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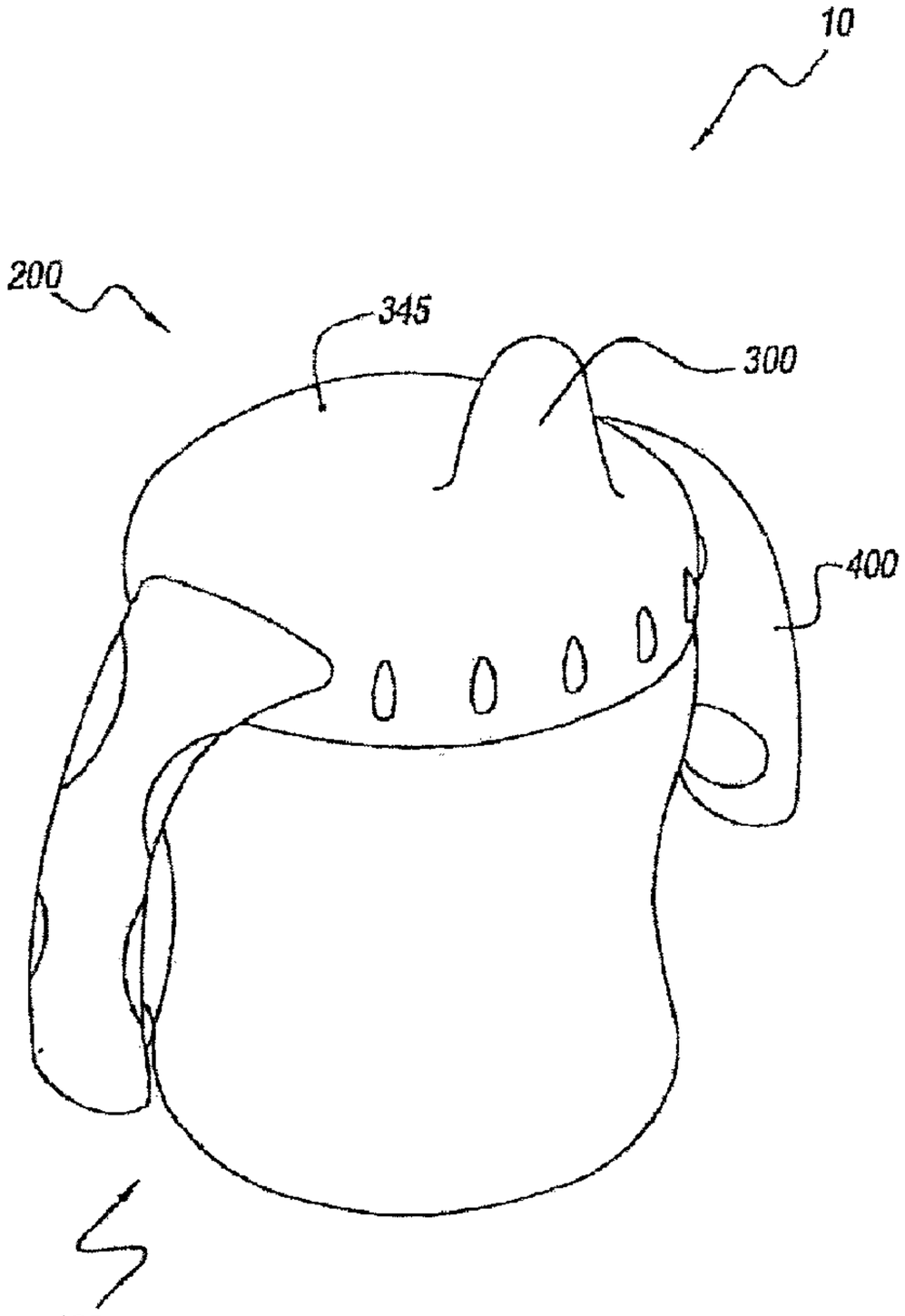

(57) Abrégé/Abstract:
A cup assembly comprises a cup, lid body, an annular flange extending from said lid, a spout; and a handle ring securable to said annular flange and, at least one handle connectable to said handle ring.

55410-50D3

ABSTRACT

A cup assembly comprises a cup, lid body, an annular flange extending from said lid, a spout; and a handle ring securable to said annular flange and, at least one handle connectable to said handle ring.

55410-50D3

SPOUT FOR A CUP ASSEMBLY

This is a divisional of Canadian Patent Application Serial No. 2,834,743 filed on November 26, 2013 which is a divisional of Canadian National Phase Parent Application Serial No. 2,520,447 filed on April 1, 2004.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to cups. More particularly, the present invention relates to infant cup assemblies.

2. Description of the Prior Art

Cups designed especially for use by infants or children are known. Such cups are intended to facilitate the gripping of the cup by the infant. Contemporary devices often employ gripping structures that are formed on the surface of the bottle.

A baby bottle with an outer surface that has been adapted to provide handles intended to allow infants and children to better grip the bottle, is disclosed in U.S. Patent 5,215,203 to Malcolm. The bottle has at least two sets of handles that are formed integrally with the bottle by a plurality of recesses extending vertically along a substantial length of the bottle. The recesses have either side walls that converge towards each other as they extend towards a central longitudinal axis of the bottle or side walls that are parallel to each other. The lobe shaped handles resulting from the converging side walls and the rectangular shaped handles resulting from the parallel side walls, allow an infant or child to partially grasp or hold the handles. The bottles provide limited assistance to infants or children because they do not allow for a complete or nearly complete closure of the infants hands around the handles.

Other cups designed especially for use by infants or children include orifices that are intended to reduce spillage of fluid from the cup. Such cups have drinking orifices and separate air vents, which allow the user to drink from the orifice without creating excessive vacuum in the cup. However, drinking orifices and air vents are liable to leak liquid stored in the cup between feedings, or if dropped during use. Drinking

orifices and the surrounding lid structure through which the orifices are disposed, have a lasting effect on the child's lip placement which can impact the child's ability to feed and swallow.

Certain cups have been developed that use valving mechanisms at the orifice and at the air vent. These valves respond to suction generated during feeding to open and allow liquid to pass through the orifice and to allow air to enter the air vent when a vacuum is developed in the interior of the cup. Patents disclosing such valves include U.S. Patent No. 5,079,013 to Belanger, U.S. Patent No. 6,422,415 to Manganiello, U.S. Patent No. 6,050,445 to Manganiello and U.S. Patent No. RE 37,016 to Morano, which are commonly assigned or licensed to the assignee of the present application.

Accordingly, there is a need for cups having handles, which facilitate gripping and grasping by infants, and motivate infants to use such handles. There is also a need for handles on cups having sufficient strength to withstand use by children. There is a further need for cups having lids and orifices that facilitate use by children, including promoting proper lip closure around the orifice.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a cup assembly that assists infants and children in holding the cup assembly.

It is another object of the present invention to provide such a cup assembly that promotes better hand-to-mouth coordination.

It is yet another object of the present invention to provide such a cup assembly that promotes independent cup drinking in the child.

It is still another object of the present invention to provide such a cup assembly that reduces or eliminates leakage and spillage.

It is a further object of the present invention to provide such a cup assembly that facilitates use of the spout.

It is another further object of the present invention to provide such a cup assembly that facilitates generation of a suction force and promotes improved flow-rate through the orifice.

It is yet a further object of the present invention to provide such a cup that promotes proper lip closure.

It is still a further object of the present invention to provide such a cup assembly that promotes better lip approximation.

These and other objects and advantages of the present invention are provided by a lid for a cup comprising a lid body removably securable to the cup; an orifice; and a handle having a rigid portion and a gripping portion. The rigid portion is formed from a first material, the gripping portion is formed from a second material, and the first material has a higher Shore A hardness than the second material. The lid body can have a spout with the orifice formed therethrough. The handle can have an upper surface and a lower surface with the gripping portion at least partially covering the upper surface and substantially covering the lower surface.

In another aspect of the invention, a cup assembly for an infant is provided comprising a cup defining an inner volume; a lid having an orifice in fluid communication with the inner volume and the lid being removably securable to the cup; and a handle having a rigid portion and a gripping portion. The rigid portion is formed from a first material, the gripping portion is formed from a second material, and the first and second materials are integrally molded. The first material has a higher Shore A hardness than the second material.

In another aspect of the invention, a cup assembly for an infant is provided comprising a cup defining an inner volume; a lid having an orifice in fluid communication with the inner volume and the lid being removably securable to the cup; and a handle comprising a rigid portion and a gripping portion and having a proximal end and a distal end. The rigid portion is formed from a first material and the gripping portion is formed from a second material. The first material has a higher Shore A hardness than the second material. The proximal end is secured to the lid

and the distal end is separated from the cup by a first distance when the lid is secured to the cup. The first distance is large enough to allow a hand of the infant to pass between the cup and the distal end of the handle.

In another aspect of the invention, a cup assembly is provided which comprises a cup defining an inner volume, and a lid having a spout, an orifice and a handle. The orifice is disposed through the spout. The handle has a rigid portion and a gripping portion. The rigid portion has a channel. The rigid portion is formed from at least a first material and the gripping portion is formed from at least a second material. The first material has a higher Shore A Hardness than the second material. A first portion of the second material is disposed in the channel and a second portion of the second material is disposed adjacent to the channel.

In another aspect of the invention, a method of making a handle for a cup assembly is provided. The method comprises molding a rigid portion of the handle from a first material, with the rigid portion having at least one channel formed therein. The method further comprises molding a gripping portion of the handle from a second material, with the gripping portion having at least a first portion disposed in the channel. The first material has a higher Shore A Hardness than the second material.

In another aspect of the invention, a method of making a lid is provided. The method comprises molding a rigid portion of the lid from a first material, with the rigid portion having a lid body, a spout, and a handle. The handle has at least one channel formed therein. The method further comprises molding a gripping portion of the lid from a second material, with the gripping portion having at least a first portion disposed in the channel. The first material has a higher Shore A Hardness than the second material.

The rigid portion can have a channel formed therein, with at least a portion of the second material disposed in the channel. The channel can be first and second channels disposed at least partially along the rigid portion. The rigid portion can have first, second and third walls integrally formed with each other and defining the first and second channels. The

first and second walls can be substantially orthogonal to the third wall. The handle can have an upper surface and a lower surface with the first wall of the rigid portion at least partially defining the upper surface, and with the gripping portion at least partially defining the lower surface.

The rigid portion can have a rib disposed along at least one of the first and second channels, and the rib can be substantially parallel with the first and second walls. The rib can be disposed in proximity to the proximal end of the handle. The first wall can have a wave-like shape, with the gripping portion having a corresponding wave-like shape adjacent to the first wall, and substantially defining the lower surface. The third wall can have a projection formed therein, and the second material can be molded over the projection to form a gripping abutment. The gripping abutment can be disposed in proximity to the distal end of the handle.

The first material can be a polypropylene and the second material can be a thermoplastic elastomer. The lid can have a spout and the orifice can be formed in the spout. The lid can have a vent hole formed therein. There can also be a flow control valve in fluid communication with the orifice, the vent hole and the inner volume, wherein the valve limits flow from the inner volume through the orifice. The handle can be a pair of handles extending from the lid and diametrically opposed along the lid. The spout can have an ellipsoidal cross-sectional area. The spout can have a distal end, and can be inwardly tapered toward the distal end. The spout can have a top wall, with the orifice being disposed through the top wall, and with the top wall having an upwardly arcuate or dome-like shape.

The molding of the gripping portion can include disposing a second portion of the second material adjacent to the channel. The molding of the rigid portion can include integrally forming a first wall, a second wall and a third wall, with the third wall connecting the first and second walls. The molding of the rigid portion can include forming a substantially planar bottom surface along the channel.

In another aspect of the invention, there is provided a cup assembly, comprising: a cup having an exterior surface and an interior surface, said interior surface defining an interior volume, said cup having a top open end, a middle portion, and a bottom portion with a closed end; a lid body having a lid wall with a top surface and a bottom surface opposite said top surface; an annular flange having a flange wall extending downwardly from said lid wall that is connectable to a cup, said flange wall having an outer surface and an inner surface opposite said outer surface; a spout extending from said top surface, said spout having a front wall, a rear wall, a first side wall connecting said front wall and said rear wall on a first side, a second side wall connecting said front wall and said rear wall on a second side opposite said first side, and a top wall, said top wall being connected to said front wall, said rear wall, said first side wall and said second side wall, said top wall being an upwardly convex shape forming chamfered edges with said front wall and said rear wall; a handle ring removably securable to said top surface of said annular flange, wherein at least one handle is connectable to said handle ring and extends curvingly downward to said bottom portion of said cup, said handle having a proximal end connected to said handle ring and a distal end, said distal end being spaced a sufficient distance from said cup such that a child's hand can pass between said distal end and said cup, wherein said inner surface of said annular flange engages said exterior surface of said top open end of said cup, wherein said first side wall and said second side wall are inwardly tapered toward said top wall, and wherein said first side wall has an angle of taper β1 from about 5° to about 18° and said second side wall has an angle of taper β2 from about 5° to about 18°, wherein said front wall and said rear wall are inwardly tapered along a substantially straight line or constant slope, wherein said front wall has an angle of taper α1 from about 5° to about 15° and said rear wall has an angle of taper α2 from about 5° to about 15°.

