MULTI-PLY FLEXIBLE CONTAINER FOR WINE AND THE LIKE

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ABSTRACT

A multi-ply flexible container comprising opposing first and second inner panels, opposing outer panels, a seal and an oxygen scavenger. The opposing outer panels extend over each of the first and second opposing inner panels respectively. The seal joins the first and second outer panels and the first and second inner panels to define an inner cavity and at least one outer cavity. The oxygen scavenger is associated with at least one of the opposing first and second outer panels.
### FIGURE 5

<table>
<thead>
<tr>
<th>Time</th>
<th>7 days</th>
<th>14 days</th>
<th>21 days</th>
<th>27 days</th>
<th>43 days</th>
<th>58 days</th>
<th>71 days</th>
<th>85 days</th>
<th>95 days</th>
<th>118 days</th>
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<tr>
<td>Oz Hybar</td>
<td>3.41</td>
<td>3.86</td>
<td>4.41</td>
<td>3.92</td>
<td>3.65</td>
<td>3.86</td>
<td>3.78</td>
<td>3.784</td>
<td>4.20</td>
<td>4.22</td>
</tr>
<tr>
<td>DS34 29mol</td>
<td>3.54</td>
<td>3.85</td>
<td>3.49</td>
<td>3.25</td>
<td>3.05</td>
<td>3.06</td>
<td>2.58</td>
<td>2.496</td>
<td>2.56</td>
<td>2.43</td>
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<tr>
<td>Scavenger</td>
<td>3.1</td>
<td>2.74</td>
<td>2.57</td>
<td>2.3</td>
<td>1.83</td>
<td>1.83</td>
<td>1.7</td>
<td>1.576</td>
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<tr>
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<td>3.59</td>
<td>3.33</td>
<td>2.91</td>
<td>2.76</td>
<td>2.47</td>
<td>2.088</td>
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### FIGURE 6

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<th>Time</th>
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<th>21 days</th>
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<tr>
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<td>22</td>
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<tr>
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<td>23</td>
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<td>16</td>
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<td>11</td>
<td></td>
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</tr>
</tbody>
</table>
MULTI-PLY FLEXIBLE CONTAINER FOR WINE AND THE LIKE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates in general to a multi-ply flexible container construction, and more particularly, to a multi-ply flexible container having an oxygen scavenger positioned between the plies. The flexible container is suitable for use as an inner container positioned within an outer container. For example, the flexible container can be suitably filled with wine. The invention is not limited to use in association with wine, and other flowable materials, both food product and non-food product are likewise contemplated for use therewith.

[0003] 2. Background Art

[0004] The use of an oxygen scavenger in a container to absorb oxygen is well known in the art. The oxygen scavenger generally absorbs oxygen which is present in the container and absorbs oxygen which is migrating through the container. While such products have been developed, certain drawbacks have been encountered.

[0005] Many of the container structures incorporating oxygen scavengers are limited to use as a part of a rigid container, or to seal an otherwise rigid container. The materials and structures are either not suitable for use in association with flexible packaging, or are not compatible with materials and durability requirements of flexible packaging. Moreover, certain of the products are not suitable for direct and continuous contact with food grade materials.

[0006] Other container structures utilizing oxygen scavengers have been contemplated for use in association with flexible packaging. While such containers have had limited success, drawbacks persist. First, some of the structures having oxygen scavenging properties are not suitable for prolonged contact with food grade products. Other products have a negative effect on the taste of the product contained within the container. Indeed, certain food products are not materially affected by the changes in taste due to the oxygen scavenger. Other products, such as wine and other taste sensitive products are destroyed by the contact with such materials. Even short exposure to the oxygen scavenging structures can destroy the taste properties of such products.

[0007] Accordingly, it is an object of the invention to provide a flexible container having oxygen scavenging properties.

[0008] It is another object of the invention to provide a flexible container having oxygen scavenging properties wherein the oxygen scavenging material does not detrimentally affect the taste of the product contained in the flexible container.

