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F. ROKOSZ ET AL

2,908,249

APPARATUS FOR UNIFORMLY COATING PHOTOFLASH LAMPS

Filed May 14, 1957

2 Sheets-Sheet 1

Fig. 1.

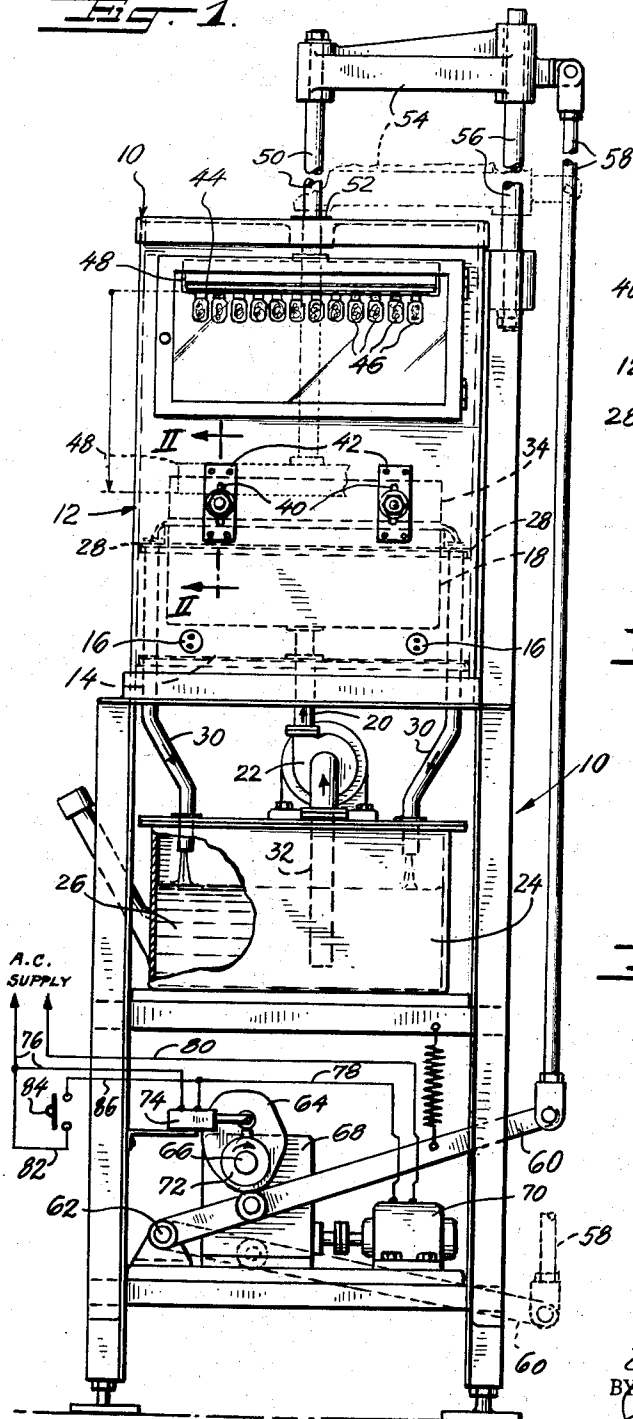


Fig. 2.

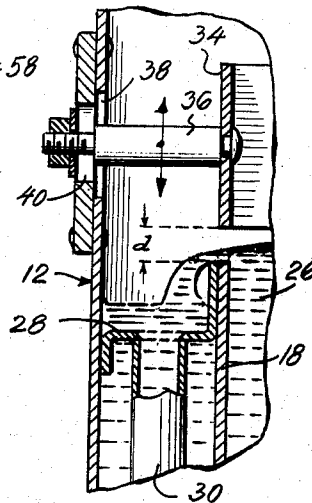


Fig. 5.

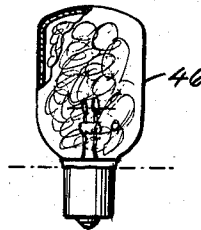
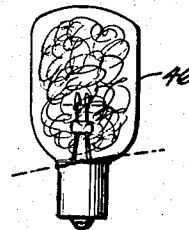


Fig. 6.

