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H. DE F. MADDEN ET AL

TIPPING TORCH FOR EXHAUST MACHINES

Filed Feb. 21, 1923

FIG. 1.

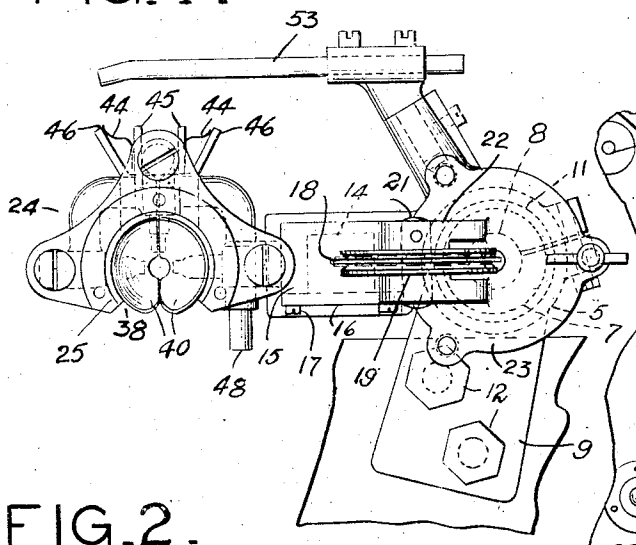


FIG. 2.

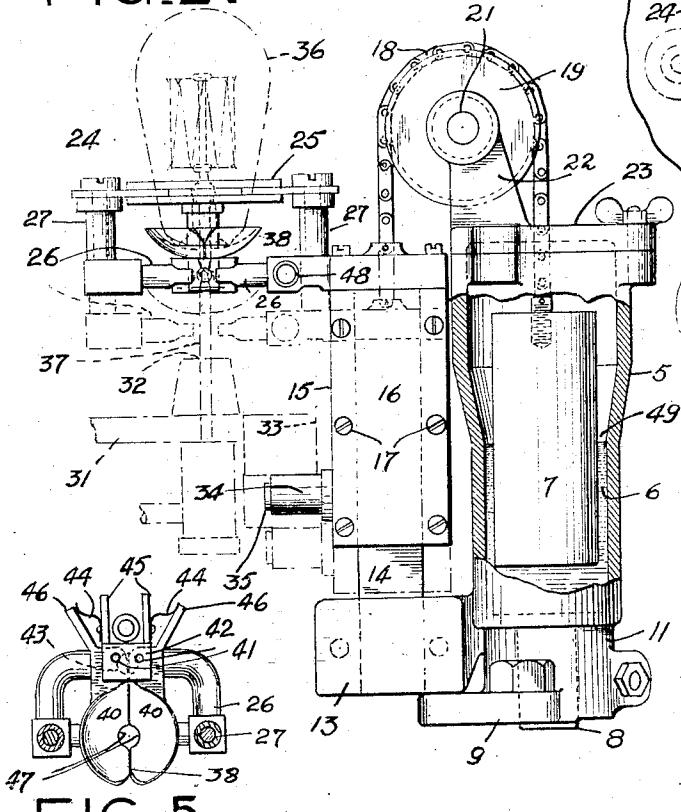
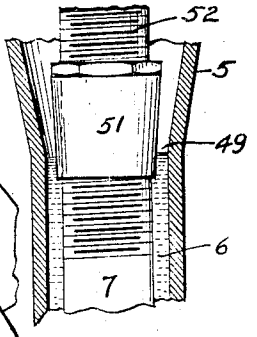


FIG. 5.

FIG. 6.



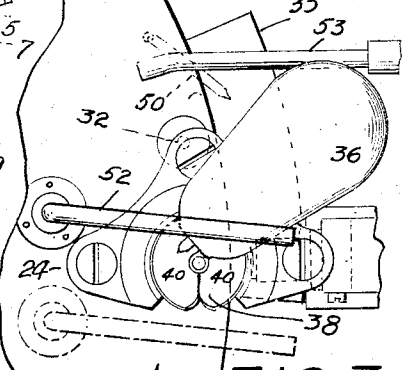


FIG. 3.

