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METHOD AND APPARATUS FOR FILLING FLASHBULBS

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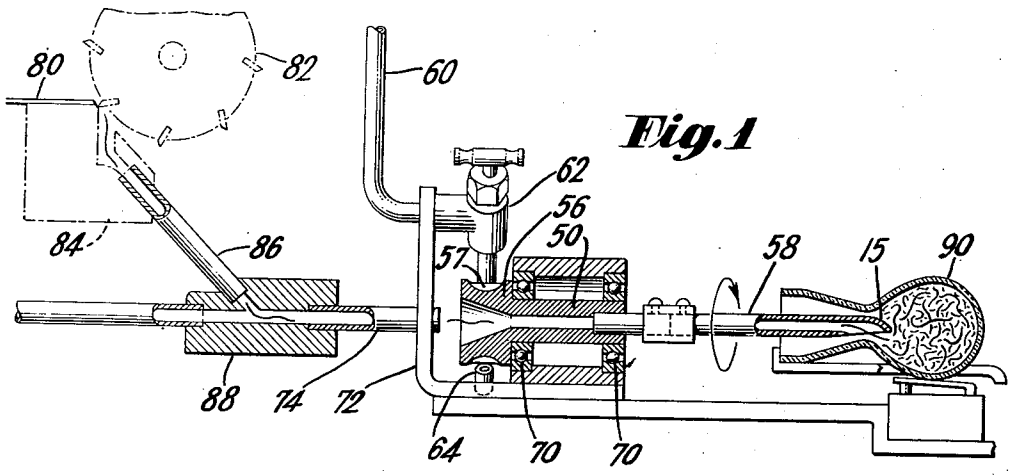


Fig. 1

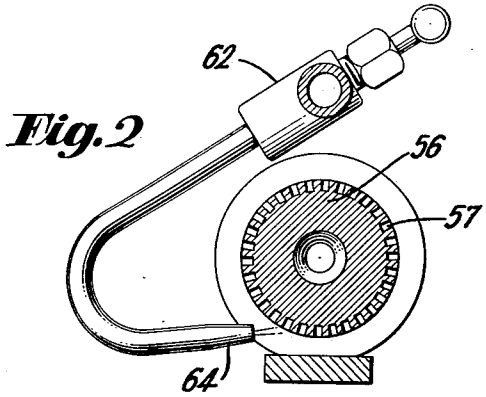


Fig. 2

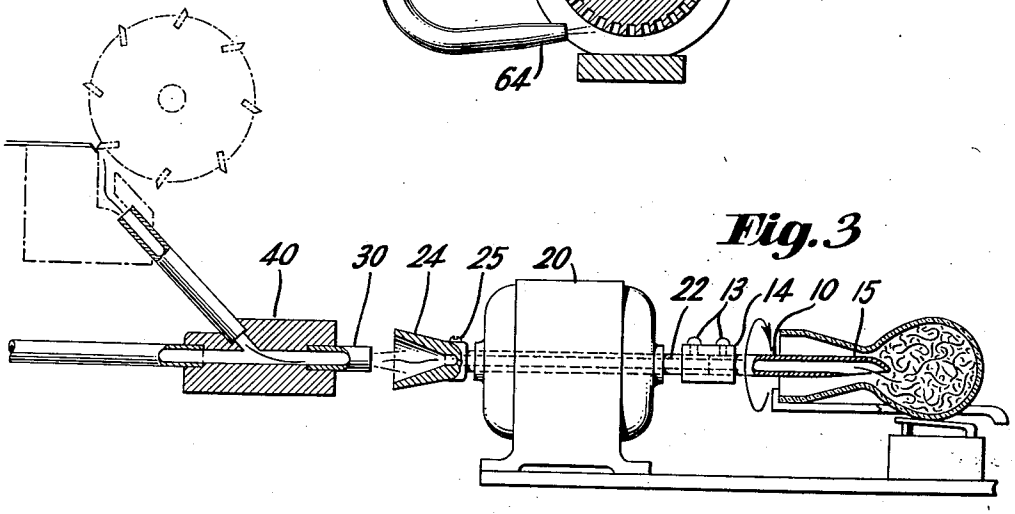


Fig. 3

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METHOD AND APPARATUS FOR FILLING FLASHBULBS

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This invention relates to a method and apparatus for introducing filamentary material into a container. More particularly, it relates to a method and apparatus for introducing and distributing a metallic filamentary material such as shredded foil into flashlamp envelopes.

The method of introducing and distributing either long single strands of wire or short lengths of shredded foil into flashlamps aided by a moving current of air is well known to the art, and has been described, for example, in Korver Patent Number 2,115,423, and Geiger and Davidson Patent Number 2,347,046. In accordance with the Korver patent the wire is sucked into a tube by means of a vacuum created with a venturi and then propelled through a tube by the current of air passing therethrough whereupon the wire is distributed in the bulb area of the flashlamp by recurrent air flow. In the Geiger and Davidson patent a suction means is used on the far side of the flashlamp. However, the results are quite similar in that the shredded foil is sucked into a tube and carried therein into the flashlamp where the shreds are distributed by the recurrent flow of air as the air leaves the vessel and proceeds to the point of suction leaving the shredded particles distributed in the flashlamp envelope. Although the methods shown and described in the above noted patents have given reasonably acceptable results with single strand wire or with fills made of a single size shredded filament, considerable difficulty has been encountered in the art when attempts were made to use these processes in the manufacture of a focal plane type of flashlamp. These focal plane lamps are made with the use of two different gauges of materials wherein the cross section of one is much coarser than the cross section of the other. The fills are introduced separately in such a manner that the coarse fill occupies the upper part of the bulbous portion of the bulb, and the fine fill occupies the space immediately beneath, and surrounds or is adjacent to the igniting means. When attempts were made to make this type of lamp with the filling devices of the prior art it was virtually impossible to obtain lamps having uniform distribution of fill and, therefore, exhibiting uniform ignition time, without resorting to additional work operations. Furthermore, even in the case of lamps having only one type of fill it was frequently difficult to obtain the desired uniform distribution without resorting to a separate fluffing operation in which the shredded fill was redistributed with the aid of a blast of air.

It is, therefore, an object of this invention to provide a method and apparatus for improving the technique of filling and distributing filamentary materials into containers such as, for example, flashlamp envelopes.

It is a further object of this invention to provide a method and apparatus adapted to fill flashlamp envelopes with filamentary material of various sizes automatically while maintaining uniform distribution.

It is a further object of this invention to provide a method and apparatus for filling focal plane type lamps automatically with two gauges of filamentary material,

while maintaining proper distribution in each, avoiding mixing of the two, and placing each in its proper location.

We have found that some of these objects and other advantages can be obtained in accordance with our invention by shaping the nozzle which delivers the fill into the container to set up eddy currents within the flashlamp.

It has been further found that this feature can be further improved upon so as to accomplish all of the above objects by giving this nozzle a rotary motion.

In the drawings which illustrate preferred embodiments of the apparatus of this invention Figure 1 is a side elevation partly in section of the relevant portion of the apparatus showing a tube in which the shredded particles are being carried toward the flashlamp envelope, an air motor and a revolving nozzle feeding the shredded particles into a flashlamp envelope, together with representative parts of the shredding and delivery system.

Figure 2 shows a back elevation partly in section of the air motor shown in Figure 1.

Figure 3 is a side elevation partly in section showing a mechanism of the type illustrated in Figure 1 being provided, however, with an electric motor rather than an air motor.

The unique filling nozzle which has been found to give extremely satisfactory results in producing uniformly distributed fill in flashlamp envelopes is illustrated in the drawings at **10**. This nozzle is preferably made of a piece of straight brass tubing about ¼–½″ outside diameter. The one end **12** of the nozzle shown is adapted for securing it to a rotary driven hollow shaft of substantially the same inside diameter by means of a coupling collar of a type shown at **14**. The other end of the nozzle which feeds the shredded particles into the envelope is formed by bending the tubing through an angle of preferably about 30° and then cutting off the projecting edge of the tubing. This end is, for example, shown at point **15** of the drawing. A nozzle of this type can readily be used in its non-rotating form in the filling of flashlamp envelopes to obtain substantially uniform distribution of the fill in the envelope. If the non-rotating nozzle is inserted to a point within the envelope so that the shredded particles strike the inside of the bulb neck near its juncture with the bulbous portion of the envelope the shredded particles will rebound into the inside of the bulb itself. This results in far fewer rejects for failure to obtain uniform distribution than would be the case if a straight nozzle were used. Furthermore, it helps to reduce the variability and improves the average quality of fill.

