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(54) **MOLDED CONTAINER HEAD WITH ORIFICE VALVE**

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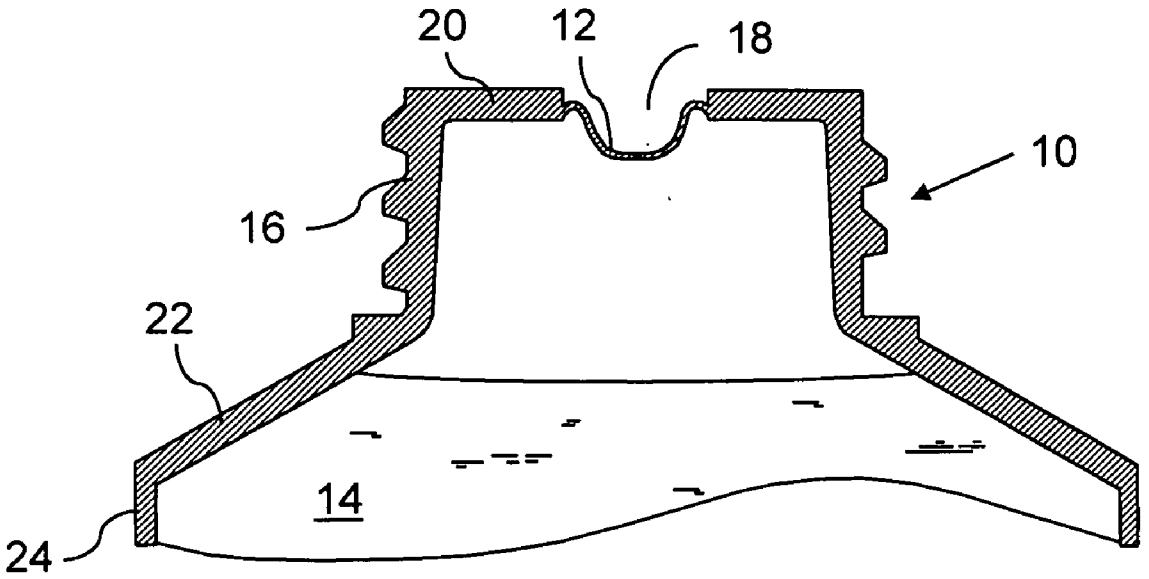
(57) **ABSTRACT**

The present invention is a molded container head with an orifice valve contiguously molded from a single piece of material. The instant container head assembly is an improvement over existing orifice valves as it can be formed during the molding of the container or container cap.



