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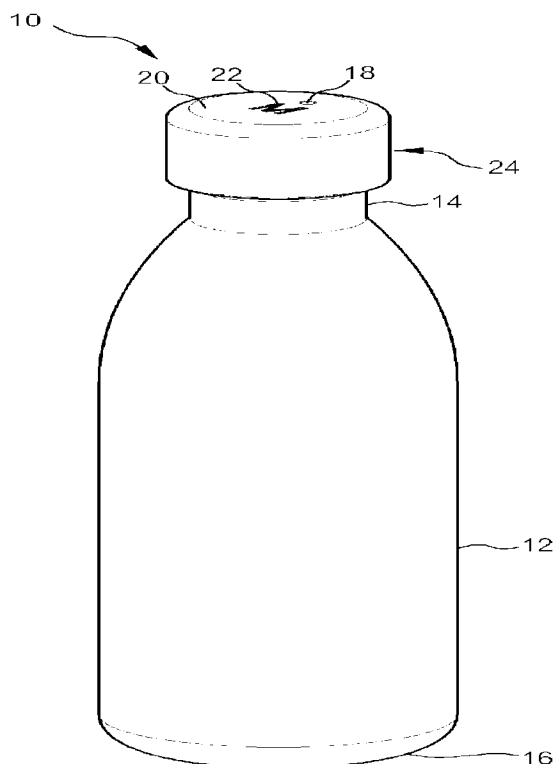


FIG. 1

(57) Abrégé/Abstract:

A container that provides temperature range indication to a user, the container including a chamber for holding heated liquid and a cap having a visual indicator and a temperature sensor, wherein in use the visual indicator illuminates a plurality of visual colours representing to the user the discrete temperature range of the heated liquid. The container is suitable for infant formula preparation and feeding.



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Abstract:

A container that provides temperature range indication to a user, the container including a chamber for holding heated liquid and a cap having a visual indicator and a temperature sensor, wherein in use the visual indicator illuminates a plurality of visual colours representing to the user the discrete temperature range of the heated liquid. The container is suitable for infant formula preparation and feeding.

TEMPERATURE INDICATOR CONTAINER

FIELD OF THE INVENTION

[0001] The present invention relates to a temperature indicator container and more particularly temperature indicator container used to retain heated liquids for infant formula preparation.

BACKGROUND OF THE INVENTION

[0002] Conventionally, it has been recognized that milk/formula given to unweaned babies or infants should be at the correct temperature. If the milk/formula liquid is too hot, the infant or baby's lips and mouth may be burned. If the milk/formula liquid is too cold, it may bring a case of indigestion or constipation.

[0003] There is always a need for carers or parents to serve a fresh bottle of baby or infant formula promptly at the correct temperature, to avoid any delays caused by heating or cooling of the infant formula.

[0004] Conventionally in the past, the most common method for determining the temperature of the liquid for infant feeding was simply by the use of the tactile feeling of the fingertip, hand palm or elbow of the person having access to the feeding bottle. This determination was therefore often unreliable, as it simply depended upon the thermal feeling and guess work of that person having access to the feeding bottle and furthermore, was not free from the influences of atmospheric or room temperature.

[0005] Other temperature indicator means used in baby bottles included the use of liquid bulb-type thermometers attached, by various methods, to the feeding bottle. With respect to using liquid bulb-type thermometers there is the obvious breakage risk, resulting from the fact that the bottle is being used by an infant and thus might be dropped or the bottle misused by the infant, thus possibly leading to cuts or poisoning.

[0006] There is a now a need for a temperature indicator container that attempts to ameliorate any one or more of the above problems.

SUMMARY OF INVENTION

[0007] Accordingly, the present invention provides a container that provides temperature range indication to a user, the container including:

a chamber for holding heated liquid;

an outlet for dispensing the heated liquid from the chamber;

a cap sealably connected to the outlet;

the cap including:

- (a) a visual indicator adapted to selectively illuminate a plurality of visual colours, wherein each one of the visual colours represents a pre-determined discrete temperature range;
- (b) a temperature sensor, extending inside the chamber that measures the temperature of the heated liquid;
- (c) a power supply adapted to power the temperature sensor and visual indicator; and
- (d) a switch operable by the user to engage the power supply;
- (e) a processor that correlates the measured temperature of the heated liquid from the temperature sensor with the visual indicator,

wherein in use, illumination of each one of the visual colours represents to the user the discrete temperature range of the heated liquid.

[0008] It is preferred that the chamber is manoeuvrable so that the heated liquid contacts the temperature sensor.

[0009] It is preferred that the processor includes a printed circuit board having an integrated circuit programmed to process an input signal to an output signal.

[0010] It is preferred that the input signal originates from the temperature sensor and the output signal is directed to the visual indicator.

[0011] It is preferred that the visual indicator includes a red, green, blue light colour emitting diode.

[0012] One advantage of the container that provides temperature range indication to a user, is that the visual indicator illustrates to the user that the heated liquid is safe to use for baby infant formula preparation.

[0013] Another advantage of the container that provides temperature range indication to a user, is that there is no liquid bulb-type thermometer making it safer to use for infants and babies.

[0014] It will be convenient to hereinafter to describe the invention with reference to the following drawings which shows thirteen (13) preferred embodiments of the container that provides temperature range indication to a user and the particularity of the attached drawings and following description should not supersede or limit the preceding broad definition of the invention.

[0015] Figure 1, is a front perspective view from above of the container that provides temperature range indication to a user, illustrating a connected cap, according to a first preferred embodiment of the invention;

[0016] Figure 2 is a front perspective view from above of the container that provides temperature range indication to a user of Figure 1, illustrating a disconnected cap, according to a second preferred embodiment of the invention;

[0017] Figure 3 is a top view of the container that provides temperature range indication to a user of Figure 1, according to a third preferred embodiment of the invention;

[0018] Figure 4 is a side perspective view of the container that provides temperature range indication to a user of Figure 1 according to a fourth preferred embodiment of the invention;

[0019] Figure 5 is an exploded view of the container that provides temperature range indication to a user of Figure 1 according to a fifth preferred embodiment of the invention;

[0020] Figure 6 is a cross sectional view of the container that provides temperature range indication to a user of Figure 4, taken through section "6-6" of Figure 3, according to a sixth preferred embodiment of the invention;

[0021] Figure 7 is a cross sectional view of the container that provides temperature range indication to a user of Figure 4, taken through section "7-7" of Figure 3, according to a seventh preferred embodiment of the invention;

[0022] Figure 8 is an enlarged view of the container that provides temperature range indication to a user, taken through circle section 8 of Figure 6, according to an eighth preferred embodiment of the invention;

[0023] Figure 9 is an enlarged view of the container that provides temperature range indication to a user, taken through circle section 9 of Figure 7, according to a ninth preferred embodiment of the invention;

[0024] Figure 10 is a top view of an upper silkscreen layer of the printed circuit board within the container that provides temperature range indication to a user of Figure 5, according to a tenth preferred embodiment of the invention;

[0025] Figure 11 is a top view of a middle solder-mask layer relative to the upper silkscreen layer of Figure 10, according to an eleventh preferred embodiment of the invention;

[0026] Figure 12 is a top view of a lower solder-mask layer relative to the upper silkscreen layer of Figure 10, according to a twelfth preferred embodiment of the invention; and

[0027] Figure 13 is a front perspective view of the temperature sensor within the container that provides temperature range indication to a user of Figure 5, according to a thirteenth preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] In this specification including the claims and drawings the phrase “heated liquid” means: heated sterile water suitable for baby or infant formula; and heated water suitable for coffee and tea.

[0029] Now referring to Figure 1, is a front perspective view from above of the container that provides temperature range indication to a user, illustrating a connected cap 10, having a chamber 12, which holds the heated liquid. The chamber 12 is supported by a base 16. The chamber 12 is a bottle shape constructed from two (2) ply aluminium material. The chamber 12 has an additional outer wall and an inner wall, both not illustrated in Figure 1. Positioned between the outer wall and inner wall there is an insulation layer comprising a vacuum space (not illustrated in Figure 1). The inner wall is externally coated in the exposed position relative to the vacuum space with copper coating finish to provide greater heat insulation capability to maintain the temperature of the heated liquid inside the chamber 12. The vacuum space (not illustrated) functions to provide further heat insulation capacity for the chamber 12. The chamber 12 can be of any suitable volume, but it is preferred to be of in the order of 750ml. The materials used for the outer wall and inner wall of the chamber 12 is that it is constructed from 304 grade stainless steel. The outer wall of the chamber 12 is finished with coated paint to make the the container that provides

temperature range indication to a user illustrating a connected cap 10 aesthetically pleasing.

[0030] Advantageously, given the structure of the chamber 12 described above, the chamber 12 can maintain the heated liquid for up to twelve (12) hours which allows users to obtain to multiple feeds for baby formulations at a safe temperature out of the container that provides temperature range indication to a user 10.

[0031] The chamber 12 extends to a neck 14 made from the same 304 grade stainless steel material as the inner wall and outer wall of the chamber 12. The cap 24 in Figure 1 illustrates being connected to the chamber 12, with the visual indicator 18 being positioned at the top of the cap 24. The cap 24 will be fully described further below, but which in Figure 1 has a removable cover 20 which is constructed from flexible silicone material that can be fully removed and flexibly fitted on the remaining aspects of the cap 24 which will be fully described further below. The removable cover 20 accommodates flexibility so that the flexible button 22 can be operated by manipulation of the user's fingers to press the flexible button 22 in order to operate the switch (not illustrated in in Figure 1). The letter "M" is merely ornamental having no technical purpose and any other symbol or letter can be used.

