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(54) **CONTAINER AND METHOD OF MAKING A CONTAINER**

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(75) **Inventor: Daniel A. Kosth, Silvis, IL (US)**

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Correspondence Address:

LAW OFFICES OF DONALD COX

40 NASSAU ST

PRINCETON, NJ 08542-4522 (US)

(57) **ABSTRACT**

(73) **Assignee: Sports Media, Inc.**

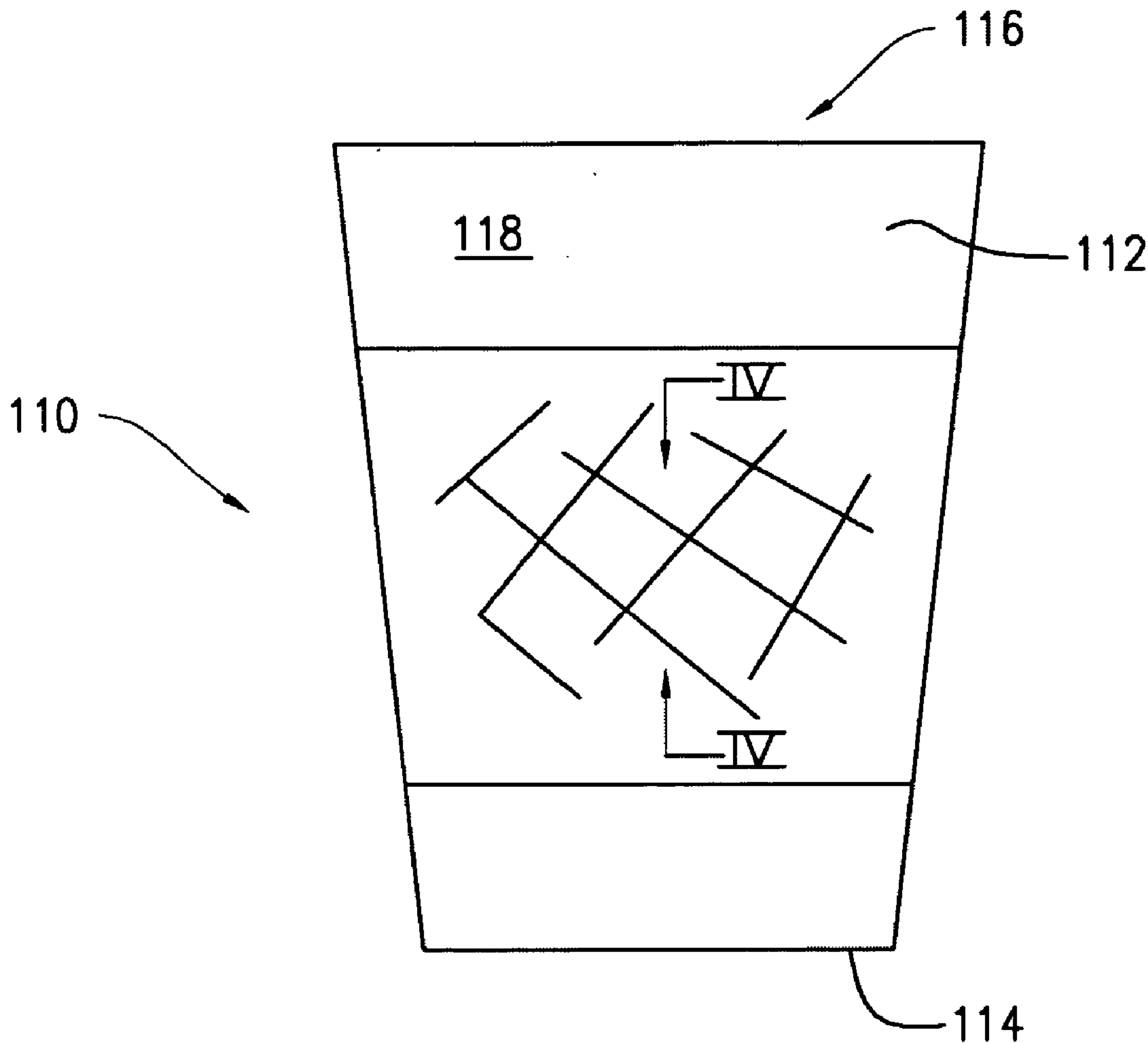
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Related U.S. Application Data

(60) **Provisional application No. 60/578,826, filed on Jun. 14, 2004.**

A container includes a hydrochromic material associated with at least a portion of a wall of the container. The hydrochromic material may be visible from the exterior of the container. The hydrochromic material may have a first appearance when in a dry form and a second appearance, different from the first appearance, when the hydrochromic material becomes hydrated.