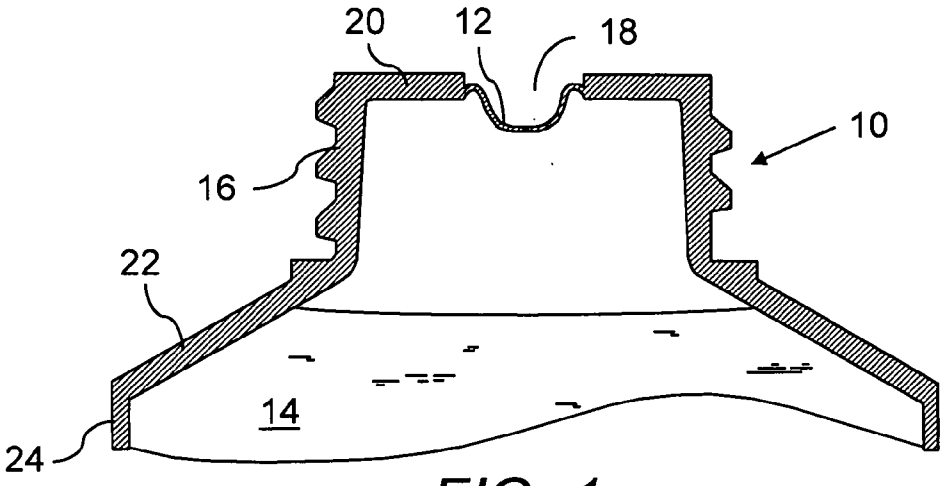


FIG. 1

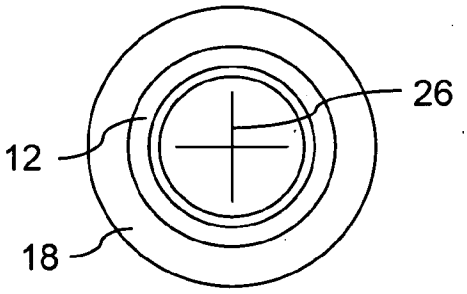


FIG. 2

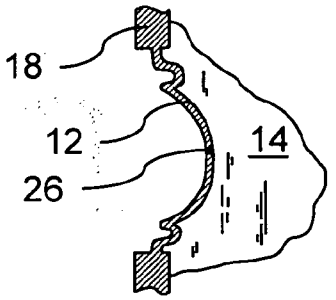


FIG. 3

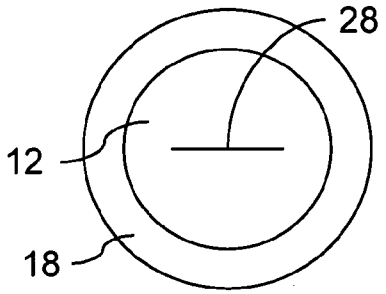


FIG. 4

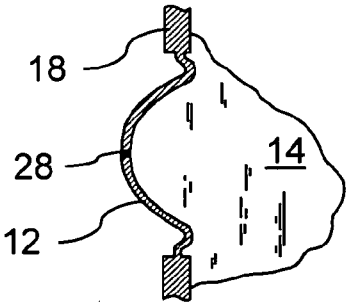


FIG. 5

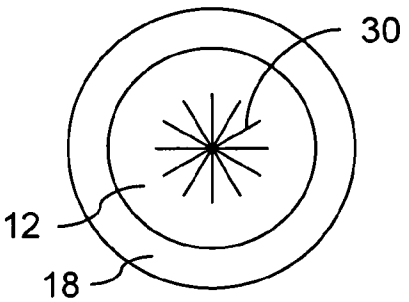


FIG. 6

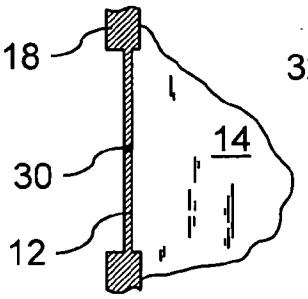


FIG. 7

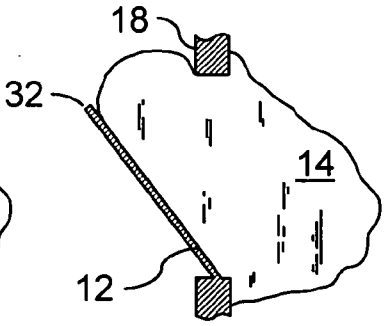


FIG. 8

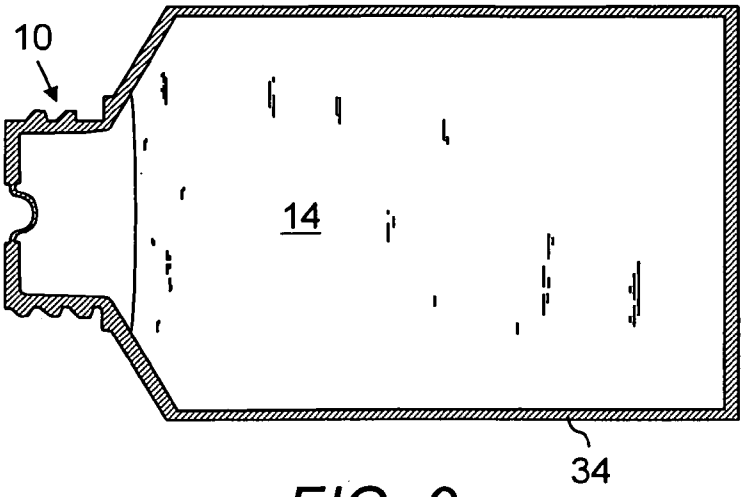


FIG. 9

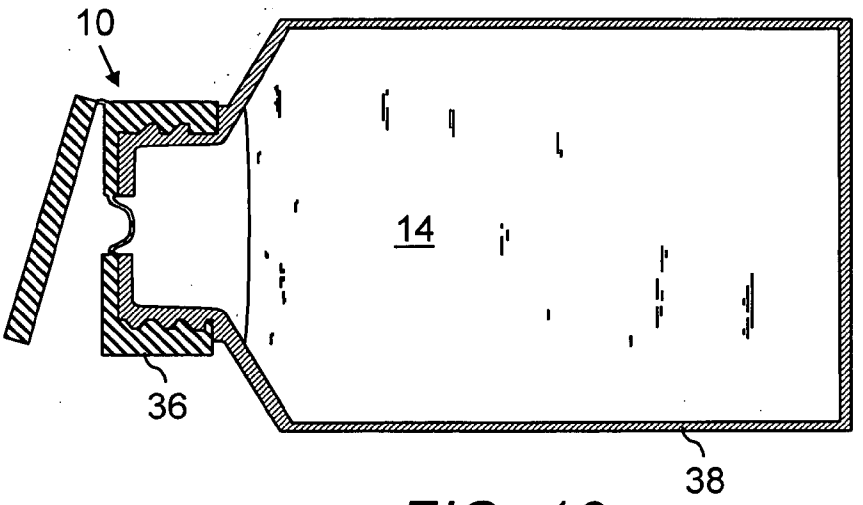


FIG. 10

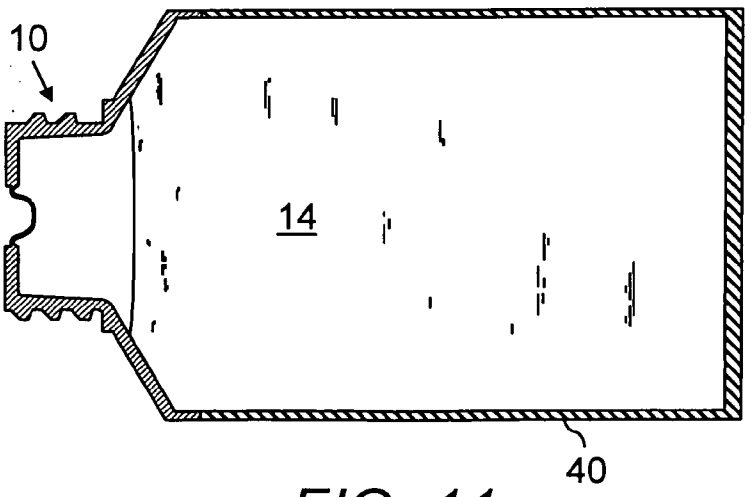


FIG. 11

MOLDED CONTAINER HEAD WITH ORIFICE VALVE

BACKGROUND OF THE INVENTION

[0001] Squeeze tube and bottle containers are used to package and dispense numerous flowable substances, such as powders, pastes or liquids. Application of pressure on the sidewall of the container dispenses a flowable substance from an orifice in a neck formed on the container. In certain instances, it is desirable to use a self-sealing or self-closing valve in combination with a container. Examples of such containers containing self-sealing valves are, for example, described in U.S. Pat. No. 5,033,655 and U.S. Pat. No. 5,213,236. As described in these patents, a dispensing package may contain a self-sealing valve which securely seals upon cessation of pressure on the side wall of the container, so as to protect the contents thereof from the atmosphere, but upon squeezing of the side wall the contents will be dispensed.

