April 4, 1961 C. J. SCHNERING 2,977,667

TOP LEAD BENDER AND ABRADER

Filed April 6, 1959

FIG. 1.

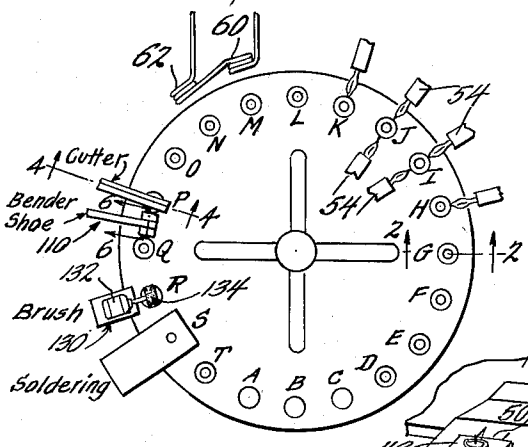


FIG. 2.

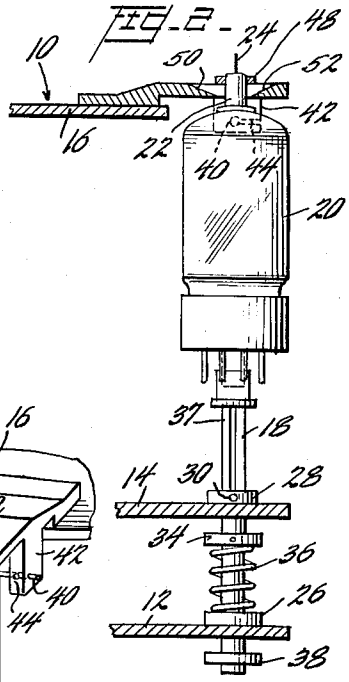


FIG. 3.

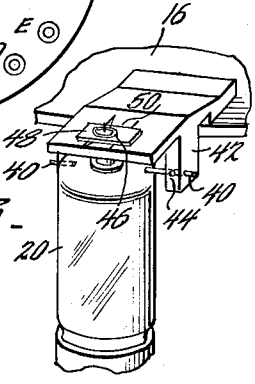


FIG. 4.

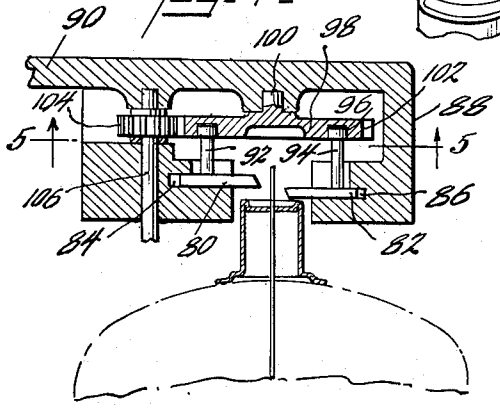


FIG. 5.

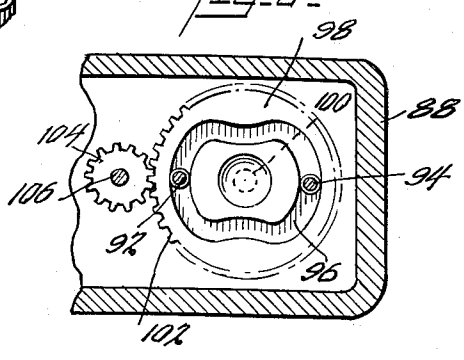


FIG. 6.

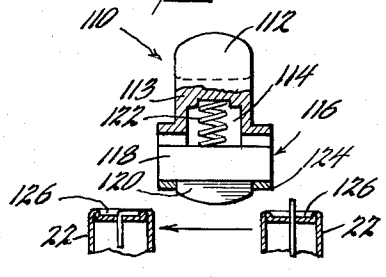
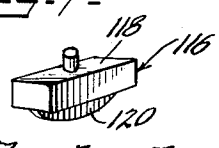


FIG. 7.



INVENTOR

Charles J. Schnering,

BY Michael Hertz,

ATTORNEY

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TOP LEAD BENDER AND ABRADER

Charles J. Schnering, Lock Haven, Pa., assignor to Sylvania Electric Products Inc., a corporation of Delaware

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4 Claims. (Cl. 29—25.2)

This invention relates to mechanism for ensuring a good soldered joint between a lead and a metal cap threaded over the lead and mounted on the bulb portion of an electron tube.

In some types of electron tubes certain voltages are fed to electrodes within the tubes by leads traversing the base of the tube and a high voltage is fed to an electrode within the tube, as to an anode, by making electrical connection with a metallic cap mounted on the bulb of the tube, usually surrounding the area where the exhaust tubulation had been pinched off after tube evacuation. In the prior art, the lead from the anode was threaded through the cap and then either directly soldered or welded to the cap.

