APPARATUS FOR PACKAGING FLUID FLOWABLE MATERIALS

William E. Meissner, New York, N. Y., assignor to American Viscose Corporation, Philadelphia, Pa., a corporation of Delaware

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1 Claim. (Cl. 53—140)

This invention relates to the packaging of flowable materials and in particular to an apparatus for packaging such materials.

Hereinafter, in the packaging of fluid materials such as liquids, and pastes such as oil, milk, soft cheese and the like, paper cartons have been employed but they must be treated to render them leakproof. The type of treatment required to accomplish this purpose depends upon the nature of the liquid being packaged and, when it was aqueous in character as in the case of milk, a heavy waxing of the paper carton is used. Frequently, it has been found that chunks of the wax chip off because of jarring and flexing that occurs during shipment and when such breakage occurs on the inside of the container, the contents of the package become contaminated with the wax particles or chunks. Occasionally, also, leakage may occur.

It is an object of the present invention to provide a simple and efficient system for the packaging of flowable materials such as liquids and pastes which avoids the difficulties of the breaking away of particles or chunks of foreign material used for coating the carton, thereby avoiding contamination of the fluid contents with such foreign materials and reducing the danger of leakage. Other objects and advantages of the invention will be apparent from the drawings and the description thereof hereinafter.

In the drawing, which is illustrative of the invention, Figures 1 to 3 illustrate successive stages of one system for carrying out the invention.

Figure 4 represents a side elevation partly in section of a second embodiment of the package,

Figure 5 illustrates a modified system for accomplishing the intended purpose, and

Figure 6 is a horizontal section taken along the line 6—6 of Figure 5.

With the present invention, in general, flowable materials such as liquids and pastes are packaged by simultaneously forming a plastic mass of a film-forming material into a container and filling the container with the flowable material. In this embodiment, it should be noted that the flowable material itself is utilized as a force for expanding the film-forming plastic mass into the container. In a second embodiment, the plastic mass of film-forming material is first formed into a container by expanding it by use of the pressure of a gas and thereafter the is displaced and the container filled with the flowable material. In each of the above embodiments, the primary plastic container thus produced may be used as the sole container for the flowable material and further the plastic container so filled may be subjected to cooling, chilling or freezing for storage, preservation and shipment. In a further embodiment, the plastic container is confined within the walls of a self-supporting surrounding receptacle which may be a carton, box, shell, cup or other secondary container formed of metal, paper, plastics or other packaging material. A gob may be first formed of the entire amount of film-forming material needed to expand into the liquid enclosing envelope and the introduction of the liquid may occur entirely after the initial formation of the gob. Alternatively, only a part of the needed amount of the film-forming material may be present in the gob at first and during the introduction of the liquid the gob expands to form the surrounding envelope, the additional film-forming material needed to form the complete full-sized envelope may be continuously supplied to the gob, such as by supplying such film-forming material continuously to an annular area or zone surrounding the area or zone of introduction of the liquid to be packaged.

In another embodiment, the plastic gob is first expanded by means of gas pressure only to make a hollow flexible container and then the flowable material is poured into such preformed container preferably while the plastic bag is supported inside an outer receptacle.

In either event, when the desired amount of liquid for a given package has been introduced into the plastic bag, the top of the plastic bag is closed about the liquid within by pinching the plastic walls together or in any other fashion, such as by twisting the material at this point.

The present invention provides a simple, efficient and low-cost system for producing packages. The outer receptacle of the package may be formed of any material such as low-cost untreated paper cartons or cups, the main function of the outer receptacle being to confine the inner plastic bag and requiring for this purpose a certain structural strength. The outer receptacle need not be leakproof, since this requirement is completely taken care of by the plastic bag which serves to line the interior of the carton and by its flexibility conforms to the contour of the interior of the receptacle. The receptacle need not be so rigid as to resist all flexing and deformation that may normally occur during handling and shipment since the inner lining is quite flexible and resists rupture when flexing and deformation, caused by normal shocks and impacts and bending forces, are imparted to the package. Because of the cohesive plastic character of the film-forming material, there is no liability that parts of the plastic bag will break off during impact and become deposited within the contents thereof.

