ABSTRACT OF THE DISCLOSURE

The disclosure relates to a flat flexible container comprising a pair of closely confronting flexible walls secured together along most of their marginal portions and unsecured along a portion thereof to form a supply opening. A valve is mounted in the supply opening, and comprises a pair of flat, confronting walls connected together along their side margins and unconnected at their upper and lower ends to form openings at the ends of the valve. A sheet of resilient material is permanently curved into an arc curved about an axis extending transversely of the end openings and secured in a flattened condition to the outside of one of the valve walls. The normally convex side thereof faces the valve walls and the springing out of the sheet of resilient material pulls the valve walls tautly over the convex side of the sheet of resilient material to form a fluid tight seal between the confronting surfaces of the valve walls.

This invention relates to containers with self-closing one-way valves, and has one of its most important applications in disposable fountain syringes, such as enema and douche bags, and in disposable urine drainage bags. In recent years, disposable enema and douche bags have gained wide acceptance in hospitals. Generally, these products are made of sheets of heat sealable material, such as polyvinyl chloride, sealed along their marginal areas except at those locations where the supply tube and filling opening are to be formed. As the most expensive of disposable products, it is of utmost importance that the cost thereof be extremely low. One of the difficult problems faced heretofore by manufacturers of disposable enema and douche bags was in developing a very inexpensive yet reliable valve for selectively opening and sealing the filling openings of the bags and wherein the valve will not leak even when the bags involved are subjected to rough handling. The sealing of the bag filling openings is desirable so the bags can be filled and then laid on their sides for delivery to the rooms where they are needed. It is, accordingly, an object of the present invention to provide a unique valve having utility, for example, in disposable enema and douche bags, and which is reliable and very inexpensive to manufacture.

A related object of the invention is to provide a valve as described which is extremely thin, so that it can be readily accommodated in the filling openings of flat flexible bags as, for example, commonly used as disposable enema and douche bags. A related object of the invention is to provide a valve construction as described which is particularly suitable for incorporation in flat flexible bags made of heat sealable material. Still another object of the invention is to provide a fountain syringe, in bag, comprising a bag, having a uniquely constructed pocket for easily receiving and securely holding and covering a grease nozzle end portion of the supply tube thereof.

In accordance with one of the aspects of the invention, a unique valve is provided which can be made, if desired, completely from synthetic plastic sheet materials, such as polyethylene and polyvinyl chloride. The most preferred form of the invention comprises two layers of flexible polyvinyl chloride plastic sheet material placed in confronting relation and sealed at their sides to form an open-ended, flattened sleeve-like structure. The opening at one end of the valve structure forms the inlet opening for fluid and the opening at the other end of the structure forms a discharge opening for fluid. The valve comprises an arcuate spring member secured in a stressed condition across the outside of one of the flexible walls of the valve so the convex side thereof faces the valve wall. When the tension on the spring member is relieved, the arcuate spring member returns to its initial shape and, in so doing, pulls the flexible walls of the valve tautly across the convex side thereof and forces the confronting surfaces of the valve walls into sealing relation. The spring member is curved about an axis extending transversely to the open ends of the valve, and is formed by a strip of resilient material, which may be a synthetic plastic material like a rigid, resilient polyvinyl chloride, which most advantageously extends across the full width of the valve and longitudinally of the valve for a substantial fraction of the valve length and terminates short of the inlet and outlet thereof.

It is preferred that one of the aforesaid layers of the valve structure extends beyond the edge of the other layer at the inlet end thereof to form a flap which can be grasped to facilitate separation of the confronting layers or walls of the valve structure. When the valve is secured in place to the filling opening of a flat flexible bag, like an enema or douche bag, the flap preferably extends slightly beyond the outer margins of the bag where it is readily visible and accessible to be grasped by one hand and pulled to separate one of the walls of the flattened sleeve-like valve structure from the other to permit the passage of the fingers of the other hand into the valve. The inserted fingers then force the spring member outwardly further to separate the valve walls, to present a large opening into the bag. The user can maintain the valve fully open by simply applying a squeezing pressure on the outside of the flexible bag with the one hand and the liquid can be poured into the bag after withdrawal of the fingers of the other hand from the valve.

