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(54) Title: A BREAST ATTACHMENT

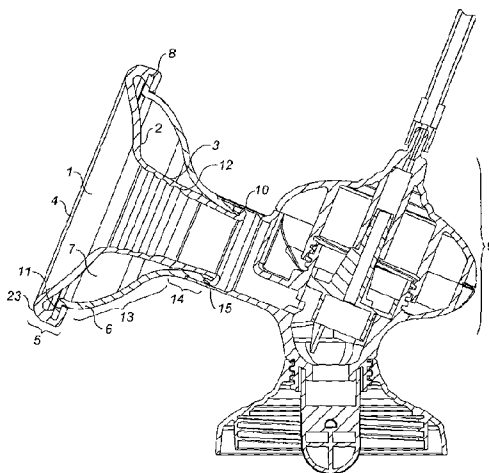


FIG. 1

(57) Abstract: The invention relates to a breast attachment, in particular a flexible insert for a breast pump or a nipple shield, wherein the insert or shield applies a positive massaging effect on a breast mimicking the natural stimulation of a baby breast feeding.



WO 2011/007140 A1

A breast attachment

The invention relates to a breast attachment, in particular a flexible insert for a breast pump or a nipple shield, wherein the insert or shield applies a positive massaging effect on a breast mimicking the natural stimulation of a baby breast feeding.

There are disadvantages associated with all known massaging breast pump inserts and shields.

The breast pump insert described in EP0727234 (Avent Limited) has recessed petals which rest against the breast and then move away from the breast when suction is applied due to the fact that the vacuum is directed to the space between the massaging insert and the rigid support horn. It is doubtful if the movement away from the breast actually provides any massaging effect.

US7396339 (The First Years Inc.) also describes a breast pump insert with recessed massaging petals, comprising regions within the massaging insert with thinned walls. However, the suction is directed via channels in the insert to the thinned regions in the space between the insert and the breast. As such, when suction is applied from the breast pump, the thinned regions move towards the breast and apply a massaging pressure. This could provide useful massage, but relies on the channels in the wall of the insert to direct suction to the recesses. However, the channels are small and will easily be blocked by the user's own breast.

Alternatively, US2004024352 (Playtex) has a massaging insert with a membrane, which again applies positive massaging force to the breast, but which utilises a build-up of pressure in the cavity between the massaging insert and the supporting horn. The breast pump described in US2004024352 either provides for no suction to the breast, which would otherwise encourage milk expression in the manner of most other known breast pumps, or it requires the breast pump to simultaneously apply suction to the breast and increased pressure to the massaging membrane. The latter would require a more complex breast pump than is desired.

It is well known that suction applied to the breast in short pulses provides the most efficient milk expression. As known in the art, applying suction to the breast stimulates milk expression by mimicking the action of a baby. The flexible regions of known breast pumps can assist milk expression by providing a small massaging effect. However, the flexible

regions move by a pressure differential across a thinned region of material and the massaging pressure is therefore minimal because it relies on stretching the material, which requires a lot of energy.

In a first aspect, the present invention provides a flexible breast attachment comprising a cup portion sized to receive a human breast; a cylindrical portion extending from the cup portion having an inner surface and an outer surface, wherein the cylindrical portion comprises a circumferential groove disposed on the inner surface for enabling the cylindrical portion to collapse along the circumferential groove, whereby the cylindrical portion can move from an uncollapsed state having a generally circular cross-section to a collapsed state having a generally flattened oval cross-section.

In an embodiment, the attachment is a breast pump insert. In an embodiment, the insert further comprises a lip at each end.

In an embodiment, the attachment is a nipple shield. In an embodiment, the cylindrical portion terminates with a domed portion. In an embodiment, the domed portion comprises cut-out regions.

In a second aspect, the present invention provides a rigid horn comprising the attachment of the first aspect, wherein said horn comprises a circular portion and a cylindrical portion and corresponds to the shape of a human breast.

In an embodiment, the attachment comprises a projection arranged to interrupt a seal between the horn and the attachment. In an embodiment, the attachment is secured to the rigid horn. In an embodiment, the attachment is secured to the horn by interaction between a lip at each end of the insert and corresponding portions of the horn.

In a third aspect, the present invention provides a breast pump comprising the horn of the second aspect, a source of pressure in communication with said attachment and a container for collecting milk. In an embodiment, the source of pressure is a diaphragm pump.

