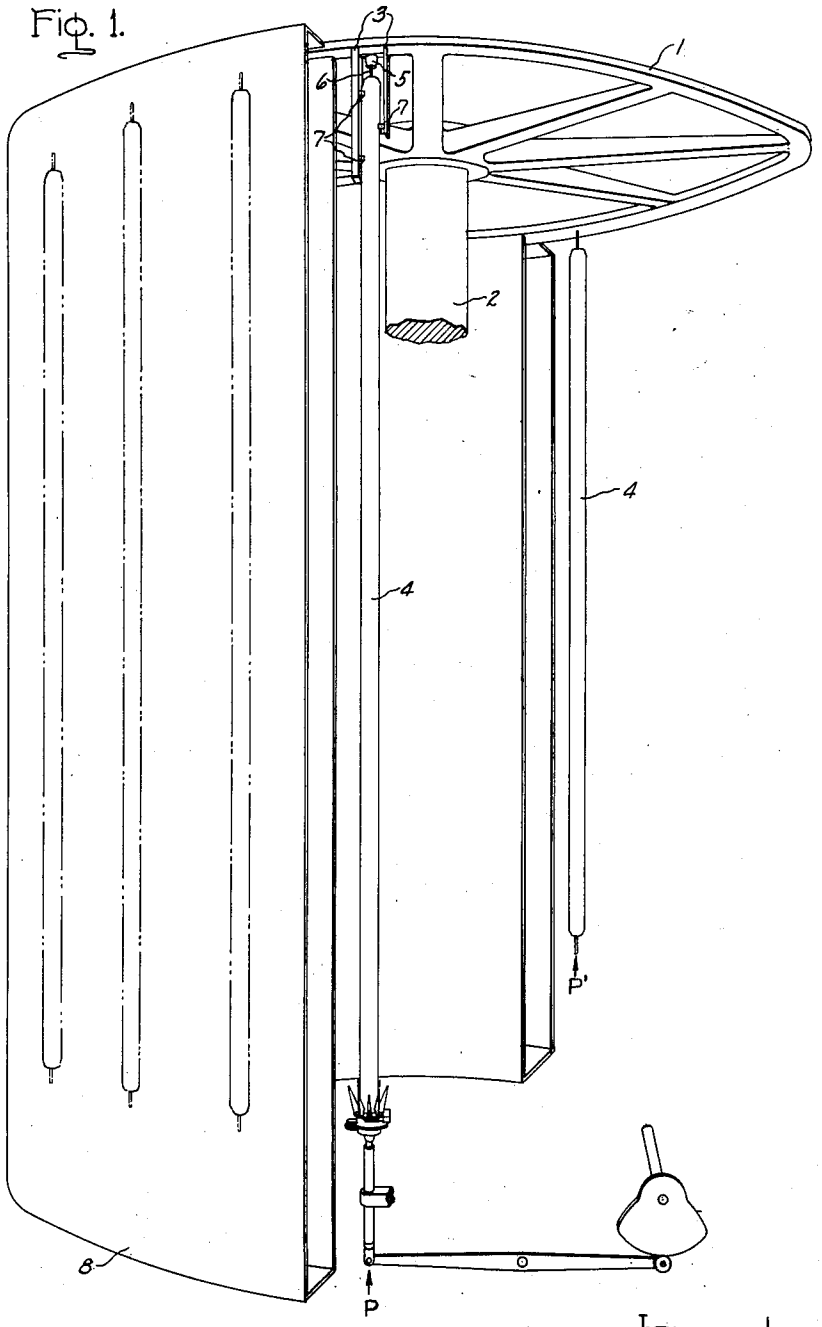
Nov. 25, 1952 R. A. KUEBLER 2,618,903

TUBULAR LAMP TIPPING-OFF APPARATUS

Filed July 12, 1950 3 Sheets-Sheet 1

Fig. 1.



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TUBULAR LAMP TIPPING-OFF APPARATUS

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Fig. 5.