[0002] The use of a self-sealing valve in combination with a tube shaped container is suggested in U.S. Pat. No. 5,033,655. In order to use such a self-sealing valve in a tubular container, however, the side wall of the tubular container must have a specific rigidity or thickness such that, while being squeezable, the side wall will return to the shape that existed before squeezing such that air will be sucked back into the container body so as to close the self-sealing valve. The formation of such thick-walled tubular containers is expensive and requires special equipment.

[0003] U.S. Pat. No. 5,911,344 discloses a rigid thermoplastic squeeze container having a self-sealing dispensing valve, for use with flowable substances, wherein the container has a cylindrical shell with a body portion, a first sealable open end and an opposite end having a head portion with a dispensing orifice closed off by a self-sealing valve. A thermoplastic cylindrical support sleeve is fitted within the cylindrical body portion which extends from a position adjacent to the head portion to a location spaced from the sealable end of the cylindrical body portion of the shell, such that the end can be sealed.

[0004] Dispensing valves for packaging containers are disclosed in U.S. Pat. Nos. 4,991,745; 5,033,655; 5,213,236; 5,339,995; 5,377,877; 5,409,144; and 5,439,143. However, the valves known in the art are neither economical nor efficient to produce because they are designed as separate components which are inserted into the container orifice.

SUMMARY OF THE INVENTION

[0005] The present invention is a molded container head with an orifice valve, wherein the orifice valve and molded tube head are contiguously molded. In one embodiment, the present invention embraces a molded container head with orifice valve and container body. In particular embodiments, the molded container of the invention is produced by selecting a material and molding the material into a container head with an orifice valve.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a sectional view of the molded container head and orifice valve.

[0007] FIG. **2** is a fragmentary top view of a concave orifice valve with a cross-cut slit aperture.

[0008] FIG. **3** is a sectional view of a concave orifice valve in the closed position.

[0009] FIG. **4** is a fragmentary top view of a convex orifice valve with a single slit aperture.

[0010] FIG. **5** is a sectional view of a convex orifice valve in the closed position.

[0011] FIG. **6** is a fragmentary top view of a flat orifice valve with a cross-cut slits.

[0012] FIG. **7** is a sectional view of a flat orifice valve in the closed position.

[0013] FIG. **8** is a sectional view of a flat orifice valve with a circumferential slit around the orifice depicted in the open position.

[0014] FIG. **9** is a sectional view of a container head assembly that is contiguous with the body of the container.

[0015] FIG. **10** is a sectional view of a container head assembly that is an integral part of the container cap and used in combination with a standard container.

[0016] FIG. **11** is a sectional view of a container head assembly produced as a separate component and welded to a container body.

DETAILED DESCRIPTION OF THE INVENTION

[0017] As illustrated in FIG. **1**, the present invention is a molded container head **10** contiguously molded with an orifice valve **12**, which controls the flow of fluid **14** out of the container. As used herein, contiguously molded is intended to mean that the molded container head **10** and orifice valve **12** are molded from a single piece of material. The container head **10** is intended to encompass the narrowed portion of a container through which fluid from the container body is dispensed. Generally, the container head encompasses the collar or neck region **16** of the container and an orifice **18** located at the top **20** of the container head **10** through which fluid **14** is dispensed. The container head **10** is typically referred to as the portion located above the shoulder **22** and body **24** portions of the container.

