Sept. 21, 1965 G. B. RABE 3,207,349

NURSING BOTTLE

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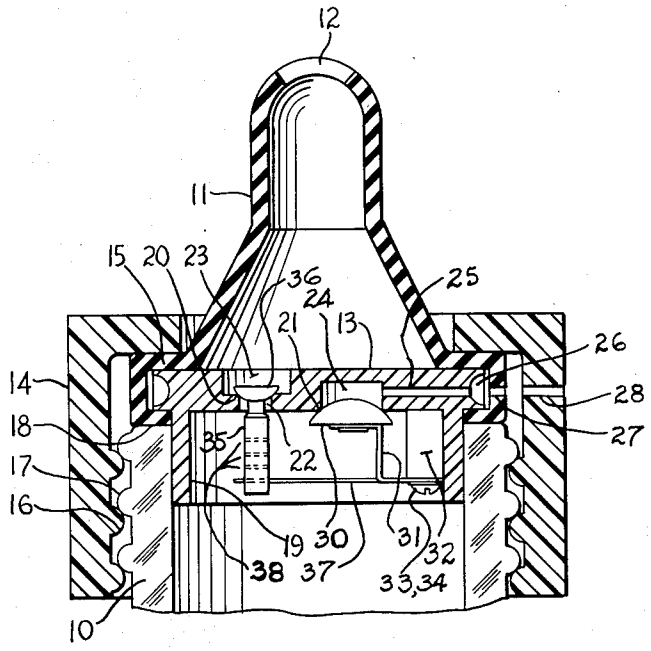

Fig. 1

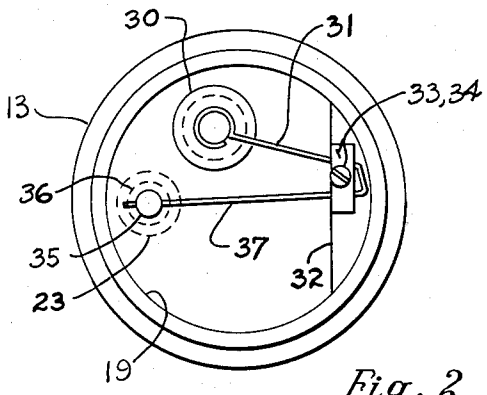

Fig. 2

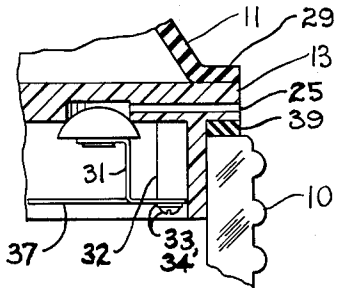

Fig. 3

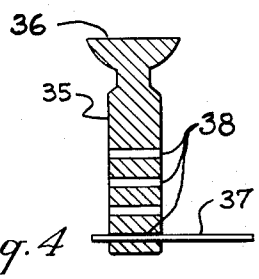

Fig. 4

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NURSING BOTTLE

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The present invention relates to a nursing bottle for infants and more particularly relates to an improved attachment for such bottles which permits an even flow of liquid from the bottle upon demand by the infant by providing liquid and air valves which are positive in action, very responsive to the small changes in pressure experienced and which allow air to enter the bottle freely during the demand period without passage through the interior of the nipple. Other advantages include a fully leakproof construction, great simplicity of structure which makes this attachment removable from the bottle as a unit, easy disassembly for cleaning and sterilizing purposes, or easy cleaning without disassembly under a water tap, and a liquid metering valve that is easily and simply adjusted to meter just the right amount of liquid to satisfy the demand of the particular infant being fed.

It is, therefore, an object of the present invention to provide a nipple and nursing bottle valve attachment for a nursing bottle wherein the nipple and attachment are easily removable from the bottle as one unit and can be washed clean or sterilized without disassembly.

It is also an object of the present invention to provide a valve attachment for a nursing bottle which can be removed from the bottle as a unit and can be washed clean or sterilized as a unit or can be quickly and easily disassembled for this purpose.

