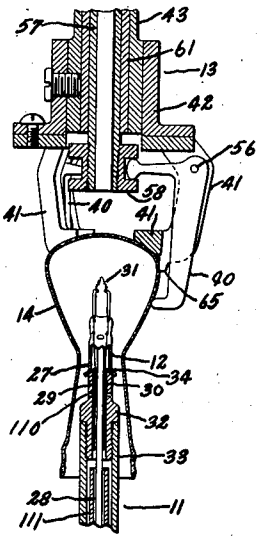
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SEALING-IN MACHINE

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Fig. 4.



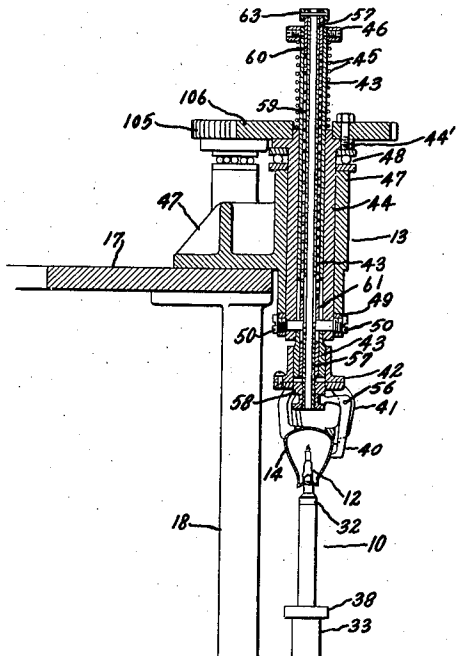
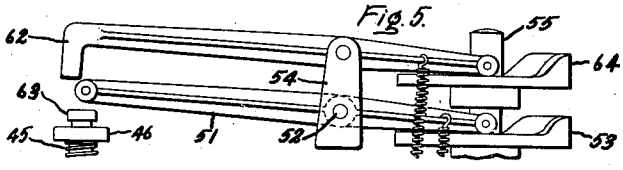




Fig. 1.

Fig. 5.




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Fig. 2.