PRIOR ART



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Fig. 3.

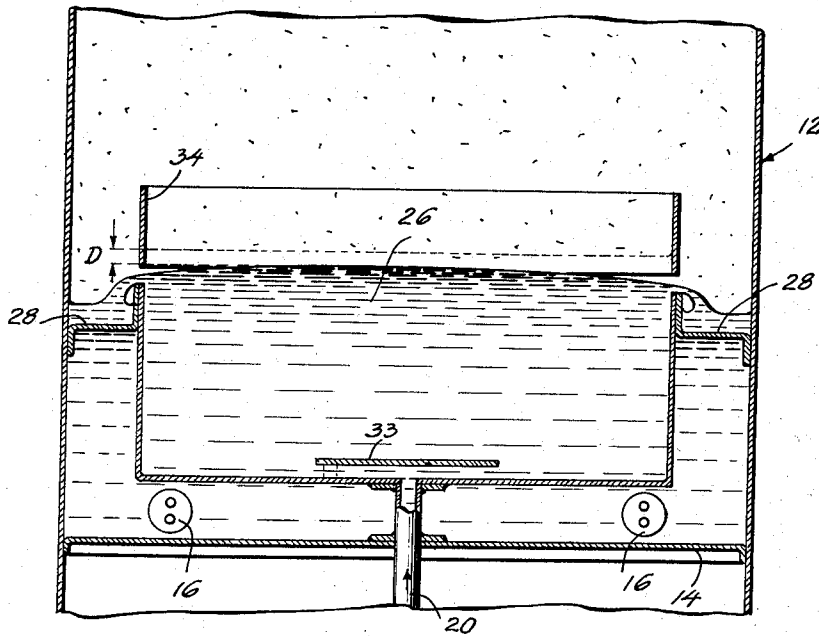
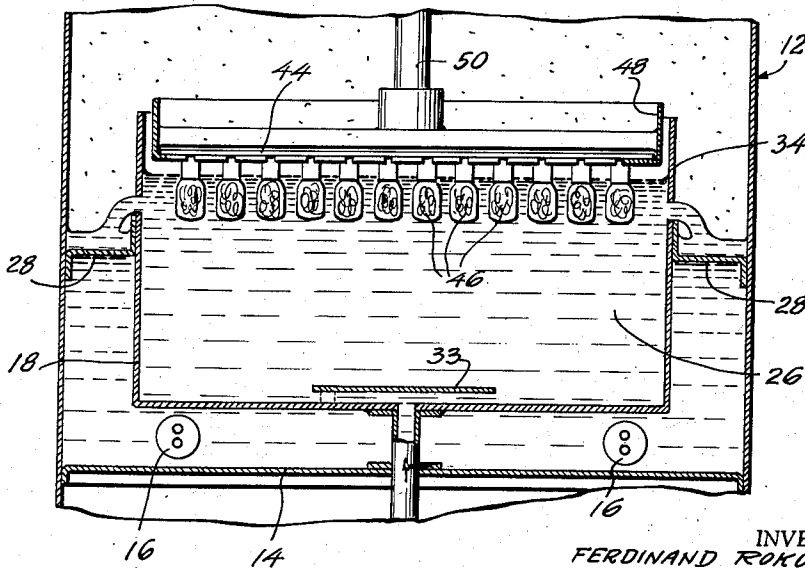


Fig. 4.



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APPARATUS FOR UNIFORMLY COATING PHOTOFLASH LAMPS

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Application May 14, 1957, Serial No. 659,129

2 Claims. (Cl. 118—425)

The present invention relates to apparatus for coating articles and, more particularly, to apparatus for coating photoflash lamps with a viscous lacquer.

Photoflash lamps (comprising a bulb or envelope of glass and containing a charge of readily combustible light-giving material which, on ignition, burns with great rapidity to produce a momentary flash of actinic light) are customarily provided with an external light-transmitting protective coating of a viscous lacquer to strengthen the bulb and prevent the cracking thereof by hot burning particles of combustible material when ignited.