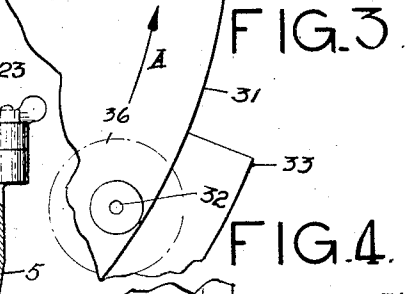
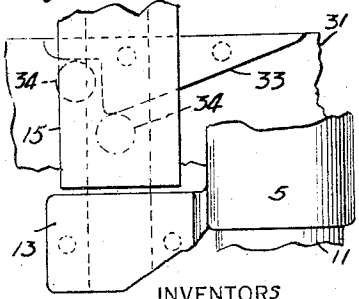


FIG. 4.



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UNITED STATES PATENT OFFICE.

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TIPPING TORCH FOR EXHAUST MACHINES.

Application filed February 21, 1923. Serial No. 620,348.

The present invention relates to machines for making incandescent electric lamps and relates more particularly to a device for tipping off the exhaust tube from an evacuated lamp bulb.

An object of the present invention is to provide a device for the expeditious and automatic performance of a tipping off operation.

Another object of the invention is to provide a device which will operate to locally heat a portion of an exhaust tube and simultaneously exert a controlled tentional stress in said heated portion to effect a parting of a section of the exhaust tube from the exhausted bulb.

A further object of the invention is to pro- a device which may be automatically operated in cooperation with an exhausting machine to effect a tipping off of an exhaust tube disposed in said machine and a removal of an evacuated lamp therefrom.

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

The manufacture of incandescent lamps includes an operation known as exhausting in which the bulb is evacuated to a given degree. Machines for producing a vacuum in lamp bulbs are well known in the art, and usually include a pump and a valve consisting of a disc movable upon a nether plate and having suitably disposed ducts in given relative positions.

The ducts are connected with intermediate passages which in turn afford communication to a plurality of ports or exhaust tube receiving apertures. These tube receiving apertures usually consist of the openings in flexible tubes of soft rubber which constitute what may be termed tube-supporting members. The disc valve may be operated to open and close the ducts leading to the supporting members to sucessively evacuate the several lamps positioned in a series of supports.

Exhausting machines of the type to which the present invention relates may consist of a conveyor preferably of circular form having a plurality of tube supporting members adjacent the periphery thereof. The supporting members are successively connected with exhaust pumps for creating from a minimum to a maximum degree of vacuum. Thus the exhaust tube of a lamp bulb being disposed in a tube-supporting member is subjected to several evacuating operations until the bulb is finally evacuated to the proper degree at which time it becomes necessary to perform a tipping-off operation to seal the bulb and remove the same from the lower portion of the exhaust tube which remains in the supporting member after the sealing operation.

When a lamp has reached the position at which it has been sufficiently evacuated, the tipping-off operation is performed and it is at this point that the present invention may be applied.

The invention therefore may operate to yieldingly secure the bulb of a lamp while fires, usually gas flames under pressure, are caused to impinge upon the exhaust tube, at which time tensional stress is imparted to the heated portion which is subsequently severed and the bulb sealed by the collapse of walls of the tube.

A device for performing this operation may comprise a bulb-carrier including a shield and a bulb rest or rack over which the bulb may be positioned when the exhaust machine has moved the bulb to a predetermined point. Coordinating machine elements upon the exhausting machine and upon the tipping off device may be so associated that the bulb rest will be in the proper relation to a bulb when the exhausted bulb has reached its final exhausting position.

In the present device, a weighted member partly immersed in a liquid is so associated with the rack that when the rack is caused to engage with a lamp bulb, downward movement of the weighted member will be prevented. When the fires, however, have heated and weakened the exhaust tube of the bulb, gravity, acting upon the weight member, produces an upward movement of the bulb-carrier with the result that the heated portion of the tube is severed and the bulb is subsequently discharged from the rack.

The invention will be more fully understood by reference to the accompanying drawings in which,

Fig. 1 is a plan view of an embodiment of the invention;

Fig. 2 is a view, partially in elevation and partially in section, of the mechanism of Fig. 1;

Fig. 3 is a diagrammatic representation of

a portion of an exhaust machine showing the relaton of the present invention thereto;

Fig. 4 is a fragmentary view of a portion of an exhausting machine and the tipping-off device;

Fig. 5 is a detail plan view of the shield for protecting the lower end of a bulb from excessive heating; and,

Fig. 6 shows a portion of the weighted member and casing in section and illustrates means for varying the area of the passage for the outlet of the liquid.

