Oct. 18, 1949. W. O. FARRELL 2,485,372

PROCESS FOR CAPPING BOTTLES

Filed Dec. 22, 1945

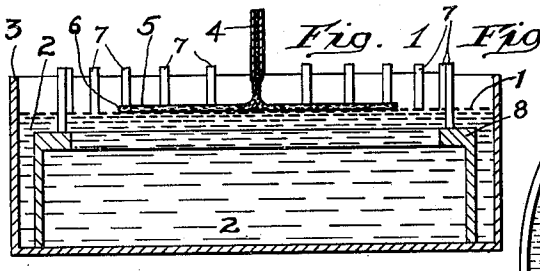


Fig. 1

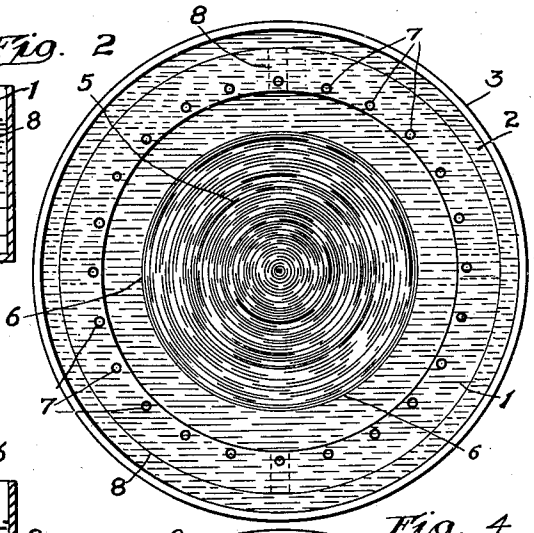


Fig. 2

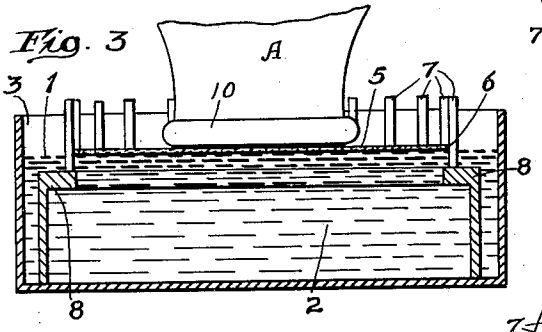


Fig. 3

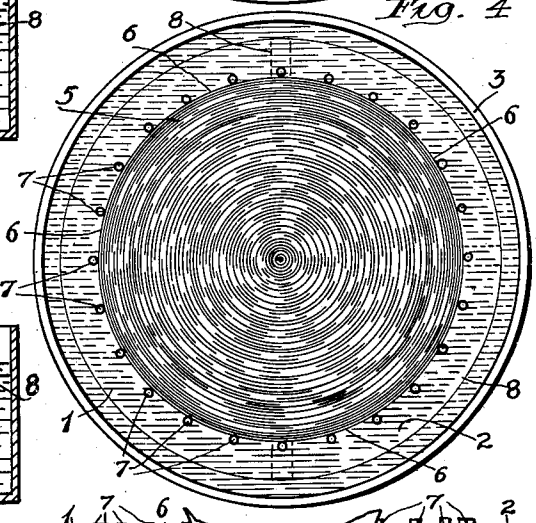


Fig. 4

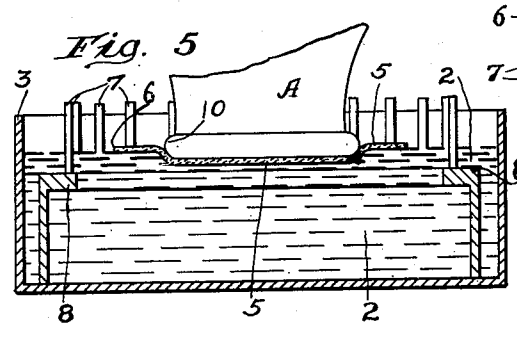


Fig. 5

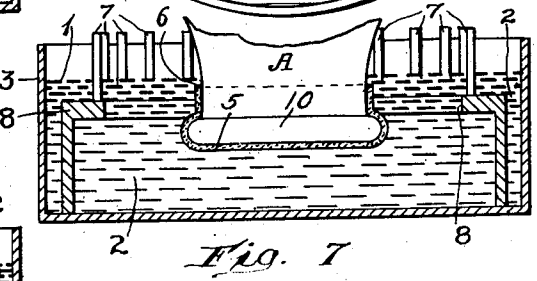


Fig. 7

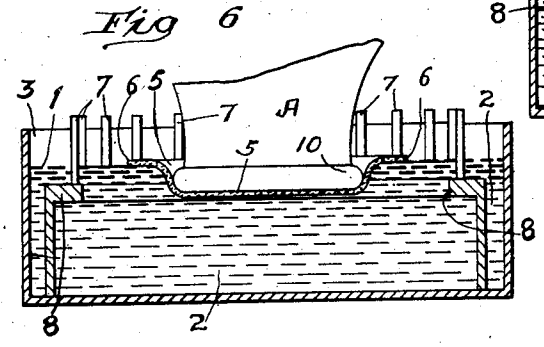


Fig 6

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PROCESS FOR CAPPING BOTTLES

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1 Claim. (Cl. 18—57)

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My invention relates to the art of making plastic film, more particularly of synthetic resins, and my invention involves a process by which the formation of a film is accomplished by floating a solution of synthetic resin or other plastic material upon the surface of a body of water, and utilizing the phenomena of interfacial surface tension to spread or expand the solution into a film of desired thickness and area.

The accompanying drawing illustrates diagrammatically means for carrying out the procedure involved in the formation of the film and the removal of the formed film from the surface of the water.

In the drawings,

Fig. 1 is a vertical section of a container for the body of water, a fence for controlling the area of the film, and the orifice member for introducing the solution to the water surface;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1 and illustrating a partially expanded forming film;

Fig. 3 is a view similar to Fig. 1, illustrating the film completely expanded to size;

Fig. 4 is a top plan view thereof; and

Figs. 5, 6, and 7 are views similar to Figs. 1 and 3, illustrating the removal of the film from the surface of the water by transferring it directly to a bottle to form a hood or cap for the bottle.

In the drawings, the thickness of the film is greatly exaggerated for the purposes of illustration, but it is to be understood that in practice the process is especially adaptable to the production of extremely thin elastic film, thinner in fact than can be formed by other known methods.

