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(54) **BEVERAGE CAN WITH INGREDIENT CHAMBER**

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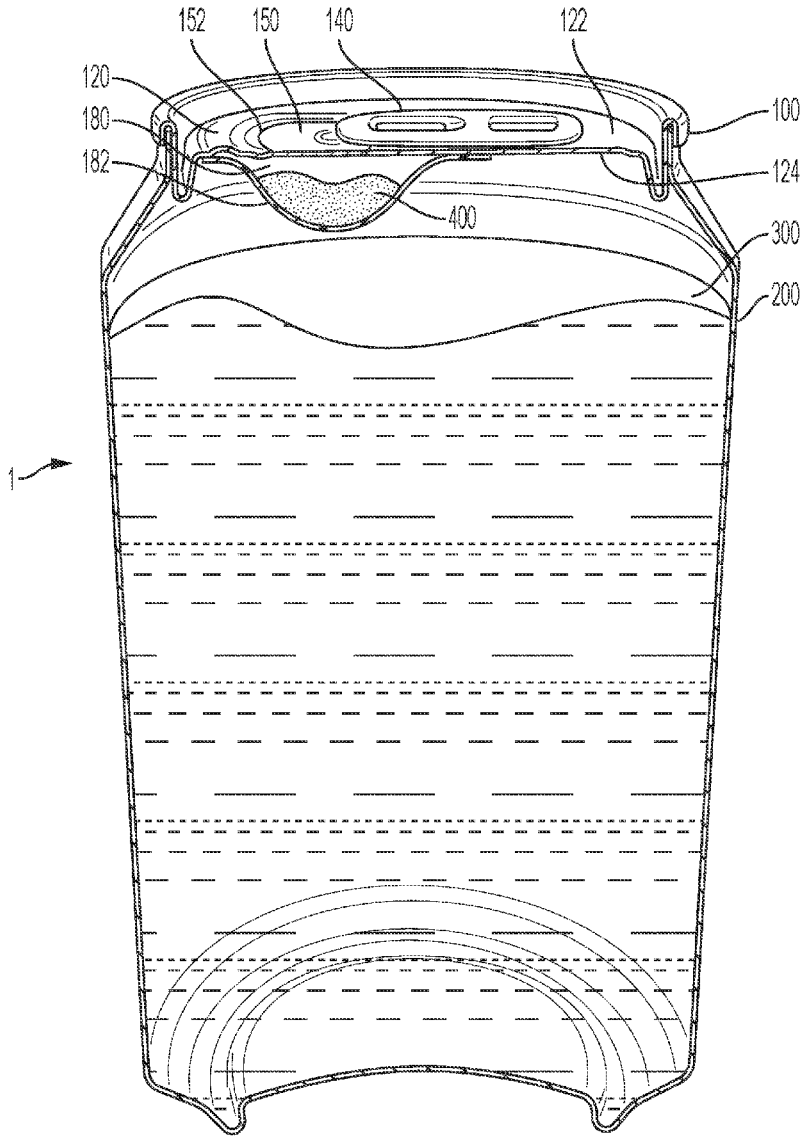
(57) **ABSTRACT**

A beverage can with an ingredient chamber for storing functional ingredients separately from a base beverage until the beverage can is opened by a consumer. The ingredient chamber may be disposed on a can end of the beverage can. The ingredient chamber may be broken open to release functional ingredients automatically when the beverage can is opened by the consumer. In some embodiments, the ingredient chamber includes a membrane that forms a sealed cavity. In some embodiments, the ingredient chamber includes a deformed cavity of the can end.



