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SEALING-IN MACHINE
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Fig. 1

Fig. 2

Fig. 3

Fig. 4

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This invention relates to sealing-in machines and more particularly to machines for sealing stems in radio bulbs and the like.

An object of the invention is to provide a simple and effective device for expeditiously sealing a bulb to a mount.

Another object of the invention is to provide a sealing-in device in which a bulb may be sealed to a mount without rotation thereof.

A further object of the invention is to provide suitable coordinating machine elements for supporting a bulb on a given axial line and for providing one or more heat zones for sealing the bulb to the mount and for severing the waste portion from the bulb.

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

Radiotrons or incandescent lamps of the character to which the present invention relates, have generally been produced by sealing a bulb to a mount comprising a flare tube and an exhaust tube for audio bulbs and in the union of a bulb to a mount including a flare tube, exhaust tube, and asear for certain types of incandescent electric lamps.

The invention will be more fully understood by reading the following detailed description.

The sealing-in operation required several steps of heating and a rotation of the bulb so that the neck thereof could be shaped previous to its union with the flare tube. That is, the necking down of the bulb could only be satisfactorily performed by a rotation of the bulb and simultaneously heating the same in a series of stages, until it was finally rendered plastic and the wall collapsed to unite the neck with a flare tube.

It has been found that by providing a bulb with a neck of but slightly greater internal diameter than the external portion of the flare tube, sufficient heat may be provided that the forming of the neck of the bulb and its union with the mount may be effected without rotation thereof. The applicant has discovered that if the space between the perimeter of the flared portion of the flare tube is spaced approximately 3/16 of an inch away from the inner surface of the neck of the bulb, a good seal is possible without the usual rotation of the work parts.

By creating a complete circular heat zone about the glass parts, it is possible to produce a uniform and efficient seal between the parts, after which fires, termed "cutting-off fires", are directed against the bulb just below the seal and the lower portion or cullet of the bulb is severed and the lamp bulb may be removed from the machine. Mechanism may also be employed for changing the relative position of the bulb and mount to stretch the seal after which the bulb may be removed.

The invention will be more fully under-
stood by reference to the accompanying drawing, in which,
Fig. 1 is a plan view of a sealing-in device embodying the present invention;
Fig. 2 is a front elevational view of the device shown in Fig. 1, a portion of the burner element being broken away;
Fig. 3 is an enlarged fragmentary view showing the relative position of a bulb in a supporting structure; and
Fig. 4 is an example of a radiotron bulb after the sealing-in operation has been performed.

The invention may include a suitable supporting table 10 having what will herein be termed a stationary sealing-in head 11 secured thereto. The head 11 may comprise a central post or guide 12 having projecting arms 13 and 14 to which may be secured uprights or supports 15 and 16 respectively. At the upper ends of the said supports may be fastened an arcuate plate 17 which carries vertical plates 18 having inclined surfaces 20 to which tension members 19 may be suitably attached. The ends of said tension members may project toward and be disposed in inclined relation to the vertical axial line of the head 11. A beveled edge 21 is provided on the arcuate plate 17 (see Fig. 3) to engage with a lower annular depressed surface of a bulb 22, when the bulb is in position between the plates 18.

A support for a stem or a mount may include a chuck or gripping device 23 to secure an exhaust tube 24 of a mount which may comprise the exhaust tube 24 consolidated at a press 25 with a flare tube 26 (see Fig. 3), the usual electrodes are fastened to supports or leading-in conductors 31 which are secured in the press. These several parts when united, constitute a mount or stem. The gripping mechanism may be of any suitable character to secure the exhaust tube and maintain the mouth in axial alignment in the head. The gripping device illustrated, may comprise a weighted member 27 slidable upon a hollow shaft 28. Spherical gripping members 29 may be disposed in the wall of the shaft and normally in engagement with an interiorly inclined surface 30 of the member 27. The member 27 is mounted upon the shaft 28 and the spheres 29 moved toward the axial line of the shaft, by reason of the potential energy of the said weighted member, to grip the exhaust tube 24 of the lamp mount when inserted into the shaft 28 and hold the mount with its axis coincident with the axial line of the head. The leading-in conductors 31 may be disposed along the side or wrapped about the exhaust tube when the same is inserted into the chuck.