[0032] Now Figure 2 is a front perspective view from above of the container that provides temperature range indication to a user of Figure 1 illustrating a disconnected cap 30, which provides the chamber 32 having the base 34, which in turn provides the necessary support, such that the chamber 32 can stand in an upright position. The chamber 32 upwardly extends to the neck 44 and further to the neck 40 which has a thread 38 which is a broad, circular and discontinuous thread around the neck 44 and neck 40. In this embodiment, the thread 38 is broad, circular and discontinuous around the neck 44 and neck 40 including additional finer threads protruding thereon. That is, the thread 38 is clever having a unique finer thread overlaying a novel, broad, circular and discontinuous thread. That is, a discontinuous broad thread and another thread having raised channels disposed on the broad thread. The thread 38 provides the required engagement structure with the cap 46, such that the cap 46 can be securely pressed down and then screwed around the neck 40 and neck 44 by the

user's hand. In the alternative embodiment, the thread 38 is running continuously and circumferentially around the neck 44 and neck 40. On the neck 44 is a rim 42 that also provides a closing and sealing function. The cap 46 can then connect with the outlet 36 by sealed engagement and/or inter-engagement. At the top of the neck 40 is an outlet 36 that functions to dispense the heated liquid from inside of the chamber 32. The outlet 36 is quite unique relative to the chamber 32 in that the upward extension from the neck 44 and further to the neck 40 provides a uniquely dimensioned outlet 36 which is unusually narrow to that known in the art, that provides easier and safer pouring of the heated liquid from the chamber 32, thereby reducing spillage. The unique and clever narrower neck 44 and neck 40 relative to the chamber 32 also prevents heat escape of the heated liquid from within the chamber 32.

[0033] The cap 46 has a removable cover 48 on the side of the cap 46 and removable cover 50 extending on the top all of which is constructed from flexible silicone material that allows the user to fully remove and flexibly fit back on. The visual indicator 52 at the top of the cap 46, illuminates a plurality of visual colours namely the colours, red, green and blue to the user, each specific colour of which represents to the user a discrete temperature range of the heated liquid in the chamber 32, which will be described more fully below. The flexible button 54 can be pressed by the user's finger to operate the switch (not illustrated) which will be described more fully below.

[0034] The cap 46 further has an upper annulus 56 which assists providing the stopper and sealing function of the cap 46 by sliding engagement with the outlet 36 and internal wall of the neck 40. Immediately extending below the upper annulus 56 is a medial annulus 58 that also provides engagement function by also providing the stopper and sealing function of the cap 46 by insertion through the outlet 36. Extending below the medial annulus 58 is the boss 60 having a temperature sensor 62 extending therethrough below. The temperature sensor 62 functions to measure the temperature of the heated liquid inside the chamber 32. Depending on how high the level of the heated liquid is inside the chamber 32, the temperature sensor either sits above or below the level of the heated liquid inside the chamber 32. When the temperature sensor 62 sits above the level of the heated liquid it will be necessary for

the user to manoeuvre the chamber 32, by tilting the chamber 32 such that the heated liquid runs over and contacts with the temperature sensor 32. Similarly, when the temperature sensor 62 sits below the level of the heated liquid it will not be necessary for the user to manoeuvre the chamber 32.

[0035] Now turning to Figure 3 is a top view of the container that provides temperature range indication to a user 70 of Figure 1 illustrating the chamber 72 and centrally located cap 74 having a removable cover 76 and a visual indicator 78 and adjacent flexible button 80. The letter "M" is merely ornamental having no technical purpose and any other symbol or letter can be used.

[0036] Having regard to Figure 4 is side perspective view of the container that provides temperature range indication to a user 90 of Figure 1, having a chamber 92 of any variable length having its base 94. Extending upward from the chamber 92 is the neck 102 with the rim 100 exposed on the external side of the neck 102. The rim 100 provides closing and sealing function. Above the rim 100 is the cap 96 with the removable cover 98.

[0037] Turning to Figure 5 is an exploded view of the container that provides temperature range indication to a user 120 of Figure 1, with the chamber 168 supported by the base 178. Extending above from chamber 168 is the neck 170 extending then to a rim 172. A thread 174 running discontinuously (and in the alternative embodiment continuously), and circumferentially around the neck 170 which provides the required engagement structure with the cap (not illustrated in its assembled form), such that the cap (not illustrated in its assembled form), can be pressed down and securely screwed onto the neck 170 and over the outlet 176 by the user. At the top of the neck 170 is an outlet 176 that functions to dispense the heated liquid from the inside the chamber 168. The cap (not illustrated in its assembled form but exploded form) has a removable cover 122 extending from the side of the cap (not illustrated in its assembled form but exploded form) and continuing over to the removable cover 128 of which is constructed from flexible silicone material that allows the user to fully remove and flexibly fit back on over the internal cap 130 which is constructed from harder resilient polyvinyl chloride (PVC) or injection moulded plastics.

Located on the removable cover 128 is an aperture 126 that provide the opening for the red, green and blue colour light emitting diode 150 to sit under the aperture 126, such that a plurality of visual colours can illustrate visually to the user. A flexible button 124 is positioned on the removable cover 128 which can be pressed by the user's finger to operate the switch 146 which will be described more fully below.

[0038] The internal cap 130 provides the necessary stable structure having at its top an opening with a biased leaf 138 which is spring loaded or flexibly biased that can move and depress upon the pressing action by the user's finger on the flexible button 124, which in turn engages the biased leaf 138. In addition, at the top of the internal cap 130 is an aperture 140 which cooperates with the aperture 126 located on the removable cover 128 such that the light emitting diode 150 can emit light therethrough both the aperture 140 and aperture 126 when assembled. The internal cap 130 at the top also has a charging port 136 for electric charging of a rechargeable battery 152. The power supply can be either a non-chargeable battery or a rechargeable battery 152. The charging port 136 provides the opening to a USB port 144 that allows the user to use a mobile telephone charging cable, for example, to recharge the rechargeable battery 152. The charging port 136 is quite advantageous as the heated liquid (not illustrated) can be maintained heated within the chamber 168 even when the rechargeable battery 152 is being recharged. All what is required is for the user to remove the removable cover 122 and utilize the USB port 144 in the charging port 136. The internal cap 130 also on its side has a projection 132 and projection 134 that each provide the necessary engagement structure for the removable cover 122, to securely fasten by flexible engagement.

[0039] Now, inside the internal cap 130 is the necessary electronics including a printed circuit board 142 which has the USB port 144 affixed thereto so that the recharging function using electrical current can pass through to the rechargeable battery 152. The printed circuit board 142 also includes the switch 146 that operates by interconnection resulting from hand pressure from a user's fingers engaging the flexible button 124, which in turn engages the biased leaf 138 to further engage the switch 146 that creates an electrical circuit through which the printed circuit board 142

electrically charges both the integrated circuit 148 which is programmed to operate and power the light emitting diode 150 and the temperature sensor 164. The printed circuit board 142 is physically secured by a boss 153 having an opening to receive screws to fasten to the printed circuit board 142. The boss 153 is internally secured to a cylindrical sleeve 154 which forms the basis of the upper annulus 56 of Figure 2. There is an additional boss (not illustrated) but internally secured to the cylindrical sleeve 154 that provides additional securement function of the printed circuit board 142. Extending below the cylindrical sleeve 154, presents a narrowed medial annulus 156 having externally exposed threads that receives a bung 160 which functions to close and seal the cap (not illustrated in Figure 5 in its assembled form but in its exploded form) as a whole from its outside. Extending below the medial annulus 156 is a boss 158. The base plate 162 closes the boss 158, whilst allowing the temperature sensor 164 to protrude through the base plate 162 which is sealed by the O-ring washer 166.

[0040] Now turning to Figure 6 is cross sectional view of the container that provides temperature range indication to a user 180 of Figure 4, taken through section "6-6" of Figure 3, which illustrates the chamber 186 holding or retaining the heated liquid 184. The person skilled in the art would appreciate by interpreting Figure 6, that given the level of the heated liquid 184 inside the chamber 186, the chamber 186 will need to be maneuvered by the user by tilting so that the heated liquid 184 contacts with the temperature sensor (not numbered but illustrated to the person skilled in the art) to correctly measure the temperature of the heated liquid 184 which will be fully described below. Circle section 8 of the cap 182 (not numbered in Figure 6) is illustrated further in Figure 8.

[0041] Now turning to Figure 7 is a cross sectional view of the container that provides temperature range indication to a user 190 of Figure 4, taken through section "7-7" of Figure 3, which illustrates the chamber 196 holding the heated liquid 194. The person skilled in the art would appreciate by interpreting Figure 7, that given the level of the heated liquid 194 inside the chamber 196, the chamber 196 will need to be maneuvered by the user by tilting so that the heated liquid 194 contacts with the

temperature sensor (not numbered but illustrated to the person skilled in the art) to correctly measure the temperature of the heated liquid 194 which will be fully described below. Circle section 9 of the cap 192 (not numbered in Figure 7) is illustrated further in Figure 9.

[0042] For the avoidance of doubt, the person skilled in the art will appreciate that both Figure 6 and Figure 7 do not illustrate the inner wall and outer wall of the chamber 186 of Figure 6 and chamber 196 of Figure 7 in these embodiments. In further embodiments, the chamber 186 of Figure 6 and chamber 196 of Figure 7 can have an additional outer wall and an inner wall. Positioned between the outer wall and inner wall where there is an insulation layer comprising a vacuum space (not illustrated in Figure 6 and Figure 7). The inner wall is externally coated in the exposed position relative to the vacuum space with copper coating finish to provide greater heat insulation capability to maintain the temperature of the heated liquid 184 inside the chamber 186 of Figure 6 and heated liquid 194 of chamber 196 of Figure 7. The vacuum space (not illustrated Figure 6 and Figure 7) functions to provide further heat insulation capacity for the chamber 186 of Figure 6 and chamber 196 of Figure 7.

[0043] Now turning to Figure 8 is an enlarged view of the container that provides temperature range indication to a user, taken through circle section 8 of Figure 6, illustrating the cap 210, having the light emitting diode 212, being a tri-colour LED illuminating red colour, blue colour and green colour, which is further described below. The biased leaf 214 is spring loaded or flexibly biased that can move and depress upon the pressing action by the user's finger on the flexible button (not numbered) situated on the removable cover 218 (which extends to the removable cover 224) which in turn engages the switch 215. A USB port 216 is located on the printed circuit board 226 which has an integrated circuit 222 affixed thereto that is operationally connected to the light emitting diode 212. Extending below the cap 210 is the temperature sensor 236 which is a thermistor type sealed from moisture by the O-ring washer 240. The temperature sensor 236 extends through the middle of the cap 210 by way of a tube 232 constructed from poly-vinyl chloride (PVC) having internally, electrically conductive side by side wiring that provides variable electrical resistance to

a current dependent on its temperature (which will be described more fully below) that is operationally connected to the printed circuit board 226. The temperature sensor 236 ultimately extends and protrudes through the cap 210 below. Operationally, the cap 210 slide fits over the neck 238 of the container (not illustrated) in the annular space between internal cap 220 and the cylindrical sleeve 242 and the cap 210 also slide fits over the neck 234 of the container (not illustrated) in the annular space between internal cap 230 and the cylindrical sleeve 228 and the user presses the cap 210 down over the outlet (not numbered) and utilises the unique threads (not numbered but described herein) on the neck 234 by twisting around the outlet (not numbered) securely.