The invention may include a chamber or dash-pot 5 containing any suitable liquid 6 preferably of a viscous nature. Disposed within the chamber is a weighted member or plunger 7 having its lower end immersed in the liquid.

The lower end of the chamber 5 may be provided with a stud 8 to which may be secured a bracket or arm 9 by means of a split collar 11. The arm 9 may, in turn, be secured to any stationary structure by tap bolts 12.

Integral with the chamber 5 is a radially-projecting clamp 13 in which is secured an upwardly extending guide rod 14. Slidably disposed upon the guide rod 14 is a sleeve or carrier 15 which may consist of a trough shaped member having one side closed by a retainer plate 16, the plate being secured to the trough shaped portion by tap bolts 17. The upper end of the carrier may be connected to one end of a chain 18 which may pass over a chain sheave 19, the other end being secured to the weighted member 7. The chain sheave may be mounted on a shaft 21 journaled in a bearing 22 integral with a cover plate 23 which may constitute a closure for the chamber 5.

Secured to the upper end of the sleeve 15 and offset therefrom, is a combined burner element and rack which, as a whole, may be termed a bulb carrier 24, having a bulb adjuster or steady-rest 25 suitably elevated above and fastened to burners 26 by posts 27.

The bulb carrier 24 is therefore reciprocable vertically with the sleeve 15 and may be partially balanced by the weighted member or counter weight 7. The counter-weight 7 is sufficiently heavier than the bulb-carrier and sleeve so as to effect an upward movement of the carrier and sleeve due to the action of gravity upon the weight; the liquid 6 acting to retard the downward movement of the weight, the advantage of which will be more fully set forth below.

It will be understood that the bulb carrier and counter weight with the necessary retaining and supporting elements constitute a device which may be applied and operated in conjunction with a lamp making machine such, for instance, as an exhausting machine. Machines for exhausting lamps are well known in the art and only such portions thereof, necessary for a complete understanding of the present invention have been shown.

As illustrated in Fig. 3, a conveyor 31 of an exhausting machine is provided with a plurality of exhaust tube receiving apertures 32. The conveyor is moved in the direction of the arrow "A" and is provided with cam members 33 (see Fig. 4) suitably disposed upon the periphery of the conveyor; a cam being positioned adjacent each exhaust tube receiving apertures.

The tipping-off device may be secured by means of the bracket 9 to any suitable stationary portion of the machine in such position that the bulb-carrier 24 overhangs the path of movement of the apertures 32. A projecting roller 34 mounted on a pin 35 secured to the sleeve 15 may be positioned to engage with the cams 33 as the conveyor moves to actuate the bulb-carrier.

The conveyors of exhausting machines are generally provided with eight exhaust tube receiving apertures symmetrically spaced and adjacent to the periphery of the conveyor; the conveyor being moved in a series of stages to successively position the apertures 32 in connection with different pumps for the exhausting operations. Thus a lamp 36 may have the exhaust tube 37 thereof disposed in an exhaust tube receiving aperture or support 32 at one stage of the movement of the conveyor and may be exhausted progressively to a given degree.

When the exhausting operation is completed one of the cams 33 will have engaged with the roller 34 and by reason of the inclination of the cam surface, the sleeve 15 will be forced downwardly with a consequent upward movement of the counter weight 7. As the conveyor continues to move, the carrier 24 being in its lower position will be so disposed that the exhaust tube may enter between two sections 40 of a split shield 38 and the bulb will, by reason of the lesser diameter at its lower end, readily enter the rack or rest 25. When the bulb is so positioned with respect to the rest, the conveyor will have moved a sufficient distance to permit the roller 34 to pass from the cam surface 33 thereby effecting an upward movement of the carrier until the shield 38 will have engaged with the lower end of the bulb 36.

It will be evident that the engagement of the shield with the bulb may prevent a complete downward movement of the weighted member and that the potential energy of the weighted member may result in an upward pull upon the bulb-carrier 24 and a consequent tensional stress in the exhaust tube of the bulb. When the exhaust tube is thus stressed, the fires 26 are in position to heat the exhaust tube at its constricted portion. As the material softens, the heated

portion of the exhaust tube is obviously weakened and the stress imparted thereto effects a parting of the tube as the walls thereof collapse to close the sections of the tube and seal the bulb.