Other and further objects, advantages and features of the present invention will be understood by reference to the following.

55410-50D3

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front perspective view of a cup assembly of the present invention;

Figure 2 is a rear view of the cup assembly of Figure 1;

Figure 3 is a top view of the cup assembly of Figure 1;

Figure 4 is a front view of the flow control valve for the cup assembly of Figure 1;

Figure 5 is a top perspective view of the cup of Figure 1;

Figure 6 is a front view of the lid of Figure 1;

Figure 7 is a side view of the lid of Figure 1;

Figure 8 is a bottom perspective view of the lid of Figure 1;

Figure 9 is a front perspective view of the lid of Figure 8 without a gripping portion;

Figure 10 is a front view of the lid of Figure 9 without the gripping portion;

Figure 11 is a side view of the lid of Figure 9 without the gripping portion;

Figure 12 is a bottom view of the lid of Figure 9 without the gripping portion;

Figure 13 is a front view of an alternative embodiment of the lid of Figure 8 without a gripping portion;

Figure 14 is a bottom perspective view of another alternative embodiment of the lid of Figure 8 without a gripping portion;

Figure 15 is a front view of a prior art PLAYTEX® conventional lid;

Figure 16 is a side view of the prior art PLAYTEX® conventional lid of Figure 15;

Figure 17 is a top view of the prior art PLAYTEX® conventional lid of Figure 15;

Figure 18 is a front view of a prior art GERBER® conventional lid;

Figure 19 is a side view of the prior art GERBER® conventional lid of Figure 18; and

Figure 20 is a top view of the prior art GERBER® conventional lid of Figure 18.

DESCRIPTION OF THE INVENTION

Referring to the drawings and, in particular, Figs. 1 through 4, there is shown a preferred embodiment of a cup assembly of the present invention, generally represented by reference numeral 10. Cup assembly 10 has a cup or container 100, a cap or lid 200, a spout 300 extending from the lid, and a valve or flow control element 700 (Fig. 4).

Referring to Fig. 5, cup 100 has a substantially cylindrical shape defining an inner volume 105. Cup 100 has a top portion 110 having an open end 115, a middle portion 140 and a bottom portion 160. Middle portion 140 can have a diameter that is smaller than the diameter of top portion 110 or bottom portion 160 to provide an hour-glass like shape. Alternative shapes can also be used for cup 100, such as, for example, tapered.

Top portion 110 has an outer surface 120 with threads 125 formed thereon. The preferred embodiment has threads 125 for removably engaging lid 200 with cup 100. However, alternative engagement structures or methods can also be used to engage lid 200 with cup 100, such as, for example, a snap fit. Cup 100 is preferably transparent or semi-transparent, which provides for visual indication of the contents and amount within the cup, and also can encourage or promote use by a child through visual stimulation. Cup 100 can also be opaque.

Referring to Figs. 1 through 8, lid 200 has a center member or lid body 210, an annular flange 250, spout 300 (which will be described later in greater detail), an air vent 345 and handles 400. Center member 210 has an upper surface 220 and a lower surface 230. Preferably, center member 210 has a circular shape. More preferably, center member 210 has an upwardly convex or dome-like shape. However, alternative shapes can also be used for center member 210, such as, for example, flat or concave. Annular flange 250 extends downwardly from the outer

circumference of center member 210 to provide a sealing or mating surface between lid 200 and cup 100.

Annular flange 250 has an outer surface 260 and an inner surface 270. Outer surface 260 preferably has gripping structures 265 secured thereto. In the preferred embodiment, gripping structures 265 are a number or series of tear-drop shaped projections formed integrally with outer surface 260 of flange 250. Preferably, gripping structures 265 are equi-distantly spaced apart. Alternative shapes, designs and/or patterns for gripping structures 265 can also be used to facilitate removable engagement of lid 200 with cup 100, such as, for example, bubbles or wave-like grooves or ridges. Inner surface 270 has threads 275 secured thereto. Threads 275 mate with threads 125 of cup 100 to removably engage the cup with the lid 200. However, as described above, alternative engagement structures or methods can be used.

Lower surface 230 of center member 210 has a liquid mating surface 235 and a vent mating surface 240. Mating surfaces 235, 240, are preferably adjacent to, or incorporated into, spout 300 and air vent 345, so as to frictionally engage flow control valve 700 and place the valve in fluid communication with the spout and air vent. In the preferred embodiment, mating surfaces 235, 240 are cylindrical channels integrally molded with center member 210 below spout 300 and below air vent 345, respectively. Cylindrical channels 235, 240 have a size and shape to mate with flow control valve 700. Preferably, cylindrical channels 235, 240 have an inner size and shape to engage with flow control valve 700. Lower surface 230 can also have a valve securing member 245, which engages with a corresponding structure on flow control valve 700 to orientate and/or assist in holding the valve in position. In the preferred embodiment, valve securing member 245 is a substantially planar, arcuate member extending orthogonally from lower surface 230 of lid 200.

Flow control element or valve mechanism 700 has first valve portion or stack 730 and second valve portion or stack 732 connected together by substrate 738. Each valve portion 730, 732 has a lower portion 726, an

upper portion 728 and valve faces 736 bearing slits. Each valve portion 730, 732 is configured to frictionally engage cylindrical channels 235, 240, respectively, and place flow control valve 700 in fluid communication with spout 300 and air vent 345, respectively.

Flow control element 700 preferably has a concave shaped valve face 736 of valve portions 730 and 732, and, in conjunction with the attendant curved shape of slits, provides superior fluid flow rate through the slit over existing valve configurations. U.S. Patent No. 5,079,013 to Belanger, U.S. Patent No. RE 37,016 to Morano, U.S. Patent No. 6,050,445 to Manganiello and U.S. Patent No. 6,422,415 to Manganiello depict examples of valves that are usable with the present invention. Additionally, alternative flow control mechanisms and valves can also be placed in fluid communication with spout 300 and/or air vent 345 to provide a resistance to flow or an inhibitor to spillage and shakeout, absent a sucking force, including a separate pair of stack valves that individually mate with cylindrical mating surfaces 235, 240.

Handles 400 are preferably a pair of handles that extend curvingly downward from annular flange 250 toward bottom portion 160 of cup 100. Preferably, handles 400 extend substantially down in proximity to bottom portion 160 of cup 100. Handles 400 are preferably diametrically opposed along annular flange 250. Handles 400 have a proximal end 450 where the handle is connected to flange 250, and a distal end 455. Handles 400 have a length and width that allow an infant or child to fully grasp the handles and preferably allow closure of the entire hand around the handles. Handles 400 preferably extend at least half way down cup 100. Handles 400 have a curvature and shape that provides for sufficient space between the handles and cup 100 for the hand of the infant or child when holding the handles. Preferably, handles 400 are separated from cup 100 at distal end 455 a sufficient distance to allow the infant or child's hand to pass between the distal end and the cup. The size, shape and positioning of handles 400 promote better hand-to-mouth coordination for the child or infant.

55410-50D3

Handles 400 have a rigid portion 420, a gripping portion 460 and a gripping abutment 480. Gripping portion 460 is an area or portion of handle 400 that is more flexible, resilient and/or softer than rigid portion 420, to facilitate grasping and holding of the handle by the infant or child. In the preferred embodiment, gripping portion 460 is molded from a different material than rigid portion 420 to provide for the difference in flexibility, resiliency and softness. The different materials have different levels of hardness or Shore A Hardness. Preferably, rigid portion 420 and the remaining parts of lid 200, i.e., center member 210, annular flange 250 and spout 300, are made of the same material and more preferably are integrally molded with each other.

Rigid portion 420 is preferably molded from a rigid material, such as, for example, a polypropylene. Preferably, gripping portion 460 is molded from a flexible, resilient and/or softer material, such as, for example, a thermoplastic elastomer (TPE). The TPE of gripping portion 460 preferably has a lower hardness or Shore A Hardness than the hardness or Shore A Hardness of rigid portion 420. While the preferred embodiment has rigid portion 420 made of a first material and gripping portion 460 made of a second material, the present disclosure contemplates more than two materials, such as, for example, the rigid portion being a plurality of materials and/or the gripping portion being a plurality of materials.

Handle 400 has an upper or over-surface 402 and a lower or under-surface 404. Gripping portion 460 is preferably formed along under-surface 404 and substantially covers the under-surface. More preferably, gripping portion 460 substantially covers under-surface 404 and wraps around sides 405 of handles 400 to partially cover the over-surface 402. In the preferred embodiment, gripping portion 460 partially wraps around over-surface 402 and has ends 406, 407 with a wave-like shape, which facilitates grasping of the handles 400. The wave-like shape of ends 406, 407 further accommodates varying sizes of hands and varying positioning of hands on handles 400. Gripping abutment 480 is formed along the under-surface 404 of handle 400 near distal end 455 and further facilitates

grasping of the handle. Preferably, gripping abutment 480 is a circular or semi-spherical projection.

Gripping portion 460 provides an infant or child with a different texture or feel, as compared to rigid portion 420. This provides textural stimulus for the use of handles 400. Preferably, gripping portion 460 has a different color than the color of rigid portion 420 to provide a visual stimulus for the use of handles 400. Other visual and textural stimuli can also be further provided on handles 400 to further motivate the child to utilize the handles, such as, for example, decorations or embossments. In the preferred embodiment, rigid portion 420 and gripping portion 460 are opaque. However, either or both of rigid portion 420 and gripping portion 460 can be transparent or semi-transparent. The transparency or semi-transparency of lid 100 provides for visual indication of the contents and amount within the cup, and also can encourage or promote use by a child through visual stimulation.

Referring to Figs. 6 through 12, preferably a first material is molded, and more preferably injection molded, to form rigid portion 420 of handles 400, as well as center member 210, annular flange 250 and spout 300 of lid 200. To provide for a flow path for a second material which is more flexible, resilient and/or softer (with a lower hardness or Shore A Hardness) and to facilitate bonding of the first material of rigid portion 420 with the second material, the rigid portion preferably has an outer or first wall 425, an inner or second wall 430 and a center or third wall 435.

Outer wall 425 and inner wall 430 are substantially equidistantly spaced apart and connected by center wall 435. Preferably, center wall 435 is substantially perpendicular or orthogonal to outer and inner walls 425, 430 to define a generally U-shaped channel 440. Channels 440 are preferably formed by outer, inner and center walls 425, 430, 435 along opposing sides of rigid portion 420. The molding process for lid 200 and handles 400 is preferably a two-shot injection molding technique using a first material, such as polypropylene, for rigid portion 420, and a second material, such as TPE, for gripping portion 460.

Preferably, there is at least one rib 445 formed in channel 440. More preferably, there are two ribs 445 in each channel 440. Ribs 445 provide additional strength and integrity to handles 400. Ribs 445 are preferably formed in channels 440 in proximity to proximal end 450 of handles 400. Preferably, ribs 445 are generally parallel to outer and inner walls 425, 430 and have a shape or curvature that is similar to the shape or curvature of channel 440. The shape, size and positioning of ribs 445 preferably reduce flow resistance and further facilitate flow of the second material into and along or through the channel 440. Ribs 445 increase the surface contact area between the first and second materials, and improve the bonding between the first and second materials of rigid portion 420 and gripping portion 460.

In the preferred embodiment, outer wall 425 of rigid portion 420 has a wave-like shape so that gripping portion 460 has a corresponding wave-like shape along handles 400. To form gripping abutment 480, a semi-circular projection 485 is formed in center wall 435 along distal end 455 of the rigid portion 420. The second material is molded over the projection 485 to form gripping abutment 480. Rigid portion 420 has an end wall 490 formed in distal end 455, which provides further rigidity to handle 400, improves the bonding between the rigid portion and the gripping portion 460, and provides a terminus for the flow of the second material of the gripping portion. Preferably, end wall 490 is substantially perpendicular to outer and center walls 425, 435.

In the preferred embodiment, inner wall 430 extends only partially along handle 400. However, alternatively, inner wall 430 can fully extend along handle 400. Also, in the preferred embodiment, channels 440 are disposed on opposing sides of rigid portion 420 and run partially along the rigid portion. However, the present disclosure contemplates any number of channels 400, which may be disposed in various orientations and positions along rigid portion 420.

Referring to Figs. 13 and 14, alternative embodiments of lid 200 with rigid portions 1320, 1420, respectively, are shown. Features of Figs. 13

and 14 similar to the features of the preferred embodiment of Figs. 1 through 12, have the same reference numerals. The rigid portion 1320 of Fig. 13 has channel 440 formed by outer, inner and center walls 425, 430, 435. But the channels 440 do not have ribs disposed at proximal end 450, compared to the preferred embodiment shown in Figs. 9 through 12.

The rigid portion 1420 of Fig. 14 has outer wall 425 formed orthogonally with a center wall 1435. But rigid portion 1420 does not have an inner wall secured to center wall 1435 and does not form a channel along rigid portion 1420, such as in the preferred embodiment. Rigid portion 1420 also does not have an end wall at distal end 455, such as in the preferred embodiment. Rigid portion 1420 has a number or series of apertures or holes 1450 formed through center wall 1435. In contrast, the center wall 435 of rigid portion 420 of the preferred embodiment, does not have apertures, and provides a generally planar solid bottom surface of channel 440 along the flow path of the second material of gripping portion 460. Apertures 1450 of rigid portion 1420 create orthogonal contact surfaces along center wall 1435 between the rigid portion and the gripping portion 460, and the second material of the gripping portion flows through the apertures.