[0018] As used in the context of the present invention, a container is intended to include squeeze tubes, squeeze bags, and squeezable bottles used for packaging and dispensing non-solid products of the type which are capable of flowing. Non-solid products include fluid or fluidized materials, including liquids, pastes, powders, and the like, which are collectively and generically referred to herein as fluids. Squeeze tubes or bags and squeezable bottles are flexible packages made from plastic material (e.g., low or high density polyethylene, polypropylene, polyethylene terephthalate, polyvinyl chloride, softouch, dual layer, or coextruded plastics), elastic material (e.g., silicone, thermoplastic elastomer, natural rubber, or synthetic rubber such as isoprene), laminate materials (ethylene vinyl alcohol resin), or combinations thereof with one open end and one closed end. In particular embodiments, the container is a squeeze tube or bag formed by sealing a filled tube at one end resulting in a package with a cylindrical, open end and a flattened, closed end (e.g., a toothpaste tube).

[0019] In one embodiment, the container head assembly **10** is integrated (i.e., contiguous) with the shoulder **22** and

body **24** of the container. As such, the shoulder **22** and body **24** of the container, container head **10** and orifice valve **12** are produced from a single piece of material to create a unitary one-piece construction. One configuration of this embodiment is illustrated in FIG. **1**, wherein the container head assembly **10** contains threads so that a cap or lid can be affixed to the container to cover the top portion **20** of the container. Another configuration of this embodiment embraces a snap-on cap or flip-top cap affixed to the container to cover the top portion **20** of the container head and orifice **18**. In another embodiment, the container head assembly **10** is integrated into a container cap or lid which is affixed to the container. As such, the container lid or cap, container head **10** and orifice valve **12** are produced from a single piece of material and affixed to the container.

[**0020**] As shown in FIGS. **2** though **7**, the orifice valve **12** can be formed in a variety of configuration. For example, the orifice valve **12** face can be concave (FIG. **3**), convex (FIG. **5**) or flat (FIG. **7**) depending on flow properties of the fluid **14** in the container. For example, a flat orifice valve face may be more suitable for proper dispensing of a highly viscous fluid than the other orifice valve face configurations.

[**0021**] Apertures of the orifice valve **12** can take the form of a cross-cut slit **26** (FIG. **2**) which includes two, perpendicular, linear slits that intersect at the center of the orifice valve; a single elongated slit **28** (FIG. **4**) that traverses the center or near-center portion of the orifice valve; a plurality of cross-cut slits **30** (FIG. **6**) or parallel slits, or a 320° circumferential slit **32** extending around the orifice so that the valve is, in operation, a flap covering the orifice (see FIG. **8**). Slits in the orifice valve are formed by slicing through the valve face, without removing any substantial amount of material therefrom, so that valve remains sealed when in the normal, fully closed position (see FIG. **3**, FIG. **5** and FIG. **7**). The slit aperture of the orifice valve can be formed during the molding process or by the capping machine before the container is capped. The length and location of slits can be adjusted to vary the predetermined opening and closing pressures of the valve, wherein slit apertures can be extend substantially from edge to edge of the valve face or constitute one or more pinpoint holes in the valve face. In operation, that orifice slits define flaps or pedals which flex inwardly and outwardly to selectively permit the flow of fluid product through the valve. In this regard, when the container is squeezed, fluid and air are displaced from the container creating a lower pressure inside the container versus the outside air pressure. This pressure differential causes the orifice valve to close after the container is released.

[**0022**] The orifice valve face configurations and apertures depicted in the figures are exemplary for application with a variety of fluid viscosities and are by no way to be construed as limiting the possible valve face and aperture combinations. For example, the valve depicted in FIG. **3** is a suitable choice for a fluid with a viscosity in the range of 300 to 500 centistokes. An orifice valve of design shown in FIG. **5** is suitable for use in combination with a fluid having a viscosity in the range of 100 to 200 centistokes, whereas the orifice valve depicted in FIG. **6** is useful in combination with a fluid having a viscosity less than 100 centistokes. As will be appreciated by the skilled artisan, any orifice valve face configuration can be used in combination with any aperture depending upon the fluid in the container and the amount and pattern of flow desired.

