April 17, 1951 F. E. BAKANAU 2,549,359

MACHINE FOR SEALING IN MINIATURE INCANDESCENT LAMP BULB MOUNTS

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Fig. 1.

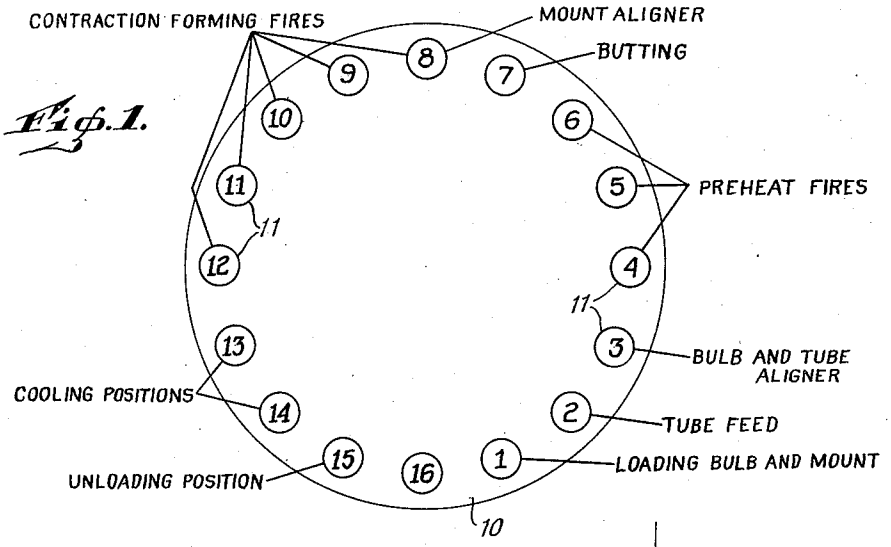


Fig. 2.

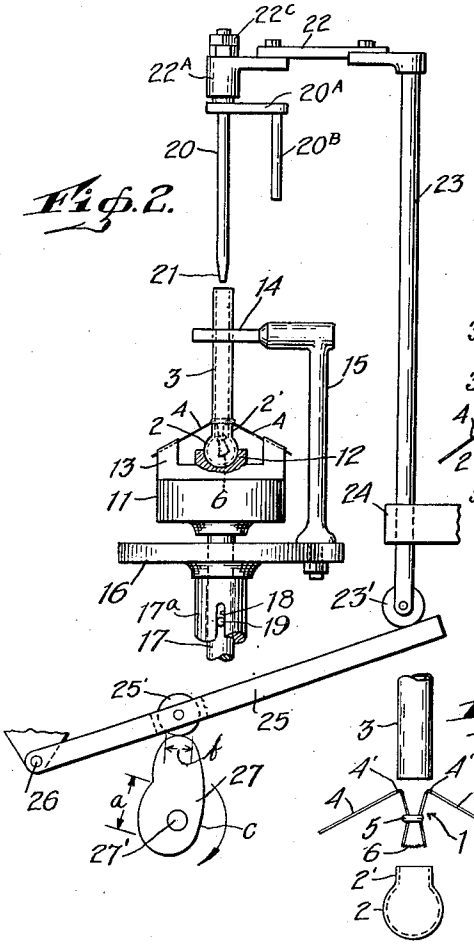


Fig. 3.

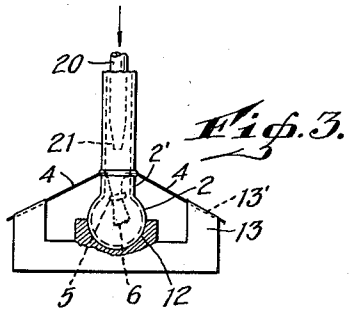


Fig. 6.

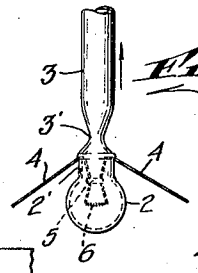


Fig. 4.