The valve is preferably secured to the aforesaid walls by placing the valve between the filling opening forming walls of the bag so the open ends of the valve extend transversely of the adjacent bag margins and by heat scaling or otherwise securing each valve wall to the adjacent bag wall at points beyond the other edge of the spring member. The spring member and the adjacent layers of the flexible material project into the bag interior so any pressure buildup in the fluid within the bag due, for example, by pressing against the bag is applied equally to all portions of the valve including its outer surfaces so that the force of the spring member is still operable to maintain a resultant sealing force between the flexible walls of the valve.

The arcuate spring member curves around an axis parallel to the bag margins (i.e., transverse to the length or open ends of the valve) because the spring member then can be placed as closely as desired to the point of connection of the valve to the bag margins at the filling opening without any adverse affect on the shape of the spring member. When the spring member is curved about an axis extending longitudinally of the open ends of the valve, the pulling together of the bag walls at the bag margins exert a flattening force on the spring member which weakens its valve sealing capability. Thus, in the latter form of the spring member, it is desirable to place the spring member as far away as possible from the bag margins, which results in a bulkier and more costly valve.
Another aspect of the invention to be described in detail relates to the unique and advantageous construction of a pocket in the enema or douche bag walls for receiving the nozzle end portion of the supply tube.

Still another aspect of the invention relates to the application of a valve like that described, but not limited to the particular direction of curvature of the spring member referred to above (which is nevertheless preferred), in a urine drainage bag.

The above and other objects, advantages and features of the invention will become apparent upon making reference to the specification to follow, the claims and the drawings whereon:

FIG. 1 is a front elevational view of a disposable enema bag constructed in accordance with the present invention;

FIG. 2 is a greatly enlarged longitudinal fragmentary sectional view through the filling end of the enema bag shown in FIG. 1, taken along the section line 2—2 therein;

FIG. 3 is an enlarged perspective view of the filling end of the bag with the valve of the present invention being held in an open position for filling the bag;

FIG. 4 is a greatly enlarged sectional view of the filling end of the open bag shown in FIG. 3, taken substantially along the line 4—4 therein;

FIG. 5 is an exploded view of the different layers of sheet material making the preferred valve of the present invention located in the filling end of the bag;

FIG. 6 shows three sheets of heat sealable material for forming a number of valves resting on a horizontal support surface prior to being heat sealed together;

FIG. 7 shows the sheet assembly of FIG. 6 in the process of being heat sealed;

FIG. 8 is a perspective view of a completed valve after it has been severed from the heat sealed sheet assembly of FIG. 7;

FIG. 9 is a transverse section through the valve body, taken along section line 9—9 in FIG. 8;

FIG. 10 is an enlarged transverse sectional view through the nozzle receiving pocket shown in the enema bag of FIG. 1, taken along section line 10—10 therein;

FIG. 11 is an enlarged longitudinal sectional view through the nozzle receiving pocket shown in FIG. 1, taken along section line 11—11 therein;

FIG. 12 is a perspective view of a urine drainage bag illustrating another application of the valve of the invention;

FIG. 13 is an enlarged vertical sectional view through the valve containing portion of the bag of FIG. 12, as taken along section lines 13—13 therein and

FIG. 14 is a horizontal sectional view through the valve containing portion of the bag of FIG. 13, as taken along section lines 14—14 therein.

Reference is now more particularly to FIG. 1, an enema bag 1 is shown having a generally rectangular outline, although other shapes can obviously be used. A supply tube 3 extends from the bottom of the bag 1 wherein it makes communication with the interior of the same. The supply tube 3 has a greased nozzle end portion 5 which is telescoped into a pocket 7 formed in the bag. A suitable clamp 9 is applied over the supply tube 3 normally to prevent the passage of liquid through the supply tube.