During the heating operation, it is desirable to avoid the application of an excess amount of heat to the upper portion of the exhaust tube or around the lower portion of the bulb, for which purpose the shield 38 is provided and serves to protect the lower end of the bulb when the bulb is in the tipping-off position. Sections 40 of the shield 38 may be pivoted on pins 41 mounted in a slotted bearing block 42 which block may be secured to the burner 26 by a stud 43. The sections 40 of the shield are normally maintained in a closed position through the action of springs 44 secured to arms 45 integral with the bearing block 42, and arms 46, one projecting from each section of the shield. The sections of the shield are thus resiliently held closed but the ends thereof are beveled to readily admit an exhaust tube and centrally disposed semi-circular notches 47 are provided to substantially fit about an exhaust tube.

The fires playing upon the exhaust tube are thus prevented from injurious or direct impingement upon portions of the bulb. The fires for heating the bulb usually consist of ignited illuminating gas, the gas being fed to the burner through an inlet 48.

It is important in the tipping-off operation to gradually attenuate the heated portion of the tube and by reason of the liquid surrounding the lower portion of the counter weight, sudden action is prevented as the exhaust tube weakens when rendered plastic. The liquid being confined in the chamber 5 is displaced by the weight but the rate of displacement thereof depends upon the area through which the liquid must pass to escape to the more ample or greater capacity portion of the chamber.

In the present invention the spaced relation of the weight and the inner wall of the chamber 5 is such as to provide a constricted passage 49. Thus the opposition to the downward movement of the weight may be varied by varying the area of the passage 49. This area may be determined by experiment and fixed as shown in Fig. 2, however, when desirable, means may be provided for varying such outlet area. For this purpose, a threaded tapered collar 51 may be screwed on a threaded portion 52 of member 7, see Fig. 6. Thus by varying the position of collar 51 longitudinally of member 7, the outlet area 49 may be increased or decreased, thereby changing the degree of opposition afforded to the downward movement of the weight. The rate of movement of the weight 7 may also be varied by varying the viscosity of the liquid 6.

When a lamp has been tipped off and the carrier 24 takes its upper position, the lamp will be retained in the rest 25. It is, however, desirable to eject lamps automatically from the carrier. Any suitable means for discharging the lamps may be provided one such means may consist in the provision of a projecting finger 52 secured to the conveyor 31 and adjacent each of the exhaust tube receiving apertures. This finger may be arranged to project outwardly from the conveyor and so proportioned as to pass a predetermined distance above the rest 25 of the carrier 24. Therefore, when the conveyor moves, the tipping-off device being relatively stationary, the arm 52 will engage with a lamp and eject it from the rest 25 and cause it to enter any suitable receptacle or chute for conveyance away from the machine.

It is also desirable to provide means for ejecting the surplus or waste ends 50 of the exhaust tubes 37 from the exhaust tube apertures 32, see Fig. 3. For such purpose, the present device is provided with a projecting rod 53 which extends across and above the path of movement of the exhaust tube apertures. As the conveyor moves, the rod 53 engages with the remaining portion of the exhaust tube and tips it over and by reason of the flexible walls of the exhaust tube receiving aperture, the exhaust tube is practically wiped therefrom.

In operation, the lamp is placed with the exhaust tube 37 thereof in one of the apertures 32. The conveyor then moves with a series of intermittent steps during which the lamp is subjected to a plurality of evacuating operations. At the time the tube reaches the position adjacent the tipping-off device the desired vacuum is obtained. As the conveyor moves the lamp to position in operative relation to the tipping-off device, the roller 34 engages with the cam 33 secured to the conveyor 31. The carrier 24 is thus moved downwardly and as the conveyor comes to the proper relative position, the exhaust tube enters between the sections 40 of the split shield 38 and the lamp is positioned within the bulb-rest 25. At this point, the roller 34 moves over the end of the cam 33 and the shield 38 is moved into contact with the lower end of the bulb.