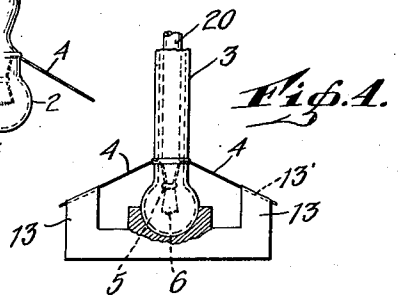
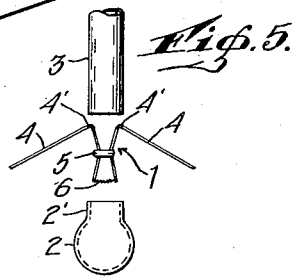


Fig. 5.



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MACHINE FOR SEALING IN MINIATURE INCANDESCENT LAMP BULB MOUNTS

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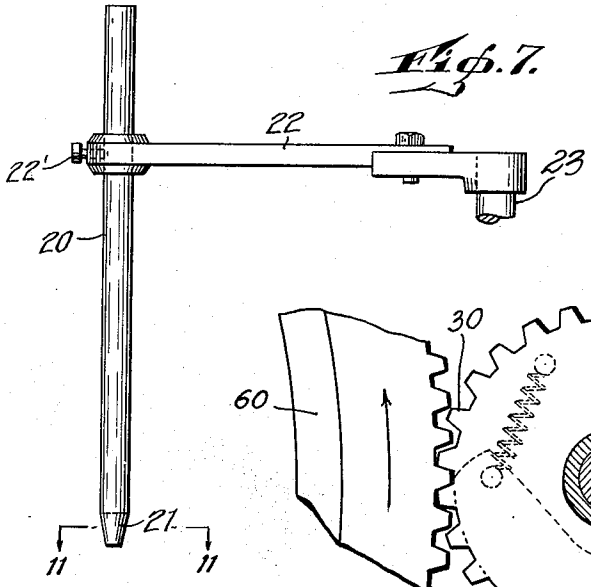
Fig. 7.



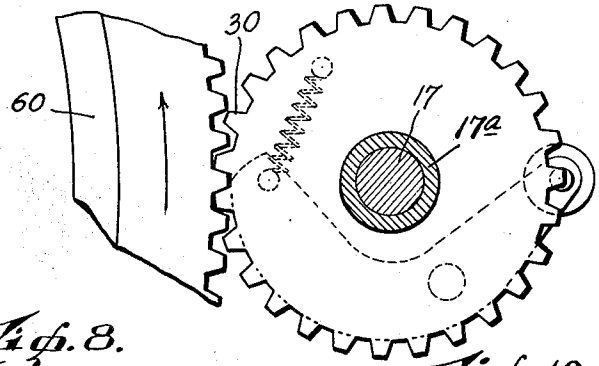


Fig. 10.

Fig. 8.

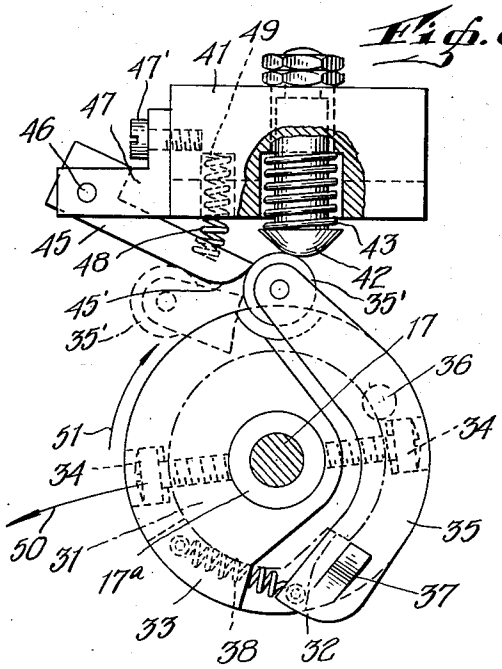
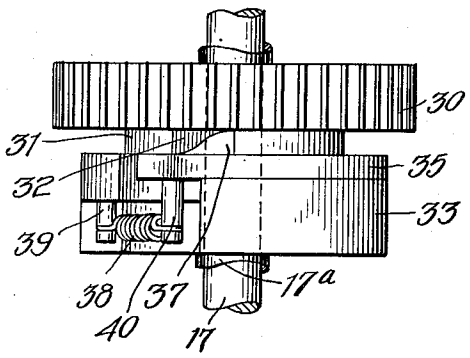


Fig. 9.



