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APPARATUS FOR IMPROVED PRIMER DIPPING
OF PHOTOFLASH LAMP LEADS
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2,699,143

Fig. 1.

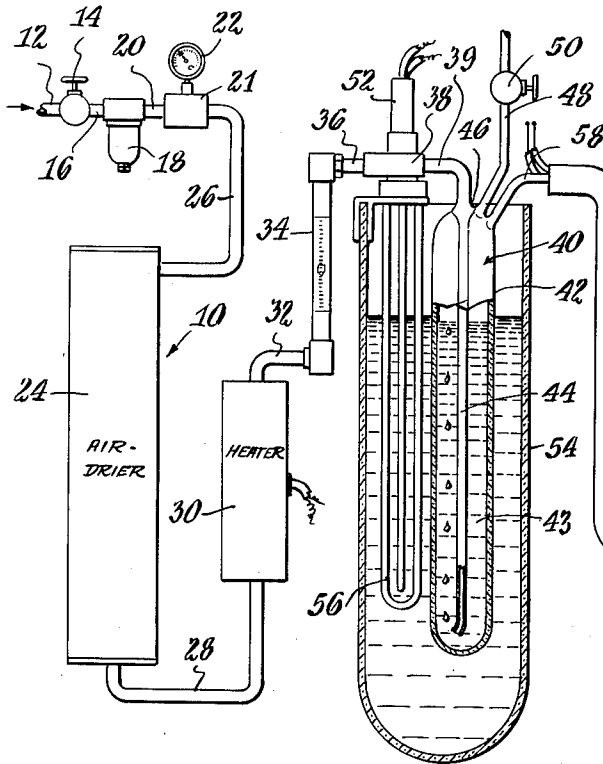


Fig. 2.

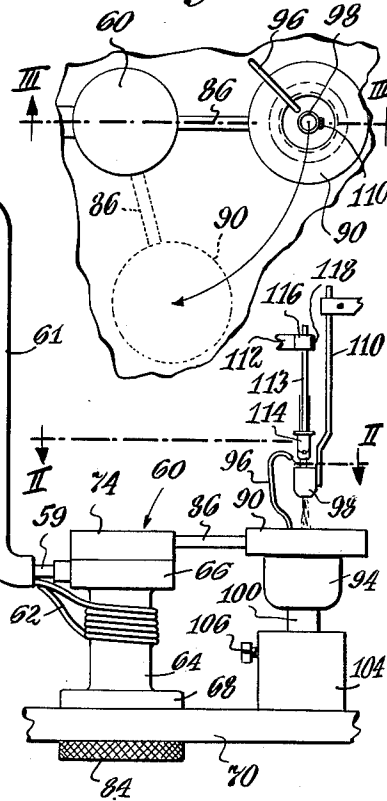


Fig. 3.

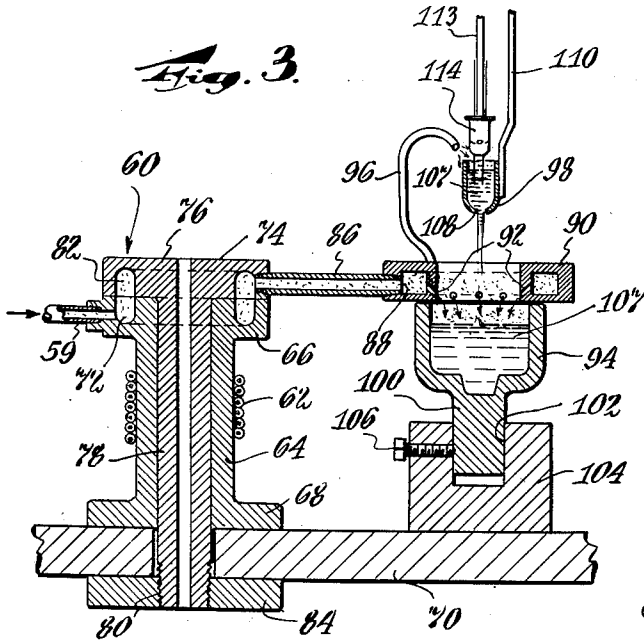
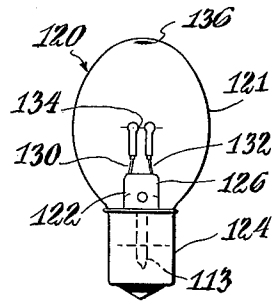


Fig. 4.



