July 31, 1962 D. G. NOILES ET AL 3,046,876

APPARATUS FOR MANUFACTURING ELECTRONIC TUBES

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Fig. 1.

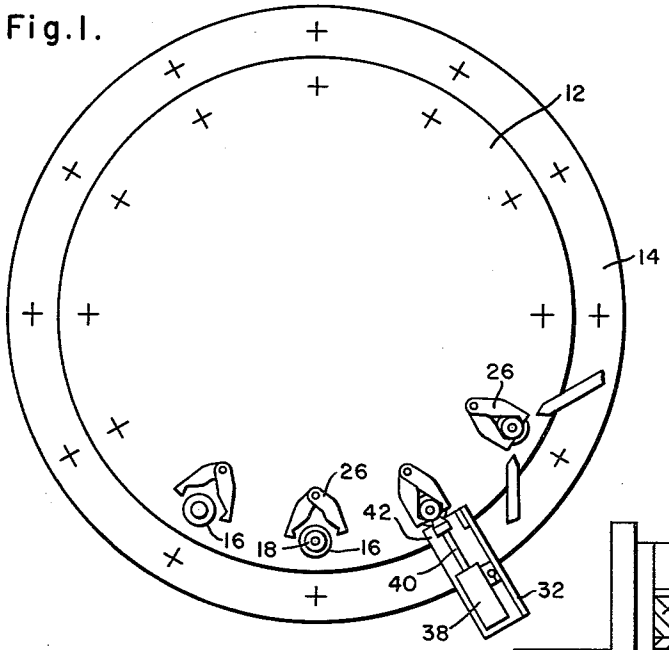


Fig. 5.

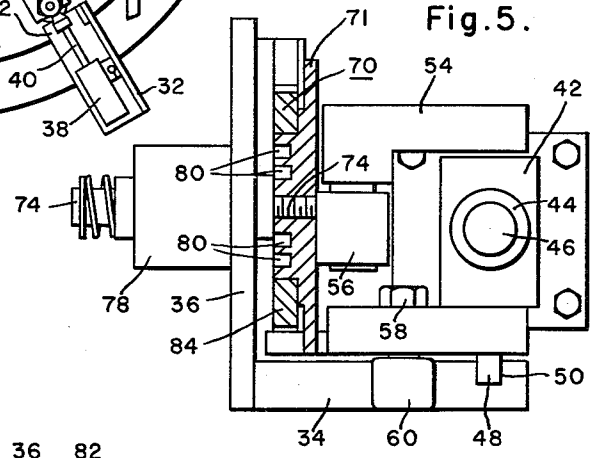
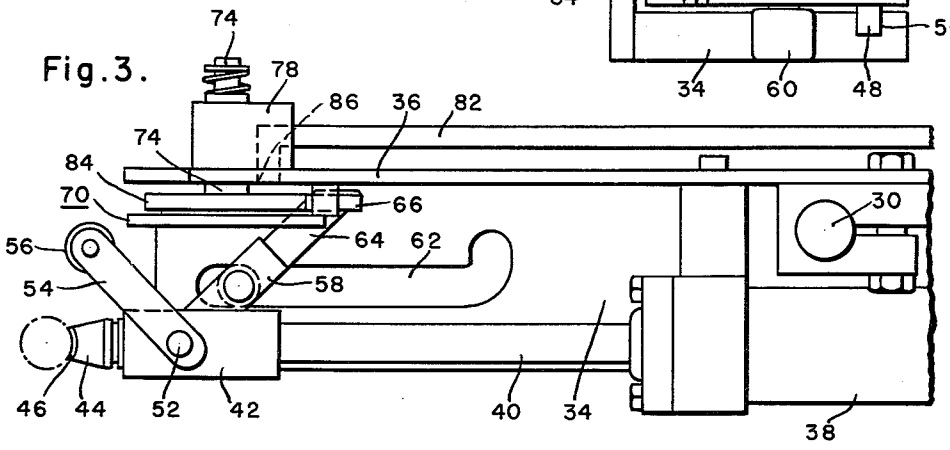


Fig. 3.



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APPARATUS FOR MANUFACTURING ELECTRONIC TUBES

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Fig. 2.