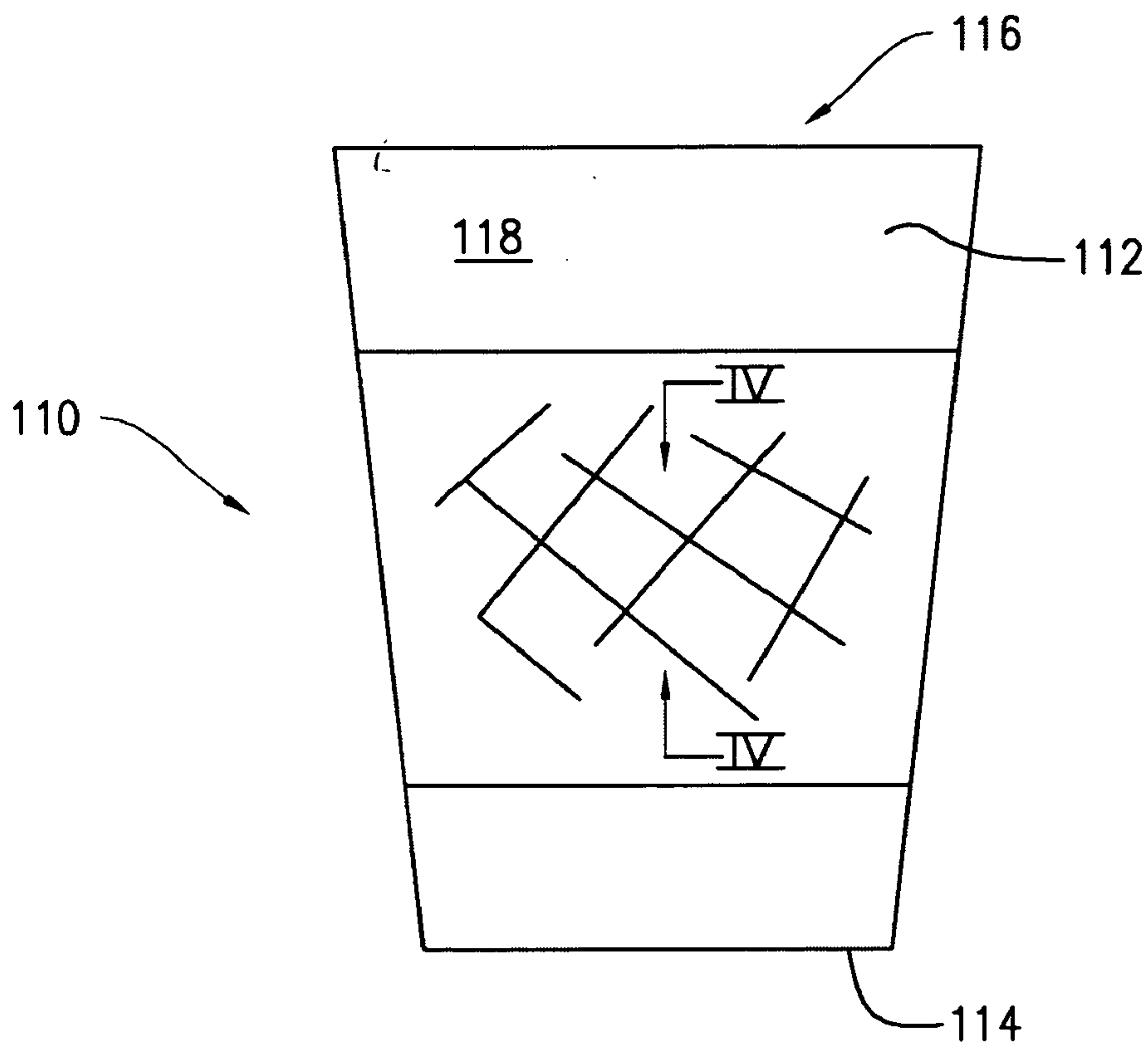


FIG. 1

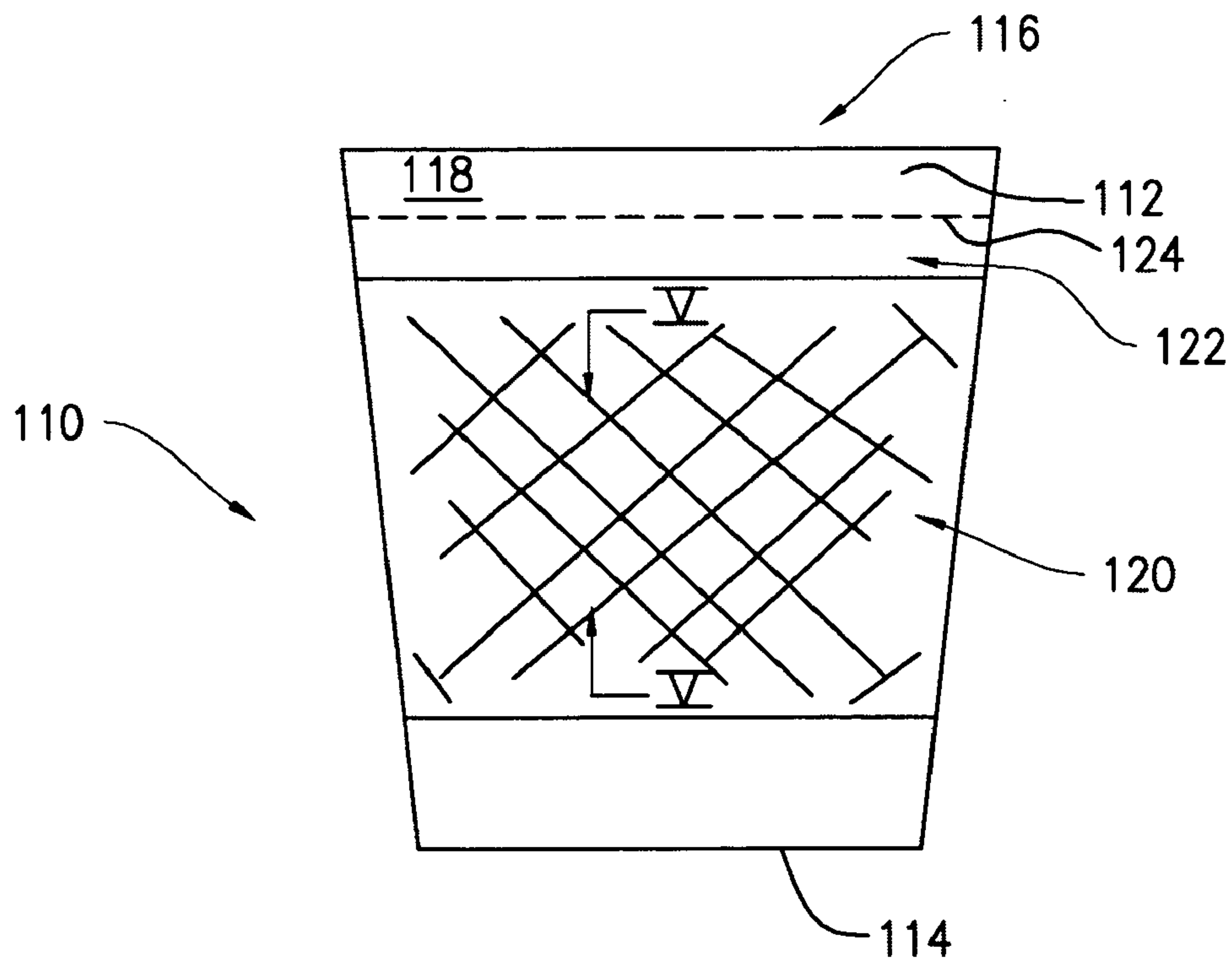


FIG. 2

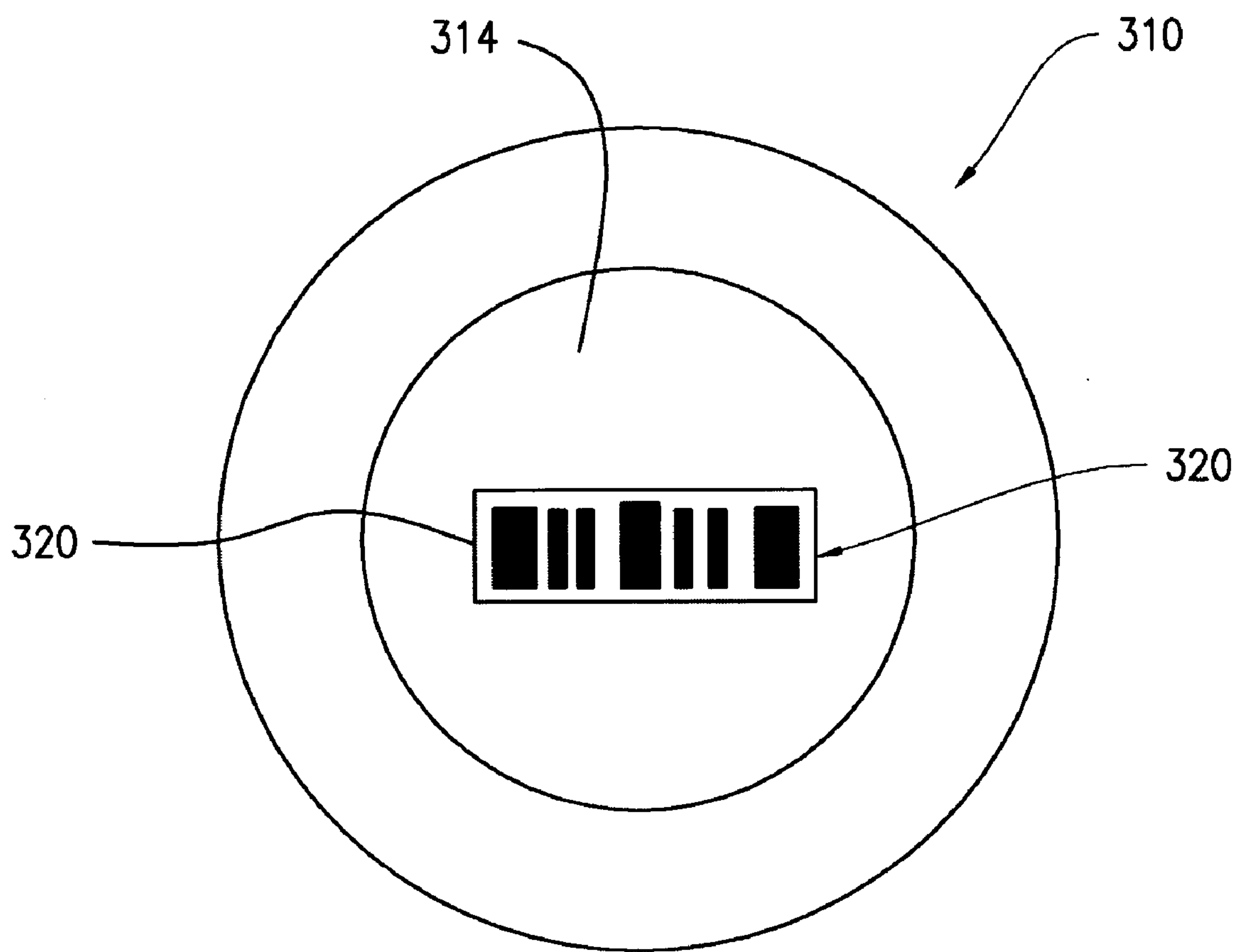


FIG. 3

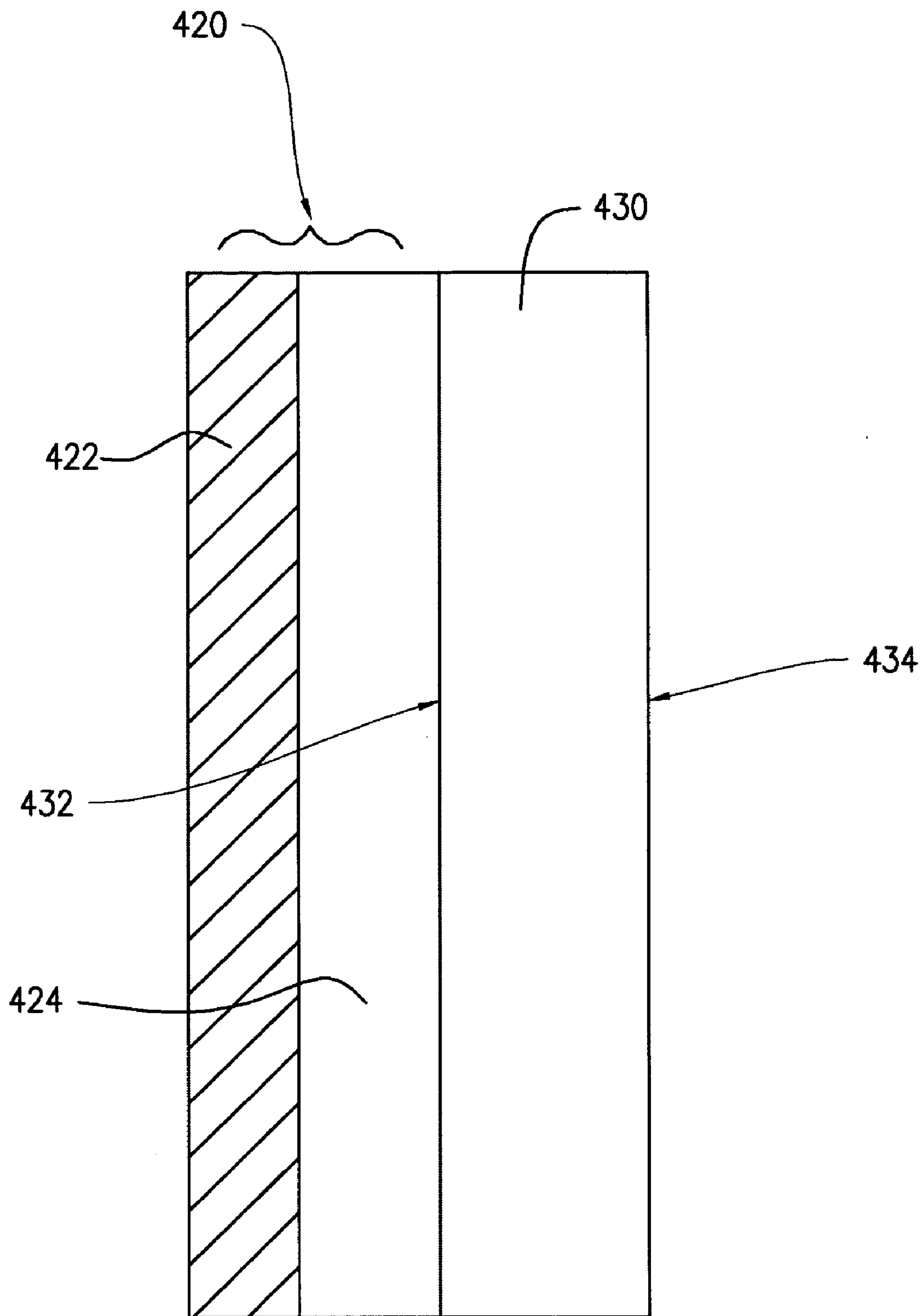


FIG. 4

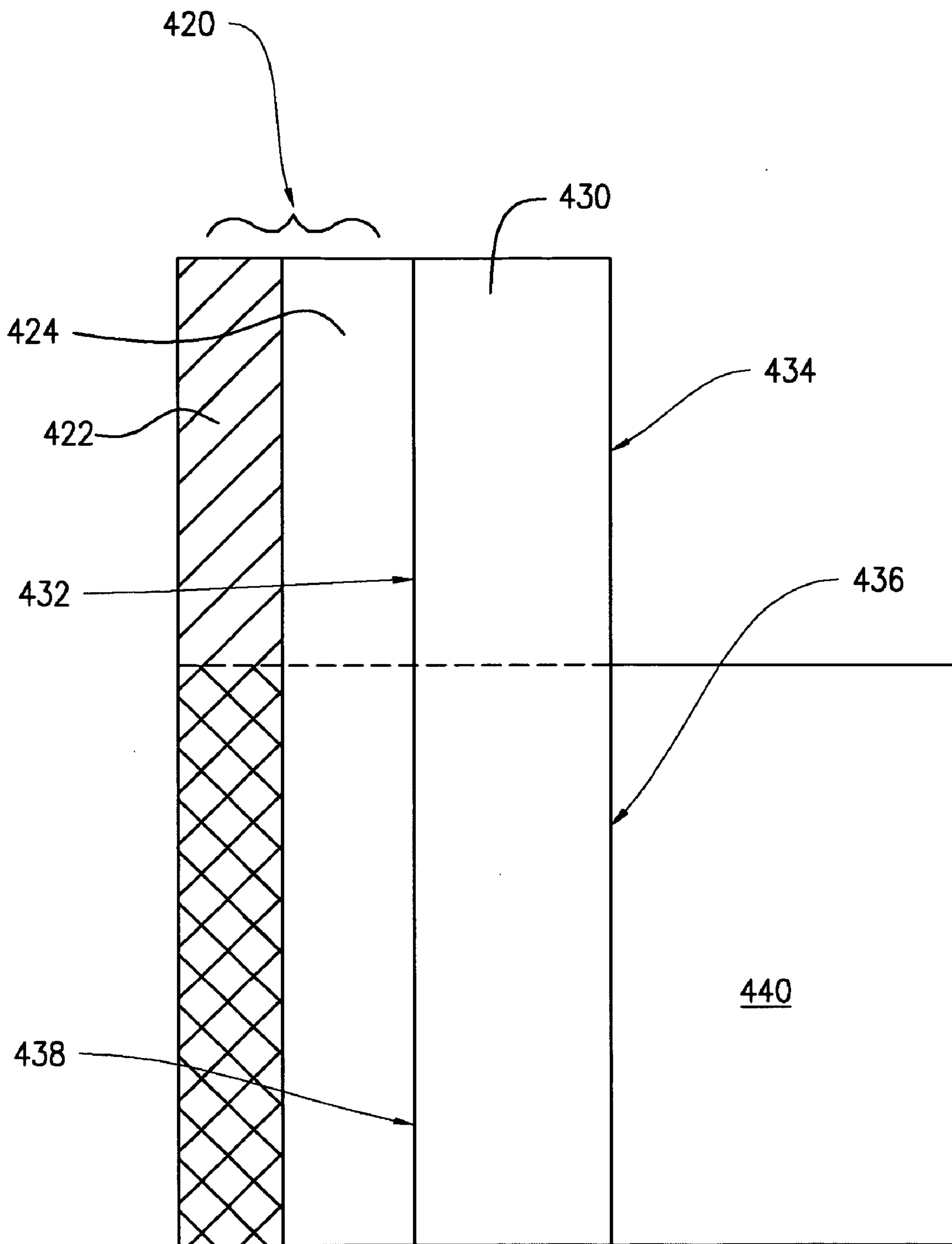


FIG. 5

CONTAINER AND METHOD OF MAKING A CONTAINER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/578,826 filed on Jun. 14, 2004, which is incorporated herein by reference.

BACKGROUND

[0002] 1. Field of the Invention

[0003] The present invention is directed to a container and a method(s) for making and using a container. More particularly, the present invention is directed to a container that may change appearance in the presence of condensation on an exterior surface of the container.

[0004] 2. Description of the Related Art

[0005] Concession stands at sports stadiums, ballparks and other public venues represent a huge income source for many of these public facilities. The distribution of food and beverages can significantly increase the profits derived from such public facilities. However, a problem