April 18, 1944. W. V. CONSOLAZIO 2,347,150

STERILIZING MEANS FOR INFANT-FEEDING BOTTLE

Filed Jan. 21, 1941

Fig. 1.

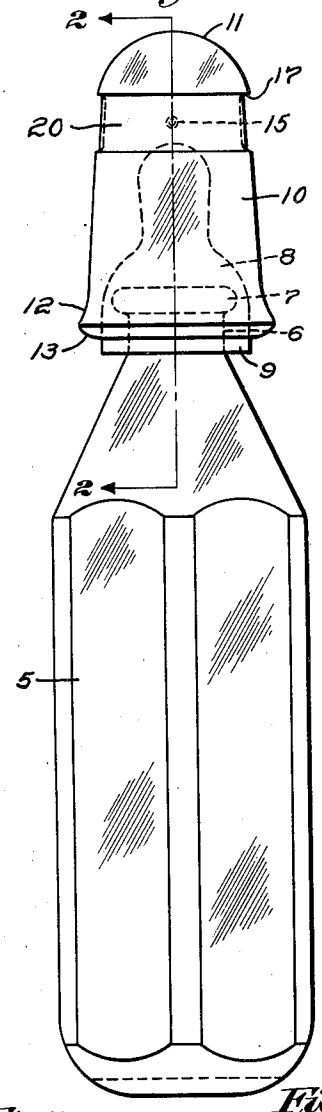


Fig. 2.

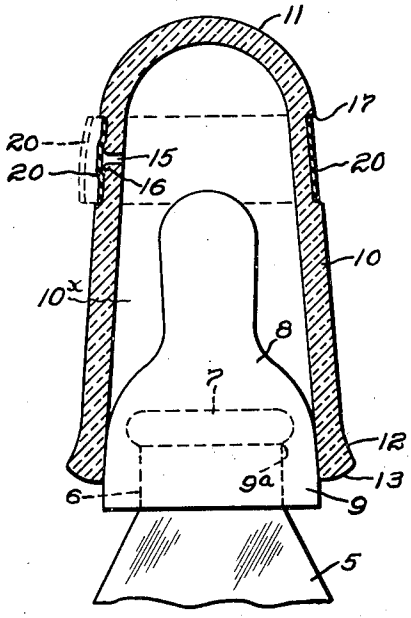


Fig. 4.

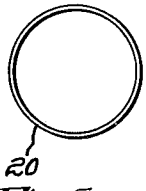


Fig. 3.

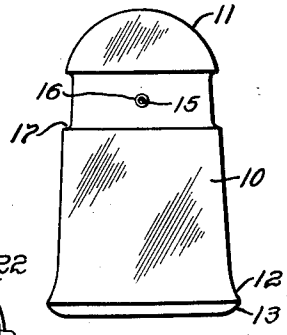


Fig. 5.

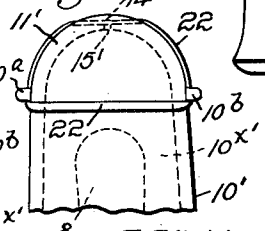


Fig. 6.

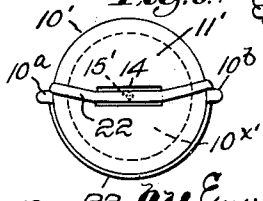
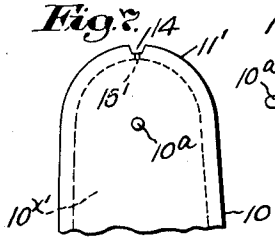


Fig. 7.



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UNITED STATES PATENT OFFICE

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STERILIZING MEANS FOR INFANT-FEEDING BOTTLES

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5 Claims. (Cl. 21—58)

My present invention relates to the sterile conditioning of fluid-dispensing containers, their contents and closures, and is particularly adapted for use with infant-feeding bottle assemblies. It has as an important object to provide reliable means of simple and inexpensive construction universally applicable to containers such as nipple-capped nursing bottles whereby the fluid content or formula baby-food may be placed in the particular bottle before sterilizing or pasteurizing, the nipple installed and the entire assembly with content together subjected to a single sterilizing heat treatment in which it is automatically sealed in ready condition for use.

In the drawing, showing one exemplary form of the invention as applied to a typical container selected for purposes of illustration and description:

Fig. 1 is a side elevation of a representative sterilizing container unit equipped in accordance with the invention;

Fig. 2 is an enlarged vertical section on the line 2—2 of Fig. 1;

Fig. 3 shows separately, in elevation, a sterilizing and sealing closure element, cap or hood such as that of Figs. 1 and 2;

Fig. 4 is a plan of a valve member of Figs. 1 and 2; and

Figs. 5, 6 and 7 are respectively a side elevation, a plan and further side elevation of another form of sterile cap or hood embodying the invention.

