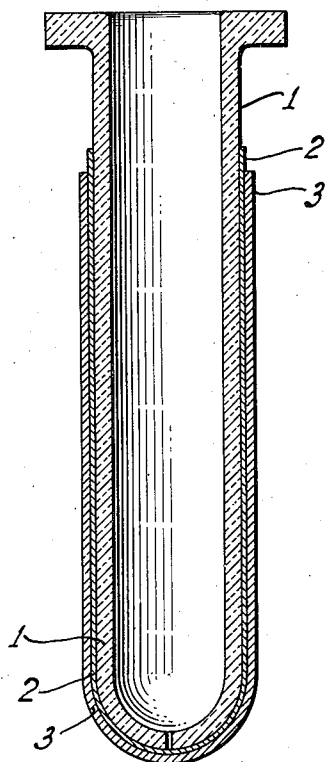


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METHOD OF PRODUCING HIGHLY LUSTROUS HOLLOW BODIES FROM
CELLULOSE PRODUCTS AND OTHER SUBSTANCES
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METHOD OF PRODUCING HIGHLY LUSTROUS HOLLOW BODIES FROM CELLULOSE PRODUCTS AND OTHER SUBSTANCES

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3 Claims. (Cl. 18—58)

The invention of my present application, which is a continuation in part of my former application Serial No. 140,768, filed May 4, 1937, relates to the production of hollow articles by dipping a mold in a dipping bath containing a solution or suspension of some plastic substance, such for example as either nitrocellulose or other cellulose esters or cellulose ethers, or natural resin (amber), or synthetic resin, as for example polystyrol, all with or without additions of other materials. I have found it particularly useful in the manufacture of articles of cellulose acetate by dipping the molds in a solution of cellulose acetate in acetone. It is the object of my invention to produce such bodies in a highly lustrous condition, and to preserve the natural transparency or translucency of the material unimpaired.

It has been suggested that a hollow article of Celluloid may be formed by dipping a hollow soft-rubber core into a solution of gelatine and water, allowing it to harden for about one minute, dipping in the cellulose solution to form the article, drying, and then immersing the mold so formed with the formed article upon it in a bath of warm water to soften the gelatine and to allow the article to be removed from the core. It is, however, impossible to produce formed articles having smooth interior surfaces in this way, because the acetone, or any other solvent of Celluloid known to me, will immediately attack the soft gelatine coating produced as above described and give it a rough and porous surface, which surface will of course be reproduced in the formed article. Further, the temperature of the water required to sufficiently soften the gelatine is so high, being around 60° C., as to cause deformation of the finished article, which is highly objectionable, particularly in the production of a number of articles intended to be of uniform size. Further, it is almost inevitable that a certain amount of acetone will exist in the article at that stage of the process where it is removed from the mold; unfortunately in a bath of water at, around or above 60° C. a reaction takes place between this acetone and the article which gives the article a cloudy, milky appearance.

It has also been proposed to form articles of Celluloid by dipping solid cores covered with a coating of paraffin, stearine, vaseline or similar substance into a bath containing Celluloid in solution, drying, and removing the formed article by heating to a temperature high enough to melt the coating. But here also the solvent will inevitably attack the coating and destroy the

smoothness of the surface, so that the formed article will not be smooth on the inside, and therefore not lustrous. Further, the reaction in the dipping bath between the acetone and the hydrocarbon coating results in giving the article an opaque appearance, which is in most cases highly objectionable, and in the case of articles intended to be transparent, ruinous.

And in general whenever in the past a layer of material different from the material of the finished body has been deposited on a core for purposes of lubrication, it has always been the practice to employ either material which is normally soft and slippery, or material deposited from a solution and used before it is dry and while it is still slippery. But, to produce finished articles of lustrous surface and high quality the surface upon which the article is formed must be smooth, hard and bone dry during the deposition of the article-forming film thereon.

I have found that for the production of highly lustrous formed articles it is necessary to use cores with highly polished and lustrous surfaces; such cores are preferably of hard, smooth material such as glass. But such hard cores are so rigid that when the formed article shrinks, as it always does in the drying process, it adheres so tenaciously to the core as to make it impossible to remove the formed article without injury.

My invention is based upon the discovery that it is possible by proper choice and treatment of the ingredients of my intermediate layer to secure a mold surface which is extremely smooth and hard during the deposition of the article-forming film, and with which the solvent in the immersion bath undergoes no deleterious chemical reaction, and which yet by the application of moisture and upon being slightly warmed becomes a slippery intermediate layer admirably adapted to supply lubrication between the core and the finished article upon removal of the latter. When such a layer is deposited upon a rigid core, it is possible to allow the formed article to shrink in drying, and yet to remove it readily from the core without injuring it. When such a layer is deposited upon a non-rigid core it gives the mold a superior luster, and aids by its lubricating properties the operation of removing the formed article.

In carrying out my invention in the best manner known to me, I provide cores of glass of the proper shape and dip them in a solution which normally comprises 100 grams of gelatine, 100 grams of saccharose and 20 grams of glycer-

ine in 800 cubic centimeters of water. The core, with the mixture adhering to it, is then subjected to a thorough drying process, until the skin upon the core is bone dry. This drying operation is conducted in air at about 40° to 45° C. for a half of an hour or more. The core is thus covered with a very thin, hard, smooth, dry lustrous skin, normally considerably less than one millimeter in thickness. Thereupon the resulting "mold" as I call it, consisting of the core with the skin upon it, is dipped in a dipping bath and dried. This operation may be repeated as many times as is necessary to produce a formed article of the proper thickness.

