.

60 Mechanism for supporting a lamp, as set forth in the present invention is important, since such mechanism may be actuated to hold a lamp in several operative positions and may, for the sake of convenience, be designated herein as a "tilting-support".

65 The invention will be more fully understood by reference to the annexed drawing, in which

70 Fig. 1 is a view in elevation of a stationary-type soldering machine embodying the present invention;

75 Fig. 2 is a plan view of Fig. 1 partly broken away;

80 Fig. 3 is a fragmentary view of a lamp showing the position of a soldering iron and solder;

85 Fig. 4 is an enlarged detail, partly in section, showing mechanism for feeding solder;

90 Fig. 5 is a detail in section showing the container for holding the flux;

Fig. 6 is an elevational view of bulb-holding mechanism;

Fig. 7 is an end view, on a reduced scale, of the holder shown in Fig. 6;

Fig. 8 is a view in elevation of a conveyor-type machine having the present invention applied thereto, and

Fig. 9 is a more or less diagrammatic plan view of Fig. 8.

Referring more particularly to Figs 1 and 2, the invention may include a base 10 having a pair of gripping members 11 and 12 movable in bearings 13 and 14 and provided with friction pads 15 for engagement with the bulb portion of a lamp 16. The members 11 and 12 may be normally urged to grip a lamp through the action of springs 17 positioned in engagement with collars 18 on the members and with bearings 14 integral with the base 10.

An additional rest 19 to receive the base portion of the lamp may be provided. When a lamp is positioned, a solder feeding mechanism indicated as a whole by the numeral 21, may be actuated to position an end 22 of a length of solder 23 adjacent a leading-in wire 24 (see Fig. 3), which projects over a base 25 of the lamp 16. The solder-feeding mechanism (see Fig. 4) may comprise a jaw 26 pivoted at the end of a lever 28, which in turn, is secured to a shaft 29 movable in a bearing at the end of a slidable part 30. The part 30 may be movable in a guide 31 at the upper end of a carrier 31'. The shaft 29 which carries the lever 28 may be bent to provide a lever arm 32 connected by a spring 33 to an arm 34 integral with the part 30. By reason of the spring 33, the lever 28 moves to press the jaw 26 in contact with the rod of solder 23 which may pass through a passage 35 in the movable part 30.

The jaw 26 is normally in comparatively light tensional engagement with the solder 23, so that when the movable part is retreated, the jaw may slide and change its position with respect to the length of solder. During the opposite or ejecting action of the jaw, means are provided to press the jaw firmly upon the solder and thereby force it forward as the movable part 30 is moved.

The above means may comprise a plunger 36 movable in a bore 37 in the part 30 and may have a beveled end 38 adapted to engage with an end 39 of the lever 28. The plunger 36 may be provided with a depending arm 41 for engagement with a rod 42 movable in the carrier and normally urged in contact with the arm 41 by a spring 43. The spring 43, therefore, operates to effect a return movement of the solder-gripping mechanism; that is, for positioning the solder in operative relation to a lamp base. When the rod of solder 22 is in position to be gripped by the jaw 26, mechanism including a lever arm 44 is actuated to engage with the

plunger 36, causing it to engage with the lever 28 and force the jaw 26 in firm contact with the rod of solder.

The mechanism for operating the lever arm 44 may comprise a bent lever 44' pivoted on a pin 45' mounted in a bearing secured to any suitable stationary portion of the machine. An end 46' of the lever 44' may be positioned in engagement with a cam 50 secured to the cam shaft 53.

A rotation of the shaft 53 will cause the bent lever 44' to engage with a pin 51' movable in a suitable bearing to bring the pin into engagement with the lever arm 44 and move the plunger 36 in opposition to the spring 43 to eject a predetermined amount of solder. A spring 52' mounted on the pin 51' may operate to normally disengage the pin with the lever arm 44 and also actuate the bent lever to maintain the end 46' thereof in contact with the cam 50.

The reciprocatory movement of the part 30 may be limited by a pin 45 secured in the plunger 36 and disposed in a slot 46 in the part 30 and the outer movement of the slide rod 42 is limited by reason of a stop arm 47 on the lever 44 adapted to engage with a lug 48 upon the carrier 31'.