In the preferred embodiment, handles 400 are a pair of handles integrally formed on opposing sides of lid 200 with a space provided at distal ends 455 of the handles. However, it is contemplated by the present disclosure for alternative numbers and positions of handles 400 to be used. It is further contemplated by the present disclosure for handles 400 to be integrally formed with cup 100 at bottom portion 160 of the cup to provide a separation or space from the cup in proximity to lid 100 or for the handles to be integrally formed with the cup at both the top and bottom portions 110, 160. It is also contemplated by the present disclosure for handles 400 to be a separate structure that is secured to cup 100 and/or lid 200, and/or removably secured, such as, for example, a handle ring having handles 400 extending therefrom. It is also contemplated by the present disclosure

that gripping portion 460 is formed with, or secured to, rigid portion 420 in other ways, such as, for example, friction fit or adhesive.

During the molding process, an unexpected and significant result occurred with the use of ribs 445 disposed in channels 440, as compared to rigid portions 1320, and 1420 that did not have ribs. It was discovered that ribs 445 prevented sink marks from developing in gripping portion 460 when the second material was molded into and through channels 440. In rigid portions 1320, 1420, sink marks developed in the area of proximal end 450, which distorted the intended shape of gripping portion 460 and had a significant negative impact on the strength and integrity of handles 400.

Additionally, during the molding process, an unexpected and significant result occurred with the use of channels 440 and the generally planar bottom surface (center wall 435) along the flow path of the second material of gripping portion 460, as compared to rigid portion 1420, which has apertures 1450 formed through center wall 1435. It was discovered that channels 440 and the generally planar solid bottom surface of center wall 435 significantly improved the flow of the second material through channels 440, resulting in an improved bond between the rigid and gripping portions 420, 460, and further provided for a smoother outer surface of the gripping portion.

Referring to Figs. 3 and 6 through 12, spout 300 has a front wall 310, a rear wall 320, a first side wall 330, a second side wall 340 and a top wall 350. Top wall 350 has a number of holes 360 formed therethrough. Front wall 310, rear wall 320, first and second side walls 330, 340 and top wall 350 are integrally molded, and define a spout volume 305 that is in fluid communication with inner volume 105 of cup 100 (through flow control valve 700) and with holes 360. In this embodiment, two holes 360 are shown but other numbers of holes can also be used.

Top wall 350 has an upwardly convex or arcuate shape and forms chamfered edges with front and rear walls 310, 320 and first and second side walls 330, 340. Top wall 350 has a radius of curvature r_1. Preferably,

radius of curvature r_1 is from about 0.25 inches to about 0.5 inches, more preferably from about 0.35 inches to about 0.40 inches, and most preferably about 0.38 inches.

Front wall 310 has an outwardly convex shape with a radius of curvature r_2. Rear wall 320 has an outwardly convex shape, in the opposite direction of front wall 310, with a radius of curvature r_3. Preferably, radius of curvature r_2 is from about 3.0 inches to about 7.0 inches, more preferably from about 4.0 inches to about 6.0 inches, and most preferably about 5.0 inches. Preferably, radius of curvature r_3 is from about 3.0 inches to about 7.0 inches, more preferably from about 4.0 inches to about 6.0 inches, and most preferably about 5.0 inches. Preferably, radius of curvature r_2 and radius of curvature r_3 are equal. The periphery of front wall 310 and the periphery of rear wall 320 have arcuate shapes and are preferably aligned so that first sidewall 330 and second sidewall 340 are essentially chamfered edges of spout 300. Preferably, front and rear walls 310, 320 define an ellipsoidal cross-sectional shape for spout 300.

Spout 300 has a distal end 370, a proximal end 380 and a height h_1. Distal end 370 of spout 300 has a width w_1 and a depth d_1. Proximal end 380 of spout 300 has a width w_2 and a depth d_2. Preferably, height h_1 is from about 0.80 inches to about 1.80 inches, more preferably from about 1.0 inches to about 1.40 inches, and most preferably about 1.20 inches. Preferably, width w_1 is from about 0.50 inches to about 0.90 inches, more preferably from about 0.60 inches to about 0.70 inches, and most preferably about 0.69 inches. Preferably, width w_2 is from about 0.80 inches to about 1.20 inches, more preferably from about 0.90 inches to about 1.10 inches, and most preferably about 0.97 inches. Preferably, depth d_1 is from about 0.10 inches to about 0.25 inches, more preferably from about 0.15 inches to about 0.22 inches, and most preferably about 0.20 inches. Preferably, depth d_2 is from about 0.25 inches to about 0.75 inches, more preferably from about 0.40 inches to about 0.60 inches, and most preferably about 0.56 inches.

Front and rear walls 310, 320 are inwardly tapered toward distal end 370. Preferably, front and rear walls 310, 320 are inwardly tapered along a substantially straight line or constant slope. Front wall 310 has an angle of taper α_1. Rear wall 320 has an angle of taper α_2. Preferably, taper angle α_1 is from about 5° to about 15°, more preferably from about 10° to about 14°, and most preferably about 13.5°. Preferably, taper angle α_2 is from about 5° to about 15°, more preferably from about 10° to about 14°, and most preferably about 13.5°. Taper angle α_1 and taper angle α_2 are preferably equal.

First and second side walls 330, 340 are inwardly tapered toward distal end 370. Preferably, first and second side walls 330, 340 are inwardly tapered along a straight line or constant slope. First side wall 330 has an angle of taper β_1. Second side wall 340 has an angle of taper β_2. Preferably, taper angle β_1 is from about 5° to about 18°, more preferably from about 10° to about 15°, and most preferably about 12°. Preferably, taper angle β_2 is from about 5° to about 18°, more preferably from about 10° to about 15°, and most preferably about 12°. Taper angle β_1 and taper angle β_2 are preferably equal.

During consumer testing of cup assembly 10, unexpected and significant results occurred from the use of spout 300, as compared to the contemporary spout designs for the PLAYTEX® and GERBER® spouts shown in Figs. 15 through 20. It was discovered that spout 300 performed significantly better with marked improvement in consumer preference and ease of use by infants, compared to both the PLAYTEX® and GERBER® spouts.

The testing included infants between the ages of six (6) months and eighteen (18) months who were provided separate cups having spout 300, the PLAYTEX® spout and the GERBER® spout, for equal periods of times. Consumer preference was tested and the use of the cups and spouts was observed by the parent(s), including the ease with which the infants were able to use the cups and spouts, and the generation of preferred flow rates.

55410-50D3

Spout 300 rated higher than the PLAYTEX® and GERBER® spouts at %80 confidence for being easier for the infant to use. Spout 300 rated higher than the PLAYTEX® spout at %80 confidence for preference of the flow-rate achieved by the infant. Cup assembly 10 rated higher than the PLAYTEX® spout at %95 confidence for ease of drinking. These results are of statistical and practical significance.

The embodiment of spout 300 tested had a change in widths w_1, w_2 of 0.97 inches – 0.69 inches = 0.28 inches over a height h_1 of 1.20 inches, resulting in a rate of change of spout width of 0.23. In contrast, the PLAYTEX® spout had a change in widths of 1.30 inches – 0.75 inches = 0.55 inches over a height of 0.875 inches, resulting in a rate of change of spout width of 0.62. The GERBER® spout had a change in widths of 1.30 inches – 0.75 inches = 0.55 inches over a height of 0.90 inches, resulting in a rate of change of spout width of 0.61.

It was discovered based on the consumer data that the parameter of rate of change of spout width, and, in particular, a lower rate of change of widths w_1, w_2 from distal end 370 to proximal end 380 of 0.23, as compared to the rate of change for the PLAYTEX® and GERBER® spouts of 0.62 and 0.61, respectively, was a contributing cause in facilitating the use of spout 300 by the infant. In particular, the lower rate of change of widths w_1, w_2 of spout 300 promoted lip closure by the infant and facilitated generation of a suction force for achieving a preferred flow-rate.

Based on the consumer data, it was determined that the rate of change of spout widths w_1, w_2 should preferably be between about 0.10 to about 0.60, more preferably between about 0.20 to about 0.30, and most preferably be about 0.23.

Additionally, it was further discovered from the consumer data that the arcuate shape of top wall 350 with chamfered edges along the transition areas between the top wall and the front and rear walls 310, 320 and first and second side walls 330, 340, further facilitated the movement of the infant's lips along spout 300, for proper lip approximation resulting in further promotion of lip closure. In contrast, the PLAYTEX® and

GERBER® spouts had substantially flat top walls with sharper edges along the transition areas between the top wall and the adjoining walls.

The embodiment of spout 300 tested had a change in depths d_1, d_2 of 0.56 inches – 0.20 inches = 0.36 inches over a height h_1 of 1.20 inches, resulting in a rate of change of spout depth of 0.30. In contrast, the PLAYTEX® spout had a change in depths of 1.00 inches – 0.30 inches = 0.70 inches over a height of 0.875 inches, resulting in a rate of change of spout depth of 0.80. The GERBER® spout had a change in depths of 0.90 inches – 0.25 inches = 0.65 inches over a height of 0.90 inches, resulting in a rate of change of spout depth of 0.72.

It was discovered from the consumer data that the parameter of rate of change of spout depth, and, in particular, a lower rate of change of depths d_1, d_2 from distal end 370 to proximal end 380 of 0.30, as compared to the rate of change for the PLAYTEX® and GERBER® spouts of 0.80 and 0.72, respectively, was a contributing cause in facilitating the use of spout 300 by an infant. In particular, the lower rate of change of depths d_1, d_2 of spout 300 promoted lip closure by the infant and facilitated generation of a suction force for achieving a preferred flow-rate.

Based on the consumer data, it was determined that the rate of change of spout depths d_1, d_2 should preferably be between about 0.10 to about 0.70, more preferably between about 0.25 to about 0.50, and most preferably be about 0.30.

Also, it was discovered from the above unexpected and significant results that the parameter of rate of change of spout cross-sectional area, and, in particular, a lower rate of change of cross-sectional area of spout 300, promoted lip closure by the infant, which facilitated generation of a suction force for achieving a preferred flow-rate. The embodiment of spout 300 tested had an ellipsoidal cross-sectional shape. The area A_1 for an ellipse is equal to Π^*a^*b, where a is the radius of the major axis and b is the radius of the minor axis.

Spout 300 has a cross-sectional area A_1 at distal end 370 of about $\Pi^*(w_1/2)^*(d_1/2)$. Spout 300 has a cross-sectional area A_2 at proximal end

380 of about $\Pi^*(w_2/2)^*(d_2/2)$. The rate of change of cross-sectional areas A_1, A_2 of spout 300 is $(\Pi^*(w_1/2)^*(d_1/2) - \Pi^*(w_2/2)^*(d_2/2))/h_1 = 0.27$. In contrast, the PLAYTEX® spout had spout cross-sectional areas of about 0.75 inches * 0.30 inches = 0.225 sq. inches at the distal end, and about 1.30 inches * 1.00 inches = 1.30 sq. inches at the proximal end. Over a height of 0.875 inches, the PLAYTEX® spout had a rate of change in spout cross-sectional area of about 1.229. The GERBER® spout had spout cross-sectional areas of about 0.750 inches * 0.250 inches = 0.1875 sq. inches at the distal end, and 1.300 inches * 0.900 inches = 1.170 sq. inches at the proximal end. Over a height of 0.900 inches, the GERBER® spout had a rate of change in spout cross-sectional area of about 1.092.

It was discovered from the consumer data that the lower rate of change of spout cross-sectional areas A_1, A_2 from distal end 370 to proximal end 380 of 0.27, as compared to the rate of change of spout cross-sectional areas for the PLAYTEX® and GERBER® spouts of 1.229 and 1.092, respectively, was a contributing cause in facilitating the use of spout 300 by an infant.

Based on the consumer data, it was determined that the rate of change of spout cross-sectional areas A_1, A_2 should preferably be between about 0.10 to about 1.0, more preferably between about 0.20 to about 0.50, and most preferably be about 0.27.

The embodiment of spout 300 tested had taper angles α_1, α_2 for front and rear walls 310, 320 of about 13.5° each, compared to corresponding overall taper angles for the PLAYTEX® spout of about 18° and 34°, and for the GERBER® spout of about 16° and 24°. It was discovered based on the consumer data that the parameter of spout taper angles and, in particular, the smaller taper angles α_1, α_2 for front and rear walls 310, 320, was a contributing cause in facilitating the use of spout 300 by an infant, promoting lip closure, and facilitating generation of a suction force for achieving the preferred flow-rate. The smaller taper angles α_1, α_2 for front and rear walls 310, 320 further facilitated the movement of the infant's lips along spout 300 for proper lip approximation resulting in further

promotion of lip closure. It was further discovered that the use of a constant slope for taper angles α_1, α_2 for front and rear walls 310, 320, also facilitated the use of spout 300 by an infant.

Based on the consumer data, it was determined that the taper angles α_1, α_2 should preferably be between about 5° to about 15°, more preferably between about 10° to about 14°, and most preferably be about 13.5°.