The bag 1 has centered near the top thereof a circular opening 11 to be used for hanging the bag in a vertical position when in use. The bag 1 has a handle-forming opening at one top corner portion thereof sized to receive the fingers of the user's hand for carrying the bag.

A portion 15 extends between the side margins of the center portion of the bag 1 for hanging a towel or the like. The portion 15 is only secured to the bag at the ends thereof to leave a towel-receiving space between the band and the bag.

To minimize cost and to provide a maximum compactness for convenience in packaging and storage for enema and douche bag applications, the bag 1 is preferably made of a heat sealable synthetic plastic material, most advantageously thin flexible polyvinyl chloride sheet material. Two layers of such material are heat-sealed together along the marginal portions thereof except between the points 16—16' where the supply tube 3 enters and is sealed to the bottom of the bag, and between points 18—18' at the top margin of the bag between which is formed a filling opening for the bag. The openings 11, 13 and 13 and the associated corner sections of the bag are defined by heat seal lines 17a, 17b, 17c and 17d connecting the polyvinyl chloride layers or walls forming the bag 1. Heat seal lines 17e, 17f, 17g and 17h along with the heat seal lines 17c define the margins of the bag interior.

The valve of the present invention is generally indicated by reference numeral 20 and is secured in the aforesaid filling opening in a manner to be described. The construction of the valve per se and its relationship to the bag 1 constitutes important aspects of the present invention. The other aspects of the invention to be described relate to the construction of end portion 7 which enables the nozzle end of the supply tube to be easily inserted into the pocket where it is snugly held in place.

The valve 20 is a normally thin flattened sleeve-like structure (FIG. 8) designed so that it can be initially opened readily by insertion of the user's fingers therein to expand and open the valve, and then be held open by a squeezing force applied from outside of the valve to the sides thereof. Upon release of the valve it snaps back into the normally flat closed condition, which seals the bag against leakage even under rough handling conditions. In fact, one can apply his entire weight to the liquid filled bag by standing or sitting on the same and the liquid will not leak from the closed valve.

The preferred form of the valve 20 which is shown in exploded view in FIG. 6 comprises three layers 20a, 20b and 20c of sheet material secured together preferably by a heat sealing operation. The adjacent layers 20a and 20b are made of a thin flexible material, preferably flexible polyvinyl chloride sheet material sealed together along their side margins to form a flattened sleeve-like structure opened at the opposite ends thereof forming the top and bottom portions when mounted in the filling opening of the bag. The layer 20c is an arcuate spring member which is most advantageously made of a rigid polyvinyl chloride sheet or similar material. One of the flexible layers, the layer 20b in the exemplary embodiment shown, extends beyond the corresponding margin of the other layer 20a to form a short flap portion 21 which is to extend about the upper margin for the bag. This flap enables the person readily to separate the flexible layers 20a and 20b for insertion of his fingers.

The confronting surfaces of the flexible layers or walls 20a and 20b of the valve are normally forced into snug sealing engagement one with another by the spring member 20c. This prevents the escape of fluid between the flexible walls 20a and 20b when the bag 1 is laid on its side where the head of the liquid produces a modest pressure on the valve. The spring member most advantageously extends across the full width of the valve and for an appreciable portion (e.g., about one third or more) of the length thereof. The convex side of the spring member faces the outer surface of the adjacent flexible wall 20b of the valve. The spring member pulls the flexible valve walls 20a and 20b tautly over the convex side thereof and, in so doing, forces the confronting surfaces of the valve walls into sealing relation. As illustrated, the spring member may be sealed to the flexible valve walls 20a and 20b only at the side margins thereof and by the same sealing operation which secures the flexible valve walls 20a and 20b together.
The flexible valve walls 20a and 20b are respectively sealed along seal lines 17i and 17j (FIG. 2) to the portions of the opposite walls 1a and 1b of the bag 1 forming the filling opening, the seal lines 17i and 17j connecting with the adjacent seal lines which secure together the bag walls 5 and 6. Beyond the filling opening into the bag 1 is through the space between the flexible walls 20a and 20b. The seal lines 17i and 17j are located beyond the top of the spring member 20c. The portion of the valve within the seal lines being unconnected with bag walls leaves clearance spaces between the valve body and the valve walls so that the liquid in the bag can pass when pressure is applied to the liquid (as by squeezing the bag) which pressure does not affect the valve seal.

As previously indicated, one important aspect of the invention is the fact that the spring member 20c is curved about an axis extending transversely from the open ends of the valve. With this arrangement, the upper marginal portions of the bag walls 1a and 1b which are pulled toward each other by the sealed together portions thereof have no effect on the curvature of the spring member and its sealing ability. Consequently, the spring member 20c of the valve 20 prevails over the seal lines 17i and 17j and the overall length of the valve can be materially less than a valve construction where the spring member curves about an axis extending longitudinally thereof where the stresses created by the bag walls should tend to straighten the spring member and thus reduces its sealing ability. The side margins of the spring member 20c should, for this reason, be spaced from the sides of the bag 1.

Although the specific thickness of the flexible valve walls 20a and 20b and the spring member 20c may vary widely, in one example the walls 20a and 20b were made of about 8 mils thick flexible polyvinyl chloride material and the spring member 20c was a rigid high temperature distortion polyvinyl chloride of about 13 mils thick.

Refer now to FIGS. 6 and 7 which illustrate the preferred method of making the preferred valve of the invention. The spring member 20c is initially formed with the desired curvature, which can be accomplished, for example, by passing an elongated sheet 20c of polyvinyl chloride material of a length to form a number of spring members against a heated mandrel (not shown). The sheet member 20c is then placed concave side up on sheets 20a’ and 20b’ of the desired thin flexible material and the spring member 20c is a rigid high temperature distortion polyvinyl chloride of about 13 mils thick.

As illustrated in FIGS. 6 and 7, FIGS. 10 and 11 which illustrate the construction of the pocket 7 which receives the nozzle end portion 5 of the supply tube 3 so that the nozzle 5 can easily be placed in the pocket and the constriction in the pocket securely holds the nozzle end portion of the supply tube.

As previously indicated, the present invention is useful in a wide variety of applications including urine drainage bags. Such bags and their supply tubes are desirably sterile when the supply tubes thereof are connected to the patient. FIGS. 12 through 14 illustrate this application of the invention. As there shown, the urine drainage bag generally identified with the reference numeral 51 includes a bag body 51 made of two confronting flexible walls 51a and 51b of synthetic sheet material, such as polyvinyl chloride, which are heat sealed at the margins thereof. The bag 51 may be made of a single sheet of material folded back upon itself at the bottom margin of the bag as illustrated or it can be made from separate sheets of material heat sealed around their entire perimeter. The bag 51 has a discharge nozzle 53 closed by a cap 54 which is removed to drain the bag. A supply tube 56 is provided with a discharge head 56 extending into the mouth of a valve 21 which is substantially identical to the valve 20 described, except for its smaller size and the fact that the flexible walls 21a and 21b thereof are of the same length. The bag walls 51a and 51b and the valve walls 21a and 21b extend upwardly and are heat sealed snugly around the discharge head 56 of the supply tube 56. The valve projects into the interior of the bag 51 and operates in the same manner as the valve 20 to prevent leakage of the urine from within the bag 51.

The upper end of the supply tube 56 has a connector head 56’ which is adapted to fit into a catheter attached to the patient. When the bag 51 is positioned substantially below the patient (e.g., 6” or more) the patient's urine flows down the supply tube 56. The head of the urine above the valve provides a sufficient pressure to force the spring pressed wall valves 21a and 21b apart enough to allow passage of the urine therebetween into the bag 51. However, as above indicated, the sealing pressure of the spring member 21c is sufficient to prevent the urine from flowing back between the flexible valve walls 21a and 21b, because any back pressure buildup in the bag is applied on the outside of the valve when it does not oppose the sealing action of the spring member 21c.

As above indicated, to facilitate the ready flow of urine into the bag, the bag should be supported beneath the patient so that the head of the urine buildup within the supply tube 56 above the valve 21 is sufficient to overcome the sealing force of the spring member. As an aid in supporting the bag 51 at a desired elevation below the patient, such as on a horizontal bar on the side of the bed below the mattress, a strap 58 is secured to the top of the bag. The strap may comprise a strip of synthetic plastic or other material having a projecting portion 60 with a pair of holes 62—62 through which the supply tube 56 passes. One end of the strap 58 is secured in any suitable fashion, as by heat sealing, to wall 51a of the bag 51 and the other end of the strap may be provided with a slit 64 adapted to removably fit over a button 66 extending from the other wall 51b of the bag.

The bag 51 is preferably sufficiently flexible that it can readily expand to take a volume of urine much greater than the initial volume of the bag, except for its smaller builds up in the bag to a point where the back pressure prevents the urine from entering the bag, which will cause a back pressure on the patient which informs him that the bag is full and needs to be emptied. Then, the nurse removes the cap 54 to drain the bag 51. When the bag drains, the atmospheric pressure on the outside of the bag will press the bag against the back pressure, so as to seal relation. This sealing action of the bag walls and the one way valve 21 minimizes the possibility of contamination of the patient which heretofore was a problem where no one way valve was used in the drainage bag and no
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7. The combination of claim 4 wherein said container forms a urine drainage bag, said valve is secured to the top of the bag and said bag is provided with a normally closed discharge opening at the bottom of the bag which can be opened to drain fluid from the bag.

5. The combination of claim 4 wherein said bag is a flat flexible bag with opposite confronting walls which are forced by atmospheric pressure into sealing engagement above the level of fluid during the draining thereof from the bag.

6. The combination of claim 4 wherein said bag is a disposable fountain syringe including a bag for holding liquid, and a supply tube attached at one end to the bottom portion of, and communicating with the interior of, the bag to carry liquid therefrom, said supply tube having a nozzle at the other end thereof adapted to be inserted into the anal passage of the user, the improvement comprising a valve having a normally flattened sleeve-like structure secured to and extending to the top of the bag and being readily manually expandable for filling the bag with said liquid, release of the manual expanding force automatically resulting in the contraction and sealing of the valve to prevent leakage of the liquid from the bag through the valve, said valve comprising a pair of flat flexible confronting walls connected together along their side margins and unconnected at their upper and lower ends to form openings at the ends of the valve, and a sheet of resilient material permanently curved into an arch extending about an axis extending transversely of the open ends thereof and secured in a flattened condition to the exterior of one of said valve walls with the normally convex side thereof facing the valve walls, the springing out of the sheet of resilient material pulling the valve walls tautly over the convex side of the sheet of resilient material to form a fluid tight seal between the confronting surfaces of the valve walls, the valve being opened by insertion of the user's fingers between the valve walls and the reverse flexing of the sheet of resilient material fully to separate the valve walls.

8. In a disposable fountain syringe including a bag for holding a liquid and a supply tube attached at one end to the bottom portion of and communicating with the interior of the bottom portion of the bag to carry liquid therefrom, and said supply tube having a greased nozzle at the other end thereof adapted to be inserted into said anal passage of the user, the improvement comprising a separate strip of sheet material on the outside of the bag and secured to the adjacent wall of the bag along a U-shaped line of connection where the ends of the legs of the U-shaped line of connection intersect one of the margins of the strip of material, to form an elongated pocket into which the nozzle carrying end of said supply tube can be readily extended to isolate the greased and sterilized nozzle from the exterior of the bag, the intermediate portion of said U-shaped line of connection of the strip of sheet material having an inwardly bowed section forming a constriction in said pocket, securely to hold the nozzle end portion of the supply tube in the pocket.

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