For the purpose of effecting a stretching operation of the seal when the bulb 22 is sealed to a flare tube 26 of the mount, in the manner to be hereinafter more fully described, the shaft 28 is slidable in the guide 12 and may be disposed in engagement with a lever 32 operable by means of a chain 33 connected to a foot treadle (not shown) to reciprocate the shaft 28. The lever 32 may be pivoted at 34 to a bracket 35 and may be normally urged into engagement with a collar 36 secured to the shaft 28 by a spring 37. A stop arm 38 may be provided to engage with the lever 32 and limit the upward movement thereof.

Means for releasing the exhaust tube 24 after the same has moved downwardly a predetermined distance, may comprise a flanged portion 39 integral with the post 12. This flanged portion is so positioned with respect to the weighted member 27 that when the shaft 28 is moved downwardly, for a predetermined distance, the said weighted member will engage with the flange 39, thus preventing further movement of the member and relieving its engagement with the gripping-spheres 29 at which time the exhaust tube 24 will be released and the sealed-in bulb may be removed from the head.

A heating element for rendering the bulb and flare tube plastic is shown in the present embodiment of the invention as comprising a pair of concentrically arranged manifolds 41 and 42. The manifold 41 may receive heat-producing fuel through a feed pipe 43 having a control valve 44 and the manifold 42 may receive fuel through a feed pipe 45 which may be provided with a control valve 46.

The manifolds may, as shown, be of circular form and the manifold 41 may have a plurality of burner nozzles 47 arranged in radial formation and spaced at intervals.

The nozzles 47 may be so disposed as to direct flames 48 against the wall of a bulb 22 to soften the same and effect a union between the wall and the flared portion of a flare tube 26 (see Fig. 3). The manifold 42 may be provided with nozzles 49 spaced at intervals and may be positioned in staggered relation with respect to the nozzles 47. The nozzles 49 are employed to sever the lower or waste portion of the bulb from the sealed bulb and flames 51 issuing from these nozzles are termed the “cutting-off fires”. In order to facilitate the cutting-off operation, an air pipe 52 is provided and may be connected to a suitable pressure line to direct a current of air through the shaft 28 and out from apertures 53 at the upper end thereof. The manifolds may be suitably supported in proper relation to the sealing-in head by a bracket 54.

In practice, the weighted member may be lifted and the exhaust tube of a stem or mount may be inserted into the stem-holder and gripped by reason of the spherical members 29 when the weight is released. A bulb
may then be placed over the stem and held in its proper relation thereto by the bulb supporting plates 18. The burners or nozzles 47 may be lighted and controlled by means of the valve 44. Flames of intense heat may be caused to heat the bulb circumferentially at the point on its surface adjacent to the flared portion of the flare tube to seal the same thereto. The valve 46 may then be manipulated to cause flames from the nozzles 49 to sever the lower or waste portion 22 of the bulb from the sealed portion. Air may be directed outwardly from the shaft by means of the air pipe 52 to stretch or thin out the wall of the neck and thus facilitate the severing operation.

After the bulb has been sealed in and the cullet cut off, a downward pull may be applied to the chain 33, thus permitting the shaft 28 to drop thereby effecting a relative downward movement of the stem with respect to the bulb while the seal is still plastic. This operation is termed the "pull-down" and is for the purpose of relieving any strains or stresses that may be set up at the point of union during the sealing operation. The pull-down will continue as long as the chuck grips the exhaust tube. A slight downward movement of the stem is all, however, that is necessary and as the weighted member 27 comes in contact with the flanged portion 39, the spherical members become disengaged with the exhaust tube and the shaft 28 is permitted a slight additional downward movement to release the exhaust tube. The bulb is therefore ready to be removed from the head and while the shaft 28 is in its lower position, the exhaust tube of another mount may be inserted between the gripping members 29 and secured thereby when the treadle is released to permit the shaft to rise and the weighted member to engage spherical members.