The embodiment of spout 300 tested had taper angles β_1, β_2 for first and second side walls 330, 340 of about 12° each, compared to corresponding overall taper angles for the PLAYTEX® spout of about 12° and 12°, and for the GERBER® spout of about 20° and 20°. It was discovered from the consumer data that the parameter of side spout taper angles, and, in particular, smaller taper angles β_1, β_2 for first and second side walls 330, 340 was a contributing cause in facilitating the use of spout 300 by an infant, promoting lip closure, facilitating generation of a suction force for achieving the preferred flow-rate, and further facilitating the movement of the infant's lips along spout 300 for proper lip approximation resulting in further promotion of lip closure. It was further discovered that the use of a constant slope for taper angles β_1, β_2 for first and second side walls 330, 340, also facilitated the use of spout 300 by an infant.

Based on the consumer data, it was determined that the taper angles β_1, β_2 should preferably be between about 5° to about 18°, more preferably between about 10° to about 15°, and most preferably be about 12°.

The embodiment of spout 300 tested had front and rear walls 310, 320 that were outwardly convex to form an ellipsoidal cross-sectional shape, compared to the PLAYTEX® and GERBER® spouts which had rear walls that were concave. Additionally, front and rear walls 310, 320 had radii of curvature r_2, r_3 of 5.0 inches. It was discovered from the consumer data that the parameters of the shape of the front and rear walls 310, 320 and the radii of curvature r_2, r_3 of the front and rear walls, were contributing causes in facilitating the use of spout 300 by an infant, promoting lip

closure, and facilitating generating a suction force for achieving the preferred flow-rate.

Based on the consumer data, it was determined that the radii of curvature r_2, r_3 should preferably be between about 3.0 to about 7.0, more preferably between about 4.0 to about 6.0, and most preferably be about 6.0 inches.

The shape of spout 300, including top wall 350 being arcuate; front wall 310 being outwardly convex and inwardly tapered; rear wall 320 being inwardly tapered; and first and second side walls 330, 340 being inwardly tapered at substantially equal angles providing symmetry to the spout, was determined to promote better lip approximation and lip closure for reducing liquid loss. The shape of spout 300 provides for better transitioning between bottle-feeding and cup drinking. Earlier promotion of lip closure in a child's life through the use of spout 300, assists in developing the necessary lip closure for stripping boluses from a spoon and maintaining lip closure for chewing. It was discovered based on the consumer data that various combinations of the above-described parameters were contributing factors in facilitating the use of spout 300 by an infant, promoting lip closure, and facilitating generation of a suction force for achieving the preferred flow-rate.

The present invention having been thus described with particular reference to the preferred forms thereof, it will be obvious that various changes and modifications may be made therein without departing from the scope of the present invention as defined in the appended claims.

55410-50D3

CLAIMS:

1. A cup assembly, comprising:

a cup having an exterior surface and an interior surface, said interior surface defining an interior volume, said cup having a top open end, a middle portion, and a bottom portion with a closed end;

a lid body having a lid wall with a top surface and a bottom surface opposite said top surface;

an annular flange having a flange wall extending downwardly from said lid wall that is connectable to a cup, said flange wall having an outer surface and an inner surface opposite said outer surface;

a spout extending from said top surface, said spout having a front wall, a rear wall, a first side wall connecting said front wall and said rear wall on a first side, a second side wall connecting said front wall and said rear wall on a second side opposite said first side, and a top wall, said top wall being connected to said front wall, said rear wall, said first side wall and said second side wall, said top wall being an upwardly convex shape forming chamfered edges with said front wall and said rear wall;

a handle ring removably securable to said top surface of said annular flange, wherein at least one handle is connectable to said handle ring and extends curvingly downward to said bottom portion of said cup, said handle having a proximal end connected to said handle ring and a distal end, said distal end being spaced a sufficient distance from said cup such that a child's hand can pass between said distal end and said cup,

wherein said inner surface of said annular flange engages said exterior surface of said top open end of said cup,

wherein said first side wall and said second side wall are inwardly tapered toward said top wall, and wherein said first side wall has an angle of taper β1 from about 5° to about 18° and said second side wall has an angle of taper β2 from about 5° to about 18°,

wherein said front wall and said rear wall are inwardly tapered along a substantially straight line or constant slope, wherein said front wall has an angle of taper α1 from about 5° to about 15° and said rear wall has an angle of taper α2 from about 5° to about 15°.

2. The cup assembly of claim 1, wherein said angle of taper β1 and said angle of taper β2 are substantially equal and said angle of taper α1 and said angle of taper α2 are substantially equal.

3. A cup assembly as claimed in claim 1, wherein the handle ring comprises a pair of handles.

4. A cup assembly as claimed in claim 3, wherein the pair of handles extend curvingly downward from the annular flange.

5. A cup assembly as claimed in claim 4, wherein the handles are diametrically opposed along the annular flange.

6. A cup assembly as claimed in claim 5, wherein each handle has a rigid portion, a gripping portion and a gripping abutment.

7. A cup assembly as claimed in claim 6, wherein the gripping portion is molded from a different material than the rigid portion.

8. A cup assembly as claimed in claim 7, wherein the rigid portion comprises polypropylene and the gripping portion comprises thermoplastic elastomer.

55410-50D3

9. A cup assembly as claimed in claim 7, wherein each handle has an over surface and an under surface.

10. A cup assembly as claimed in claim 9, wherein the gripping portion is formed along the under surface.

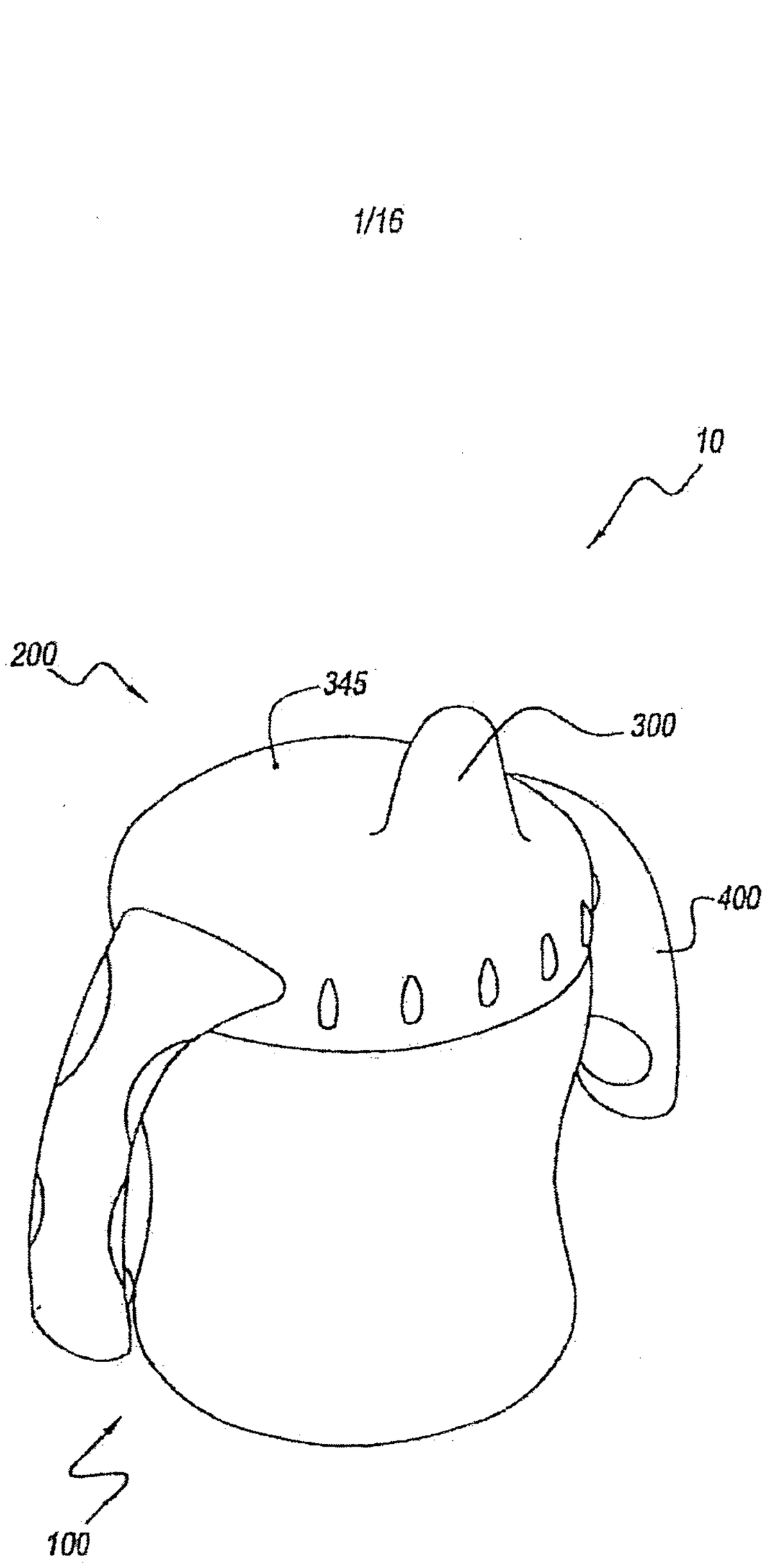

Fig. 1

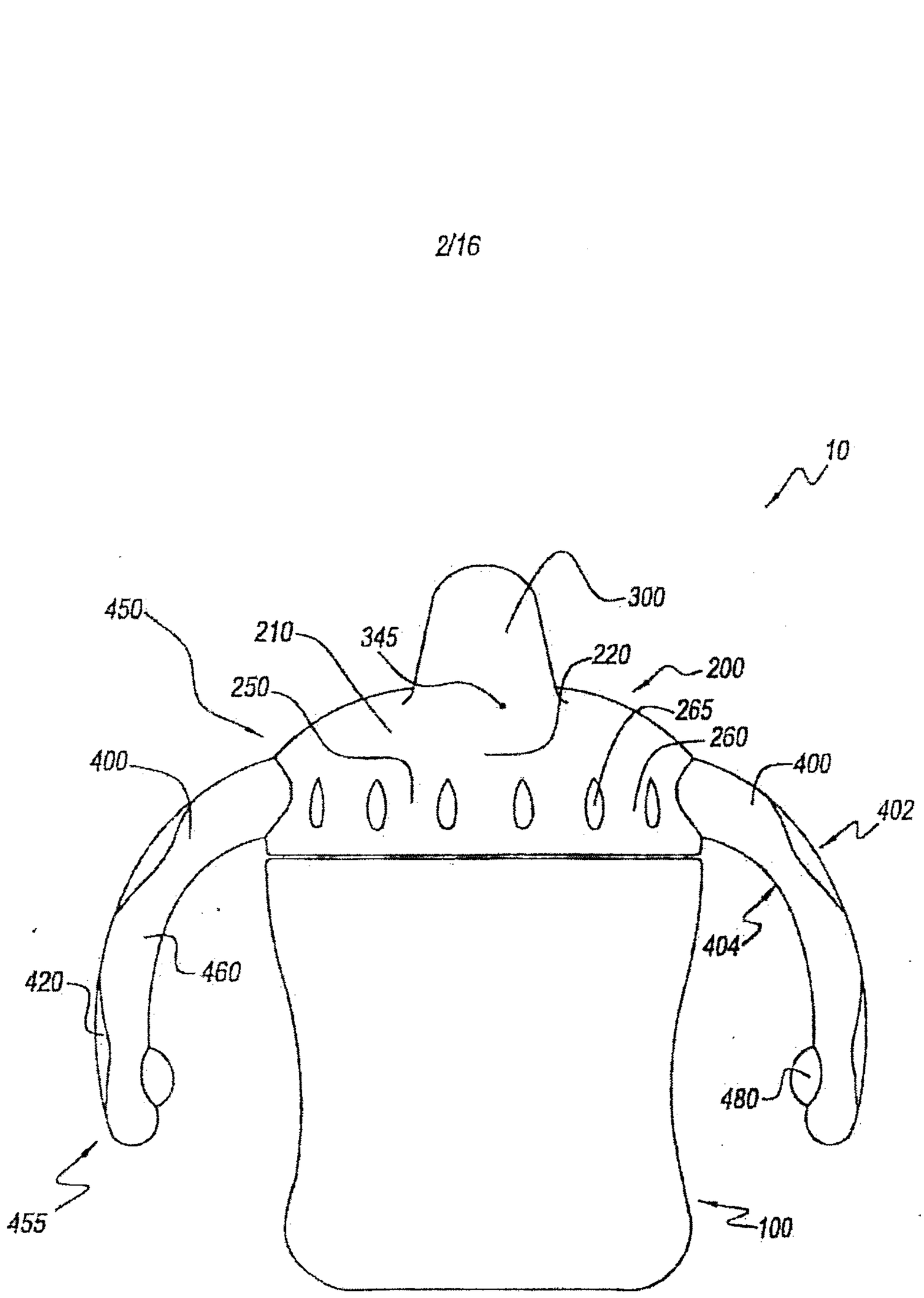
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Fig. 2