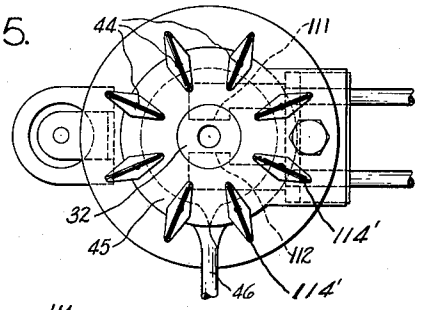
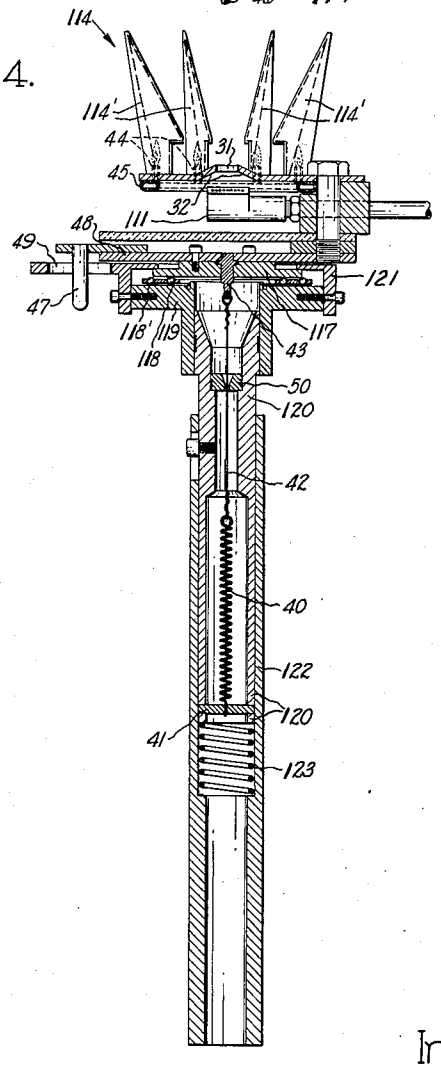


Fig. 4.



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Fig. 2.

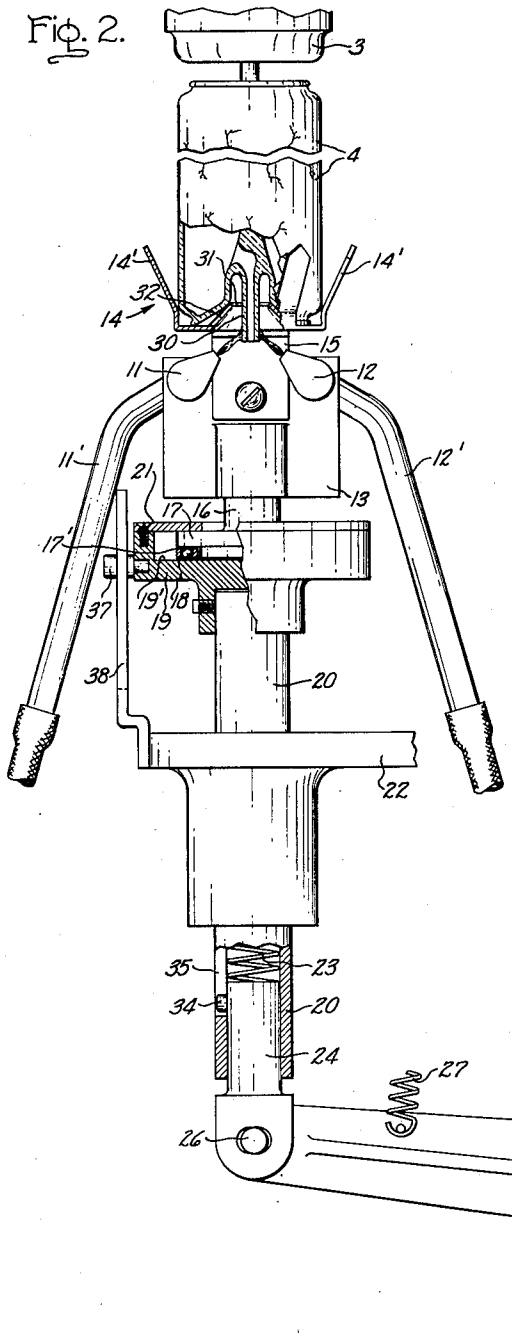
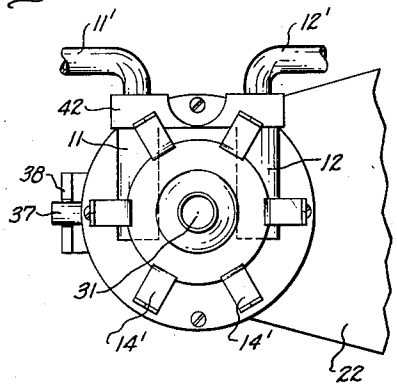


Fig. 3.



