The present invention relates to feeding bottles for babies, and more particularly to an improved feeding bottle incorporating novel arrangements facilitating the withdrawal of liquid from the bottle while avoiding the withdrawal of air therefrom.

In the feeding of small babies, substantial problems arise in connection with the swallowing of air by the baby, which often causes substantial pain, vomiting, and other upset conditions. Accordingly, precautions must be taken in the bottle feeding of babies, to the end that a supply of liquid is constantly available at the nipple, so that the baby does not suffer air from the bottle.

With the more conventional feeding bottles, it is necessary to constantly attend the baby during feeding, so that the baby is held in the proper position and the bottle is tilted downwardly at all times to maintain a continuous supply of milk at the nipple. Heretofore, certain so-called improved feeding bottles have been devised, utilizing straws and/or valve devices for the intended purpose of permitting the bottle to be used in any position while avoiding the likelihood of the baby swallowing air. However, we have found such prior arrangements to be unsatisfactory in one or more respects, and in particular in that the devices are unnecessarily complicated and/or do not accomplish the desired end result. Accordingly, the present invention seeks generally to provide an improved feeding bottle for babies which is of a simplified and inexpensive design and which is effective in preventing the withdrawal of air from the bottle, regardless of the position in which the bottle is held during feeding.

More specifically, the invention provides an improved feeding bottle for babies incorporating an improved suction tube device which projects to a point adjacent the bottom of the bottle, and is supported for limited universal movement whereby liquid may be drawn from all areas of the lower end of the bottle, depending on the manner in which the bottle is tilted. In this respect, the suction tube of the improved feeding bottle incorporates an improved valve means permitting liquid to be drawn from the bottle in all positions, and providing for the retention of liquid in the suction tube at all times, so that the tube does not become filled with air during momentary pauses during feeding.

Another improved feature of the invention resides in a novel, simplified, and economical arrangement for supporting the suction tube in the bottle for limited universal movement therein, with the upper end of the tube acting as a valve to cause liquid to be drawn through the tube when the bottle is tilted upwardly and directly through the nipple when the bottle is tilted downwardly. More specifically, the new feeding bottle incorporates a valving collar which is inserted within and held by the nipple, and supports the suction tube at its upper end. The arrangement is economical, yet wholly effective, and simplifies cleaning of the various components and filling of the bottle.

For a better understanding of the invention, reference should be made to the following detailed description and accompanying drawing, in which:

- Fig. 1 is a longitudinal cross-sectional view of a baby feeding bottle constructed and arranged in accordance with the teachings of the invention, the bottle being illustrated in an upwardly tilted position;
- Fig. 2 is a longitudinal cross-sectional view of the feeding bottle of Fig. 1 in a horizontal position;
- Fig. 3 is a longitudinal cross-sectional view of the feeding bottle of Fig. 1 in a downwardly tilted position;
- Fig. 4 is an enlarged fragmentary perspective view of the upper end of a suction tube incorporated in the feeding bottle of Fig. 1; and
- Fig. 5 is an enlarged fragmentary perspective view of the lower end of the suction tube of Fig. 4.

Referring now to the drawings, the numeral 10 designates the body or container of the feeding bottle. The container 10 is preferably formed of glass or other resilient material, and may be of generally conventional design. The upper end or neck 11 of the container is of reduced diameter and is threaded, as at 12, for the reception and engagement of a screw cap 13. The screw cap 13 has an enlarged opening 14 in its top wall, in which a nipple 15 of rubber or other resilient material. In the illustrated form of the invention, the nipple 15 has a base or flange 16 of relatively large diameter which is received inside the cap 13 and forms a resilient seal between the cap 13 and container neck 11 when the cap is screwed tightly onto the container 10. Spaced axially a short distance from the flange 16 the nipple is a second flange 17 which forms a shoulder engaging the upper surface of the cap 13 to firmly retain the nipple and cap in assembled relation. The outer end of the nipple 15 is provided with one or more openings 18 of conventional form which permit liquid to be withdrawn from the bottle.