The plastic bag may be made from a wide variety of plastic materials. Preferred types include the synthetic linear polymers of thermoplastic character and the elastomeric types. Examples include vinyl resins, such as polyvinyl acetate, copolymers of vinyl chloride and vinyl acetate, copolymers of acrylonitrile and vinyl acetate, polyacrylonitrile and copolymers of acrylonitrile with vinyl chloride, vinyl acetate, methacrylonitrile, and so forth, polyethylene, linear superpolymers of the polyester or nylon (polymide) type, polyvinyl butyral, polyvinyl alcohols, polyvinyl ethers; elastomeric types may include neoprene, polymers of chloroprene, copolymers of butadiene with styrene or acrylonitrile, polybutadiene and so forth. It is to be understood that the mentioning of these particular materials is not intended to limit the invention thereto but merely to illustrate the wide variety of film-forming materials that can be used in carrying out the invention. Of course, the selection of any particular material depends upon the character of the liquid to be packaged. Thus polyvinyl acetate, polyvinyl acetics and polyvinyl alcohols and neoprene, especially the latter two types, are highly advantageous when packaging oils especially of the hydrocarbon type. Polyvinyl acetate, polyvinyl chlorides, related copolymers of these two monomers, and polyethylene are particularly adaptable to the packaging of aqueous liquids.

The film-forming material may be converted to a fluid mass by fusion or by the incorporation of plasticizers or solvents capable of dissolving or dispersing the ma-
material. Thus, any of the thermoplastic materials may be heated to fusion and the liquid to be packaged may be introduced into a gob of the fused material preferably at the same temperature as the fused material. If necessary, the fusion temperature of fusion may be lowered by the incorporation of a plasticizer either of solid or liquid character. When plasticizers or solvents are incorporated into the plastic material to form the gob, the plasticizer or solvent is preferably insoluble in the liquid to be packaged unless the particular use to which the liquid package is put allows the presence of the plasticizer or solvent that is used. The cooling of the fused mass, whether it does or does not contain a plasticizer or plasticizers at the time the expanded envelope strikes the wall of the receptacle, serves to set the mass into the shape desired, conforming with the wall of the receptacle. Volatile solvents may be employed for dissolving or dispersing the film-forming material so that the gob may be formed at room temperature and expanded with a liquid at room temperature, the setting or coagulation of the expanded envelope occurring by volatilization of the solvent after expansion into the receptacle. Known solvents and plasticizers may be selected and the selection depending upon the particular film-forming material to be used. Thus acetone or dioxane may be used for vinyl acetate or copolymers of vinyl acetate or vinyl chloride or acrylonitrile. The concentration of the film-forming material, when a solution thereof is used, is preferably as great as possible, the concentration being limited only by the necessity that the plastic mass expand under the pressure available for exertion upon the liquid during the filling operation. The lower concentration limit of film-forming material is determined by the necessity of having to be placed in a coherent plastic mass which, in the forming of the gob, is capable of supporting its own weight and does not fall away from the filling nozzle during expansion.

As shown in the system of Figures 1 to 4, the liquid to be packaged may be supplied from a container 3 having a downwardly extending nozzle 4, with the liquid flow being controlled by a cock or valve 5. The gob 6 of plastic film-forming material is supplied to the tip of the nozzle 4 so as to surround the opening 7 therein. A receptacle 8, supported on a table or other platform 9, is disposed beneath the nozzle 4 to receive the filled envelope. The receptacle 8 may be any form of packaging container, as for example, a cardboard carton of rectangular section having the usual flaps 10 extending from each of the four upper edges of the side walls, and having the flaps at the bottom in overlapped and sealed relationship. Alternatively, the container may be a cylindrical shell provided with a bottom cap secured in position at the time of filling and adapted to receive an upper telescoping cover.

After the receptacle 8 is disposed under the nozzle 4 and a gob of the film-forming material is applied to the tip of the nozzle as shown in Figure 1, the cock 5 is opened allowing the liquid from container 3 to enter the gob 6 and to expand it into the form of an envelope 11 as shown in Figure 2, wherein the filling operation is at an intermediate stage with the bottom of the envelope in contact with the bottom of the receptacle 8. The liquid in container 3 may be forced into the gob by pumping or by virtue of its own static hydraulic head in the container 3. If desired, the nozzle may be lowered with the gob thereon into the container before or during the initial introduction of the liquid, with the nozzle being raised after the envelope fills. The gob 6 conforming with the inside surfaces of the walls of the receptacle 8 after which relative rotation is imparted between the nozzle 4 and the receptacle 8 whereby the narrow neck of film-forming material, as shown at 12, is twisted together to seal the top of the envelope. Thereafter, the neck 12 is pulled away from the nozzle 4 and the flaps 10 are folded into overlapped relation and, if desired, sealed with the usual adhesives to form the final package shown in Figure 3.

