Feb. 3, 1970 E. M. FADDOUL ET AL 3,493,139

INFANT FEEDING DEVICE

Filed Aug. 18, 1967 2 Sheets-Sheet 1

Fig. 1

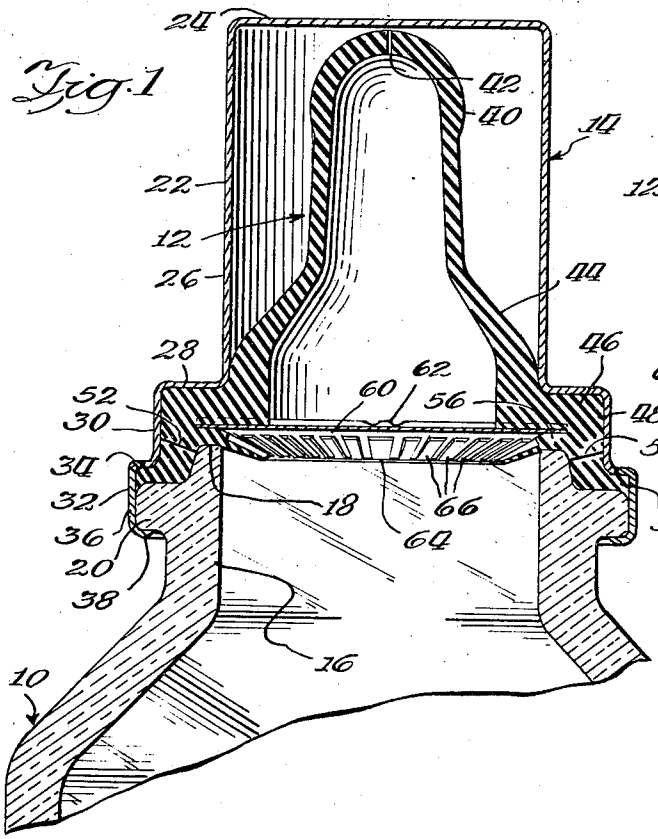


Fig. 2

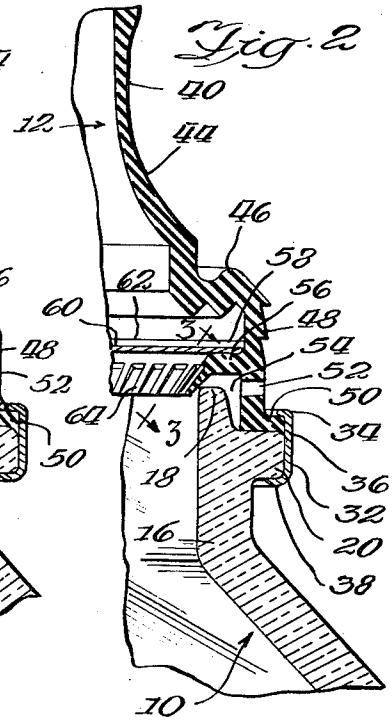


Fig. 4

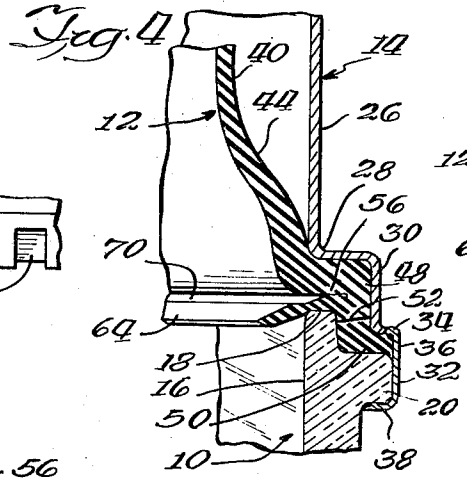


Fig. 3



Fig. 5

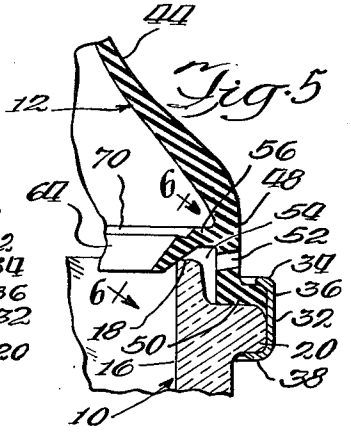


Fig. 6