Heretofore, as described and shown in U.S. patent application, Serial No. 475,194, filed December 14, 1954, now abandoned, by H. J. Eppig and assigned to the present assignee of the subject application, a plurality of based photoflash lamps have been loaded into a tray which is then manually lowered with the lamps in the base-up position into a dipping reservoir containing the viscous lacquer until an indicator on the tray engages the rising surface of the lacquer and the lacquer wets the lamps up to a point about 3 ± 1 mm. above the lower edge of the base, whereupon the lamps are then removed from the dipping reservoir and the lacquer is permitted to dry. This manual immersion of the lamps into the lacquer is not adapted to high speed production rates and the control over the height of the lacquer coating is dependent upon the skill and dexterity of the operator. Further, no provision is made in this conventional coating apparatus for maintaining the surface of the lacquer at a predetermined level, for replenishing the lacquer which is coated onto the lamps or for recirculating the lacquer to maintain the proper viscosity thereof.

If, for example, the lacquer is continuously pumped into the reservoir and allowed to overflow the edge of the reservoir, immersion of the lamps into the lacquer causes the outer edges of the surging lacquer to cling to the top edge of the reservoir and the inner portion of the surface of the lacquer to surge upwardly, thereby creating a convex meniscus or curved upper surface of the fluid column and providing the coating of the lamps with an arcuate cut-off line. In addition, the lamps in the center of the tray are coated above the desired cut-off line and the lamps on the outer edges of the tray are coated below the desired cut-off line.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of and objections to the prior art practices by the provision of a coating apparatus which provides a relatively small dipping reservoir and which prevents the formation of a convex meniscus on the surface of a viscous fluid during the immersion coating of articles, and to thus maintain a flat surface on the fluid during the upward surge of the surface, which surge is due to displacement of the fluid by the immersion of the articles therein.

A specific object of the present invention is the provision of a coating apparatus which will uniformly control

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the height of a coating of a viscous fluid applied to a plurality of articles.

Another object is the provision of a coating apparatus which will provide a plurality of articles with a uniform coating having a level cut-off line.

An additional object is the provision of a coating apparatus which minimizes the loss of the viscous fluid from the dipping reservoir after removal of the coated articles therefrom with resultant shorter time between coating operations and a higher rate of production.

A further object of the present invention is the provision of a coating apparatus which automatically maintains the surface of the coating fluid at a predetermined level and which recirculates the coating fluid to properly condition the same even under high speed production rates of lamp coating.

The aforesaid objects of the invention, and other objects which will become apparent as the description proceeds are achieved by providing a reservoir for a viscous fluid, overflow means for maintaining the surface of the viscous fluid at a predetermined level, and means for substantially containing the upward surge of the surface of the displaced fluid when the articles are immersed therein to thereby maintain the surface of the fluid flat during the surge.

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

Fig. 1 is a front elevational view of the coating apparatus of the invention.

Fig. 2 is an enlarged fragmentary vertical sectional view of a portion of the surge retaining means of the coating apparatus along the line II—II of Fig. 1 and showing the adjustable mounting of the surge retaining means.

Fig. 3 is an enlarged vertical sectional view of the dipping reservoir, surge retaining means, overflow means, overflow connecting means and heating tank before coating of the articles and showing a convex meniscus formed on the surface of the viscous fluid.

Fig. 4 is a view similar to Fig. 3 of the coating apparatus after the immersion of the articles in the viscous fluid and showing the uniform coating of the articles to a predetermined height and with a level cut-off line.

Fig. 5 is a side elevational view of a photoflash lamp partially broken away to show the applied viscous coating and the level cut-off line of the coating.

Fig. 6 is a view similar to Fig. 5 but showing the undesirable slanted cut-off line of the coating of the prior art coating apparatus.

Although the principles of the invention are broadly applicable to the coating of articles with a viscous fluid, the invention is particularly adapted to the coating of photoflash lamps with a viscous lacquer and hence it has so been illustrated and will be so described.