persists at concession stands with inventory control in which food and beverages that are not pre-packaged for the employees may be readily distributed to the public without recording the sale for the benefit of the concession stand owner.

[0006] This problem is particularly acute in concession stand operations that rely on beverages poured on demand by the employees for the customer. Often variations in the volume of liquid poured varies from one container to the next container, such differences in volume and other factors render it very difficult for a concession stand owner to determine whether an employee is pocketing a sale for himself or providing free samples to the public.

[0007] Currently preferred solutions for maintaining inventory control of beverages poured on demand utilize inventory control of the beverage containers and/or beverage fountains and taps that can dispense pre-measured amounts of the beverage. In this way, cup inventory control coupled with records of the number of pre-measured beverages dispensed can be used to determine losses in inventory. One drawback to this solution is the ability of employees to provide refills of cups already sold to the public. Employees can easily refill an existing cup and charge for the beverage without detection by concession stand management while pocketing the income for himself or providing a free refill to the customer.

[0008] Solutions have been devised to stop inventory losses from refills provided by employees. One such solution, disclosed in U.S. Pat. No. 5,820,951 to Codell Industries, Inc. includes the use of thermo-chromic ink on the beverage container that changes colors when the temperature of a beverage container changes between predetermined hot and cold temperatures. Thus, pouring a cold beverage into a cold beverage container will result in a color change and pouring a hot beverage into a hot beverage container will result in a color change. This solution while fit for its intended purpose of providing some degree of inventory control has drawbacks as the color change is not permanent allowing for customers or others to reset the containers by

simply adding a hot beverage to a container intended for a cold beverage or a cold beverage to a container intended for a hot beverage. Moreover two separate sets of cups need to be held in inventory, one for cold beverages and one for hot beverages. Furthermore, keeping track of color changes depending upon whether the drink is supposed hot or cold can lead to confusion by the concession stand employees as to whether the cup is already used. Finally, transportation of beverage containers is not usually provided in temperature-controlled environments. Thus, cold beverage containers shipped or stored in cold temperatures at or below the color-changing threshold may be rendered unfit for their intended purpose. Likewise, beverage containers shipped in hot temperatures at or above the color-changing threshold may also be rendered unfit for their intended purpose. Thus, the need exists for a way to provide automatically marked or identified cups that have been used for a sale of beverages from cups that are remaining in inventory.

