Aug. 4, 1931. K. TSUYUKI 1,817,783

METHOD AND APPARATUS FOR INSIDE COATING BULBS

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Fig. 1.

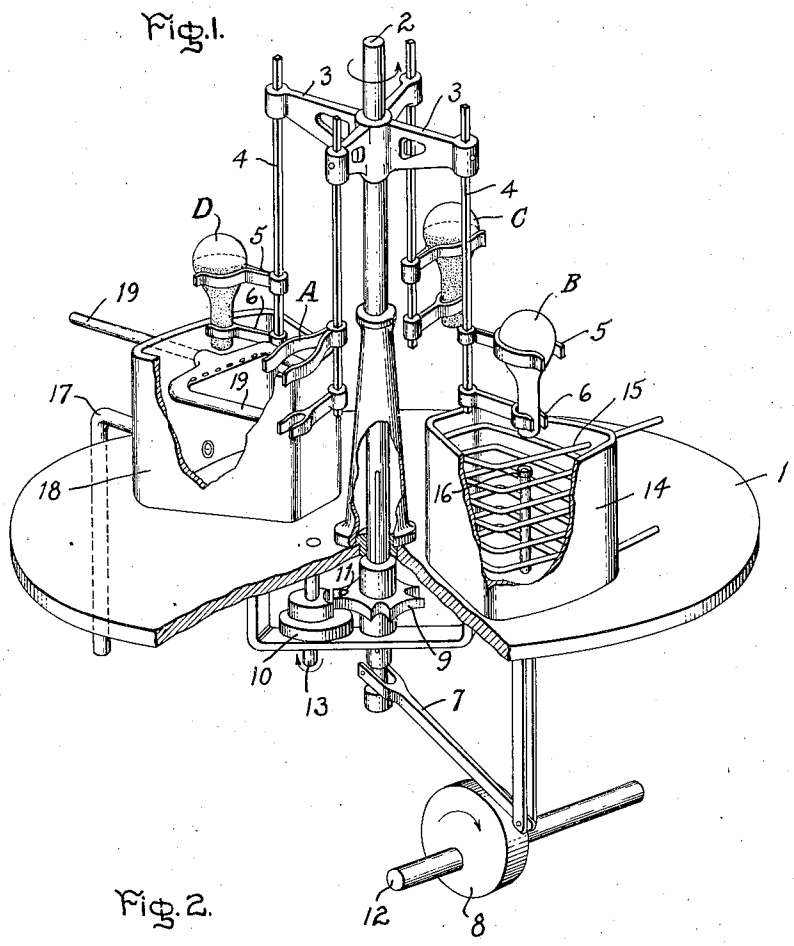
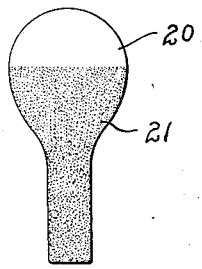


Fig. 2.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR INSIDE COATING BULBS

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The present invention relates to a method of and apparatus for applying to a part of the inner surface of a lamp bulb or similar glass container having only one neck or opening a protective coating prior to frosting the uncoated part of the inner surface by etching and more particularly to coating a selected part of the inner surface of the bulb with a film of protective material, preferably by dipping it neck downward into said material in liquid form, and venting the air in the bulb to the atmosphere so as to cover the submerged portion of the bulb with a film which protects the glass surface from the effect of etching compound.

The object of the invention is to provide simple and reliable means for coating a bulb or similar article on only a part of the inside surface, and to accurately limit in a simple way not requiring any particular skill the area affected by the etching compound.

The invention relates more particularly to a method of confining the frosting to a predetermined part of the inside surface of a bulb or similar empty glass container having one neck or opening, by placing the bulb with the opening downward, venting the interior of the bulb by connecting it to the atmosphere, as for example, by means of a connecting tube, and dipping the bulb into the liquid protective material to such a depth that the only part which remains free from a film or coating of the protective material is that part of the inside surface which is to be frosted by the etching compound, which usually contains hydro-fluoric acid. A satisfactory material for protecting the glass from the etching compound, and one that has a low melting point and easily coats the glass surface, is paraffin or wax.