In the present construction, a bulb may be sealed to a mount in a uniform and efficient manner and heads constructed according to the present invention avoid the necessity of several belts and pulleys which have heretofore been necessary to rotate the heads. Furthermore, mechanism for stopping the heads in given relative positions is also eliminated. The initial and maintenance cost of heads of the present construction is also considerably less than has generally been necessary when employing the various machine elements required heretofore for rotating and stopping the sealing-in heads. It will be understood that although a single head is shown and described, that a plurality of such heads may be placed on a rotary or other type of conveyor and the various operations performed during a movement of the conveyor as is common in other sealing-in machines.

Although a preferred embodiment of the invention is shown and described herein, it is to be understood that modifications may be made herein without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:
1. A sealing-in head comprising a support for a bulb, means for securing the exhaust tube of a mount to support the mount within said bulb, means for creating a continuous heat zone circumferentially of the bulb to fuse the bulb to the mount and means for creating a second heat zone circumferentially of the neck of the bulb to sever the same from the bulb.

2. A sealing-in head comprising a support for a bulb, means for securing the exhaust tube of a mount to support the mount within said bulb, means for creating a continuous heat zone circumferentially of the bulb to fuse the bulb to the mount, means for creating a second heat zone circumferentially of the neck of the bulb to sever the same from the bulb and means for directing a current of air against the neck of the bulb to facilitate the severing operation.

3. A sealing-in head comprising a support for a bulb, means for securing the exhaust tube of a mount to support the mount within said bulb, means for creating a uniform heat zone circumferentially of the bulb to fuse the bulb to the mount, means for creating a second heat zone circumferentially of the neck of the bulb to sever the same from the bulb and means for changing the relative positions of the mount and bulb while the sealed portion is still plastic.

4. A sealing-in head comprising a support for a bulb, means for securing the exhaust tube of a mount to support the mount within said bulb, means for creating a continuous heat zone circumferentially of the bulb to fuse the bulb to the mount, means for creating a second heat zone circumferentially of the neck of the bulb to sever the same from the bulb, means for directing a current of air against the neck of the bulb to facilitate the severing operation and means for changing the relative positions of the bulb and mount.

5. A machine for uniting a plurality of work parts such as a lamp bulb and mount comprising a non-rotatable support for the bulb and mount and non-rotatable means for creating a zone of heat about the bulb at a temperature sufficient to fuse together the said work parts.

6. A machine for uniting vitreous lamp parts such as a bulb and mount comprising a non-rotatable support for a bulb, non-rotatable means for holding a mount within a bulb and in a predetermined relation to the wall thereof, a non-rotatable substantially annular burner for creating a heat zone of sufficient intensity to fuse and unite the said lamp parts.
7. A sealing-in machine comprising a non-rotatable support for a bulb, a non-rotatable support for retaining a mount within a bulb and in alignment with the longitudinal axis thereof, non-rotatable means for obtaining heat about the bulb at a temperature sufficient to unite the bulb and mount and means for changing the relative positions of the bulb and mount while the fused and united portions are still plastic.

8. A sealing-in machine comprising a support for a bulb, means for supporting a mount within the bulb, a manifold disposed about said mount and bulb, a plurality of burners associated with said manifold for creating a zone of heat circumferentially of the neck of said bulb to unite the same to said mount without rotation thereof and means for creating a heat zone circumferentially of the neck of the bulb to sever the same from the bulb.

9. A sealing-in machine comprising a support for a bulb, means for supporting a mount within the bulb, a manifold disposed about said mount and bulb, a plurality of burners associated with said manifold for creating a zone of heat circumferentially of the neck of said bulb to unite the same to said mount without rotation thereof, means for creating a heat zone circumferentially of the neck of the bulb to sever said neck therefrom and means for changing the relative position of said mount and said bulb while their point of union is still plastic.