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INFANT FEEDING DEVICE

Filed Aug. 18, 1967 2 Sheets-Sheet 2

Fig. 7

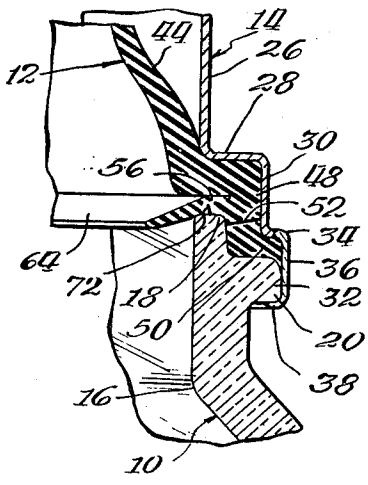


Fig. 8

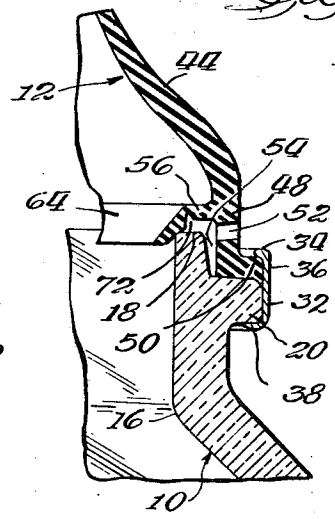


Fig. 9

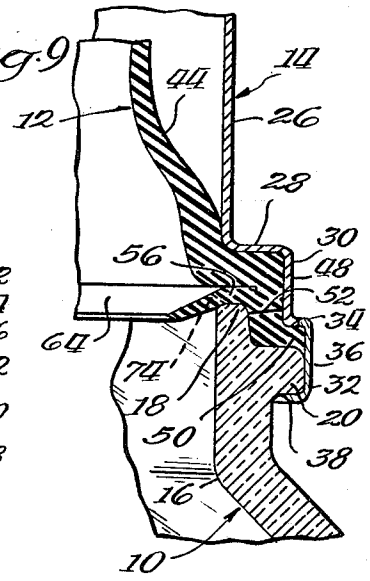
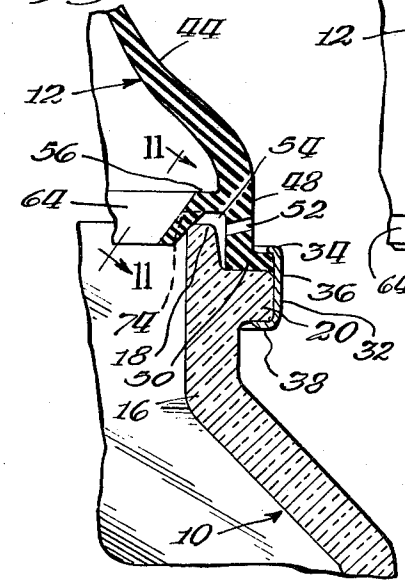


Fig. 10



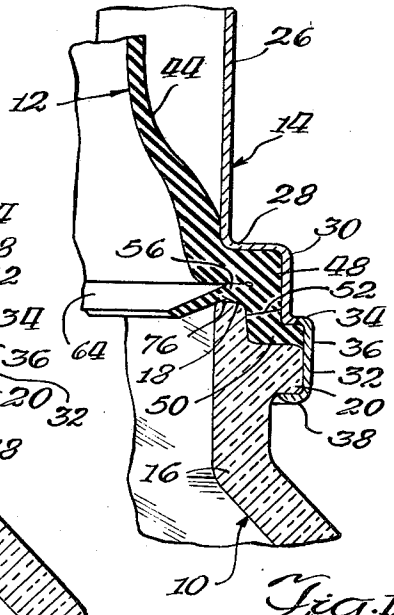
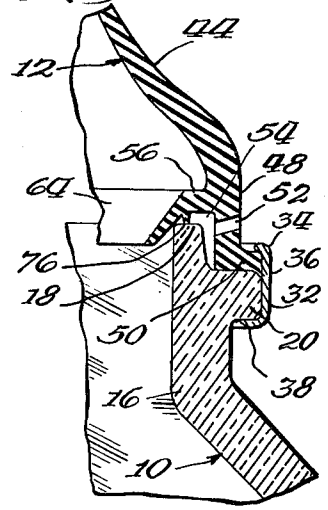