SUMMARY OF THE INVENTION

[0009] In some aspects, a container may include walls to form a receptacle, and a hydrochromic material associated with at least a portion of the peripheral wall. The hydrochromic material may be visible from the exterior of the container. The hydrochromic material may have a first appearance when in a dry form and a second appearance, different from the first appearance, when the hydrochromic material becomes hydrated.

[0010] In accordance with some aspects, a method of making a container includes connecting a bottom wall with a peripheral side wall, providing a dry hydrochromic material having a first appearance that substantially matches an appearance of the peripheral side wall, and applying the dry hydrochromic material to at least a portion of the peripheral wall such that the hydrochromic material is visible from an exterior of the container. The hydrochromic material has a second appearance, different from the first appearance, when the hydrochromic material becomes hydrated.

[0011] In some aspects, an inventory control method includes providing a container configured to contain a product, introducing a product into the container, and changing indicia on at least a portion of the container when condensation forms on the container. The indicia is visible from the exterior of the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Other aspects, advantages and novel features of the invention will become more apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

[0013] **FIG. 1** is a side elevation view of an exemplary container having a first appearance in accordance with some aspects of the invention;

[0014] **FIG. 2** is a side elevation view of the container of **FIG. 1** having a second appearance in accordance with some aspects of the invention;

[0015] **FIG. 3** is a bottom view of an exemplary container in accordance with aspects of the invention;

[0016] **FIG. 4** is a cross-sectional view of the container of **FIG. 1** taken along line IV-IV; and

[0017] FIG. 5 is a cross-sectional view of the container of FIG. 2 taken along line V-V.

DETAILED DESCRIPTION

[0018] An exemplary embodiment of a container 110 is shown in FIG. 1. The container 110 may be described as including a peripheral wall 112 and a bottom wall 114. The peripheral wall 112 and the bottom wall 114 may be formed of plastic (including, but not limited to, PP=Polypropylene and PET=Polyester), paper, wax-coated paper, or other suitable materials for beverage containers. It will be appreciated by those skilled in the art, that typically for hot liquids, the container is formed from an insulated material such as a light, resilient polystyrene plastic sometimes referred to as Styrofoam™ or may include an insulated holder such as a ring or corrugated cardboard to insulate the holder's hand from the hot liquid; while cold beverages are typically served in a container of non-insulated material. The peripheral wall 112 and the bottom wall 114 cooperate to define a receptacle 116. The receptacle 116 is configured to contain a beverage, for example, an alcoholic beverage (beer), soft drinks (soda or carbonated beverages), juice, coffee, hot chocolate, tea or water.

[0019] Advantageously, an exposed surface 118 of the peripheral wall 112 includes a layer of hydrochromic material 120 applied thereon to provide an intelligent packaging layer that reacts to the presence condensation on the layer 120.

[0020] Preferably the hydrochromic material is produced in a printing ink form suitable for use in conventional printing systems. Furthermore, the hydrochromic material is such that it can be readily applied to any type of container material. The hydrochromic material to form layer 120 may be applied to the surface 118 by, for example, standard printing or silk screening processes known to those of ordinary skill in the art. In some aspects, the hydrochromic layer 120 may be applied to a label (not shown), which in turn is attached to the container.

[0021] In one preferred embodiment, the hydrochromic ink is preferably produced from comestible ingredients such as, but not limited to, a soy bean oil derivative.

[0022] The hydrochromic layer 120 has at least two different, visibly discernible appearances. By way of example as shown in FIG. 1, the layer 120 has a first appearance before a container is used to hold a liquid. The first appearance may be similar to that of the exposed surface 118 such that the layer 120 is minimally visible or opaque. Alternatively, the layer 120 may be clearly visible. By hydrating the hydrochromic layer 120, for example, by causing condensation to form on the exposed surface 118, the hydrochromic layer 120 changes from the first appearance to a second appearance, as shown in FIG. 2. The first appearance may comprise, for example, a first color, and the second appearance may comprise, for example, a second color that is different than the first color. The condensation may be caused by introducing a beverage 122, for example, a chilled beverage, a heated beverage, or a room-temperature beverage, into the container 110 to a fill line 124. As shown in FIG. 2, the portion of the hydrochromic layer 120 corresponding to the filled region may then change to the second appearance.

[0023] With the exception of hot drinks such as coffee, tea, or hot chocolate, most concession stand beverages, such as beer, juice and soft drinks, are typically served chilled with ice at temperatures between 36° and 43° F. The introduction of beverages into the receptacle 116 causes condensation to form on the exposed surface 118 and the hydrochromic layer 120, thereby changing the layer 120 from the first appearance to the second appearance. Condensation forms under the principle that there are three temperatures one for the cup, one for the beverage and one for the ambient air. When combined by the introduction of a beverage into the container, the three temperatures of ambient air, container and beverage creates condensation that causes the change in the hydrochromic layer. Sufficient condensation may be formed each time the beverage is added whether it is hot or cold. Additionally, moisture may be transferred to the container from the palm of a person's hand or by wiping the container after each pour with a damp cloth.

[0024] In a preferred embodiment, the second appearance is maintained permanently, even when the receptacle 116 is emptied and the condensation removed from the exposed surface 118 and the layer 120.