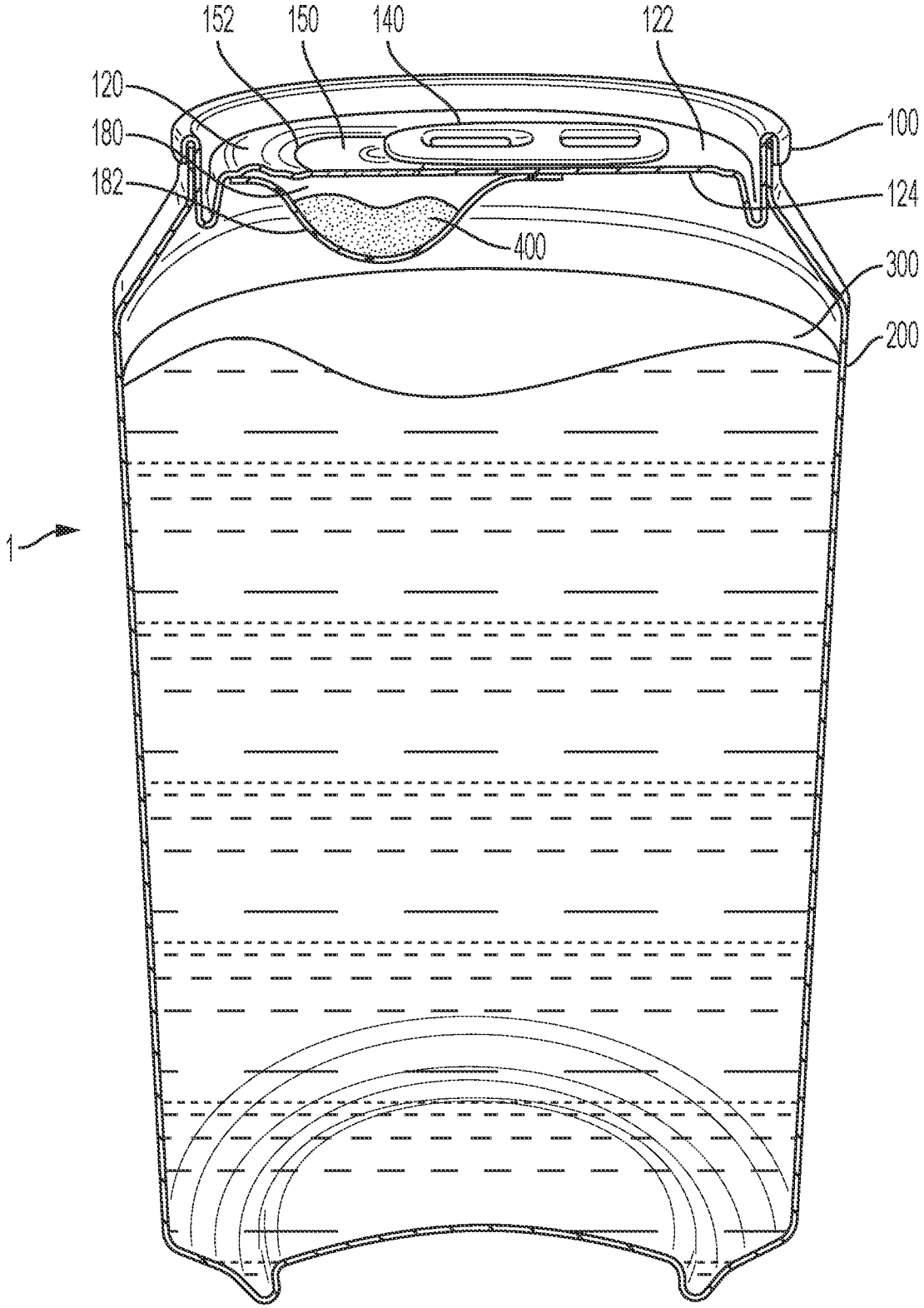


FIG. 1

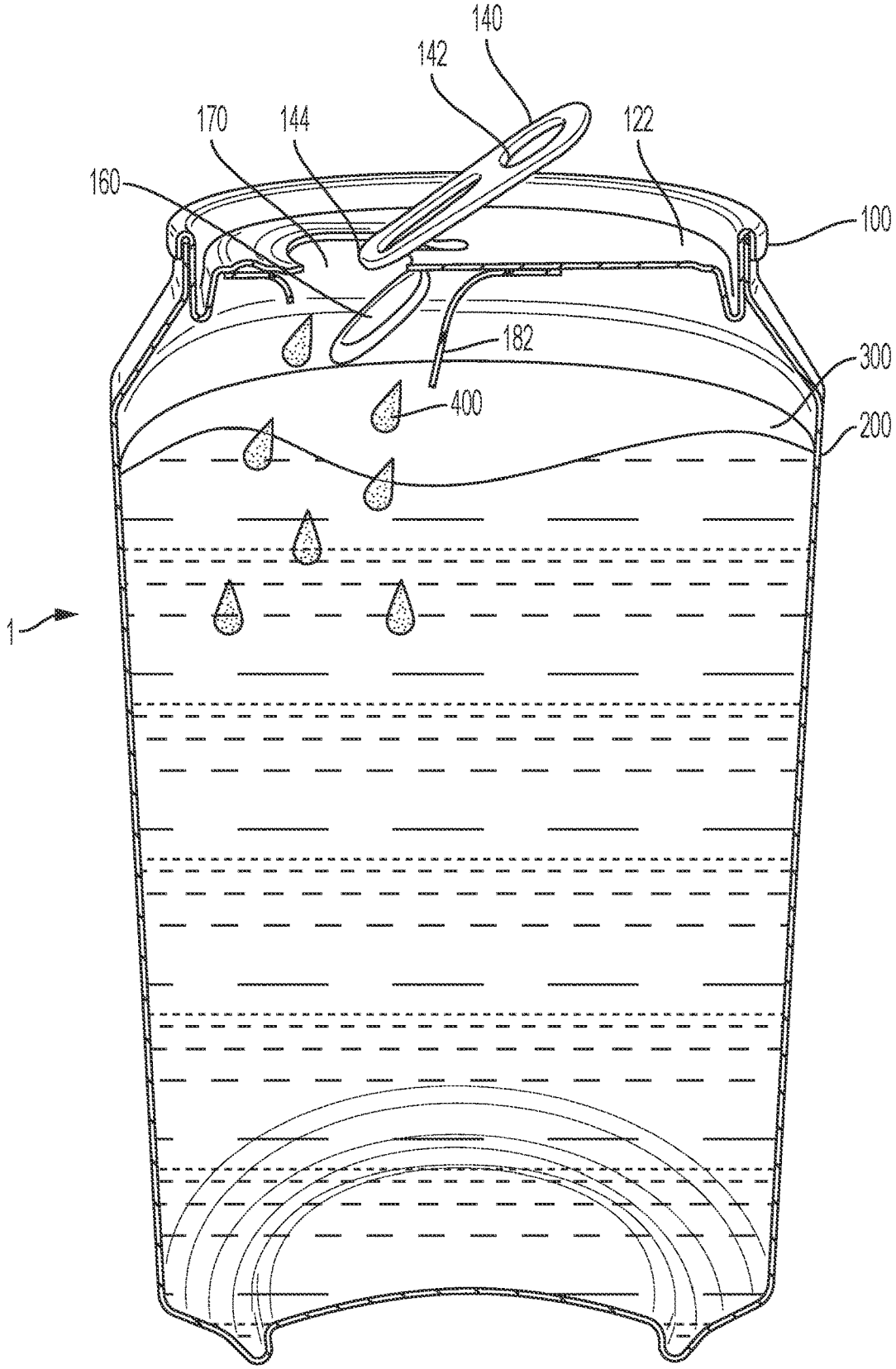


FIG. 2

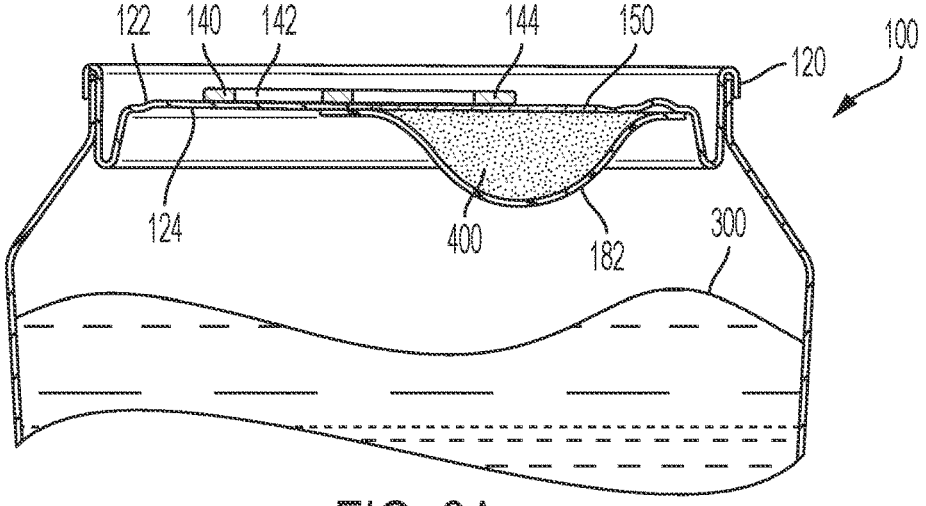


FIG. 3A

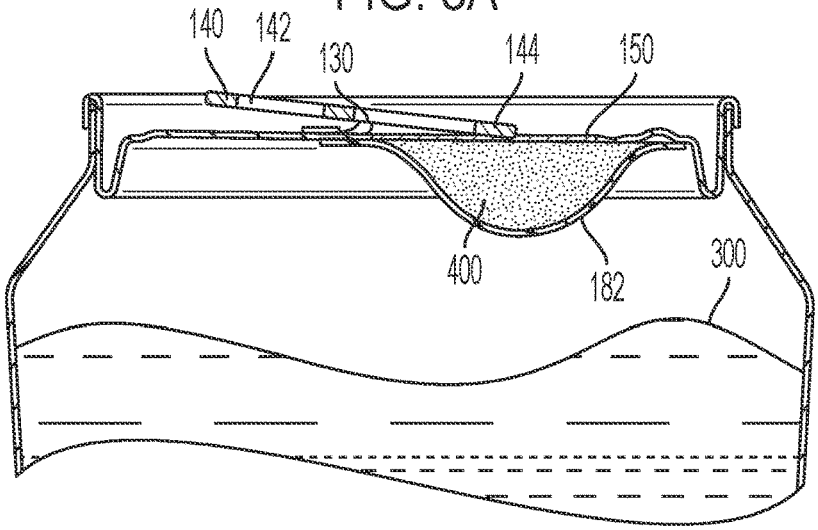


FIG. 3B

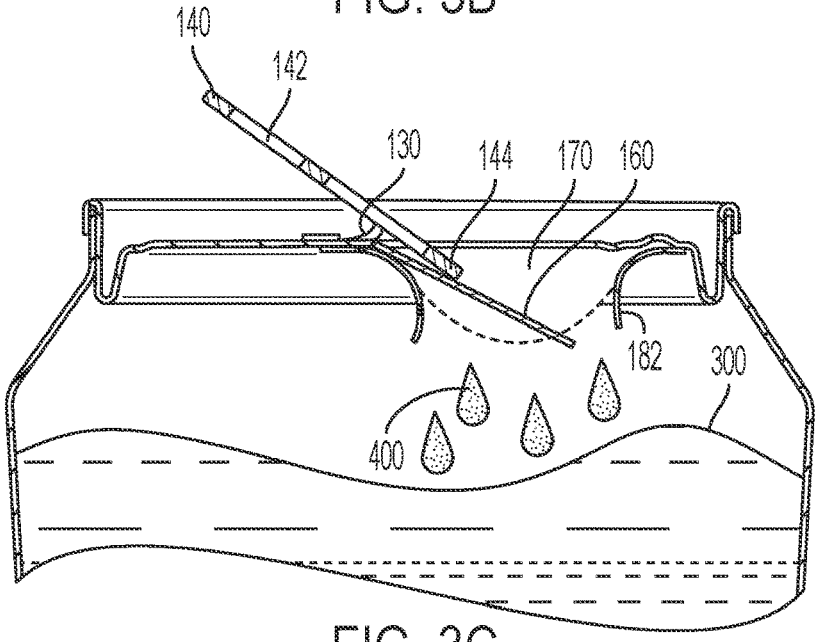


FIG. 3C

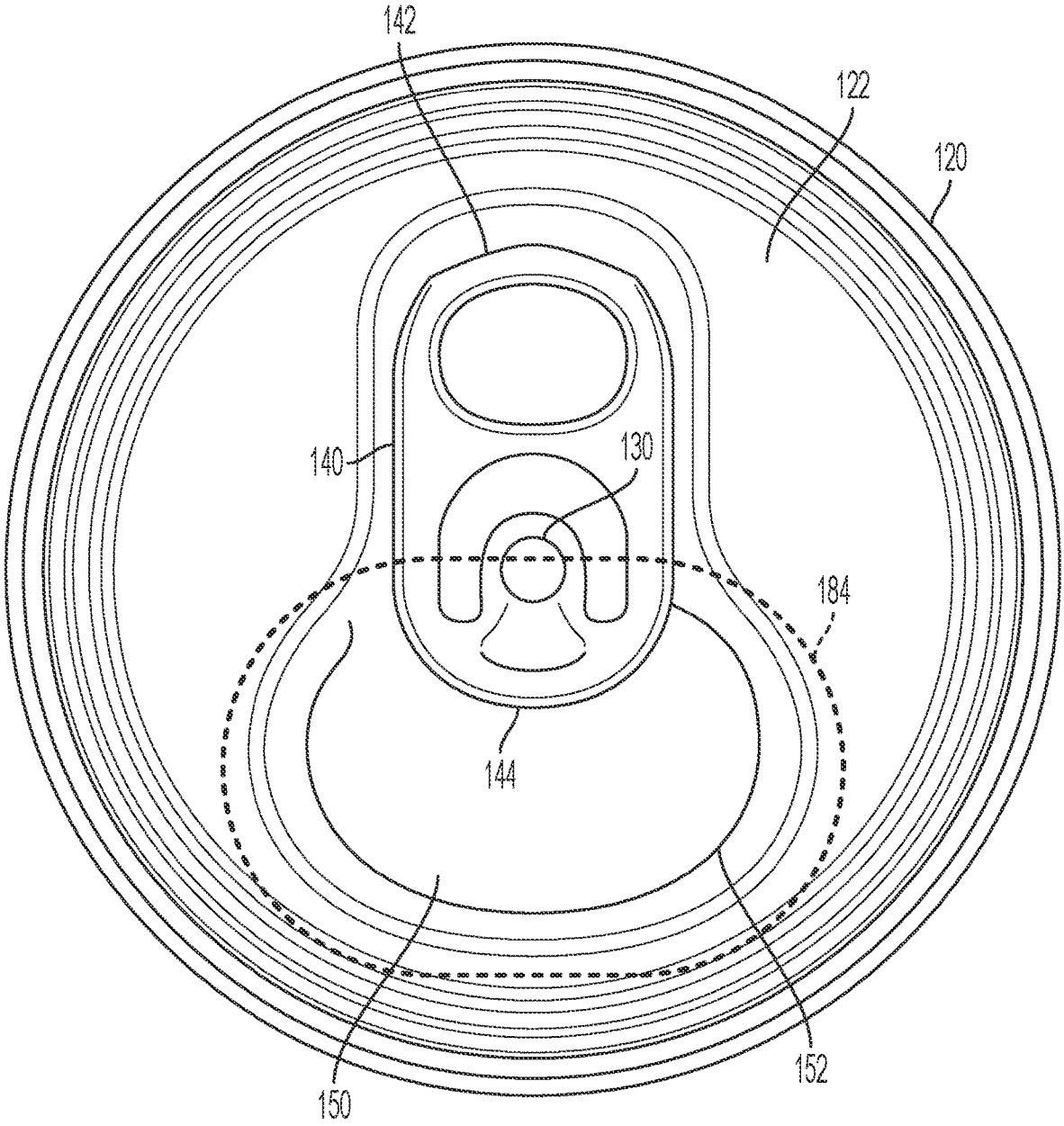


FIG. 4

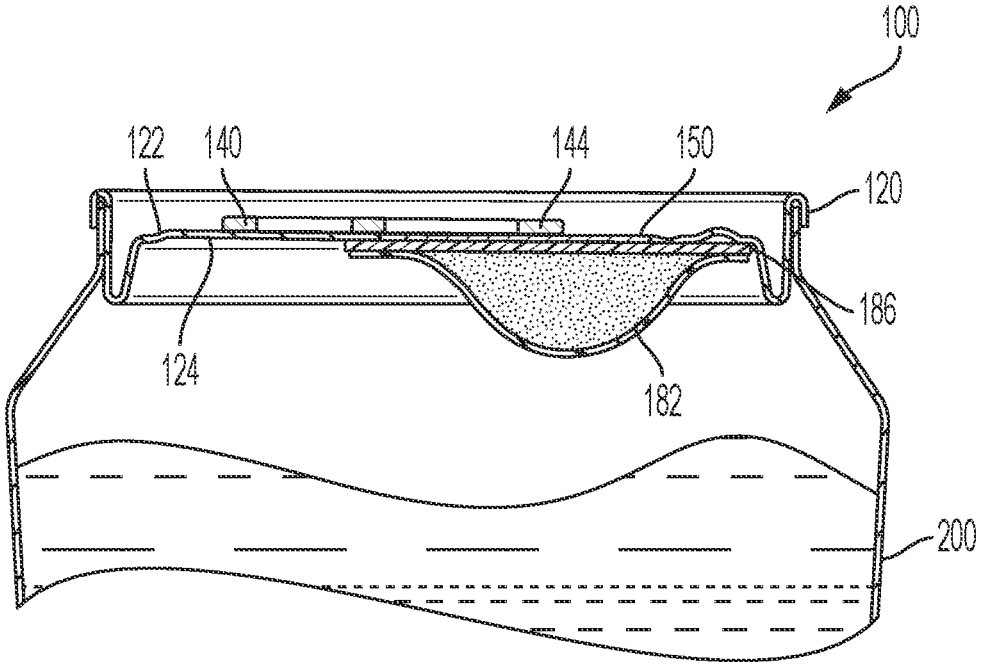


FIG. 5

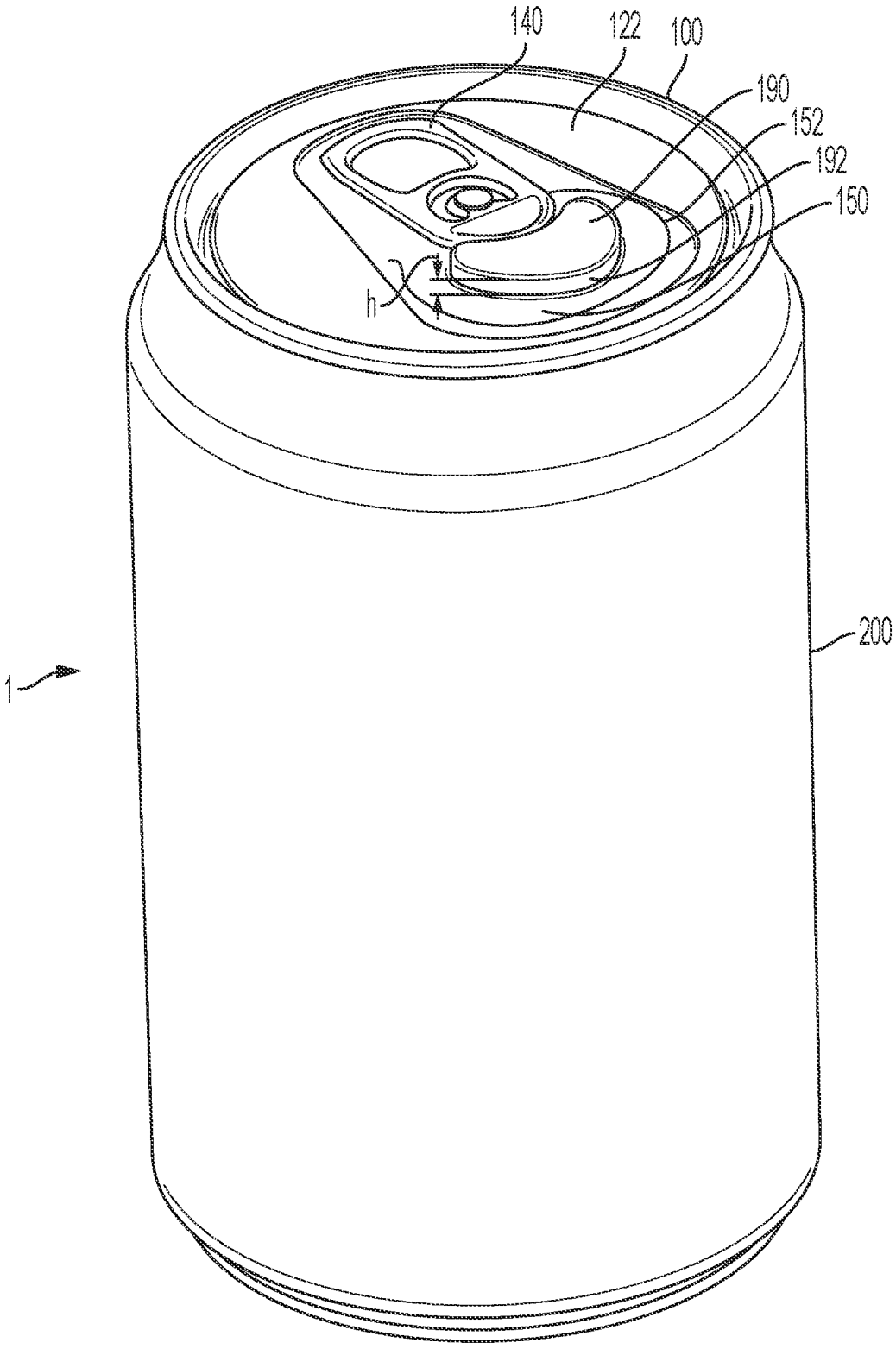


FIG. 6

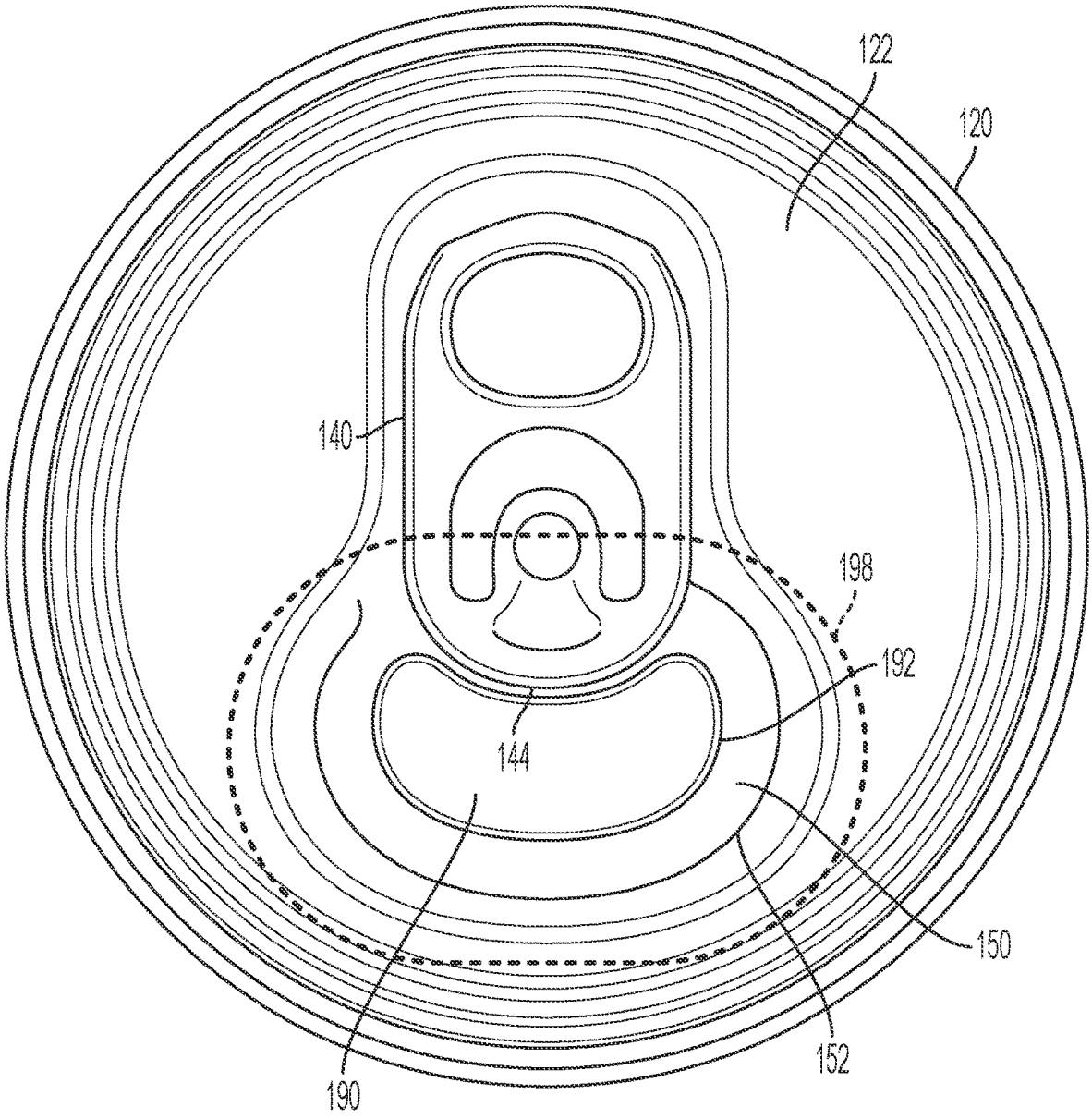


FIG. 7

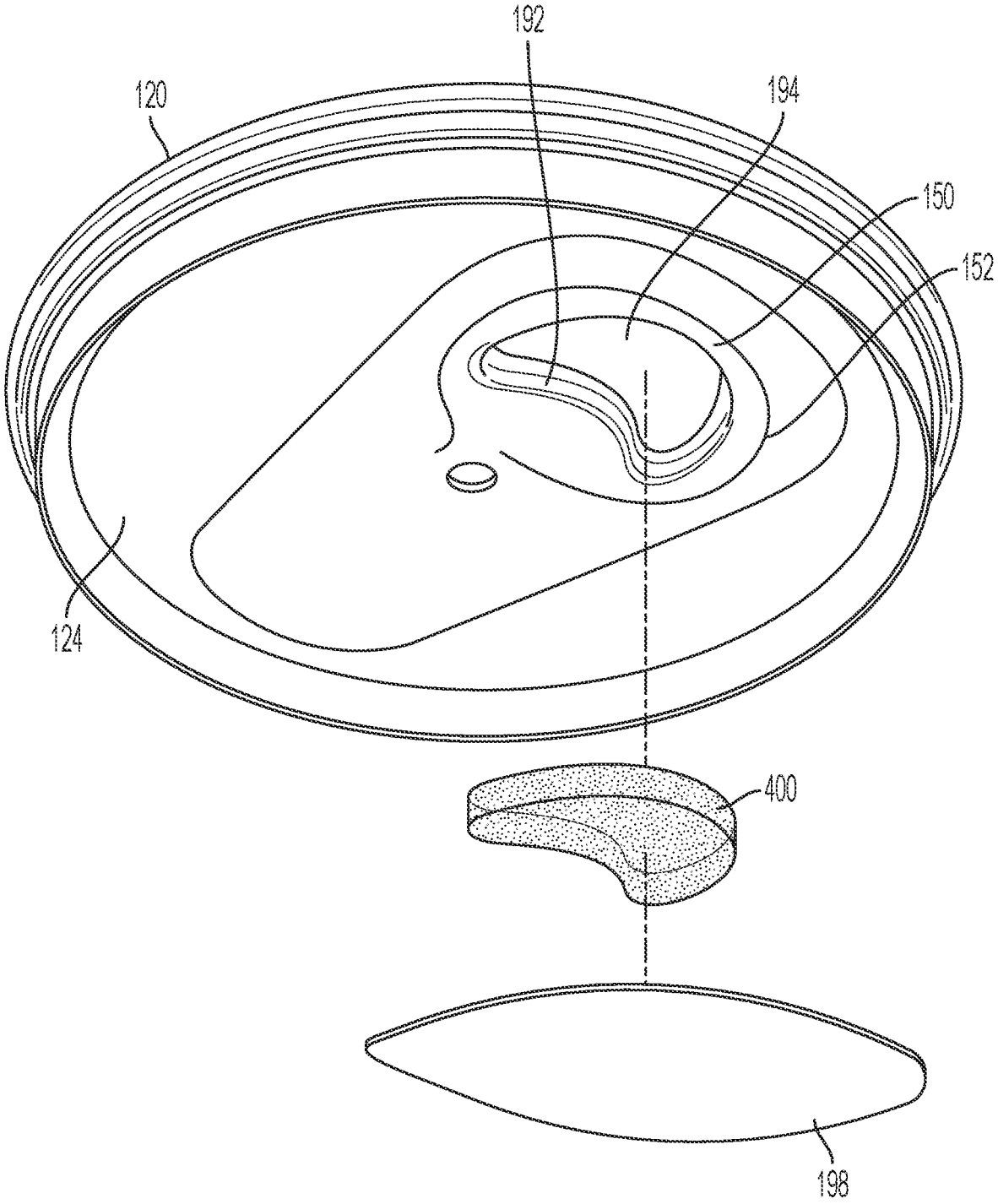


FIG. 8

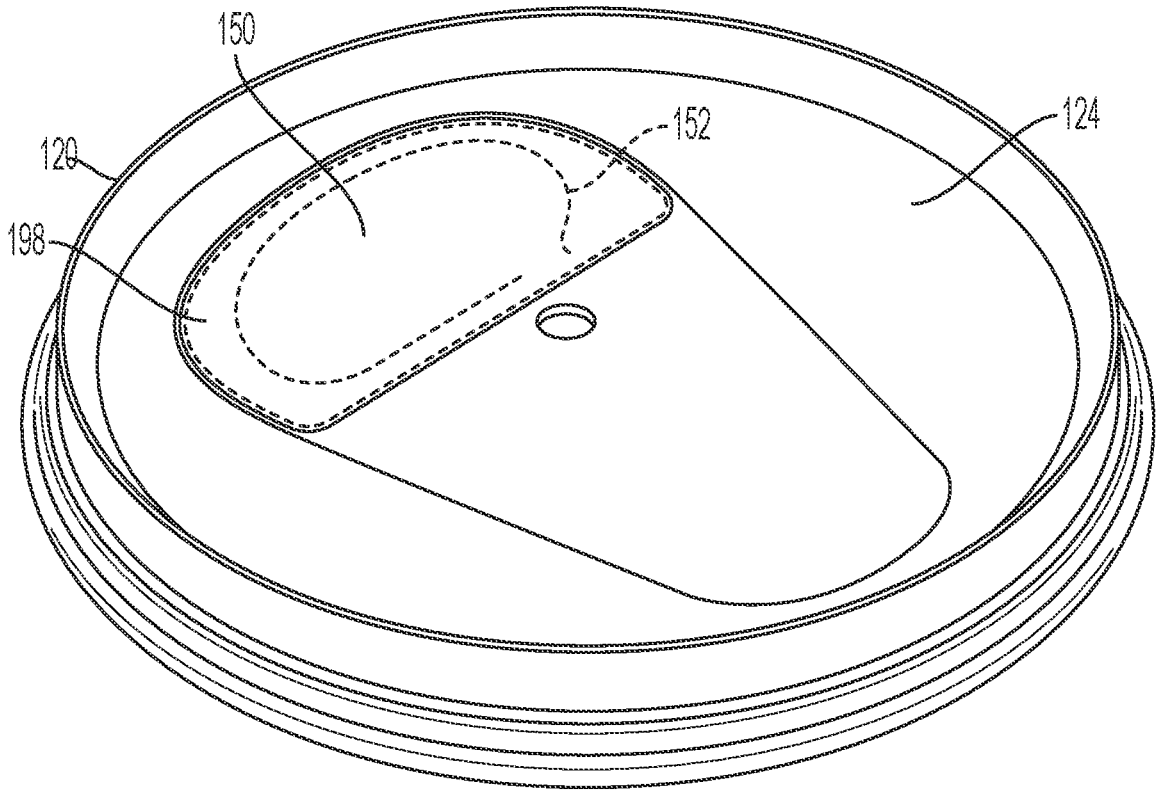


FIG. 9

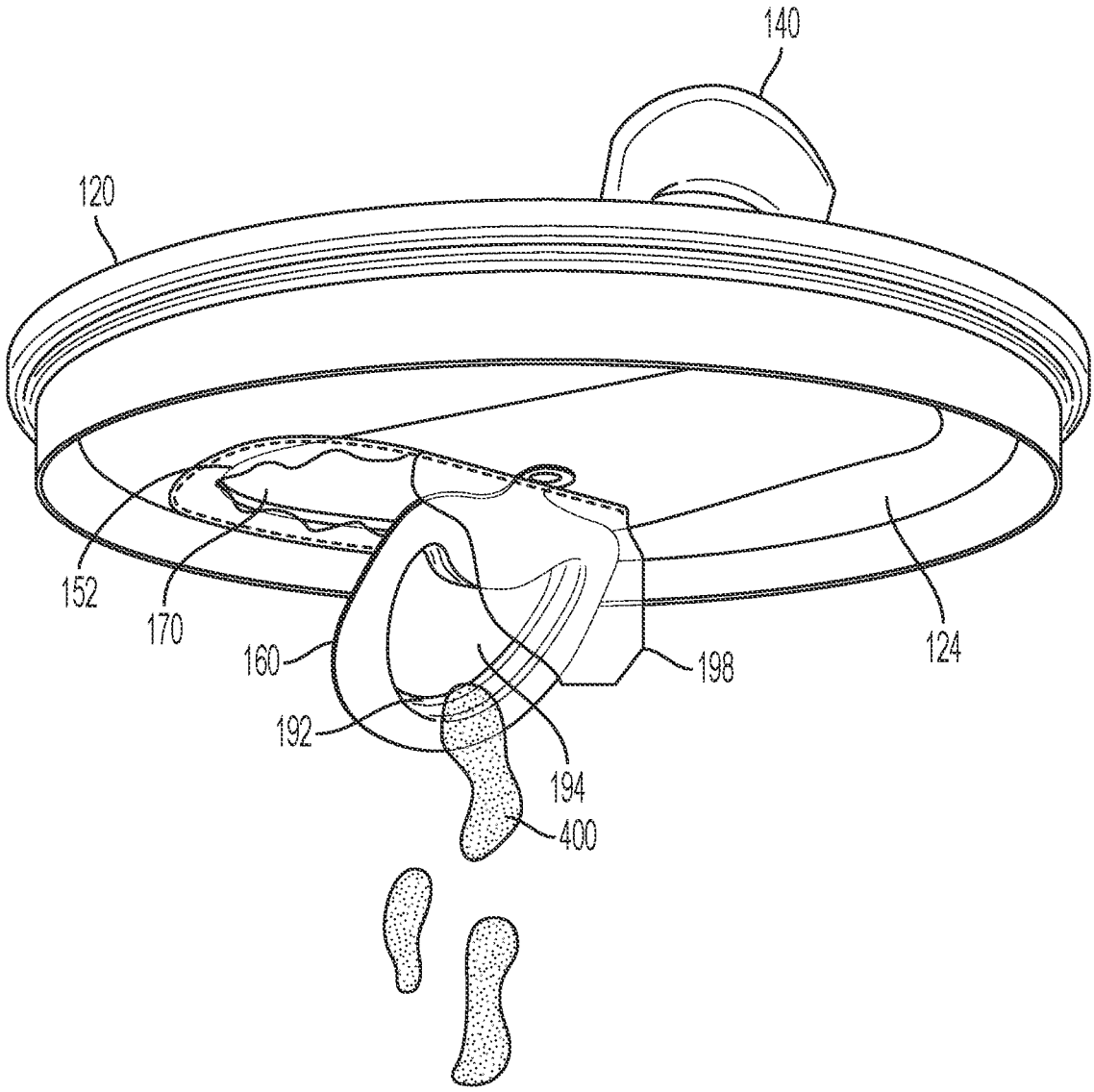


FIG. 10

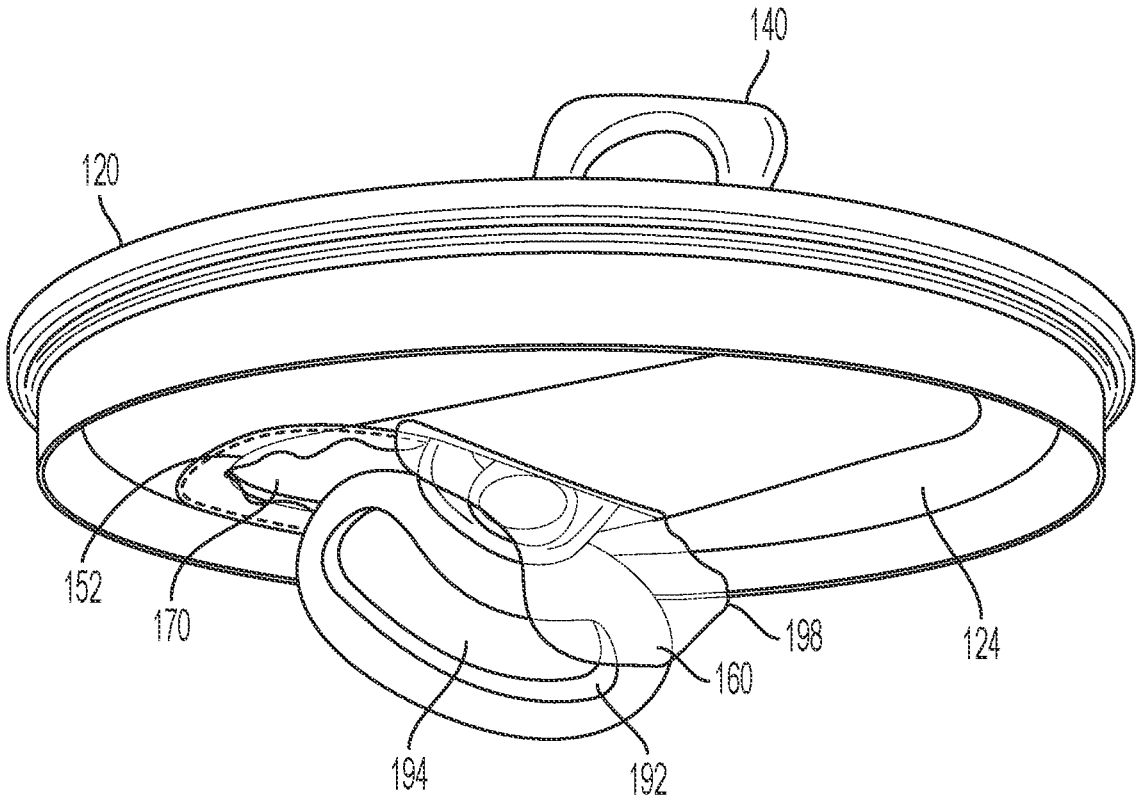


FIG. 11

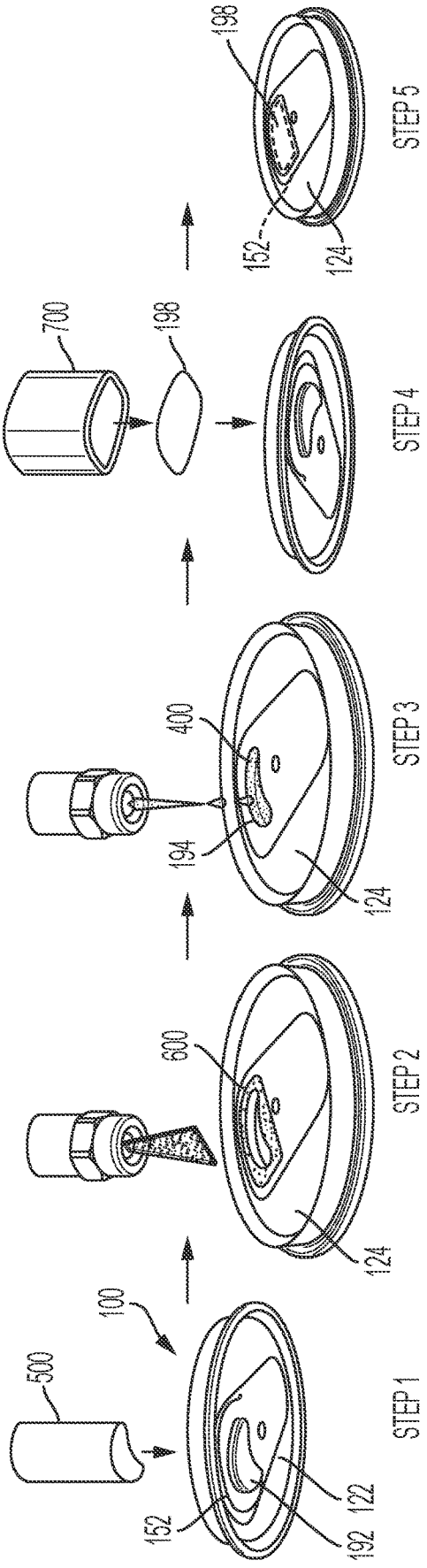

STEP 1
STEP 2
STEP 3
STEP 4
STEP 5
100
500
152
192
122
600
124
400
194
700
198

FIG. 12

BEVERAGE CAN WITH INGREDIENT CHAMBER

FIELD

[0001] This disclosure generally relates to beverage cans. More specifically, some embodiments relate to metal beverage cans and beverage can ends with ingredient chambers.

BACKGROUND

[0002] As functional beverages and ingredients gain popularity among consumers, it becomes desirable to create ready-to-drink beverages (RTD) with functional ingredients. However, some functional ingredients are unstable and sensitive to the environment, so their functionality may degrade within a short period after interaction with other ingredients of the beverage.