Adjacent the base of the nipple 15, the interior recess thereof is of cylindrical form, as indicated at 19. In accordance with the invention, the cylindrical portion 19 of the nipple recess is adapted to receive a collar 20, which is also of cylindrical form. The collar 20 is of slightly greater diameter than the cylindrical portion 19 of the nipple recess, so that upon insertion of the collar into the nipple the collar will be frictionally gripped and firmly retained by the nipple. As shown in Figs. 1-3, the collar 20 has an axial opening 21 therethrough, which is of reduced diameter intermediate the ends of the collar and flares outwardly toward each end. The upper end of the collar 20 mounts a diaphragm 22 which is of annular form and has inner lip portions 22a projecting radially inward over the upper end of the collar opening 21 and partially closing off the opening. Advantageously, the diameter of the central opening through the annular diaphragm 22 is not substantially less than the reduced diameter or neck portion of the collar opening 21.

Loosely received in the collar opening 21 is an elongated suction tube, generally designated by the numeral 23. The suction tube 23 may be formed of glass or suitable plastic material, and has an enlarged head portion 24. The head portion 24 of the tube has upwardly diverging side walls, and has a maximum diameter, at its upper end extremity, which is somewhat greater than the diameter of the neck portion of the stopper opening 21. The Shank of the suction tube is smaller in diameter than the collar opening 21 and the opening in the annular diaphragm 22.

When the container 10 is in its normal upright position, the suction tube 23 will be suspended in vertical relation by means of the collar 20. The weight of the tube causes it to be drawn downwardly into the flared upper portion of the stopper opening 21, urging the enlarged head por-
tion 24 of the tube into sealing engagement with the projecting lips of the diaphragm 22. When the container 10 is disposed in an upwardly tilted position, as shown in Fig. 1, the lower end of the suction tube 23 will swing over against the side wall of the container, substantially freeing movement in this manner being provided since the shank of the suction tube 23 is of lesser diameter than the stopper opening 21. It will be observed, however, that when the container 10 is tilted and the suction tube 23 swung into skewed relation to the collar 20 the seal between the head portion 24 of the tube and the collar 20 is not disturbed. The projecting lips 22a of the annular diaphragm 22 are freely flexible, and are retained in sealing engagement with the head portion 24 of the tube throughout its limited range of swinging movement.

When the container end is tilted downwardly, as shown in Fig. 3, the suction tube 23 is urged toward the nipple 15, by gravity, causing the head portion 22 of the tube to drop out of the collar 20 and into engagement with the walls of the nipple. At this time the reduced diameter shank portion of the suction tube 23 lies within the collar 20 and diaphragm 22; and, since both the diaphragm and collar openings are of greater diameter than the shank portion of the tube, a free fluid passage is provided through the stopper 20 and diaphragm 22. As shown in Fig. 4, the enlarged upper end of the suction tube 23 is provided with a plurality of recesses 25 providing fluid passages between the head portion 24 and nipple 15 when the suction tube 23 is in the position shown in Fig. 3.

At the lower end of the suction tube 23 is a shouldered fitting 26 adapted to be received in and frictionally or otherwise retained by the end of the suction tube. The fitting 26 has an axial bore 27 extending from its upper end and terminating in an enlarged cylindrical recess 28 adjacent the lower end of the fitting. The upper end of the fitting has a valve surface upon which a valve ball 29 is adapted to be seated to close off the axial bore 27. The valve ball 29 is of somewhat smaller diameter than the interior of the suction tube, to provide for the flow of liquid about the ball, and is adapted for a limited longitudinal movement within the suction tube between the valve end surface of the fitting 26 and suitable stop means 30 extending across or projecting into the interior of the suction tube above the fitting 26.

At the lower end of the fitting 26, the enlarged chamber 28 receives a valve ball 31, which is of smaller diameter than the recess 28, and is adapted for movement between a valve surface 32 and inwardly projecting stops 33 at the lower end extremity of the fitting. Advantageously, the stops 33 are integral with the fitting 26, and the lower end of the fitting is slotted longitudinally to permit segments thereof to be deflected for inserting a valve ball 31 into the chamber 28, and to eliminate suction upon the ball 31 when the tube 23 is used as a straw.

In the use of the new feeding bottle, the container 10 is first filled by removing the cap 13, and withdrawing the suction tube 23. In this respect, when the suction tube 23 is tilted upwardly, as in Fig. 1, the lower valve ball 31 rolls downwardly against the stops 33, opening the lower end of the axial passage 27. The upper valve ball 29, on the other hand, is urged by gravity into sealing relation with the upper end of the fitting 26, closing the upper end of the axial passage 27. However, when suction is applied through the tube 23, the upper valve ball 29 is lifted off its seat, to provide for the upward flow of fluid in the tube. During momentary pauses in the feeding, the ball 29 drops downwardly and seals against the fitting 26 to trap the liquid in the suction tube 23. This prevents the suction tube from becoming filled with air during such pauses, and prevents the drawing of air by the baby, as would otherwise occur when feeding was resumed.