SUMMARY OF THE INVENTION

[0009] A multi-ply flexible container comprising an inner ply, an outer ply and a fitment. The inner ply comprises a first inner panel, a second inner panel and at least one seal. The first inner panel has an outer surface and an inner surface. The second inner panel has an outer surface and an inner surface. The inner surfaces of each of the first and second inner panels face each other. At least one seal joins the first and second outer panels to define an inner cavity. The outer ply includes a first outer panel, a second outer panel, an oxygen scavenger and at least one seal. The first outer panel has an outer surface and an inner surface. The first outer panel is positioned such that the inner surface of the first outer panel faces the outer surface of the first inner panel. The second outer panel has an outer surface and an inner surface. The second outer panel is positioned such that the inner surface of the second outer panel faces the outer surface of the second inner panel. The oxygen scavenger is associated with at least one of the first and second outer panels. The at least one seal joins the first and second outer panels to one of each other and the respective first and second inner panels to define an outer cavity. The fitment provides fluid communication with the inner cavity.

[0010] In a preferred embodiment, each of the first and second outer panels include an oxygen scavenger.

[0011] In another preferred embodiment, each of the seals joining the outer plies and the seals joining the inner plies are substantially coextensive.

[0012] In yet another embodiment, at least one of the first and second panels comprise a multi-layer construction having a seal layer, and a cap layer, the oxygen scavenger being positioned between the seal layer and the cap layer. In one such embodiment, the first and second panels further comprise a nylon layer positioned between the seal layer and the cap layer. In another such embodiment, the first and second panels include an identical multi-layer construction.

[0013] In a preferred embodiment, the oxygen scavenger comprises a ferrous oxide based material.

[0014] In another aspect of the invention, the invention comprises a multi-ply flexible container comprising opposing first and second inner panels, outer panels, a seal and an oxygen scavenger. The outer panels comprise opposing first and second outer panels extending over each of the first and second opposing inner panels respectively. The seal joins the first and second outer panels and the first and second inner panels to define an inner cavity and at least one outer cavity. The oxygen scavenger is associated with at least one of the opposing first and second outer panels.

[0015] In one embodiment, the seal joins the first and second outer panels and the first and second inner panels to define an inner cavity and two outer cavities. Each outer cavity opposes the inner cavity.

[0016] In another embodiment, at least one of the first and second outer panels comprises a multi-layer construction having a seal layer and a cap layer. The oxygen scavenger positioned between the seal layer and the cap layer thereof.

[0017] In one embodiment, each of the first and second panels comprises a multi-layer construction having a seal layer and a cap layer, the oxygen scavenger positioned between the seal layer and the cap layer thereof.

[0018] Preferably, the first and second inner layers comprise an oxygen permeable material.

[0019] In another preferred embodiment, the first and second inner layers and the first and second outer layers are dimensionally substantially identical. Preferably, at least one outer cavity comprises two outer cavities, each outer cavity
being substantially identical in configuration and each of the two outer cavities positioned on opposing sides of the inner cavity.

[0020] In another aspect of the invention, the invention comprises a wine container. The wine container comprises an outer container, a multi-ply flexible container and a wine product. The multi-ply flexible container is positioned within the outer container and includes opposing first and second inner panels, outer panels, a seal and an oxygen scavenger. The outer panels comprise opposing first and second outer panels extending over each of the first and second opposing inner panels respectively. The seal joins the first and second outer panels and the first and second inner panels to define an inner cavity and at least one outer cavity. The oxygen scavenger is associated with at least one of the opposing first and second outer panels. The fitment provides fluid communication with the inner cavity. The wine product is positioned within the inner cavity of the multi-ply flexible container.

[0021] In a preferred embodiment, the wine includes free SO₂. The oxygen scavenger is capable of maintaining free SO₂ in excess of 10 ppm for a period of time greater than a multi-ply flexible container either of EVOH or metalized polyester based material.

[0022] In another preferred embodiment, the wine includes dissolved oxygen. The oxygen scavenger is capable of reducing the dissolved oxygen within the wine over a predetermined period of time to a level lower than that achievable with a multi-ply flexible container either of an EVOH or metalized polyester based material.

[0023] In another preferred embodiment, the dissolved oxygen is at least 30% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 71 days.

[0024] In yet another preferred embodiment, the dissolved oxygen is at least 20% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 95 days.