It is a main objective of this invention to provide a better electrical connection between lead and cap than had been attained in the prior art.

Other objectives will become apparent upon consideration of the following specification when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a diagrammatic representation of a machine embodying the invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of a portion of the machine showing how the upper end of a bulb is supported.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a section on the line 6—6 of Fig. 1 and Fig. 7 is a perspective view of the wire bending shoe.

This invention is an improvement on the type of machine disclosed in the patent to Laubscher, 2,829,941.

In general, the machine comprises an indexible turret 10 having three decks 12, 14, and 16 at different horizontal levels. Spindles 18, traversing decks 12 and 14, are spring urged upwardly to hold a capped bulb 20, of the electron tube to be processed, in proper position with respect to the turret and with its bulb part and cap centered by appropriate elements on the upper deck 16, these elements being opposed to the spindles. Each of the caps 22 prior to assembly over the lead-in wire 24 has been internally coated with a resin so that the cap would adhere to the top of the bulb when the resin is suitably baked. In the final stages of the machine, the caps and lead-in wires are soldered together.

Each of the spindles 18 passes through a bushing 26 fast on the lowermost deck 12 and through a second bushing 28 fast on the mid deck 14. In the bushing 28 there is a screw 30 passing radially through the bushing in the nature of a key, and extending into a longitudinal key way or slot 37 in the spindle. Thus the spindle while free for reciprocation in the bushings 26 and 28 will be held against rotation. To urge a spindle to a raised position, it is provided with a collar 34 suitably secured to the spindle against movement with respect thereto, and a compressed coil spring 36 reacts between the bushing 26 and collar 34. The spring will urge the spindle upwardly until a stop collar 38, fast on the spindle, engages the under surface of the deck 12, when there is no bulb on the spindle. If a bulb be located on the spindle, the dome of the bulb will abut bulb centering and upward movement limiting pins 40 passing through a metallic bracket 42 mounted on any suitable manner on the top deck 16, these pins being held in adjusted position by locking screws 44. Before baking a cap, it is centered, independently of the bulb, by the snug but frictionless insertion of the cap into an opening 46 in a plate 48 fastened in any convenient manner on the bracket 42. The bracket is suitably channeled as at 50 and 52 to allow flames of baking-on burners 54 to strike the cap and set the resin. The baking-on mechanism, per se, forms no part of this invention and therefore no further description thereof appears to be necessary.

Subsequent to the baking of the resin in the cap, the lead-in wire was soldered or welded to the cap. Flashing of the getter within the bulb could take place prior to cap soldering as in the Laubscher patent or even after removal from the cap attaching machine. In the prior art, the resin loaded cap was threaded over the wire prior to positioning of the tube on the spindle, with the wire just protruding through the cap. With this invention, the tube is inserted on the spindle as before, but the wire extends a considerable distance above the cap. Means are provided on the machine to cut this wire at a distance considerably above the cap to allow for enough wire to be bent against the top surface of the cap. Furthermore means are provided for abrading the bent wire and adjoining cap area prior to the soldering of the wire to the cap.

Since there are many idle positions on the machine of the type illustrated in Laubscher, it was found feasible to shift getter flashing coils such as are illustrated at 60, and 62 to positions closer to where the caps are baked onto the bulbs. For example, with a twenty spindle machine, the spindles could be loaded at any of stations A to G in Fig. 1, unloaded at stations T to F, and the getter flashing mechanism described and claimed in the Laubscher patent could be located at stations M and N. At a subsequent station, for example, station P, a pair of cutter blades 80 and 82 are mounted in slideways 84 and 86 attached to the lower ends of a U shaped bridge 88 secured to a fixed portion 90 of the machine, the blades having pins 92 and 94 extending through slots in the guideways and into a cam grove 96 in a cam plate 98 pivoted on a pin 100 fast in the bridge 88. The cam plate has peripheral teeth 102 meshing with a gear 104 fixed on a shaft 106 driven concomitantly with the shaft which, through indexing mechanism, drives the turret. Since the turret drive, per se, forms no part of the invention, it is not shown. The cam 96 is orientated as to cause rapid approach and receding movement of the blades during each dwell of the turret. Between the selected cutter station and next station, i.e., between stations P and Q, is fixed a wire bending mechanism 110. This mechanism comprises an L-shaped support 112 fixed to the stationary frame of the machine, the lower end of a vertical arm 113 of the support being recessed, as at 114, to slidably support a wire bending shoe 116 having a parallelepiped portion 118 riding in the recess and an arcuate shoe 120 of less width than and arranged longitudinally centrally of the parallelepiped projecting downwardly from the portion 118 within the recess 114. A stiff spring 122 thrusts the shoe against the protruding cut off end of lead-in wire 24 as the turret indexes, and bends the top end of the wire into a horizontal plane. The shoe may be made of case hardened material. A cover plate 124 through which the shoe extends limits the downward displacement of the shoe. The cap itself, for best results, is dished as indicated at 126, and the wire when bent will lie wholly in the dished portion. If the cap be not dished, if that be desired, the wire will lie on the flat