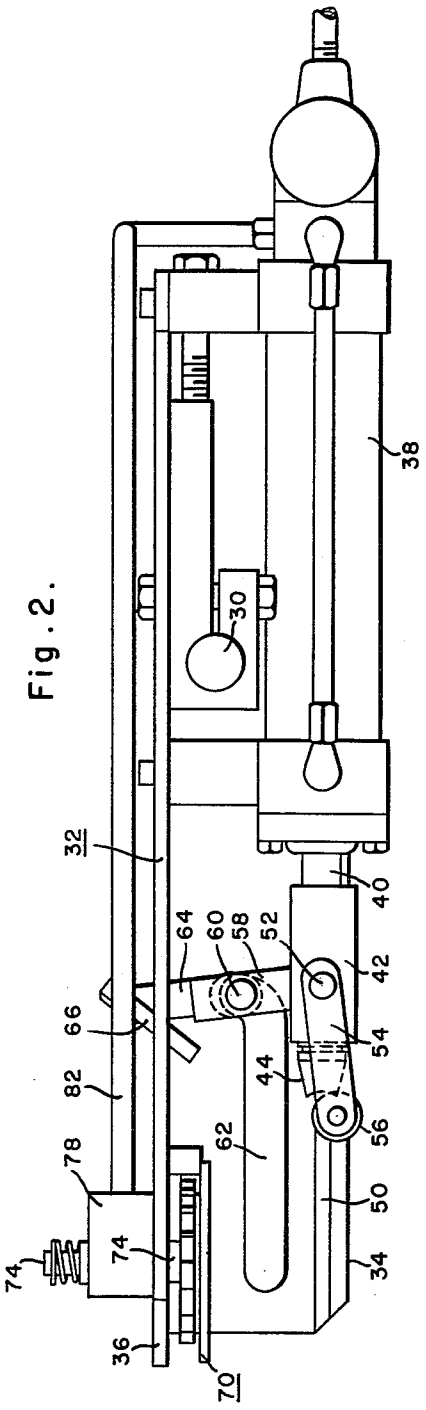
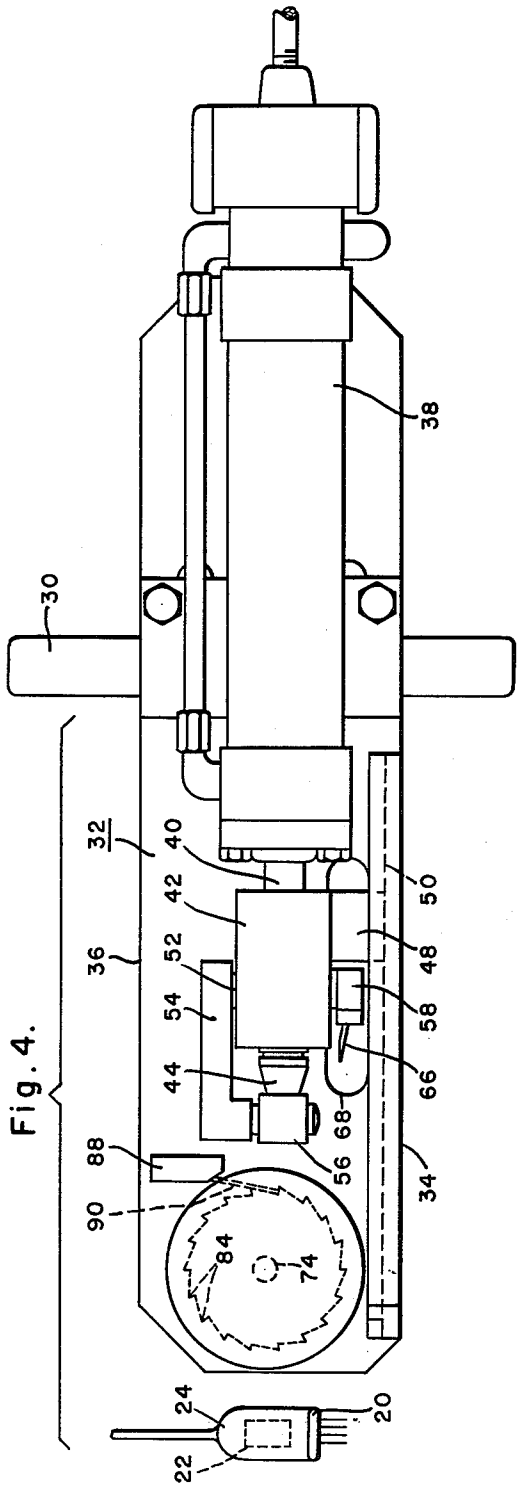


Fig. 4.



