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2,868,670

FLASH LAMP COATING PROCESS

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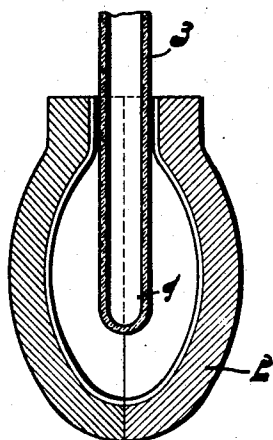


Fig. 1.

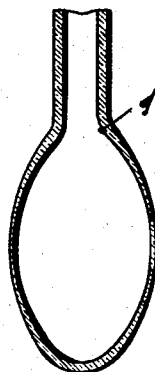


Fig. 2.

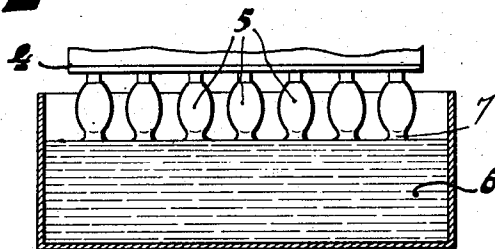


Fig. 3.

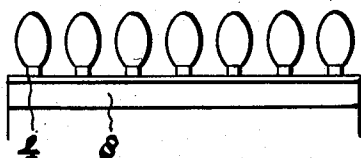


Fig. 4.

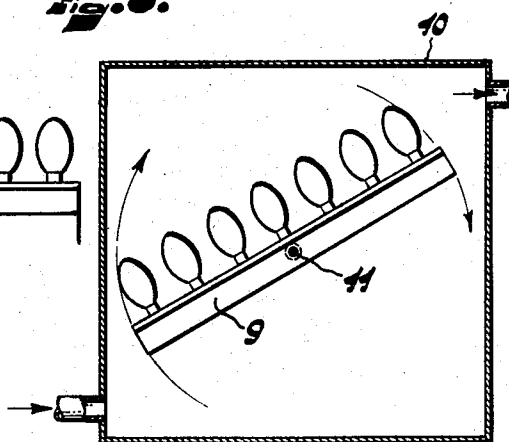


Fig. 5.

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AGENT

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FLASH LAMP COATING PROCESS

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3 Claims. (Cl. 117—94)

The invention relates to a flash light lamp of the kind comprising a closed glass envelope, which is coated externally with a protective layer mainly of a thermo-plastic synthetic resin. In the interior of the envelope are provided an actinically burning material, an ignition mechanism and a gas filling. It is known that the protective layer, having a thickness of 0.05 to 0.3 mm., serves to re-inforce the glass envelope, in order that in the event of breakage thereof the fragments are held together and that the possibility of breakage during the handling of the flash light lamp, prior to ignition, is reduced.

It has now been found that material additional advantages are obtained, if use is made of a protective layer of thermo-plastic synthetic resin of 0.5 to 1.5 mms. in thickness. With the known flash light lamps having a thin protective layer on the glass envelope the layer becomes so hot due to the combustion inside the envelope that the lamp cannot be held by the hand, so that, if a rapid exchange of a used flash light lamp against a fresh lamp is required, use is made of a mechanism which detaches the lamp rapidly from the holder but which drops the used flash light lamp. Owing to the high external temperature the lamp is then liable to cause damage.

A further disadvantage of the known flash light lamps resides in that often, the glass part breaks down and the protective layer is at the same time damaged, so that manipulation of the lamp may cause harm by protruding glass fragments. This risk is comparatively great, since the protective layer can, as a rule, not resist the heat produced by internal combustion without being damaged. As a result the protective layer often contains residues of volatile substances, including bubbles due to the evaporation of these substances. Particularly if actinic material engaging the glass wall is burned, the layer may furthermore be softened and be decomposed, so that subsequent to the ignition of the lamp the layer loses its rigidity.