In a fourth aspect, the present invention provides a method of expressing milk comprising placing the horn of the second aspect on a breast, applying a negative source of pressure and collecting the expressed milk.

DETAILED DESCRIPTION

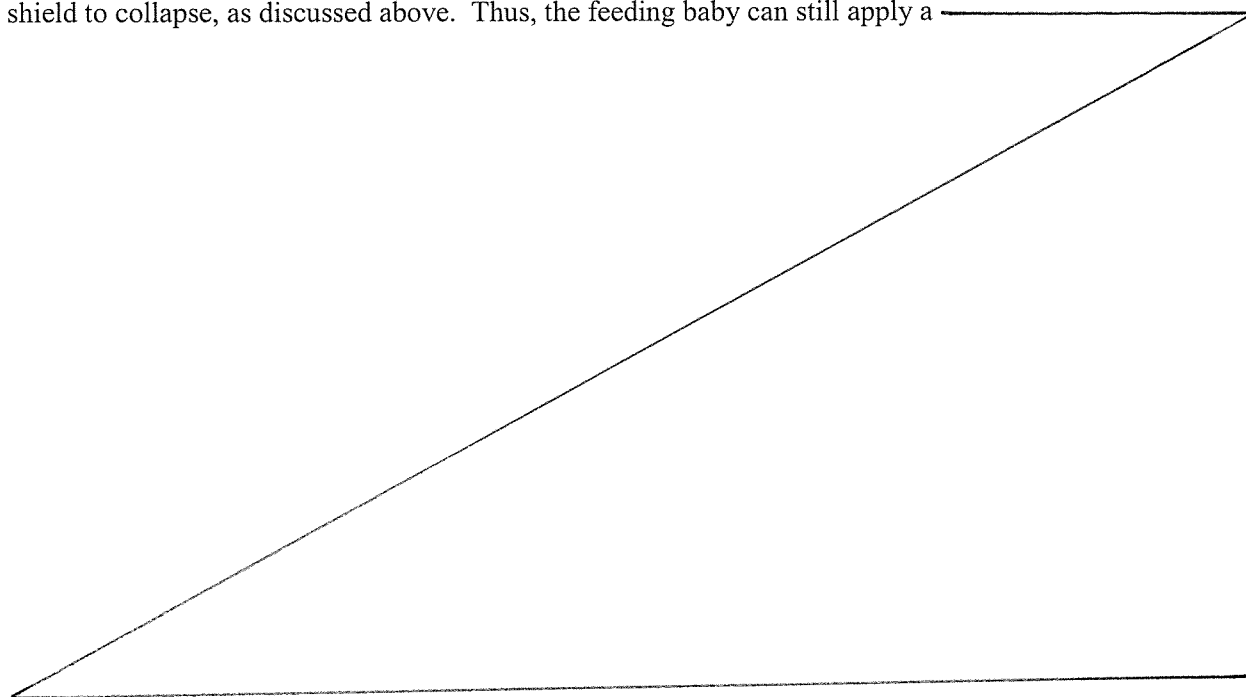
Known nipple shields have a constant wall thickness and are either too rigid due to thick walls, which inhibits massage, or too flexible due to thin walls, which do not provide enough protection for the mother and risk damage to the shield.

Accordingly, the present invention provides a breast attachment that can be used as an insert in a breast pump or as a nipple shield to provide a positive massaging effect, which promotes milk expression. The attachment achieves this positive massaging effect by including at least one circumferential groove on the neck of the attachment and a cushioned outer rim. The circumferential grooves in the attachment of the invention provide weaknesses in the wall of the insert, which react to a decrease in pressure within the insert to collapse inwardly and significantly distort the attachment. The attachment shape change provides a much greater massaging pressure without needing to provide a lot of suction.

This is unlike the known art, where the massaging force is dependent on stretching the material and hence is directly proportional to the suction applied. In addition, the known breast pump inserts exert localised force, towards or away from the breast, acting approximately perpendicular from the breast, which is not representative of a baby's mouth. The shape change of the insert of the invention is much more representative of the action of a baby's mouth when feeding, so is likely to be more successful at causing milk expression. Specifically, the whole insert collapses and deforms, mimicking a baby's mouth as it goes from a wide "O" shape to a flattened shape.

When the insert is placed on the user's breast, the cushioned outer rim gives a comfortable feel due to the locating channel away from the surface of the insert which contacts the breast. Hence, when suction is applied and the user presses the pump onto her body, she cannot feel the hard outer rim of the rigid horn pressing through the flexible insert.