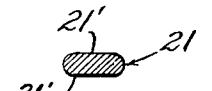


Fig. 11.

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MACHINE FOR SEALING IN MINIATURE INCANDESCENT LAMP BULB MOUNTS

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Application February 7, 1945, Serial No. 576,639

1 Claim. (Cl. 49—2)

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This invention relates to sealing in machines for miniature incandescent lamp bulbs and particularly bulbs of the butt seal type.

In sealing in mounts of this character the bond between the mount and the glass butt seal is sometimes imperfect and also the mount is often off-center with respect to the bulb.

One object of the invention is a sealing in machine for mounts of this character whereby a more perfect and satisfactory bond is obtained between the mount and the seal.

A further object of the invention is a sealing in machine for mounts of this character whereby the mounts are uniformly centered or positioned with respect to the bulbs.

A further object of the invention is a novel and improved machine for sealing in mounts in bulbs of the butt seal type which is characterized by its simplicity in construction and operation and by the efficiency and effectiveness with which the mounts are sealed, positioned in the bulbs and the lead wires bonded to the seals.

Further objects of the invention will hereinafter appear.

For a better understanding of the invention reference may be had to the accompanying drawings forming a part of this application, wherein—

Fig. 1 is a diagram in plan indicating the stations of a sealing in machine embodying the invention;

Fig. 2 is an elevational view of a part of the machine;

Figs. 3 and 4 are views corresponding to Fig. 2 showing different stages in the operation of the machine;

Fig. 5 is an exploded view of a bulb, a mount and a tube which are sealed together in the machine;

Fig. 6 is a view of a bulb with the mount sealed therein, and the contraction formed as explained subsequently;

Fig. 7 is an elevational view of a modified part of the mechanism;

Fig. 8 is a diagrammatic view of another part of the mechanism cooperating with that shown in Fig. 7;

Fig. 9 is an elevational view of the drive and clutch control for the embodiment of Figs. 7 and 8;

Fig. 10 is a plan view with certain parts in section showing the drive;

Fig. 11 is an enlarged sectional view along the line 11—11 of Fig. 7.

The invention relates to the sealing in of a mount 1 into a bulb 2 by effecting a butt seal between the end of a glass tube 3 and the neck

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2′ of the bulb 2. These three elements are shown in Fig. 5. The complete butt sealed bulb is illustrated in Fig. 6. The mount 1 comprises a pair of lead-in wires 4, a glass bead 5 and a filament 6. The lead wires 4 are sealed into the bead 5 and slightly diverge from each other up to the hook parts 4′. The mount 1 is assembled upon the bulb 2 with its filament 6 and bead 5 within the bulb and with the leads 4 having their hooks 4′ resting upon the periphery of the neck 2′ of the bulb. In that position the tube 3 is brought into abutting relation with the end of the neck 2′ of the bulb and the seal is effected.

The machine embodying the invention comprises a conventional indexing turn-table or turret diagrammatically shown at 10, the indexing and operating means being omitted for convenience in illustration. This turret is provided with a plurality of bulb and mount holders or heads 11, there being in the particular embodiment shown 16 of these holders. Each bulb holder comprises a spherical socket or recess 12 for the reception of the similarly shaped bulb 2 and a pair of diametrically opposite upwardly extending arms 13 with grooves or recesses 13′ in their free ends for receiving the lead-in wires 4, these grooves being inclined downwardly and outwardly as indicated at 13′ to conform generally to the angular relation of the projecting ends of the lead-in wires 4. For each bulb holder there is provided a member 14 for holding a glass tube 3 in alinement with the neck 2′ of the bulb. This holder 14 may be of any conventional form and is diagrammatically illustrated. It is carried by a bracket member 15 which is mounted at its lower end upon the rotatable disc part 16 fastened to a hollow shaft 17A suitably journaled in the turn-table. Each bulb holder 11 is mounted on a vertical shaft 17 projecting down through the part 16 and shaft 17A whereby the holder 11 may be lowered slightly with respect to the tube holder 14 for a purpose hereinafter set forth, the shaft 17A being provided with a slot 18 and the shaft 17 with a pin 19 for permitting relative longitudinal movements. The bulb holder and the tube holder are rotated in unison about a vertical axis extending through the center of the rod 17 but for convenience in illustration this operating means is omitted from Fig. 2. As the driving connection between the shaft 17 and the part 16 is a positive one, the rod 20 that is adapted to engage the filament mount as will be described must also be rotated.