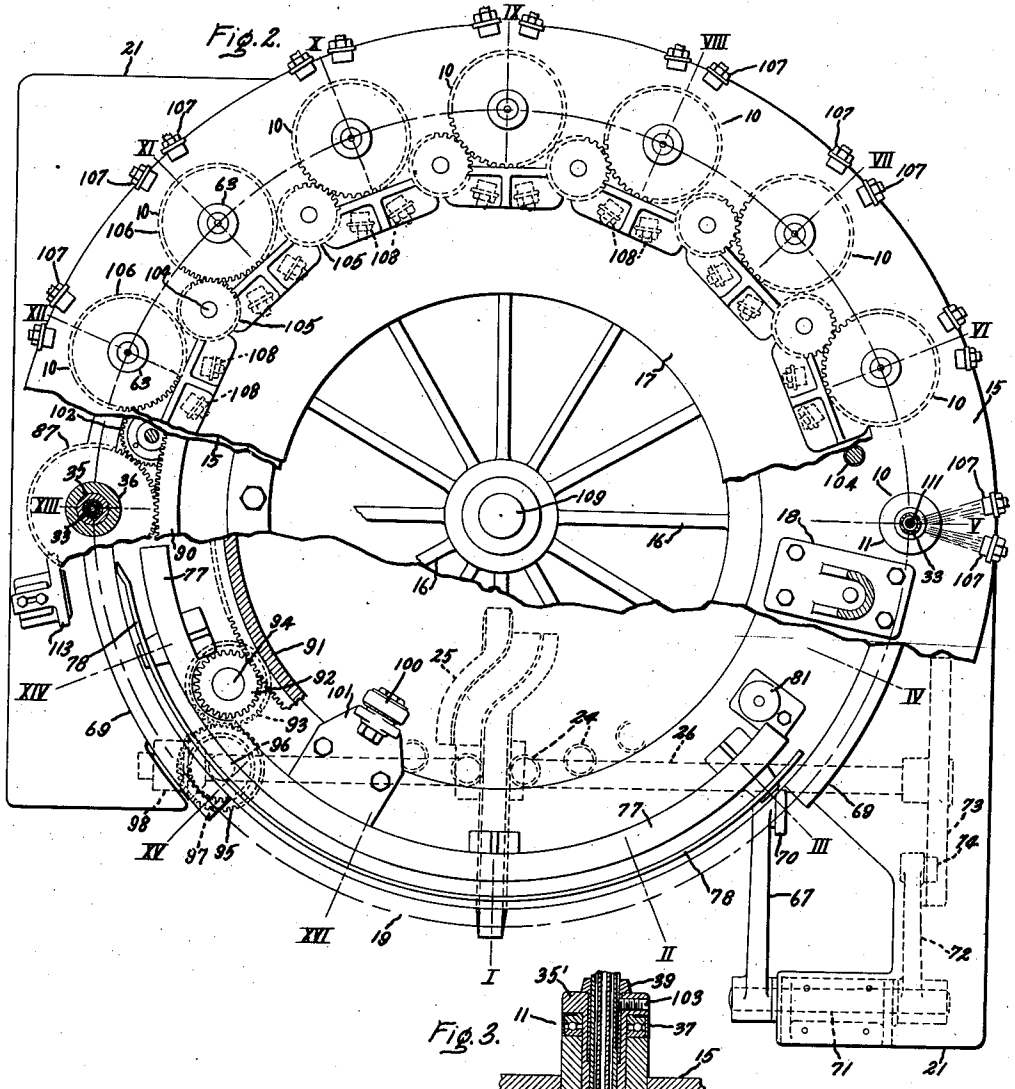


Fig. 3.

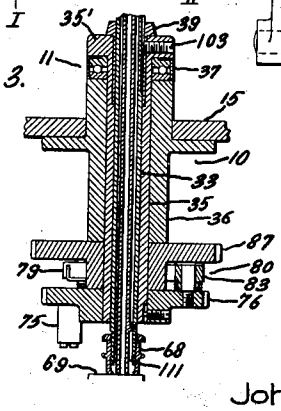
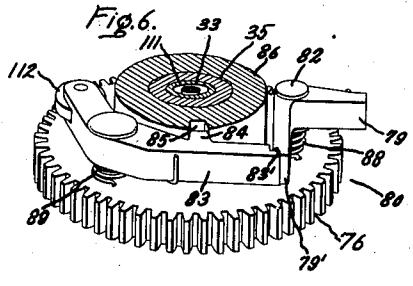


Fig. 6.



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# UNITED STATES PATENT OFFICE

2,185,704

## SEALING-IN MACHINE

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Application April 13, 1938, Serial No. 201,796

10 Claims. (Cl. 49—2)

Our invention relates to machines for sealing electric lamps, radio tubes and other like devices, and more particularly to a machine for fusing a bulb in a definite relation to a stem or other vitreous body so as to definitely position the filament or other objects carried by the stem or other vitreous body in said bulb. Some difficulty has been experienced heretofore in retaining the bulb, stem and filament of an incandescent lamp in the desired relation during the sealing of the bulb and stem. Prior to our invention, the manufacture of an accurate lamp required the presence of an operator at each sealing machine to adjust these parts to the correct relationship before the seal cooled. This manual method of adjusting the stem and bulb is not reliable; it requires frequent relieving of the operator; and, in addition, is requires special apparatus for permitting the adjustment and for showing the relationship of the lamp parts. The bulb and stem are disarranged during the sealing operation by slight irregularities in size and thickness thereof and by changes in the alignment of the parts of the sealing machine.

The principal object of our invention is to provide a machine for sealing the bulb and stem or other vitreous body together in proper alignment to each other. Another object of our invention is to provide a sealing machine for holding slightly irregular bulbs and stems in proper alignment during the sealing operation, and still another object of our invention is to provide a sealing machine in which the sealing heads retain their proper alignment at all times. Still other objects and advantages of our invention will be apparent from the detailed description which follows and the accompanying drawings of one species thereof.

In the drawings, Fig. 1 is a vertical section through one half of a sealing machine comprising our invention; Fig. 2 is a plan view thereof with various portions broken away to show the underlying portions; Fig. 3 is a vertical section through the lower portion of one of the heads of the machine; Fig. 4 is a vertical section on a larger scale of the bulb and stem holding portions of one of the heads; Fig. 5 is a side elevation of jaw opening and vertically adjusting means for the upper portions of the heads; and Fig. 6 is a partially sectioned perspective view of a clutch for controlling the rotation of one of the heads, taken along line 6—6 of Fig. 1.