The invention also relates to a nipple shield that comprises the same circumferential grooves allowing the shield to collapse, as discussed above. Thus, the feeding baby can still apply a



natural massaging effect and promote milk expression, even when the shield is in place. The shield also protects the mother's nipple.

Embodiments of the invention will now be described by way of example with reference to the drawings of which:

Figure 1 shows a cross-section view of a breast pump insert (1), with a circular portion (2), attached to a head unit (9), which in turn is attached to a container and a pump lead.

Figure 2 shows a cross-section view of a breast pump insert (1) comprising a circular convex portion (16) in place of a circular cup portion.

Figure 3 shows a cross-section view of a nipple shield.

Figure 4 shows an overview of a nipple shield.

The attachment can comprise a circular cup portion (2). At the base of the cup (2), the attachment also comprises a cylindrical neck (3) that extends from the cup portion (2) of the attachment (1). The attachment (1) is made of a flexible material.

The cylindrical portion (3) of the attachment (1) comprises at least one circumferential groove (12) on the inner surface. The grooves alternative with lands (i.e. ridges that result due to the grooves). Preferably the cylindrical portion (3) comprises two, three, four, five or six grooves. The grooves (12) can additionally or alternatively occur on the outer surface of the cylindrical portion (3). The attachment (1) does not include thinned regions around the circumferential grooves (12). The circumferential grooves (12) and lands provide the cylindrical portion (3) with an undulating cross section.

The attachment can be an insert for a breast pump. The circular portion (2) of the insert (1) has a shallow cup shape when it is not attached to any other components of the breast pump. The edge or rim (4) of the cup portion (2) folds back on itself to form a lip (5). By folding out and back on itself, this portion of the insert (1) also forms a rim (23) i.e. bulbous section that has a cushioning effect when in use.

The insert can also comprise a circular convex portion (16) in place of the circular cup portion. The convex portion (16) domes outward to provide a cushion against which the user can press. The convex portion (16) ensures that the breast cannot be pressed against the rim of the rigid horn.

When assembled for use, the insert (1) fits into a rigid horn (6), such that the entire of the inner surface of the rigid horn (6) is protected by the insert (1). The shape of the rigid horn (6) therefore corresponds generally to the shape of the flexible insert (1) i.e. the horn (6) is made up of a circular cup portion (13) with a cylindrical neck portion (14) extending from the base of the circular portion. The cup shape of the circular portion (13) of the horn (6) is significantly more pronounced than the cup-shape of the flexible insert (1) when the flexible insert (1) is not secured within the horn (6). The rigid horn (6) comprises a step (15) from the cup portion (13) to the cylindrical portion (14). When the rigid horn (6) is attached to a head unit (9), the entire cylindrical portion fits into a corresponding portion in the head unit

A cavity (7) is formed between the flexible insert (1) and the rigid horn (6). The lip (5) of the flexible insert (1) at the edge of the circular portion (2) or circular convex portion (16) comprises a recess or channel (8) formed between a pointed ridge on the outer surface of the insert (1) and the outer edge of the lip (5). A corresponding portion of the rigid horn (6) fits into the recess or channel (8), so as to achieve a tight connection between the flexible insert (1) and the horn (6). Thus, the mouth of the insert (1) hooks onto the rigid horn (6).

The seal of the cavity (7) between the flexible insert (1) and the rigid horn (6) is broken by two small parallel flat-topped projections on the insert (1) that run perpendicular to the lip (5) at the edge of the circular portion. The projections can also run in any other direction relative to the lip provided the projections break the seal between the insert (1) and the horn (6). The projections may be any structure that juts out from the insert (1) e.g. a ridge, a bar or a formation. If the cavity (7) was sealed, deformation of the insert during use would change the volume of the cavity. This would affect the pressure and any change in pressure would provide resistance to the insert (1) deformation (thus inhibiting the amount of massaging provided by the insert). The two small flat-topped ridges provided on the insert (1) create an air passage around the outer rim of the horn (6) and ensures that the cavity (7) can maintain ambient pressure regardless of any volume deformations inside the cavity (7).

At the end of the cylindrical portion (3) of the insert (1) that attaches to a head unit (9), the insert portion also folds back on itself, to provide a channel or recess (10) into which the rigid horn (6) can tightly fit. Thus, the flexible insert (1) hooks onto the rigid horn (6) at both ends.

