June 4, 1957 M. EBER 2,794,699

MANUFACTURE OF SMALL LAMPS

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Fig. 1.

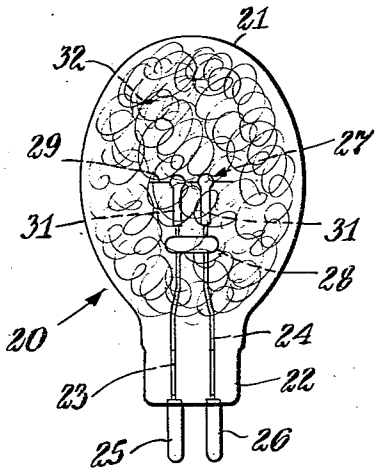


Fig. 2.

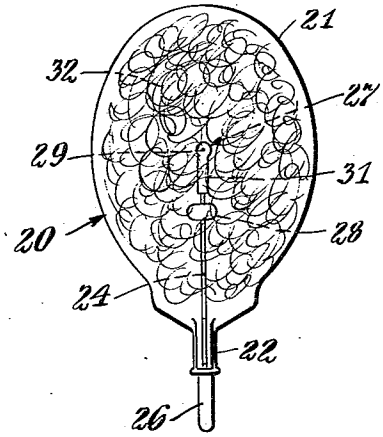


Fig. 5.

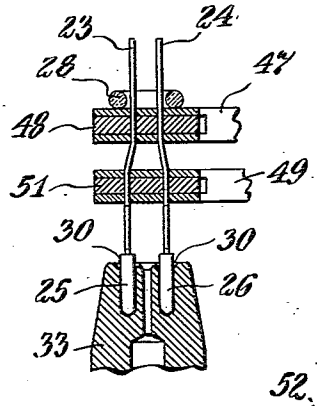


Fig. 3.

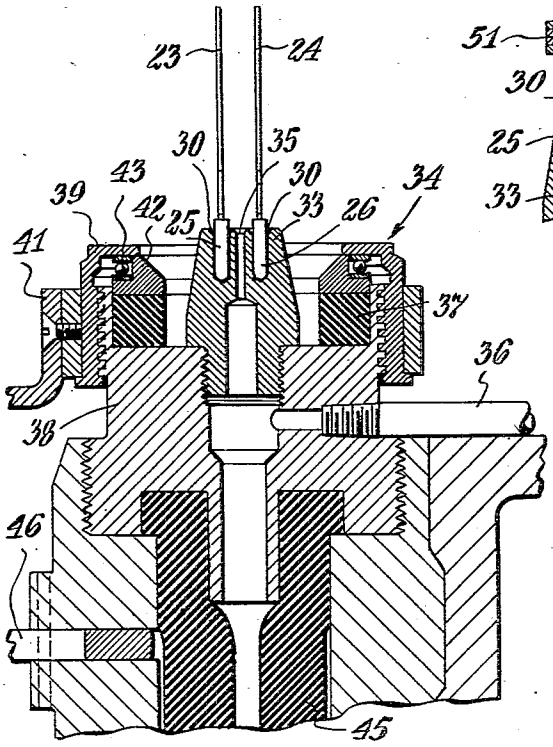
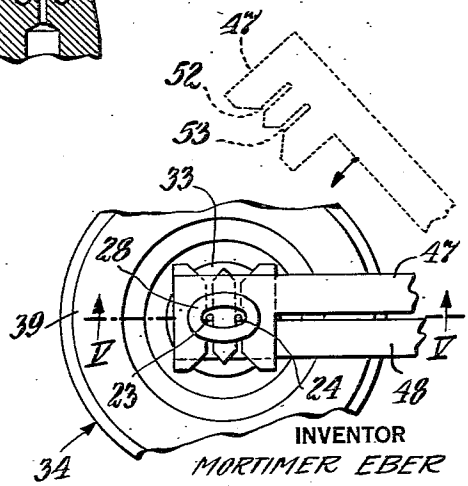


Fig. 4.