Referring to Figs. 1 and 2, the machine comprises a plurality (sixteen) of heads 10, each having a separate lower portion 11 for holding a lamp stem 12 and a separate upper portion 13 for holding a lamp bulb 14. The lower portions 11 of the heads 10 are mounted at regular spaced intervals around the periphery of the ring 15 which in turn is supported by the spider 16, and the upper portions 13 are mounted in alignment with the lower portions 11 on the ring 17 which is mounted on a plurality of supports 18 located between every other head 10 on the first ring 15. The spider 16 is indexed in a counter-clockwise direction and advances the heads 10 in turn through the sixteen stations located in the circular path 19 at which the various sealing operations take place. The ring type construction is believed to be largely responsible for the proper alignment of the stem and bulb supporting means at all times and places all the supports for the bulb supporting means out of the range of the sealing fires. The spider 16 is mounted on the hollow shaft 20 which extends downward through an aperture in the frame 21 and is supported by the ball bearing 22 resting thereon and is indexed by the spider 23 attached to the lower end thereof. As shown in Fig. 2, the turret-like structure formed by spider 16 and the ring 15 is indexed by a plurality of rollers 24 mounted on the spider 23 which are advanced by the rotation of the cam 25 located on the drive shaft 26 of the machine.

The indexing movements of the heads 10 carries them first through stations I and II which are occupied by an operator or by mechanical means for inserting the lamp stem 12 into the lower portion 11 thereof. The stem 12 shown is of the so-called tipless variety having a flared stem tube 27 definitely aligned with the axis of the stem, an exhaust tube 28 extending downwardly therefrom and also aligned with said axis, leading-in wires 29 and 30 and the filament 31 mounted on the upper ends of the leading-in wires 29 and 30 in a definite relation to the stem and exhaust tubes 27 and 28 respectively. The exhaust tube 28 and the lower ends of the leading-in wires 29 and 30 are inserted into the aperture in the cap 32 of spindle 33 which is only sufficiently large to allow their rapid insertion thereinto. The stem 12 is pushed down until the flared stem tube 27 passes over the raised boss 34 on the cap 32 and comes to rest on the sloping upper portion of said cap 32. The stem 12 is definitely located in the axis of the head 10 by the boss 34 and the aperture of cap 32 in which the exhaust tube 28 is located and is positioned vertically by the cap 32. The said cap 32 is mounted directly on the spindle 33 which in-

creases in size at the bottom and which is mounted, as shown in Fig. 3, in the sleeve 35 in bracket 36. The sleeve 35 is provided with a flange 35' on its upper end which rests on the ball bearing 37 carried by the bracket 36 which in turn is mounted on the ring 15. When the stem 12 is mounted on the spindle 33, said spindle 33 is located much lower than shown in the drawings and is supported by the collar 38 thereon which rests against the bushing 39 located in the sleeve 35.

Following the indexing movement of the head 12 which carries it to station III, the lamp bulb 14 is inserted in the upper portion 13 of the head 10 either by an operator or mechanically. The mechanical means for supplying the bulb 14 may, for instance, consist simply of a turret which carries the bulb 14 into a position below the upper portion 13 of the head 10 since the jaws 40 and positioning fingers 41 of the head 10 are carried down and thereafter raised to the sealing position. Each head 10 is provided with three positioning fingers 41 (Figs. 1 and 4) which are mounted on the collar 42 fastened to the tubular spindle or sleeve 43 and are carried down into engagement with the bulb 14, or into a position where the bulb 14 is manually placed thereagainst, by movement of hollow spindle 43 in the sleeve 44. Normally the spindle or sleeve 43 is retained in the up position by the spring 45 located between the collar 46 on the top end of the spindle 43 and the sleeve 44 which is stationary and is supported by the bracket 47 mounted on the upper ring 17. A flange 44' on the sleeve 44 rests on the ball bearing 48 carried by the bracket 47, and a collar 49 attached to the lower end of the sleeve 44 by the studs 50 prevents said sleeve 44 from shifting vertically.