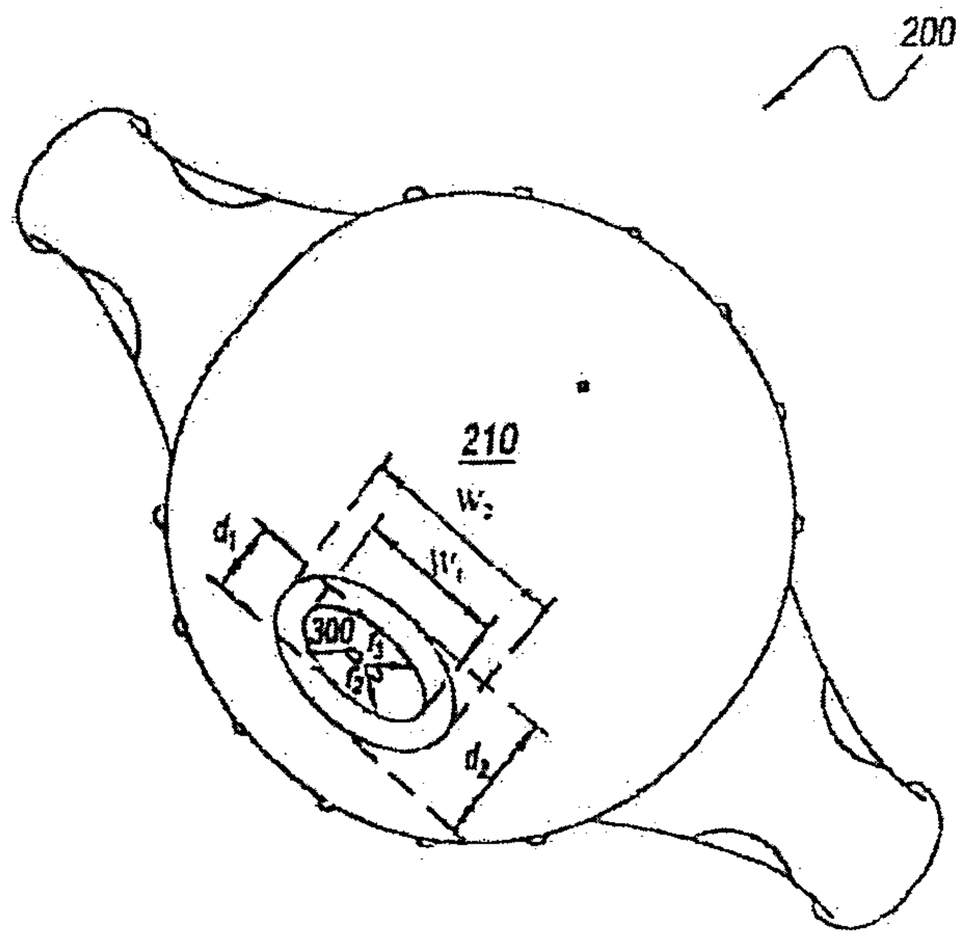

Fig. 3

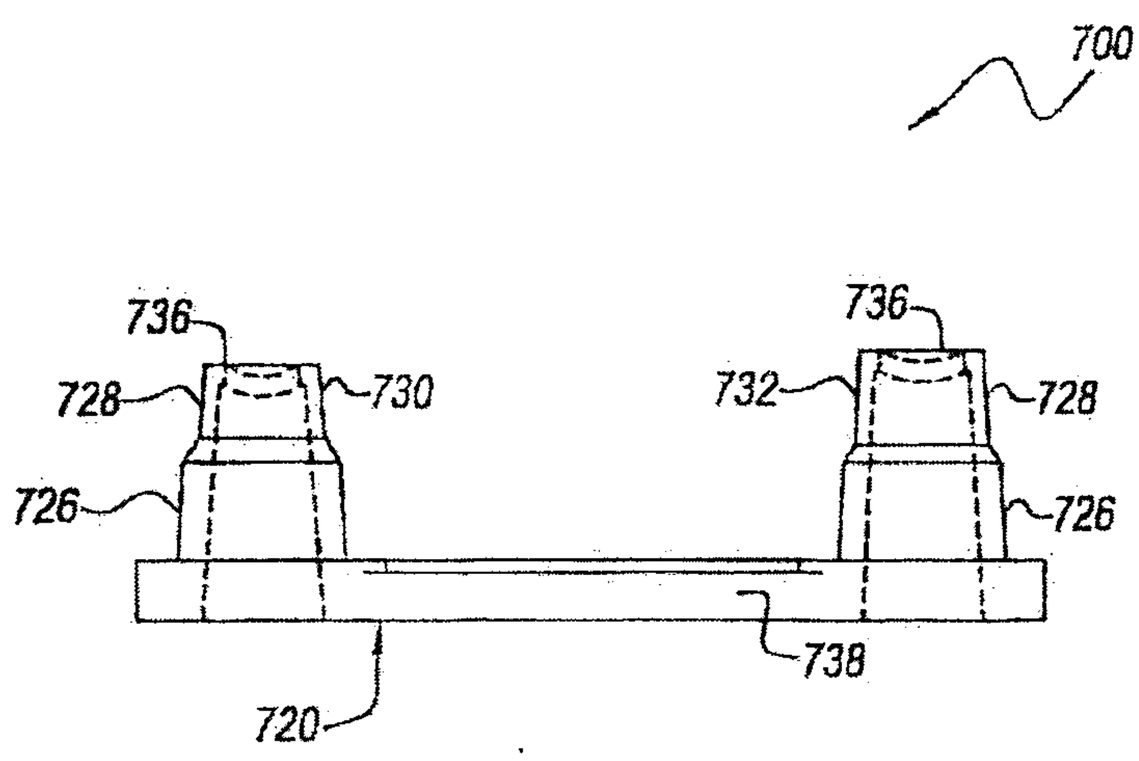

Fig. 4

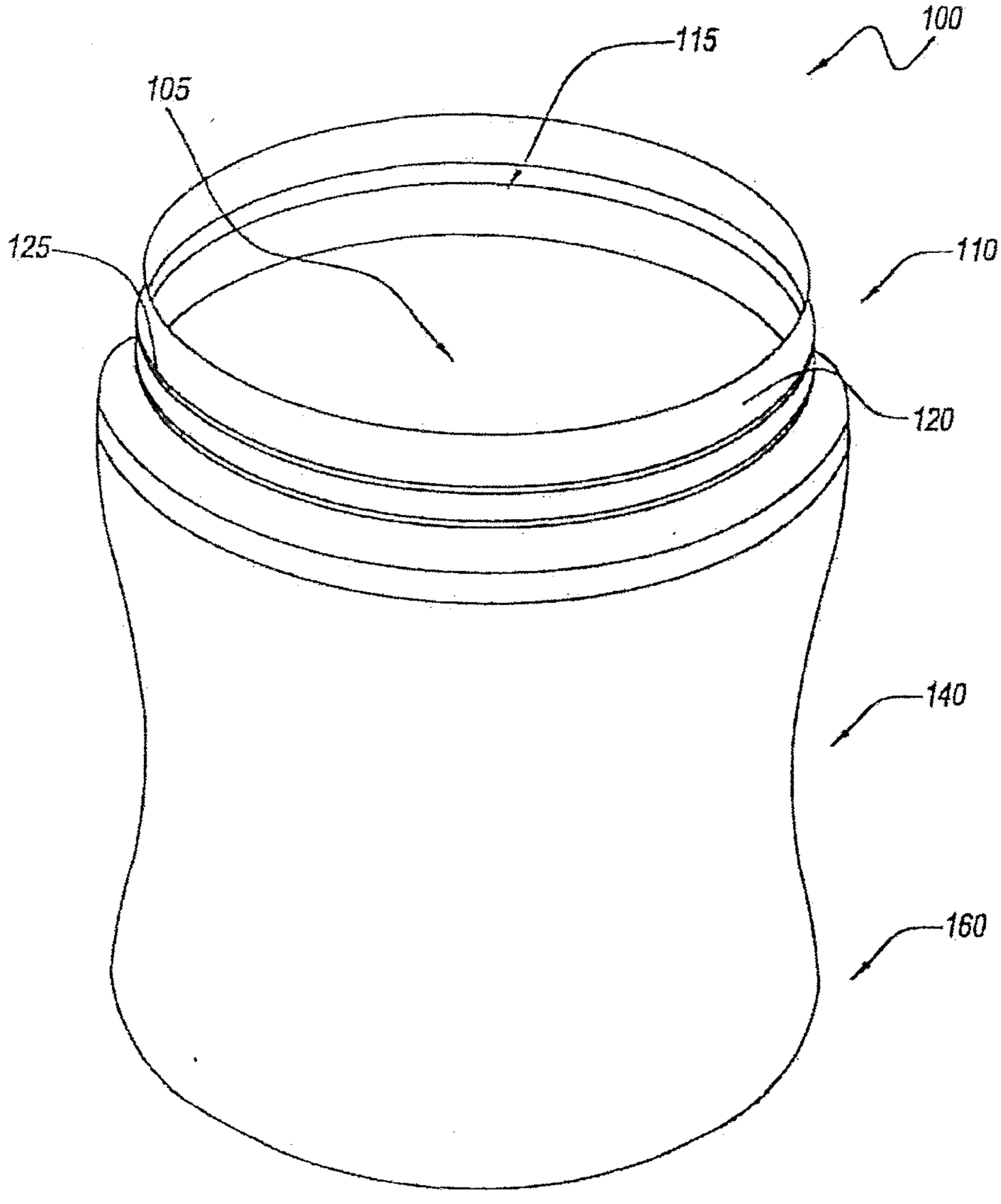

Fig. 5

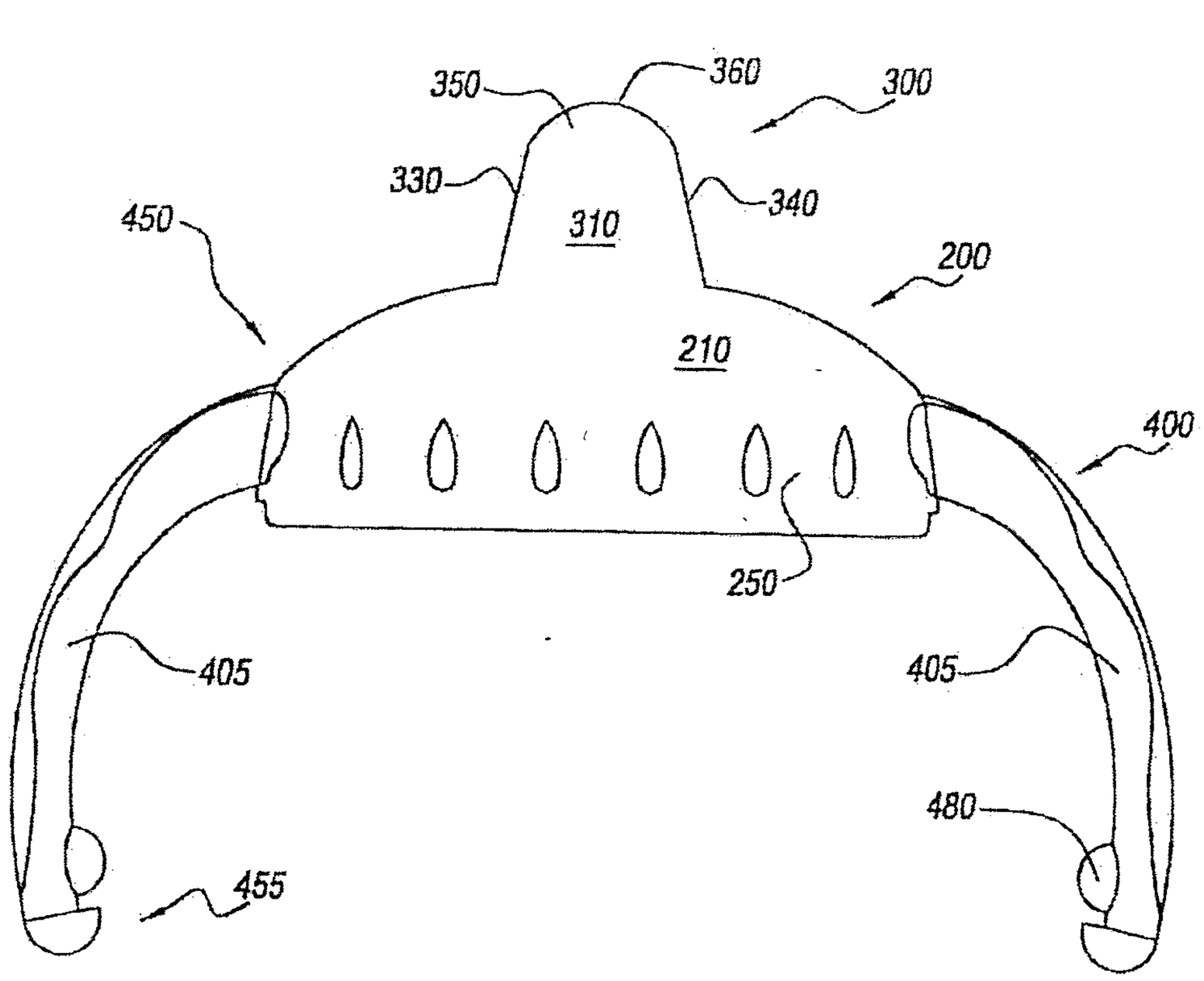

Fig. 6