[0044] Turning to Figure 9 is an enlarged view of the container that provides temperature range indication to a user, taken through circle section 9 of Figure 7 illustrating the cap 260 having the biased leaf 262 which is spring loaded or flexibly biased that can move and depress upon the pressing action by the user's finger on the flexible button (not numbered) located on the removeable cover 282 which in turn engages the switch 263. The flexible button (not numbered) situated on the removable cover 282 which in turn extends to removable cover 266 on the other side of the cap 260. Extending below the cap 260 is the temperature sensor 272 which is a thermistor type sealed from moisture by the O-ring washer 274. The temperature sensor 272 extends through the middle of the cap 260 that is operationally connected to the printed circuit board 264 via a tube of which the person skilled in the art would appreciate is partially blocked from view (near the lower end) by the internal moulding structures of the cap 260. The temperature sensor 272 ultimately extends and protrudes through the cap 260 below, which is sealed from moisture by the O-ring washer 274. Operationally, the cap 260 slide fits over the neck 278 of the container (not illustrated) in the annular space between internal cap 280 and the cylindrical sleeve 286 and the cap 260 slide fits over the neck 270 of the container (not illustrated) in the annular space between internal cap 268 and the cylindrical sleeve 284. The slide fit also is securely sealed by the threads (described herein) in the neck 278 and the neck 270 by hand twisting by the user of the cap 260 creating sealed interengagement. The rechargeable battery 276 is located therein to power the

container that provides temperature range indication to a user of Figure 7. The rechargeable battery 276 is of any suitable type in the field such as a polymer lithium battery having 3.7V, 250 mAh°. The rechargeable battery charger voltage that users should charge the rechargeable battery 276 is about 5V and 1 Ω using, for example, a mobile iPhone™ charging block.

[0045] The person skilled in the art would appreciate that the cap 210 of Figure 8 and cap 260 of Figure 9 is constructed from injection moulded plastics, ABS Food grade plastics or poly vinyl chloride (PVC), with internal electrical systems so that the cap 210 of Figure 8 and cap 260 of Figure 9 is water resistant to operate when the heated liquid (not illustrated) contacts the relevant temperature sensor 272 of Figure 9 and temperature sensor 236 of Figure 8.

[0046] Figure 10 is a top view of an upper silkscreen layer of the printed circuit board within the container that provides temperature range indication to a user of Figure 5, illustrating the silkscreen layer 290 and the component outlines including the light emitting diode LED region 292 to secure the tri-colour LED illuminating red colour, blue colour and green colour, and the USB Region 294 that receives a Type A male USB type standard mobile telephone charging cable for charging the rechargeable battery (not illustrated) and the switch region 296 and the integrated circuit region 298, which may also include a thermistor type integrated circuit programmed to cooperate with the temperature sensor (not illustrated in Figure 10). The secure hole 300 is used to secure the various layers of the printed circuit board (when fully assembled) to be secured to a boss (see boss 153 of Figure 5).

[0047] Figure 11 is a top view of a middle solder-mask layer relative to the upper silkscreen layer of Figure 10, illustrating the solder mask layer 310 having the secure hole 312 is used to secure the various layers of the printed circuit board (when fully assembled) to be secured to a boss (see boss 153 of Figure 5). A first solder region 314 having tracking and a second solder region 316 having further tracking.

[0048] Figure 12 is a top view of a lower solder-mask layer relative to the upper silkscreen layer of Figure 10 illustrating the solder mask layer 350 having a green

solder region 352 which is used to provide electronic circuit functionality to activate the green LED light and a blue solder region 354 is used to provide electronic circuit functionality to activate the blue LED light and red solder region 356 is used to provide electronic circuit functionality to activate the red LED light. The secure hole 358 is used to secure the various layers of the printed circuit board (when fully assembled) being Figure 10, Figure 11 and Figure 12 on the relevant substrate known in the art, which is secured to a boss (see boss 153 of Figure 5). Located opposite to the secure hole 358 is another secure hole (not numbered) adjacent to a negative charge point for the rechargeable battery 360 and positive charge point for the rechargeable battery 362.

[0049] Figure 13 is a front perspective view of the temperature sensor within the container that provides temperature range indication to a user of Figure 5, the temperature sensor 370, which is a thermistor type having a connector shell 372 which operatively engages the switch (not illustrated) on the printed circuit board (also not illustrated). The connector shell 372 is connected to a side by side wire 374 of variable length and suitable material having an electrical resistance function which is enclosed by a polyvinyl chloride (PVC) tube. A bullet shaped shell 376 extends to a cylindrical shell 378 further below with a covered epoxy resin region 380 for providing impermeably as well as providing secured sealing and electrical resistance to prevent the heated liquid in the container (both not illustrated) from entering inside the cap (not illustrated). The materials used for the temperature sensor 370 include those being metal oxides. An upper electrical resistance region 382 of about 23mm in length, which protrudes outside the cap (not illustrated) when assembled, extends to the mid electrical resistance region 384 of about 5.5mm and the end electrical resistance region 386 of about 2mm the latter of which extends most into the chamber (not illustrated). The mid electrical resistance region 384 has a capacity of 100K (kelvin) $\pm$ 1%. The temperature sensor 370 thermistor functional characteristics which include (i) a zero power resistance : $R_{25}=100K\Omega$ (ii) B Value of $B_{25/50}=3950k\pm 1\%$; (iii) a thermal time constant: 16s max (iv) a dissipation constant : $2.0mW/^{\circ}C$; (v) power rating : 10mW and (vi) and an operating temperature range of $-30^{\circ}C$ to $108^{\circ}C$. The overall length of the temperature sensor 370 is at least 115mm $\pm$ 5mm.

[0050] The temperature sensor 370 is an NTC being a negative temperature co-efficient type using the following temperature resistance table below utilizing known metal conductive wiring materials used in the art and having the following characteristics:

[0051] TEMPERATURE VS RESISTANCE TABLE

- Resistance 100k Ohms at 25deg. C
- Resistance Tolerance + / - 1%
- B Value 3950K at 25/50 deg. C
- B Value Tolerance + / - 1 %

Temp. (deg. C)	Rmax (k Ohms)	Rnor (k Ohms)	Rmin (k Ohms)
0	334.2264	327.0195	319.9360
1	317.4508	310.7640	304.1877
2	301.6157	295.4121	289.3072
3	286.6631	280.9084	275.2418
4	272.5389	267.2014	261.9423
5	259.1926	254.2428	249.3626
6	246.5770	241.9877	237.4601
7	234.6482	230.3940	226.1943
8	223.3650	219.4224	215.5278
9	212.6890	209.0361	205.4255
10	202.5840	199.2007	195.8544
11	193.0167	189.8841	186.7836
12	183.9552	181.0559	178.1844
13	175.3704	172.6881	170.0298
14	167.2345	164.7540	162.2942
15	159.5216	157.2290	154.9539
16	152.2075	150.0898	147.9867
17	145.2694	143.3144	141.3716
18	138.6861	136.8825	135.0889
19	132.4375	130.7749	129.1202
20	126.5049	124.9734	123.4482
21	120.8705	119.4612	118.0564
22	115.5180	114.2223	112.9298
23	110.4316	109.2417	108.0537
24	105.5969	104.5053	103.4147
25	101.0000	100.0000	99.0000
26	96.7127	95.7132	94.7146

Temp. (deg. C)	Rmax (k Ohms)	Rnor (k Ohms)	Rmin (k Ohms)
27	92.6306	91.6333	90.6378
28	88.7426	87.7492	86.7583
29	85.0386	84.0505	83.0655
30	81.5090	80.5274	79.5497
31	78.1446	77.1707	76.2012
32	74.9370	73.9717	73.0115
33	71.8779	70.9222	69.9721
34	68.9598	68.0144	67.0752
35	66.1755	65.2411	64.3134
36	63.5182	62.5954	61.6798
37	60.9814	60.0707	59.1677
38	58.5591	57.6610	56.7710
39	56.2456	55.3604	54.4837
40	54.0355	53.1635	52.3004
41	51.9235	51.0651	50.2158
42	49.9049	49.0602	48.2250
43	47.9752	47.1443	46.3232
44	46.1298	45.3130	44.5062
45	44.3649	43.5621	42.7696
46	42.6764	41.8878	41.1096
47	41.0607	40.2862	39.5224
48	39.5143	38.7539	38.0044
49	38.0339	37.2876	36.5524
50	36.6163	35.8842	35.1631
51	35.2587	34.5405	33.8335
52	33.9582	33.2538	32.5608
53	32.7121	32.0214	31.3423
54	31.5178	30.8408	30.1754
55	30.3731	29.7096	29.0576
56	29.2755	28.6253	27.9868
57	28.2230	27.5860	26.9607
58	27.2135	26.5895	25.9772
59	26.2450	25.6338	25.0343
60	25.3156	24.7171	24.1303
61	24.4237	23.8376	23.2633
62	23.5675	22.9937	22.4315
63	22.7454	22.1836	21.6336
64	21.9560	21.4061	20.8678
65	21.1977	20.6594	20.1328
66	20.4692	19.9424	19.4272
67	19.7693	19.2537	18.7497
68	19.0966	18.5920	18.0990
69	18.4499	17.9562	17.4740
70	17.8282	17.3452	16.8735

Temp. (deg. C)	Rmax (k Ohms)	Rnor (k Ohms)	Rmin (k Ohms)
71	17.2304	16.7578	16.2965
72	16.6554	16.1930	15.7419
73	16.1023	15.6499	15.2087
74	15.5702	15.1276	14.6961
75	15.0581	14.6251	14.2032
76	14.5652	14.1417	13.7291
77	14.0907	13.6764	13.2729
78	13.6339	13.2286	12.8341
79	13.1940	12.7976	12.4118
80	12.7703	12.3825	12.0053
81	12.3622	11.9828	11.6139
82	11.9689	11.5978	11.2372
83	11.5900	11.2270	10.8743
84	11.2247	10.8697	10.5248
85	10.8727	10.5254	10.1881
86	10.5332	10.1935	9.8637
87	10.2059	9.8736	9.5511
88	9.8902	9.5652	9.2499
89	9.5858	9.2678	8.9594
90	9.2920	8.9809	8.6794
91	9.0085	8.7042	8.4094
92	8.7350	8.4373	8.1489
93	8.4710	8.1797	7.8977
94	8.2161	7.9312	7.6554
95	7.9700	7.6912	7.4215
96	7.7324	7.4596	7.1958
97	7.5029	7.2360	6.9780
98	7.2812	7.0201	6.7677
99	7.0670	6.8115	6.5647
100	6.8601	6.6101	6.3686
101	6.6601	6.4155	6.1793
102	6.4668	6.2274	5.9964
103	6.2799	6.0457	5.8197
104	6.0993	5.8701	5.6489
105	5.9246	5.7003	5.4839

[0052] For the avoidance of doubt, it will be appreciated by the person skilled in the art that the full range temperature resistance table used and operated for the temperature sensor 370 of Figure 13 referred to above ranges from about -30°C to about 108°C.