With specific reference to the form of the invention illustrated in the drawings there is shown in Fig. 1 the coating apparatus of this invention which comprises a frame 10 for supporting an enclosed jacket assembly 12 of the type shown in U.S. copending application, Serial No. 475,194, filed December 14, 1954, now abandoned, by H. J. Eppig, and assigned to the present assignee of the instant application. A heating tank 14 (Figs. 1, 3 and 4) is mounted within the jacket assembly 12 on the frame 10 and is filled with water which is electrically heated by a plurality of heating units 16, the temperature of said water being thermostatically controlled by conventional means (not shown). Disposed within the tank 14, to be heated thereby, is a dipping reservoir 18. To provide mounting means for the dipping reservoir 18 as well as inlet means into the reservoir, a pipe 20 extends from a pump 22 mounted on the cover of a recirculating

tank 24 secured to the frame 10, and supports the dipping reservoir 18 which contains a viscous coating fluid 26, such as a cellulose acetate butyrate having a viscosity in the order of 1000 c.p.s. or greater. This viscosity is recited as an example and not as a limitation and does not imply that the invention will be ineffective at viscosities less than 1000 c.p.s. One convenient method of further supporting the dipping reservoir 18 and also collecting the overflow of the viscous fluid 26 from the dipping reservoir 18 is to provide a peripheral Z-like plate 28 secured to both the dipping reservoir 18 and the side walls of the jacket assembly 12.

As shown in Figs. 1 and 2 a pair of overflow pipes 30 carry the overflow of the viscous fluid 26 from the plate 28 to the supply of viscous fluid 26 in the recirculating tank 24. To permit the pump 22 to transport the viscous fluid 26 from the recirculating tank 24, an intake pipe 32 depends from the pump 22 into the fluid 26 in the recirculating tank 24. As shown in Figs. 3 and 4, it is advisable to mount a baffle plate 33 on the bottom of the dipping reservoir 18 adjacent the pipe 32 to eliminate turbulence within the reservoir 18.

To adjustably mount a surge dam or surge retaining means 34, suitably an open ended box extension of the dipping reservoir 18, any desired distance "d" above the upper edge of the reservoir 18, bolts 36 (Fig. 2) carried by the retaining means 34 extend through slots 38 in opposed side walls of the jacket assembly 12 and a slot 40 in each of four brackets 42, secured in pairs to the opposed side walls of the jacket assembly 12. The bolt 36 is secured by a suitable nut and lock washer to position the surge retaining means 34 the desired distance "d" above the reservoir 18. The spacing of the surge retaining means 34 the distance "d" from the dipping reservoir 18 provides an overflow aperture for maintaining the surface of the viscous fluid 26 constant at a predetermined level between coating operations. It will be understood that the pump 22 is operable to supply sufficient fluid to the dipping reservoir 18 between coating operations to maintain the predetermined level. If a fluid having a fixed viscosity is to be employed in the coating apparatus, the upper portion of the reservoir 18 may be used as the surge retaining means 34 and the reservoir may be provided, a suitable distance below the upper edge thereof, with an overflow aperture or apertures of desired size, shape and spacing.

To provide supporting means for a photoflash lamp tray 44 (Figs. 1 and 4) loaded with a plurality of, for example one hundred forty-four, photoflash lamps 46 within the jacket assembly 12, a conventional flanged tray holder 48, of the type shown in the aforementioned U.S. application, Serial No. 475,194, filed December 14, 1954, by H. J. Eppig and assigned to the present assignee of the subject application is carried by a rod 50 which is reciprocable in a bearing 52 (Fig. 1) in the cover of the jacket assembly 12, by an automatic tray holder reciprocating mechanism which immerse the lamps 46 into the viscous fluid 26 to a predetermined depth (Fig. 4) and then retracts the coated lamps 46 to the position shown in Fig. 1.