The tubular spindle or sleeve 43 is moved down, as shown in Fig. 5, by the lever 51 which engages the collar 46 and which is rotated about the pin 52 by engagement of raised portions of the cam 53 with a roller on the end thereof. The pin 52 is mounted on a stationary arm 54 fastened indirectly to the machine frame 21 whereas the cam 53 is mounted on the shaft 55 which is geared to the main drive shaft 26 by means not shown. At the same instant that the positioning fingers 41 are moved down, the jaws 40 which are pivoted on the pins 56 extending from said fingers are spread by the downward movement of the spindle or sleeve 57 so as to pass freely about the bulb 14. The spindle 57 is located within the tubular spindls 43 and has a head 58 on the lower end thereof which has a circumferential groove therein in which the end of an arm extending from each jaw 40 is located. The spindle 57 is normally held in a raised position and the jaws 40 in a closed position by the spring 59 which is compressed between the sleeve 60 on the upper end of the spindle 57 and the bushing 61 which is kept from moving by the studs 50—50. The jaws 40 are separated and the spindle 57 is moved down by the lever 62 (Fig. 5) which is moved by cam 64 on shaft 55 so as to engage and force downward the collar 63 on the upper end of said spindle. The bulb 14 is positioned vertically by the portions of the fingers 41 which extend inward toward the center and which have the same general contour as the crown or top of the bulb 14. The said bulb is also located concentrically with respect to the head 10 by the downwardly extending portions or projections 65 of the fingers 41 which engage the maximum diameter of the bulb 14 and, together with the other portions of said fingers 41, form a pocket into which the said crown of the bulb fits. The jaws 40 each move an equal amount and, after the bulb 14 has been placed therebetween, close and swing the bulb into alignment with the head 10.

Having properly gripped and positioned the bulb 14, the jaws 40 and positioning fingers 41 are allowed to raise by movement of levers 51 and 62 until said bulb 14 is located in the sealing position. This position of the bulb 14 is set by the engagement of the studs 50—50 with the lower end of the slots in sleeve 43. The studs 50—50 are located in a close fitting aperture in the sleeve 44 which holds them in place, are screwed into the collar 49 which prevents the sleeve 44 from moving upward, and extend into slots in the tubular spindle 43, the bushing 61 and the spindle 57. Now before the head 10 indexes from station III, the spindle 33 is raised, carrying the stem 12 into the bulb 14 and into the proper sealing position. The spindle 33 is raised by the lever 67 (Fig. 2) which engages the shoe 68 on the lower end of spindle 33 and raises it above the track 69. The lever 67 engages the shoe 68 through the roller 70 and is fastened to the shaft 71 supported by the frame 21 and turned by the lever 72 which engages ways of the cam 73 on the main shaft 26 through the roller 74.

The next indexing movement of the head 10 causes both the lower and upper portions 11 and 13 to be rotated so that the sealing fires located at some of the succeeding stations thereof are caused to play equally on all sides of the seal portion of the bulb 14. The rotation is brought about, first, by the movement of the roller 75, which is attached to the gear 76 on the lower end of the sleeve 35, away from between the track rails 77 and 78 which releases the head 10 from the track and allows it to rotate and, second, by the striking of the release latch 79 of the clutch 80 (Fig. 6) against the stationary roller 81 (Fig. 2) which causes said clutch 80 to be engaged. The latch 79 is pivoted on the pin 82 extending from the gear 76 and before striking the roller 81 it is so positioned that the notched end 79' thereof is locked with the notched end portion 83' of the lever 83 which prevents said lever 83 from swinging and keeps the dog 84 thereon out of engagement with the notch 85 in the hub 86 of the gear 87. When the latch 79 strikes the roller 81, said latch 79 is momentarily turned so that the torsion spring 88 located on a boss thereof adjacent the gear 76 is more tightly coiled and the lever 83 is allowed to swing so that the torsion spring 89 located on a boss thereof adjacent the gear 76 partially uncoils. As shown in Fig. 1, the gear 87 is constantly in motion due to its engagement with the large gear 90 of a drive system consisting of the gear 90, the ring gear 91 attached thereto, the gears 92 and 93 on shaft 94 (Fig. 2), the gear 95 on shaft 96 and the bevel gears 97 and 98 on shaft 96 and the drive shaft 26. The gear 90 engages gear 87 on each of the sixteen heads 10 and is mounted on the boss 99 extending from the frame 21 and is supported by three equidistantly spaced rollers 100 each fastened to said frame 21 by a bracket 101. The shafts 94 and 96 are held in place by brackets (not shown) attached to different portions of the frame 21. The clutch 80 drives both lower and upper portions 11 and 13 of the head 10 through the gear 76 which is directly mounted on the sleeve 35 of the lower portion 11 and engages the gear 102 of a system which engages the sleeve 44

of the upper portion 13. The sleeve 35 operates the spindle 33 through the screw 103 which extends into a longitudinal groove in said spindle 33. The gear 102 is attached to a vertical shaft 104 which is held in place by arms extending from brackets 36 and 47 and which is provided with a gear 105 in engagement with the gear 106 on sleeve 44.