It has heretofore been considered difficult to frost only a part of the inside surface of a bulb having only one neck or opening and particularly to manufacture by the inside frost method the so-called "half frosted" or bowl frosted lamp and keep the half near the neck transparent and frost the other half toward the bowl or top, although there is a large demand for such lamps. To use the ordinary method and apparatus for manufacturing lamps which are half frosted or bowl frosted on the outside by an etching compound is impossible; to pick up the bulb carefully and inside frost the bowl of the bulb by gently pouring the etching compound into the bulb while held bowl down is troublesome and requires skill; and sand blasting the inside of the bowl of the bulb is attended by many difficulties and troubles if done on a commercial scale. By the present invention, however, the bowl part of the inside of the bulb can be frosted by practically any frosting process, because a protective film not affected by the etching or frosting compound is, by a simple and easy operation which requires no skill, applied to the part which is not to be frosted. The invention can be practiced by hand, but I prefer to coat that portion of the inside of the bulb which is to remain clear with a film of a protective material resistant to the etching compound by means of a machine which handles the bulbs to form a film of a protective material, such as paraffin, on a desired portion of the inside of the bulb, and fixes the film on the glass by cooling it. Then the uncoated portion of the inside of the bulb is frosted, usually by a machine.

The invention will best be understood in connection with the accompanying drawings, in which one embodiment of the invention is illustrated and in which Figure 1 is a view in perspective with parts broken away of one form of apparatus for applying the protective film prior to frosting, and Figure 2 shows the coated bulb produced on the machine.

The particular machine shown comprises a table 1 on which several heads constructed to hold the bulbs are mounted to reciprocate vertically and also travel step by step along a circular path. Each head or bulb holder comprises bulb clamps 5 and 6 secured to the lower part of a vertical rod 4 suspended from an arm 3 of a spider fixed to the upper part of a reciprocating and rotatable carrier for the heads, such as a shaft 2 which extends vertically through the table 1. Each head holds the bulb with its neck downward and its longitudinal axis vertical. To the lower part of the carrier or shaft 2 a driving mechanism is attached in order to reciprocate and

rotate said shaft. The reciprocating mechanism comprises, for example, a pivoted lever 7 which engages at one end the lower part of said shaft 2 so as not to hinder its rotation, and has its other end controlled by a cam 8 which through the lever moves the shaft 2 up and down, as the cam is rotated by the source of power.

In the drawings the shaft 2 is shown in its highest position, where it is rotated one step to move the head or bulb support from one working position to the next, and since, in the apparatus shown in the drawings, there are four heads the shaft makes one revolution in four steps, so that the shaft 2 turns one fourth of a revolution each time it rotates. The driving mechanism for rotating the shaft intermittently is preferably a Geneva gear comprising a notched wheel 9 splined on the shaft 2 to rotate it regardless of the reciprocating movement of the said shaft and making one fourth of a revolution for each revolution of the driving pinion 10 which has a pin 11 to engage the notches on the wheel 9. The relative speeds of the countershaft 12 for the cam 8 and the driving shaft 13 of the pinion 10 are such that when the shaft 2 is in its highest position the Geneva gear rotates it one fourth of a revolution. Each head or bulb support is lifted by the cam 8 at each working position and while lifted it is rotated one fourth of a revolution by the Geneva gear to the next working position where it is lowered and this operation is repeated to carry each head from one working position to another.

The coating device by which any desired part of the bulb supported in a head is coated with a film that protects the glass surface from the effect of the etching compound, is placed at one of the points where the head or bulb supports stop as the shaft 2 intermittently rotates on the table 1. The particular device shown comprises a tank 14 for a static or quiet body or pool of paraffin or wax, which is resistant to an etching compound containing hydro-fluoric acid, and in the tank is a heating coil, such as a steam pipe 15 which extends outside the tank. The paraffin is melted and rendered liquid by heating it. To permit the liquid paraffin to rise inside the bulb to the level of the quiet body of melted paraffin in the tank the bulb is vented through the neck by some means, such as a vent pipe 16 which stands vertically in the tank and opens through the bottom of the tank and is so mounted that it is in alignment with the axis of the bulb held by the bulb support, so that as the neck of the bulb sinks into the static body of melted paraffin as the bulb is lowered with the bulb support, the vent pipe assists the bulb to sink into the paraffin by exhausting or venting the air in the bulb to the outside.

A film fixing device, which sets and hardens the paraffin film on the glass surface may be placed on the table 1 in one of the working positions reached by the head during its travel. The apparatus shown in the drawings facilitates hardening of the coating by so locating the fixing device that each head stops between the coating device and the fixing device (position C) to permit the excess paraffin to drain off and the coating to cool to some extent. However, it is not always necessary to do so. The film fixing device comprises an open ended vessel or tank 18 having an outlet pipe 17 at the bottom, and a forked inlet pipe 19 with a plurality of orifices or sprinklers so placed that a bulb lowered into the tank by the head in which it is supported, is surrounded by said water pipe 19 whereby the paraffin coat on the glass is sufficiently cooled by water sprinkled on it, thereby fixing the coating.