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Patented Nov. 25, 1952

2,618,903

UNITED STATES PATENT OFFICE

2,618,903

TUBULAR LAMP TIPPING-OFF APPARATUS

Robert A. Kuebler, University Heights, Ohio, assignor to General Electric Company, a corporation of New York

Application July 12, 1950, Serial No. 173,447

9 Claims. (Cl. 49—2)

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This invention relates generally to the sealing of vitreous vessels and more particularly to the tipping-off of the exhaust tubes of elongated gaseous discharge devices such as fluorescent lamps.

The present application is a continuation-in-part of my copending application Serial No. 669,140, filed May 11, 1946, and since abandoned in view of the filing of this application. It presents certain improvements in the tipping-off device described in the afore-mentioned application, particularly with regard to automatic recentering of the device, which improvements were necessitated by the coming into general use of longer fluorescent lamps than were being manufactured at the time that application was filed.

In the manufacture of electric lamps, it is necessary to provide for exhausting and sealing off the glass envelope. The actual sealing off comprises heating an exhaust tube extending from an end of an electric lamp to its melting point so that it is fused into a tip which seals the lamp permanently. This operation is generally known as "tipping-off" the lamp. The purpose of the exhaust tube, it will be understood, is to permit exhausting air from the interior of the bulb or envelope and also to permit filling with gas and, in certain instances, to permit the introduction of other substances such as mercury.

In the case of elongated tubular discharge devices, such as the common fluorescent lamp, exhaust tubes are generally provided at both ends of the device. This simplifies processing and permits flushing the envelope by injecting gas into one end and expelling it through the exhaust tube at the other end. Also, the exhaust tubes may afford means for holding one of the elements of the lamp, such as the stem, during its course of manufacture, in particular for mounting the filaments on the lead-in wires.

The tipping-off or sealing operation is usually accomplished by the heat and pressure of a gas flame directed against a portion of the vitreous exhaust tube and occurs while the electrical device from which the exhaust tube extends is retained by other associated apparatus, such as an exhausting and gas filling machine. These machines may be of the turret type comprising a series of heads for holding the lamps while various operations are performed upon them. The turret indexes each head to various work stations at spaced time intervals during which the specific manufacturing operations take place. The tipping-off apparatus may be located adjacent one of these work stations and must move into operative engagement with the lamp while it is still retained in the particular head to which it was attached when first placed in the turret machine. In order to realize the full benefits of its combination with the turret machine, the tipping-off apparatus must be operated automatically and in proper synchronism with the indexing system.

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The principal object of my invention is to provide automatic tipping-off apparatus for operation in combination with automatic lamp making machinery which periodically carries an electrical device provided with a vitreous exhaust tube to a work station occupied by the apparatus.

Another object of my invention is to provide tipping-off apparatus of the afore-mentioned character which is adapted to move automatically to the correct operating position relative to electrical devices successively located at a work station by means of associated apparatus.

Still another object of my invention is to provide self-positioning and automatic recentering tipping-off apparatus adapted to assume the correct operating position relative to successive electrical devices presented at a work station, the positions of these devices being only approximately determined or fixed by means of associated apparatus.

It will be understood that tipping-off apparatus is available for taking a definite operating position relative to a work station and that no problem is presented thereby. However, where the position of that portion of the lamp adjacent the exhaust tube which is to be tipped-off is subject to considerable variation, an entirely different problem is encountered which requires a different solution. Variations in position of the type in question here may occur because the devices, such as long tubular fluorescent lamps, are supported at points remote from the end which the tipping-off apparatus is required to engage. The fluorescent lamps may not be perfectly straight or, again, bowing may occur as a result of unequal cooling of different sides of the lamp. It will readily be understood that in the case of an eight-foot lamp, such as a 96–T–12, a very slight variation in the temperature of one side of the lamp with respect to the other may cause a bowing and lateral displacement at one end of as much as one inch when the lamp is supported exclusively from the other end. The tipping-off apparatus in accordance with my invention is designed to take care of variations in positioning of this order.

For further objects and advantages and for a better understanding of my invention, attention is now directed to the following description and accompanying drawing. The features of my invention believed to be novel will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a pictorial representation, considerably simplified in certain respects, illustrating the application of the tipping-off apparatus of my in-

vention to a turret type sealing and exhausting machine for long fluorescent lamps.

Fig. 2 is a side elevation of a tipping-off device embodying my invention and shown in operating relationship to a fluorescent lamp retained by the head of an associated exhausting apparatus. Certain sections of the device have been broken away in order to illustrate more clearly the construction of the internal parts.

Fig. 3 is a plan view of the tipping-off device of Fig. 1.

Fig. 4 is a side elevation, likewise with certain sections broken away, of another tipping-off device embodying an improved form of my invention which is particularly suitable for very long fluorescent lamps.

Fig. 5 is a plan view of the tipping-off device of Fig. 4.

Referring to Fig. 1, the rotary turret machine illustrated therein comprises essentially a circular platform or wheel 1 which is supported by, and pivots with, a shaft 2. At spaced intervals near the periphery of the platform 1, are located a number of combined heads and chucks 3 for receiving and holding elongated tubular glass envelopes such as fluorescent lamps 4. Each head 3 comprises a tubular sleeve 5 which is adapted to fit over and make hermetic contact with the upper exhaust tube 6 of lamp 4. In addition, head 3 comprises a number of clamping pieces or jaws 7 which grip the upper end of the lamp and hold it in vertical alignment below the head. It will be understood that the turret is intermittently rotated or indexed in order to advance each head thorugh a series of work positions whereat different operations are performed on the lamp.

The tubular sleeve 5 is connected to suitable evacuating apparatus which is not shown in the drawing. It will be understood that the purpose of the machine is to permit flushing the air out of the lamps, evacuating them, filling them with gas, and tipping-off the exhaust tubes while simultaneously annealing at suitable temperatures. A lamp begins its course through the machine at a position P' and is inserted in a chuck 3 at that position by the operator. With this particular machine, immediately after its insertion into the chuck at position P', the lamp enters a semicylindrical annular oven 8; and during the course of its travel through this oven, the lamp is heated to a suitable temperature for the processing that takes place after its emergence at position P. Also, during the course of its travel through the oven, the lamp is flushed with a suitable gas for cleaning out any air, moisture, and other impurities which may be occluded within the interior glass walls of the envelope. Upon its emergence from oven 8 at position P, it is desired to seal or tip-off the lower exhaust tube of the lamp. It will be understood that upon emergence at position P, the lamp is at a temperature of several hundred degrees centigrade and is likely to be slightly bowed. Since the lamp is supported exclusively from its upper end, even a very slight bowing will cause a considerable displacement at its lower end. Moreover, the lamp is emerging from a hot oven into room air at a relatively cold ambient atmosphere, and the unavoidable sudden chilling of one side causes a bowing in the direction of chilling. Although the total average amount of this bowing is unimportant, the actual amount varies between successive lamps; and, in practice, it has been found that with an eight-foot fluorescent lamp of the type commonly known as the 96–T–12, a variation in

displacement at the lower end of as much as one inch occurs during manufacturing.

The tipping-off apparatus must, accordingly, be designed to move vertically upwards as each succeeding lamp reaches the operating station in question. Since the lateral position of the bottom ends of the lamps varies, the tipping-off apparatus must also be designed to have the necessary freedom of motion in a plane normal to the axis of the lamp. The flexibility of the system must be such that it be capable of surrounding the lower exhaust tube with the requisite tipping-off flame without exerting any undue side thrust and without bending the lamp in its softened state. Since the lamps are very long and slender and quite pliable at the temperature at which they emerge from oven 8, it will be understood that the tipping-off apparatus must be free to move transversely in a horizontal plane with a pressure exerted thereon by the end of the lamp not in excess of a few ounces.