INVENTOR
MORTIMER EBER
BY
ATTORNEY

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Fig. 6.

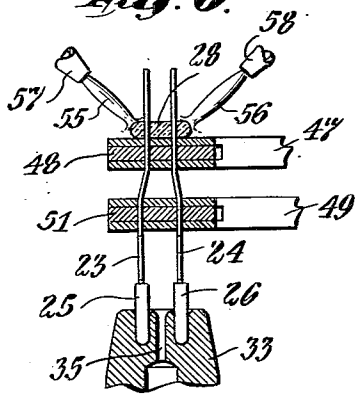


Fig. 7.

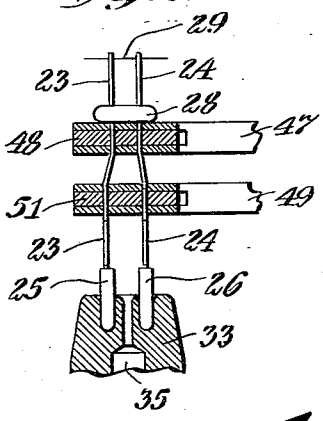


Fig. 8.

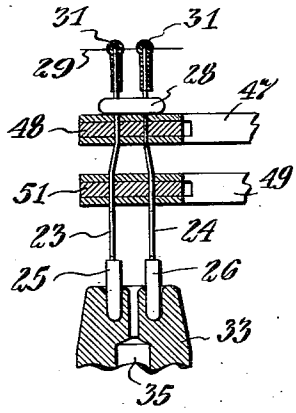


Fig. 9.

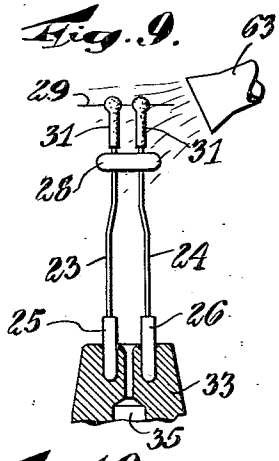


Fig. 10.

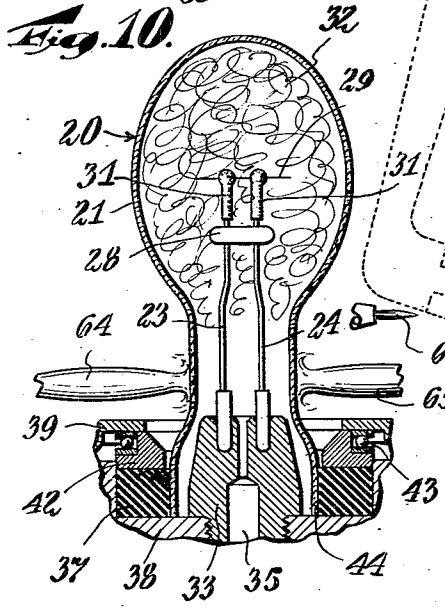
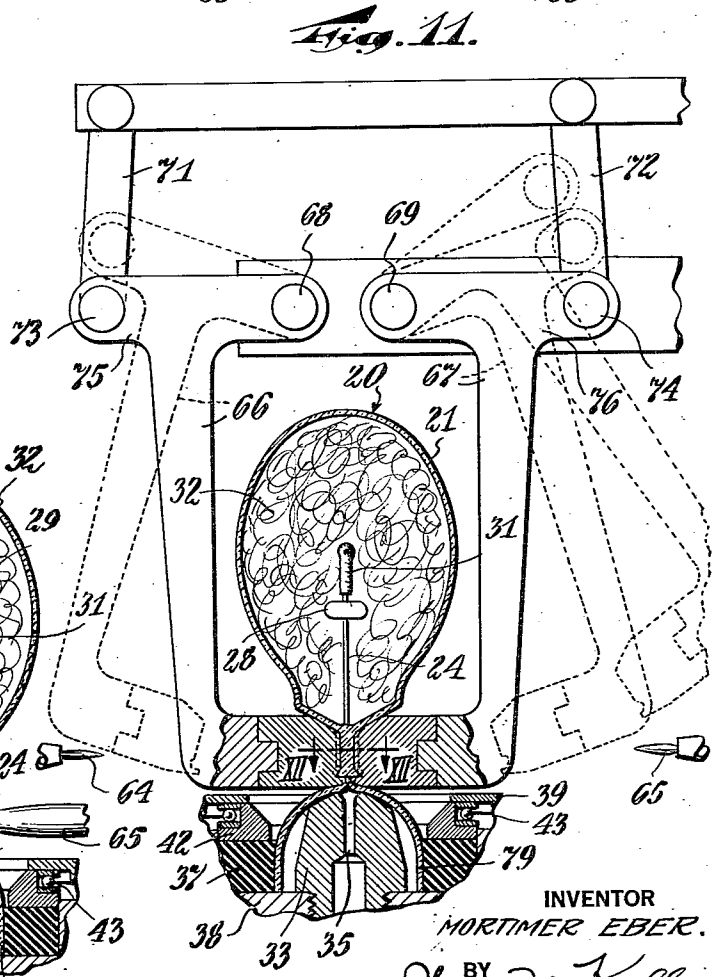


Fig. 11.



INVENTOR
MORTIMER EBER.
BY
ATTORNEY

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Fig. 15.

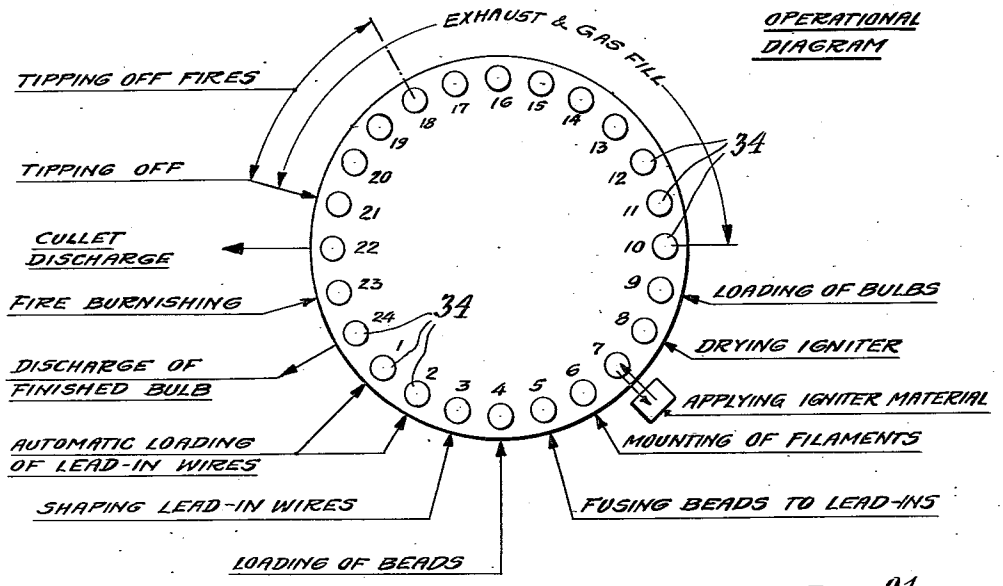


Fig. 13.