[0025] Accordingly, a purveyor of beverages, such as a concession stand manager, can monitor the container 110 to determine whether the container 110 is being filled for the first time or being refilled by visually observing the appearance of the exposed surface 118 and the hydrochromic layer 120. When the layer 120 is applied to a large portion of the exposed surface 118, as shown in FIG. 1, the color of the layer 120 can be viewed from a distance thereby permitting even the use of security camera's to monitor unauthorized refills. Even if the layer 120 covers only a portion of the exposed surface 118 as shown in the FIGS. 1 and 2, it will be appreciated by those skilled in the art that the layer 120 may cover the entire exposed surface 118 or a smaller area as needed for visual recognition of the layer 120.

[0026] It will further be appreciated by those skilled in the art that by applying the hydrochromic layer 120 using standard printing processes the layer 120 may be arranged in any predetermined form such as a message, for example, "NO REFILLS", or a predetermined design. The design may simply be an indication to concession workers that the container has been used and is not to be refilled. Alternatively or additionally, the hydrochromic layer 120 may be arranged in a predetermined form of an advertisement, for example, a logo or design. It should also be appreciated that the first appearance and/or the second appearance of the hydrochromic layer 120 may be multi-colored.

[0027] In one embodiment, the container 310 (FIG. 3.) includes a layer of hydrochromic material 320 arranged in a machine-readable form or pattern 326, for example, a barcode. A machine reader such as barcode scanner (not shown) may be configured to sense the pattern 326 with the layer 320 in first and second appearances. Upon sensing the presence of the layer 320 in the first appearance, the scanner may send a signal to a processor (not shown) such that the processor may determine that an unused container is present and that a beverage may be dispensed. Upon sensing the presence of the layer 320 in the second appearance, the scanner may send a signal to the processor such that the processor may determine that a previously used container is

present and that a beverage should not be dispensed. A scanner of the type suitable for this purpose is disclosed in U.S. Pat. No. 5,820,951.

[0028] It should be noted that other machine-readable configurations might be implemented with the hydrochromic ink without departing from the spirit of the invention. For example, the exposed surface of the container **310** may include a light reflective material or barcode printed using a non-hydrochromic ink. The hydrochromic ink may be of a form that varies in opaqueness. That is it transitions from or into an opaque form to or from non-opaque image or pattern thereby blocking the reflective material or barcode image when the hydrochromic ink is in an opaque form. In the case of using reflective material, a standard electric eye configuration adapted to sense the presence or absence of the reflective material maybe used to sense whether the container may be refilled.

[0029] In an alternative form of this embodiment, the hydrochromic layer may be printed with a machine-readable unique identifier for each cup or a series of cups so that a machine reader can track the number of refills used for this cup. Such a configuration is particularly desirable where the uses of novelty cups are used. Often the novelty cups are sold at a much higher price than the cost of a normal beverage; however, consumers are often offered refills in the novelty cups at a discounted price. By employing a machine-readable unique identifier, concession stand operators can track or even limit the number of refills available per cup. Alternatively where each unique identifier refers to a series of cups, different series can be released on different days, at different events or for different beverages, such as domestic or imported beer. Thus, a concession operator may be able to limit the refills only to cups in series that is purchased that day, for that event or for that beverage type. It will be appreciated by those skilled in the art that the number of possible uses for a unique identifier on a cup may be used for a number of different configurations. Thus the examples provided above are intended to be exemplary and not limiting to such uses of a unique identifier.

[0030] With such arrangements, unauthorized refilling of the containers **310** can be prohibited. At the same time, attempted refilling of containers can be made known to the establishment by identifying and/or recording the same through the processor.

[0031] Referring now to **FIGS. 4 and 5**, a layer of hydrochromic material **420** may be applied to a first surface **432** of a substrate **430**. The substrate **430** may be, for example, a plastic, a paper, or a wax-coated material. The substrate **430** may be shapeable into, for example, a container, such as a container configured to contain a beverage. The layer of hydrochromic material **420** may include one or more coloring compositions **422**, for example, pigments and/or masking agents and a bonding resin, printing ink, and/or fixation agent **424**.

[0032] The bonding resin, printing ink, or fixation agent **424** is selected such that the resin, ink, or agent **424** may bond the one or more coloring compositions **422** to the substrate **430** via a standard flexographic or screen printing process known to persons of ordinary skill in the art. The bonding resin, printing ink, and fixation agent **424** is also selected such that the resin, ink, or agent **424** can absorb moisture to hydrate the one or more coloring compositions

422, for example, caused by condensation on the substrate **430**, but can also retain the hydrated coloring compositions with minimal bleeding. The one or more coloring compositions **422** may include two or more coloring compositions such that an initial, non-hydrated appearance of the coloring compositions masks a final, hydrated appearance of the one or more coloring compositions. The initial and final appearances may be colors, and the initial and/or final appearance may include one or more colors. The one or more coloring compositions **422** may be applied in a dry form, for example, powder or crystal.

[0033] As shown in **FIG. 5**, when a liquid **440**, for example, a chilled beverage, comes into contact with a region **436** of a second surface **434** of the substrate **430**, condensation developing on the first surface **432** may be absorbed by the bonding resin, fixation agent, and/or printing ink **424** and the one or more coloring compositions **422** in a corresponding region **438** of the first surface **432**. The second surface **434** is on the opposite side of the substrate **430** from the first surface **432**. As a result, the one or more coloring compositions **422** may change from the initial appearance to a final appearance. For example, the initial appearance of the hydrochromic material **420** may be a yellow color. Upon hydration, a red coloring may mix with the yellow, thus changing the appearance of the hydrochromic layer **420** to an orange color.