The very stringent requirements outlined above are met by a construction of a tipping-off apparatus embodying my invention and illustrated in Fig. 2. Referring now to Fig. 2, there is shown the fluorescent lamp 4 which is connected to a head 3 of the exhausting apparatus. It will be understood that the upper clamping jaws 7 have not been shown in this figure and that a very substantial midportion of the lamp has been broken away. The lamp is shown in the position which it would occupy at the lower tipping-off station corresponding to P in Fig. 1. The actual head 3 connected to the lamp may correspond to that shown in the exhausting apparatus disclosed in U. S. Patent 2,247,513 to A. J. Marshaus. When the head 3 and the lamp 4 first enter this particular work station, the tipping-off device lies in a downwardly retracted position below the path of movement of the lamp and out of operative relationship therewith.

The tipping-off device comprises a pair of gas burners 11 and 12 which are mounted on a head 13 and which have upwardly and inwardly inclined jets for directing the flames to a common central point. A funnel-shaped guide 14 is affixed to head 13 by means of a bracket 15 and comprises a number of outwardly flared fingers 14' which are adapted to engage and locate the lower end of lamp 4. Head 13 is mounted on a post 16 attached to a disc 17, the whole constituting the upper supporting means for the burners. The upper supporting means is provided with a limited freedom of movement in a horizontal plane by the arrangement whereby disc 17 floats on a ring of ball bearings 18 located within a housing 19. This housing is attached to the upper end of a rod 20 which may move vertically upwards and downwards and constitutes part of the lower supporting means for the burner. The relatively movable upper and lower portions of the supporting means for the device, that is, disc 17 on which the upper parts are mounted and housing 19 which is affixed to the lower portion, are characterized by superposed surfaces perpendicular to the vertical direction of movement of rod 20. These superposed surfaces are constituted by the lower surface 17' of disc 17 and the upper plane surface 19' of housing 19. The ball bearings interposed between these two surfaces are maintained in spaced relationship about an annular area of disc 17. A ring-shaped cover plate 21 is attached over the housing 19 and serves to keep disc 17 and the burner supported thereon in spaced relationship with respect to the hous-

ing and prevent any tipping of these elements by a side thrust.

Rod 20 is adapted to slide within a bracket 22 which extends from the frame of the turret machine and serves as a means for holding the entire tipping-off device at the correct position with respect to the work station. The vertical motion is transmitted to rod 20 and by means of a linkage comprising a spring 23 contained within the hollowed out lower extremity of rod 20 and compressed by a piston 24. Piston 24, in turn, is driven by means of a lever 25 which is linked thereto by a pin 26 fitting in a suitable slot within the lower end of the piston. Lever 25 is pivoted on a shaft 25' and is normally biased by means of a spring 27 which extends to a stationary part of the frame for the machine. Lever 25 has a roller 28 at its opposite extremity which roller is adapted to follow the contour of a cam 29 so as to be actuated thereby. Since the operation of the tipping-off device must be synchronized with the indexing movements of the lamps in the turret machine to and from the spaced work stations, the cam 29 is preferably actuated by the driving means for the turret machine.

The upper floating section of the tipping-off device is provided with sufficient freedom of movement in a horizontal plane to permit adjustment for any ordinary variation in the positioning of the lower extremities of the lamps 4 which may be encountered during the course of manufacturing operations.

After a lamp has been indexed into the station corresponding to the tipping-off operation, the cycle is initiated by an upward movement of piston 24 which results in an upward movement of the floating portion comprising the burners and the guide 14. The upper extremities of the guide fingers 14' are spread out enough that no matter where the lower extremity of the lamp happens to be positioned with respect to the work station, it will strike the inwardly sloping surface of one of the fingers. Immediately thereupon, the upper floating portion of the tipping-off device will shift sideways by movement of the disc 17 over the upper surface 19' of the housing 19. The lateral movement will continue while the tipping-off device is moving upwardly until finally the lower end of the lamp is seated squarely within the flared guide 14.

