EXHIBIT 1009:

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Holley, Jr.

(10) **Patent No.: US 6,880,713 B2**
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(54) **FLOW CONTROL ELEMENT WITH PINHOLES FOR SPILL-RESISTANT BEVERAGE CONTAINER**

(75) Inventor: **James W. Holley, Jr.**, Colorado Springs, CO (US)

(73) Assignee: **Insta-Mix, Inc.,**, Colorado Springs, CO (US)

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(22) Filed: **Jan. 10, 2003**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 10/236,459, filed on Sep. 6, 2002, now abandoned.

(51) **Int. Cl.**[7] **A61J 9/00**; A61J 11/00; B26F 1/00

(52) **U.S. Cl.** **215/11.4**; 215/11.1; 220/714; 30/368

(58) **Field of Search** 215/11.1, 11.4, 215/11.5; 220/711, 714; 30/368

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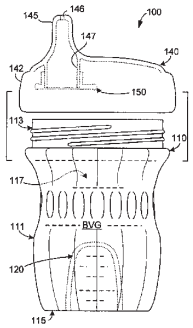
Primary Examiner—Sue A. Weaver
(74) *Attorney, Agent, or Firm*—Bever, Hoffman & Harms LLP; Patrick T. Bever

(57) **ABSTRACT**

A spill resistant container (e.g., a sippy cup) including a flow control element including a membrane defining multiple pinholes for controlling the flow of liquid through a drinking spout. The flow control element is mounted on a cover that screws onto a cup-shaped body such that the membrane is positioned between liquid stored in the cup-shaped body and the drinking spout, which is formed on the cap. The flow control element is formed from a suitable elastomeric material (e.g., soft rubber, thermoplastic elastomer, or silicone) such that the membrane stretches when subjected to a differential pressure. The pinholes are formed by puncturing the membrane using one or more pins having a substantially circular cross-section and sized such that each pinhole is closed by the surrounding elastomeric material when the pins are removed.

17 Claims, 2 Drawing Sheets



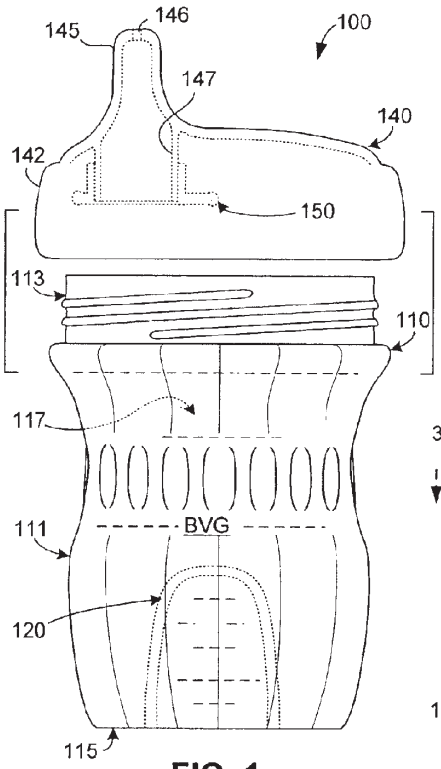


FIG. 1

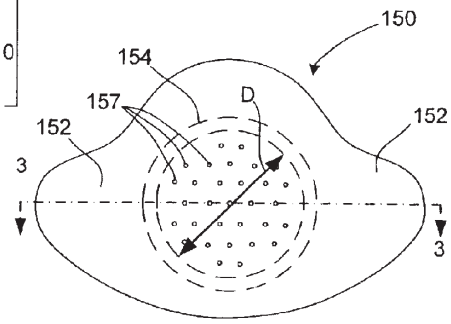


FIG. 2

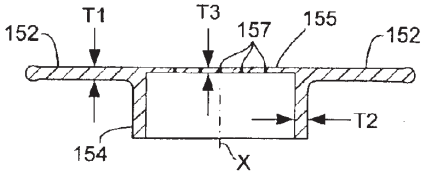


FIG. 3

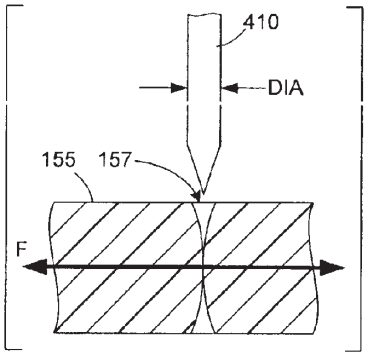


FIG. 4(A)