Referring to the drawing in more detail, the fluid container or bottle 5 of Figs. 1 and 2 is illustrated as one of the well-known standard forms of infant-feeding or formula containers commonly referred to as nursing bottles. This style of bottle has a hexagonal shaped body tapering at its upper end to a cylindrical neck 6 having a prominent lip or bead 7 at its open top. Such bottles are generally made of a heat-resistant glass such as known in the trade as "Pyrex." It will be understood however that the bottle shown is but one example of those to which my invention is applicable, including the wide-mouthed and other forms as well as the relatively narrow neck type of Figs. 1 and 2.

Customarily in preparing fluid feedings for infants the desired quantity of the formula is made up, being separately pasteurized if necessary, and placed in the individual bottles which have first been cleaned and sterilized, empty, after previous use. The loaded bottles, either open or with temporary stoppers, such as cotton wadding, generally are refrigerated until required for use. At a feeding time a nipple is installed on the selected bottle. Considerable manipulation usually is needed to seat the nipple, even by an experienced operator, with attendant danger of contamination to both bottle and nipple and thence to the fluid content.

In contrast with such procedure my invention contemplates that the bottles with their content shall first have their nipples put in place on them, before heat-treating or sterilizing. The containers, contents and nipples are then simultaneously subjected to the sterilizing heat treatment, in such manner that the fluid content and the major portions of the nipples are automatically sealed and maintained in their sterile condition without further attention.

Referring again to Figs. 1 and 2, it is assumed that the bottle 5 has received its appropriate fluid content, before the latter has had its heat treatment. A nipple 8 is put in position on the neck of the bottle. Such nipple may be of any of the various known or preferred types and constructions. That here shown for purposes of illustration has a relatively thick-walled skirt 9 with an internal annular shoulder 9a for engaging under the bead 7 at the bottle top, the skirt gripping tightly around the neck 6 of the bottle below the bead.

The bottle 5 with its fluid content and thus nippled, but prior to heating, has cooperatively applied to it the novel means of the invention, preparatory to sterilizing, cooling and storing or transporting. Such means in the illustrated example comprises an inverted bell-like hood, cap or cover 10. This nipple-and-bottle-hood may be formed of any suitable material of the desired rigidity and capacity to withstand sterilizing temperatures. Preferably it is transparent or partially so, one material found satisfactory in actual use being a laboratory or heat-resistant glass similar to that of the nursing bottle 5. Other materials having the stated characteristics may be used, including various of the plastics and compositions now available. This cover element, capping member or shielding hood 10 has a closed upper end 11, desirably rounded substantially as shown, to avoid internal angular corner formations, for ease in washing and cleaning. The glass or other material of the hood 10 is of a thickness to give the desired strength and firmness and to reduce likelihood of breakage in use, while also giving the hood capacity to withstand such internal pressures both positive and negative as may develop in the course of the operations of sterilizing and subsequent cooling.

This nipple-shielding cap or hood 10 desirably has somewhat of a flare toward its open bottom 12. Around its mouth or base is a laterally protuberant and downwardly rounded rim 13 on which the hood may stand when not in use. The internal diameter of the hood bottom or mouth portion 12 is so calculated with reference to the neck 6 and top bead 7 of the bottle and to the lower or skirt portion 9 of the nipple as to adapt the hood to have a firm gripping seat directly on and in compressive clamping and sealing engagement with the nipple skirt below the extreme top of the bottle neck and below the level of the bead 7. Thus when the hood 10 is placed over and onto the nipple a slight push or pressing upon it readily brings its mouth or base 12 down onto the nipple skirt 9 to a seated position substantially as in Fig. 2. As there seen, the base 12 of the hood firmly engages and tends to compress the opposite portion of the nipple, augmenting the resilient gripping of the latter about the neck of the bottle below the bead 7. Accordingly the hood serves to hold the nipple securely in installed position, and at the same time is itself given a firm sealing fit and seat on and against the nipple substantially below the extreme top of the bottle 5. Thus the hood, the nipple skirt and the neck portions of the bottle all have a cooperative self-sealing and seating action as the hood is set on and forced gently down onto the nippled bottle. In said seated sealing position the flared bottom rim 13 of the hood may extend to or below the extreme lower end of the nipple skirt. In Figs. 1 and 2 the latter projects slightly below the hood where it may conveniently be grasped in subsequently removing the hood.