However, when the improved nozzle hereinabove described is used in conjunction with a spinning mechanism it has been found to further improve the quality of the product produced and has even been found to be adaptable for use in the filling of focal plane type lamps which use two separate fills differing in gauge. In its essentials the improved device consists of a nozzle having a curved delivery end and a spinning device for rotating the nozzle during the period in which the shredded particles are being delivered to the envelope. In the preferred example illustrated in Figure 3 of the drawings the nozzle is caused to rotate by means of an electric motor **20** provided with a hollow shaft **22** coupled to the nozzle **10** by means of sleeve **14** and set screws **13**. The receiving end of the hollow shaft **22** of the motor is provided with a funnel-like element **24** detachably secured to it by means of set screw **25**. The motor and its attached rotating nozzle and funnel is so positioned with respect to the delivery tube **30** in preferred embodiments of this invention that an air gap which may vary from zero to 2″ is provided therebetween. The tube **30** leads back to the source of filamentary material which is illustrated in this

case as a rotary cutter where the foil used in making fill is shredded. In the illustrated embodiment the air current carrying the particles in tube **30** is developed by means of a venturi assembly **40**. However, it is unquestionably true that the rotary nozzle can be used with equal advantage if the suction head providing the air current is positioned at a point beyond the flashlamp envelope if these elements are adapted for use with the apparatus as shown in Geiger and Davidson Patent Number 2,347,046.

The embodiment illustrated in Figure 1 of the drawings differs only from that shown in Figure 3 in the means for rotating the nozzle. In this case the hollow shaft **50**, of which a funnel **56** is a part, together with nozzle **58**, is driven by an air jet provided by a blast of air supplied through air line **60**, valve **62** and nozzle **64**. Valve **62** provides means for regulating the amount of air supply and controlling the speed of the rotating shaft **50**. The air from nozzle **64** is made to impinge on milled slots **57** provided on the outside edge of the funnel **56** as shown in Figure 2. The funnel and hollow shaft being set in ball bearings **70** and mounted on a bracket **72** enables the tube to be positioned appropriately with respect to the tubing **74** through which the shredded particles are supplied.

In some cases it has been found desirable to insert the rotary nozzle farther into the bulb than is desirable when the stationary bent nozzle is used. This insures even distribution and keeps all the shredded particles within the bulb.

While operating speeds ranging between 1750 R. P. M. and 4800 R. P. M. have been used successfully it has been found that speeds in the vicinity of 2100 R. P. M. are most desirable if the best all-around results are to be obtained.

The air gap between the funnel and the delivery tube has been found to be essential in those cases in which the venturi means of propelling the shredded particles is used. It has, for example, been found that if the gap between the funnel and the delivery tube is too small more air reaches the lamp envelope than can be tolerated in the production of fluffy fills. By regulating the air gap any compacting tendency can be avoided. As has been indicated hereinabove at the preferred speed of approximately 2100 R. P. M. the air gap ranges from zero to approximately 2". This has been found to vary with the pressure of the air within the carrying tube and with the type of fill being made. This air pressure may also vary over rather wide limitations. However, for best results it has been found that air pressures of about 6 to 10 pounds are considered suitable for the even distribution of extremely fine shredded particles, for example, one part of the charge at the focal plane lamps. In other types of lamps the recommended air pressure is closer to 20 pounds, and in a few types it may run to 40 pounds.