SUMMARY

[0003] In some embodiments, the beverage can end includes a metal body, wherein the metal body has a weakened portion configured to be broken open to create a drinking opening. A tab is disposed on a topside of the metal body, configured to be actuated to break open the weakened portion. An ingredient chamber is disposed on an underside of the metal body. The ingredient chamber includes a sealed membrane containing a beverage ingredient.

[0004] In some embodiments, the beverage can end includes a metal body, wherein the metal body has a break-away flange that creates a drinking opening through the metal body when broken away from the rest of the metal body. The metal body defines a cavity with an opening on an underside of the metal body. The cavity may store a beverage ingredient. A tab is disposed on a topside of the metal body. The tab may be actuated to apply force to the break-away flange to break the break-away flange away from the rest of the metal body.

BRIEF DESCRIPTION OF THE FIGURES

[0005] The accompanying drawings, which are incorporated herein and form part of the specification, illustrate embodiments of the present invention and, together with the description, further serve to explain the principles of the invention and to enable a person skilled in the relevant art(s) to make and use the invention.

[0006] FIG. **1** is a side sectional view of a beverage can with an ingredient chamber.

[0007] FIG. **2** is a side sectional view of the beverage can of FIG. **1** with the ingredient chamber broken open.

[0008] FIGS. **3**A-**3**C are schematic side views of a can end with an ingredient chamber, showing different stages of opening.

[0009] FIG. **4** is a schematic top view of the can end of FIGS. **3**A-**3**C.

[0010] FIG. **5** is a schematic side view of a can end with a self-contained ingredient chamber.

[0011] FIG. **6** is a perspective view of a beverage can with a can end having a deformed cavity as an ingredient chamber.

[0012] FIG. **7** is a schematic top view of the can end of FIG. **6**.

[0013] FIG. **8** is an exploded view of the can end of FIG. **6**.

[0014] FIG. **9** is a bottom perspective view of the assembled can end of FIG. **6**.

[0015] FIG. **10** is a bottom perspective view of the assembled can end of FIG. **6** after opening.