It has been found desirable to apply a flux to the solder by dipping an end thereof into a quantity of liquid flux. The flux may be carried in a container 49, mounted on a support 51, secured to the base 10. The container 49 serves as a reservoir to hold a relatively large quantity of flux and an auxiliary receptacle 52 is movable into and out from the container to carry a quantity of flux to position for the immersion of the solder therein. The auxiliary receptacle 52 provides means whereby an amount of flux is positioned for the insertion of the solder irrespective of the level of the main quantity of flux in the container. The receptacle 52 may be a relatively shallow vessel or may be in the form of a plate either solid or in the form of a mesh which, upon immersion in the flux within the reservoir, carries a sufficient amount of the flux for deposit upon the solder.

Motion may be transmitted for performing the various operations through the agency of the cam shaft 53 which is provided with a bevel gear 52' in mesh with a bevel gear 53' on a shaft 54' which may be driven by means of any suitable source of energy, such for example, as a motor (not shown). The shaft 53 is provided with a cam 54 for effecting a vertical reciprocable movement of the receptacle 52, which is fastened to a guide 55 slidable on the support 51.

Secured to the guide 55 is a slide rod 56 movable in a bearing 57 secured to the base 10. The free end of the rod 56 is provided with a roller 58 disposed in contact with one

arm of a lever 59 pivoted in a depending bearing 61. An opposite end 62 of the lever 59 is normally held in engagement with the cam 54 through the action of a spring 63, having one end secured to the rod 56 and the opposite end secured to a rigid portion of the machine. It will be evident, therefore, that a rotation of the cam 54 which may be suitably proportioned will operate to move the receptacle 52 into and out from the container 49. An actuation of the solder-feeding mechanism carrier 31' to move the solder into the flux is caused by an association of such mechanism with the cam shaft 53. The carrier is mounted on a shaft 64 journaled in a supporting block 65, which may be integral with the base 10. A lower end 66 of the shaft may project from the block and may be secured to one end of an arm 67. The opposite end 70 of the arm may be disposed in contact with a lateral cam face 68 (see Fig. 2) of a cam 69 secured to the cam shaft 53.

A spring 71 (see Fig. 2) having one end secured to the arm 67 and the other end secured to a rigid portion of the machine serves to maintain the end 70 in contact with the cam face 68. A rotary movement of the cam 69 will, therefore, effect a movement of the end 70 in a substantially horizontal plane and thus cause an oscillation of the shaft 64. This oscillatory movement of the shaft imparts a similar movement to the carrier 31 to bring the end 22 of the solder into the flux and to position over the base 25 of a positioned lamp. It will be understood that when the carrier 31' is moved to immerse the solder in the flux, the lever arm 44 travels away from the pin 51' but is returned to operative relation when the carrier has been moved to position for the ejection of solder upon the base.

When the solder is positioned, a soldering iron in the form of a heated member 72, is moved in contact with the solder to cause a fusion thereof and a deposit of a portion of solder upon the leading-in wire to secure it to the base. The iron 72 may be heated by any suitable means, as for example, a burner 73 positioned to direct a flame adjacent the operative end of the iron. The iron 72 is moved vertically to make contact with the end 22 of the solder and is carried on a cross member 74 secured to a slide-rod 75 movable in a bearing 76, which may be integral with the base 10. A lower end of the slide rod 75 is positioned in contact with a cam 77 positioned on the cam shaft 53.

A spring 78 secured to the member 74 and to the base 10, serves to maintain the slide rod in contact with the cam surface and normally operates to bring the iron 72 in contact with the end 22 of the solder, the cam 77 may be so proportioned, as to then lift the rod 75 and thus remove the iron from

its operative position. The burner 73 may be secured to a bracket 79 which may be fastened to the slide rod 75 and thus be movable with the soldering iron to maintain a constant impingement of the flame thereon.

The foregoing construction and operations relate to a machine in which bulbs are inserted and a soldering operation performed, after which the bulb is removed by an operator.

The invention may, however, be applied to a conveyor type of machine, wherein the bulbs are inserted in position for one of the soldering operations and their positions automatically change for the other soldering operation.

Mechanism for supporting a bulb in several positions is more clearly illustrated in Fig. 6, and may comprise a bracket 86 having an offset portion 87 provided with an aperture 90 to receive the axial contact of the base of a lamp from which a leading-in wire 90' projects. A concave member 88 for engagement with the bulb portion of a lamp is also provided to secure the base in contact with the offset portion 87 of the bracket 86. The member 88 may be provided with a shank 89, slidable in bearings 91 and 92 integral with the bracket 86.