face of the cap. At a subsequent dwell station of the turret, for example station R, there is fixed to the frame of the machine a support arm **130** carrying a fractional horse power electric motor **132** driving a disc type wire brush **134**. Preferably and for the sake of simplicity, the motor is continuously driven although obviously it could be wired in with index movement of the turret to be driven only during dwells of the turret. The wire bristles will engage the exposed surfaces of the bent over wire **24** as well as the adjacent top surface of the cap, and will clean and abrade the same, preparatory to the application of flux and solder to the joint between wire and cap. The application of flux and solder may be effected at station S by any suitable mechanism. In so far as this invention is concerned, the application of flux, solder and heat at station S may be considered as done by hand and so no specific mechanism for soldering is illustrated.

In operation, an operator will unload a finished tube at station T or at the next few stations, by depressing the bulb **20** and spindle **18** against the action of spring **36** and remove the tube by a tilting action. In somewhat similar fashion the tubes with resin loaded caps **22** loosely threaded over the lead-in wires **24** are loaded into the machine at stations A to G. On indexing of the turret, the burners **54** will play against the caps and ensure affixing them to the bulbs. As the turret continues to index, the getter within the bulb will be flashed by the coils **60** and **62**. At a subsequent dwell of the turret the wire **24** will be cut by the reciprocating blades **80** and **82**. Then as the turret indexes, the end of a wire **24** protruding through the cap will be engaged by the shoe **120** and will be bent into tight engagement with the top surface of the cap or with the dished portion of the cap. Next the brush will clean and abrade the exposed wire and adjacent cap areas. At a subsequent station the cap and wire are intimately and cleanly joined by a soldering operation.

Having thus described the invention, what is claimed is:

1. In a machine for securing together a lead-in wire traversing a bulb and an electrode connecting cap mounted on the bulb and threaded over the wire with a portion of the wire extending above the cap, an indexible turret, centering structure on the turret adapted to engage the cap to locate it with reference to the turret, a wire bending mechanism comprising a fixed number, located above the turret, said fixed member carrying a shoe adapted to engage a wire and bend the same against the cap, and wire and cap cleaning mechanism located above the turret at an index position of the turret beyond the wire bending mechanism to enable the bent and cleaned wire to be secured to the cap by a subsequent soldering operation.

2. In a machine for securing together a lead-in wire traversing a bulb and an electrode connecting cap mounted on the bulb and threaded over the wire with a portion of the wire extending above the cap, an indexible turret, centering structure on the turret adapted to engage the cap to locate it with reference to the turret, a wire bending mechanism including an arcuate shoe located at a fixed station above the turret adapted to have its arcuate portion engage a wire and bend the same against the cap and between stations when the turret is at an indexed position, and wire and cap cleaning mechanism located above the turret at an index position of the turret beyond the wire bending mechanism to enable the bent and cleaned wire to be secured to the cap by a subsequent soldering operation.

3. In a machine for securing together a lead-in wire traversing a bulb and an electrode connecting cap mounted on the bulb and threaded over the wire with a portion of the wire extending above the cap, an indexible turret, centering structure on the turret adapted to engage the cap to locate it with reference to the turret, a wire bending mechanism located at a fixed station above the turret adapted to engage a wire and bend the same against the cap and between stations when the turret is at an indexed position, said wire bending mechanism including an arcuate shoe adapted to engage the wire as the turret indexes and spring means to urge the shoe downwardly against the wire and cap, and wire and cap cleaning mechanism located above the turret at an index position of the turret beyond the wire bending mechanism to enable the bent and cleaned wire to be secured to the cap by a subsequent soldering operation.

4. In a machine for securing together a lead-in wire traversing a bulb and an electrode connecting cap mounted on the bulb and threaded over the wire with a portion of the wire extending above the cap, an indexible turret, centering structure on the turret adapted to engage the cap to locate it with reference to the turret, a wire bending mechanism located at a fixed station above the turret including a shoe with an arcuate wire engaging portion adapted to bend the same against the cap and between stations when the turret is at an indexed position, and wire and cap cleaning mechanism including a motor driven wire brush with the bristles of the brush in position to engage both the bent wire and cap, said cap cleaning mechanism being located above the turret at an index position of the turret beyond the wire bending mechanism to enable the bent and cleaned wire to be secured to the cap by a subsequent soldering operation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,739,506	Deibel	Dec. 17, 1929
1,760,507	Loebe et al.	May 27, 1930
2,069,386	Palucki	Feb. 2, 1937