[0016] FIG. **11** is a bottom perspective view of the assembled can end of FIG. **6** after opening.

[0017] FIG. **12** is a diagram of a manufacturing process of the can end of FIG. **6**.

DETAILED DESCRIPTION

[0018] The present invention(s) will now be described in detail with reference to embodiments thereof as illustrated in the accompanying drawings. References to "one embodiment," "an embodiment," "some embodiments," etc., indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described.

[0019] Functional food and ingredients have potential benefits to health and wellness. Examples of such functional ingredients include vitamins, probiotics, creatine, ginseng, citicoline, and tart cherry. However, it sometimes is difficult or unpalatable to directly consume those functional ingredients because of their taste or mouthfeel. In order to help the intake of an effective amount of functional ingredients, one way to consume functional ingredients is to mix them with a flavored beverage to make a functional beverage.

[0020] As such functional beverages become popular among consumers, it is desirable to store functional beverages in traditional beverage packaging, such as beverage cans. Traditional beverage packaging provides processing efficiency, storage and transportation efficiency, and longer shelf life of the product. It therefore helps to bring functional ingredients and functional beverages to the market on a mass production scale.

[0021] However, traditional beverage packaging generally allows for only a single homogenous solution to be stored, and traditionally-packaged beverages are filled and sealed long before reaching a consumer.

[0022] Functional ingredients, on the other hand, are sometimes unstable and sensitive to the environment, and the efficacy of their claimed benefits may degrade within a short period after dissolved in another ingredient, such as an acidic solution. For example, vitamin C, probiotics, and aspartame are known to degrade in an acidic solution ($pH<7$). In many cases, in order to preserve high (e.g., maximum) efficacy of the claimed benefits, it is desirable to mix functional ingredients with the rest of the beverage immediately before consumption.

[0023] As a result, since traditional beverage packaging stores functional ingredient with the rest of the beverage as a single homogenous solution long before reaching a consumer, traditional beverage packaging may not be ideal for delivering functional ingredients effectively to consumers.