The preceding operations permit the exhaust tube 30, extending beyond the lower end of the lamp 4, to pass through a central aperture 31 in the lower shield portion 32 of the guide 14. Finally, at the limit of the vertical upward movement of the device, the shield portion 32 of the guide 14 abuts directly against the lower end of lamp 4 as shown in the drawing, and the burners 11 and 12 are then properly positioned to direct their flame to melt and seal the lower extremity of the exhaust tube 30. The motion of the operating lever 25 and piston 24 is actually greater than what is normally required to assure positive seating of the lamp in guide 14, and the excess motion is absorbed by the compression of spring 23 located between the lower end of rod 20 and the upper end of piston 22. This is in order to permit positive seating of the various lamps in spite of dimensional tolerances and variations. In between the times when the tipping-off device is bearing against the lower end of a lamp, the expansion of spring 23 is limited by means of a pin 34 which is carried by piston 24 and rides in a longitudinal slot 35 in the lower portion of rod 20.

The melting of the glass and the sealing of the exhaust tube is brought about by the action of the relatively hard flames from the burners 11 and 12 and consists, in this particular instance where a short exhaust tube is presented, in fusing and working the end into a permanently sealed tip. Should the exhaust tube 30 be of excessive length, the portion below the seal can be caused to separate and fall from the portion remaining attached to the lamp. In the present instance the lower exhaust tube which the tipping-off device described herein is designed to seal, is not connected to any exhausting apparatus. Its function is different from that of the exhaust tube extending from the upper end of lamp 4 and connected to one of the heads 3 of the turret machine. The lower exhaust tubes served their purpose during the flushing operation of the lamp and are of no further use during succeeding manufacturing operation.

Following the tipping-off or sealing-off of the exhaust tube 30, the tipping-off device is lowered away from engagement with the end of lamp 4 by means of suitable movement of cam 29. This permits rotation of the turret machine and the indexing thereof to the succeeding station while another lamp is brought into the work station P associated with the tipping-off of the lower exhaust tube. It will be understood that the lowering of the device is performed by the reverse movement of the operating lever 25 and completes one cycle of operation. Succeeding cycles of operation follow the same course as that just described.

Since it is desirable that the device be kept from turning in order to prevent the flexible tubes 11' and 12' supplying gas to the burners 11 and 12, respectively, from engaging extraneous apparatus and interfering with the operation of the device, means are provided for so doing. These means comprise a pin 37 extending from housing 19, which pin 37 is located in a vertical slot in an arm 38 attached to bracket 22.

In the embodiment of my invention illustrated in Figs. 4 and 5, certain improvements have been incorporated which have been specifically designed for the manufacturing operation of tipping-off the lower exhaust tube in an eight-foot tubular fluorescent lamp of the type commonly known as the 96–T–12 and 96–T–8. It might be mentioned that these designations signify tubular florescent lamps 96 inches in nominal length and 12/8 and 8/8 inches in diameter, that is 1½ and 1 inches in diameter, respectively.

In connection with the tipping-off device of Fig. 2, it will be realized that, after a particular lamp has been sealed off, the device remains in whatever position of lateral displacement it occupied when it was lowered away from the previous lamp upon which it operated. Under certain circumstances, this may lead to difficulties. Thus, if a preceding lamp had an extreme deviation to the right whereas the succeeding lamp has an extreme deviation to the left, the amount of travel or lateral displacement required of the guides and burners is doubled. With very long lamps, in connection with which the variations in deviation of the lower ends are apt to be considerable, it becomes very desirable to provide some means for automatically recentering the disc 17 and the burners with respect to the housing 19.

Referring to Fig. 4, wherein there is shown a tipping-off device of generally similar construc-

tion to that of Fig. 2, the automatic recentering feature is provided by means of a light helical spring 40 which is secured at one end by means of a pin 41 to the lower extremity of a rod 120 and which is connected at its upper end by means of a flexible wire 42 to a pin 43 fixed to the movable disc 117. Wire 42 passes through a guide bushing 50 located within rod 120, so that the portion of the wire between the bushing and pin 43 is bent out of the vertical whenever movable disc 117 moves out of its central position. The spring 40 is adjusted to exert at all times a slight tension on the wire 42 as a result of which disc 117 is automatically returned to a central position within the housing 119 whenever the device is lowered away out of engagement with a lamp.