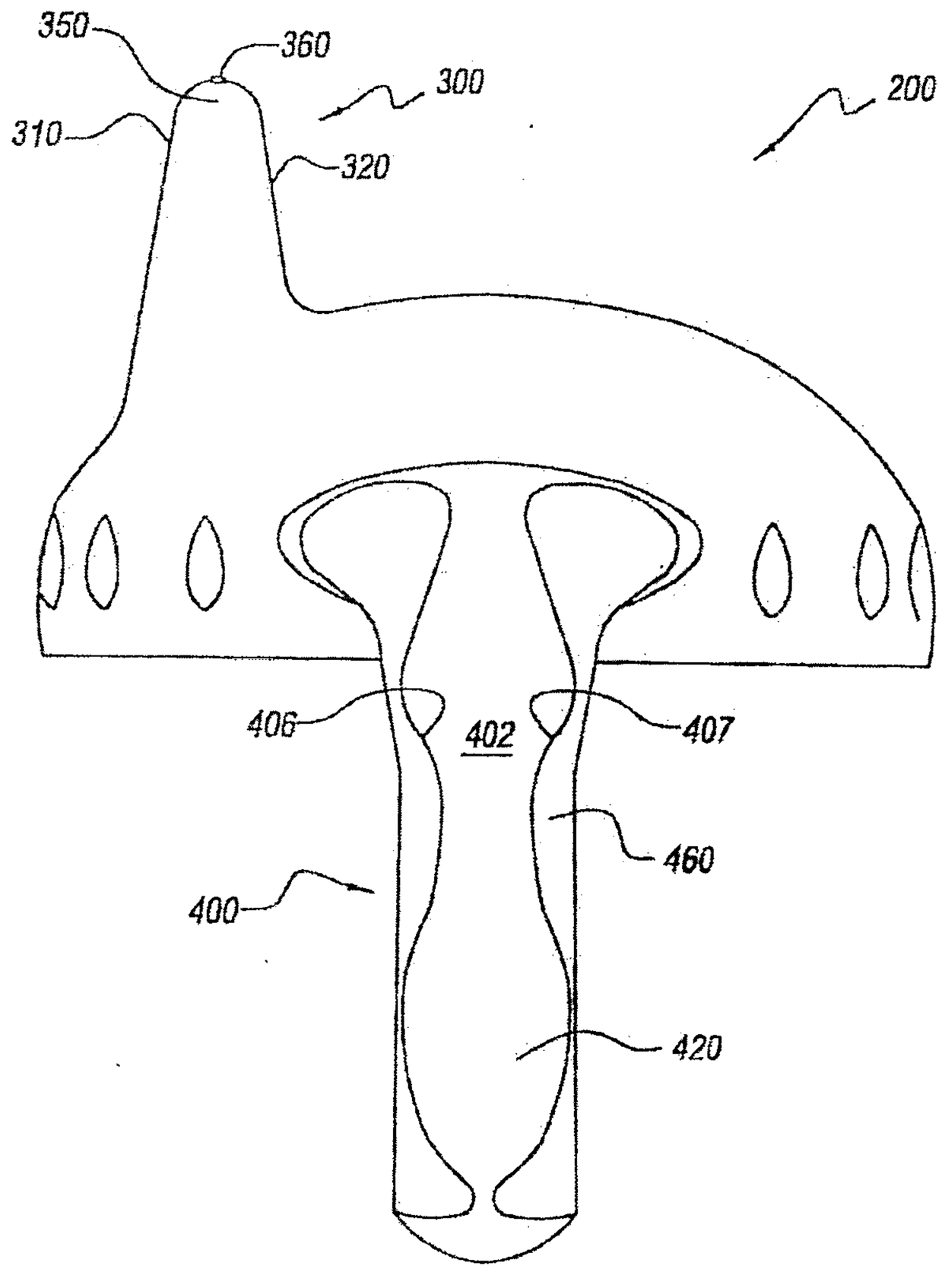

Fig. 7

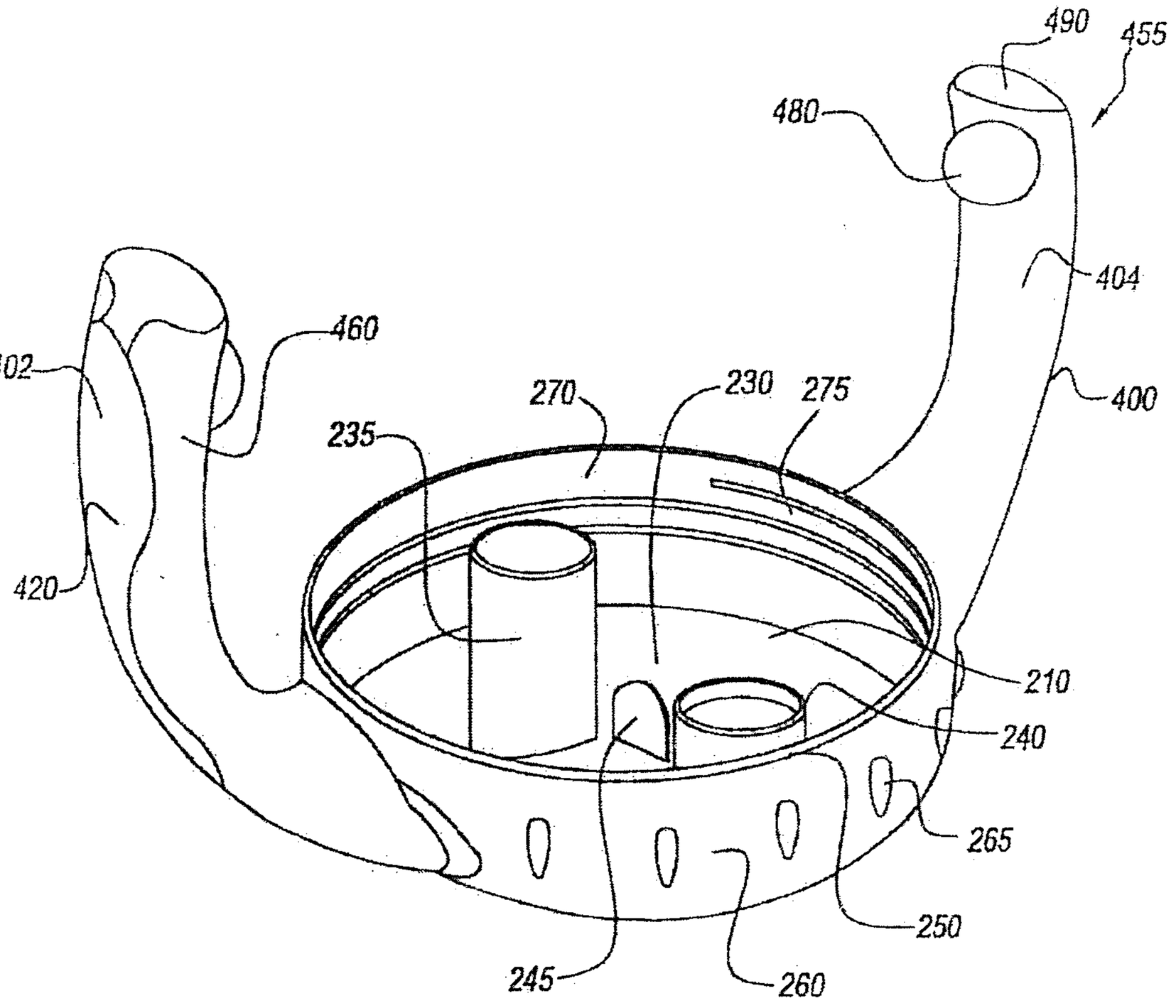
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Fig. 8

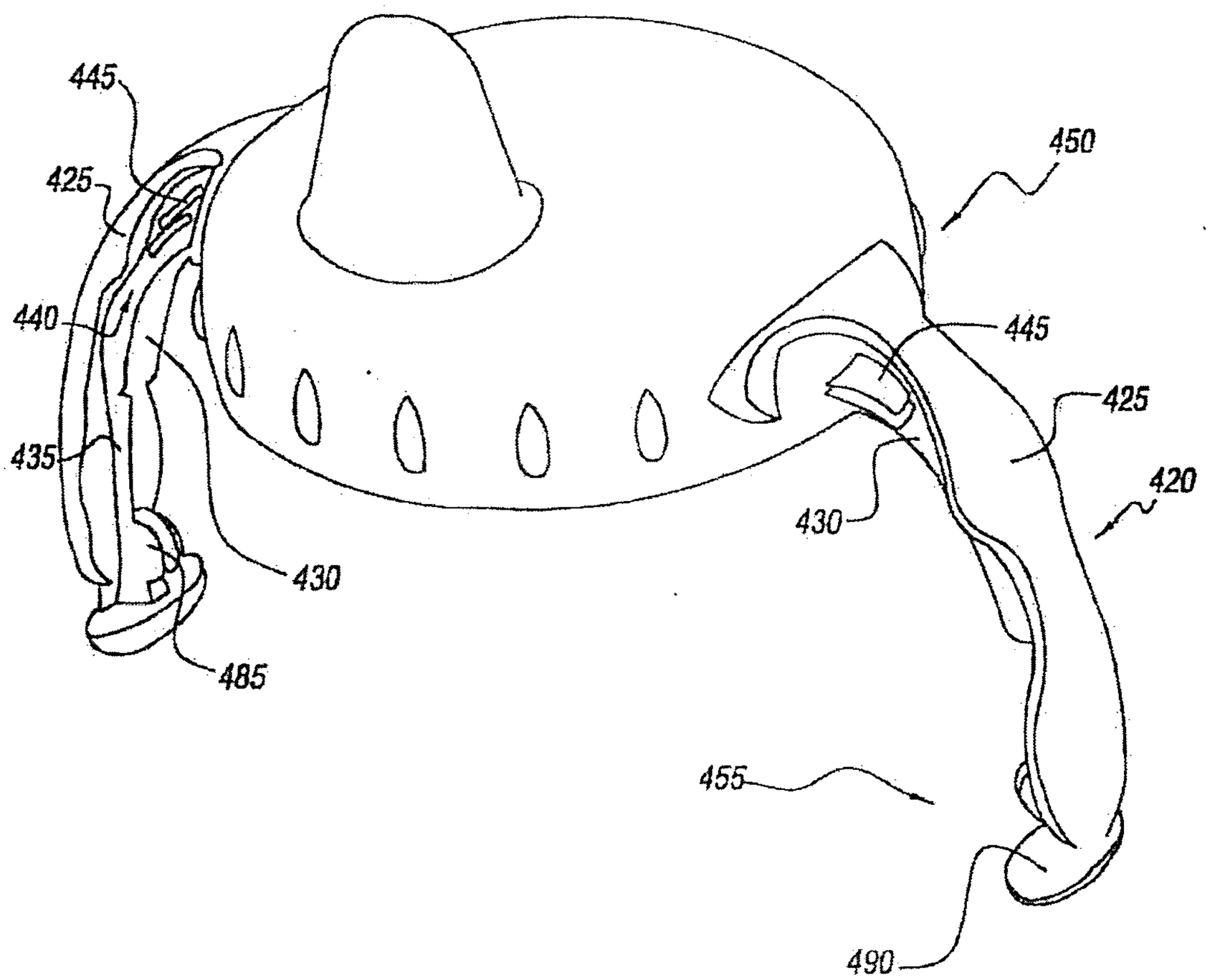
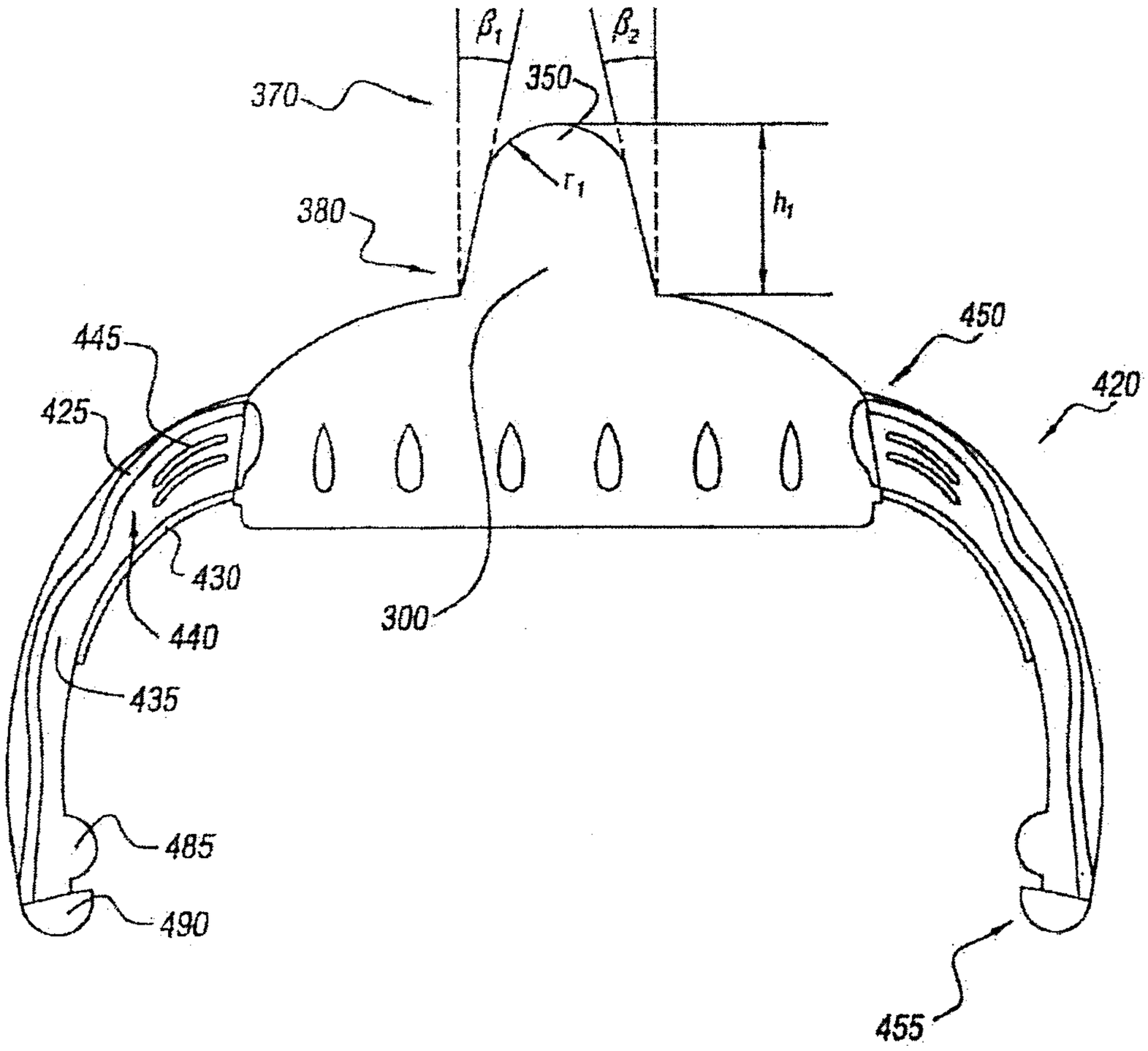