It will be noted that the inner surface of the hood wall, which need not be tapered upwardly as shown, is of a diameter and height such that, except where the gripping base 12 of the hood seats on the nipple skirt 9, said hood wall throughout is substantially spaced from contact with the nipple, thus forming a free space, enclosure or chamber 10*x* of substantial volume around and completely enclosing all portions of the nipple above the top of the bottle.

In use, the covered bottle, or a plurality of them, is subjected to sterilizing heat treatment in any suitable vessel. At such time the expanding air, steam or other gases, those in the bottle and nipple having access to the nipple-surrounding interior of the hood through the small outlet (not shown) at the tip of the nipple, are afforded escape from the nipple hood or cover 10. Automatic means is herein provided for that purpose, constructed and arranged for automatic closure against entrance of atmospheric air at other times. While such automatic venting means may be variously formed, I have herein illustrated an efficient and simple valve device, easy to remove and replace, and especially adapted to and combined with the nipple-shielding hood 10.

Noting particularly Fig. 2, a through aperture or vent 15 of relatively small diameter is formed in the wall of the upper closed portion of the hood 10, desirably at a level near or somewhat above the tip of the nipple, substantially as shown. Said venting aperture 15 terminates outwardly with a slight flare, immediately around which the material of the hood may be slightly raised to form an annular rib 16 around the vent 15. At the level of the vent and extending somewhat above and below it, preferably about equally, an annular recess or flat-bottomed circumferential groove 17 is formed at the outer face of the upper side wall portion of the hood 10. This recess 17 provides a positioning and retaining seat for the valve element 20, the latter seen separately in Fig. 4, and herein consisting of an annular diaphragm-like band of a resilient material not adversely affected by sterilizing temperatures, such as a substantially pure or specially treated rubber or rubber-like composition, thin enough and sufficiently elastic to be distended by gases at sterilizing temperatures but of a consistency non-porous to atmospheric air. It may be translucent or otherwise.

This ring valve member 20 has a natural or unextended diameter somewhat less than that of the outer wall surface of the hood 10 at the floor of the groove 17, so that when installed in the latter the valve member 20 is under sufficient tension to retain it securely in place in its said annular seat and in tight closing engagement over the vent 15. The normal closed relation of the valve and vent is improved and insured by the described bead or rib 16 about the mouth of the vent 15, further tensioning the immediately overlying area of the valve ring 20 and so increasing the firm seating action of the latter against the mouth of the vent. The normal tensioned or expanded condition of this diaphragm valve band 20 upon its seat 17 is adequate to keep the entire inner surface area of said band, including that immediately outside the bead 16, flat against the hood, as represented in Fig. 2. Preferably, and as shown, there is but a single vent 15, so that the valving action is simplified and made more certain.

In operation, the expanding air, steam or other gases during the heating process are by the described means afforded automatic escape at the upper portion of the hood by lifting the valve ring 20 slightly off from the mouth of the vent 15, as represented in somewhat exaggerated manner by the dotted line showing at the left in Fig. 2. The gases thus are free to pass out through the vent 15 and out from under the top, bottom or both edges of the valve ring 20. Immediately on relief of such internal pressure the valve member 20 recloses tightly against the mouth of the vent. During subsequent cooling, which may result in the building up of a substantial negative pressure within the hood and bottle, the external atmospheric pressure serves all the more firmly to close the valve, avoiding all possibility of access by non-sterile air to the nipple or the contents of the bottle. Any such negative pressure developed within the hood 10 tends also to retain the latter in all the more firmly seated position, further compressing the nipple skirt adjacent the bead 7 and improving the seal afforded by the nipple between the bottle neck and the base of the hood.

In Figs. 5, 6 and 7 I have illustrated another construction for the nipple-covering cap or hood in accordance with my invention. In these figures parts corresponding to those of Figs. 1 to 4 are given corresponding reference numerals with the addition of prime markings. Except as otherwise described the hood of Figs. 5 to 7 may be substantially similar to that of the preceding figures. In this instance the hood 10' having the similar enclosing chamber 10*x*' about the nipple 8, the upper end of which is seen in Fig. 5, has the pressure-relieving aperture or vent 15' formed in its top wall 11'. The location of the vent is selected with a view to facilitating the molding or other formation of the hood including said vent in a single manufacturing operation,

a convenient point for this purpose being at substantially the center of the top wall, as indicated.

The escape vent 15' opens outwardly at the bottom of a transverse cleft or groove 14 in the outer top wall and extending but part way through the latter. This groove 14, shown as extending diametrically of the hood as viewed in top plan, Fig. 6, has a general V-shape, somewhat truncate if desired, being so shown in Fig. 7.