Since automatic reciprocating mechanisms for dipping articles in a fluid are known to be old, as exemplified by the U.S. Patent No. 2,493,754, issued January 10, 1950, to M. I. Dorfman, it is deemed sufficient to say that the mechanism comprises a triangular yoke 54 (Fig. 1) secured to the rod 50, which yoke 54 is slidable on stationary guides 56 secured to the side wall of the jacket assembly 12 and frame 10. The yoke 54 is pivotably joined by a connecting rod 58 to a lever 60 pivoted at 62 on a portion of the frame 10 of the coating apparatus. One suitable way of imparting motion to the lever 60 is to mount a cam follower on the lever 60 and spring bias the follower into continuing engagement with a one revolution cam 64 mounted on the output shaft 66 of a gear

reduction unit 68 which is driven during the coating interval of the coating operation by a prime mover, such as a motor 70.

For the purpose of providing control means for interrupting the operation of the motor 70 when the lamps 46 have been coated and returned to the solid line position of Fig. 1, thereby permitting the removal of the tray 44 of coated lamps 46 from the holder 48 through the door in the jacket assembly 12 and the loading of the holder 48 with a tray 44 of uncoated lamps 46, an interrupting cam 72 is mounted on the shaft 66, and is engageable with a normally closed microswitch 74 in a "motor-energizing" circuit.

This "motor-energizing" circuit (Fig. 1) comprises a conductor 76 extending from one side of a voltage supply, indicated generally by the legend "A.C. supply," to one side of the switch 74, a conductor 78 connecting the other side of the switch 74 to the motor 70 and a conductor 80 which joins the motor 70 to the other side of the voltage supply, thereby insuring continued rotation of the motor 70 during the coating interval of the coating operation, which interval continues until the "motor-energizing" circuit is interrupted by the cam 72 again opening switch 74 at the point in the coating operation when the reciprocating mechanism has returned the tray holder 48 and the tray 44 of the coated lamps 46 to the loading and unloading position (Fig. 1).

To permit the start of the next coating cycle after a tray 44 of uncoated lamps 46 is loaded into the tray holder 48, a "cycle-initiating" circuit is provided which circuit is shunted across the switch 74.

This "cycle-initiating" shunt circuit extends from the conductor 76, through a conductor 82 to one side of a manually operated, normally open push button 84, through a conductor 86 from the other side of the push button 84 to the conductor 78 and through the motor 70 and the conductor 80, to thereby cause the energization and rotation of the motor 70 upon manual closure of the push button 84 by the operator at the desired time.

Operation

At the start of the coating operation, the operator opens the door on the jacket assembly 12 (Fig. 1) and inserts a tray 44 of uncoated photoflash lamps 46 into the holder 48. The operator then depresses the push button 84 closing the "cycle-initiating" circuit and energizing the motor 70 thereby causing the rotation of the cams 64 and 72 in a clockwise direction, as viewed in Fig. 1, with cam 72 causing closure of normally-closed microswitch 74 to assure continued rotation of the motor upon release of the push-button 84 by the operator, and rotation of cam 64 causing the attendant clockwise movement of the lever 60. This movement of the lever 60 causes the reciprocating mechanism to move the tray 48 from the solid line position, shown in Fig. 1, to the dotted line position shown therein, thereby immersing the lamps 46 into the viscous fluid 26 to a predetermined depth (Fig. 4). This immersion of the lamps 46 into the viscous fluid 26 causes the surface thereof to surge upwardly a distance "D" shown in Fig. 3 to bridge the aperture between the surge retaining means 34 and the upper edge of the dipping reservoir 18, which means 34 substantially eliminates the convex meniscus (Fig. 3) from the surface of the surging fluid 26 and maintains the surface substantially flat during said surge, thereby causing the viscous fluid 26 to coat the lamps 46 up to a predetermined height, as shown in Figs. 4 and 5, and with a level cut-off line.