Fig. 12

Fig. 13



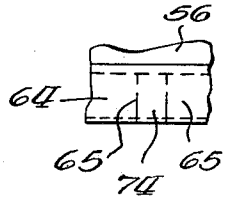


Fig. 11

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INFANT FEEDING DEVICE

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Int. Cl. A61j *11/02, 11/04*

U.S. Cl. 215—11 2 Claims

ABSTRACT OF THE DISCLOSURE

An infant feeding assembly including a nipple having vent holes formed therein and provided with an annular flapper valve formed on the internal surface of the nipple and arranged to sealingly engage the finish of the bottle when the nipple is attached to the open end neck portion of the bottle to prevent leakage of fluid contained therein. The flapper valve and vent holes are constructed and arranged to allow the ingress of air into the interior of the bottle to eliminate the possibility of a pressure differential between the interior of the bottle and the exterior to thereby prevent a vacuum from being formed therein. The assembly also includes a protective cap or shroud and retaining ring structure which clamps and maintains the assembly together. The protective cap encloses the nipple during the storage period and is connected to the assembly in such a manner as it compresses the nipple and positively closes the air vent holes and seals the entire assembly from leakage while in storage, thus providing a fluid-tight, sterile feeding unit assembly.

BACKGROUND OF THE INVENTION

The present invention relates to a novel nipple structure for use with a nursing bottle or container assembly.

In the prior art, it has been found that infant feeding devices which include feeding nipples require means to vent the interior of the container to the atmosphere exterior of the container to equalize the interior and exterior pressures to afford a regular and easy liquid flow. Otherwise, as the child sucks on the nipple and draws the fluid from the container, a vacuum will be formed on the inside of the container, the nipple will collapse, and the flow of fluid from the container will stop. This situation will frustrate the child, cause excessive sucking, and disrupt the otherwise normal and enjoyable feeding experience.

While vent arrangements have been previously provided in infant feeding nipples, they have employed vent means which are located inwardly of the bottle finish and have involved arrangements which require clearance between the assembly retaining ring, the bottle and the nipple structure to allow the passage of outside air to therebetween. The last mentioned arrangement requires manual manipulation of the retaining ring to open and close the venting means. An example of this type of structure is found in U.S. Patent No. 2,982,432, granted to R. M. Mehl, on May 2, 1961.

Furthermore, in recent years, with the mothers' desire to have "convenience foods," it appears desirable to have sealed sterile container assemblies capable of storage in compact spaces for long periods of time commercially available to retail store outlets. These containers must be designed to provide an entire infant feeding unit including a disposable dispenser container, a nipple, and a protective cover therefor in a sterile condition while in storage. Such units must be so constructed as to remain completely sealed and allow no leakage of the fluid

internally or externally until used, but must include adequate venting means for optimum feeding conditions.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides an improved nipple structure having air vent means therein which will be effective at all times to prevent a vacuum within the bottle and the collapsing of the feeding nipple during use due to a pressure reduction within the bottle assembly.

Additionally, this invention provides a novel nipple structure having improved venting means and seal arrangement which does not require manual manipulation or adjustment during the feeding process.

Furthermore, this invention is to provide a feeding unit assembly which seals the venting means and protects the nipple during the storage period prior to use. Such assembly includes a protective cap or cover used in combination with the nipple and bottle clamping or retaining means which when combined with the improved nipple provides a complete sealed, protected, and unitary feeding assembly.

To accomplish the above, there are provided various nipple designs which function to provide a seal with respect to the finish of the bottle. The nipple includes annular valve arrangements which seal against the finish of the bottle, but which when subjected to differential pressure will move away from the finish to permit venting to take place through the vent holes provided in the sidewall of the nipple.