[0025] In another preferred embodiment, the dissolved oxygen is at least 30% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 95 days.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0026] The invention will now be described with reference to the drawings wherein:

[0027] FIG. 1 of the drawings comprises a perspective view of a multi-ply flexible container of the present invention;

[0028] FIG. 2 of the drawings comprises a perspective view of an outer container having a multiple flexible container of the present invention positioned therein;

[0029] FIG. 3 of the drawings comprises a cross-sectional view of the multi-ply flexible container of the present invention taken generally along lines 3-3 of FIG. 1;

[0030] FIG. 4 of the drawings comprises a partial cross-sectional view of the multi-ply flexible container of the present invention, showing, in particular, the outer ply thereof taken generally along lines 4-4 of FIG. 1;

[0031] FIG. 5 of the drawings comprises a graph of the results of an experiment pertaining to four different containers, plotting dissolved oxygen versus time; and

[0032] FIG. 6 of the drawings comprises a graph of the results of an experiment pertaining to four different containers, plotting free SO₂ versus time.

**DETAILED DESCRIPTION OF THE INVENTION**

[0033] While this invention is susceptible of embodiment in many different forms, there is shown in the drawings several specific embodiments with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

[0034] It will be understood that like or analogous elements and/or components, referred to herein, are identified throughout the drawings by like reference characters. In addition, it will be understood that the drawings are merely representations of the present invention, and some of the components may have been distorted from actual scale for purposes of pictorial clarity.

[0035] Referring now to the Figures, and in particular to FIG. 1, multi-ply flexible container 10 is shown. As will be explained, the multi-ply flexible container of the present invention is particularly well suited for the transport and dispensing of wine and other oxygen sensitive materials. It will be understood that the container is not limited to use in association with wine or any particular flowable material. Generally, the container is filled with a wine product 110 and positioned within an outer container, such as outer container 100 of FIG. 2 (wherein the multi-ply flexible container is shown in dashed lines). The outer container generally comprises a cardboard container, although it is not limited thereto. In use, fitment 16 is extended through container 100 and generally attached thereto to facilitate dispensing.

[0036] With reference to FIG. 3, multi-ply flexible container 10 comprises inner ply 12, outer ply 14 and fitment 16 (FIG. 1). Inner layer 12 comprises first panel 20, second panel 22 and seals 24. First panel 20 comprises outer surface 30 and inner surface 32 opposing the outer surface. Second panel 22 comprises outer surface 34 and inner surface 36 opposing the outer surface. The two panels are positioned such that inner surface 32 and inner surface 36 of the first and second panels, respectively, face each other. Seals 24 are strategically positioned about the outer periphery of the panels to join same. The seals are substantially continuous so as to, with the first and second panels, define cavity 26.

[0037] The first and second inner panels may comprise a multi-layer construction comprising a variety of different layers. Furthermore, the first and second inner panels comprise a material which is preferably oxygen permeable within certain desired limits. Of course, it is contemplated that the first and second inner panels comprise a co-extrusion, a laminate or another multi-layer construction.

[0038] Outer ply 14 is shown in FIG. 3 as comprising first outer panel 40, second outer panel 42 and seals 44. First
outer panel 40 comprises outer surface 50 and inner surface 52. Second outer panel 42 comprises outer surface 54 and inner surface 56. The two panels are positioned about the respective outer panels in such a manner in which inner surfaces 52 of first outer panel 40 faces outer surface 30 of first panel 20, and inner surface 56 of second outer panel 42 faces outer surface 34 of second panel 22. In turn, the inner plies are sandwiched between the first and second panels of the outer ply.

[0039] The two outer ply panels are joined together by seals 44 so as to define cavity 46. In the embodiment shown, seals 24 and 44 are merged, such that a single set of seals joins each of the outer plies and inner plies together. In other embodiments, portions of seals 24 and 44, or the entirety of seals 24 and 44 may be distinct. In either structure, cavity 26 is at least partially surrounded by the outer ply. Preferably cavity 26 is fully contained within cavity 46, and cavity 46 is bisected into first cavity 60 and second cavity 62. First cavity 60 is defined by inner surface 52 of first outer panel 40 and outer surface 30 of first panel 20, bound by seals 44. Second cavity 62 is defined by inner surface 56 of second outer panel 42 and outer surface 34 of second panel 22, bound by seals 44.