As the weight drops, its initial movement, which is comparatively rapid, is retarded as a greater volume of the weight enters and displaces the liquid. Since the liquid is confined to the chamber 5 and can only escape upwardly through the restricted passage 49, the downward movement of the weight will result in placing a portion of the liquid under pressure and the opposition of the liquid to the movement of the weight causes the shield 38 to move gently into contact with the lower end of a bulb thus the detrimental effect as heretofore caused by impact between the

carrier and the bulb is avoided. The stress caused by the weight is a maximum only when there is no movement or when the rate of movement is very slow.

The fires then operate to render plastic a portion of the exhaust tube and as the tube begins to weaken it is gradually stretched by reason of the pull effected by the counter weight 7. Owing to the elastic medium in which the weight is received, the pull upon the exhaust tube is gradual and may be properly timed to provide the proper collapse of the walls of the tube to give the desired sealing of the bulb.

When the tube has been sealed off, the carrier 24 will have reached its upper position and as the conveyor is then moved, the severed bulb is engaged by the finger 52 and is discharged from the carrier; subsequently the rod 53 engages with a portion of an exhaust tube of a previously tipped off bulb and as the conveyor continues to move, this tube is ejected from the aperture 32.

Heretofore devices have been constructed for performing the tipping-off operation, but owing to certain peculiar conditions incident to tipping-off a lamp when being exhausted on an exhaust machine, these prior devices were unsatisfactory as they could not be made to meet the variable conditions. Furthermore, the lamp as manufactured up to the point of the tipping-off operation, may have been weakened in certain portions thereof particularly at the junction between the exhaust tube and the other component parts of the lamp. Considerable difficulty has heretofore been encountered in tipping-off a bulb without stressing, too severely, this relatively weak portion of the lamp. A certain amount of the difficulty consisted in the lack of suitable coordinating mechanism to properly bring the shield or stop member of the lamp carrier in contact with the end of the bulb.

In order to avoid detrimental impacts or sudden stress, this operation must be performed in an exact and delicate manner. At the same time, a sufficient potential force must be preserved and subsequently released to gradually impart the necessary tensional stress to the exhaust tube for the severing operation.

In the present invention the desirable cooperation of machine elements is effected whereby the shield is rapidly moved up to and makes contact with the lower end of a lamp. Severe impact, however, is avoided and at its initial stage, the stress is less than the stress subsequently applied when the exhaust tube has been rendered plastic.

The desirable result attained in the present invention is made possible by reason of the elastic action of the fluid 6 which may be a medium weight oil and in which the weight 7 is partially immersed. More positive means are thus provided for effecting the tipping-off operation. This operation is of considerable importance in the lamp industry and in order to maintain the rate of production desired of an exhaust machine it is necessary to provide a tipping torch which will operate efficiently and with a minimum amount of attention from an operator. The simplicity and positiveness of the present device therefore makes it an important appliance for use with machines which operate to produce volume products such as electric incandescent lamps.

Although a preferred embodiment of the invention is shown and described herewith, it is to be understood that modifications may be made therein without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A tipping off device comprising a bulb-carrier, a counter weight, means for positioning said carrier about a bulb, means for causing an upward movement of said carrier by reason of the potential energy of said counter weight, a liquid disposed in the path of said counter weight for displacement thereby and adjustable means for restricting the displacement of said liquid.

2. A tipping off device comprising a bulb-carrier, a counter weight, means for positioning said bulb-carrier about a bulb, means for causing an upward movement of said carrier by reason of the potential energy of said counter weight, a fluid disposed in the path of said counter weight for displacement thereby, a restricted passage for the outlet of said fluid and means for varying the area of said passage.

3. In a machine for exhausting electric incandescent lamp bulbs, the combination with a device for tipping off lamp bulbs secured in exhausting apertures of said machine, said device comprising a bulb-carrier, a counter weight, means associated with said machine for positioning said rest about a bulb secured in an exhausting aperture, means for producing a tensional stress in said exhaust tube by reason of the action of gravity of said counter weight, means for rendering a portion of said tube sufficiently plastic to permit the applied tensional stress to sever said tube, a liquid disposed in the path of movement of said counter weight to retard the movement thereof, a restricted outlet for said liquid and means for varying the area of said outlet.

In testimony whereof, we have hereunto subscribed our names this 19th day of February 1923.

HARRY DE FOREST MADDEN.
JOHN JOSEPH HIGGINS.