In carrying out my process, a predetermined quantity of solution of plastic material such as synthetic resins in liquid form or condition is deposited or introduced to the surface 1 of a body of water 2 maintained in a suitable container or receptacle 3. The solution is introduced to the water through a small orifice in a nozzle member 4 preferably positioned in the center of the area of the film to be formed and spaced somewhat above the surface of the water, although it may be projected into the water so as to introduce the solution slightly below the surface thereof. Bodily moving the stream of solution relatively to water surface by moving the nozzle as the stream is ejected from the nozzle breaks up the pool of solution as it contacts with the water surface and facilitates the initiation of the spreading action of the solution on the water surface. Any suitable means may be used for measuring the quantity of solution in accordance with the area and thickness of the film to be formed.

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From the point of deposit, which preferably is centrally of the area, the solution rapidly spreads or expands radially over the surface of the water as a film 5 by virtue of the surface tension of the water and solution, as indicated in Figs. 1 to 4. The extent to which the film spreads is determined by means of a fence which retards or obstructs further spreading when the leading edge or margin 6 of the film reaches the fence. This fence or control device comprises a series of upright pins 7 projecting through and above the surface of the water and supported on a ring-shaped mounting 8 positioned below the water surface. The fence pins are preferably circular in section and are spaced apart sufficiently to provide collectively a restriction against spread of the film beyond them. They do not, however, present surface for adhesion to the film margin sufficient to prevent the removal of the film from the water surface. In the present illustration, the fence is circular, surrounds the area, and thus determines the size of the individual film formed.