The structure by means of which the above noted and other advantages of the invention will be attained will be fully described in the following specification taken in conjunction with the accompanying drawings showing illustrative embodiments of the invention, in which:

FIGURE 1 is a fragmentary vertical sectional view of the feeding unit assembly in the closed or sealed position for storage;

FIGURE 2 is a fragmentary sectional view of the feeding unit assembly shown in FIGURE 1 with the protective cap or shroud removed and the feeding unit ready for use;

FIGURE 3 is a fragmentary view of the flapper valve seal structure disclosed in FIGURES 1 and 2 and is taken on line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary vertical sectional view of the feeding unit assembly having a modified form of flapper valve and is shown in the closed or sealed position for storage;

FIGURE 5 is a fragmentary sectional view of the modified feeding unit assembly shown in FIGURE 4 with the protective cap or shroud removed and the feeding unit ready for use;

FIGURE 6 is a fragmentary view of the modified flapper vave seal structure shown in FIGURES 4 and 5 and is taken on line 6—6 of FIGURE 5;

FIGURE 7 is a fragmentary vertical sectional view of the feeding unit assembly having a modified form of flapper valve shown in the closed or sealed position for storage;

FIGURE 8 is a fragmentary vertical sectional view of the modified feeding unit assembly shown in FIGURE 7 with the protective cap or shroud removed and the unit ready for use;

FIGURE 9 is a fragmentary vertical sectional view of the feeding unit assembly having a different form of flapper valve shown in a closed or sealed position for storage;

FIGURE 10 is a fragmentary vertical sectional view of the feeding unit assembly having the modified form of

flapper valve shown in FIGURE 9, with the protective cap removed and the feeding unit ready for use;

FIGURE 11 is a fragmentary view of the modified flapper valve shown in FIGURES 9 and 10 taken on line 11—11 of FIGURE 10;

FIGURE 12 is a fragmentary vertical sectional view of the feeding unit assembly having still another form of valve arrangement and is shown in its closed or sealed position for storage; and

FIGURE 13 is a fragmentary vertical sectional view of the feeding unit assembly having the modified flapper valve shown in FIGURE 12 with the protective cap or shroud removed and the feeding unit assembly ready for use.

In the drawings, the bottle or container is generally indicated by the numeral **10** with the nipple generally referred to by the numeral **12**. The protective cap or shroud and clamping or retaining ring structure is indicated generally by the numeral **14**.

The container or bottle is conventional in form and includes a neck portion **16** defining an annular upper edge surface **18** conventionally referred to as the bottle finish. The outer periphery of the neck portion **16** is provided with a circumferential annular ridge or bead **20**. The ridge or bead **20** may be in the form of a helical screw thread having at least one complete turn around the periphery of the bottle neck **16**, or a continuous coplaner bead, as indicated at **20**. The particular form of the ridge or bead **20** is not a part of this invention, and the use of a helical thread or coplanar bead would be determined by the type of retaining clamp or ring utilized for the assembly, which secures or clamps the entire unit together.

The unitary protective cap or shroud and clamping or retaining ring assembly **14** comprises a generally cylindrical cap **22** having a closed end portion **24**, vertically extending wall portions **26**, a laterally extending annular flange **28**, and an annular vertically extending skirt portion **30** which terminates at the point of connection of the cap to the retaining ring or clamp **32**. The cap or shroud **14** is secured to the retaining ring **32** by a frangible connection (not shown), at the place where skirt **30** joins the upper fllange **34** of the retaining ring **32** and can be readily disconnected when the feeding unit is readied for use.

The annular retaining or clamping ring **32** comprises an inwardly extending annular flange **34**, a vertically extending annular skirt portion **36**, and an inwardly extending lower flange **38**. It will be noted that lower flange **38** embraces by crimping, or the like, the underside of ridge or bead **20** to secure the assembly to the bottle.

It should be noted that the structure previously recited is common to all of the various modifications of the feeding unit assembly herein disclosed. The alternative embodiments of the invention are provided by various types of nipple structures and will be described hereinafter according to the figures illustrating such structures.