The portion of the rigid horn (6), which the cup portion of the insert (1) hooks onto is a flat rim (11) that fits into (or interacts with) the channel or recess of the insert (8). The other end of the rigid horn (6) that the cylindrical portion (3) of the insert (1) fits onto has a portion cut out to leave a section of cylindrical rigid horn that is thinner than the remainder of the horn and that fits into (or interacts with) the recess or channel (10) provided by the insert (1).

When the flexible insert (1) is attached to the rigid horn (6), the flexible insert (1) is stretched causing the cup shape of the insert (1) to become more pronounced and correspond generally to the shape of a breast, such that the insert (1) can be placed on a breast.

The combined structure of the insert (1) and rigid horn (6) attaches to a head unit (9) i.e. the main body of the pump) at the end of the cylindrical portion (3).

The head unit (9) can be attached to a manual pump or an electrical pump. A suitable electric pump is a diaphragm pump.

When in use the head unit (9) is also connected to a container in which the milk is collected. The head unit (9) can comprise an internal thread for screwing the unit onto a container. The unit can also comprise a one way valve at the portion of the unit that attaches to the container, such that when a container is attached, milk passes through the unit and the valve into the container. The one way valve may be a duck-bill valve or flap valve as known in the art.

When in use, suction is applied to the breast and the flexible insert by a pump causing the flexible insert to collapse along the circumferential grooves. This causes the cylindrical neck (3) of the insert (1) to collapse and distort, going from a circular cross-section to a flattened oval cross-section. This change in shape provides a massaging pressure on the breast, which stimulates milk production.

After the suction pulse ends and the pump bleeds air back into the unit and the flexible insert (1) returns to the original shape. Any milk that is expressed during the suction cycle will pass

down the neck of the insert (1) into the unit body (9) and subsequently into a storage container via a one-way valve.

The two flat-topped projections on the insert (1) ensure that deformation of the insert occurs with minimal resistance because the cavity (7) between the flexible insert (1) and the rigid horn (6) is not sealed from the ambient atmosphere.

The flexible insert (1) can be made from silicone rubber, while the horn (6) and head unit (9) of the pump can be made from a rigid plastic such as polypropylene.

The attachment can also be a nipple shield. When the attachment is a nipple shield the cylindrical neck terminates with a domed portion (19), shaped to receive a nipple.

The dome shaped portion (19) of the shield comprises at least one cut-out portion (17). The cut-out portions can represent substantially a fifth, a quarter, a third or more of the total domed portion. The domed portion can additionally comprise smaller holes (18) in the tip of the domed portion.

The cup shaped portion of the nipple shield is a wide, flat region that can be made of thin material and can seal to a breast. The cylindrical portion (3) and the domed portion (19) can be made from thicker material.

The nipple shield can be made from silicone rubber.

When in use the nipple shield is placed on a breast and a baby sucks the cylindrical portion (3). As the baby feeds, the circumferential grooves (12) in the cylindrical portion (3) cause the shield to collapse and thereby exerting a natural massaging effect on the breast, promoting milk release.

The baby may also apply a massaging action caused by changing the shape of its mouth from an "O" to a flatter shape. The circumferential grooves (12) thereby ensure that the nipple shield can collapse easily and transmit the natural massaging action to the breast with minimal interference. In other words, if the shield does not collapse it will resist the massaging force from the baby's feeding action. This is undesirable as the nipple shield will inhibit the natural

feeding action and reduce stimulation of the breast which may, ultimately, cause the mother's milk supply to decrease.

The cut-out portions allow release of a substantial amount of milk into the baby's mouth. In addition, the cut-out portions can mean that the baby can feel the mother's nipple.

When not in use the shield can be stored and protected by a casing. The casing (22) comprises a first cup shaped portion (20) with a second dome shaped portion (21) to accommodate the nipple portion of the shield.

Although a preferred embodiment of the present invention has been described in the foregoing detailed description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the scope of the invention.