During the spread of the film and for sufficient period of time thereafter, the film is allowed to dry by the evaporation of the solvent. The rapidity of drying can be varied and regulated by the thickness, solvents used, and solids concentration of the solution, and by the temperature of the water upon which the film is floated, and can be made a matter of seconds where individual films are to be rapidly produced for such purposes as application to bottles as seal caps or hoods.

The removal of the film from the surface of the water after it has dried and solidified to the extent that it can be handled, may be accomplished in various ways. The formed film may be used as a hood or seal cap for milk bottles, and in the drawings the application of the film to a bottle A is utilized as the method for removal of the formed film from the water surface. The film is transferred and applied to the bottle by inverting the bottle A, centering it over the film, and plunging it downwardly into the water a sufficient depth to submerge the film in the water. The nozzle 4, of course, is moved out of the way while the bottle is being lowered. The bottle, the neck portion of which is shown in the drawings, is a standard type of milk bottle having a bead or lip 10 surrounding the end. Fig. 3 shows the inverted bottle with its beaded mouth adjacent the film on the water surface and about to

start downwardly into the water, carrying the film with it. Figs. 5, 6, and 7 illustrate the progress of the bottle downwardly into the water and the forming of the film to the contour of the bead and the adjacent neck portion of the bottle. As the bottle moves downwardly, carrying the film with it, pressure of the water beneath the film forces the film into intimate contact with the bead and neck portion of the bottle and causes it to conform to the contour of the bottle and form a seal or hood over the opening and neck portion of the bottle. The film adheres to the bottle surface and remains in that condition upon the withdrawal of the bottle from the water. Thus the removal of the film from the water surface is accomplished in the operation of applying the film to the use for which it is intended.

Film may be formed by this process of any materials which will float and spread or expand upon the surface of a body of water by surface tension and solidify so that it can be removed from said surface and handled or used for whatever purpose intended. Any of the synthetic resins, especially the Vinylite V resins, which are effective film-forming material, may be used. The resins are dissolved in suitable solvents, such as methyl ethyl and methyl isobutyl ketone, cyclohexanone or acetone, to form a liquid solution having the viscosity which enables the solution to spread effectively on the water surface, and having a density which enables the solution to float.

The physical properties of the resultant film, such as toughness, tensile strength, elasticity, flexibility, transparency, and adhesion, can be obtained by the used of plasticizers, lubricants and pigment or dyes in the solution. Plasticizers of the chemical solvent type, the oil type, the resinous type, or suitable synthetic rubber type, may be used to obtain the desired physical properties of the film. Of the chemical solvent type, the most effective are dioctyl phthalate, butyl

phthalyl, butyl glycollate, and tricresyl phosphate. Of the lubricants, the most effective are calcium stearate, stearic acid, and oleic acid.

I have found that a film suitable for the hooding or capping of milk bottles hereinbefore referred to, is obtained by a solution of 20% solids and 80% solvents. Of the 20% solids, Vinylite VYHH resins comprise 100 parts, tricresyl phosphate 46 parts, and stearic acid 4 parts. Of the 80% solvents, equal parts of methyl ethyl, ketone, and acetone are used.

The solution is prepared by mixing dry the resin, plasticizers, and lubricants, and then dissolving the mixture in the solvents with agitation and heated at reflux until solvated.

I claim:

The process of capping bottles which consists in depositing a quantity of plastic material in liquid form upon the surface of a body of water, allowing the material to spread in a film upon the water surface, confining the spreading of the material to a given area, and then placing the end of the bottle in contact with the film and forming the film into contact with the bottle surface and forcing the film below the water surface by lowering the end portion of the bottle into the water.

WALTER O. FARRELL.

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