As will be observed in Fig. 2, liquid may be drawn through the suction tube 23 when the container 10 is in a horizontal position and substantially emptied of its contents. The enlarged upper end 24 of the tube is retained in sealing engagement with the collar 20 by means of the flexible diaphragm 22, and the lower end of the tube, which is weighted somewhat by the valve balls 29, 31, drops against the lower surface of the bottle container, providing for the continued withdrawal of liquids therefrom until such time as the container is substantially completely exhausted of its contents.

If the bottle is moved from an upwardly tilted position, as shown in Fig. 1, to a downwardly tilted position, as shown in Fig. 3, the lower valve ball 31, at the end of the fitting 26, is drawn by gravity into sealing contact with the end of the chamber 28, closing off the outer end of the axial passage 27. This traps the fluid within the suction tube 23. At the same time, the tube 23 drops out of the collar 20, as previously described, so that a continuous supply of fluid is provided at the nipple 15 by means of the passages through the diaphragm 22 and collar 20. The valve ball 31 performs an important function at this time since without this feature the suction tube 23 would be drained of fluid and would be empty when the bottle was subsequently returned to an upwardly tilted position. Thus, there would be an interval of time in which air would be drawn through the suction tube 23 to refill the tube with liquid.

One of the important advantages of the improved baby feeding bottle is that the bottle may be held in any position during feeding, and may be moved about, tilted, etc., while maintaining a constant supply of liquid at the nipple so that the feeding baby does not draw air from the bottle and suffer the discomforts and ill effects thereof. To this end, the new feeding bottle incorporates improved suction tube arrangements including a suction tube having a simplified double acting valve at its free end, and improved means for mounting the suction tube, whereby adequate sealing is afforded between the upper end of the tube when the nipple is in all upwardly tilting positions of the bottle, and the suction tube is permitted to drop out of sealing relation when the bottle is inverted. The double acting valve in the free end of the tube is highly advantageous in that during times when liquid is being drawn through the tube for feeding, the liquid is retained in the tube during momentary pauses in feeding. Likewise, when the bottle is inverted, and even through fluid at this time flows directly into the nipple, the valve is opened so that the suction tube is maintained in the continuity of the liquid supply at the nipple when the bottle is subsequently tilted upwardly.

Another important feature of the invention resides in the novel arrangement for mounting the suction tube by means of a collar 20 received in and frictionally retained by the nipple 15. This substantially facilitates cleaning and filling of the container 10 since, when the cap 13 is
removed, the suction tube 23 is carried therewith and thereby withdrawn from the bottle. The suction tube 23 and collar 20 may themselves be readily taken apart for cleaning by simply removing the collar 20 from the cylindrical portion 19 of the nipple recess. The improved suction tube mounting is also advantageous in that a resilient support is provided for the upper end of the tube, substantially reducing the possibility of breakage in cases where the tube is formed of glass.

It should be understood, however, that the specific device illustrated and described herein is intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the invention. Accordingly, reference should be made to the following appended claims in determining the full scope of the invention.

We claim:

A feeding bottle for babies comprising a container, a feeding nipple mounted at one end of said container and communicating with the interior of said container through an opening, a suction tube received in said opening and having an upper end portion of greater diameter than said opening, flexible sealing means surrounding said opening and normally sealingly engaging the head portion of said suction tube, said suction tube being movable longitudinally in said opening to provide a fluid passage between said tube and opening, and double-acting valve means at the free end of said suction tube operative to retain a supply of liquid in said tube while permitting free flow of liquid through said tube toward said nipple when said bottle is in an upwardly tilted position, said opening having a central portion of reduced diameter, and increasing in diameter in both axial directions from said central portion, and said flexible sealing means comprising an annular diaphragm positioned at the end of said opening adjacent said nipple and having inner lip portions partially closing off the end of said opening.

References Cited in the file of this patent

UNITED STATES PATENTS

345,518 Lelièvre ------------ July 13, 1886

FOREIGN PATENTS

1,173 Great Britain 1872
3,198 Great Britain June 27, 1883
3,251 Great Britain Mar. 8, 1886