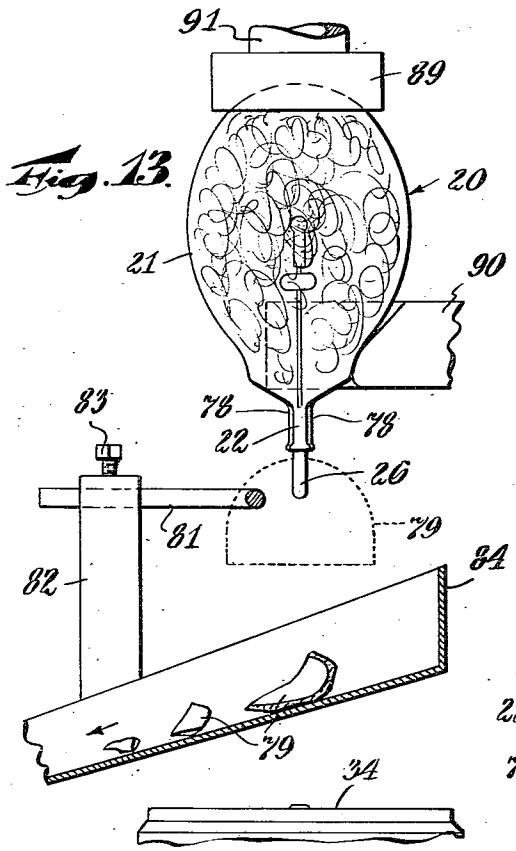
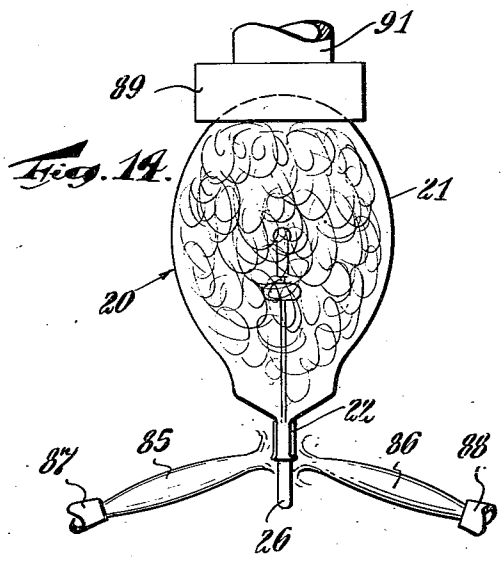


Fig. 14.



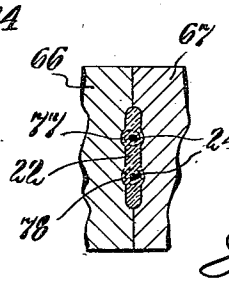


Fig. 12.

INVENTOR
MORTIMER EBER.
BY
ATTORNEY

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MANUFACTURE OF SMALL LAMPS

Mortimer Eber, East Orange, N. J., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application December 13, 1952, Serial No. 325,826

4 Claims. (Cl. 316—19)

This invention relates to the manufacture of small lamps, such as incandescent filament lamps and photoflash lamps.

The principal object of my invention, generally considered, is the simplification of the manufacturing procedure for small lamps, with a more complete mechanization.

Another object of my invention is the provision of a lamp of the character specified, in which the bulb has a straight wall neck, the extreme end of which is pressed about leads, either those of the dumet type so as to connect with a conventional screw-threaded base, or multiple piece leads for pin contact construction.

A further object of my invention is the manufacture of small electrical devices involving the following steps:

1. Loading the leads into a holder;
2. Slipping a glass bead over the leads and fusing the same thereto, which step, however, is optional;
3. The mounting of a filament, or other translation means, on the inner ends of said leads, and the coating with a primer, if a photoflash lamp;
4. Dropping the bulb over the mount so constructed, with the lower end of the neck fitting in a compression rubber;
5. Exhausting said bulb through said neck;
6. Filling the bulb with oxygen, if a photoflash lamp;
7. Pinching off the neck of the bulb to form a press-type seal, and snapping off the cullet below said seal; and
8. Fire polishing the rough edge of the seal.

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

In the drawing:

Fig. 1 is a side elevational view of a small lamp, of the photoflash type, embodying my invention.

Fig. 2 is an elevational view of the lamp of Fig. 1, looking from the left thereof.

Fig. 3 is a fragmentary vertical and axial sectional view of an exhaust machine (position No. 1 or position No. 2 in the view of Fig. 15), which may be used for manufacturing lamps in accordance with my invention.

Fig. 4 is a fragmentary plan of part of the machine of Fig. 3 (position No. "3" for the dotted line part, and position No. "4"), for the remainder, in the view of Fig. 15.

Fig. 5 is a fragmentary vertical and axial sectional view, on the line V—V of Fig. 4, in the direction of the arrows, but showing the parts in a subsequent position (No. "4" in Fig. 15), where the lead-in wires have been shaped and a glass bead placed around them.

Fig. 6 is a view corresponding to Fig. 5, but showing a subsequent position (No. "5" in Fig. 15) in which the glass bead around the lead wires is being heated for fusing it into position with respect thereto.

Fig. 7 is a view corresponding to Fig. 6, but showing a subsequent position (No. "6" in Fig. 15) in which a bridge wire or ignitor filament has been mounted on the upper ends of said leads.

Fig. 8 is a view corresponding to Fig. 7, but showing a subsequent position (No. "7" in Fig. 15) in which the ignitor material or combustion mixture has been secured to the upper ends of said leads.

Fig. 9 is a view corresponding to Fig. 8, but showing a subsequent position (No. "8" in Fig. 15) in which the lead supporting jaws have been removed and the leads and combustion mixture are being cooled by a jet of air.

Fig. 10 is a fragmentary view of the apparatus shown in Fig. 3 in a subsequent position (No. "9" in Fig. 15) in which an envelope or bulb has been placed over the supported mount of the device and the neck thereof is being heated.

Fig. 11 is a fragmentary sectional view, at right angles to the view of Fig. 10, and showing a subsequent position (No. "21" in Fig. 15) in which the heat-softened neck of a bulb has been formed into a press about the supported leads.

Fig. 12 is a horizontal sectional view on the line XII—XII of Fig. 11, in the direction of the arrows.

Fig. 13 is a view corresponding to Fig. 12 but showing the lamp in a subsequent position (No. "22" in Fig. 15) where it has been raised to a position where the cullet or neck portion beneath the press may be broken off.

Fig. 14 is a view corresponding to Fig. 13, but showing a subsequent position (No. "23" in Fig. 15) in which fires are used to polish the lower edge of the press.

Fig. 15 is a diagrammatic plan of an exhaust machine which may be used for practicing my invention.

Referring to the drawing in detail, there is shown in Figures 1 and 2, an electrical device or lamp **20** of the photoflash type, which has been manufactured in accordance with my invention. This lamp comprises an envelope or bulb **21**, which is distinguished from those of the conventional type in that it has no tip or exhaust tubulation through which the air was exhausted during the process of manufacture. Instead, it has a press **22** in the neck through which air was exhausted, and through which pass lead wires **23** and **24**.

Although, in the present embodiment, the outer ends of the lead wires have rigid contact posts **25** and **26** projecting therefrom forming a base of the pin-contact construction yet, in the alternative, said leads may be of the customary dumet construction and each lamp may be completed by having a screw-threaded or other metal base secured to the press **22**, as by basing cement or the like, one of said leads being connected to the shell of said base and the other to the central contact member, in accordance with conventional practice. The lamp of the present embodiment has the translation device **27** carried on the inner ends of the leads, said leads being shown as braced to one another by means of a glass bead **28** fused thereto.

The present embodiment of the translation device **27** comprises a bridge wire or ignitor filament **29** extending from one lead to the other, and the portions of said leads adjacent the upper ends thereof are coated with ignitor or combustible material **31**. The bulb **21** may additionally enclose combustible wire or foil **32**, conventional in character.

In manufacturing lamps in accordance with my invention, the leads **23** and **24** are first loaded, preferably automatically, into upwardly opening pockets **30** in the inner member **33** of a bulb holder **34**, at position No. "1" or No. "2" of Fig. 15. This may be one of the members or heads of an exhaust machine of the rotary type, such as shown diagrammatically in Fig. 15, and corresponding generally with that disclosed in the Mullan Patent No. 2,254,905, dated Sept. 2, 1941, and owned by the assignee of the present application. A similar exhaust valve for

such a machine is also disclosed in the Mullan Patent No. 2,113,798, dated April 12, 1938.

Exhaust machines, such as indicated in Fig. 15, are usually provided with two pumps, a preliminary exhaust pump and a final exhaust pump. The devices **20** to be evacuated, are first connected to a preliminary exhaust pump and exhausted, as they travel with the conveyor, while mounted on heads **34**, that is, they are moved from station to station while being exhausted. The same procedure is followed when the devices are subjected to the second or final exhaust pump.