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APPARATUS FOR MANUFACTURING ELECTRONIC TUBES

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4 Claims. (Cl. 101—41)

This invention relates to automatic apparatus of the type utilized in the manufacture of electronic tubes.

In the manufacture of miniature electronic tubes, the general practice in the industry is to provide a glass disc or button to which is sealed lead-in conductors for the electrodes of the tube. This button stem is normally assembled by a moulding machine. An electrode cage is then normally assembled and secured to the button stem member. The button stem and cage assembly and the envelope portion, commonly referred to as a bulb, are sent to a sealing and exhaust machine where these components are assembled to provide the finished miniature electron tube.

The present practice in the art is to etch the bulb member with the tube type number prior to distributing the bulb to the sealing and exhaust machine location. For example, this etching process has been done on the bulb cutting and tubulation machine. Another practice is to mark the tube type on a finished tube by sand blast techniques. The above mentioned processes are subject to problems of scheduling, inventory and errors in marking. It is desirable to incorporate a printing or marking mechanism within the sealing and exhaust machine which is the final step in the manufacture of the tube.

The sealing and exhaust machine in general consists of an inner and an outer rotatable turret provided with a plurality of spaced sockets for receiving and holding tube stems. The inner turret is normally utilized for sealing the tube and therefore is referred to as the sealing turret while the outer turret is normally utilized for exhausting the sealed envelope and is referred to as the exhaust turret. The sealing and exhaust machine is provided with a plurality of gas burners upon the sealing turret for sealing the bulb to the button stem. The exhaust turret also contains a number of gas flames for certain operations as well as additional heating for processing the tube elements. The result is that the ambient temperature in the vicinity of the heating sections of the machine may be at least 100° F. and therefore any attempt to mark the tubes with type numbers on the sealing and exhaust machine has resulted in a number of problems associated with the heat which have been unsolved up until this time.

It is accordingly an object of our invention to provide improved apparatus for the manufacture of electronic tubes.

It is another object to provide improved methods and apparatus for etching tube type numbers on electron devices in the manufacturing process of the device.

It is a further object to provide a new and improved apparatus for etching tube type numbers on electron discharge devices on the sealing and exhaust machine.

These and other objects of our invention will be apparent from the following description taken in accordance with the accompanying drawing, throughout which like reference characters indicate like parts, and in which:

FIG. 1 is a diagrammatic plan view of a sealing and exhaust machine incorporating our invention;

FIG. 2 is a plan view of the printing mechanism appearing at one of the operating stations in rest position and embodying our invention;

FIG. 3 is a partial view of apparatus shown in FIG. 2 to illustrate the apparatus in the stamp position;

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FIG. 4 is a side view of the apparatus shown in FIG. 2; and

FIG. 5 is a front view partly in section of the mechanism shown in FIG. 2.

Referring to FIG. 1, there is shown a diagrammatic plan view of a sealing and exhaust machine. The machine includes an inner turret 12 and an outer turret 14. The turrets 12 and 14 are arranged concentrically and are adapted by suitable means (not shown) for intermittent angular displacement or rotation about a common vertical shaft (not shown). The inner turret 12 is disposed in a horizontal plane spaced above the outer turret 14.

The sealing turret 12 carries on its upper surface adjacent the periphery thereof a plurality of spaced tube sockets 16. The tube socket 16 is formed to include a plurality of circularly arranged receptacles adapted for receiving the tube prongs of a tube stem 18 mounted therein. The tube stem 18 comprises a button portion of glass 20 and the electrode cage structure 22 mounted thereon, with tube leads or prongs extending through the glass button. This structure is referred to as a mount. The glass portion of the stem is adapted for being bonded at its periphery to the edge of a bulb portion 24 to provide a tube envelope.

The mount is "bulbed" by placing the bulb over the mount. This is usually done prior to arrival of the mount at sealing an exhaust machine location. The operator inserts the unsealed "bulb over mount assembly" in each of the stem sockets on the machine at the load position. The next step. after the loading operation, is that the turret rotates to move the stem socket to the next position which is hereafter referred to as the tube type marking station. Clamping members 26 rotate with the tube stem socket and clamp the bulb 24 to hold it in the desired position.