[**0023**] Another feature of the container head assembly is the thickness of the orifice valve relative to the container head. In general, the orifice valve is substantially thinner than the container head. In particular embodiments, the orifice valve **12** is a thin membrane with a thickness in the range of approximately 0.05 mm to approximately 0.5 mm, wherein the container head **10** is in the range of approximately 1.0 mm to approximately 2.0 mm. In other embodiments the thickness of valve **12** is in the range of 1:5 to 1:2 relative to the thickness of container head **10**. The size and shape of the orifice valve in conjunction with the thickness and configuration of the adjacent container head material may be varied in accordance with the viscosity and other physical characteristics of the fluid being dispensed, as well as the desired flow rate, flow pattern, threshold pressure, and sealing pressure. The term threshold pressure as used herein refers to the pressure in or on the fluid product which will cause the valve orifice to shift from the closed position to the outwardly open position. The force necessary to achieve the threshold pressure will be dependent upon the shape, size, rigidity, and material selected for the container and the valve. All such factors are desirably balanced and adjusted to achieve the correct dispensing characteristics for the orifice valve.

[**0024**] In accordance with the present invention, the one-piece construction of the container head assembly is produced by selecting a suitable material and compression molding, injection molding, or bi-injection molding (e.g., when employing a combination of materials) a container head **10** with a thin valve **12** covering the orifice. As will be appreciated by the one of skill in the art, the material selected for producing the instant container head assembly can be dependent upon several factors including the flow properties of the fluid being dispensed and whether the container head assembly **10** is contiguous with the body of the container **34** (FIG. **9**), an integral part of the container cap or lid **36** used with a standard container **38** (FIG. **10**), or produced as a separate component and welded to the container body **40** (FIG. **11**). Desirably, the material selected for producing the container head assembly is resilient and flexible, retaining its physical and/or chemical characteristics in response to ambient changes such as temperature fluctuations, repeated use, or exposure to active ingredients in the product. In this regard, the designed material flow rate and sealing pressure of any particular orifice valve will remain relatively constant. However, because the container material or cap material is composed of the same material as the orifice valve, it may be necessary to respectively select a more rigid container cap material or container body material suitable to stabilize the flexible material required of the orifice valve. Moreover, particular embodiments embrace the use of container body and orifice valve materials wherein the valve and container work together; the valve opening when the container is squeezed to dispense the product and closing due to differential pressure and memory of the valve material and shape after squeezing.

[**0025**] The instant container orifice valve formed contiguously with the container head can replace valves that are molded separately and inserted in the head or cap as a separate piece. Molding the valve as part of the container

head eliminates the molding and assembly operation required when the valve is made separately. The instant container head assembly is used to control product flow, reduce leakage, and provide a clean orifice area because the valve cuts off the product flow thereby preventing stringing and product residue around to the orifice. Moreover, the container head assembly of the invention prevents air from sucking back into the container and reacting with the product to spoil or otherwise degrade the product and reduce the product shelf-life. As such the orifice valve preserves the hygienic nature of the product during repeated use. The container head assembly of the invention finds application in the packaging and dispensing of a variety of consumable or purchased goods or products including consumable products such as personal care products (e.g., soaps, shampoos, make-up, insect repellents, and the like); first aid products (e.g., ointments, sunscreens, and the like); cleaners (e.g., detergents and cleaning solutions); paints; and foodstuffs (e.g., yogurt, cheese-like products, jelly, oils, condiments, and the like). The instant invention is a significant improvement in the manufacture of containers with orifice valves because the valve can be manufactured simultaneously with the container thereby decreasing the cost and increasing the efficiency of production.

What is claimed is:

1. A molded container head with an orifice valve, wherein the orifice valve and molded tube head are contiguously molded.

2. The molded container head with orifice valve of claim 1, further comprising a container body.

3. A method for producing a contiguously molded container head with an orifice valve comprising selecting a material and contiguously molding the material into a container head with an orifice valve.

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