It is another object to provide an adjustable metering valve for the outward flow of the liquid in a nursing bottle and to provide adjustable means for allowing air to enter the bottle to replace the space formerly displaced by the liquid.

It is also an object to provide air intake means which receives air from the exterior of the bottle without passage of the air through the interior of the nipple where it would undesirably mix with the liquid and cause the infant to swallow air along with the liquid.

It is also an object of the present invention to provide a nursing bottle of the foregoing type which is entirely leakproof in all attitudes of the bottle.

Other objects and advantages of the present invention will be apparent from the detailed description which follows.

In the drawings:

FIGURE 1 is an elevational longitudinal cross section of the upper part of a nursing bottle showing the nipple and valve attachment attached to the bottle;

FIGURE 2 is a view of the underside of the valve body showing the valves and springs;

FIGURE 3 is fragmentary view of the valve attachment in use with a nipple having a flat annular rim;

FIGURE 4 is an enlarged view showing the adjustment feature of the liquid metering valve.

With reference to FIGURE 1 of the drawing, an infant feeding or "baby" bottle **10** is shown closed at the bottom end and open at the top. Bridging the opening at the top of bottle **10** and closing the opening is a resilient nipple **11** of rubber, latex or the like material being substantially in the form shown and having a slit **12** in its upper or outer end substantially to the extent shown. The lower extremity of nipple **11** is annular in form and fits snugly about the periphery of annular valve body **13**. An annular cap **14** is provided with a central opening in its upper surface of a diameter such that the cap **14** overlaps the annular edge or shoulder **15** of the nipple **11** and yet the nipple is permitted to pass upward through the opening. The remainder of cap **14** is also annular and extends downward around the screw threads **16** on the inner surface of the cap to engage with mating threads **17** on bottle **10**. It will now be apparent that upon tightening of the cap **14** by means of the screw threads, the periphery of the nipple becomes clamped about the periphery of the valve body **13** and both body **13** and nipple **11** become clamped to the bottle **10**, the rubber of nipple **11** being compressed between body **13** and bottle **10** to form substantially fluid-tight seals at **15** and **18**. A short annular collar **19** integral with valve body **13** extends downward into bottle **10** along its inner wall and acts as a guide to keep valve body **13** centered with respect to the bottle. It also serves as protection for the valves and springs on the underside of body **13** when it is removed from the bottle and perhaps placed upon a table or handled during washing.

As will be seen again by reference to FIGURE 1, valve body **13** has two valve seats **20** and **21** formed in it, seat **20** comprising the upper rim of circular aperture **22** which opens on the lower side of body **13** into the bottle **10** and into the nipple **11** through larger circular recess **23**. Seat **21** comprises the rim of circular recess **24** as it opens on the lower side of body **13**. A passage **25** is provided in valve body **13** and is in communication with valve chamber or recess **24** at one end and at its other end with annular groove **26** in the periphery of valve body **13**. An aperture **27** is formed in nipple **11** and provides an air passage between groove **26** and the interior of cap **14** while another aperture **28** is provided in cap **14** to allow air to pass freely through it to the surrounding atmosphere. Closing recess **24** is air valve poppet **30** which is circularly rounded on its upper surface to seat on rim **21** while the lower side of poppet **30** is substantially flat with a protrusion adapted to accept a circular loop of wire spring **31** which in turn extends outward in cantilever manner from post **32** where spring **31** is attached by means of a screw and washer **33, 34**. It will be seen that poppet **30** is held firmly against rim **21** by the force of spring **31** so that air and liquid flow is effectively sealed at this point. Spring **31** is light enough, however, and poppet **30** is so large, that the poppet will easily be lifted from its seat by the pressure differential which will be caused by the withdrawal of liquid from the bottle as will be explained later. The force exerted by spring **31** can easily be adjusted by bending spring **31** toward or away from recess **24**, bending it toward the recess decreasing the force and vice versa.