The improved nipple disclosed in FIGURES 1, 2, and 3 includes a teat portion **40** having formed therein one or more feeding apertures **42**. The nipple **12** is hollow and has an outwardly extending flared portion **44** which is common to all forms of the nipple disclosed herein. The flared portion **44** has formed at the lower portion thereof an outwardly extending annular shoulder portion **46** having a generally vertically extending annular sidwall **48**. At the lower end of the sidewall **48**, there is provided a larger diameter horizontally extending base flange **50**. The underside of the base flange **50** is seated on and in sealing engagement with the upper surface of the bead **20** and is retained thereto by the clamping ring **32**. The inwardly extending flange **34** of the clamping ring **32** engages the upper surface of the nipple base flange **50** to retain the assembly.

At this point, we would like to mention that the nipple structure **12** shown in FIGURES 4 through 13 is essentially the same as that shown in FIGURES 1 and 2, with the exception that the flared portion **44** and the shoulder portion **46** and sidewall portion **48** are in a somewhat altered form. The other forms of the nipples illustrated provide that outwardly flared annular portion **44** flows directly into a vertically extending wall portion **48** which terminates in a larger radially extending annular flange **50** which is in sealing engagement with the upper edge of bead **20**. All forms of the invention provide that the upper edge of the radially extending flange **50** is in engagement with the inwardly extending flange **34** of the retaining ring **32** to insure proper clamping of the nipple to the bottle.

In reviewing the nipple structures shown in FIGURES 1 through 13, it will be noted that each embodiment of the invention provides for the vertically extending annular wall portion **48** to include vent holes **52** which extend therethrough. Furthermore, the internal annular surface of vertical wall portion **48** encircles the outer periphery of the bottle neck **16** above the bead **20**, but does not engage such bottle surface when the shroud **14** has been removed and the nipple is ready for feeding. When the shroud has been removed, there is formed a recess or gap **54** between the annular wall and bottle finish adjacent the inner end of vent hole **52**. In all embodiments of the invention, there are two vent holes **52** provided in the vertical wall portion **48** of the nipple **12**, and such vent holes **52** are diametrically opposed, as best seen in FIGURE 1, illustrating the feeding unit assembly in the closed position. However, any number of vent holes **52** could be formed in the wall **48** depending on their size and the particular requirement of the feeding unit assembly.

On the internal surface of the nipple, there is formed an inwardly projecting annular shoulder or flange **56** which defines an internal annular recess **58** between the upper surface of the flange **56** and the lower internal surface of shoulder **46**. This particular recess **58** is only present in the structure shown in FIGURES 1 and 2.

It should be noted that annular flange **56** is present in all forms of the invention and extends over, but does not engage the bottle finish **18** when the assembly is ready for use, as shown in FIGURES 2, 5, 8, 10, and 13. Thus, a gap and unrestricted passage is present between the interior of the bottle to gap or recess **54**. When the unit is closed, as shown in FIGURES 1, 4, 7, 9, and 12, the shoulder **56** sealingly engages the bottle finish to restrict fluid from leaking or flowing into gap or recess **54**.

In the embodiment of the invention shown in FIGURES 1 and 2, it will be noted that there is provided a disk **60** which serves to provide an effective seal when the assembly is in the closed position shown in FIGURE 1. Sealing disk **60** is not essential to the invention covered herein. However, it can be utilized to prevent the flow of liquid into the teat portion **40** of the nipple **12** when the feeding unit assembly is in storage. The sealing disk **60** is seated in the recess **58** and in the embodiment illustrated has a series of radially extending grooves **62** formed in the lower surface of disk **60**. Grooves **62** allow for the passage of the fluid from the interior of the bottle **10** around the sealing disk when the feeding unit is in its released condition, as shown in FIGURE 2. As will be apparent, sealing disks **60** could be utilized with all forms of the improved nipple structures disclosed herein. Furthermore, other types of sealing disks could be used where necessary, depending on the sealing and flow requirements desired, without departing from the present invention.

As originally stated, it is the intention of this invention to provide a flapper valve to sealingly engage the finish **18** when the shroud has been removed, which valve will open when a vacuum occurs in the bottle to allow the ingress of air through vent holes **52** over the finish **18** into the bottle as the infant sucks and draws the fluid from the bottle through nipple apertures **42**.