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APPARATUS FOR IMPROVED PRIMER DIPPING OF PHOTOFLASH LAMP LEADS

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2 Claims. (Cl. 118—421)

This invention relates to photoflash lamps and, more particularly, to an improved apparatus for the primer dipping of photoflash lamp leads.

The conventional envelope of a photoflash lamp has an inner and outer transparent safety jacket of a lacquer coating thereon to prevent bulb shattering during flashing. It is sealed to a conventional stem, and filled to a suitable pressure with oxygen for supporting the flash. A straight wire filament or heater is mounted on the lead wires of the stem below the lead wire extremities and the primer coating or bead is applied to the extremities of the leads. In the high speed photoflash lamp, ignition of the primer coating on the lead wire ends by the filament provides the light flash. In another type the primer coating functions as an igniter, in turn, for aluminum foil packed about the stem within the oxygen filled envelope.

The conventional equipment for primer dipping the lead wire extremities comprises a primer cup containing a primer suspension, and a rotatable stem arm which swings the leads into position above the suspension within a vertically reciprocable dipper which travels from the suspension in the cup into contact with the lead extremities. The primer suspension may comprise active ingredients, such as potassium perchlorate and sodium chlorate and lacquer or zirconium primer powder and a volatile vehicle, such as amyl acetate.

One of the most pressing problems in the manufacture of photoflash lamps is the maintenance of the proper consistency of the primer suspension or primer. If the viscosity of the primer becomes greater than normal, too large a bead will form on the lead tips. This condition will cause the lamp to flash faster than the customer anticipates, and may also cause the lamp to explode. To adjust the viscosity to the desired consistency, more amyl acetate must then be added to the primer cup. If too much amyl acetate is added, the primer viscosity becomes too low and an insufficient amount of primer will be deposited upon the lead tips, thereby producing a slow flash or insufficient light. Under the present method of primer consistency regulation, the viscosity is inadequately controlled and subject to the judgement and diligence of the machine attendant.

Furthermore during humid weather the primer coating suspension often becomes contaminated with moisture, thus losing its fluidity and failing to coat the tips of the leads properly. The contaminated bead does not adhere properly to the leads and poor photoflash timing results.

Even under optimum conditions, the dry primer is a potential source of explosion and extremely dangerous to handle. Great care must be exercised to prevent the formation of a dry primer coating on the side walls of the primer cup and on the dipper handle. The reciprocating motion of the dipper, in and out of the primer suspension with the cup, raises the level of the suspension against the cup sides and the dipper handle and causes the undesired drying of the primer thereon.

Furthermore the dry primer on the dipper handle often builds up a lump which may become large enough to collide with the stem and knock off the newly dipped primer bead. As a result, the dipping machine must be stopped periodically to remove this lumped formation.

Hence, it has been found advantageous, according to my invention, to keep the consistency or viscosity of the primer suspension constant by maintaining an atmosphere

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above the primer cup which is saturated with a primer vehicle such as amyl acetate. Low pressure air is cleaned, dried, heated to a desired temperature, bubbled thru amyl acetate at a desired temperature and velocity, and discharged above the primer cup. The adjustment of the temperature and velocity of the circulating air determines the amount of amyl acetate vapor carried therein and the proper adjustment thereof prevents condensation of the vehicle on the walls of the primer cup. The velocity of the air is desirably adjusted to the minimum necessary to develop the requisite degree of vehicle concentration above the primer cup.

In its general aspect the present invention has the objective of overcoming the defects of the prior art apparatus and methods of primer dipping as applied to photoflash lamps.

Specifically, an object of the present invention is to maintain constant the consistency of the primer suspension during the dipping operation by maintaining the atmosphere above the primer cup approximately saturated, but not supersaturated, with the primer vehicle.

Another object is a method of primer dipping which will lower lamp shrinkage due to faulty primer application, produce lamps with more uniform characteristics and higher quality, and reduce the danger of lamp explosions due to excessive primer application.