With the flash light lamp according to the invention these disadvantages are completely obviated. Immediately after the ignition the temperature of the lamp is externally slightly higher than that of the hand. The lacquer layer is completely undamaged and adequately rigid to carry out the required manipulations as for example the removal from the flash light apparatus. Since the heat is better distributed, the layer is substantially not decomposed, so that no part of the light to be emitted is intercepted by a coloured lacquer layer. A flash light lamp according to the invention may therefore be used for taking photographs, when the source of light is in contact with the human or animal skin or is to be housed in the mouth, the throat, the stomach, the gullet or an intestine.

The invention, moreover, offers the possibility of using an internal gas pressure of more than 1 atmosphere, so that the quantity of light to be emitted per volume unit of the envelope may be increased.

Whilst, moreover, the glass part of the envelope of

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the known flash light lamps is usually strong and may have a sufficient, uniform thickness, use may be made of a glass envelope for a flash light lamp according to the invention which is only required to be gas-tight. Thus use may be made of a glass envelope obtained by blowing out an unilaterally sealed glass tube, subsequent to softening of the glass, to form a round oval or ellipsoidal bulb. Such a bulb may be manufactured at lower costs than a bulb, the wall of which has a uniform thickness, as is described in United States Patent No. 2,306,563.

Use may particularly be made of a flash light lamp according to the invention, of which the glass envelope is constituted by a blown-out tube, the thickness of the glass wall of which is 0.5 to 0.15 mm. at the areas blown out farthest.

When a flash light lamp comprising an external protective layer was manufactured by the method hitherto used, this method included the immersion of the glass envelope in a solution of a thermo-plastic synthetic resin in an organic solvent and the subsequent evaporation of this solvent from the layer deposited on the glass envelope.

In order to manufacture a flash light lamp according to the invention in this manner, this operation had to be repeated one or more times, which is circuitous and thus costly, whilst, moreover, the weakening of the layer of synthetic resin referred to above, due to the formation of bubbles subsequent to the combustion of the actinic material as far as these bubbles are due to the abrupt evaporation of solvent residues, can be avoided only with difficulty.

According to a preferred embodiment of the invention, the glass envelope of a flash light lamp is provided with a protective layer of a thermo-plastic synthetic resin by immersing the glass envelope in a dispersion of thermo-plastic synthetic resin particles in a softener or in a liquid containing a softener and by causing subsequently the liquid layer deposited on the envelope to solidify by heating.

Dispersions of thermo-plastic synthetic resin particles in a softener or in a liquid containing a softener are known per se in a form by which comparatively thin layers are obtained by a single immersion. For the application of a protective layer according to the invention by a single immersion, however, a concentrated viscous dispersion must be used, i. e. dispersions of which the viscosity during the immersion is 250 to 1000 poises (measured at 20° C. in a Höppler viscosimeter).

In order to render such viscous dispersions workable and to cover the envelope of the flash light lamp with a uniformly thick protective layer, the following precautions will preferably be taken:

(1) The envelope is immersed in the viscous liquid with a speed of 5 to 25 cms. a minute in order to prevent air occlusions.

(2) The envelope is raised at a rate of 1.3 to 3.5 cms. a minute until the envelope is entirely over the liquid surface.

(3) Then this rate is increased 10- to 100-times, until the flow of liquid connecting the envelope with the immersion liquid is interrupted.

(4) The envelope is turned 180° about a horizontal axis and is left for a short time, for example 0.5 to 1 minute,

(5) then the envelope is introduced into a heated furnace, in which it is caused to rotate about a shaft at right angles to the longitudinal axis of the envelope,

(6) then the envelope is removed from the furnace and is cooled.

Although good results may be obtained in this manner, the desired viscosity can be attained, if the liquid phase

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of the dispersion is constituted only by a softener, only by using such a high content of softener that the final protective layer to be obtained is soft and sticky. Use is therefore preferably made of a volatile diluting agent which decreases the viscosity of the dispersion, but which evaporates during the heating of the layer. Such volatile diluting agents, having a boiling point of less than or slightly higher than 100° C., are frequently used in such dispersions.

However, if the disadvantage inherent in the use of volatile substances in a layer to be heated is to be avoided, the conventional diluting agent having a low boiling point cannot be used in this case, the more so since the solidification of the dispersion requires a heating to a comparatively high temperature, so that already during the solidification of the dispersion bubbles may be produced in the comparatively thick layer.