The particular flapper valve structure shown in FIGURES 1, 2, and 3 includes an annular lip **64** integrally

formed on the inner end of sealing flange or shoulder **56**. The annular lip or flapper valve **64** angularly depends from the flange **56** and when the nipple is assembled to the bottle **10**, it engages and overlays the bottle finish **18**.

Generally speaking, all forms of the improved nipple have a similar flapper valve constructed and arranged as above discussed, thus the numeral **64** is used in all illustrations. However, the exact construction of the details of the valve differs, as will be hereinafter explained. That is to say, all forms of the invention use a flapper valve **64**, but the alternate structures of the valve include various configurations and surface contours which will be discussed separately hereinafter.

The flapper valve or lip **64** shown in FIGURES 1, 2, and 3 includes a series of radially extending grooves **66** formed in the upper surface of the angularly disposed lip. These grooves **66** provide for a reduced thickness to the lip **64** to increase and enhance its flexibility, so that the differential pressure which normally exists during feeding will be sufficient to move the lip **64** away from finish **18**.

Disclosure of the particular form of the valve or lip **64** shown in FIGURES 4, 5, and 6 provides for a smooth upper and lower surface of the lip **64**. However, an annular groove is formed at the juncture of the lip or valve portion **64** and flange or shoulder **56** to provide greater flexibility at that section for the required movement of the valve **64**. This groove indicated at **70** is on the upper surface thereof and allows for efficient movement of the flap valves **64**, toward and away from bottle finish **18** when the feeding unit is in use.

The valve embodiment shown in FIGURES 7 and 8 is similar to the arrangement illustrated in FIGURES 4, 5, and 6. However, the annular groove **72** is formed on the underside of the lip **64** at the juncture of the valve **64** and the flange or shoulder **56**. The annular groove **72** on the underside of the lip **64** will provide greater flexibility for movement of the flapper valve **64** toward and away from bottle finish **18**.

The alternate valve embodiment shown in FIGURES 9, 10, and 11 provides for a separate flapper valve **74** provided on the annular lip **64**. The upper and lower surface configurations of the lip are smooth and the lip **64** is of a relatively thick cross section. At predetermined points, the lip **64** is radially slit, as shown in FIGURE 11, and thus provides a relatively short flapper valve **74** defined by the slits. The radial slits or cuts **65** in the lip portion **64** are arranged to be diametrically opposed to vent holes **52**. Accordingly, one such valve **74** would be provided for each vent hole **52**.

In the embodiment shown in FIGURES 12 and 13, the horizontally extending flange portion **56** and the angularly disposed lip portion **64** are arranged as previously described and have smooth surface configurations. The alteration in this particular structure involves modification of the lip portion **64** in that it includes a vertically extending annular lip **76** having a relatively thin cross section. The lip **76** provides the seal between the nipple and the finish **18** when the shroud has been removed. The main portion of the flange **64** is not arranged to control the flow of air into the interior of the bottle. The lip **76** is relatively thin and flexible and will move toward and away from the bottle finish **18** during feeding. As previously described in all forms of this invention, when the protective cap or shroud **14** is removed and the nipple is released to assume its working position, the underside of the inwardly extending shoulder **56** forms with the internal surface of the vertically extending wall **48** an annular recess **54** and a clearance gap between the upper surface or finish of the bottle **18** and the lower surface of the flange or shoulder **56**. This recess and gap allows for the movement of air to pass through the vent holes **52** over the bottle finish **18** into the interior of the bottle. However, when the feeding unit assembly is in its closed position prior to the removal of the protective cap **14**, the compression of the nipple by the cap completely closes the vent holes **52** and the recess **54**. By such an arrangement, effective sealing is maintained for the bottle in storage.

In operation, when it is intended to ready the feeding unit assembly for use, the cap **14** is deformed enough to sever it from its frangible connection to the ring **32** and it is removed from the assembly. At this time, the bottle and nipple assembly will assume the position shown in FIGURES 2, 5, 8, 10, and 13. In each instance, there is an annular recess and gap formed between the bottle neck portion **16** and the bottle finish **18** and the internal surfaces of the nipple, which clearance cavities permit the passage of air to the interior of the bottle.