[0040] The first and second outer panels, comprise a multi-layer construction having a high barrier to oxygen. For example, one or both of the outer panels may comprise a multi-layer construction as shown in FIG. 4 having cap layer 5l, nylon layer 55 and seal layer 57. A scavenger material 53 may be positioned between the various layers of the multi-layer laminate. Of course, other laminate constructions are contemplated for use, and the scavenger may be positioned in any number of locations therebetween. In other embodiments, the scavenger material may be in a separate matrix which is adhered or otherwise associated with one or more of the outer panels. With respect to the scavenger material in particular, one oxygen scavenging material that has exhibited suitable properties comprises a product sold by Ciba under the trade name SHELLFLEXUO. The particular product comprises an iron based scavenger having a sodium chloride activator. The invention is not limited to any particular type or class of oxygen scavengers. For example, other oxygen scavengers are contemplated for use as well, including, but not limited to oxidizable polymers, UV activatable polymers, among others.

[0041] Incorporating an oxygen scavenger material with the outer ply material maintains the oxygen scavenger physically away from inner cavity 26, while effectively scavenging the oxygen positioned within first cavity 60 and second cavity 62, either present due to the manufacturing process, or migrated from within cavity 26 or through the outer ply. Thus, the physical separation precludes the oxygen scavenger from affecting the taste of the product contained within the container. Even if a pin hole or other small breach occurs within the inner ply, and some product migrates between plies, the limited contact of such material with the outer ply minimizes the possibility that the oxygen scavenger can affect the taste of the product. For flowable materials that are less susceptible to taste degradation, an oxygen scavenger may be associated with the inner ply as well, such as, for example, on the outer surface of the inner ply.

[0042] Certain tests were performed to determine the effectiveness of the container of the present invention. In particular, four different containers were formed and filled with the same wine product. The first container comprised a metalized polyester type flexible bag produced by Scholle Corporation under the trade name Hybar. The second container comprised an EVOH type flexible bag produced by Scholle Corporation under the trade name DS34. The third container comprised another EVOH type flexible bag produced by Scholle Corporation under the trade name DS34ES. Finally, the fourth container comprised a flexible bag produced in accordance with the present invention.

[0043] Each container was filled with an oxygenated wine provided from the same batch. Wine is a particular fluid which is susceptible to oxidation (degradation) and which is susceptible to taste variation caused by packaging material. Once filled, the containers were sealed. The graph shown in FIG. 5 shows the dissolved oxygen present in the containers over a period of 118 days. Significantly, at the outset, a reading of 4 ppm (parts per million) of dissolved oxygen was measured in each container. After 118 days, 1.43 ppm of dissolved oxygen was measured in the container produced in accordance with the present invention. The lowest reading of the remaining containers was 2.18 ppm of dissolved oxygen which was measured in the EVOH based DS34ES product. A reading of 4.22 ppm was measured in the metalized polyester based Hybar container.

[0044] In addition to the foregoing measurements, measurements were taken of the free SO2 that was present in the containers. Typically, free SO2 is provided in wine to preclude oxidation of the wine, and, in turn, degradation. Once free SO2 measurements fall below about 10 ppm, oxidation of the wine accelerates. Thus, it is desirable to maintain a level of free SO2 in excess of 10 ppm as long as possible, to preclude oxidation and degradation. In the tested containers, the graph shown in FIG. 6 shows the quantity of free SO2 measured in the containers. Testing of free SO2 was terminated once the quantities present fall below 10 ppm. Significantly, between 43 and 58 days after being filled, the free SO2 levels fell below 10 ppm in each of the test containers (other than the container made in accordance with the present invention). The free SO2 levels remained above 10 ppm for at least 71 days, and fell below 10 ppm between 71 and 85 days after being filled. Accordingly, the shelf life of the wine within the container produced in accordance with the present invention was enhanced.

[0045] The foregoing description merely explains and illustrates the invention and the invention is not limited thereto except insofar as the appended claims are so limited, as those skilled in the art who have the disclosure before them will be able to make modifications without departing the scope of the invention.