A further object is the elimination of moisture contamination of the primer.

An additional object is the elimination of the formation of potentially-explosive dry primer on the side wall of the primer cup and the handle of the dipper.

A still further object is the elimination of the formation of dry primer lumps on the dipper handle, and collisions between the stem and such lumps which knock off the primer bead, and necessitate machine shutdown.

Another object is primer dipping apparatus for photoflash lamps comprising a flow valve and gauge, an air drier, a heater, a temperature controlled vehicle bubbler and a swivel union for delivering vehicle-saturated air at controlled temperature and velocity above the primer cup, to create thereabove an atmosphere close enough to saturation with the vehicle to avoid appreciable evaporation of the vehicle from said cup.

Other objects of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation and by implication by the context.

Referring to the accompanying drawing, in which like numerals of the reference indicate similar parts throughout the several views:

Fig. 1 is a side elevational view of the primer-dipping apparatus of my invention.

Fig. 2 is a horizontal view of the rotary valve, primer cup, and dipper of the primer coating apparatus on the line II—II of Fig. 1, in the direction of the arrows.

Fig. 3 is a vertical sectional view of the rotary valve, primer cup, and dipper on the line III—III of Fig. 2, in the direction of the arrows.

Fig. 4 is a side elevational view of a photoflash lamp which may be manufactured by apparatus embodying my invention.

In the specific embodiment of the invention illustrated in the drawing, apparatus for primer dipping of photoflash lamp leads is designated by the reference numeral 10. This apparatus has a line 12 from a low pressure air supply (not shown) leading into means for regulating the velocity of the air, such as a flow valve 14 which, in turn, is connected by a second line 16 to means, such as a filter or trap 18, for collecting deleterious solid materials such as dirt, glass, etc. carried by the air.

A line 20 connects the trap 18 to a pressure regulator 21 and gauge 22 which is joined by a line 26 to means for the removal of moisture, such as an air drier 24. The air is then conducted through a line 28 to means, such as a heater 30, for raising its temperature to the desired degree. From the heater 30, a line 32 extends to a flow gauge 34 for giving visual indication of the air velocity. A line 36 connects the gauge 34 through a nipple 38 to an inlet connection 39 of means, such

as an amyl acetate bubbler 40, for saturating said air with primer vehicle at a controlled temperature.

This bubbler comprises a tubular envelope 42 containing a primer vehicle, such as amyl acetate 43, and having a bubbler tubulation 44 extending axially into said amyl acetate from its inlet connection 39. An amyl acetate supply line 48 and a suitable valve 50 are provided in the upper end of the envelope adjacent the inlet connection 39 for replenishing and adjusting the level of said vehicle in the envelope 42. The temperature of the primer vehicle 43 is desirably controlled by a thermostatically-controlled heater 52, shown in Fig. 1. The bubbler 40 is substantially immersed in water held in a cup-shaped container 54, which is maintained at a desired temperature by thermostatically-controlled heating elements 56.

An outlet line 58 from the bubbler 40, adjacent the amyl acetate supply line 48, conducts the saturated air from said bubbler 40 to a swivel union 60. This line 58 is suitably insulated along its length, as by asbestos 61, and heated by a resistance type heater 62. The main portion of the heater element of heater 62 is wound around a hollow stanchion or stationary portion 64 of the union 60.

This stanchion 64 of the union 60, as shown particularly in Figures 2 and 3, has an upper circular flanged portion 66 and a lower circular flanged portion 68, which rests on a suitable table or platform 70. The line 58 is joined by a suitable connection 59 to an annular cavity 72 formed in the upper face of the upper flanged portion 66. An upper or rotary portion 74 of the union has top flange 76 which is complementary to the upper flanged portion 66 of the stanchion 64 and an axial rod-like portion 78 which extends through the hollow portion of stanchion 64 and the table 70 and is provided with a threaded extremity 80. An annular cavity 82, complementary to the annular cavity 72 of stanchion 64, is formed in the lower face of top flange 76. To secure the top and bottom portions of the union 60, in a suitable juxtaposition with respect to each other a cap 84 is threaded onto the threaded extremity 80 of the rod-like portion 78.

A line 86 connects the annular cavity 82 in the top flange 76 to an annular cavity 88 within a discharge ring 90 and rigidly affixes the ring 90 to the rotary portion 74 of the union 60. Inclined discharge holes 92 are provided in the inner face of the ring 90 to direct the flow of saturated air into a primer cup 94, suitably located axially below the ring 90. A flexible discharge line 96, shown in Figs. 2 and 3, extends upwardly from the cavity 88 and has its saturated air flow directed at a point of maximum travel of a vertically reciprocable dipper 98. This ring 90 and the rotary portion 74 of the union 60 can be readily swung out of its normal position above the device 94, as shown in Fig. 2, to permit easy access thereto.

This primer cup 94 (Figs. 2 and 3) has a rod-like bottom portion 100 which is adjustably secured in a suitable hole 102 of a platform 104, as by a set screw 106. The platform 104 in turn rests on the table 70. The primer cup is filled to a desired level, as shown in Fig. 3, with a primer suspension 107 which may comprise a powdered metal, such as zirconium, which burns to a white oxide, as the active ingredient, suspended in a volatile vehicle such as amyl acetate.

As shown in Figures 2 and 3, the dipper 98 is a small hollow cup having an axial drainage hole 108 in its bottom side wall for allowing gravitational circulation of the suspension 107 contained within during its vertical travel, and a vertical arm or handle 110 which is attached to vertically reciprocating means such as shown in U. S. Patent 2,449,648, entitled "Method of and Apparatus for Manufacturing Flash Lamps" issued to J. Flaws, Jr. on September 21, 1948, and assigned to the General Electric Company. The dipper is reciprocated vertically downward through the ring 90 and into the suspension 107 in primer cup 94, where it is filled with some of the suspension 107, which it simultaneously agitates, and then upwardly to a desired point of maximum travel where the dipping operation is performed, as hereinafter explained.

A stem holder 112 (shown particularly in Figure 1) oscillatable horizontally by means such as shown in the aforementioned U. S. Patent 2,449,648, is provided for securing a tubulation 113 of a stem 114, which is to be

dipped, within a pair of jaws 116 and 118, and for rotating said stem 114 approximately 90° from its loading position to a position above the vertically reciprocating dipper 98.

In Figure 4 is shown a photoflash lamp 120 having a vitreous envelope 121, an element mount 122 sealed to the open end of said envelope, and a base 124. This mount 122 comprises the stem 114 having a vitreous press 126, the exhaust tubulation 113, a pair of suitable leading-in conductors 130 and 132, and a filament 134 mounted across the conductors 130 and 132 a short distance from the inner extremities thereof. The envelope 121 is provided with a painted conductive dot 136 on its upper inside surface to aid in a leak test of the device.

Operation

According to my invention, air is admitted into the apparatus 10 by the line 12 at the desired velocity as controlled by the flow valve 14 and regulated by pressure regulator 21. It is cleansed of deleterious solid material in the filter or trap 18 and dried in the air drier 24 to remove water vapor. The clean warm air is then heated to the desired temperature by means of the heater 30 and fed at the desired velocity, as shown visually by the flow gauge 34, into the bubbler tubulation 44 of the amyl acetate bubbler 40. The air bubbles through the amyl acetate, which is maintained at the desired temperature by the thermostatically controlled heater 56, and becomes saturated with amyl acetate vapor. The saturated air is then maintained at required temperature during its passage through the line 58 by the insulation 61 and the portion of the heating element of the heater 62 about said line 58. The heater 62 about the rotary valve 60 holds the saturated air, being delivered therethrough, at the same desired temperature.

From the line 58 the saturated air, at controlled temperature and velocity, is fed through the cavity 72 in the upper flanged portion 66 of the stanchion 64 of the rotary valve 60 and the cavity 82 in the top flange 76 of the upper rotary portion 74 through the line 86, the cavity 88, and the discharge holes 92 in the ring 90, downwardly into the primer cup, where it inhibits and prevents appreciable evaporation of the solvent from the suspension 107 contained therein, thus maintaining the suspension viscosity constant, and preventing the formation of potentially-explosive dry primer on the side wall of the cup 94. In turn, the line 96 similarly continuously delivers saturated air and, more particularly directs saturated air onto the dipper arm 110 when the dipper arrives at its maximum point of vertical travel and is in contact with the stem 114.

To perform the dipping operation, the tubulation 113 of the stem 114, to which a suitable filament 134 has been previously attached, is loaded into the jaws 116 and 118 of the holder 112 so that the lower extremities of the leads 130 and 132 lie in a desired horizontal plane. The arm is rotated in a horizontal plane by means (not shown) into vertical alignment with the dipper 98. Simultaneous with the arrival of the stem 114 at the desired location, the dipper 98, filled with primer suspension 107, starts its upward travel from within the suspension 107 in primer cup 94 and proceeds through the saturated vapor above the suspension, and the ring 90 and into contact with the lower extremities of the leads 130 and 132 of the stem 114.

While primer beads 138 and 140 are being formed on the leads 130 and 132, respectively, while immersed in the primer suspension within the dipper, saturated air is directed upon the dipper 110 by means of the discharge line 96, thereby preventing the formation of a dried primer lump on said arm. After a matter of seconds, the dipper 98 is reciprocated downwardly through the ring 90 and into its normal position within the primer cup 94. The arm 112, with the stem 114 having the primer beads 138 and 140 formed on the extremities of the leads 130 and 132 respectively is rotated horizontally back to the original starting position where the stem is unloaded. The element mount 122 is then sealed into the envelope 121, and the lamp is exhausted. This exhaust may comprise a suitable bake, evacuation, a final fill with oxygen to a desired pressure and sealing off of the exhaust tubulation 113 from the exhaust position. The base 124 is then secured to the sealed end of

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the lamp with a suitable cement to produce a photoflash lamp 120, an example of which is shown in Fig. 4.

Thus, it will be seen from the foregoing description that the apparatus 10 of my invention has overcome a defect of the prior art apparatus of primer dipping of photoflash lamp leads. By maintaining the atmosphere, above the primer suspension 107 in the primer cup 94 and around the dipper arm 110 when it is in the lead dipping position, saturated with the primer vehicle, the consistency of the primer suspension is maintained practically constant during the dipping operation. Due to this saturated atmosphere, contamination of the primer suspension with moisture is eliminated. Formation of potentially explosive dry primer powder on the side wall of the primer cup 94 or the handle 110 of the dipper 98 is also prevented. The formation of lumps of dry primer on the dipper handle 110, which might collide with the stem 114 knocking off the newly formed primer beads 138 and 140 during the downward retraction of the dipper 98 has been prevented by the maintenance of a saturated atmosphere above the dipper. Considerable shut-down time, normally required for the removal of such a formation, has been eliminated.

My dipping apparatus 10 comprises essentially an air flow valve 16, a pressure regulator 21 and gauge 22, an air drier 24, a heater 30, a flow gage 34, a bubbler 40 containing primer vehicle maintained at a desired temperature by a heater 56, and a temperature-controlled swivel union 60 for delivering air saturated with a volatile vehicle to the suspension 107 by means of a discharge ring 90 above the primer cup 94. This apparatus 10 will lower lamp shrinkage due to faulty primer application, produce lamps with more uniform characteristics and higher quality, and reduce the danger of lamp explosions due to excessive primer application.

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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 the appended claims.

I claim:

1. Apparatus for primer dipping of photoflash lamp leads and maintaining the consistency of a primer suspension constant by providing an atmosphere above said suspension saturated to a desired degree with a primer vehicle comprising a primer cup for containing said suspension, means for saturating air with a primer vehicle and means for delivering saturated air above said suspension.

2. Apparatus for primer dipping of photoflash lamp leads and maintaining the consistency of a primer suspension constant by providing an atmosphere above said suspension saturated to a desired degree with a primer vehicle comprising a primer cup for containing said suspension, a vertically reciprocable primer dipper, means for reciprocating said dipper, means for saturating air at controlled temperature and velocity with said primer vehicle at a controlled temperature, and means for delivering air saturated with said vehicle above said suspension in both said cup and said dipper.

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