The next stop of the head is at the loading and delivery position A where the operator who stands at this position A removes the coated bulb and inserts an uncoated transparent bulb into the bulb clamps 5 and 6 while the head is stationary. The shaft 2 lifts the bulb and the head because of the rotation of the shafts 12 and 13, transfers it to the coating position B, and then lowers it into the quiet pool of melted paraffin in the tank 14. The extent of dipping the bulb into the paraffin is varied as desired by adjusting the point of attachment of the rod 4 to the arm 3 in accordance with the height of surface of the paraffin and the extent of the portion of the bulb to be coated with protective film. The bulb is lowered and is dipped into the quiet pool of paraffin as deep as the boundary line of the area desired to be coated. Then, since the air sealed in the bulb as the neck enters the paraffin can escape freely through the vent pipe 16 the paraffin surface inside the bulb equalizes with that on the outside so that the inside surface of the bulb except the part where frosting is desired is completely wet by the paraffin and when lifted up by the head all inner surface of the bulb, except the part to be frosted, is coated with paraffin. According to the kind of paraffin, and the temperature of the location of the apparatus the protective film of paraffin will quickly be hardened and stick to the surface if the bulb is merely left exposed to the air. In summer, or if the paraffin has a low melting point, or the speed of working is to be increased, water cooling may be adapted for the hardening and fixing position, as shown in the drawings, that is, the bulb which has been coated with paraffin at B is transferred step by step to the position D and there goes down into the fixing tank 18 with the result that the paraffin is cooled and sticks to the glass surface because of the shower of water sprinkled upon it from pipe 19.

When the bulb comes back to position A the operator takes the bulb which is coated with paraffin out of the support and replaces it with an uncoated bulb.

The bulb that has been coated with the protective film of paraffin on a part of the inside surface may be frosted by any known method and apparatus, and then the protective film or coat on the glass surface is taken off preferably by blowing into the bulb an alkaline steam.

What is shown in the drawings is an apparatus for facilitating the carrying out of the preparation of the bulb, but if the position for blowing the alkaline steam into the frosted bulbs be placed in proper relation to the working positions of the inside frosting machine for incandescent electric lamps or similar articles the troubles due to transfer of the coated and frosted bulbs to different machines are greatly lessened.

The bulb 20 after it has been coated by the machine as above described has, as best shown in Figure 2, a thin protective coating of paraffin 21 on the inside which leaves only the bowl of the bulb exposed to the etching compound.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The method of temporarily coating a portion of the inside surface of a hollow glass article having one opening which consists in submerging the opening of the article to a pre-determined depth in a static pool of molten liquid coating material, venting the article through said opening to permit the molten material to rise in said article and thereby wet a pre-determined portion of its inner surface, cooling said article to convert the adherent material on the wetted surface into a solid protective coating and subsequently removing said coating.

2. The method of temporarily coating a portion of the inside surface of a hollow glass article having one opening which consists in submerging the opening of the article to a predetermined depth in liquid paraffin, venting the article through said opening to permit the paraffin to rise inside said article to the same level as outside, and thereby wet a predetermined portion of said inner surface, cooling the coated article to convert the adherent liquid paraffin on the wetted surface into a solid protective coating, and subsequently removing said solid coating by treatment with an alkaline reagent.

3. The method of temporarily coating a portion of the inside surface of a hollow glass article having one opening which consists in submerging the opening of the article to a predetermined depth in a bath of heated praffin, venting the article through said opening to permit heated paraffin to rise in said article to the outside level of the bath and thereby wet a predetermined portion of its inner surface, cooling the coated article until the heated paraffin adherent to the wetted surface becomes a solid protective coating, and subsequently subjecting said solid coating to an alkaline vapor to remove said coating.

4. In a device of the character described, the combination of a table, a bulb holder for holding a bulb neck downward and mounted to rotate about a vertical axis and to reciprocate vertically, an open ended coating vessel mounted on said table with its open end adjacent the path of said holder, a vertical vent pipe inside said vessel in alignment with the axis along which said bulb holder reciprocates, an open ended fixing vessel on said table with its open end adjacent the path of said holder, and actuating means for intermittently rotating said holder to bring it into registry with said vessels in succession, and to lower said holder while in registry with said coating vessel to dip the neck of a bulb into said vessel and over said vent pipe and then raise said holder, and to lower the bulb into and raise it out of said fixing vessel while said holder is in registry with said fixing vessel.

In witness whereof, I have hereunto set my hand this 6th day of September, 1927.

KEIJI TSUYUKI.