Heretofore, marking of the tube was accomplished either prior to loading the tube bulb on the sealing and exhaust machine or was accomplished after the tube was completed and removed from the sealing and exhaust machine. This invention provides means for automatically marking the tube type on the tube at the station following the loading operation in the sealing and exhaust machine. The marking apparatus is more fully described in FIGS. 2, 3, 4 and 5. The relative position of the marking member, with respect to the sealing and exhaust machine is clearly illustrated in FIG. 1.

The marking apparatus is mounted on the sealing and exhaust machine to maintain a fixed position and is located at an index station of the machine. The apparatus is mounted on the sealing and exhaust machine by means of a vertical central support bar 30 and a horizontal shielding member 32 of a suitable material such as aluminum. The shielding member 32 is positioned to be substantially parallel to a radius of the turret and has an angle shaped cross-section to provide a base plate 34 and an upright plate 36. The upright plate 36 is secured to the bar 30. The base plate 34 does not extend the full length of the upright plate 36. The inner portion of member 32 is adjacent the stem mount.

An air motor 38 is secured to the outer portion of the upright plate 36 with respect to the machine for actuating and moving a plunger rod 40 in a longitudinal direction. The plunger rod 40 is provided with a head block 42. A stamping or printing head 44 is provided on the inner surface of the head block 42. The printing head 44 is provided with a rubber stamp 46 with the tube type designation. A projection member 48 is provided in the lower surface of the head block 42. The projection member 48 rides in a groove 50 provided in the upper surface of the base plate 34. The groove 50 prevents rotation

of head 42 as the head 42 advances to make contact with the tube envelope 24.

An inking mechanism is provided for applying ink to the stamp 46. A vertically rotatable pivot shaft 52 is provided in the head block 42. An arm 54 is provided having one end connected to the upper end of the pivot shaft 52. The free end of the arm 54 is provided with a vertically oriented pin with a rotatable ink roller 56 thereon. The roller 56 may be of any suitable material such as rubber. An arm 58 is connected to the lower end of the pivot shaft 52 which projects below the head block 42. A projecting pin 60 is provided from the lower surface of the arm 58 and at the free end thereof. The arm 58 and pin 60 serves as a cam follower. The pin 60 rides in a groove 62 in the base member 34 which provides a substantialy L shaped cam surface as shown in FIG. 3. An extension arm 64 is provided from the free end of the arm 58 and is provided with a pawl member 66. An opening 68 is provided in the upright member 36 for operational clearance of extension arm 64.

Positioned at the inner end of the upright member 36 is an ink platen number 70 including a disk member 71 of a suitable material such as aluminum. The outer surface of the disk 71, with respect to the inner surface of the upright member 36, provides an ink holding surface. A shaft 74 is provided from the inner surface of the disk 71 and extends through an opening in the upright member 36. The shaft 74 is mounted by suitable means, including a bearing housing 78, to the upright member 36. The inner surface of the disk 72 is provided with circular grooves 80 to provide additional cooling surface and control the flow of air directed thereon. A tubular member 82 is connected into the bearing housing 78 to provide an air conduit. The tubing 82 directs an air blast through an opening 86 in the upright member 36 onto the grooves 80 on the disk 71. The other end of the tubing 82 is connected to the exhaust air port of the air motor 38 to provide the necessary air cooling. A ratchet wheel 84, provided with 18 notches, is also secured to the inner surface of the disk 71.

In the operation of the device, the sealing turret 12 indexes the bulb 24 to the marking station. The clamping members 26 hold the bulb. The clamping members 26 are designed so that sufficient area of the bulb is open to permit the strap 46 to contact the bulb. Suitable cam mechanism (not shown) connected with the turret actuates a pilot air supply which in turn activates the air supply to the air motor 38. The air motor 38 actuates the plunger 40 moving the printing head 44 forward into contact with the envelope 24 and the tube type number is printed on the bulb 24 by the stamp 46. In the forward stroke, the inking roller 56 is rotated clockwise from the position shown in FIG. 2 in response to the cam following action of pin 60 in the cam surface 62. The ink roller 56 is rotated clockwise into contact with the ink platen 70 as shown in FIG. 5. Further forward movement rolls the roller 56 across the ink holding surface of the platen 70 to the stamp position shown in FIG. 3. On the return stroke, the ink roller 56 again contacts and rolls across the surface of the ink platen member 70. When the pin 58 reaches the angle portion of the groove 62, the roller 56 is rotated counterclockwise and rolls across the stamp 46 applying ink thereto.