In this particular instance, the bulb 14 is not heated until it is indexed into station V where fires from the burners 107 on the outside of the machine are directed upon the neck of the bulb 14 adjacent the flared portion of the stem tube 27. Similar sets of burners 107 occupy each of the stations V to XII inclusive and other sets of burners 108 are located inward radially from the heads 10 at stations VI to XII inclusive. The burners 108 are supported by means (not shown) extending from the stationary center post 109 of the machine and over the top of the heads 10 to adjacent supports. In accordance with general practice, air is blown against the seal through the lateral holes 110 in the cap 32 to assist in separating from the bulb 14 the excess neck portion or cullet, and air is also blown into the bulb 14 through the exhaust tube 28 to expand and properly form the seal. The air for the former purpose is blown into the lower end of the spindle through a hole (not shown) in the track 69 registering therewith at the desired station of the head 10 and passes upward in the space between the spindle 33 and the tube 111 mounted therein and between the exhaust tube 28 and the cap 32 to the holes 110. The air for the latter purpose enters the lower end of the tube 111 through a hole in the track 69 registering therewith at another station of the head 10 and passes through the said tube 111 and the exhaust tube 28 to the interior of the bulb 14.

Upon being indexed from station XIII, the rotation of the head 10 is stopped by the engagement of the roller 112 of the clutch 80 against the stationary stop bar 113 which causes the lever 83 on which the roller 112 is mounted to swing so that the dog 84 is pulled from the notch 85 and the latch 79 is allowed to swing so that the notched end 79' engages the notched end 83' of said lever 83. The latch 79 prevents the lever 83 from pivoting to return the dog 84 to the notch when the roller 112 passes from the bar 113. The partial rotation of the head 10 after the disengagement of the dog 84 carries the roller 75 on the gear 76 between the track rails 77 and 78 which stops the rotation of said head 10 until it again passes from station III to repeat the cycle of operations already described. Between stations XIV and XV the track 69 declines very rapidly and the spindle 33 is separated from the stem 12 by the downward movement thereof which continues until the collar 38 thereon rests against the bushing 39. The stem 12 and bulb 14 are now completely sealed together and are removed from the head 10 at either of stations XV or XVI by simply pushing the top end of the spindle 57 downward until the jaws 40 separate and release the bulb 14.

While we have shown and described a preferred embodiment of our invention, it will be obvious to those skilled in the art that various substitutions, modifications or omissions may be made therein without departing from the spirit of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A sealing head comprising a spindle for supporting a stem in axial alignment therewith, means located axially of said spindle and a definite distance therefrom for engaging the upper end and sides of a bulb to position said bulb in a definite relation to said spindle, and jaws located adjacent said positioning means and arranged to grip said bulb and push its upper end and sides into engagement with said positioning means to cause said bulb and stem to be definitely positioned and aligned.

2. A sealing head comprising a spindle for supporting a stem in axial alignment therewith, a second spindle axially aligned with said first-mentioned spindle and having means attached thereto at a definite distance from said first-mentioned spindle for engaging the upper end and sides of a bulb and positioning it definitely along the axis passing through said spindles, and jaws mounted on said second-mentioned spindle and arranged to grip said bulb and push the upper end thereof against said positioning means to cause said bulb to be axially aligned and definitely positioned with reference to the said second-mentioned spindle, and means for supporting said second-mentioned spindle and permitting axial movement thereof to displace said jaws and positioning means to carry said bulb to a definite axial position with reference to said first-mentioned spindle and the stem thereon.

3. A sealing head comprising lower and upper portions for supporting a stem and bulb respectively, said lower portion comprising a spindle having means at its upper end for supporting a stem in definite alignment therewith, and said upper portion comprising a second spindle axially aligned with said first-mentioned spindle and having means attached thereto for positioning said bulb definitely along the axis thereof, and jaws for gripping said bulb and pushing the upper end thereof against said positioning means to cause said bulb to be aligned with said first-mentioned spindle and held in a definite axial relation thereto and to the stem thereon, a shaft extending longitudinally of said spindles, gears attached to each of said spindles and other gears attached to said shaft and meshing with said first-mentioned gears for rotating both of said spindles at the same rate of speed.

4. A sealing head comprising a spindle for supporting a stem in axial alignment therewith, a sleeve located above said spindle in axial alignment therewith and having bulb-positioning fingers attached thereto, a second spindle located within said sleeve and movable relatively thereto, pivotally mounted bulb-engaging jaws having their ends engaged by said second-mentioned spindle whereby relative movement of said second-mentioned spindle causes said jaws to grip said bulb and push its upper end into engagement with said positioning fingers, and supporting means for said sleeve permitting axial movement thereof to carry said bulb into definite relation with said first-mentioned spindle and the stem thereon.