In the embodiment shown in FIGURES 1 and 2, as the infant withdraws fluid from the bottle assembly, the reduced cross-sectional areas **66** of the lip **64** allow the valve to move toward and away from the edge portion of the bottle finish **18** and air will pass through the vent holes **52** to the interior of the bottle. This action will equalize the interior and exterior pressures and permit the continuous flow of fluid to the infant. In the particular embodiment of FIGURES 1 and 2, the fluid will flow around the disk **60**, through the groove **62** and into the hollow end portion of the nipple teat **40**.

The embodiments shown in FIGURES 4, 5, 6, 7, and 8 will respond essentially in the same manner during the feeding process in that the fluid passes from the interior of the bottle **10** into the hollow end portion of the nipple. The flap valve **64** will move away from the finish **18** of the bottle to permit air to move to the interior of the bottle to equalize the pressure. The annular grooves **70**, **72** of the lip **64** permit greater flexibility of the flap valve or lip **64** to allow the air to move readily to the interior of the bottle.

In the embodiment shown in FIGURES 9, 10, and 11, the angularly extending flap valve **64** is of relatively thick cross section, and it will not be inclined to flex easily. However, the radial slits **65** are made in this lip portion to form individual flap valves **74**, which are positioned diametrically opposite the vent holes **56**. These small flap valves **74** will move easily toward and away from the finish portion **18** of the bottle neck **16** and allow the ingress of air to the interior of the bottle to equalize the pressure.

In the embodiment shown in FIGURES 12 and 13, the thin annular lip portion **76** will respond relatively easily to the pressure differential caused by the sucking of the infant drawing the fluid from the bottle. This lip **76** will move inwardly as the pressure is reduced on the inside of the bottle allowing air to pass through vent holes **52** through the recess **54** over the bottle finish **18** to the interior of the bottle to equalize the pressure and prevent a vacuum from being formed therein.

Thus, it will be seen that when the nipple teat portion **40** is inserted in the infant's mouth, the formula will flow through the aperture **42** in response to the sucking or feeding action. As the infant feeds and the formula flows from the container, a suction or vacuum is created which will cause the valve **64** in its various forms to flex inwardly and move away from bottle finish **18**. This allows air to flow in through vent holes **52** and pass into the container to replace the volume of fluid withdrawn from the bottle, thereby equalizing pressure conditions inside and outside of the container.

Of course, it will be realized that fluid cannot flow out of the vents **52** because the reduced pressure condition within the container causes only an inward flow of air. As soon as the pressure conditions are equalized, the resilient flap valve in its various forms will move back against the finish portion **18**, which will close the interior of the container to the vents **52**.

Although the invention has been described and illustrated in detail, such detail is to be understood in an instructive, rather than restrictive sense and many variants being possible.

What is claimed is:

1. A hollow feeding nipple adapted to be connected to the finish of a bottle comprising a teat portion at one end thereof, an open end portion at the opposite end thereof and defined by an outwardly extending annular flange, an integral annular vertical wall disposed between the teat portion and the outwardly extending annular flange portion, said vertical wall defining a vent aperture extending therethrough, an annular inwardly extending flange formed on the internal surface of the hollow nipple and disposed between said teat portion and said vertical wall portion defining the vent, the inwardly extending flange including an annular angularly disposed lip integral therewith on the innermost end thereof, said angularly disposed lip being provided in its upper surface with a large multiplicity of uniformly spaced radial grooves, said grooves being more closely spaced than the width of the grooves, whereby flexing of the groove area relative to the lower surface of the lip and relative to the bottle finish during the feeding action occurs to facilitate venting of the bottle.

2. A hollow feeding nipple adapted to be connected to the finish of a bottle comprising a teat portion at one end thereof, an open end portion at the opposite end thereof and defined by an outwardly extending annular

flange, an integral annular vertical wall disposed between the teat portion and the outwardly extending annular flange portion, said vertical wall defining a vent aperture extending therethrough, an annular inwardly extending flange formed on the internal surface of the hollow nipple and disposed between said teat portion and said vertical wall portion defining the vent, the inwardly extending flange including an annular angularly disposed lip integral therewith on the innermost end thereof, said angularly disposed lip is provided adjacent the vent with a relatively narrow radially extending flapper valve formed by closely spaced apart radial slits in said lip portion.

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U.S. Cl. X.R.

128—252