In addition, the forward movement of the marking block 42 rotates the platen member 70. This is accomplished by the pawl 66 engaging a notch on the ratchet wheel 84 causing the platen 70 to rotate clockwise. This allows the roller 56 to cover the entire surface of the platen member 70. Any suitable etching ink may be used. The ink is composed of glycerine, lead borate and silver oxide. The ink is applied to the platen 70 at about 2 to 3 hour intervals with a production of 700 to 900 tubes per hour. A locking pawl 88 including a resilient means 90 may be provided to lock the ratchet wheel 84.

The base plate 34 and upright member 36 are positioned

to be interposed between the ink platen 70 and the burners at the station on the sealing and exhaust machine subsequent to the marking station. The base plate 34 and upright member 36 act as a heat shield as well as a heat sink. Further cooling is provided by coupling the exhaust air from the air motor 38 through the air conducting pipe 82 to the finned or grooved rear surface of the platen 70. This circulating air maintains the ink platen member at a relatively cool temperature so that the ink does not evaporate from the platen member 70.

In the general operation of the sealing and exhaust machine, the tube socket provided on the machine is rotated from the load position to the mark position and the tube envelope is held by the clamping members. When the tube element stops in the mark position, the air cylinder 38 is actuated causing the marking head 44 to print the tube type on the envelope. The envelope is then moved to subsequent burner stations where the ink is etched into the glass due to the heat applied.

While we have shown our invention in only one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications without departing from the spirit and scope thereof.

We claim as our invention:

1. A sealing and exhausting machine for miniature receiving tube envelopes comprising heating means and apparatus for placing type numbers on the exterior portion of said miniature tube envelopes successively brought to a marking station, said apparatus comprising means for holding a stamping member, means for moving said stamping member in and out of contact with said miniature tube envelopes, inking means associated with said stamping member, said inking means comprising an ink roller applicator member, means associated with said ink roller applicator member to roll said ink roller applicator member across said stamping member, an ink platen member, means associated with said ink roller applicator member such that said ink roller applicator member is rolled across the surface of said ink platen member to pick up ink for application to said stamping member, means for cooling said ink platen member and heat shielding means positioned between said inking means and said heating means.

2. A sealing and exhaust machine for receiving tubes comprising rotating means for moving envelopes and mounts of said receiving tubes through a plurality of stations including heating means to seal and exhaust said tubes, apparatus located at one of said stations for marking envelopes successively brought to said station, said apparatus comprising a marking head, means for moving said marking head into and out of contact with said envelopes, applicator means for applying marking ink to said marking head, marking ink holding means for supplying ink to said applicator means, cooling means connected to said ink holding means and heat shielding provided between said ink holding means and said heating means.

3. A sealing and exhaust machine for receiving tubes comprising rotating means for moving envelopes and mounts of said receiving tubes through a plurality of stations, heating means provided at a plurality of said stations to seal and exhaust said tubes, apparatus located at a station separated from any heating means for marking said envelopes successively brought to said station, said apparatus comprising a marking head mounted at the outer periphery of said stations to advance from its normally retracted position and mark said envelopes, applicator means for applying marking ink to said marking head, marking ink holding means for supplying ink to said applicator means positioned adjacent the path of said marking head, said marking ink holding means comprised of a disk member having a coating of ink on one surface facing the path of said marking head and provided with a grooved surface on the opposite surface thereof, means provided between said marking ink holding means

and said heating means for shielding said marking ink holding means from said heating means, and means for directing air upon the grooved surfaces of said disk member.

4. A sealing and exhaust machine for receiving tubes comprising rotating means for moving envelopes and mounts of said receiving tubes through a plurality of stations, heating means provided at a first group of said stations to seal and exhaust said tubes, apparatus located at one of a second group of said stations for marking said envelopes successively brought to said station, said apparatus comprising a marking head, means for moving said marking head into contact with said envelopes, means for moving said marking head away from said envelopes, applicator means adjacent the path of said marking head for moving across said marking head for applying a coating of ink thereto, means adjacent the path of said marking head comprising a disk means for holding ink and supplying ink to said applicator means, said disk means rotating about its axis in response to movement of said marking head, an air motor for driving said marking head with the exhaust air from said motor directed onto said disk ink holding means to artificially cool said disk and heat shielding means positioned adjacent said disk means for substantially shielding said disk means from said heating means.

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