It has furthermore been found that the heating for solidifying the dispersion requires some precautions, if it is to be avoided that the temperature-sensitive parts of the flash light lamp in the interior of the envelope produce ignition of the lamp or vary at least the combustion characteristic i. e. the curve indicating the relationship between the time and the light intensity, to an inadmissible extent.

It has now been found that the invention may be satisfactorily carried out in a manner avoiding the said disadvantages, by using a dispersion of polyvinyl chloride particles in an organic liquid constituted by a softener suitable for polyvinyl chloride and a mixture of hydrocarbon practically free from aromatic constituents, having a boiling range between 200 to 245° C., this organic liquid containing no substances boiling at lower temperatures and by introducing the flash light lamps immersed in this dispersion without previous heating into a furnace heated to 170° C. to 225° C. In this manner, at 170° C. and a heating time of about 30 minutes and at 220° C. and a heating time of about 2 minutes, a complete solidification of the dispersion may be obtained without premature ignition of the flash light lamps. During this heating the diluting agent used volatilizes substantially completely without producing bubbles. By choosing hydrocarbons free from aromatic constituents as diluting agents inspissating of the dispersion due to a beginning of solidification without heating is delayed, so that the viscosity of the dispersion subsequent to its production, increases only slowly. Thus a smaller quantity of such a diluting agent than of other diluting agents not delaying the inspissating may be used, for example ketones and aromatic hydrocarbons.

Apart from the aforesaid features the polyvinyl chloride dispersion has the feature that it is composed in accordance with the dispersions used in this technique, i. e. use is made of a vinyl chloride polymeride having a molecular weight of at least 20,000 and being produced for at least 85% of vinyl chloride and having a ratio between polymeride and softener which may vary between 5:1 and 1:1. Suitable softeners may for example be tricresyl phosphate and various phthalic acid esters, for example dioctyl phthalate and dinonyl phthalate and moreover, diethylene glycolbenzoate and diethylene dibenzoate, diethylene glycolmonomethyl ether phthalate dioctyl sebacate and dioctyl adipate.

The above and other features, objects and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

Fig. 1 is a diagrammatic view of a glass tube introduced to a mold and about to be blown out to the shape shown in Fig. 2.

Fig. 2 is a bulb of a flash lamp.

Fig. 3 is a diagrammatic view of a rack supporting a plurality of flash lamps after being immersed in a container housing a liquid.

Fig. 4 is a view of the rack rotated 180° and

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Fig. 5 is a diagrammatic view of the rack being rotated in a furnace.

Example.—A unilaterally sealed glass tube, designated in Fig. 1 by 1, having an internal diameter of 8.5 mms. and an external diameter of 11.5 mms. is introduced in a soft state owing to heating into a mould 2, after which air is blown into it through the open end 3. The glass tube is thus blown out to the shape shown in Fig. 2. The largest diameter of the glass envelope of the flash light lamp thus obtained is 30 mms. The thickness of the glass wall at this sectional area is about 0.35 mm. This envelope is provided in known manner with an electric ignition mechanism comprising a filament wire and ignition paste applied thereto, wire-shaped actinically burning metal and an oxygen filling under a pressure of 65 cms. Hg. Fig. 3 shows how the lamps 5 housed in a stand 4 are immersed in a dispersion of polyvinyl chloride in an organic liquid. This dispersion is contained in a container 6. The stand 4 is lowered at a rate of 10 cms. a minute and, after the glass envelope has been moistened throughout its surface by dispersion, it is lifted from the container at a rate of 2.5 cms. a minute. Fig. 3 shows the position of the lamps after the lowest point of the glass envelope lies slightly over the liquid surface. A slowly descending flow of the liquid 7 still connects the liquid on the envelope of the lamp with the liquid contained in the container 6.