[0053] By referring to Figure 5, Figure 10, Figure 11 and Figure 12, the processor correlates the measured temperature of the heated liquid (not illustrated) from the temperature sensor 164 with the visual indicator. This means that the processor includes a printed circuit board 142 having an integrated circuit 148 programmed to process an input signal to an output signal. The input signal originates from the temperature sensor 164 and the output signal is directed to the visual indicator, in this case being the red, green and blue colour light emitting diode 150. The processor may be a microcontroller or microprocessor, for example an integrated chip. The processor may execute an algorithm to determine the temperature of the heated liquid measured by the temperature sensor 164.

[0054] The visual indicator being the tri-colour LED, selectively illuminates the colours red, blue and green colour specifically to illustrate to the user the discrete temperature and whether the heated liquid in the container is the correct temperature for infant formula preparation.

[0055] The colour blue indicates that the temperature range of the heated liquid is $< 25^{\circ}\text{C}$ degrees which is too cold to serve to prepare and serve infant formula. The colour green indicates that the temperature range of the heated liquid is between $>25^{\circ}\text{C}$ and $<45^{\circ}\text{C}$ and safe to serve to an infant when mixed with baby formula. The colour red indicates that the temperature range of the heated liquid is $>45^{\circ}\text{C}$ and is too hot and unsafe to serve to an infant. These different colours (blue, green and red) are directed to illuminate on these pre-determined temperature ranges using the electrical components and arrangements on the printed circuit board 142 in Figure 5 and fully described herein.

[0056] By referring to Figure 5, operationally the user handles the container that provides temperature range indication to a user 120. The user firstly presses the flexible button 124 once (whilst contemporaneously manoeuvring the chamber 168 by tilting of the user's hand, so that the heated liquid contacts the temperature sensor 164) which pushes the biased leaf 138 to engage the switch 146 to use the power in the rechargeable battery 152 which then powers the necessary current through the printed circuit board 142 to produce a current through the temperature sensor 164 of

Figure 5 being a thermistor which is heated accordingly to the contact temperature of the heated liquid in the container 168, thereby inducing electrical resistance, measurable by the electronics components back to the printed circuit board 142. There is a 1.5 to 2 second delay for the temperature sensor 164 to make the reading and for the red, green and blue colour light emitting diode 150 to illuminate with any one of the colours blue, green and red colour reflecting the predetermined discrete temperature range described herein. This 1.5 to 2 second delay allows time for the user to tilt the container 168 back to vertical so the user can then read which coloured light is emitted by the light emitting diode 150 through the aperture 126.

[0057] By referring to Figure 6, the person skilled in the art would appreciate that when the levels of the heated liquid 184 is high enough in the chamber 186 such that the heated liquid 184 touches the temperature sensor (not numbered but illustrated) there is no need to manoeuvre the chamber 186 by tilting.

[0058] By referring to Figure 5, advantageously in order to recharge the rechargeable battery 152, the user removes the removable cover 122 and then utilises the electric charging port 136 and the USB port 144 to receive a Type A male USB type standard mobile telephone charging cable (not illustrated) for charging the rechargeable battery 152. When the Type A male USB type standard mobile telephone charging cable is engaged to a standard external power socket, the visual indicator in this case being the light emitting diode 150 uniquely illuminates the colour red when the rechargeable battery is recharging. When the visual indicator in this case being the light emitting diode 150 illuminates the colour green, this uniquely illustrates to the user when the rechargeable battery 152 is fully charged and the Type A male USB type standard mobile telephone charging cable (not illustrated) can then be removed from the internal cap 130. The unique combination of the visual indicator that provides both temperature indication on the one hand and rechargeability indication of the rechargeable battery 152 on the other to the user, is quite clever for use in baby infant formula preparation. There is an additional advantage using the chamber 168 as described herein with the use of the inner wall and outer wall

separated by an insulation layer comprising a vacuum space, all providing high quality heat retaining function of heated liquid in baby infant formula preparation.

[0059] The person skilled in the art would appreciate that having regard to the unique and inventive combination and cooperation of all components and features of the container that provides temperature range indication to a user 10 of Figure 1 and described herein, provides a substantial improvement for the use of heated liquid in the preparation of milk/formula for babies and infants for their health and safety.

[0060] Although the container that provides temperature range indication to a user 10 can be used for the preparation of baby infant formulation, it can also be used in schools, hospitals and nursing homes for the preparation of coffee and tea.

[0061] In an alternative embodiment, given the structure of the chamber 12 described above, the chamber 12 can maintain chilled water for up to twenty-four (24) hours such that the container that provides temperature range indication to a user 10 can be used as a drink bottle.

[0062] In an alternative embodiment, the chamber 12 can be of any suitable shape such as the bottle shape of Figure 1 or any other variation.

[0063] One advantage of the container that provides temperature range indication to a user, is that the visual indicator illustrates to the user that the heated liquid is safe to use for baby infant formula preparation.

[0064] Another advantage of the container that provides temperature range indication to a user, is that there is no liquid bulb-type thermometer making it safer to use for infants and babies.

[0065] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise" and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or step or

group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

[0066] A reference to any prior art in this Specification is not, and should not be taken as, an acknowledgment or any form or suggestion that the prior art forms part of the common general knowledge.

[0067] Various alterations and/or additions may be made to the container that provides temperature range indication to a user hereinbefore described in this Specification, without departing from the spirit, ambit or scope of the invention.

CLAIMS

1. A container that provides temperature range indication to a user, the container including:
 - a chamber for holding heated liquid;
 - an outlet for dispensing the heated liquid from the chamber;
 - a cap sealably connected to the outlet;
 - the cap including:
 - (a) a visual indicator adapted to selectively illuminate a plurality of visual colours, wherein each one of the visual colours represents a pre-determined discrete temperature range;
 - (b) a temperature sensor, extending inside the chamber that measures the temperature of the heated liquid;
 - (c) a power supply adapted to power the temperature sensor and visual indicator; and
 - (d) a switch operable by the user to engage the power supply;
 - (e) a processor that correlates the measured temperature of the heated liquid from the temperature sensor with the visual indicator,wherein in use, illumination of each one of the visual colours represents to the user the discrete temperature range of the heated liquid.
2. The container according to claim 1, wherein the chamber is manoeuvrable so that the heated liquid contacts the temperature sensor.
3. The container according to claim 1 or claim 2, wherein the processor includes a printed circuit board having an integrated circuit programmed to process an input signal to an output signal.

4. The container according to claim 3, wherein the input signal originates from the temperature sensor and the output signal is directed to the visual indicator.
5. The container according to any one of claim 1 to claim 4, wherein the visual indicator includes a red, green, blue light colour emitting diode.
6. The container according to claim 5, wherein the colour green represents the temperature range of the heated liquid being $> 25^{\circ}\text{C}$ to $< 45^{\circ}\text{C}$.
7. The container according to claim 5 or claim 6, wherein the colour blue represents the temperature range of the heated liquid $< 25^{\circ}\text{C}$.
8. The container according to any one of claim 5 to claim 7, wherein the colour red represents the temperature range of the heated liquid $> 45^{\circ}\text{C}$.
9. The container according to any one of claim 1 to claim 8, wherein the switch includes a button being spring loaded or flexibly biased.
10. The container according to any one of claim 1 to claim 9, wherein the cap further includes an electric charging port to charge the power supply.
11. The container according to claim 10, wherein the electric charging port includes a USB port.
12. The container according to any one of claim 1 to claim 11, wherein the power supply includes a rechargeable battery.
13. The container according to claim 12, wherein the visual indicator illuminates the colour red when the rechargeable battery is recharging.

14. The container according to claim 12 or claim 13, wherein the visual indicator illuminates the colour green when the rechargeable battery is fully charged.
15. The container according to any one of claim 1 to claim 14, wherein the cap includes a removable cover.
16. The container according to any one of claim 15, wherein the removable cover is constructed from flexible silicone.
17. The container according to any one of claim 1 to claim 16, wherein the chamber includes an outer wall and inner wall separated by vacuum insulation.
18. The container according to claim 17, wherein the inner wall includes heat insulation coating.
19. The container according to claim 18, wherein the heat insulation coating includes coated copper.
20. The container according to any one of claim 1 to claim 19, wherein the temperature sensor includes a thermistor.
21. The container according to any one of claim 1 to claim 20, wherein the heated liquid is used for baby infant formula preparation.
22. The container according to any one of claim 1 to claim 21, wherein the heated liquid is or includes water.
23. The container according to any one of claim 1 to claim 22, wherein the cap interengages a circularly discontinuous first thread disposed adjacent the outlet and a second thread having raised channels disposed on the first thread.