Fig. 9


β_1
β_2
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350
r_1
h_1
380
450
445
420
425
430
300
440
435
485
490
455

Fig. 10

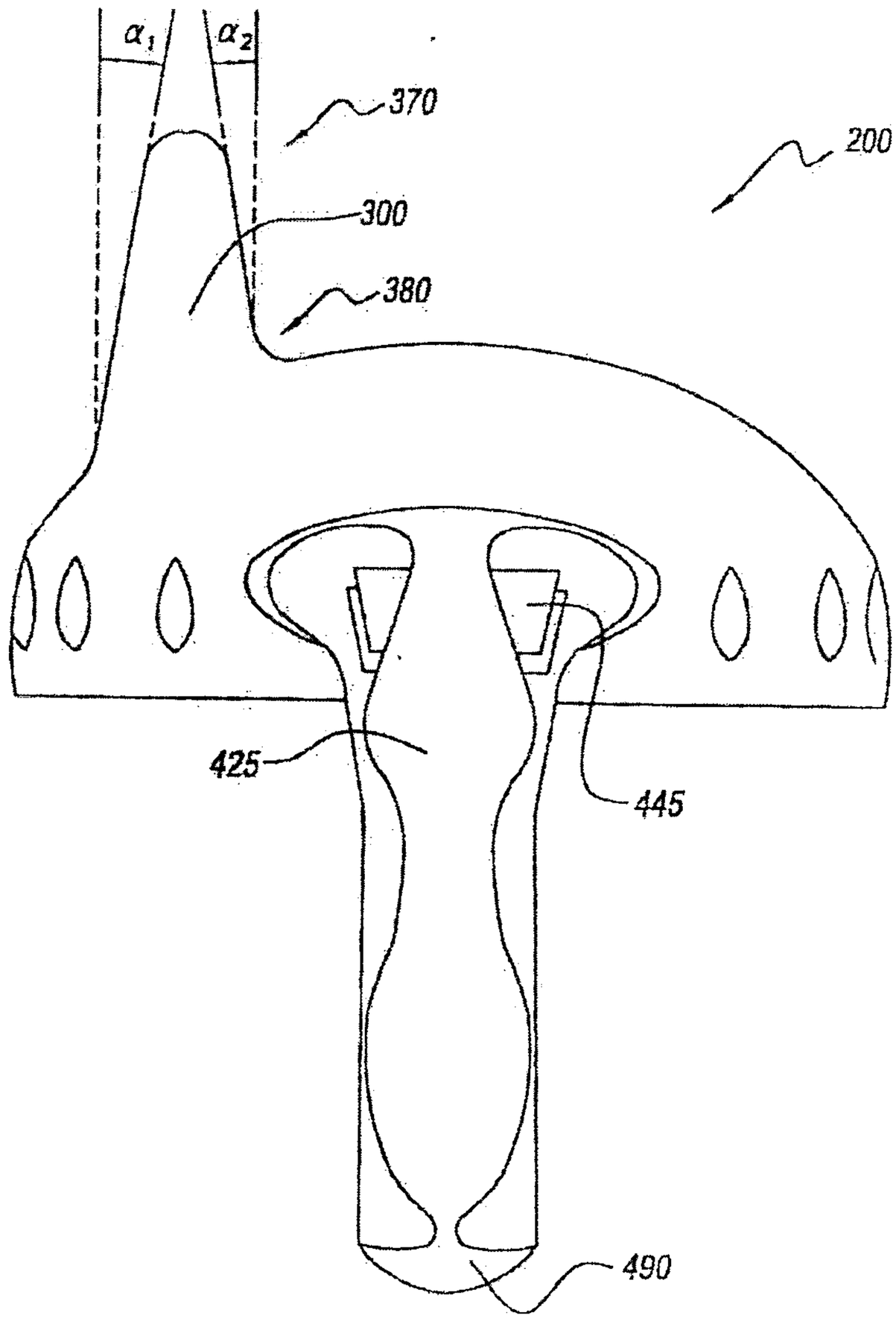

Fig. 11

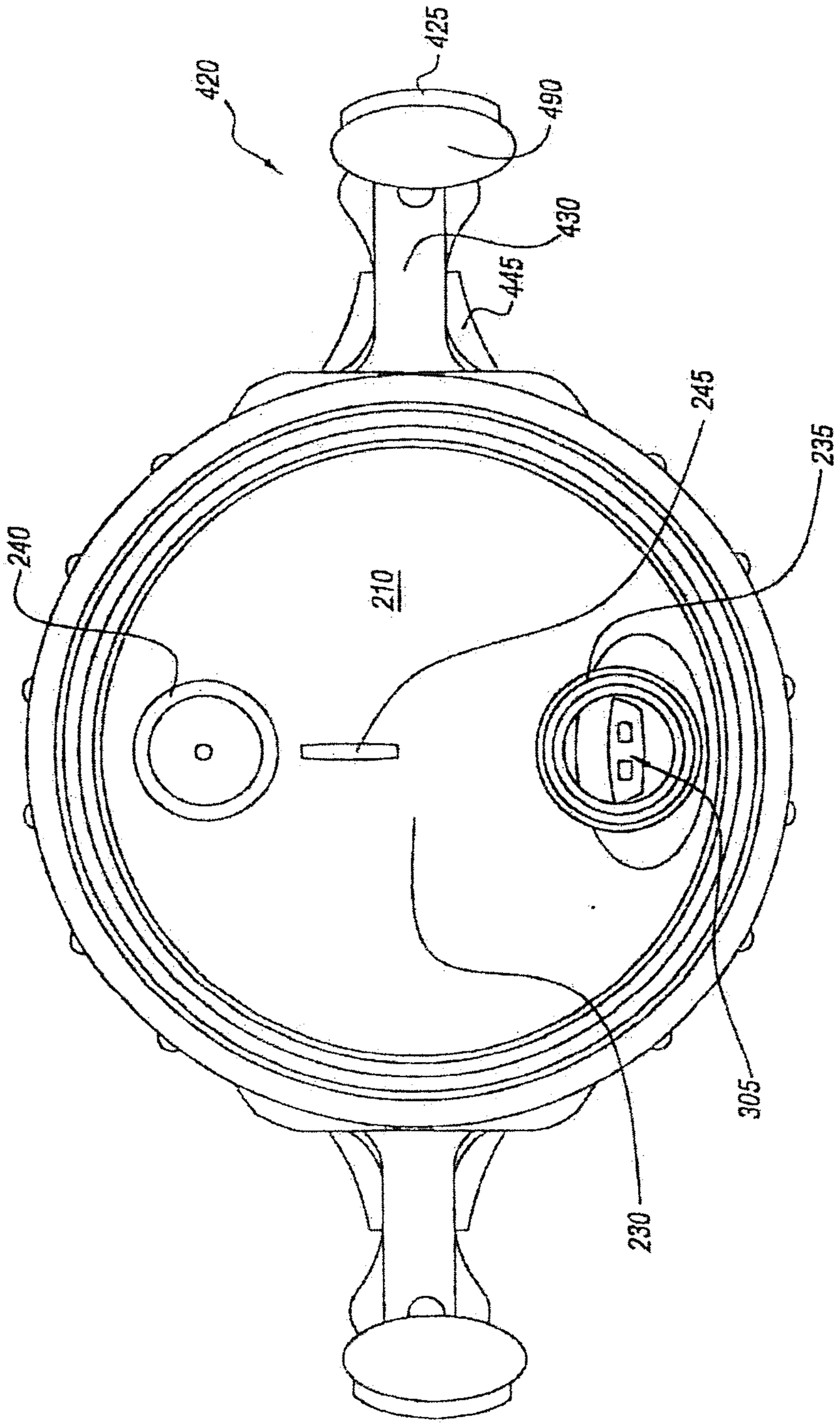

Fig. 12

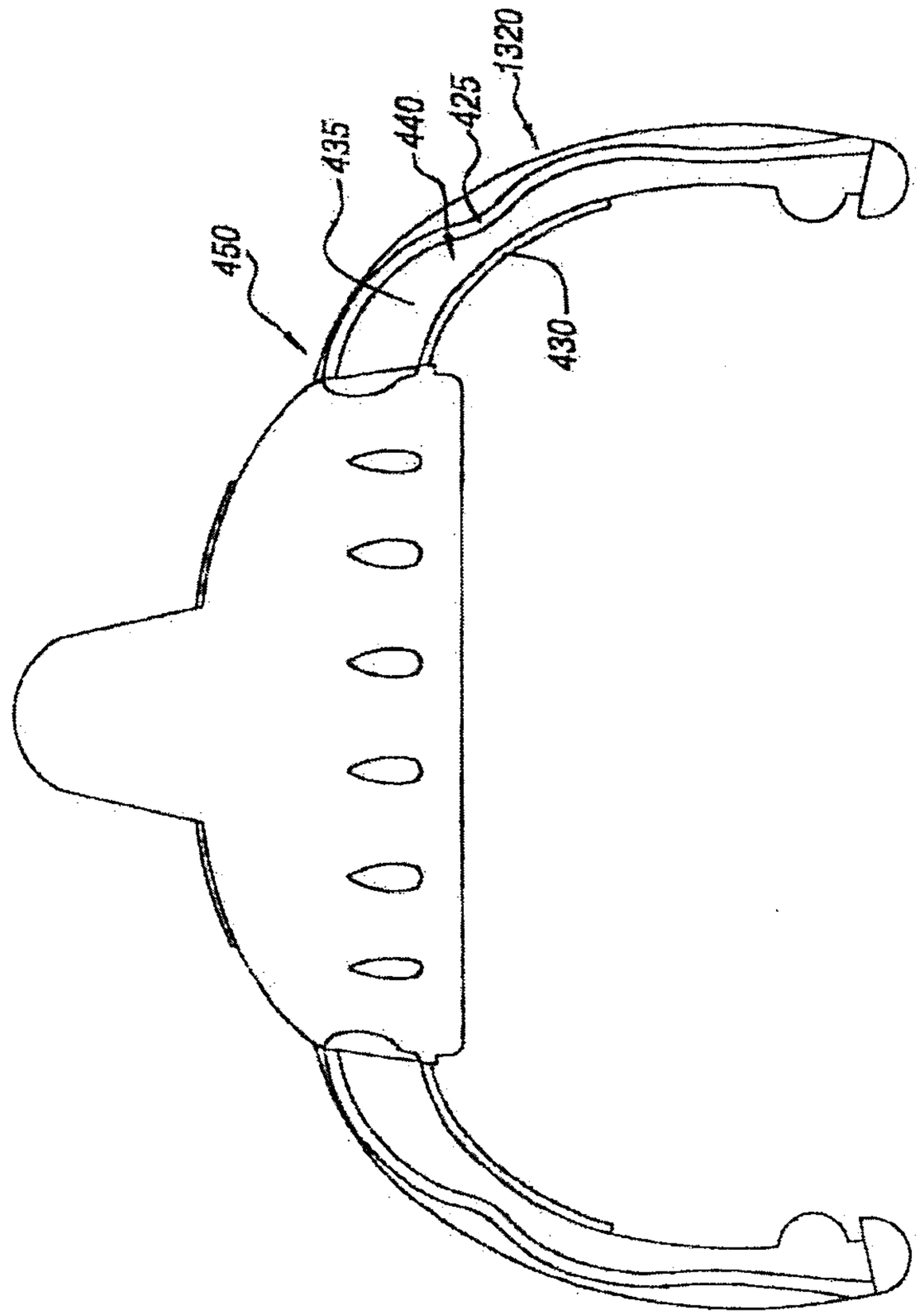

Fig. 13

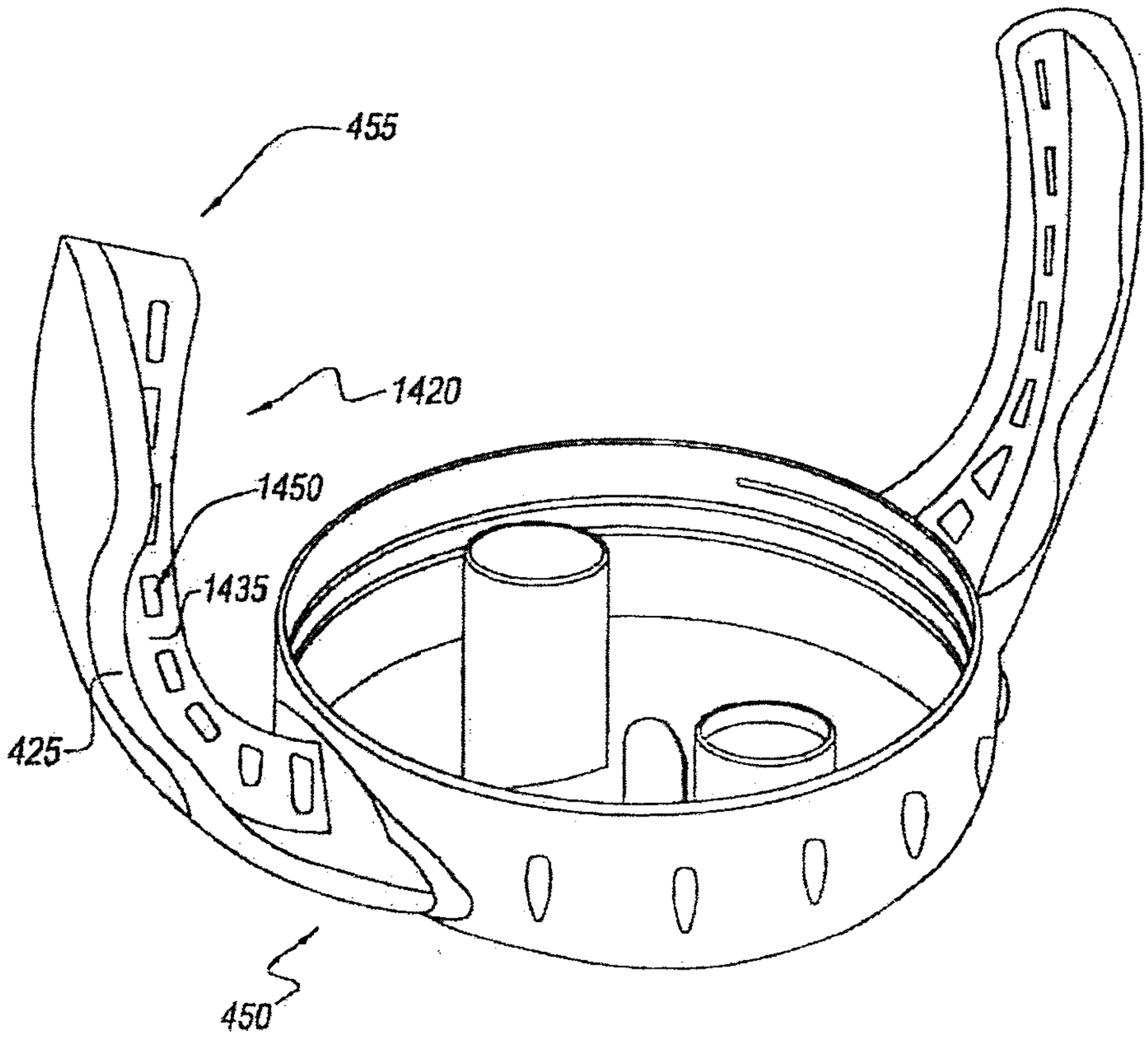

Fig. 14