[0024] In order to effectively deliver functional beverages in traditional beverage packaging, there is a benefit to storing them separately from other ingredients of the beverage, to be mixed shortly before consumption. And to

efficiently deliver functional beverages to consumers, there is a benefit to leveraging traditional beverage cans. In some embodiments described herein, a sealed ingredient chamber is provided underneath a can end for separately storing the functional ingredients. In some other embodiments, a can end is deformed to create a cavity that can be sealed to form an ingredient chamber for separately storing the functional ingredients. In either case, the sealed ingredient chamber is broken open when the can is opened by a consumer, at that point releasing functional ingredients from the ingredient chamber into the rest of the beverage stored in the can. In this way, a traditional can form can be used to efficiently store and deliver a functional beverage to a consumer, while maintaining the functional ingredients separate from the rest of the beverage until the can is opened by the consumer in order to preserve high (e.g., maximum) efficacy of the claimed benefits.

[0025] Embodiments described herein thus provide a separate storage for functional ingredients with minimal modification to consumer behavior. In some embodiments described herein, the separate storage for functional ingredients is provided underneath the drinking opening of the can end, such that it is broken open automatically with a traditional stay-on tab lever mechanism. This provides a separate storage for functional ingredients without requiring the consumer to perform a separate additional step of breaking open and releasing the functional ingredients before consuming the beverage. Because the mechanism for breaking open and releasing the functional ingredients does not involve deviation from current consumer behavior for opening a traditional can, there is little-to-no risk that consumers would forget to or unsuccessfully release the functional ingredient—it happens automatically upon opening.

[0026] In order to leverage the efficiencies and established process of existing can and can end manufacturing, it can be beneficial to minimize disruption attendant to adding steps or processes in the manufacturing process. Therefore, according to some embodiments described herein, the separate storage for functional ingredients can be formed in a traditional can end through a simple and quick process, or can be formed as a separate self-contained sealed cavity, manufactured independently from the can end, and attached to the can end after the can end is has been manufactured.

[0027] A beverage can **1** as shown in FIG. **1** includes a can end **100** and a can body **200**, which together define a sealed cavity for storing beverages. A base beverage **300** may be stored inside can body **200**. Can end **100** has a metal body **120** with a topside **122** and an underside **124**. According to one embodiment, an ingredient chamber **180** is created by a membrane **182** disposed on underside **124** of metal body **120** for storing a beverage ingredient **400**, such as a functional ingredient, separately from base beverage **300**. Membrane **182** may be disposed on underside **124** through an adhesive material. Membrane **182** may be attached directly to underside **124** to create a sealed cavity for beverage ingredient **400**. Alternatively, membrane **182** may be attached to a top layer **186** to create a sealed cavity for beverage ingredient **400**, and top layer **186** is then attached to underside **124**, as shown in FIG. **5**.

[0028] Membrane **182** may be made of a material breakable under a pressure exerted by a flange **160** when an opening **170** is created, as shown in FIG. **2**. Membrane **182** may also be made of a material that does not chemically interact with beverage ingredient **400** or base beverage **300**. For example, membrane **182** may be made of a polymer or metal, such PVC, PE, nylon, or aluminum. Membrane **182** may be homogeneous or made of a combination of materials (e.g., in a form of laminated multi-layer films).

[0029] Ingredient chamber **180** formed by membrane **182** may have a capacity between 0.1 cc and 65 cc, (e.g., between 0.1 cc and 3 cc, between 1 cc and 3 cc, between 7 cc and 9 cc, or between 55 cc and 65 cc). In some embodiments, such capacities may pertain to a 12-fluid-oz beverage can **1**. However, the capacity of ingredient chamber **180** may be proportional to the capacity of beverage can **1**. For example, ingredient chamber **180** may have a capacity between 0.03% and 18% of the capacity of beverage can **1** (e.g., between 0.03% and 0.8% of the capacity of beverage can **1**, between 0.3% and 0.8% of the capacity of beverage can **1**, between 2% and 2.5% of the capacity of beverage can **1**, or between 15% and 18% of the capacity of beverage can **1**). For example, smaller capacities may be used for ingredients that are effective in smaller amounts (e.g., orange essence in a chamber having a capacity between 0.1 cc and 3 cc, or between 0.03% and 0.8% of the capacity of the beverage can), moderate capacities may be used for ingredients that are effective in moderate amounts (e.g., creatine in a chamber having a capacity between 7 cc and 9 cc, or between 2% and 2.5% of the capacity of the beverage can), and larger capacities may be used for ingredients that are effective in larger amounts (e.g., protein in a chamber having a capacity between 55 cc and 65 cc, or between 15% and 18% of the capacity of the beverage can).

[0030] On topside **122** of metal body **120**, as shown in the top view of FIG. **4**, a weakened portion **150** is defined by a weakened line **152** and is configured to be broken away from the rest of metal body **120** along weakened line **152**. Additionally, a tab **140** is disposed on topside **122** and connected to metal body **120** by a rivet **130**. Tab **140** has a ring **142** and a tab end **144** on opposite ends, and tab end **144** is located above weakened portion **150**.

[0031] FIG. **2** shows beverage can **1** after opened by a consumer. After weakened portion **150** breaks away from the rest of metal body **120**, a flange **160** is created from weakened portion **150**, bending downwards from metal body **120**, and a drinking opening **170** is created on metal body **120**. Ingredient chamber **180** may be located under weakened portion **150** and disposed across weakened portion **150**, such that at the same time weakened portion **150** breaks away from metal body **120** to create drinking opening **170**, flange **160** breaks membrane **182** automatically to release beverage ingredient **400** from ingredient chamber **180**.

[0032] FIGS. **3**A-**3**C show side views of can end **100** with ingredient chamber **180** and illustrate in detail the process of opening ingredient chamber **180** according to one embodiment. Before consumption, a consumer's finger pulls tab **140** at ring **142**. Through a traditional stay-on tab lever mechanism, with rivet **130** serving as a fulcrum, tab end **144** exerts a downward force on weakened portion **150**, as shown in FIG. **3**B. Thereafter, weakened portion **150** breaks away from the rest of metal body **120** along weakened line **152** to create flange **160** and drinking opening **170**. Finally, as shown in FIG. **3**C, tab end **144** pushes flange **160** further downwards to pierce through and break membrane **182** to release beverage ingredient **400** from ingredient chamber **180**.

[0033] In order to ensure that flange **160** pierces through and breaks membrane **182** automatically when weakened portion **150** breaks away from metal body **120** to create drinking opening **170** and flange **160**, membrane **182** may be disposed across weakened portion **150** and extend beyond weakened line **152**. The top view of can end **100** as shown in FIG. **4** illustrates the relative location of each element. Membrane is disposed on underside **124**, sealed along a membrane seal line **184** as shown in dotted line. Membrane seal line **184** is located outside weakened line **152**, such that weakened portion **150** is enclosed by membrane seal line **184**. Therefore, when weakened portion **150** breaks away from metal body **120** by tab end **144** to create flange **160**, membrane **182** remains attached to underside **124**. Flange **160** then is pushed downwards into ingredient chamber **180** and eventually pierces through and breaks open membrane **182** from the inside of ingredient chamber **180**.

[0034] FIG. **5** shows another embodiment of ingredient chamber **180**, which further includes a top layer **186**. Instead of being directly attached to underside **124** of metal body **120**, membrane **182** is attached to top layer **186** to create a sealed cavity for storing beverage ingredient **400**. Accordingly, ingredient chamber **180** is a self-contained chamber independent from metal body **120** and attachable to underside **124** of metal body **120** through top layer **186**. Top layer **186** may be made of a same material as membrane **182** or may be made of a different material from membrane **182**. Top layer **186** may be made of a material that allows flange **160** to pierce through. Top layer **186** may be attached to underside **124** at a position such that membrane **182** is at the same relative position to weakened portion **150** and weakened line **152** as shown in FIG. **4**.

[0035] This embodiment offers minimum disruptions and modifications to traditional can and can end manufacturing processes. Because self-contained ingredient chamber **180** is sealed by membrane **182** and top layer **186**, it may be manufactured separately from can end **100** and can body **200** and does not disrupt the established process for either can end manufacturing or can body manufacturing. The only additional step is to attach the self-contained ingredient chamber **180** to underside **124** of metal body **120** after can end **100** has been manufactured and before can end **100** is sealed with can body **200**.

[0036] FIG. **6** shows yet another embodiment. Instead of an ingredient chamber created by membrane **182** as shown in FIGS. **1-6**, in this embodiment, ingredient chamber **190** is created by a deformed cavity **192** on metal body **120**. Deformed cavity **192** may be created, for example, by a punching process from underside **124** of metal body **120**. An opening **194** on underside **124**, shown in FIG. **8**, allows beverage ingredients **400** to be injected into or released from deformed cavity **192**. As shown in the top view of FIG. **7**, deformed cavity **192** may be located at weakened portion **150** within weakened line **152** and spaced apart from tab end **144**. In this way, deformed cavity **192** does not interfere with the lever mechanism for breaking away weakened portion **150** to create drinking opening **170**, and deformed cavity **192** also becomes part of flange **160** that bends downwards.