What is claimed is:

1. A multi-ply flexible container comprising:
   a. an inner ply comprising:
      a first inner panel having an outer surface and an inner surface;
      a second inner panel having an outer surface and an inner surface, wherein the inner surfaces of each of the first and second inner panels face each other; and
   at least one seal joining the first and second outer panels to define an inner cavity;
an outer ply comprising:

a first outer panel having an outer surface and an inner surface, the first outer panel positioned such that the inner surface of the first outer panel faces the outer surface of the first inner panel;

a second outer panel having an outer surface and an inner surface, the second outer panel positioned such that the inner surface of the second outer panel faces the outer surface of the second inner panel;

an oxygen scavenger associated with at least one of the first and second outer panels; and

at least one seal joining the first and second outer panels to one of each other and the respective first and second inner panels to define an outer cavity; and

a fitment providing fluid communication with the inner cavity.

2. The multi-ply flexible container of claim 1 wherein each of the first and second outer panels includes an oxygen scavenger.

3. The multi-ply flexible container of claim 1 wherein each of the seals joining the outer plies and the seals joining the inner plies are substantially coextensive.

4. The multi-ply flexible container of claim 1 wherein at least one of the first and second panels comprise a multi-layer construction having a seal layer, and a cap layer, the oxygen scavenger being positioned between the seal layer and the cap layer.

5. The multi-ply flexible container of claim 4 wherein the first and second panels further comprise a nylon layer positioned between the seal layer and the cap layer.

6. The multi-ply flexible container of claim 4 wherein the first and second panels include an identical multi-layer construction.

7. The multi-ply flexible container of claim 1 wherein the oxygen scavenger comprises a ferrous oxide based material.

8. A multi-ply flexible container comprising:

opposing first and second inner panels;

opposing first and second outer panels extending over each of the first and second opposing inner panels respectively;

a seal joining the first and second outer panels and the first and second inner panels to define an inner cavity and at least one outer cavity; and

an oxygen scavenger associated with at least one of the opposing first and second outer panels.

9. The multi-ply flexible container of claim 8 wherein the seal joins the first and second outer panels and the first and second inner panels to define an inner cavity and two outer cavities, each outer cavity opposing the inner cavity.

10. The multi-ply flexible container of claim 8 wherein at least one of the first and second outer panels comprises a multi-layer construction having a seal layer and a cap layer, the oxygen scavenger positioned between the seal layer and the cap layer thereof.

11. The multi-ply flexible container of claim 10 wherein each of the first and second panels comprises a multi-layer construction having a seal layer and a cap layer, the oxygen scavenger positioned between the seal layer and the cap layer thereof.

12. The multi-ply flexible container of claim 8 wherein the first and second inner layers comprise an oxygen permeable material.

13. The multi-ply flexible container of claim 8 wherein the first and second inner layers and the first and second outer layers are dimensionally substantially identical.

14. The multi-ply flexible container of claim 13 wherein the at least one outer cavity comprises two outer cavities, each outer cavity being substantially identical in configuration and each of the two outer cavities positioned on opposing sides of the inner cavity.

15. A wine container comprising:

an outer container;

a multi-ply flexible container positioned within the outer container, comprising:

opposing first and second inner panels;

opposing first and second outer panels extending over each of the first and second opposing inner panels respectively;

a seal joining the first and second outer panels and the first and second inner panels to define an inner cavity and at least one outer cavity;

an oxygen scavenger associated with at least one of the opposing first and second outer panels; and

a fitment providing fluid communication with the inner cavity; and

a wine product positioned within the inner cavity of the multi-ply flexible container.

16. The wine container of claim 15 wherein the wine includes free SO₂, the oxygen scavenger is capable of maintaining free SO₂ in excess of 10 ppm for a period of time greater than a multi-ply flexible container either of EVOH or metalized polyester based material.

17. The wine container of claim 15 wherein the wine includes dissolved oxygen, the oxygen scavenger is capable of reducing the dissolved oxygen within the wine over a predetermined period of time to a level lower than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material.

18. The wine container of claim 15 wherein the dissolved oxygen is at least 30% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 71 days.

19. The wine container of claim 18 wherein the dissolved oxygen is at least 20% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 95 days.

20. The wine container of claim 18 wherein the dissolved oxygen is at least 30% lower within the wine than that achievable with a multi-ply flexible container of either an EVOH or metalized polyester based material over a predetermined period of time in excess of 95 days.