In Fig. 1 I have indicated the sixteen stations at which each holder is stopped between indexing operations of the turret or turn-table. At sta-

tion 1 the bulbs 2 and the mounts 1 are assembled and positioned either manually or automatically upon the holder 11. At station 2 the glass tube 3 may be fed either manually or by machine and at station 3 the tube 3 and the bulb 2 are accurately alined, with the lower end of the tube 3 resting over the hooks 4' of the lead-in wires and with the hooks resting upon the rim of the above neck 2'. At stations 4, 5 and 6 the lower end of the tube 3 and the upper end of the neck 2' of the bulb are preheated by suitable fires to soften the glass at the seal, and at station 7 the actual butt sealing of the tube 3 to the neck 2' of the bulb takes place.

The mount 1 may be off-center with respect to the bulb 2 at this station 7 as indicated in Figs. 2 and 3 and at station 8 there is provided a special means for both straightening and centering the filament of the mount and working the soft glass at the seal to effect a more perfect bond. This is effected by inserting a wedge shaped pin down through the tube 3 to engage and slightly move the mount. This pin is indicated by the numeral 20 which has a wedge shaped end 21 whose width is narrower than the distance between the lead wires at the top of the bead. This glass working and centering pin 20 is mounted on a bracket 22 which in turn is fastened to the upper end of a reciprocable rod 23, the latter being guided in any suitable manner for up and down movements, as for example by means of a guide bearing 24 fixed to a fixed part of the machine. After each of the holders moves to station 8 the reciprocating rod 23 is caused to lower the wedge pin 20, 21 to perform its glass working and filament centering functions. In the particular embodiment shown, the rod 23 and the wedge pin 20 are lowered by gravity and are held in the uppermost position during the indexing operation by means of a lever 25 pivoted at 26 to a fixed part of the machine with the free end thereof engaging a roller 23' carried by the lower end of the push rod 23. This lever 25 in turn is operated by a cam 27 which engages a roller 25' carried by the lever 25. This cam 27 is operated synchronously with the machine to lower the wedge pin 20 and to lift the same to the uppermost position while the holder is stationary at station 8. During the short period that the machine is indexing, as indicated above, the wedge pin 20 is held in a position to clear the incoming and outgoing tubes 3.

The cam 27 may be of any suitable conformation for accomplishing the purpose. A cam approaching the outline shown has been used. It comprises a combination of merging curved surfaces. The part *a* of the cam is on one radius and the part *b* is on a larger radius than that of the part *a*. The parts *a* and *b* are connected on both sides with merging curved surfaces of the general character indicated.

In the embodiment shown in Fig. 2 the head 11 is rotating at the station 8 and accordingly it is desirable to have the wedge 20, 21 rotate at the same speed and in unison therewith at that station since the drive to plate 16 can not be interrupted. For this purpose the rotating wedge 20, 21 is held in a round shaft holder 22C (as for example by a set screw not shown). This round shaft holder rotates in a bushing or bearing located in a boss 22A which is carried by the bracket 22. Attached to the shaft holder 22C is a driving pin 20B which is fastened to and carried by an arm 20A, the latter being fastened directly to the part 22C. When the push rod 23 is lowered at the station 8 the driving pin 20B is engaged by the tubulation holder 14 to rotate the wedge 20, 21.