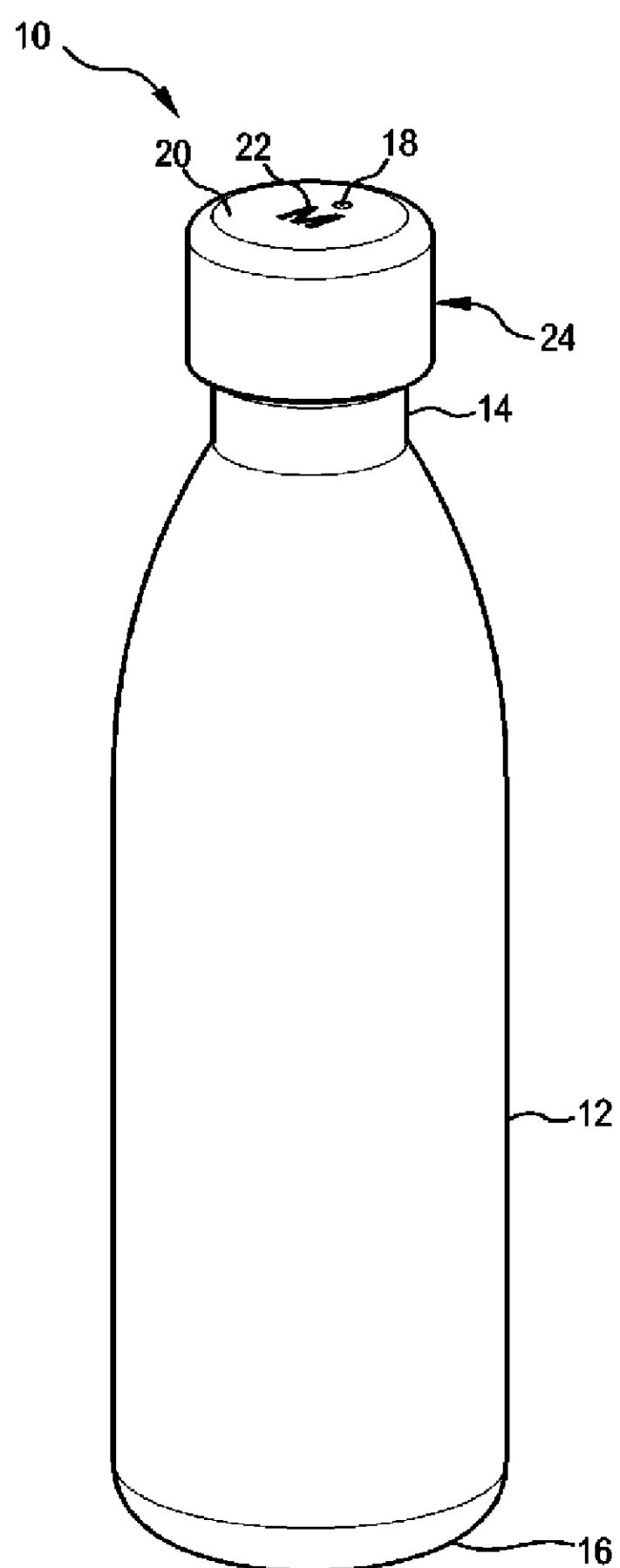


FIG. 1

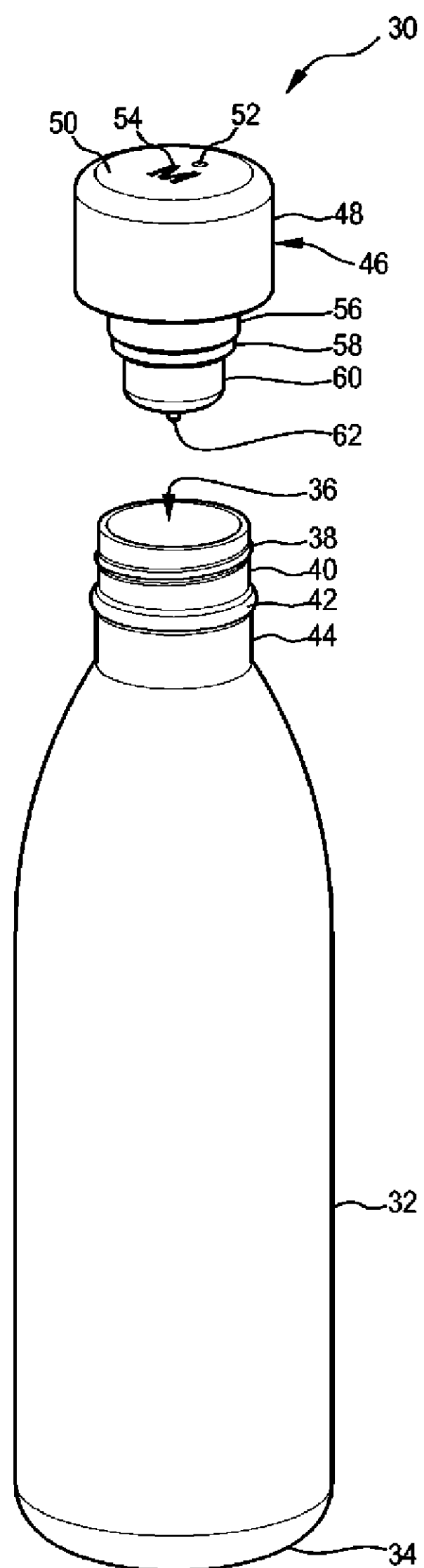


FIG. 2

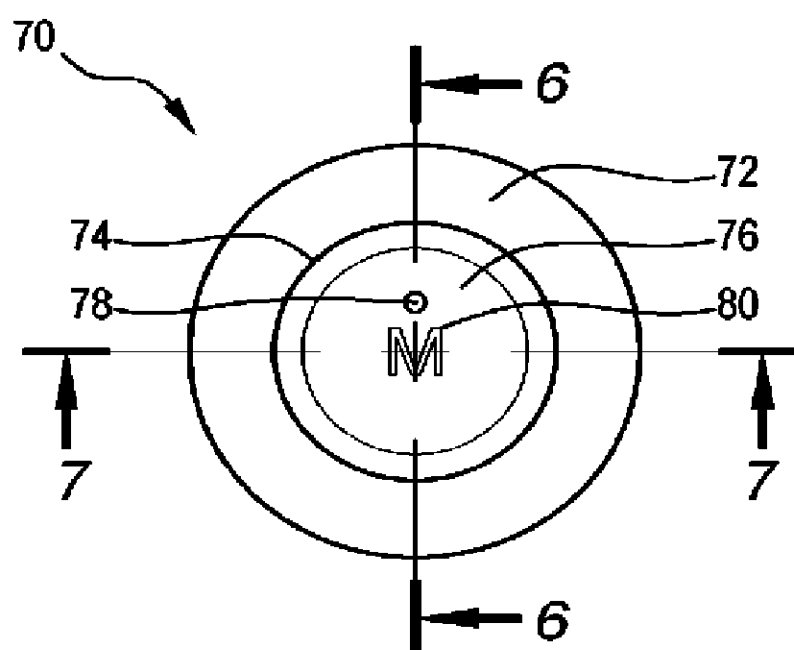


FIG. 3

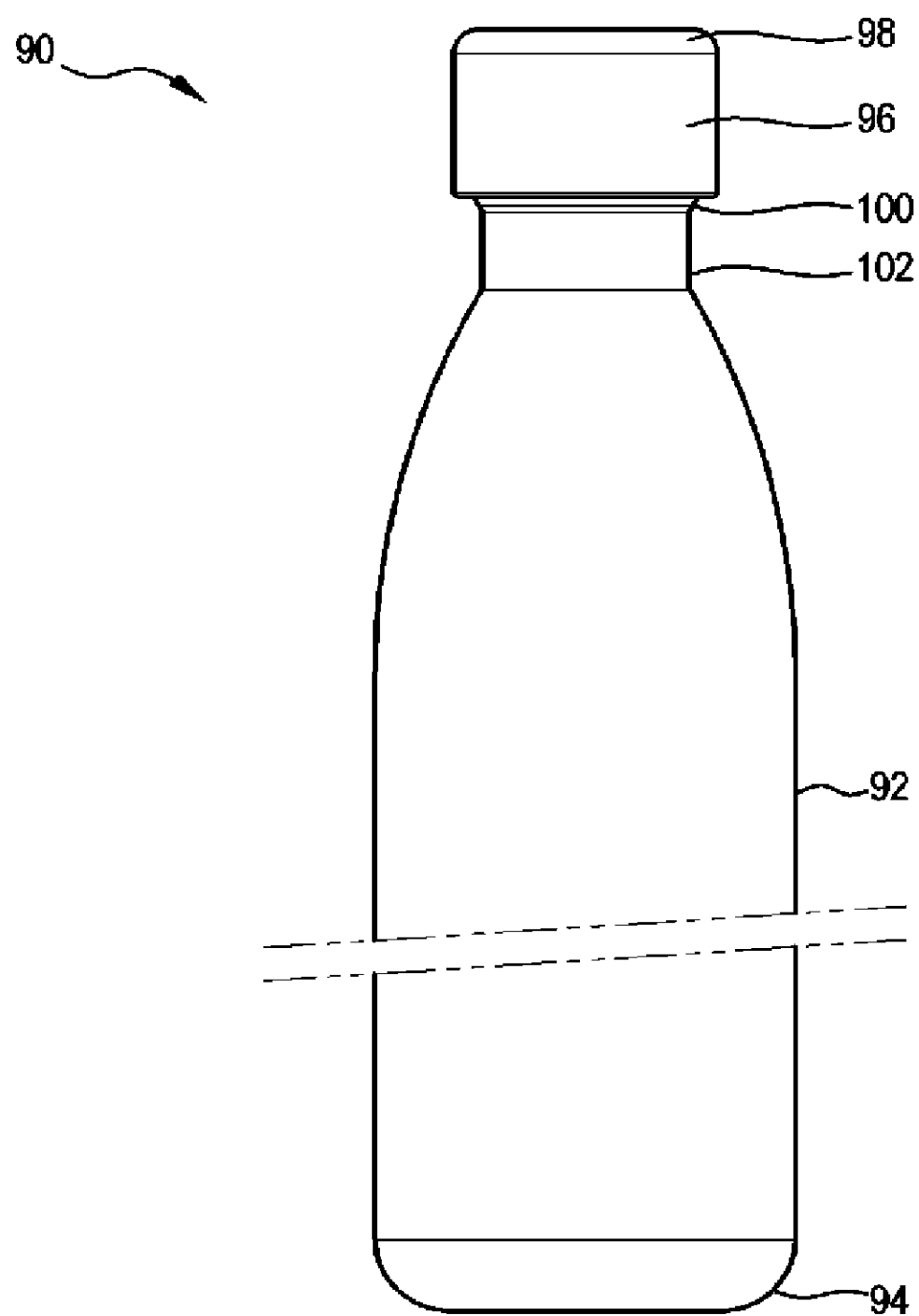


FIG. 4

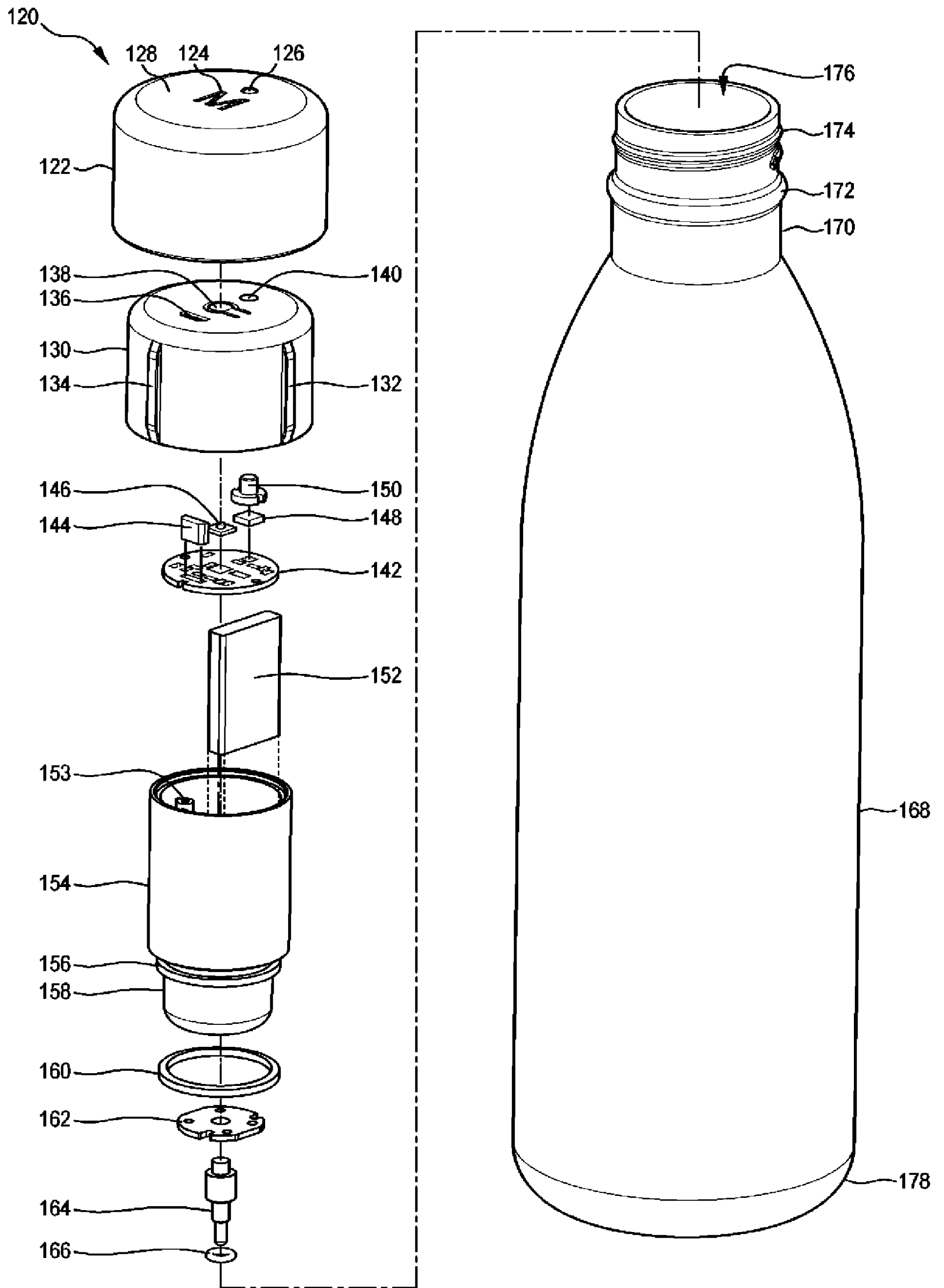


FIG. 5

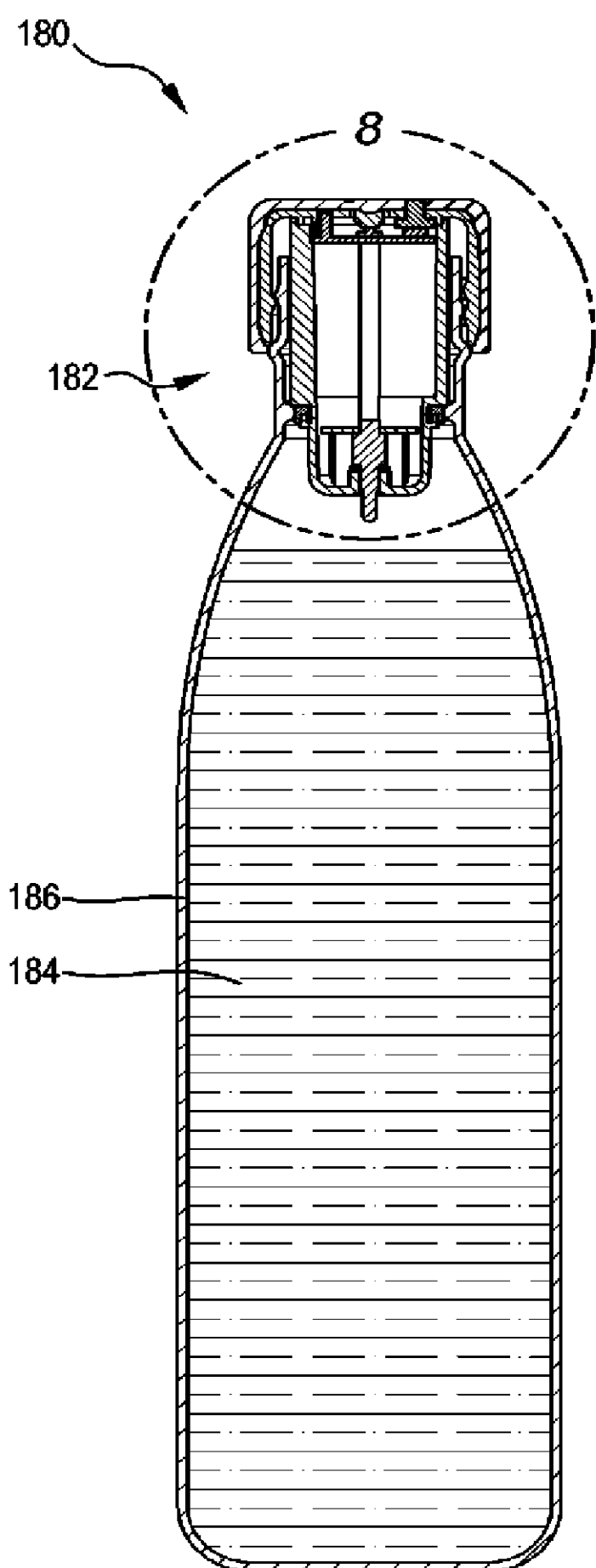


FIG. 6

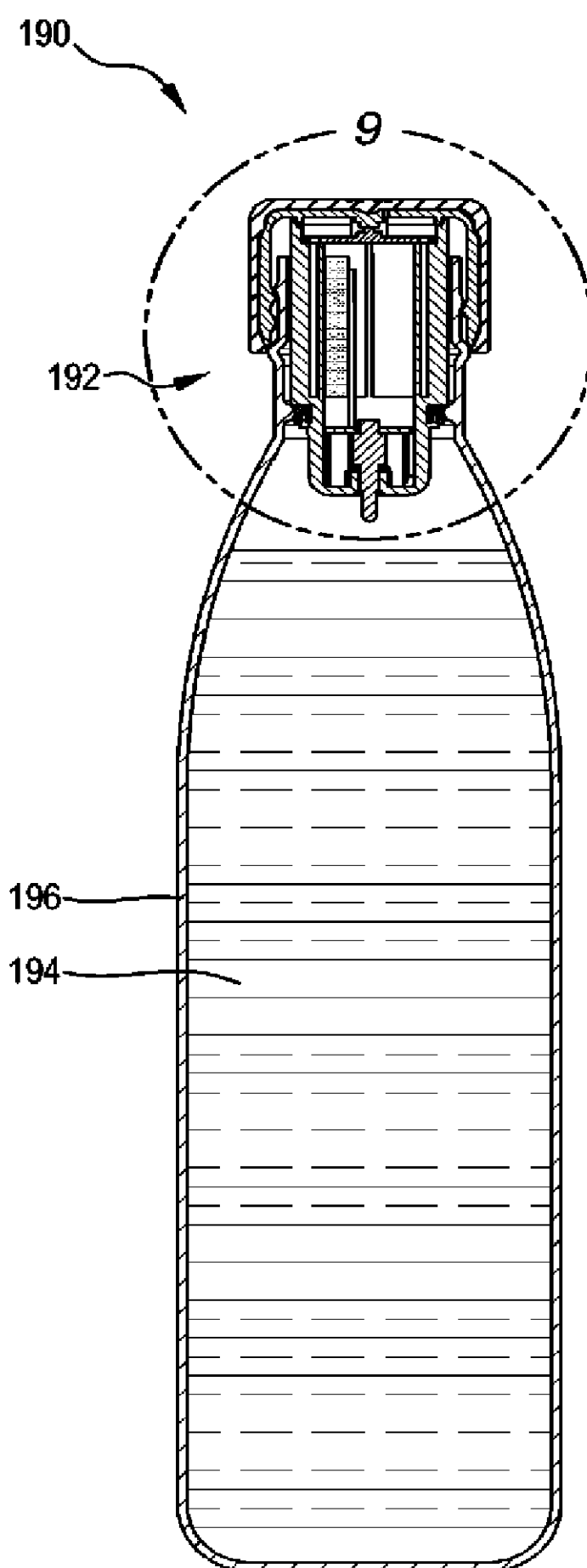


FIG. 7

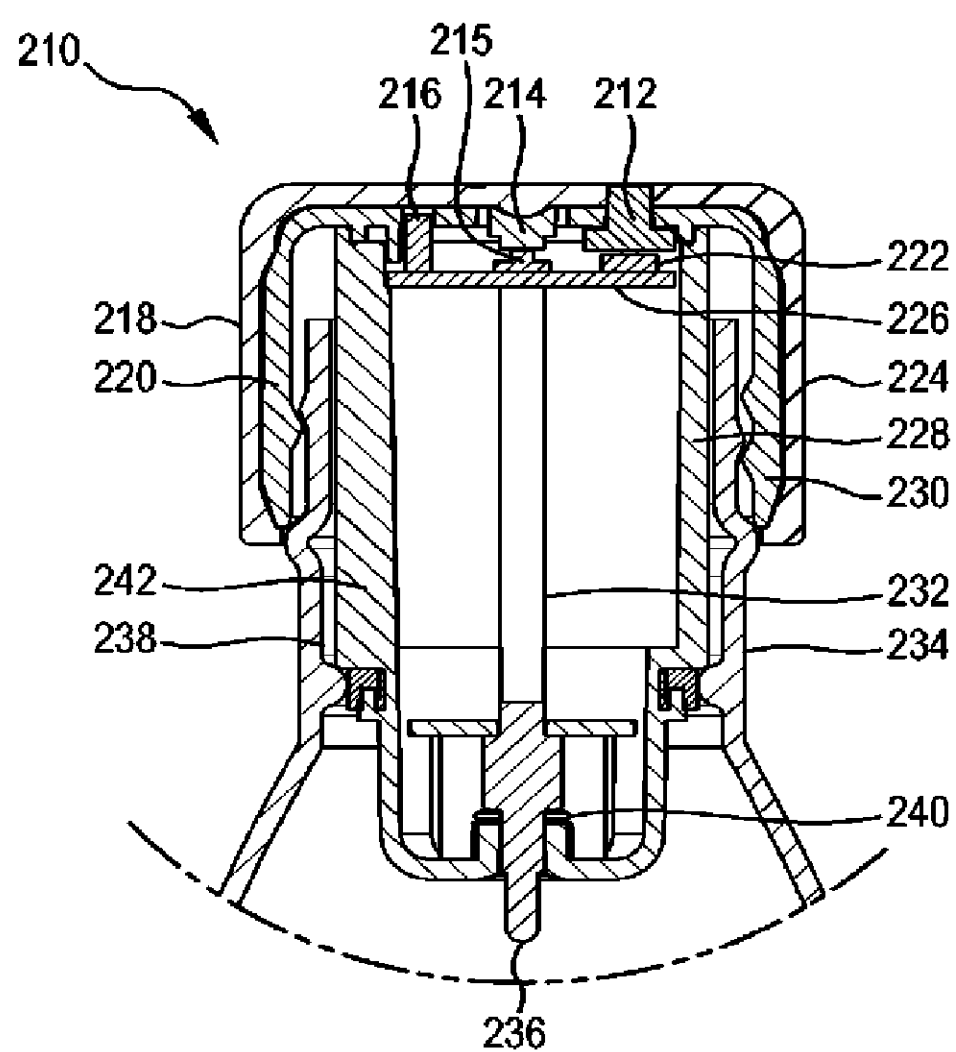


FIG. 8

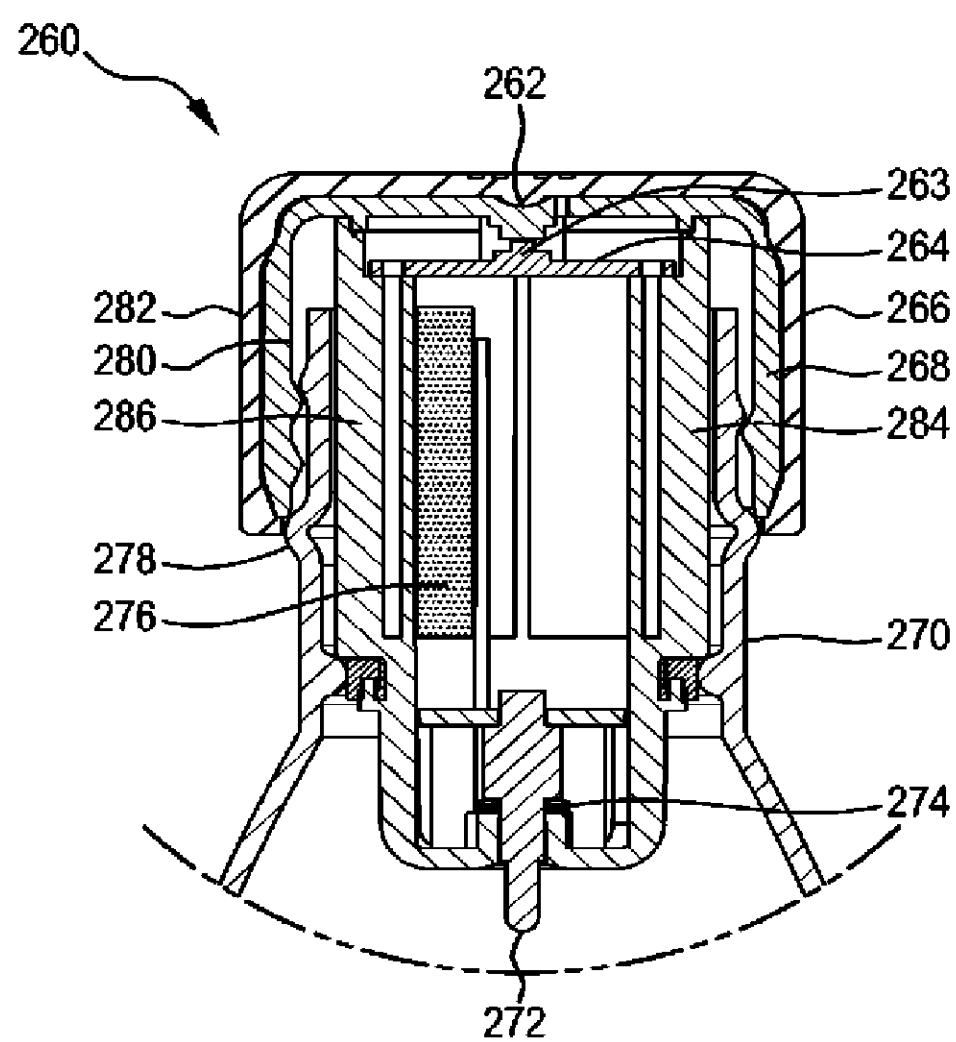


FIG. 9

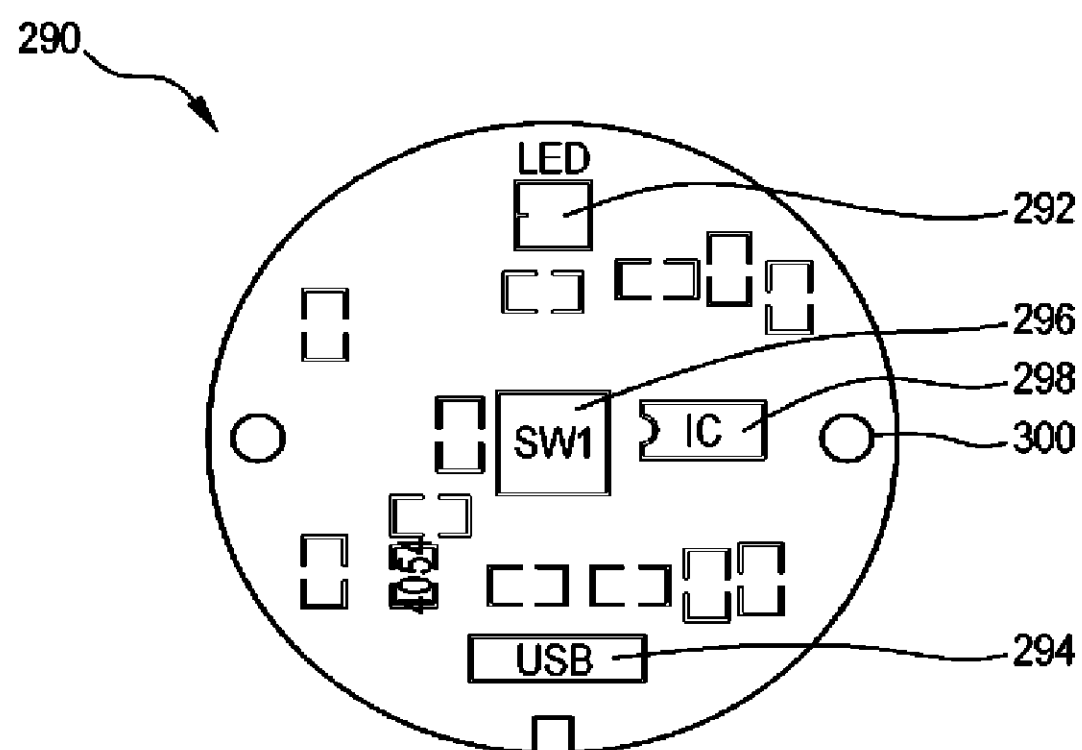


FIG. 10

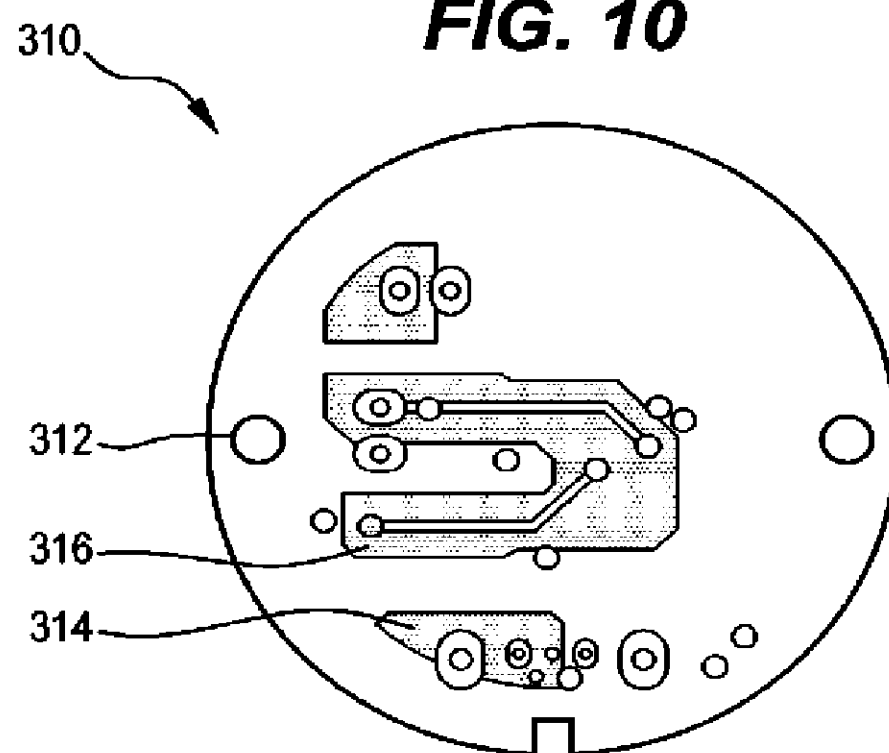


FIG. 11

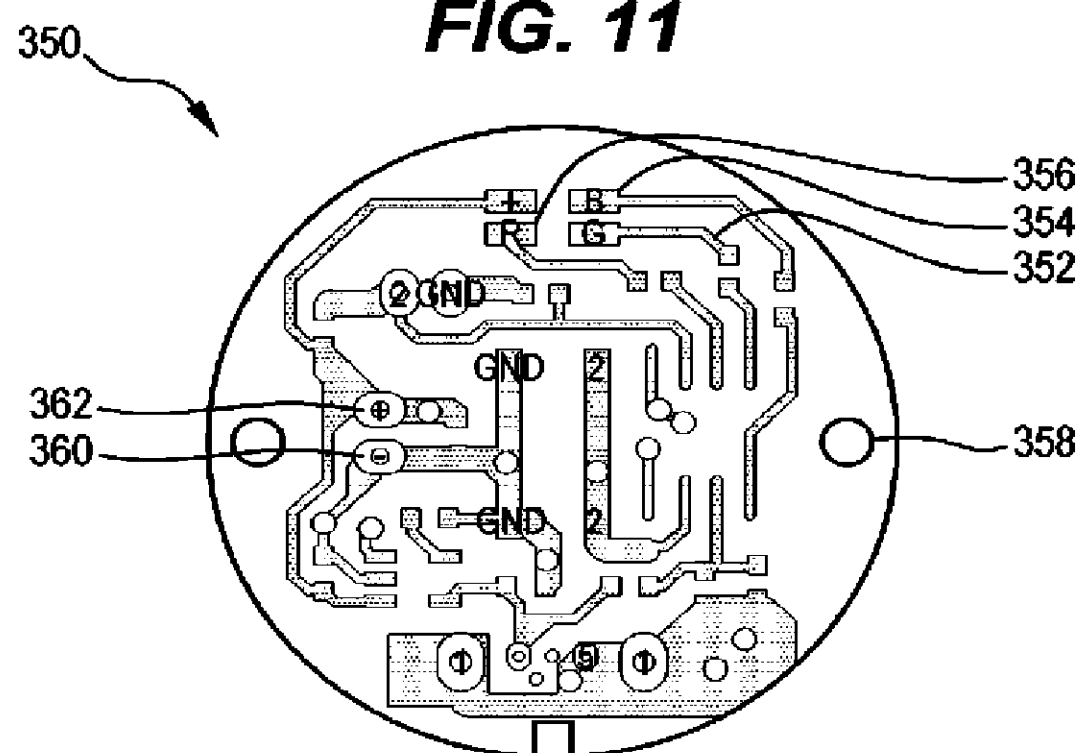


FIG. 12

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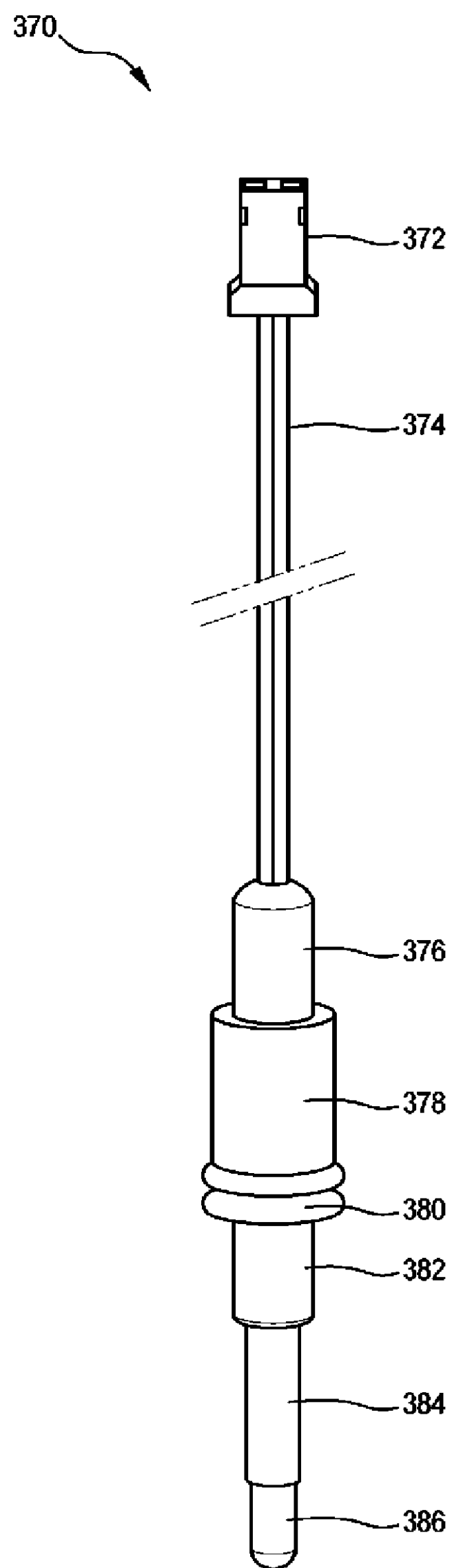


FIG. 13

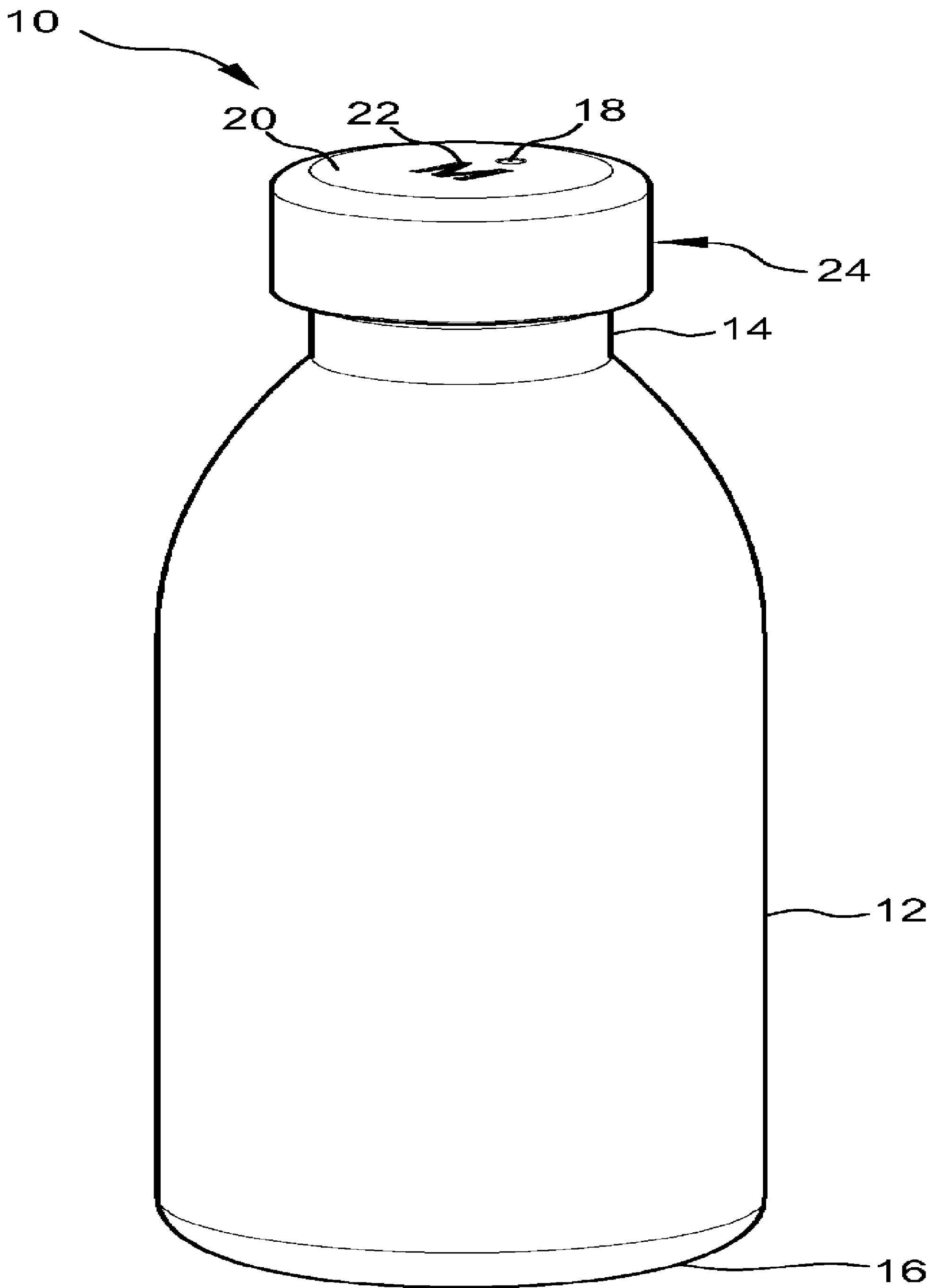


FIG. 1