A spring 93 may be mounted upon the shank and positioned between a collar 94 and the bearing 92, to normally urge the concave member to position to engage with a lamp. The bracket 86 may be provided with a hub 95 having a shaft 96 secured therein, which shaft may be journaled in and project from a bearing 97 integral with a support 98. This support may be in the form of a conveyor to be later described.

Keyed to the shaft 96 may be provided a pinion 99 disposed in mesh with a suitably positioned gear-rack 100. The gear-rack may be provided with an extension 101 having rollers 102 and 103 adjacent its lower end. The holder or bracket 86 may therefore be moved from a vertical to a horizontal position by a reciprocation of the rack 100. The rack may be operated by a box cam 104 suitably positioned on a disk 105 rotatable with a shaft 106. The bracket 86 may support a lamp with its longitudinal axis in a vertical position, until the roller 102 enters the box cam, at which time the shaft 106 may be rotated by mechanism hereinafter described.

As the cam is moved and the roller 102 traverses the inclined surface thereof, the rack 100 is raised, thus effecting an oscillation of the bracket 86 to position the lamp, held therein, with its longitudinal axis in a horizontal position.

The above mechanism for supporting a lamp may readily be applied to a conveyor type machine having a spider or conveyor 98, as illustrated in Figs. 8 and 9. The con-

veyor may be provided with any desired number of brackets or lamp holders 86 adjacent the periphery thereof. The conveyor mechanism may comprise a supporting table 5 108 having a central bearing 109, in which a vertical shaft 111 may be disposed, having its lower end secured in a step 112 and its upper end extending above the conveyor to provide a support for solder feeding mechanisms. 10

The solder feeding mechanisms employed in the conveyor type of machine may be similar to the mechanism shown in Fig. 1. As shown in Fig. 8, soldering mechanism 15 112' for soldering the circumferentially disposed leading-in wire is shown supported on a bracket 113', secured to the shaft 111. Mechanism 114' is shown for soldering the leading-in wire at the axially disposed contact of a lamp and this mechanism may be supported on a bracket 115' secured to the shaft 111. 20

The solder feeding mechanisms, when employed in the conveyor type machine, may be suitably positioned as more clearly shown in Fig. 9, to operate upon the bulbs when in their vertical and horizontal positions. 25

Mechanism for operating the various movable parts of the conveyor machine may include the vertical shaft 111 which is provided with a sleeve 113 upon which is another or outer sleeve 114, both of the sleeves being arranged to run free. The sleeve 113 is provided with a bevel gear 115, in mesh 30 with another bevel gear 116, which in turn is connected by a stub shaft 117 to a gear 118 in mesh with a gear 119 secured to a driving shaft 121 rotated by a motor 120 which is associated with this shaft by mechanism to be later described. A rotation of 40 the shaft 121 will, by reason of the aforementioned gears, transmit rotary motion to the sleeve 113. This sleeve extends upwardly through the conveyor 98 and is provided with a spur gear 122 disposed in mesh with another gear 123 carried on a supporting 45 bracket 124.

Secured to the underside of the gear wheel 123, is a bevel gear 125 disposed in mesh 50 with another bevel gear 126. The bevel gear 126 is secured to cam shaft 53, which may carry cams for operating the various movable parts of the soldering device, as shown in Fig. 2 and described in connection therewith. The sleeve 113 may also 55 have secured thereto, a gear wheel 127 in mesh with a gear-wheel 128 carried in a bracket 129 mounted on the shaft 111. The gear-wheel 128 may also be provided with a bevel gear 131 disposed in mesh with a bevel 60 gear 132, secured to a cam shaft 133. The shaft 133 may be provided with the necessary cam members to operate the various movable parts of the soldering mechanism 65 in a manner similar to that described above

for the operation of the soldering mechanism, shown in Figs. 1 and 2. The conveyor 98 is secured to the outer sleeve 114 and may be intermittently rotated.