In that embodiment of the apparatus shown in Figure 5, the plastic material passes through a conduit 20 from a supply container, not shown, and is forced by means of a piston pump 21 that produces for delivery line 22, and valve 23 and into a discharge nozzle 24. Air pressure is maintained on the plastic flowing through the nozzle 24 by means of an air chamber 25 which communicates through a pipe 26 with the nozzle space 27 to provide an air cushion when the plastic material is forced into the nozzle 24. The flow of plastic mass is regulated by the opening line 30 which is provided with a valve 31, the cylinder 32 of which is driven by gears 33 and 34, with the gear shaft 35 being connected to a prime mover, such as an electric motor not shown. The valve stem 35 is provided with an air bleeding passage 36. The flowable material passes through the valve 31 through a pipe 37, and into the nozzle 24 through a centrally positioned tube 38.

To operate the apparatus, the plastic material is delivered by the pump 21 until the space 27 and delivery line 22 are substantially filled. Thereafter, each stroke of the pump 21 will deliver a unit amount of plastic to the space 27 and thus force a corresponding amount of plastic as a mass 29 hanging on to the orifice 28. During each delivery stroke of the pump 21, the valve 31 is closed to the flowable material but the passage 36 is open, thereby permitting air to bleed from the space 37. As the valve stem 32 is slowly turned, some of the flowable material flows down the inner pipe 38 and at the same time, air bleeds out through the partially open passage 36. As the valve stem continues its turning movement, the air passage 36 is eventually closed and the line 10 is opened fully so that the flowable material then passes through the tube 38 and forces the plastic mass 29 ahead of it into the form of a primary container 40.

By providing the air chamber 25 with a pump, it is possible to first expand the plastic mass into a container form 40 by means of air pressure, after which the container 40 is open and the air in the container is then displaced by the flowable material.

To separate the container from the orifice and close the same, there is provided a plurality of air jets so positioned as to swing across the orifice at the point where it is attached to the nozzle. These air jets include a pair of nozzles 41 and 42 pivotally mounted on the arms 43, with means, not shown, being provided for swinging the nozzles 41 and 42 past the orifice of the receptacle 8. The air nozzles 41 and 42 move in opposite directions relative to the nozzle 24, so that the air streams cause a twisting of the walls of the plastic container 40 just below the orifice 28. Since the plastic material is still tacky during this closing stage, it will adhere together and the container will then separate from the nozzle.

It is understood that the plastic container 40 enclosing the flowable material may be used as the sole container therefor and the package so formed will be flexible. Such a plastic package may then be chilled, cooled or frozen for storage, preservation and shipment.

Many variations may be made in the package, for example as shown in Figure 4, wherein the outer receptacle 8 contains a plurality of separate filled plastic containers A and B.

When packaging milk and other flowable materials in cartons which are already provided with opening cap, the procedure is to place the milk carton under the nozzle, open the cap, insert the nozzle in the opening, form and fill the plastic container in the carton and then withdraw the nozzle so that the top parts of the plastic container contact and adhere to the edges of the carton opening. Thus, when the cap is forced back over the opening, the carton will be completely sealed. In general, however, it
is preferable to close the plastic container by a coalescing of the walls of the plastic container as by pinching or twisting them until they are in contact.

If the plastic material is delivered continuously instead of intermittently to the nozzle, the container may be formed as a long seamless tubing which is simultaneously filled as it is formed with the flowable material.

I claim:

In an apparatus for packaging flowable materials in a flexible plastic container, the combination of the nozzle having an inner and outer fluid passage, means for delivering a gob of plastic film-forming material through the outer passage of said nozzle so as to close one end thereof, means for delivering flowable materials through the inner passage of said nozzle and against the gob of plastic film-forming material to expand said gob into the form of a container and fill the same, and a pair of opposing air jets disposed adjacent to said one end of said nozzle, said air jets being mounted for movement in opposite directions so as to effect a twisting and sealing of and seal the opened end of said filled container.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,872,766

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William E. Meissner

It is hereby certified that an error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 56, for "gobof" read — gob of —; column 4, line 39, for "chamber" read — chamber —; column 5, line 21, strike out "and seal".

Signed and sealed this 16th day of June 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents