

[54] NURSING UNIT

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[58] Field of Search 215/11 R, 11 E;
220/63 R; 150/5

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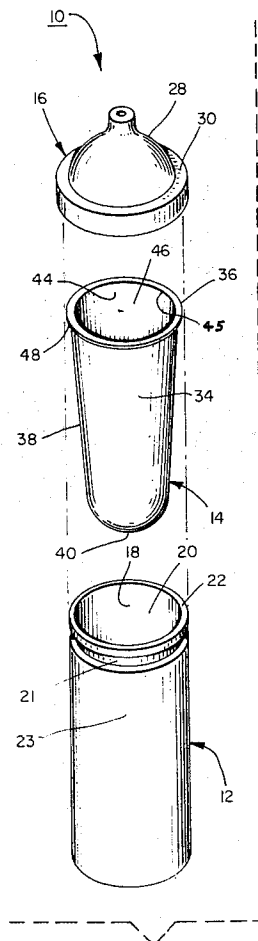
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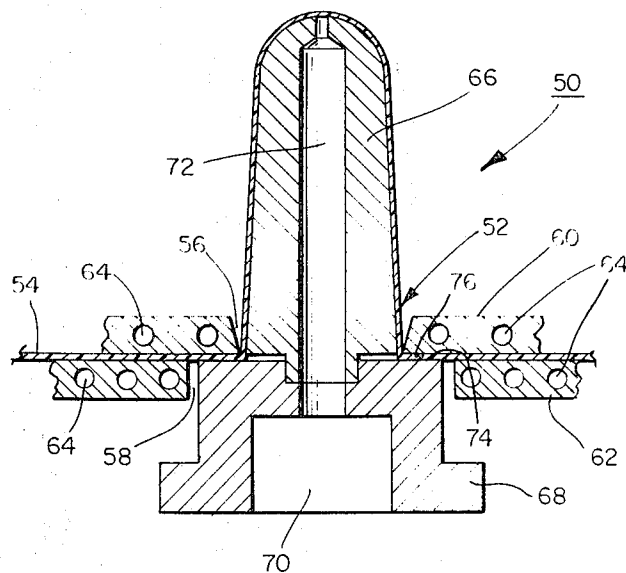
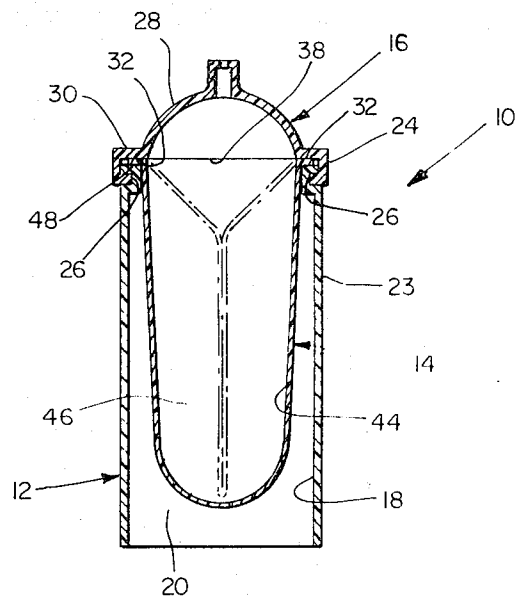
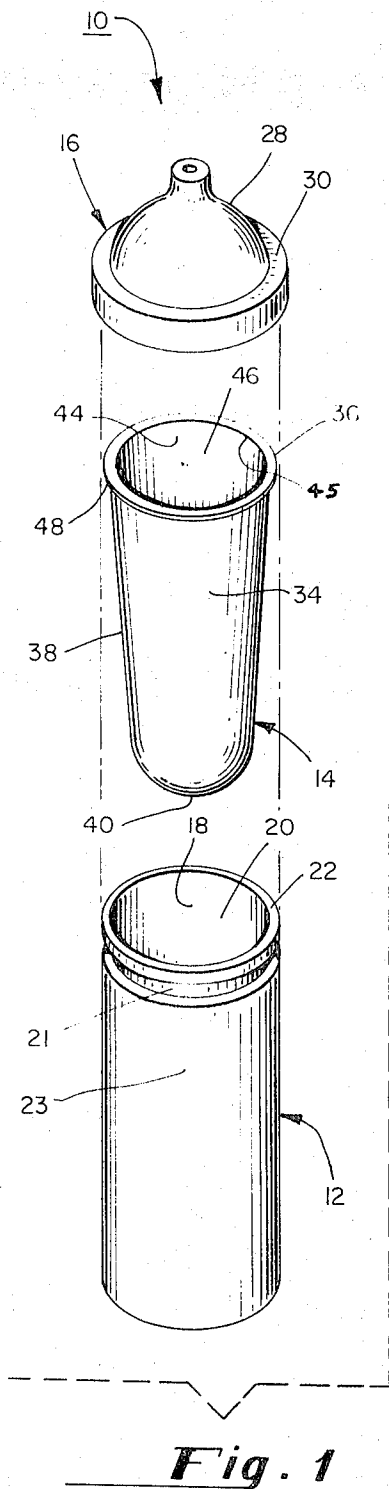
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ABSTRACT

A nursing unit having a disposable, seamless, plastic liner for containing liquid; a self-supporting tubular holder for the plastic liner and a nipple for closing an open end of the tubular holder. The disposable, seamless, plastic liner has a flexible, collapsible body portion defining a cavity for containing liquid, and an upper, firm flange extending transversely beyond an outer side surface of the body portion. The body portion collapses as liquid is drawn out of the liner during nursing to prevent the formation of a vacuum in unfilled portions of the cavity. The flange defines and maintains an open mouth under ambient, uniform pressure when said flange is unsupported by the holder, said open mouth permitting egress and ingress of liquid. The flange is clamped between an upper margin of the tubular holder and a downwardly extending shoulder on the nipple.

16 Claims, 3 Drawing Figures





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NURSING UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a nursing unit, and more specifically, to a nursing unit having a disposable, plastic liner for receiving and containing liquid.

2. Description of the Prior Art

Nursing units having presterilized, disposable, collapsible liners for containing milk or other liquids to be fed to an infant have become quite popular. These liners are not selfsupporting and require the use of a holder to support them during use of the nursing units. The liners are so flexible as to be extremely difficult to handle and assemble with the supporting holders, and in some cases a special mechanical insertion device, such as is disclosed in U.S. Pat. No. 2,900,779, must be utilized to secure the liners to the holders. Alternatively, these liners have been provided with tab extensions adjacent the upper ends thereof, as exemplified in U.S. Pat. No. 3,204,855, and these tabs are manually grasped and pulled outwardly and downwardly about the outer surface of the holders to define an open mouth in the liners, and to secure the liners to the holders.

Use of mechanical insertion devices, such as the one disclosed in U.S. Pat. No. 2,900,779, complicates the use of the nursing unit and requires sterilization of an additional item. In addition, the chances of deesterilization or contamination are increased in handling the mechanical applicator. Even when tab extensions are included on the liners the handling of the liners to assemble them to a holder is difficult, requiring a degree of manual dexterity which many people do not possess, due to the extremely flexible nature of the liners.

The prior art disposable, collapsible liners are made by a continuous extrusion process in which a plastic tube is continuously formed and transversely heat sealed at spaced intervals equal to the desired liner length, as shown in U.S. Pat. No. 3,204,855, and then packaged in a roll. These heat-sealed regions define the bottom closure of individual liners, and it is quite common for the bottom closures of several liners in a given roll to be defective. These defective closures permit fluid leakage through the bottom of the liners which obviously is undesirable.

A nursing unit having a self-supporting disposable liner, preferably fabricated of paper, is suggested in U.S. Pat. No. 2,110,928. This liner appears to have a reinforcing bottom member which will prevent the required volumetric collapsing of the liner to prevent the formation of a partial vacuum in the liner as liquid is drawn therefrom. The formation of a partial vacuum inside the liner causes labored sucking and air swallowing during nursing which may upset the digestive system of an infant. In addition, the bottom member and side walls of the self-supporting disposable liner appear to be separate elements which are secured to each other at a seal region. Separation at the seal region can create a leakage problem similar to that encountered in the prior art collapsible liners described above.

SUMMARY OF THE INVENTION

This invention relates to a nursing unit having a disposable, seamless, plastic liner which is adapted to receive and contain liquid. The plastic liner has a flexible,

collapsible body portion having an inner surface defining a cavity for containing liquid therein. At least a substantial elongate portion of said body portion will collapse as fluid is drawn out of said liner during nursing to provide a steady flow of liquid by preventing the formation of a vacuum in unfilled portions of the cavity. The creation of a vacuum in an unfilled portion of the cavity can cause labored sucking and excessive air swallowing which will upset the digestive system of an infant. The liner further includes an upper, firm flange for defining and maintaining an open mouth under ambient, uniform pressure when said firm flange is unsupported by a holder, said open mouth permitting egress and ingress of liquid. The flange extends outwardly beyond an outer side surface of the body portion of the liner to seat on an upper margin of a self-supporting holder. The firm flange construction facilitates the assembling of the liner with a holder in a manner which has not been achievable with prior art collapsible plastic liners. The plastic liner of this invention has an internal depth to maximum width ratio of greater than 2:1, and is deep drawn from a sheet of plastic material in a thermo-forming operation.

In the preferred embodiment of the invention the body portion is sufficiently self-supporting to substantially maintain a preshaped, open configuration under ambient, uniform pressure; and is sufficiently flexible to collapse as fluid is sucked out of the liner through a nipple secured to the upper end of the supporting holder. Preferably the body portion of the liner is sufficiently flexible to collapse as fluid is permitted to exit therefrom by gravity when the nursing unit is turned upside down, i.e. the body portion of the liner is sufficiently flexible to collapse without the aid of suction created during nursing.

The plastic liner can be grasped about the outer margin of the firm flange and inserted into the opening of a hollow holder such that the flange is supported on an upper margin of said holder. The plastic liner of this invention is inserted in the holder more easily than prior art collapsible liners, and this ease of insertion results from the firm construction of the flange which maintains the mouth of the liner in open condition under ambient, uniform pressure.

A nipple is removably secured to the holder for closing the open end thereof, and the nipple has a downwardly extending shoulder overlying the upper margin of the holder for clamping the flange of the liner between the downwardly extending shoulder of the nipple and the upper margin of the holder.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded isometric view of the various elements forming the nursing unit of this invention;

FIG. 2 is a longitudinal sectional view through the assembled nursing unit showing the approximate configuration of the disposable liner in solid lines prior to and after receiving liquid therein, and showing schematically the collapsed condition of the liner in dashed lines after nursing of an infant; and

FIG. 3 is a schematic view, in section, of a single thermoforming station of a thermoforming apparatus for forming the disposable liners of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. 1, the nursing unit 10 of this inven-

tion is comprised of a self-supporting tubular holder 12; a disposable, or throw-away seamless plastic liner 14 and a nipple 16. The holder 12 is made of a plastic material, and is self-supporting to retain its tubular configuration when held by either an adult or child during nursing, and also when placed on a supporting surface. Other materials from which a self-supporting tubular holder can be constructed may be utilized in place of plastic. Also, the self-supporting holder can be in the form of a ring, such as is disclosed in U.S. Pat. No. 2,541,934. The self-supporting tubular holder 12 has an inner wall 18 which defines an opening 20 for receiving the plastic liner 14. The opening 20 terminates at an open end defined by an upper margin 22. The bottom of the tubular holder 12 can be either open or closed. A circumferential groove, or recess 21 is formed in outer wall 23 of the tubular holder 12 a short distance below the upper margin 22.

Referring to FIG. 2, the nipple 16 has a downwardly extending skirt portion 24 which overlies the outer wall 23 of the holder. An inwardly directed rib 26 is integrally formed with the skirt portion and cooperates with the circumferential recess 21 for retaining the nipple 16 to the holder 12. The nipple 16 has an upper breast portion 28 which is joined to the downwardly extending skirt portion 24 through a shoulder region 30. The shoulder region 30 has a downwardly facing surface 32 which overlies the upper margin 22 of the holder 12 when the nipple 16 is secured to said holder for a purpose which will be described later. The specific arrangement for retaining the nipple to the tubular holder can be varied, and is not intended to be limiting on the present invention. For example, screw-type nipples can be utilized in lieu of nipple 16.

Referring to FIG. 1, the plastic liner 14 is of a seamless construction, and is comprised of a flexible, collapsible body portion 34 and an upper, firm, circumferential flange 36. The body portion 34 is defined by a side wall region 38 and a rounded bottom region 40. The side wall region has an outer side surface which is disposed adjacent the inner wall 18 of the holder 12 when the liner 14 is supported by said holder (FIG. 2). The body portion 34 has an inner surface 44 which defines a cavity 46 for containing milk, or other liquid therein. The upper, firm, circumferential flange 36 defines and maintains an open mouth 45 under ambient, uniform pressure when said flange is unsupported by the holder 12. The flange 36 extends outwardly beyond the outer side surface of the liner to define a downwardly facing surface 48 which is adapted to seat on the upper margin 22 of the tubular holder 12.

The seamless, plastic liner 14 is formed in a preshaped, open configuration by a thermoforming operation which will be described later, and the body portion 34 of the liner 14 preferably is sufficiently self-supporting to maintain said preshaped, open configuration under ambient, uniform pressure. The body portion is sufficiently flexible so that at least a substantial elongate portion thereof will collapse, as schematically shown in dashed lines in FIG. 2, as a result of the pressure differential created between the inside and outside of said body portion 34 during the nursing of an infant. A region of the body portion adjacent the flange 36 may be prevented from collapsing completely as a result of being supported by the firmly constructed flange. FIG. 2 schematically indicates the collapsed condition of the liner in dashed lines after the liner is

completely filled with liquid and drained during nursing. It should be understood that the body portion of the liner will not necessarily completely collapse in a transverse direction, but will collapse to a sufficient degree to accommodate the volumetric displacement of liquid from the liner during substantially the entire nursing operation to prevent the formation of a vacuum in regions vacated by the liquid. Thus, the collapsing of the liner prevents the formation of a vacuum therein for substantially the entire nursing operation to thereby minimize labored sucking and air swallowing. The excessive swallowing of air often upsets the digestive system of an infant, and this problem is eliminated by the liner 14 of the present invention.

In the preferred embodiment of this invention, the body portion 34 of the liner is sufficiently flexible to collapse as fluid is permitted to exit from the cavity thereof by the action of gravity alone when the nursing unit 10 is turned upside down. Stating this another way, the body portion 34 is sufficiently flexible to collapse without the increased pressure differential created between the inside and outside thereof by the sucking action of a baby during the nursing operation.

The liner 14 can be grasped around the outer periphery of the flange 36 for insertion into the opening 20 of the holder 12. This flange 36 is sufficiently firm to prevent collapsing of the open mouth 45 during handling of the liner 14 to facilitate the insertion of said liner into opening 20 of the holder. Since the preshaped open configuration of the mouth 45 is maintained during handling of liner 14 the necessity of opening the liner and draping a portion of said liner about the outer side surface of the holder 12 is eliminated.

Referring to FIG. 2, the downwardly directed surface 48 of the flange 36 is in overlying relationship with the upper margin 22 of the holder, and seats on said upper margin when the plastic liner is properly positioned within the holder 12. The downwardly facing surface 32 of the nipple 16 cooperates with the upper margin 22 of the holder to firmly clamp the circumferential flange 36 of the liner between the nipple and holder to assure that the liner is retained as part of the nursing unit 10 during the nursing operation.

In the preferred embodiment of the invention the body portion 34 of the plastic liner is self-supporting under ambient, uniform pressure and thereby facilitates the handling of the liner for insertion into the opening 20 of the tubular holder 12. It is within the scope of this invention to provide a disposable, seamless, plastic liner in which the body portion is not sufficiently self-supporting to maintain a preshaped open position; however, a plastic liner in which the body portion is self-supporting is preferred and is easier to handle. It is extremely important that the circumferential flange 36 be sufficiently firm to maintain the mouth 45 of the liner 14 in its open condition such that the downwardly directed surface 48 of the flange will be properly positioned to seat on the upper margin 22 of the holder without requiring spreading, or opening of the liner in the region of the open mouth 45. The downwardly directed surface 48 preferably is planar; however, this surface can assume other configurations within the purview of this invention. For example, the flange may be formed such that the lower surface 48 is provided with a raised area or areas which cooperate with complementary recesses formed in upper margin 22 of the tubular holder 12. Such raised areas may be

circumferentially continuous areas or discrete discontinuous areas as desired.

The plastic liner 14 preferably is formed from a sheet of plastic material in a deep-draw, thermoforming operation, and the plastic liner has an internal height to maximum internal transverse dimension ratio of greater than 2:1, and preferably this ratio is in the range of 2:1 to 3:1. The plastic liner can be made from any suitable plastic material which can be deep-drawn in a thermoforming operation, and which will set in its thermoformed configuration upon cooling. The polyolefins, and in particular polyethylene, have been found to be suitable for use in forming a seamless, plastic liner 14 of this invention.

In the preferred embodiment of this invention the seamless, plastic liner 14 has a circular, transverse configuration; however, other configurations are within the scope of this invention. Also, the body portion 34 is tapered in a downstream direction from the open mouth 45 of the liner to facilitate the stacking of a plurality of liners into a conventional packaging system. Alternatively, the liners can be individually packaged, and sold as single units.

In an exemplary embodiment, the seamless, plastic liner 14 of this invention is deep-drawn in a thermoforming operation into a substantially cylindrical configuration from a 30 mil thick sheet of high density polyethylene. The seamless, plastic liner 14 has an internal depth between approximately 5 to 5-1/2 inches, and a maximum internal diameter between approximately 2 to 2-1/2 inches. The circumferential flange 36 is substantially unstretched during the thermoforming operation and has substantially the same thickness as the unformed sheet, i.e. 30 mils. The body portion of the liner has a thickness in the range of between approximately 1.5 mils and 8 mils, and is preferably in the range of 1.5 to 3 mils. The body portion of the liner collapses under a pressure differential of less than 0.5 lbs. per square inch.

Referring to FIG. 3, a single thermoforming station 50 in a thermoforming apparatus is shown, and exemplifies a preferred method of manufacturing the disposable liners 14. The thermoforming apparatus can be provided with a plurality of identical thermoforming stations 50 for forming a plurality of seamless, plastic liners 14 from a sheet of plastic material; however, for purposes of explanation, only the single thermoforming station 50 shown in FIG. 3 will be described.

The thermoforming station 50 has a forming assembly 52 movable from an upstream position (not shown), in which the forming assembly 52 is below the plane occupied by plastic sheet 54, to a downstream position shown in FIG. 3, wherein the thermoforming of the plastic, seamless liner 14 of this invention is complete. The body portion 34 of the plastic liner 14 is formed by stretching the plastic sheet 54 in unclamped regions defined by aligned cavities 56, 58 disposed through clamping plates 60, 62, respectively. The clamping plates are provided with cooling passages 64 through which a cooling fluid, such as water or oil, can be passed to cool the clamping plates and chill portions of the plastic sheet 54 which are engaged by the clamping plates prior to the thermoforming operations.

The forming assembly 52 includes a male plug 66 secured to a support member 68 by any suitable means (not shown). The support member 68 has a vacuum chamber 70 formed therein which is connected to a

source of vacuum (not shown), and this vacuum chamber 70 is in communication with a vacuum passage 72 extending through the male plug 66. The support member 68 extends transversely beyond the outer periphery of the male plug 66 to define a shoulder 74 facing in a downstream direction. This shoulder 74 cooperates with an opposed surface 76 of clamp plate 60 when the forming assembly 52 is in its downstream position shown in FIG. 3 to accurately form the transversely extending flange 36 of the plastic liner 34.

In operation, the clamp plates 60, 62 are initially opened to permit the feeding of the plastic sheet 54 therebetween by any suitable feed means (not shown). The plastic sheet 54 can be heated by any suitable means, such as a radiant heater (not shown), to a thermoforming temperature prior to being fed between the clamp plates 60, 62; or alternatively, the unclamped regions of the plastic sheet 54 can be heated after the clamp plates 60, 62 are closed to firmly grasp and confine the plastic sheet 54. The forming assembly 52 is in its upstream position below the plane of the plastic sheet 54 as the plastic sheet is fed and clamped between the clamp plates 60, 62. After the sheet is properly clamped, the forming assembly 52 is actuated by any suitable means (not shown) to move said forming assembly from its upstream position to the downstream position shown in FIG. 3. As the forming assembly moves to the downstream position shown in FIG. 3, the male plug 66 engages the unclamped regions defined by the aligned cavities 56, 58 within the clamping plate 60, 62, to stretch this region and form the body portion 34 of the plastic liner 14. The upper and lower clamping plates chill the plastic sheet 54 in the region adjacent the unclamped regions of the plastic sheet to prevent excessive stretching in the region which will constitute the circumferential flange 36 of the plastic liner 14. A vacuum is pulled through the vacuum chamber 70, and the vacuum passage 72 after the forming assembly 52 has been moved to its complete downstream position shown in FIG. 3, to thereby create a pressure differential to assure that the stretched plastic material constituting the body portion 34 of the liner will closely conform to the outer periphery of the male plug 66. The sheet is then permitted to cool with the male plug in its downstream position to set the plastic material in its stretched condition. The vacuum application is terminated after setting of the plastic, and the mold assembly is moved in an upstream direction to a position below the plane of the unstretched portions of the plastic sheet 54. The clamping plates 60, 62 are then opened, and the sheet 54 is removed and fed to a separate severing station (not shown) at which individual seamless, plastic liners 14 are severed from the plastic sheet 54.

The male plug can be made from any suitable material which will not adhere, or stick to the plastic material, and in the preferred embodiment of this invention, the material is a woven cloth impregnated with a phenolic resin which is sold under the trademark SYNTHANE by Synthane, Taylor Corporation of Valley Forge, Pennsylvania. The support member 68 can be made of any suitable material, such as steel.

The above-described thermoforming operation is intended to be representative of one preferred method for manufacturing the disposable liners of this invention. Other methods can be utilized, such as the elec-

trostatic spray molding method invented by Spray-Mould Ltd., Preston, Ontario, Canada.

What is claimed is:

1. A disposable, seamless, thermoplastic liner adapted to receive and contain liquid and adapted to be supported in an opening defined within a self-supporting holder of a nursing unit, said plastic liner being drawn from a sheet of thermoplastic material and comprising:

A. a flexible, collapsible body portion of a pre-shaped and set self-supporting open configuration which is sustained under ambient, uniform pressure, said body portion including a substantially continuously rounded bottom region and a sidewall region extending upwardly and tapering outwardly from said bottom region said body portion defining a cavity for containing liquid and terminating at an upper end defining an open mouth into said cavity for permitting egress and ingress of said liquid, said body portion being sufficiently thin for permitting at least a substantial portion thereof to collapse as liquid is drawn out of said liner during nursing to prevent the formation of a vacuum in said cavity during substantially the entire nursing operation, whereby a steady flow of liquid from said liner is achieved without labored sucking and excessive air swallowing; and

B. an upper, firm flange extending outwardly from and transversely beyond the upper end of said body portion, said flange being thicker than said body portion and non-collapsing during handling of said liner for sustaining said mouth in an open configuration when assembling said liner with a self-supporting holder, said flange being adapted to be supported on an upper margin of a self-supporting holder of a nursing unit.

2. The disposable, seamless, plastic liner according to claim 1, wherein said flexible, collapsible body portion collapses under a pressure differential of less than 0.5 lbs. per square inch.

3. The disposable, seamless, plastic liner according to claim 1 having an internal depth to maximum internal transverse dimension ratio of greater than 2:1.

4. The disposable, seamless, plastic liner according to claim 3, wherein said body portion has a thickness of between approximately 1-½ mils and 8 mils.

5. The disposable, seamless, plastic liner according to claim 3, wherein said internal depth to maximum internal transverse dimension ratio is in the range of 2:1 to 3:1.

6. The disposable, seamless, plastic liner according to claim 5, wherein said flexible, collapsible body portion collapses under a pressure differential of less than 0.5 lbs. per square inch.

7. The disposable, seamless, plastic liner according to claim 6, in combination with at least one other liner of the same construction, said liners being disposed in telescopic relationship with each other.

8. The disposable, seamless, plastic liner according to claim 5, wherein said body portion has a thickness of between 1-½ mils and 8 mils.

9. The disposable, seamless, plastic liner according to claim 8, wherein said flexible, collapsible body portion collapses under a pressure differential of less than 0.5 lbs. per square inch.

10. The disposable, seamless, plastic liner according to claim 9, in combination with at least one other liner of the same construction, said liners being disposed in telescopic relationship with each other.

11. The disposable, seamless, plastic liner according to claim 1, in combination with at least one other liner of the same construction, said liners being disposed in telescopic relationship with each other.

12. A nursing unit including a self-supporting tubular holder having an inner wall defining an opening therein which terminates at an upper margin of said holder; a seamless, thermoplastic liner drawn from a sheet of thermoplastic material, said liner including a body portion disposed within the opening of said holder and a flange disposed on the upper margin of said holder, said body portion including a bottom region and a side wall region defining a cavity for containing liquid, said side wall region terminating at an upper end defining an open mouth into said cavity for permitting egress and ingress of liquid, said flange extending outwardly from and transversely beyond the upper end of said body portion; and a nipple disposed on said holder for closing the open end thereof, said nipple having a shoulder overlying the upper margin of said holder for clamping the flange of the liner between the shoulder of the nipple and the upper margin of the holder to retain the liner in assembled relationship with the nipple and the holder, wherein the improvement comprises said bottom region of the body portion being substantially continuously rounded, and said side wall region extending upwardly and tapering outwardly from said bottom region, said body portion of said liner being of a pre-shaped and set self-supporting open configuration which is sustained under ambient, uniform pressure, said body portion being sufficiently thin for permitting at least a substantial portion thereof to collapse as liquid is drawn out of said liner during nursing, said body portion having a transverse dimension relative to the transverse dimension of the opening in the holder for permitting the body portion to be assembled and maintained within the opening of the holder without transverse distortion of the pre-shaped open configuration of said body portion said flange being thicker than said body portion and non-collapsing during handling of said liner for sustaining the mouth of the liner in an open configuration when assembling said liner with the self-supporting holder.

13. The nursing unit according to claim 12, wherein said flexible, collapsible body portion collapses under a pressure differential of less than 0.5 lbs. per square inch.

14. The nursing unit according to claim 12, said plastic liner having an internal depth to maximum internal transverse dimension ratio of greater than 2:1.

15. The nursing unit according to claim 14, wherein said body portion has a thickness of between 1-½ mils to 8 mils.

16. The nursing unit according to claim 12, wherein the side wall region of the body portion of the liner in the preshaped open configuration of said body portion is spaced inwardly from the inner wall of the tubular holder, whereby the liner can be assembled with the tubular holder without altering the pre-shaped open configuration of said body portion.

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