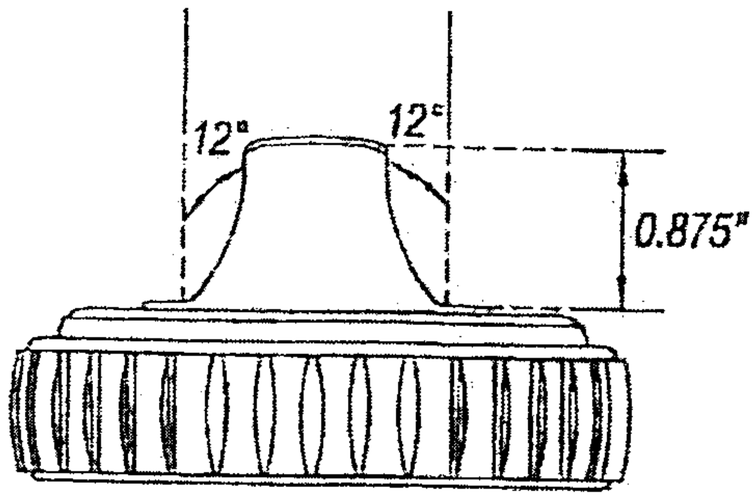

Fig. 15
(Prior Art)

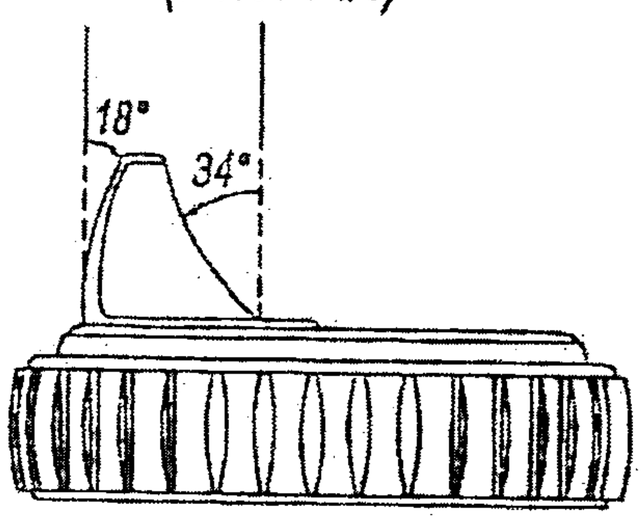

Fig. 16
(Prior Art)

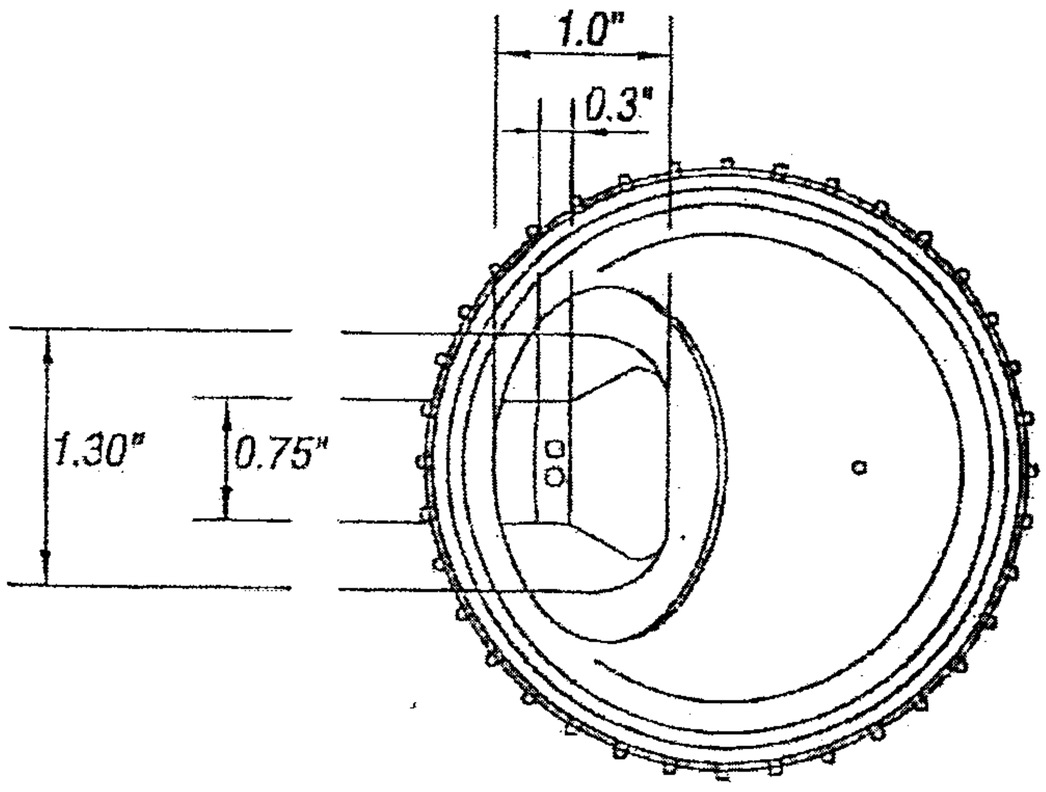

Fig. 17
(Prior Art)

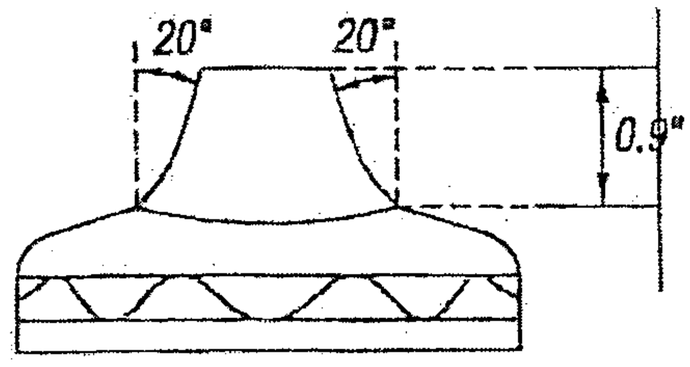

Fig. 18
(Prior Art)

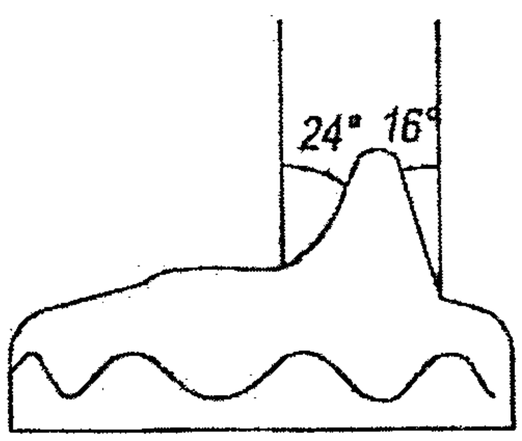

Fig. 19
(Prior Art)

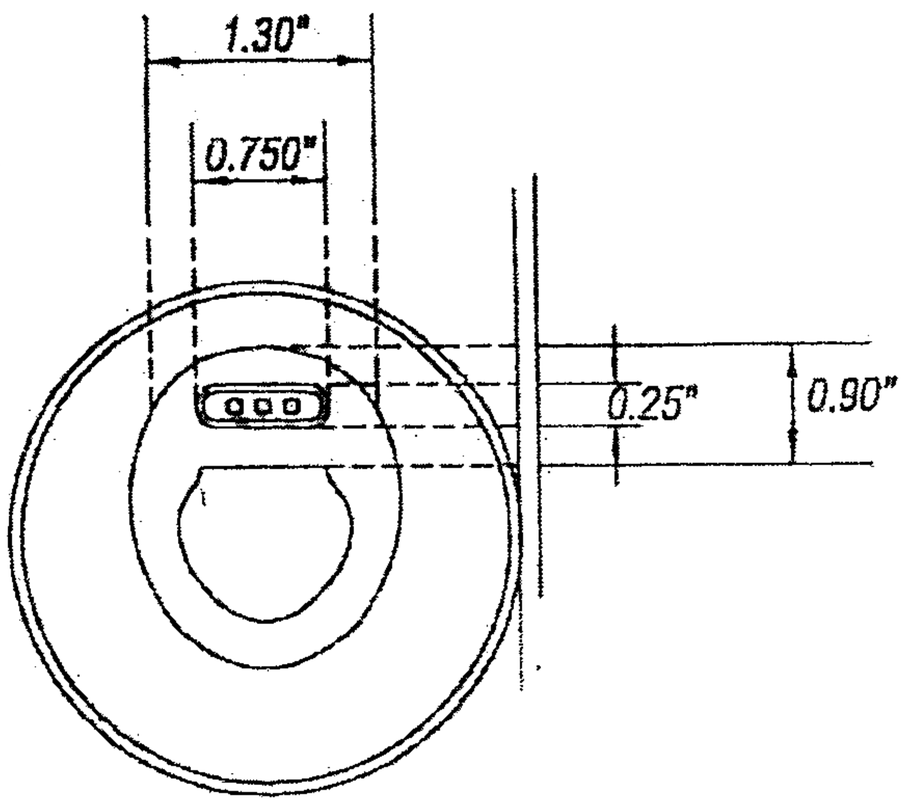

Fig. 20
(Prior Art)