Each conduit from the vacuum pumps to the devices being evacuated, is provided with a plurality of ports arranged to communicate with a plurality of slots, as described in the patents before referred to. The conveyor moves with the upper rotary disc valve section and communicates with the pumps through ports in said upper valve section, which successively communicate first with slots in the lower valve section connected to the preliminary pump, and then those which connect with the final pump, so that a progressive evacuation of the lamp bulbs or other devices is effected, during movement of said devices from the initial position where the bulbs are loaded on the machine, to a station where they are removed therefrom.

In view of the fact that the gradual exhaust of lamp bulbs or the like, as well as the admission and flushing of fill gas, is known to those skilled in the art, and machines for which the present invention is especially adapted have been described in the Mullan patents, before referred to, I will not further describe the exhaust operation; simply stating that my invention involves a modification on the machines of the patents mentioned, especially when such machines are equipped with the type of head illustrated in Fig. 3.

The inner member **33** of each head **34**, as shown in Fig. 3, includes an exhaust port **35**. By virtue of the construction previously disclosed, the valve sections which constitute a valve unit, serve to open and close the vacuum lines to the ports **35**, as well as the lines to the oxygen supply pipes **36** if photoflash lamps are being manufactured. In making such photoflash lamps, each may be first exhausted, then filled with oxygen, again exhausted, and finally filled with oxygen at the desired pressure.

Each head **34** is desirably provided with an apertured exhaust rubber or conduit **37** in the portion provided with the exhaust port **35**. This exhaust rubber is mounted in a fitting **38**, to which is threaded a cap **39** provided with a laterally-extending arm **41**, and adapted to be cam-actuated to either press a washer member **42**, through ball bearings **43**, against the exhaust rubber **37** to squeeze it about the lower end portion of the neck **44** of a bulb **21** at the proper time, to effect an air-tight connection therewith, or release the pressure thereon to facilitate insertion or withdrawal therefrom.

Air is exhausted from a bulb through the rubber tube connection **45**, mounted in the head and adapted to be closed, as by means of a pinch-clamp **46** forming a valve which may be operated through the arm of said clamp, as desired or automatically upon the development of a leak. Connection with the vacuum pumps is effected through the lower valve section and vacuum lines, by means of the rubber hose connection **45**, a similar connection providing for the introduction of oxygen through pipe **36**, as indicated by the reference character 93 in Fig. 3 of the Mullan Patent 2,254,905, a pinch clamp, as is there disclosed at 91, being employed for opening and closing such connection.

Operation

Referring now particularly to Fig. 15, the operation of the apparatus and conveyor diagrammatically illustrated in practicing my invention, may be as follows:

At station No. "1" or No. "2," a pair of lead wires are loaded onto the conveyor, by inserting the lower ends thereof into upwardly opening apertures in the inner member **33** of a head as it indexes at the station. These leads may be of a type, designated **23** and **24**, with rigid contact portions **25** and **26**, or they may be of the ordinary flexible "dumet" and serve for connection with a screw-threaded or other type of base. The leads above the contact portions **25** and **26** may be sufficiently rigid so that they do not need to be connected together, or they may be flexible so that the mount to be formed is rigidified by not only having the leads shaped, when the supporting head indexes at station No. "3," but encircled by a connecting bead upon indexing at station No. "4."

Thus, in accordance with one embodiment, the leads **23** and **24**, after being indexed at station No. "3," are shaped as shown particularly in Figures 4 and 5, by shaping jaws **47**, **48**, **49** and **51**, intermeshing as illustrated in Fig. 5. Each jaw is formed as indicated in dotted lines in Fig. 4, so that it carries the lead wires into notches **52** and **53**, thereby spacing them in proper relation to one another, and shapes the leads between the upper set of jaws **47** and **48** and the lower set of jaws **49** and **51**. The leads **23** and **24** are thus desirably more closely spaced at their upper portions than at their lower portions, thereby adapting them for the reception of a connecting glass bead.