As illustrated, this intermittent movement 70 may be accomplished in any desirable manner as for example, through the action of a disk 134 secured to the sleeve 114. The disk is provided with a plurality of lugs 135 adapted to engage with a rib 136 or a cylindrical member 137 which is mounted on 75 a shaft 137' of the motor 120. The shaft 137' is connected by bevel gears 138 and 139 to the driving shaft 121 which effects a rotation of the sleeve 113. One end of the 80 driving shaft 121 may be employed to actuate mechanism for rotating the extension 101 which carries the disk 105 upon which the box cam 104 is mounted.

The last mentioned connecting mechanism 85 may include a bevel gear 139 in mesh with a bevel gear 141 rotatable on a shaft 142 in a bearing 143, integral with the underside of the supporting table 108. The shaft 142 may also be provided with a bevel gear 90 144 disposed in mesh with a bevel gear 145 secured to the extension 101.

Suitable gear ratios may be provided so that when the roller 102 enters the cam 104, the driving shaft will operate to rotate the 95 disk 105 and thus lift the shank 101 to position the lamp holder or bracket 86 to bring a lamp secured therein with its longitudinal axis in a horizontal position. Suitably arranged upon the table 108 may be 100 provided a stationary cam 145 (see Figs. 8 and 9) having an inclined surface 147 to engage with the roller 103 of the extension 101 and thus during the travel of the conveyor, cause a downward movement of the 105 extension 101, thereby actuating the rack 100 to rotate the pinion 96 and bring a lamp in the bracket 86 to a vertical position for a soldering operation at the axially disposed contact of the base and for the convenient 110 removal of the lamp.

In practice, an operator may feed lamps to a machine by placing them in the holders when the holders are in their vertical positions. The machine may include any desired 115 number of holders and when a lamp is properly positioned, it moves a holder in operative relation to the mechanism for soldering the leading-in wire to the axially disposed contact portion of the base. 120

During the time interval when the operator is positioning a lamp, the soldering mechanism may operate simultaneously to solder the leading-in wire to an axially disposed contact and the leading-in wire upon 125 the side or periphery of the base.

The indexing mechanism may be timed to permit the soldering operation, during which time an operator removes one lamp and positions another lamp in the holder. 130

When the lamps are in their positions for unloading, they are preferably disposed vertically.

From the foregoing, it will be appreciated that the present machine facilitates the operation of soldering leading-in wires to bases and the cost of this operation is thus greatly reduced.

Although a preferred embodiment of the invention is shown and described herewith, it is obvious that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. In a soldering machine the combination with a support for a based lamp having leading-in wires disposed adjacent to different portions of the exterior of the base, a solder feeding mechanism movable to and from said base, means for moving said mechanism to position solder adjacent to a leading-in wire, a solder iron independent of said mechanism, means for heating the iron, means for moving the same to cause a portion of solder to secure the leading-in wire to said base and means for changing the position of said lamp to present another leading-in wire for a soldering operation.

2. In a soldering machine the combination with a support for a based incandescent electric lamp having leading-in wires positioned external of said base, a container having a flux therein, common means for automatically dipping solder into said flux and for positioning said solder adjacent to a leading-in wire, means for heating the solder to cause a portion thereof to secure the leading-in wire to the base and means for changing the position of the lamp to present another leading-in wire for a soldering operation.

3. A machine for soldering leading-in wires to the bases of incandescent electric lamps comprising a conveyor, means for rotating said conveyor, a plurality of pivoted lamp-supports mounted on said conveyor, mechanism for applying solder to a leading-in wire adjacent the axially disposed contact of the base of a lamp, mechanism for applying solder to the leading-in wire disposed circumferentially of the base of a lamp, means for actuating the supports for automatically moving lamps in said supports in operative relation to said soldering mechanisms and means for oscillating the lamp supports to change the positions of lamps therein for the respective soldering operations.

4. In a machine for soldering the leading-in wires to the base portions of incandescent electric lamps, the combination with a lamp-support comprising a bracket pivoted at one end thereof, a projection on said bracket to receive the base portion of a lamp, a concave

member and means for resiliently retaining said member in contact with the bulb portion of said lamp to retain the lamp in said bracket, a pinion associated with said bracket at the pivot point thereof, a rack engaged with said pinion and means for reciprocating said rack to effect an oscillatory movement of said bracket to position lamps for soldering operations.