10. A sealing-in machine comprising a support for a bulb, means for securing the exhaust tube of a mount to support the same within said bulb, a plurality of manifolds concentrically arranged with respect to said supported mount and bulb, burners associated with one of said manifolds for directing flames to fuse the bulb and mount together and burners on another of said manifolds for directing flames to sever a portion of the neck of said bulb therefrom.

11. A sealing-in machine comprising a support for a bulb, means for securing the exhaust tube of a mount to support the same within said bulb, a plurality of manifolds concentrically arranged with respect to said supported mount and bulb, burners associated with one of said manifolds for directing flames to fuse the bulb and mount together, burners on another of said manifolds for directing flames to sever a portion of the neck of said bulb therefrom and means for directing a current of air against the wall of said neck to facilitate the severing operation.

12. A sealing-in machine comprising a support for a bulb, means for securing the exhaust tube of a mount to support the same within said bulb, a plurality of manifolds concentrically arranged with respect to said supported mount and bulb, burners associated with one of said manifolds for directing flames to fuse the bulb and mount together, burners on another of said manifolds for directing flames to sever a portion of the neck of said bulb therefrom and means for directing a current of air against the wall of said neck to facilitate the severing operation.

13. A sealing-in head comprising means for supporting a bulb with its longitudinal axis coincident with the vertical axis of the head, a chuck for securing the exhaust tube of a mount to position the mount with its longitudinal axis coincident with the axial line of said head, burners disposed about the neck of said bulb to create a circumferential zone of heat to unite the neck of the bulb to the mount.

14. A sealing-in head comprising means for supporting a bulb with its longitudinal axis coincident with the vertical axis of the head, a chuck for securing the exhaust tube of a mount to position the mount with its longitudinal axis coincident with the axial line of said head, burners disposed about the neck of said bulb to create a circumferential zone of heat to unite the neck of the bulb to the mount and means for creating a second heat zone to sever a portion of the neck below the seal.

15. A sealing-in head comprising means for supporting a bulb with its longitudinal axis coincident with the vertical axis of the head, a chuck for securing the exhaust tube of a mount to position the mount with its longitudinal axis coincident with the axial line of said head, burners disposed about the neck of said bulb to create a circumferential zone of heat to unite the neck of the bulb to the mount, means for creating a second heat zone to sever a portion of the neck below the seal and means for directing a current of air against the wall of the neck to facilitate the severing operation.

16. A sealing-in head comprising means for supporting a bulb with its longitudinal axis coincident with the vertical axis of the head, a chuck for securing the exhaust tube of a mount to position the mount with its longitudinal axis coincident with the axial line of said head, burners disposed about the neck of said bulb to create a circumferential zone of heat to unite the neck of the bulb to the mount, means for creating a second heat zone to sever a portion of the neck below the seal, means for directing a current of air against the wall of the neck to facilitate the severing operation and means for changing the relative positions of the mount and bulb while the sealed portion is still plastic.

17. A sealing-in head comprising means
for supporting a bulb with its longitudinal axis coincident with the vertical axis of the head, a chuck for securing the exhaust tube of a mount to position the mount with its longitudinal axis coincident with the axial line of said head, burners disposed about the neck of said bulb to create a circumferential zone of heat to unite the neck of the bulb to the mount, means for creating a second heat zone to sever a portion of the neck below the seal, means for directing a current of air against the wall of the neck to facilitate the severing operation, means for changing the relative positions of the mount and bulb while the sealed portion is still plastic and means for releasing said exhaust tube.

18. A sealing-in device comprising a support for a mount having a flare tube, means for non-rotatably supporting a bulb over said mount, said bulb having a neck with the inside diameter thereof slightly greater than the greatest diameter of the flare tube, and burners to provide sufficient heat to cause the neck of the bulb to contact with the flare tube.

In testimony whereof, I have hereunto subscribed my name this 29th day of July, 1924.

JOHN JOSEPH HIGGINS.