Such a bead **28** may then be applied over the shaped leads at station No. "4," resting on the shaping jaw **47**. At station No. "5," as shown most clearly in Fig. 6, the bead is heated and fused around the upper portions of the leads, as by means of fires **55** and **56** from burners **57** and **58**, respectively.

At station No. "6," as shown most clearly in Fig. 7, an incandescent filament **29** may be mounted on the upper ends of the leads **23** and **24**. However, if a photoflash lamp is being manufactured, such a filament is not made of the customary tungsten coil for continuously giving light, but is rather made of a wire serving to ignite a combustible mixture on the ends of the lead wires and usually also, by means of said mixture, a surrounding mass of combustible wire or foil filling the envelope.

At station No. "7," as shown most clearly in Fig. 8, the combustible mixture or ignitor material **31** is desirably applied to the ends of the leads **23** and **24**, as by suitable automatic means (not shown). That is, the jaws **47**, **48**, **49** and **51** may transfer the leads from their head, as indicated by the radial, outwardly-directed arrow in Fig. 15, dip the upper ends of said leads in a suitable combustible mixture, and return said leads to the head, as indicated by the radial inwardly-directed arrow in said figure.

At station No. "8," the igniter material is preferably dried as by means of a blast of air issuing from a tube **63**, as shown most clearly in Fig. 9.

At station No. "9," after the jaws **47**, **48**, **49** and **51** have opened to the dotted line position indicated in Fig. 4, a bulb **21** of the character illustrated in Fig. 10, is applied over the mount so formed, with the lower end portion of its neck **44** fitted in the apertured exhaust rubber **37**, which is then in released position by virtue of the cap **39** being in its uppermost position with respect to the fitting **38**.

If an incandescent filament lamp is being manufactured, the bulb **21** is of course empty when applied. However, if a photoflash lamp is being manufactured, the bulb may be filled with combustible material, such as wire or shredded foil **32**. After the bulb is loaded, it is indexed at station No. "10," where the cap **39** has been turned to squeeze the exhaust rubber **37** to make an air-tight connection with the lower end **44** of the neck of the bulb **21**.

The bulb is then indexed through station Nos. "11" to "17," inclusive, where it is exhausted and if the gas-filled type, also filled with suitable gas, or with oxygen if a photoflash lamp is being manufactured, through pipe **36**. At station Nos. "18" to "21," inclusive, the lamp is sub-

jected to the action of tipping-off fires, designated by the reference characters **64** and **65** in Fig. 10. At station No. "21," said fires having softened the neck sufficiently, the tipping-off operation takes place by jaws **66** and **67** swinging from open position, illustrated in dotted lines in Fig. 11, to closed position indicated in full lines in the same figure, about their supporting pivots **68** and **69**, to squeeze the heated portion of the bulb neck **44** and form a flattened press **22**.

The jaws **66** and **67** are desirably operated by suitable power-operated means, connected through links **71** and **72** and pivot pins **73** and **74**, to arms **75** and **76** projecting outwardly from the jaws **66** and **67**, respectively. Upon upward movement of said links, the jaws are separated, whereas upon downward movement thereof they are brought into compressive engagement into the neck of the bulb being tipped off. The neck-engaging portions of these jaws are desirably of special configuration, as shown most clearly in Figs. 11 and 12, so that they leave bulges **77** and **78** around the press **22** where the leads pass therethrough, thicken the lower edge of said press, and very much reduce the thickness of the section immediately below the thickened lower edge portion of the press **22**, so that the cullet of waste portion **79** of the neck may be readily removed therefrom.

As the conveyor indexes from station No. "21" to station No. "22," the tipped-off bulb **21** is raised from its head by conveyor suction device **89** and while also supported by steadying device **90** which is brought into contact therewith, the cullet **79** strikes a stop **81**, adjustably positioned in a standard **82**, as by means of a set screw **83**, and is broken off and drops into a discharge trough **84**, from whence it is removed from the machine (Fig. 13).