When the sealing machine is indexing, the roller 25' is in contact with the cam 27 at the part *b* thereby elevating the wedge 20 and the arm 20B above the tubulation and holder 14. When the roller is in contact with the cam outline part *a* the lower end of the engaging arm 20B is permitted to drop below the level of the holder 14 so as to enable the latter to rotate the wedge. During the time of travel of the roller 25' along the parts *a* and *c* of the cam 27 the rotating holder 14 engages the driving arm 20B to rotate the wedge 20, 21 in unison therewith. This permits a definite orientation of the sides 21' of the wedge 20 and the mount lead wires 4, the orientation being such as indicated in Fig. 2 that the wedge end 21 enters the bulb neck 2' with the sides 21' of the wedge disposed toward the wires 4. In the vicinity of the point *c* of the cam 27 the wedge 20 is lowered sufficiently to go between the lead wires to the proper or desired depth and to perform the straightening and glass-working function.

In the embodiment of Figs. 7, 8 and 9, which is the present preferred embodiment, the rotation of the head 11 is arrested at the mount alining station 8 so that at this station neither the head 11 nor the wedge 20, 21 is rotating. This is accomplished by the interposition of a releasable clutch between the part 16 and the driving means therefor. The machine in both modifications is provided with a conventional drive for the spindle 16, 17A comprising a clutch drive that engages a free running gear to the main drive or bull gear for rotation of the sealing-in heads 11. At station 8 a conventional clutch disengaging device is utilized for arresting the rotation of the head 11 and the latter is locked in a certain prearranged angle during the stay at this station. This eliminates the need for the rotation of the wedge 20, 21 and the need for a bearing 22A and the driving arms 20A and 20B. Referring to Fig. 7 the wedge 20, 21 is now locked or fastened at its upper end in any suitable manner (as by the set screw 22') to the bracket arm 22 in the same desired relative position as the locked sealing-in head so it can properly enter the tube 3 and straighten the mount 1 and perform its glass-working function.

Figs. 8 and 9 illustrate somewhat diagrammatically the clutch drive which is provided for each of the heads, and the clutch disengaging and head orienting means at the station 8. A gear wheel 30 is driven continuously at a uniform speed by a bull gear (omitted from the drawings for convenience in illustration). This gear wheel rotates freely on the shaft 17A. It is provided on one side thereof with a clutch or coupler part 31 having a coupling notch 32 on one side and in the periphery thereof with which a driven clutch member rigidly fastened to the shaft 17A is adapted to engage to rotate the shaft 17A in unison with the gear 30. This clutch member is indicated generally by the numeral 33. It comprises a main body which is fastened to and adjusted upon the shaft 17A by means of set screws 34. The main body of the clutch member carries a clutch arm or lever 35 which is pivotally fastened to the main body for pivotal movements in a plane at right angles to the shaft 17A, the pivot pin fastening being indicated at 36. The two arms of this lever 35 on opposite sides of the

pivotal axis 36 are disposed substantially at right angles with one arm turning inwardly toward the shaft 17A from the axis 36 and this latter arm of the lever carries an ear or clutch tooth 37 which in one position of the lever 35 engages the notch 32 on the gear 30 and in another position is disengaged therefrom. A spring 38 biases this arm of the lever 35 in an inward direction to cause the coupling tooth 37 to enter the path of the coupling notch 32. This spring may be fastened in any suitable manner, as for example by being fastened at one end to a pin 39 carried by the main body of the clutch and at its other end to a pin 40 fastened to the lever 35. The free end of the lever 35 carries a roller 35' at its outer end and means are provided at station 8 for engaging this roller and operating the lever 35 against the tension of the spring 38 to disengage the clutch. This means at station 8 comprises a fixed frame member 41 which may be mounted on the stationary part of the frame of the machine in any suitable manner. It carries a means for engaging the free end of the lever 35 to disengage the clutch and in the particular embodiment shown a throw-out plunger 42 has its projecting end disposed in the path of the roller 35' for engaging the latter and disengaging the clutch. This throw-out plunger is biased by a spring 43 disposed in a recess in the frame member 41 whereby the plunger is yieldingly held in the path of the free end of the lever 35. When a head is indexed to the station 8 the rotation of the member 33 with its clutching lever 35 is arrested by the free end of the lever 35 engaging the throw-out plunger 42 and the rotation of the head is stopped in the position shown in Fig. 8. To prevent accidental backward rotation of the clutch and the shaft 17A when its rotation is suddenly arrested by the throw-out plunger 42 a safety pawl 45 is provided which is pivotally mounted at 46 to a bracket arm 47 fastened to the frame member 41. The free end of this pawl 45 is urged to a position where it is in the path of the roller 35' by a spring 48 having one end fastened to the pawl 45 and the other end disposed in a recess 49 formed in the frame member 41. The arrow 51 indicates clockwise rotation of the shaft 17A. The roller 35' engages the pawl 45 and presses the same inwardly against the tension of the spring 48 and when the roller 35' passes the pawl 45 and engages the throw-out plunger 42 to arrest the rotation, the end 45' of the pawl 45 is in a position to engage the roller 35' on its back side so as to prevent backward rotation of the shaft 17A. The head 11 is thereby arrested in its rotation and held in position wherein it is properly oriented with respect to the wedge 20, 21. The pawl 45 while preventing backward rotation of the clutch and the shaft 17A when the latter is disengaged from the driving gear 30 does not interfere with the indexing of the head to the next station. The arrow 50 indicates the direction of indexing movement of the head, and the arrow 51 indicates the direction of rotation of the head when the clutch is engaged. The full line position of the clutch lever 35 in Fig. 8 shows it at the moment of disengagement from the notch 32 of the gear 30, 31, and the dotted position when the clutch is engaged.