5. A sealing head comprising a spindle for supporting a stem in axial alignment therewith, a sleeve located above said spindle in axial alignment therewith and having bulb-positioning fingers attached thereto, a second spindle located within said sleeve and movable relatively thereto, bulb-engaging jaws pivotally mounted on pins extending from said bulb-positioning fingers and having their ends engaged by said second-mentioned spindle whereby relative movement of said second-mentioned spindle causes

said jaws to grip said bulb and push its upper end into engagement with said positioning fingers, and supporting means for said sleeve permitting axial movement thereof to carry said bulb into definite relation with said first-mentioned spindle and the stem thereon.

6. A sealing machine for uniting a stem and bulb comprising a plurality of heads each having lower and upper portions for supporting a stem and bulb respectively in the desired relation, a rotatable turret-like structure having said lower head portions mounted at spaced intervals about the periphery thereof, a ring supporting said upper head portions in alignment with said lower head portions, and supports attached to said ring and to said turret-like structure adjacent the periphery thereof for supporting said ring and causing the said upper head portions to be moved with said lower head portions when said structure is rotated.

7. A sealing machine for uniting a stem and bulb comprising a plurality of heads each having lower and upper portions for supporting a stem and bulb respectively in the desired relation, a rotatable turret-like structure having said lower head portions mounted at spaced intervals about the periphery thereof, a ring supporting said upper head portions in alignment with said lower head portions, supports attached to said ring and to said turret-like structure adjacent the periphery thereof for supporting said ring and causing the said upper head portions to be moved with said lower head portions when said structure is rotated, gears attached to both the lower and upper head portions for causing rotation thereof, and a shaft adjacent each head with gears at both ends meshing with said first-mentioned gears for causing rotation of both head portions at the same rate of speed.

8. A sealing machine for uniting a stem and bulb comprising a plurality of heads each having lower and upper portions for supporting a stem and bulb respectively in the desired relation, a rotatable turret-like structure having said lower head portions mounted at spaced intervals about the periphery thereof, a ring supporting said upper head portions in alignment with said lower head portions, supports attached to said ring and to said turret-like structure adjacent the periphery thereof for supporting said ring and causing said upper head portions to be moved with said lower head portions when said structure is rotated, gears attached to both the lower and upper head portions for causing rotation thereof, a shaft adjacent each head with gears at both ends meshing with said first-mentioned gears for causing rotation of both head portions at the same rate of speed, means located adjacent the path of travel of said heads for engaging and rotating said heads, and a clutch attached to each of said heads for disconnecting said rotating means during part of the rotation of said turret-like structure.

9. A sealing machine for uniting a stem and bulb comprising a plurality of heads each having lower and upper portions, said lower portion comprising a spindle having means at its upper end for supporting a stem in definite alignment therewith, and said upper portion comprising a second spindle axially aligned with said first-mentioned spindle and having means attached thereto for positioning a bulb axially thereof and jaws for gripping said bulb and pushing the upper end thereof against said positioning means, a rotatable turret-like structure having said lower head portions mounted at spaced intervals about the periphery thereof, a ring supporting said upper head portions in alignment with said lower head portions, and supports attached to said ring and to said turret-like structure adjacent the periphery thereof for supporting said ring and causing said upper head portions to be moved with said lower head portions when said structure is rotated.

10. A sealing machine for uniting a stem and bulb comprising a plurality of heads each having lower and upper portions, said lower portion comprising a spindle having means at its upper end for supporting a stem in definite alignment therewith, and said upper portion comprising a second spindle axially aligned with said first-mentioned spindle and having means attached thereto for engaging the upper end and sides of a bulb and definitely positioning it, jaws attached to said second-mentioned spindle for gripping said bulb and pushing it against said positioning means, and means for supporting said second-mentioned spindle and permitting axial movement thereof to displace said jaws and positioning means to carry the bulb to a definite position with relation to said first-mentioned spindle and the stem thereon, gears attached to both the spindles of the lower and upper head portions for causing rotation thereof, a shaft adjacent each head with gears at both ends meshing with said first-mentioned gears for causing rotation of both head portions at the same rate of speed, a ring having the said lower head portions mounted at spaced intervals thereon, a rotatable spider for supporting said ring, a second ring supporting said upper head portions, and supports mounted on said first-mentioned ring and engaging said second-mentioned ring for holding it with said upper head portions in alignment with said lower head portions.

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