Throughout this specification, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

All publications mentioned in this specification are herein incorporated by reference. Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed in Australia or elsewhere before the priority date of each claim of this application.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A flexible breast attachment comprising a cup portion sized to receive a human breast; a cylindrical portion extending from the cup portion having an inner surface and an outer surface, wherein the cylindrical portion comprises a circumferential groove disposed on the inner surface for enabling the cylindrical portion to collapse along the circumferential groove, whereby the cylindrical portion can move from an uncollapsed state having a generally circular cross-section to a collapsed state having a generally flattened oval cross-section.
2. The attachment of claim 1, wherein the attachment is a breast pump insert.
3. The attachment of claim 2, wherein the insert further comprises a lip at each end.
4. The attachment of claim 1, wherein the attachment is a nipple shield.
5. The attachment of claim 4, wherein the cylindrical portion terminates with a domed portion.
6. The attachment of claim 5, wherein the domed portion comprises cut-out regions.
7. A rigid horn comprising the attachment of claim 2 or claim 3, wherein said horn comprises a circular portion and a cylindrical portion and corresponds to the shape of a human breast.
8. The horn of claim 7, wherein the attachment comprises a projection arranged to interrupt a seal between the horn and the attachment.
9. The horn of claim 7 or claim 8, wherein the attachment is secured to the rigid horn.
10. The horn of claim 9, wherein the attachment is secured to the horn by interaction between a lip at each end of the insert and corresponding portions of the horn.
11. A breast pump comprising the horn of any one of claims 7-10, a source of pressure in communication with said attachment and a container for collecting milk.
12. The breast pump of claim 11, wherein the source of pressure is a diaphragm pump.
13. A method of expressing milk comprising placing the horn of any one of claims 7- 10 on a breast, applying a negative source of pressure and collecting the expressed milk.