5. In a machine for soldering the leading-in wires to the base portions of incandescent electric lamps, the combination with a lamp-support comprising a bracket pivoted at one end thereof, a projection on said bracket to receive the base portion of a lamp, a concave member and means for resiliently retaining said member in contact with the bulb portion of said lamp to retain the lamp in said bracket and means associated with said bracket to effect a movement thereof from a vertical to a horizontal position to facilitate soldering operations.

6. In a machine for soldering the leading-in wires to the base portions of incandescent electric lamps, the combination with a lamp support comprising a bracket pivoted at one end thereof, a projection on said bracket to receive the base portion of a lamp, a concave member and means for resiliently retaining said member in contact with the bulb portion of said lamp to hold the lamp in said bracket, a pinion associated with said bracket at the pivot point thereof, a rack engaged with said pinion, an extension on said rack having a roller, a cam member and means for rotating said cam member to engage said roller to move said support to a horizontal position to facilitate soldering operations.

7. In a machine for soldering the leading-in wires to the base portions of incandescent electric lamps, the combination with a lamp support comprising a bracket pivoted at one end thereof, a projection on said bracket to receive the base portion of a lamp, a concave member and means for resiliently retaining said member in contact with the bulb portion of lamp to hold the lamp in said bracket, a pinion associated with said bracket at the pivot point thereof, a rack engaged with said pinion, an extension on said rack having a roller, a cam member, means for rotating said cam member to engage said roller to move said support to a horizontal position and means for moving said rack to a vertical position to facilitate soldering operations.

8. In a machine for soldering the leading-in wires to the base portions of incandescent electric lamps, the combination with a lamp support comprising a bracket pivoted at one end thereof, a pinion associated with said bracket, a rack engaged with said pinion, an extension on said rack, rollers upon said extension, a rotatable cam, means for rotating said cam to engage one of said

rollers to bring the rack to a horizontal position for a soldering operation and a stationary cam to engage another roller to bring the rack to another position for another soldering operation.

9. A machine for soldering leading-in wires to the bases of incandescent electric lamps comprising a conveyor, a plurality of pivoted lamp supports mounted on said conveyor, means for moving the lamp supports alternately from vertical to horizontal positions during a movement of the conveyor, means for soldering leading-in wires to one portion of bases of said lamps when the lamps are in their horizontal positions and means for soldering leading-in wires to another portion of the bases when the lamps are in their vertical positions.

10. A machine for soldering leading-in wires to the bases of incandescent electric lamps comprising a conveyor, a plurality of pivoted lamp supports mounted on said conveyor, means for rocking said supports to alternately move lamps from vertical to horizontal positions, a plurality of solder feed mechanisms, means for applying a flux to solder supported in said mechanisms, means for actuating said lamp supports to alternately position lamps in horizontal and vertical positions in operative relation to said solder mechanism.

11. A machine for soldering a leading-in wire to a base of an incandescent electric lamp comprising a conveyor, means for rotating the conveyor, a movable lamp support mounted on the conveyor, mechanism for applying solder to the leading-in wire adjacent to the axially disposed contact on the base of a lamp, means for changing the position of said support after the last mentioned soldering operation, mechanism for applying solder to the leading-in wire dis-

posed circumferentially of the base of the lamp and means for actuating the conveyor to convey a supported lamp from one soldering mechanism to another.

12. A machine for performing a lateral and axial soldering operation on an object comprising a movable support for the object, a soldering means, and means for actuating said support to alternately position said object in operative relation to said soldering means for performing a lateral and axial soldering operation.

13. A machine for performing a lateral and axial soldering operation on an electric incandescent lamp comprising means for supporting a lamp, a soldering device, and means for changing the relative positions of said device and said support to alternately position a lamp for a lateral and axial soldering operation.

14. A machine for soldering leading-in wires to the sides and ends of lamp bases comprising supports for said bases, a plurality of soldering devices, means for moving said supports from one soldering device to another and means for changing the relative positions of said bases during said movement.

15. A machine for soldering leading-in wires to the sides and ends of lamp bases comprising a plurality of oscillating supports for said bases, a plurality of soldering devices, means for moving said supports from one soldering device to another, and means for oscillating said supports during their movement between the soldering devices to present different surfaces of the bases to the soldering devices.

In testimony whereof I have hereunto subscribed my name this 19th day of February, 1924.

HARRY DE FOREST MADDEN.