[0037] The capacity of deformed cavity **192** is accordingly determined by the size of opening **194** and a height (h) of deformed cavity **192**. In some embodiments, height (h) of deformed cavity **192** may be between 1 mm and 2 mm.

[0038] FIG. **8** shows an exploded view of can end **100** and ingredient chamber **190** assembled with beverage ingredient **400**. Beverage ingredient **400** is added (e.g. injected) into deformed cavity **192** through opening **194**. Beverage ingredient **400** may be in a powder form, a liquid form, or a solid form. When beverage ingredient **400** is in a solid form, it may be made in a shape that conforms to the shape of opening **194**. After beverage ingredient **400** is added into deformed cavity **192**, a seal **198** is disposed across opening **194** on underside **124** to seal beverage ingredient **400** inside deformed cavity **192**. Seal **198** may be attached to underside **124** through an adhesive material. Seal **198** may be made of aluminum foil. Seal **198** may be broken open or detached altogether from underside **124** by flange **160**. As shown in FIG. **10**, when seal **198** breaks open or detaches from underside **124**, beverage ingredient **400** is released from deformed cavity **192** through opening **194**.

[0039] In order to ensure that seal **198** breaks open or detaches from underside **124** automatically when weakened portion **150** breaks away from metal body **120** to create flange **160** and drinking opening **170**, seal **198** may be extended beyond weakened line **152**, as shown in FIG. **9**, and attached to underside **124** only on the portion beyond weakened line **152**, and preferably only around the perimeter of seal **198**. In this way, when weakened portion **150** breaks away from metal body **120**, flange **160** is initially enclosed by seal **198**, and when flange **160** is pushed further downwards, flange **160** exerts a force on seal **198** to either break it open or detach it from underside **124**.

[0040] FIG. **10** shows the assembly of FIGS. **8** and **9** after opened by a consumer. After weakened portion **150** breaks away from metal body **120**, flange **160**, including deformed cavity **192**, is pushed downwards and breaks open seal **198**. Because seal **198** is not attached to weakened portion **150**, it is not attached to flange **160**, and it can automatically separate from opening **194** to release beverage ingredient **400** from deformed cavity **192**.

[0041] FIG. **11** shows a further embodiment where flange **160** may be rotated by tab **140** after it breaks open seal **198**. This allows separating opening **194** further away from seal **198**. Because seal **198** may be made of a flexible material, it is possible that seal **198** does not separate from opening **194** by self-weight, or it is possible that pressure from base beverage **300** inhibits seal **198** from separating from opening **194**. Accordingly, allowing opening **194** to be rotated away from seal **198** ensures that beverage ingredient **400** can be released from cavity **192** free of seal **198**.

[0042] Ingredient chamber **190** also provides a benefit in the ease of manufacturing. Deformed cavity **192** may be created through a punching process after can end **100** has been manufactured and before it is sealed with can body **200**, in order to minimize disruptions and modifications to traditionally established can manufacturing and can end manufacturing processes.

[0043] FIG. **12** shows a flow chart of the steps for manufacturing and assembling ingredient chamber **190**. At step **1**, a punch **500** deforms can end **100** at a location within weakened line **152** to create deformed cavity **192**. At step **2**, an adhesive PVC layer **600** is applied (e.g. brushed or sprayed) onto underside **124**. At step **3**, beverage ingredient **400** is added (e.g. injected) into deformed cavity **192**. At step **4**, heat and pressure **700** is applied on seal **198**, preferably around the perimeter of seal **198**, allowing seal **198** to adhere to adhesive PVC layer **600**. Step **5** shows the fully assembled ingredient chamber **190**. Ideally, the perimeter of seal **198** extends beyond weakened line **152**.

[0044] It is to be appreciated that the Detailed Description section, and not the Summary and Abstract sections, is intended to be used to interpret the claims. The Summary and Abstract sections may set forth one or more but not all exemplary embodiments of the present invention as contemplated by the inventor(s), and thus, are not intended to limit the present invention and the appended claims in any way.

[0045] The foregoing description of the specific embodiments will so fully reveal the general nature of the invention that others can, by applying knowledge within the skill of the art, readily modify and/or adapt for various applications such specific embodiments, without undue experimentation, without departing from the general concept of the present invention. Therefore, such adaptations and modifications are intended to be within the meaning and range of equivalents of the disclosed embodiments, based on the teaching and guidance presented herein. It is to be understood that the phraseology or terminology herein is for the purpose of description and not of limitation, such that the terminology or phraseology of the present specification is to be interpreted by the skilled artisan in light of the teachings and guidance.

[0046] The breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the claims and their equivalents.

What is claimed is:

1. A beverage can end with an ingredient chamber, the beverage can end comprising:
- a metal body having a topside and an underside, wherein the metal body has a weakened portion configured to be broken open to create a drinking opening;
- a tab on the topside, configured to be actuated to break open the weakened portion; and
- an ingredient chamber comprising a sealed membrane containing a beverage ingredient, wherein the ingredient chamber is attached to the underside of the metal body, disposed across the weakened portion,
- wherein the sealed membrane is broken in response to the actuation of the tab to break the weakened portion, such that the beverage ingredient is released from the sealed membrane.

2. The beverage can end of claim **1**, wherein the actuation of the tab breaks the weakened portion to create a flange and forces the flange through the sealed membrane, such that the beverage ingredient is released from the sealed membrane.

3. The beverage can end of claim **1**, wherein the sealed membrane is attached to the underside of the metal body by an adhesive.

4. The beverage can end of claim **1**, wherein the sealed membrane comprises a top portion disposed on the underside of the metal body and a bottom portion, and wherein the top portion and bottom portion together define a sealed cavity containing the beverage ingredient.

5. The beverage can end of claim **1**, wherein the ingredient chamber has a size between 0.1 cc to 65 cc.

6. The beverage can end of claim **1**, wherein the beverage ingredient has a functional property that degrades in an acidic environment.

7. A beverage can comprising the beverage can end of claim **1**.

8. The beverage can of claim **7**, further comprising a beverage can body to which the beverage can end is attached, wherein the ingredient chamber is not in contact with the beverage can body.

9. The beverage can of claim **7**, further comprising:
- a base beverage sealed within the can; and
- a beverage ingredient sealed within the ingredient chamber,
- wherein the base beverage and the beverage ingredient are separated by the sealed membrane while the can remains closed.

10. The beverage can of claim **9**, wherein opening the can breaks the sealed membrane and causes the beverage ingredient to be released into the base beverage.

11. A beverage can end with a beverage ingredient chamber, the beverage can end comprising:
- a metal body having a topside and a underside, wherein the metal body has a break-away flange that creates a drinking opening through the metal body when the break-away flange is broken away from the rest of the metal body, and wherein the metal body defines a cavity with an opening on the underside, configured to store a beverage ingredient; and
- a tab on the topside, configured to be actuated to apply force to the break-away flange to break the break-away flange away from the rest of the metal body.

12. The beverage can end of claim **11**, wherein the cavity is part of the flange.

13. The beverage can end of claim **11**, wherein the cavity has a height of 1-2 mm.

14. The beverage can end of claim **11**, further comprising a seal attached to the underside covering the opening of the cavity.

15. The beverage can end of claim **14**, wherein the seal is formed of aluminum foil.

16. The beverage can end of claim **14**, wherein the seal extends across an interface between the flange and the rest of the metal body, such that when the flange is broken away from the rest of the metal body to create the drinking opening, the seal is either broken apart or at least partially detached from the underside to release the beverage ingredient from the cavity.

17. The beverage can end according to claim **16**, wherein the tab is configured to twist the flange after the flange is broken away from the rest of the metal body to create the drinking opening.

18. The beverage can end of claim **11**, wherein the beverage ingredient has a functional property that is diminished in an acidic environment.

19. A beverage can comprising the beverage can end of claim **14**.

20. The beverage can of claim **19**, further comprising:
- a base beverage sealed within the can; and
- a beverage ingredient sealed within the cavity of the flange,
- wherein the base beverage and the beverage ingredient are separated by the seal while the can remains closed.

21. The beverage can of claim **20**, wherein opening the can breaks the seal and causes the beverage ingredient to be released into the base beverage.

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