The soft glass at the seal is worked so as to make a better bond between the lead-in wires 4, 4' and the glass. This is effected by the slight movement of the lead wires or the hooks 4' by means of the end 21 of the wedge pin. For example, in one type of miniature bulb the pin

engages the bead 5 of the mount and moves it downwardly approximately .010 inch. The locus of the pin is along the vertical axis of the bulb and this operation results in centering the filament 6 in the bulb and in moving the lead wires through the soft glass in the butt seal. The soft glass is thus simultaneously worked to improve the bond between the leading-in wires and the glass. In the particular embodiment of the invention the width of the wedge 21 is from .003 to .006 inch narrower than the distance between the lead wires at the top of the bead 5.

With the soft glass thus worked and the filament 6 of the mount centered with respect to the bulb at station 8, at the next indexing operation the holder goes to station 9 and then successively to station 10, station 11 and station 12. At these stations are disposed contraction-forming fires for heating the tube 3 over a small area above the butt seal and forming a contraction 3' in the tube for sealing-off purposes. At one or more stations, as for example at stations 10, 11 and 12, the holder 11 is lowered slightly with respect to the tube holder 14 to assist in forming the contraction 3'. This is conventional equipment and is omitted from the drawing for convenience. At stations 13 and 14 the butt seal is gradually cooled. Stations 15 and 16 are unloading stations. The finished bulb assembly is indicated in Fig. 6.

By means of the apparatus described rejects due to improper positioning of the mounts and poor bonds or seals are very substantially reduced, and bulbs are obtained which are characterized by the precision positioning of the filaments, by the production of bulbs of uniform quality and by a minimum of failures in use.

I claim:

In the manufacture of an incandescent lamp wherein an exhaust tube is welded to the neck of a bulb with a mount positioned in the bulb and the filament leading-in wires of the mount pass through the weld and then converge forwardly into the bulb to support the filament therein, means for holding the bulb, means for holding the exhaust tube in alinement with the bulb neck, means for alining the leading-in wires and the filament carried thereby relative to the bulb, comprising a pin movable through the exhaust tube and into the bulb, a wedge-shaped end portion on said pin with the included angle of the wedge substantially equal to the included angle between the converging part of the leading-in wires, and means for moving the pin through the exhaust tube with said end portion forcibly contacting said convergent part of the leading-in wires and thereby aline the filament with respect to the bulb.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
966,571	Mickey	Aug. 9, 1910
1,491,436	Strickland	Apr. 22, 1924
1,716,167	Grogan	June 4, 1929
1,742,153	Stiles et al.	Dec. 31, 1929
1,842,184	Madden	Jan. 19, 1932
2,006,568	Gustin et al.	July 2, 1935
2,023,628	Van Sant	Dec. 10, 1935
2,185,704	Donovan et al.	Jan. 2, 1940
2,230,075	Chase	Jan. 28, 1941