In this improved embodiment of the invention, the fingers 114' of the guide 114 are provided with heating means for raising their temperature to a point approximately equal to that of the lower end of the lamp when it emerges from the oven 8. The fingers are V-shaped in cross section and open to the rear, that is, on the side facing radially outwards. The heating means comprise small jets or nozzles 44 located below the guide fingers 114' and connected to a gas supply ring 45. Ring 45 is supplied with gas through an inlet tube 46 which is normally connected to a supply by means of flexible rubber tubing. The bottom plate or seat 32 of the guide 114 is shaped somewhat like an inverted funnel in order to guide the flame from the burners 111 and 112 onto the lower tip of the exhaust tube 30.

Since the burners and guides mounted on disc 117 in the present embodiment have a greater range of lateral displacement, it has been found desirable to provide a double ring of ball bearings in order to obviate any tendency toward tipping. Accordingly, two rows of balls 118 and 118' are provided in a single retaining ring. Thus, one ring is at all times fully beneath the disc 117 so that it is impossible for the burner assembly mounted thereon to tip over, and it always bears evenly on the balls. A slightly different arrangement is utilized herein for limiting the lateral displacement of disc 117 with respect to housing 119. This arrangement consists of a vertical pin 47 attached to a mounting plate 48 secured to the disc 117, and a locating ring 49 which is formed in a lateral projection of the cover plate 121 of housing 119. The pin and locating ring combination prevents the edge of the disc 117 striking the housing 119 and possibly damaging one or the other. Rod 120 which supports the housing, is received in a sleeve 122 and resiliently supported therein by a spring 123. The tipping-off device is raised against the lower end of the lamp through an upward displacement of sleeve 122. The excess movement, after engagement of the lamp, is taken up by compression of spring 123, in generally similar fashion as with spring 23 in the embodiment of Fig. 2.

While certain specific embodiments have been shown and described, it will of course be understood that various modifications may be made without departing from the invention. The invention is essentially characterized by the provision of the tipping-off burners and locating guides for receiving the lower extremity of the lamp on a disc or plate which has lateral or transverse freedom of movement with respect to the vertical displacement of the assembly towards the end of a lamp. Although the embodiments herein have been described with all the refinements which have been found desirable for the very delicate operations contemplated in the use of the machine, such as ball bearing mountings, these refinements need not all be observed where work of a grosser type is satisfactory. Likewise, in the arrangement for providing the vertical upward movement to the assembly, the refinements for taking care of dimensional variations in the length of the lamps are not essential and may likewise be dispensed with. The appended claims are, therefore, intended to cover any such modifications coming within the true spirit and scope of the invention.

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

1. A self-positioning tipping-off device, comprising a heater, support means for said heater comprising an upper section terminating at its lower end in a horizontal disc and a lower section comprising a vertically reciprocable rod under said upper section and terminating at its upper end in a horizontal surface for supporting said disc, and means holding said disc in fixed vertical position relative to said surface but permitting limited floating motion of the disc laterally, and guide means attached to said upper section of the support means and adapted to engage with an article to be heated to accurately position the heater with respect to said article.

2. In apparatus for processing an elongated electric lamp or similar device having an exhaust tube projecting from each end thereof, the combination of an exhaust head mounted for intermittent movement to a series of work stations and adapted to support a lamp in a suspended vertical position by gripping it adjacent its upper end, and a tipping-off device located at one of said work stations in vertical alignment with the exhaust head at said station and below the lamp held thereby, said tipping-off device comprising heating means for fusing the lower exhaust tube of said lamp, support means for said heating means, means for vertically reciprocating said support means to carry the heating means thereon toward and alternately away from the lower end of the said lamp, means mounting said heating means on said support means for limited horizontal floating motion, and guide means mounted on said support means in fixed relationship with said heating means and adapted to engage the lower end of said lamp and shift said heating means horizontally into accurate relationship to said lower exhaust tube.

3. In apparatus for processing an elongated electric lamp or similar device having a vitreous exhaust tube projecting from each end thereof, the combination of an exhaust head mounted for intermittent movement to a series of work stations and adapted to support a lamp in a suspended vertical position by gripping it adjacent its upper end, and a tipping-off device located at one of said work stations in vertical alignment with the exhaust head at said station and below the lamp held thereby, said tipping-off device comprising heating means for fusing the lower exhaust tube of said lamp, support means for said heating means, means for vertically reciprocating said support means to carry the heating means thereon toward and alternately away from the lower end of the said lamp, means mounting said heating means on said support means for limited horizontal floating motion, and funnel-like guide means mounted on said support means in fixed relationship with said heating means and

adapted to engage the lower end of said lamp and shift said heating means horizontally into accurate relationship to said lower exhaust tube.