The drying operation should be commenced in a cool atmosphere to prevent the formation of bubbles, in accordance with the invention of my application Serial No. 218,327, filed July 9, 1938, which forms no part of the present application and is not herein claimed. It should be continued at progressively higher temperatures and should be thorough. When the drying operation has been completed, the molds with the formed articles thereon are immersed in a bath of water at a temperature of 45° C. or somewhat lower. The water makes its way between the formed article and the mold, and by its action, plus the action of the heat, softens the skin and converts it into a lubricant. Thereupon the formed article may readily be removed in any convenient manner; for example, it may be blown off the mold by a jet of air forced through a channel in the core, in the manner described in my Patent No. 2,114,794. The formed article is then washed in warm water and dried. The cores are washed and used again. The gelatine, glycerine and sugar may be recovered for subsequent use.

I have referred above to the evil effects which result from attempting to remove articles of this character from the molds on which they are formed, or otherwise treat them for any substantial time, in water at or above the danger temperature, which temperature is in the neighborhood of 60° C., these evil effects being:

(1) A deformation of the formed article, so that its final shape is not that which it would have had if not so deformed; and

(2) The tendency to milkiness, cloudiness or opacity due to the heat reaction on the formed article of the trace of acetone which is almost sure to be present in the formed article at this stage of the process.

To avoid these evil effects I keep my water bath well below the danger temperature; in order to be able to do this I make the skin of a material which will soften and turn into a lubricant under moist heat well below the danger temperature. A very simple and efficacious means for producing this result is to make the skin, as described above, of a mixture of gelatine and sugar or some other material which will have a similar action in reducing the temperature at which gelatine softens. These materials must be neutral to all materials with which the skin comes in contact during the subsequent operations.

Sugar has the additional advantage of greatly increasing the rapidity with which the water travels through the skin and softens it, thus reducing the time which is necessary to keep the mold with the formed article upon it in the warm water bath. This is particularly important when the articles manufactured are of considerable length, and particularly when their diameter is

relatively small. The sugar also adds considerably to the smoothness and lustre of the dried skin, and therefore of the formed article, the surface of which is dependent upon the surface of the coating on which it is laid down.

The function of the glycerine is to add to the lubricating properties of the skin when it is softened in the warm water bath, thus further facilitating the removal of the formed article from the mold.

The core, which I have hitherto described as being made of glass, may be made of metal, wood, plaster, synthetic resin, soft rubber or any other material which is not attacked by the materials with which it comes in contact during the dipping operation.

If cores not of themselves highly polished and lustrous are used without the skin above described, as for example cores made of soft rubber, the resulting formed articles are not lustrous. I find, however, that by dipping such cores in the skin-forming solution and drying as above described, I produce a skin or coating upon the cores which is much smoother and more lustrous than the cores themselves, and therefore leads to the formation of a hollow article of superior lustre, although the hollow articles thus formed are not in general as lustrous as those formed on rigid, highly polished cores, as for example cores of glass or highly polished metal, in the manner above described.

I am of the opinion that in the water bath the skin swells, and by swelling tends to assist the removal of the formed article.

In the drawing attached to the specification, which shows a vertical section of a core with the intermediate layer upon it and with the formed article deposited in place on the intermediate layer, 1 is the core, 2 is the intermediate layer and 3 is a formed article dried and ready for removal.

I claim:

1. The method of producing lustrous hollow articles of plastic composition which includes forming on a core a thin skin of a material capable of being hardened by drying, and of being softened again by the action of moist heat, which skin is neutral to and not substantially attacked or modified by any material with which it comes in contact during the subsequent dipping operation, thoroughly drying said skin to provide a hard, dry, lustrous surface, immersing the mold so formed in a dipping bath, thereby producing a hollow article on the mold, drying the article, subjecting the mold with the article thereon to the action of moist heat at a temperature sufficiently high to soften the skin, and removing the hollow article from the mold.

2. The method comprising forming on a hard core a thin, dry, lustrous skin of a composition comprising gelatin, glycerin and sugar by dipping said core into a solution of said composition and drying said solution upon said core, immersing the coated core in a bath comprising a solution of a cellulosic material, removing the core from the bath, drying the cellulosic material upon the core to form a hollow article thereon, subjecting the core with the article thereon to the action of moist heat at a temperature below 60° C., whereby the composition between the core and the hollow article is softened, and removing the hollow article from the core.

3. The method of producing lustrous, hollow articles of cellulosic material which comprises forming on a hard core a thin skin of a material

comprising a mixture of gelatin, glycerin and sugar by dipping said core into a solution of said material and drying said solution upon said core, immersing said core with the dried skin thereon in a bath comprising a solution of cellulosic material, removing the core from the bath, drying the solution of cellulosic material upon the core

to form thereon a hollow article, and subjecting the core and the article thereon to the action of moist heat at a temperature of approximately 45° C., whereby said skin is softened and said hollow article may be removed from said core.

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