[0034] With this arrangement, the hydrochromic layer may change from the first appearance, shown in **FIG. 4**, to the second appearance, shown in **FIG. 5**, to give a concession worker a visual indication that the container formed of the substrate **430** was previously filled with a beverage, thus helping to prevent unauthorized refills.

[0035] In the presently preferred embodiment of this invention, the transition of the hydrochromic ink when it is hydrated is intended to be permanent, thus drying of the container surface will not cause the hydrochromic material to transition back into its dry state.

[0036] Furthermore, it will be appreciated that the cups utilizing a hydrochromic material are not subject to temperature fluctuations during transport and storage. While exposure to humidity may affect the hydrochromic material, exposure to humidity during transport and storage of the containers may be controlled by simply packaging the container in plastic bags which is generally already done today for sanitary considerations. Furthermore for novelty cups or other odd shaped containers, a removable layer (not shown) may be included to overlie to the hydrochromic material to protect it from humidity during transport and storage. This layer would then be removed at the time of purchase to expose the hydrochromic material to condensation.

[0037] In another preferred embodiment, the hydrochromic material is used as a visual indicator to communicate that the sanitary condition of the container has been maintained during transport and storage prior to use by the consumer. Often QSR's (Quick Service Restaurants) and convenience stores put containers out or provide self serve dispensers for their customers. The container area can get messy and either store employees or customers may unknowingly return containers that have already received a beverage to the stack of clean containers. In this instance the hydrochromic layer is used to indicate that the container has

not been stored or transported under sanitary conditions or has already received a beverage. In this way customers and employees may then dispose of the container without using it.

[0038] It will be apparent to those skilled in the art that various modifications and variations can be made to the container and method of the present disclosure without departing from the scope of the invention. Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only.

What is claimed is:

1. A container, comprising:
 - walls arranged to define a receptacle; and
 - a hydrochromic material associated with at least a portion of the walls and visible from an exterior of the container, the hydrochromic material having a first appearance when in a generally dry state and a second appearance, different from the first appearance, when the hydrochromic material becomes hydrated.
2. The container of claim 1, wherein the first appearance and the second appearance are selected from the group consisting of colors, patterns and opaqueness.
3. The container of claim 1, wherein at least a portion of the hydrochromic material permanently changes from the first appearance to the second appearance when the hydrochromic material becomes hydrated.
4. The container of claim 3, wherein the first appearance and the second appearance are selected from the group consisting of colors, patterns and opaqueness.
5. The container of claim 1, wherein the hydrochromic material being in the dry form when the receptacle is empty and becoming hydrated when the receptacle is filled with a liquid that causes condensation to come into contact with the hydrochromic material.
6. The container of claim 5, wherein the liquid is a chilled liquid.
7. The container of claim 5, wherein the first appearance and the second appearance are selected from the group consisting of colors, patterns and opaqueness.
8. The container of claim 1, wherein a portion of the walls have an appearance that substantially matches the first appearance of the hydrochromic material.
9. The container of claim 1, wherein the change of hydrochromic material from the first appearance to the second appearance is permanent.
10. The container of claim 1, wherein the walls are made of a material chosen from a plastic, a paper, and a wax-coated paper.
11. A method of changing an appearance of a hydrochromic material, comprising:
 - providing a dry hydrochromic material having a first appearance that substantially matches an appearance of a substrate;
 - applying the dry hydrochromic material to at least a portion of the substrate;

permitting the generation of condensation on the substrate; and

hydrating the hydrochromic material to cause the hydrochromic material to assume a second appearance different from the first appearance.

12. The method of claim 11, wherein the first appearance, the second appearance, and the appearance of the substrate are selected from the group consisting of colors, patterns and opaqueness.

13. The method of claim 12, wherein said hydrating causes the hydrochromic material to permanently assume the second appearance.

14. A method of making a container, comprising:

connecting a bottom wall with a peripheral side wall;

providing a dry hydrochromic material having a first appearance that substantially matches an appearance of the peripheral side wall; and

applying the dry hydrochromic material to at least a portion of the peripheral wall such that the hydrochromic material is visible from an exterior of the container, the hydrochromic material having a second appearance, different from the first appearance, when the hydrochromic material becomes hydrated.

15. The method of claim 14, wherein the first appearance, the second appearance, and the appearance of the peripheral side wall are selected from the group consisting of colors, patterns and opaqueness.

16. An inventory control method, comprising:

providing a container configured to contain a product;

introducing a product into the container; and

changing an appearance of indicia on at least a portion of the container when condensation forms on the container, the indicia being visible from an exterior of the container.

17. The method of claim 16, wherein said revealing indicia includes:

providing the indicia with an initial color that substantially matches a color of the container; and

changing the indicia to a second color, different from that of the container, when the indicia becomes hydrated.

18. The method of claim 17, wherein said changing the indicia includes introducing a liquid into the container.

19. The method of claim 18, wherein said liquid is a chilled liquid.

20. The method of claim 16, wherein said indicia is permanently revealed.

21. The method of claim 20, wherein the indicia indicates that the container has contained a product.

22. The method of claim 16, wherein said providing includes applying a dry hydrochromic material to at least a portion of the container.

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