4. A self-positioning tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from elongated envelopes periodically presented at a work station, with individual variations in the positioning of succeeding envelopes, comprising lower supporting means defining a horizontal surface and adapted to move vertically upwards towards the lower end of said envelope, upper support means slidably mounted on said lower support means and adapted to move freely on said surface in a direction transverse to said vertical movement, a guide attached to said upper support means and adapted to engage the lower end of said envelope in order to cause said upper support means to be displaced transversely with respect to said lower support means into position for engaging said lower end, and burners attached to said upper support means for sealing off said vitreous tube.

5. A self-positioning tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from glass envelopes periodically presented at a work station with lateral variations in the positioning of succeeding envelopes, comprising lower support means adapted to move vertically upwards towards the lower extremity of said envelope, upper support means mounted with horizontal freedom of movement on said lower support means, each of said support means defining a plane surface, one superposed upon the other, and adapted to slide, one with respect to the other, burners attached to said support means for sealing off said vitreous tube, and a guide mounted on said upper support means for engaging said lower extremity and for causing said upper support means to be displaced transversely to the extent necessary for centering said burners about said exhaust tube.

6. A self-positioning tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from glass envelopes periodically presented at a work station with lateral variations in the positioning of succeeding envelopes, comprising lower support means adapted to move vertically upwards towards the lower extremity of said envelope, upper support means mounted with horizontal freedom of movement on said lower support means, each of said support means defining a horizontal plane surface, one superposed upon the other, ball bearings located between said surfaces for reducing the friction of sliding, burners attached to said upper support means for sealing off said vitreous tube, and a guide mounted on said upper support means for engaging said lower extremity and for causing said upper support means to be displaced transversely to the extent necessary for centering said burners about said exhaust tube.

7. A self-positioning tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from glass envelopes periodically presented at a work station with lateral variations in the positioning of succeeding envelopes, comprising lower support means adapted to move vertically upwards towards the lower extremity of said envelope, upper support means mounted with horizontal freedom of movement on said lower support means, each of said support means defining a horizontal plane surface, one superposed upon the other, ball bearings located between said surfaces for reducing the friction of sliding, burners attached to said upper support means for sealing off said vitreous tube, and a guide comprising flared fingers mounted on said upper support means for engaging said lower extremity and causing a side thrust to be exerted for shifting said upper support means horizontally to the extent necessary for centering said burners about said exhaust tube.

8. A self-positioning and automatically recentering tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from glass envelopes periodically presented at a work station, succeeding ones of said envelopes having variations in their positioning with respect to said station, comprising lower support means arranged for vertical movement towards the lower extremity of said envelope, upper support means slidably mounted with respect to said lower support means in a manner to provide horizontal freedom of movement, a guide attached to said upper support means for engaging the lower extremity of said envelope and causing said upper support means to shift transversely during the continued upward movement of said lower support means, said shifting being in a direction for causing said lower extremity to seat squarely in said guide, burners mounted on said upper support means and located for fusing and sealing-off said vitreous tube upon seating of said envelope within said guide, and a tension spring connected between central points in said upper and lower support means for automatically recentering said upper support means upon disengagement of said guide from said lower extremity.

9. A self-positioning and automatically recentering tipping-off device for fusing and sealing the ends of vitreous tubes projecting downwardly from glass envelopes periodically presented at a work station with lateral variations in the positioning of succeeding envelopes, comprising lower support means adapted to move vertically upwards towards the lower extremity of said envelope, upper support means mounted with limited horizontal freedom of movement on said lower support means, each of said support means defining a horizontal plane surface, one superposed upon the others, ball bearings located between said surfaces for reducing sliding friction, burners attached to said upper support means for sealing off said exhaust tube, a guide mounted on said upper support means for engaging said lower extremity and for causing said upper support means to be displaced transversely in order to center said burners about said exhaust tube, and a tension spring connected between a central point in said upper support means and a central point below said surfaces in said lower support means for automatically recentering said upper support means upon disengagement of said guide from said extremity.

ROBERT A. KUEBLER.

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