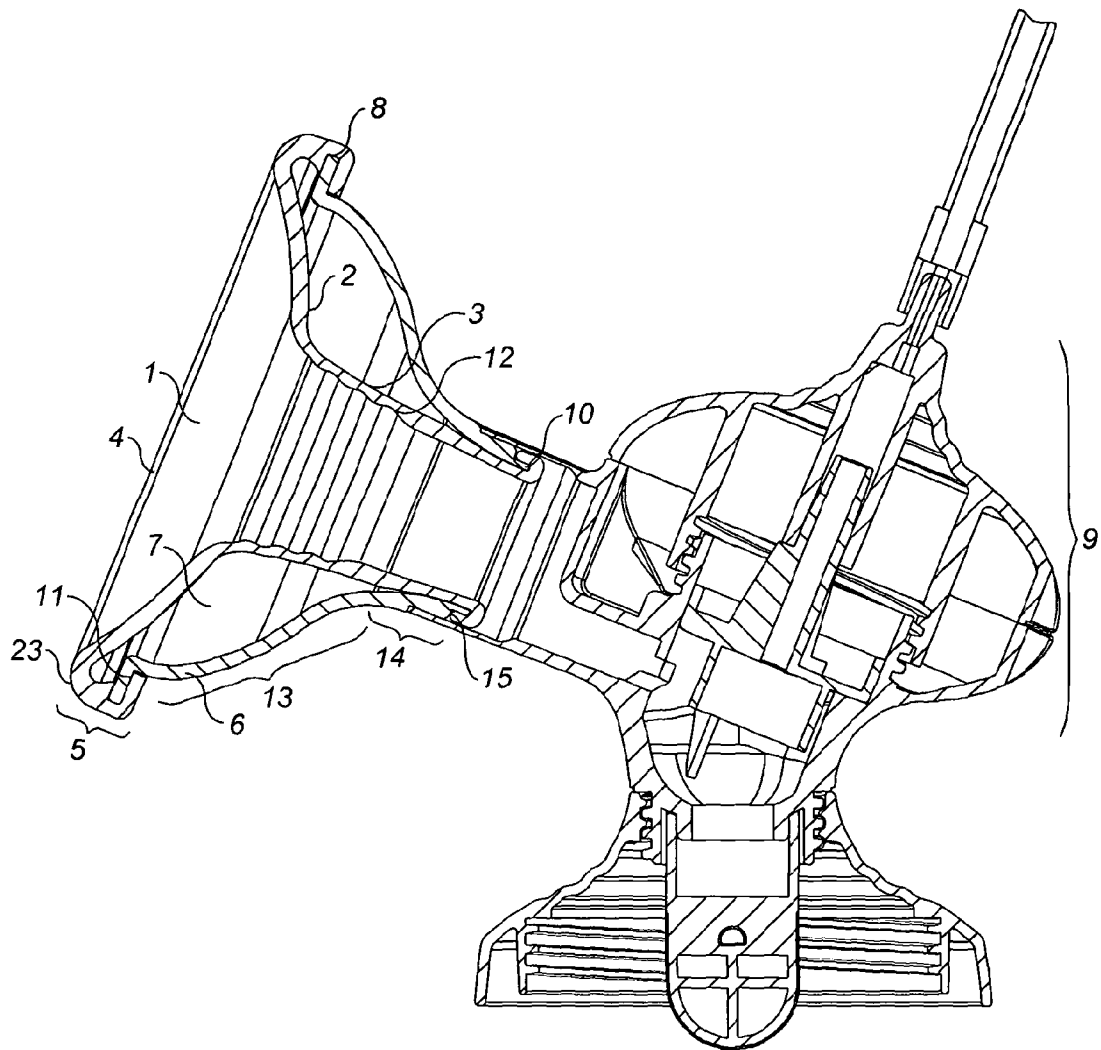


FIG. 1

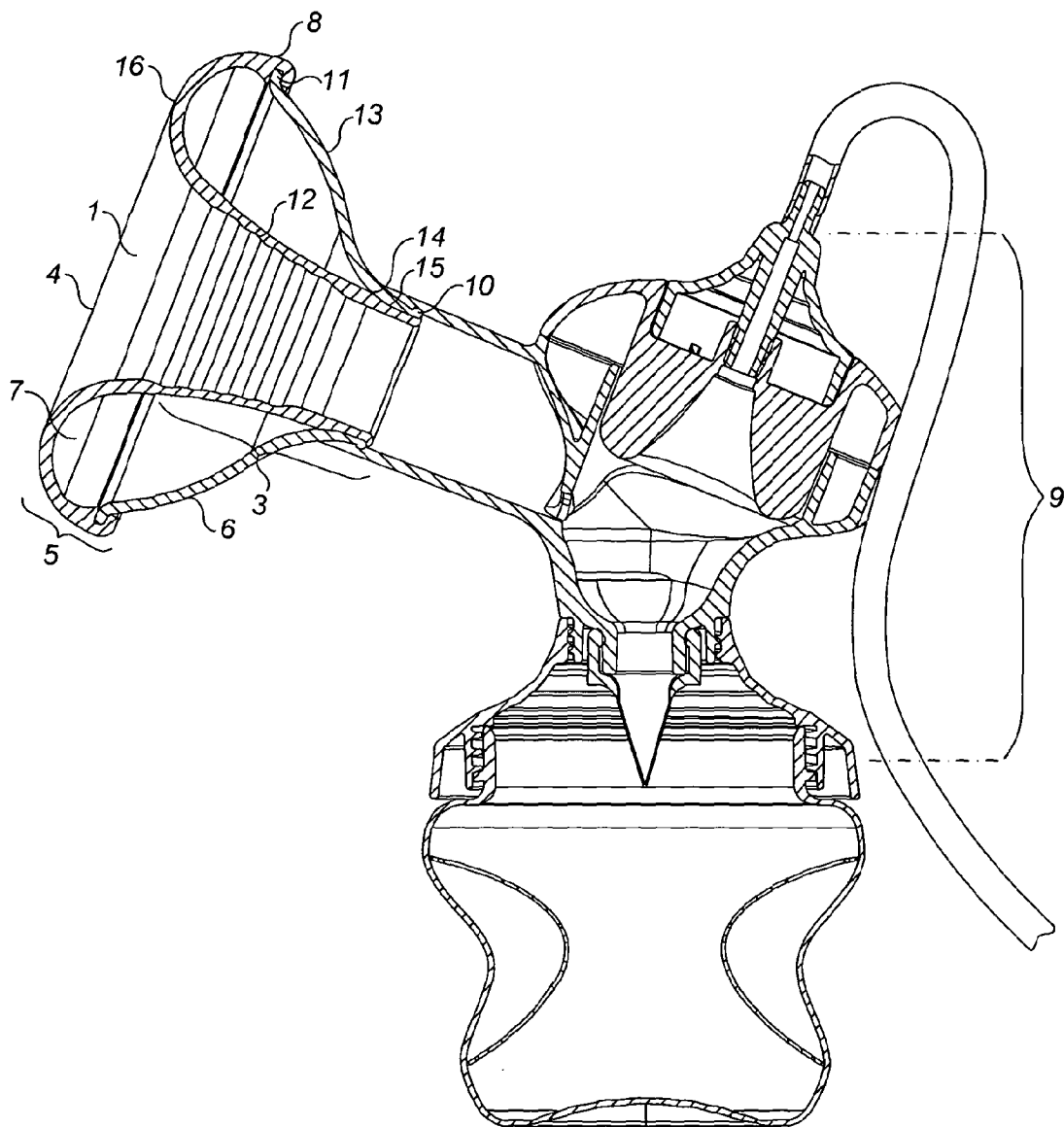


FIG. 2