Still with reference to FIGURE 1, poppet **35** is located in aperture **22** with its stem passing freely through it and has a valve head or flange **36** at its upper end resting upon rim **20** in the manner shown. A wire spring **37**, preferably an extension of the wire of spring **31** and also held in place by screw and washer **33, 34**, extends substantially straight outward in cantilever manner from post **32** and intercepts the stem of valve **35**, passing through one of several adjustment holes **38** in it as shown. Holes **38** are a loose fit about spring **37** so that poppet movement longitudinally of the valve stem will not be interfered with or bound by it, and spring **37** is biased against the hole through which it passes in the stem of poppet **35** in a direction away from aperture **22** so as to urge the under side of head **36** of poppet **35** firmly against seat **20** so as to create an effective seal against the flow of either liquid or air past this point. The force exerted by spring **37** can be adjusted by removing the wire from the hole in which it is inserted and replacing it in another hole. Placing it in a hole nearer to aperture **22** will increase the force and conversely, placing it in a hole further from the aperture will decrease the force.

From the foregoing description, it will be apparent that the entire valve body assembly including the poppet valves

and springs can be easily removed from the bottle as a unit simply by unscrewing the cap **14** and removing the nipple **11**. The assembly can then be cleaned by washing it under a water tap without any necessity for disassembly of the valves, and sterilization of the valve body assembly can then be accomplished simply by subjecting it to steam or boiling water. The bottle, nipple and cap can also be cleaned and sterilized in this manner.

In operation, the bottle is tilted with the nipple end down and the infant sucks on the nipple to withdraw liquid from it. As the infant does so, a pressure differential is created across the valves causing both of them to open. Liquid then flows into the nipple through aperture **22** and recess **23** and air is drawn into the bottle through cap aperture **28**, groove **26**, passages **27** and **25**, and then through recess **24** into the bottle. As the infant ceases to demand liquid from the bottle, the pressure differential ceases and both valves close tightly thus preventing loss of liquid from the bottle proper during periods of no demand, regardless of the bottle's attitude.

It will be seen from the manner in which the air enters the bottle through the side of the cap as described, that air cannot enter the nipple proper to mix with the liquid thus precluding an undesirable air-liquid (such as air-milk or air-formula) mixture from entering the infant's mouth.

In FIGURE 3 is shown another type of resilient nipple in which an annular shoulder is not employed but a flange **29** is shown instead upon which cap **14** bears to form a fluid tight seal. In this instance a washer or gasket **39** of resilient material such as rubber or latex is used under the valve body **13** between it and a bottle **10** to provide a fluid-tight seal above and below it as previously. The air passages remain as in the showing in FIGURE 1 except that there is no aperture in the flange of the nipple and no groove in the rim of the valve body, the air passing into the bottle in otherwise exactly the same manner.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the following claims.

What is claimed is:

1. An attachment for a nursing bottle to prevent air lock of the liquid therein during baby feeding therefrom comprising, in combination, a valve body including a pair of passages affording the interior of the bottle separate communication with the space within the nipple and with the atmosphere, a nipple mounted on said body, a cap securing said body and said nipple to the bottle, check valves mounted on said body and controlling each of said passages, and spring means biasing said valves to closed position when the pressure in the bottle and in the nipple is equal and permitting the opening of said valves when said pressure is unequal due to sucking of the nipple to effect flow of liquid into said nipple space and air flow into the bottle, said valves being poppets and said passages terminating in oppositely disposed seats for the poppets.

2. The combination recited in claim **1** wherein the springs are cantilevers respectively connected at opposite ends to said body and to a poppet.

3. The combination recited in claim **1** wherein said nipple is of resilient material and includes a valve-body-receiving annular rim surrounding the outer rim of said valve body to effect a fluid tight seal between said body, nipple, and cap when secured to the bottle.

4. The combination recited in claim **1** wherein said nipple is of resilient material, and a gasket is mounted between said body and the upper rim of the bottle to effect a fluid tight seal between said body, nipple, and cap when secured to the bottle.

5. The combination recited in claim **1** wherein said body includes an annular collar depending slightly below said springs and valves to effect an encircling guard therefor.

6. The combination recited in claim **2** wherein one of said poppets includes a stem having a plurality of longitudinally spaced transverse bores for the selective reception of and connection with the free end of the spring cantilever.

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