Continued rotation of the cam 64 by the motor 70 causes the spring-biased lever 60 to move from the dotted line position shown in Fig. 1 to the solid line position shown therein and the reciprocating mechanism to move the tray holder 48 and the now coated lamps 46 upwardly from the dotted line position shown in Fig. 1

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(and the position shown in Fig. 4) to its solid line position of Fig. 1. As the lamps 46 are removed from the viscous fluid 26 within the dipping reservoir 18, the surface of the fluid 26 recedes downwardly across the aperture between the surge containing means 34 and the top edge of the dipping reservoir 18 with a minimum loss of fluid 26 through said aperture, thereby minimizing the amount of fluid which must be added to the dipping reservoir 18 by the pump 22 before the next coating operation.

By the time the tray holder 48 has reached the solid line position in Fig. 1, the interrupting cam 72 has rotated sufficiently to open the microswitch 74 thereby deenergizing the motor 70 and discontinuing the rotation of the cam 64 and permitting the operator to open the door in the jacket assembly 12 (Fig. 1) to then remove the tray 44 of the coated lamps 46 from the tray holder 48 and to insert another tray 44 of uncoated lamps 46 therein, whereupon the coating cycle may be repeated.

It will thus be obvious to those skilled in the art that a coating apparatus has been provided by the present invention which prevents the formation of a convex meniscus on the surface of the viscous fluid during the immersion coating of the photoflash lamps and thus maintains a flat surface on the fluid during the upward surge of the surface due to the displacement of the fluid by the immersion of the photoflash lamps therein. The coating apparatus of the invention will uniformly control the height of the coating of the viscous fluid applied to the photoflash lamps within the required 3 ± 1 mm. above the lower edge of the lamp base and will provide a uniform coating thereto having a level cut-off line. In addition, the coating apparatus is desirably adapted to high speed production rates, automatically maintains the surface of the coating fluid at a predetermined level and recirculates the coating fluid to properly condition said fluid and maintain uniform viscosity therein.

As a possible alternative embodiment it should be noted that articles other than photoflash lamps may be coated in accordance with the teachings of this invention.

While in accordance with the patent statutes, one best-known embodiment of the invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

We claim:

1. Apparatus for uniformly coating photoflash lamps with a viscous lacquer comprising a reservoir having a side wall and for containing a body of said lacquer, a surge dam disposed above and aligned with said side wall to provide an overflow aperture therebetween for maintaining the surface of said lacquer at a predetermined level in the interval between the coating of suc-

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cessive lamps, said surge dam being operable to substantially contain the upward surge of said lacquer when said lamps are immersed therein to a predetermined depth below said level to substantially eliminate meniscus from the surface of said surging lacquer and to maintain said surface substantially flat during said surge, thereby causing said lacquer to coat said lamps up to a predetermined height and with a level cut-off line, said surge dam being adjustably mounted on said apparatus to vary the size of said overflow aperture, said overflow aperture being adapted to be bridged by said surging lacquer to minimize the loss of said upwardly surging lacquer and being further adapted after removal of said coated lamps from said lacquer to permit the restoration of said level with a minimized loss of said lacquer from said reservoir.

2. In an apparatus for uniformly coating photoflash lamps with a fluid having a reservoir provided with a side wall and for containing a body of said fluid, means connected to said reservoir for replenishing and circulating said fluid in said reservoir, means disposed adjacent said reservoir for collecting and returning overflowing fluid from said reservoir to the latter and means for immersing said lamps into said fluid to a predetermined depth below the surface of said fluid and for removing coated lamps therefrom, the improvement comprising a surge dam disposed above and aligned with said side wall to provide an overflow aperture therebetween for maintaining the surface of said fluid at a predetermined level in the interval between the coating of successive lamps, said surge dam being operable to substantially contain the upward surge of said fluid when said lamps are immersed therein to a predetermined depth below said level to substantially eliminate meniscus from the surface of said surging fluid and to maintain said surface substantially flat during said surge, thereby causing said fluid to coat said lamps up to a predetermined height and with a level cut-off line, said surge dam being adjustably mounted on said apparatus to vary the size of said overflow aperture, said overflow aperture being adapted to be bridged by said surging fluid to minimize the loss of said upwardly surging fluid and being further adapted after removal of said coated lamps from said lacquer to permit the restoration of said level with a minimized loss of said fluid from said reservoir.

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