When the apparatus of the type shown in the drawings and described in the specification is made use of to fill photoflash lamps the foil **80** from which fill is made as shown in Figure 1 is fed into the rotary cutter **82**, which cuts off strips or shredded particles which are then picked up in a pickup shoe **84** and sucked into tube **86** by the action of the venturi **88** and pushed through delivery tube **74**. The shredded particles are then charged into the revolving funnel **56** and passed on down through the hollow shaft **50**, and are ultimately discharged from the curved end of the nozzle **58** within the glass envelope **90**.

In those cases in which the rotary nozzle is to be used for filling focal plane lamps the rotary cutter is adjusted so as to cut relatively coarse shreds. These are fed into the flashlamp envelope by means of the rotary nozzle which is placed close to the mouth of the flashlamp envelope which permits the shredded particles to be evenly distributed in the top half of the flashlamp envelope. Another rotary cutter is adjusted to cut relatively fine shreds and then feeds the shredded particles into the lamp through another rotary nozzle which has been well inserted into the lamp so that the fine particles are deposited in an evenly distributed fluffy manner near the entrance to the bulb.

In those cases in which the rotary nozzle is to be used in the manufacture of single gauge types of flashlamps a single rotary cutter is adjusted to cut the required size and number of shreds which are then fed into the flashlamp envelope by means of the rotary nozzle inserted well within the lamp. The positioning of the nozzle well within the envelope and off the axis of the neck of the envelope serves to promote a fill mass rotation within the envelope during the fill cycle. A nozzle rotation in the vicinity of 2100 R. P. M. helps maintain this fill mass rotation, which in turn is an aid in the production of strong well knit fills, evenly distributed throughout the bulb area.

While the above description and drawings submitted herewith disclose preferred and practical embodiments of the method and apparatus for introducing filamentary material into flashlight envelopes it will be understood by those skilled in the art that the specific details of construction and arrangement of parts as shown and described are by way of illustration and are not to be construed as limiting the scope of the invention.

What we claim is:

1. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, means for supporting a flashbulb envelope, means comprising conduits for transporting filamentary particles in a gas stream from a source of supply to said envelope, said conduits including a tubular nozzle having a delivery end bent at an angle adapted to project the filamentary particles therefrom to one side of the tube axis, said bent end having no parts projecting beyond the cylindrical walls of the tube, the axis of the nozzle being arranged to be offset from the axis of the tube.

2. In an apparatus for use in introducing and arranging filamentary particles in a flashlamp envelope, an electrically driven motor having a hollow shaft, a nozzle at one end of said shaft having a delivery opening in the side wall thereof adapted to project filamentary particles therefrom to one side of the axis of rotation of said hollow shaft, and means for supporting a flashbulb in position to receive said nozzle along an axis offset from the axis of the flashbulbs.

3. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, the combination of a delivery tube adapted to carry filamentary particles therethrough by means of a current of air, said tube having an end, a funnel-like element spaced from said end in position to receive filamentary particles projected from said delivery tube and a tubular nozzle connected to said funnel and adapted to project filamentary particles therefrom directly toward the inside sidewall of said envelope.

4. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, the combination of a delivery tube adapted to carry filamentary particles therethrough by means of a current of air, said tube having an end, a funnel-like element spaced from said end in position to receive filamentary particles projected from said delivery tube, and rotatable nozzle connected to said funnel and adapted to project filamentary particles therefrom.

5. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, the combination of a delivery tube adapted to carry filamentary particles therethrough by means of a current of air, said tube having an end, a funnel-like element spaced from said end in position to receive filamentary particles projected from said delivery tube, a hollow shaft connected to the small end of said funnel-like element, means for rotating said hollow shaft and a nozzle at the far end of said hollow shaft having a delivery opening in the side wall thereof adapted to project filamentary

particles therefrom to one side of the axis of rotation of said hollow shaft.

6. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, the combination of a delivery tube adapted to carry filamentary particles therethrough by means of a current of air, said tube having an end, a funnel-like element spaced from said end in position to receive filamentary particles projected from said delivery tube, a motor driven hollow shaft connected to the small end of said funnel-like element and a nozzle at the far end of said hollow shaft having a delivery opening in the side wall thereof adapted to project filamentary particles therefrom to one side of the axis of rotation of said hollow shaft.

7. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, the combination of a delivery tube adapted to carry filamentary particles therethrough by means of a current of air, said tube having an end, a funnel-like element spaced from said end in position to receive filamentary particles projected from said delivery tube, a hollow shaft connected to the small end of said nozzle, said hollow shaft being the shaft of an electric motor and a nozzle at the far end of said hollow shaft having a delivery opening in the side wall thereof adapted to project filamentary particles therefrom to one side of the axis of rotation of said hollow shaft.

8. In a method for introducing and arranging filamentary material in a flashbulb envelope, the steps comprising moving filamentary particles through a delivery tube by means of an air current, said tube having an end, projecting the filamentary particles from said delivery tube into a funnel-like element attached to a hollow rotating shaft, carrying said filament particles through said hollow rotating shaft and into a nozzle attached to said shaft by means of a gaseous current of air, projecting said filamentary particles from said nozzle toward the side walls of a flashbulb envelope whereby said particles are distributed and arranged within said envelope while permitting the gaseous carrying medium to leave said envelope through its neck portion.

9. In a method for introducing and arranging filamentary material in a flashbulb envelope, the steps comprising projecting filamentary particles from a rotating nozzle toward the side walls of a flashbulb envelope with the aid of a moving gaseous medium whereby said particles are distributed and arranged within said envelope, and withdrawing the gaseous carrying medium from said envelope through its neck portion.

10. In a method for introducing and arranging filamentary material in a flashbulb envelope, the steps comprising moving filamentary particles through a delivery tube by means of an air current, said tube having an end, projecting the filamentary particles from the end of said delivery tube into a funnel-like element from said delivery tube into a funnel-like element attached to a hollow rotating shaft carrying said filamentary particles through said hollow rotating shaft and into a nozzle attached to said shaft by means of a gaseous current of air projecting said filamentary particles from said nozzle into a flashbulb envelope whereby said particles are distributed and arranged within said envelope, and permitting the gaseous carrying medium to leave said envelope through its neck portion.

11. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope means for supporting a flashbulb envelope, means comprising conduits for transporting filamentary particles in a gas stream from a source of supply to said envelope, said conduits including a tubular member adapted to receive and transport filamentary particles and a tubular nozzle in communication therewith having a delivery opening in the side wall thereof and a curved wall surface at its end adapted to project the filamentary particles therefrom to one side of the tube axis.

12. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope means for supporting a flashbulb envelope, means comprising conduits for transporting filamentary particles in a gas stream from a source of supply to said envelope, said conduits including a tubular member adapted to receive and transport filamentary particles, and a tubular nozzle having a delivery opening in the side walls thereof and a curved wall surface at its end bent at an angle of approximately 30° and adapted to project the filamentary particles therefrom to one side of the tube axis.

13. In an apparatus for use in introducing and arranging filamentary particles in a flashlamp envelope, the combination of: a delivery tube adapted for connection to a source of air under pressure at one end and having its other end open; another tube in communication with a source of filamentary particles and connected to the side of said delivery tube between the ends thereof so that filamentary particles from said other tube will be carried into and through the delivery tube; a funnel-like element spaced longitudinally from the open end of said delivery tube to receive filamentary particles emerging therefrom; a hollow shaft in communication at one end with said funnel-like element to receive the filamentary particles from said funnel-like element; means for rotating said hollow shaft; a nozzle at the other end of said hollow shaft, said nozzle having a delivery opening in the side wall thereof through which said filamentary particles can be projected; and means for supporting a flashbulb in position to receive said filamentary particles against the side of said bulb.

14. The combination of claim 13, in which the means for supporting the flashbulb supports said bulb with the axis thereof offset from the axis of said nozzle.

15. In an apparatus for use in introducing and arranging filamentary particles in a flashbulb envelope, means comprising conduits for transporting filamentary particles in a gas stream from a source of supply to said envelope, said conduits including a hollow member adapted to receive and transport filamentary particles and a nozzle in communication therewith for projecting said filamentary particles in a directed stream, and means for supporting a flashbulb envelope on an axis offset from the axis of the discharge end of the nozzle and in position to receive said stream directly on the inside sidewall of said envelope.

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