Then the rate of rising the lamp is increased 40 times, so that the flow of liquid is interrupted. The stand 4 is then put upside down on the table 8, as is shown in Fig. 4. After the liquid has distributed itself uniformly over the surface of the glass envelope, it is introduced into a holder 9, housed in a furnace 10; then the holder is rotated about the shaft 11. The furnace 10 is internally heated to 215° C. After three minutes the initially milky layer has become transparent and the stand 4 is fixed in a horizontal position and moved out of the furnace. The dispersion in the container 6 had been obtained by mixing polyvinyl chloride powder, having a particle diameter of 0.2 to 5 μ and a mean molecular weight of 80,000, in a ratio of 100 parts by weight of polyvinyl chloride to 60 parts by weight of dioctyl phthalate and by adding thereto such a quantity of hydrocarbon fraction free from aromatic constituents, having a boiling range from 210° C. to 240° C., that subsequent to intensive stirring a dispersion having a viscosity of 450 poises is obtained (measured by means of a Höppler viscosimeter at 20° C. with a ball of 7.8525 g.; specific weight of the ball 7.68; diameter 12.50 mms.; diameter of the viscosimeter tube 15.941 mms.). The quantity required thereto was about 1 to 10 cm.³ per 100 gs. of polyvinyl chloride and varies slightly with the molecular weight of the polyvinyl chloride used. In the experiment described above 1 cm.³ was initially added, but after 24 hours a further 4 cms.³ had to be added to compensate the increase in viscosity which had in the meantime taken place.

It is advisable to stabilize the polyvinyl chloride dispersion against decomposition due to heating by adding an adequately effective quantity of a suitable stabilizer, in order to prevent the layer from being discoloured during the solidification due to heating. To this end the organic tin compounds described in American patent specification 2,618,625 were found to be very suitable. Quantities of 1 to 3% are found to prevent a complete discolouring of the layer at a furnace temperature of 180° C. to 225° C. The thickness of the layer thus obtained was found to be very uniform and to be 0.8 mm. If a flash light lamp thus manufactured is ignited, the protective layer is not damaged, although the glass part of the envelope may break down to pieces. During and subsequent to the ignition the envelope, which assumes a slightly higher temperature than the hand, can be fetched by the hand. The thermo-plastic envelope is furthermore sufficiently coherent to the lamp base and it is

sufficiently rigid to permit of screwing or pulling the lamp out of the fitting of a flash light apparatus.

If the glass wall is to be kept undamaged or if it should be sufficiently coherent to avoid serious deformation of the envelope, for example in the event of using the flash light lamp in human or animal organs, it is advisable to provide the flash light also with an internal coating. In order to avoid the disadvantages inherent in a possible decomposition or liquification of the internal coating due to the heating required for solidification, use is made of an internal coating from a high polymeride organic silicon compound. Such products, also referred to as "silicons" have a comparatively great thermal stability and hence do not dissociate during solidification. A suitable example of such a silicon is the film producing polyalkyl siloxane, for example the product known under the trademark of "DC40C."

What is claimed is:

1. A method of coating the glass bulb of a flash lamp comprising, immersing said glass bulb a single time in a viscous dispersion of thermoplastic synthetic resin particles in a softener to form a protective layer on the exterior surface of said bulb having a thickness of from 0.5 mm. to 1.5 mms., said dispersion having a viscosity between 250 and 1000 poises measured at 20° C. in a Höppler viscometer, and heating the glass bulb to gelatinize said resin dispersion.

2. A method of coating the glass bulb of a flash lamp as set forth in claim 1 wherein said glass bulb is immersed in a viscous synthetic resin dispersion at an im-

mersion rate of 5 to 25 cms. per minute, and further raising the bulb at a rate of 1.5 to 3.5 cms. per minute until the bulb lies over the surface of the liquid, turning said bulb substantially 180° about a horizontal axis, introducing said bulb into a heated furnace in which it is caused to rotate about a shaft at right angles to its longitudinal axis, and removing the bulb from the furnace and cooling the same.

3. A method of coating the glass bulb of a flash lamp as set forth in claim 1 wherein the single immersion of the glass bulb in a dispersion of polyvinyl chloride particles in an organic liquid constituted by a softener suitable for polyvinyl chloride and a hydrocarbon mixture substantially completely free from aromatic constituents coats said glass bulb, said liquid having a boiling range between 200° C. and 245° C., and heating said lamp after immersion in a furnace at a temperature between 170° C. to 225° C.

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