The valve closure element in this instance is a relatively narrow rubber or other resilient band 22. This latter may be the ordinary elastic band familiar as an article of office and household stationery, replacements for which accordingly will be readily available. Such ready supply of the elastic valving element 22, as well as the feature of one-piece manufacture of the hood, are important considerations from the practical viewpoint. The groove 14 is shaped for operative reception either of the flat type of elastic or the thicker type, having an approximately square or other section, said groove locating such elastic band accurately over the mouth of the vent 15' and retaining it there in use.

At substantially opposite points on the outer wall of the hood, below its extreme top, is a pair of laterally projecting ears, bosses or nubbins 10*a*, 10*b*, positioned and arranged for cooperation with the groove and valve band. The latter is adapted to be looped or caught around said ears, with at least on length of the band extending up from under the ear at one side of the hood, across in vent-closing position through the groove 14, and down about the opposite ear. Preferably the remaining length of the band extends circumferentially of the hood between the two ears as represented in Figs. 5 and 6, but may be returned across the top of the hood through the groove 14. Said arrangement of the band as in Figs. 5 and 6 has been found convenient and effective, the band desirably having a circumferential length, in its untensioned condition apart from the hood, accommodating it to installation as illustrated, with its bent-closing portion under tension. But any convenient operative positioning of the band by means of the groove 14 and projections 10*a*, 10*b* may be followed, depending somewhat on the particular length of band available, at least some portion of this elastic band element being disposed directly over and in normal automatic closing relation to the vent 15'.

My invention is not limited to the particular embodiments thereof illustrated and described herein, and I set forth its scope in my following claims:

1. A sterilizing protective enclosure device for nipples installed on filled nursing bottles, said device comprising an inverted cup-like heat-resistant glass hood having a continuous top and side wall and being open and of maximum diameter at its lower end, said hood adapted to have a sealing seat solely on and laterally against the base of such installed nipple wholly external of all portions thereof and below the bottle top and being shaped and proportioned internally for completely enclosing non-contacting spaced relation to the entirety of the nipple above such seat, a pressure-relieving vent in an upper wall portion of the hood, at or above the level of the nipple tip, a recessed formation at the outer face of the hood wall, said vent opening outwardly into said formation, and resilient bandular valve means received wholly on and vertically above the lower end of the hood and having at least a portion positioned in and by the recessed formation so as to overlie and normally to close the vent.

2. A sterilizing and protective device for nursing bottle assemblies including bottle, content and nipple, said device comprising an inverted cup-like hood with a continuous top and side wall and an open lower end to fit in sealing relation on and to receive its entire support from a bottle-installed nipple, a pressure-relieving vent in an upper portion of the hood wall, an elastic bandular member directly associated and having supported engagement solely with the hood so as normally to close the vent subject to automatic opening and closing for pressure-relieving and air excluding purposes, and a plurality of holding formations for said member externally disposed on the hood wall and oppositely spaced relative to the vent, said bandular member at all times when supportedly associated with the hood being in its entirety substantially spaced vertically above the lower end of the hood.

3. A sterilizing and protective device for nursing bottle assemblies including bottle, content and nipple, said device comprising an inverted cup-like hood with a continuous top and side wall and an open lower end to fit in sealing relation on and to receive its entire support from a bottle-installed nipple, a pressure-relieving vent in an upper portion of the hood wall, an elastic bandular valve member for the vent, and a groove formation externally disposed on the vented wall portion so that the vent opens outwardly into such groove formation, the latter adapted to receive and operatively position the vent-closing portion of said valve member and operatively to retain the latter in position upon, and wholly above the lower end of, the hood.

4. A sterilizing and protective device for nursing bottle assemblies including bottle, content and nipple, said device comprising an inverted cup-like hood with a continuous top and side wall and an open lower end to fit in sealing relation on and to receive its entire support from a bottle-installed nipple, a pressure-relieving vent extending substantially radially through an upper lateral portion of the hood wall, an elastic bandular valve removably disposed wholly on the hood and normally closing the vent with capacity for automatic opening and closing for pressure-relieving and air-excluding purposes, and a circumferential valve receiving and positioning annular recess formed on the hood and receiving the entirety of the valve and retaining it against unintended displacement.

5. A sterilizing and protective device for nursing bottle assemblies including bottle, content and nipple, said device comprising an inverted cup-like hood with a continuous top and side wall and an open lower end to fit in sealing relation on and to receive its entire support from a bottle-installed nipple, a pressure-relieving vent positioned substantially centrally in the hood top wall, a flexible band valving member for the vent, a band-receiving groove formation extending externally across the hood top wall with the vent opening into said formation, and a plurality of holding projections for the valving member at spaced points on the hood wall, one adjacently below each end of the groove formation.

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