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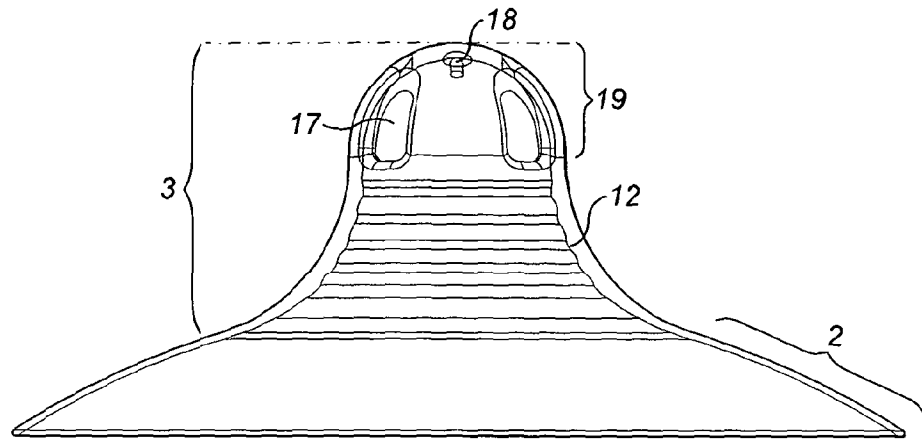


FIG. 3

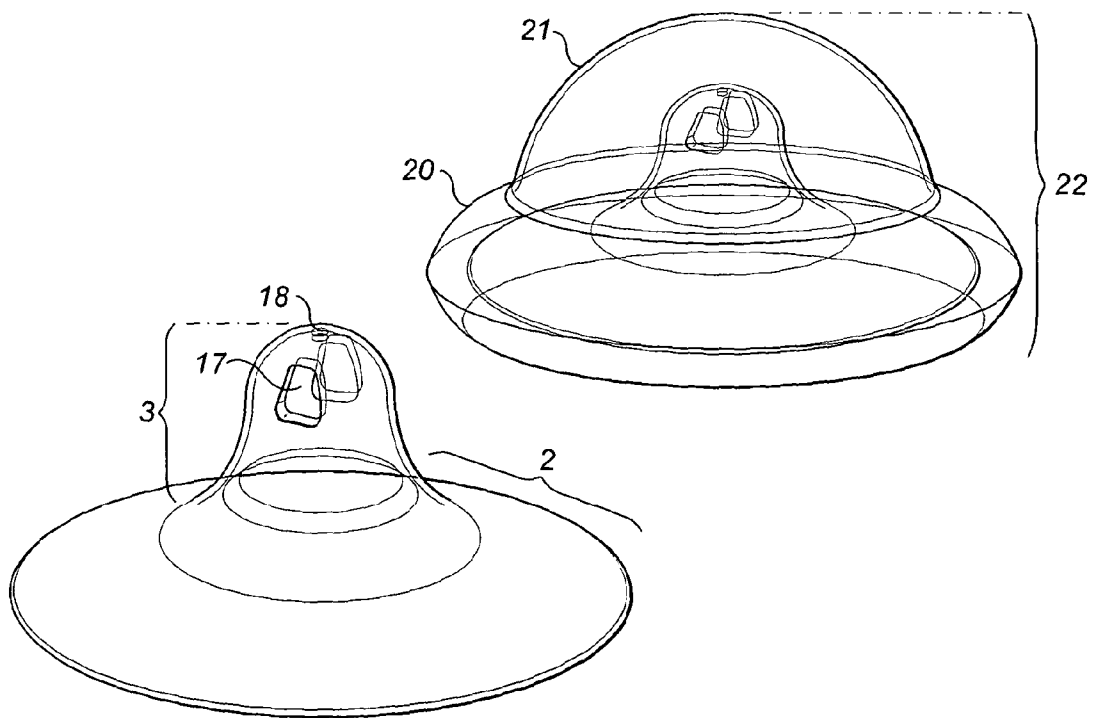


FIG. 4