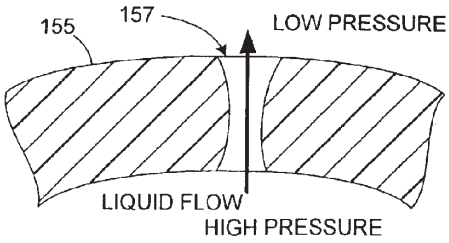


FIG. 4(B)

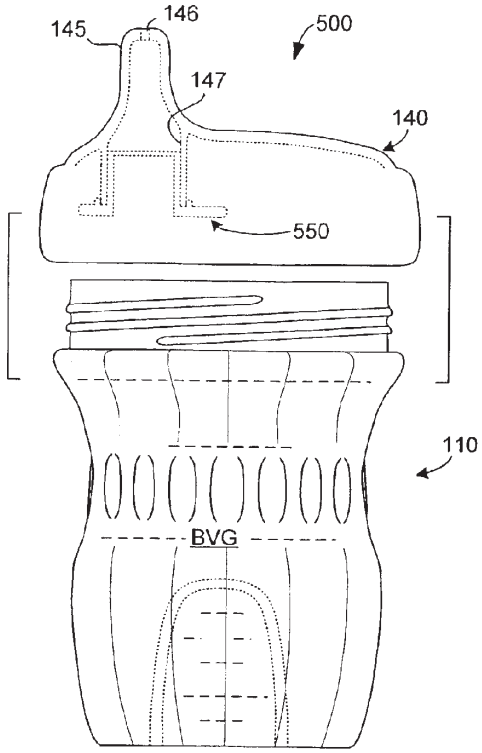


FIG. 5

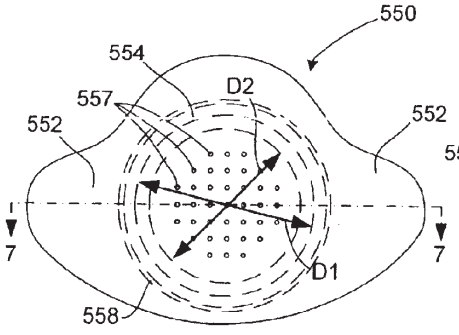


FIG. 6

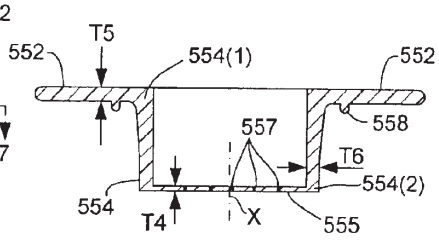


FIG. 7

FLOW CONTROL ELEMENT WITH PINHOLES FOR SPILL-RESISTANT BEVERAGE CONTAINER

RELATED APPLICATION

The present application is a continuation-in-part of commonly owned U.S. patent application Ser. No. 10/236,459, "FLOW CONTROL ELEMENT WITH PINHOLES FOR SPILL-RESISTANT BEVERAGE CONTAINER" filed Sep. 6, 2002 now abandoned by James W. Holley, Jr.

FIELD OF THE INVENTION

The present invention relates to fluid containers, and more particularly to spill-resistant beverage containers.

RELATED ART

Spill-resistant containers are widely used for storing liquids in situations where the liquid may spill from an open-top cup. For example, travel mugs have lids or caps that resist accidental spillage of liquid that slosh due to rough road conditions. A drinking hole is provided in the lids or caps through which liquids (e.g., coffee) may be sipped by a person traveling in an automobile, and an air inlet hole is provided that admits air to replace the volume of beverage sipped from the travel mug. Sports bottles are another type of spill-resistant container that typically includes a screw-on lid having a built-in straw, and a cap for sealing the end of the straw. Some of these sports bottles also have a manually operated pop-up air intake vent that admits air to replace the volume of beverage drawn through the straw.

Sippy cups are a third type of spill-resistant container typically made for children. Sippy cups include a cup body and a screw-on or snap-on lid having a drinking spout molded thereon. An elastomeric flow control element, such as a soft rubber or silicone outlet valve, is provided in some sippy cups to control the flow of liquid through the drinking spout. Such flow control elements typically include a sheet of the elastomeric material located between the inner cup chamber and the drinking spout that defines one or more slits formed in an X or Y pattern. As a child tilts the container and sucks liquid through the drinking spout, the slits yield and the flaps thereof bend outward, thereby permitting the passage of liquid to the child. When the child stops sucking, the resilience of the causes the slits to close once more so that were the cup to be tipped over or to fall on the floor, no appreciable liquid would pass out the drinking spout. The lid often also includes an air inlet port (vent) formed to admit air into the cup body to replace the volume of liquid sipped or sucked through the drinking spout, and a rubber or spring-loaded self-sealing air inlet control valve is sometimes provided to prevent spillage through the air inlet.

A problem with conventional sippy cups that utilize elastomeric flow control elements is that the elastomeric material in the region of the slits can fatigue and/or become obstructed over time, and the resulting loss of resilience can cause leakage when the slit flaps fail to fully close after use. This failure of the slit flaps to close can be caused by any of several mechanisms, or a combination thereof. First, repeated shearing forces exerted at the end of each slit due to repeated use can cause tearing of the elastomeric material in this region, thereby reducing the resilient forces needed to close the slit flaps after use. Second, thermal cycling or mechanical cleaning (brushing) of the elastomeric material due, for example, to repeated washing, can cause the elastomeric material to become less elastic (i.e., more brittle), which can also reduce the resilience of the slit flaps. Third, solid deposits left by liquids passing through the slits can accumulate over time to impede the slit flaps from closing fully.

What is needed is a spill-resistant beverage container including an elastomeric flow control element that avoids the problems associated with conventional slit-based elastomeric flow control elements.

SUMMARY

The present invention is directed to a spill resistant container (e.g., a sippy cup, travel mug, or sports bottle) including a flow control element including a membrane defining multiple pinholes, instead of conventional slits, for controlling the flow of liquid through a drinking spout. The membrane is formed at one end of a cylindrical wall formed such that the flow control element can be mounted on a corresponding cylindrical mounting structure formed on a cover that screws onto a cup-shaped body. In one embodiment, the cylindrical wall is mounted over the mounting structure and a relatively large diameter membrane is positioned at an end of the mounting structure away from the drinking spout, which is formed on the cap. In a second embodiment the cylindrical wall of the flow control element is pushed into the mounting structure such that a relatively small diameter membrane is located adjacent to the drinking spout. In either embodiment, the membrane is positioned between liquid stored in the cup-shaped body and the drinking spout. The flow control element is formed from a suitable elastomeric material (e.g., soft rubber, thermoplastic elastomer, or silicone) such that the membrane stretches when subjected to a differential pressure (e.g., as a result of a child sucking on the drinking spout). The pinholes are formed by puncturing the membrane using one or more pins having a substantially circular cross-section and formed with the membrane in radial tension such that each pinhole is closed by the surrounding elastomeric material when the pins are removed and the tension is relieved. Accordingly, under normal atmospheric conditions (i.e., when the cup is not in use), the pinholes remain closed, thereby preventing leakage of liquid from the cup through the membrane. During subsequent use, the applied pressure differential causes the membrane to stretch, thereby opening the pinholes and allowing liquid to pass through the membrane and through the drinking spout. Upon removal of the differential pressure, the membrane returns to its original (e.g., planar) shape, and the pinholes are again closed. Because the pinholes are substantially circular (i.e., do not include slits that can fatigue or trap deposits), the pinholes facilitate reliable leakage prevention over a longer period than that possible using conventional, slit-based flow control elements.

The present invention will be more fully understood in view of the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view showing a sippy cup according to an embodiment of the present invention;

FIG. **2** is a plan view showing a flow control element utilized in the sippy cup of FIG. **1**;

FIG. **3** is a cross-sectional side view taken along section line **3**—**3** of FIG. **2**; and

FIGS. **4**(A) and **4**(B) are simplified enlarged cross-sectional views showing the opening of a pinhole formed in the flow control element of FIG. **2** during operation;

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