At station No. "23" the lower edge of the press **22** is smoothed or fire-polished by fires **85** and **86** from burners **87** and **88**, respectively. At station No. "24" the bulb is removed from the machine, as by means of the conveyor suction device **89** by which it is supported. Said device **89** is connected to a suitable source or vacuum through pipe **91**, whereby upon rising it withdraws the completed lamp from the head and thereby takes it away from the conveyor (Fig. 14).

From the foregoing, it will be seen that I have provided a method and apparatus for the production of a novel form of lamp, which lamp may be one of the vacuum or gas-filled incandescent filament type or one of the photoflash type. Novelty resides in the fact that it has neither a reentrant press and exhaust tube carrying portion, nor a tip through which exhaust is effected. The bulb, on the contrary, is exhausted directly through its neck portion, generally conventional except that its lower edge portion is preferably slightly enlarged and cylindrical, so as to be directly gripped by the exhaust rubber of a head on an exhaust machine.

Although a preferred embodiment of my invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of my invention.

I claim:

1. The method of manufacturing lamps having tipless envelopes with leads sealed therethrough comprising rigidly holding said leads in a predetermined spaced relation, mounting a filament on the free ends of said leads, placing a bulb with a preformed neck and opening over said leads, effecting an air-tight seal around the end portions of said neck, evacuating the bulb through its neck, heating said neck to plasticity, compressing the neck inwardly to form a press which hermetically encloses intermediate portions of said leads and seals off said bulb, releasing the end portions of the neck from said air-tight seal, and removing that portion of said neck which extends beyond said press.

2. The method of manufacturing lamps having tipless envelopes with multiple piece leads sealed therethrough for pin-type electrical connection comprising securing a rigid contact-post base-pin to one end of each of said leads, fixedly holding said leads by said base-pins in upright closely-spaced relation, shaping the free ends of said leads to a preselected configuration, threading a bead over said leads and fusing it to intermediate portions adjacent the upper ends thereof, mounting a filament on the upper ends of said leads, placing a bulb with a downwardly opening preformed neck over said leads, directly gripping the end portions of said neck to effect an air-tight seal therearound, evacuating the bulb through its neck, heating said neck to plasticity, compressing the neck inwardly to form a press which hermetically encloses intermediate portions of said leads including the upper end portions of said base-pins and seals off said bulb, releasing the end portions of the neck from said air-tight seal, removing that portion of said neck which extends beyond said press, and fire-polishing the lower edge of said press.

3. The method of manufacturing photoflash lamps having tipless envelopes with leads sealed therethrough comprising rigidly holding said leads in a predetermined spaced relation, mounting an ignitor filament and combustion mixture on the inner ends of said leads, placing a bulb with a preformed neck and opening over said leads, effecting an airtight seal around the end portions of said neck, evacuating the bulb through its neck, filling said bulb with oxygen, heating said neck to plasticity, compressing the neck inwardly to form a press which hermetically encloses intermediate portions of said leads and seals off said bulb, releasing the end portions of the neck from said air-tight seal, and removing that portion of said neck which extends beyond said press.

4. The method of manufacturing photoflash lamps having tipless envelopes with multiple piece leads sealed therethrough for pin-type electrical connection comprising securing a rigid contact-post base-pin to one end of each of said leads, fixedly holding said leads by said base-pins in upright closely-spaced relation, shaping the free ends of said leads to a preselected configuration, threading a bead over said leads and fusing it to intermediate portions adjacent the upper ends thereof, mounting an ignitor filament and combustion mixture on the upper ends of said leads, placing a bulb enclosing combustible material and having a downwardly opening preformed neck over said leads, directly gripping the end portions of said neck to effect an air-tight seal therearound, evacuating the bulb through its neck, filling said bulb with oxygen, heating said neck to plasticity, compressing the neck inwardly to form a press which hermetically encloses intermediate portions of said leads including the upper end portions of said base-pins and seals off said bulb, releasing the end portions of the neck from said air-tight seal, removing that portion of said neck which extends beyond said press, and fire-polishing the lower edge of said press.

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