The present invention is directed to a tamper-resistant storage container. The storage container includes a container and lid portion having formed channels and surfaces along their perimeters configured to interlock securely to each other to attach the lid to the container. The lid includes at least one open area spanned by a breakaway stringer defining an area of weakness along a perimeter of the lid such that removing or attempting to remove the lid from the container breaks the stringer to provide a visible indication that the container has been opened or tampered with.
TAMPER-RESISTANT STORAGE CONTAINER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

BACKGROUND OF THE INVENTION

[0003] The present invention relates generally to storage containers, and more particularly to sealable storage containers having a tamper-resistant feature to indicate if the container has been opened since its original sealing.

DESCRIPTION OF RELATED ART

[0004] Storage containers are commonly used for the storage and distribution of numerous products, including food products. For example, storage containers are often wrapped with a cellophane band, ostensibly affixing the lid to the receptacle portion of the container such that the cellophane band must be broken or removed to open the container so that an un-banded container may indicate that the container has been opened since its original sealing. This type of indicator is deficient, however, in that the consumer must first be aware that a cellophane band should even be present. In addition, because food storage containers are typically made of a resilient, deflectable material, it is possible to remove and replace the cellophane bands onto the containers without breaking or tearing them. Thus, sealing methods such as a cellophane band do not provide a positive indicator of potential tampering with the container and/or food product as is desired by merchants and consumers.

[0005] Other types of tamper resistant features have also been developed, such as a security seal hindering access to the lid of a storage container. This type of security feature typically includes a break-away seal that must be removed in order to access and remove the lid from the container. While generally effective, this additional seal method of securing a container requires that one or more additional parts be manufactured and installed on the container, thus increasing the container cost and the labor cost to assemble the container with the seal.

SUMMARY OF THE INVENTION

[0007] The present invention is directed to a tamper-resistant storage container comprising a container having an open top for receiving and storing contents, with a lid configured to mate securely with the container to seal the contents therein. The lid includes formed channels extending around its outer perimeter, those channels and surfaces conform to and mate with similarly shaped channels and surfaces formed on the upper perimeter of the container. The engagement between the channels and surfaces on the lid and container provide a seal between the two. In addition, a protruding lip on the upper perimeter of the container overlaps a setback portion of the lid to provide an interference fit so that removal of the lid is very difficult without severely deforming the container and/or lid.

[0008] The lid includes one or more tamper-resistant features, including open areas positioned along the perimeter, the open areas spanned by a relatively narrow stringer to provide one or more areas of weakness around the lid's perimeter. The stringers allow a portion of the lid to be broken away to relieve the interference fit between the lid and container at that area, thus allowing easy removal of the lid, with the broken stringers providing a visual indication that the lid has been removed since the original sealing of the container. Because the lid fits so tightly to the container the force of removing or attempting to remove the lid from the container breaks the stringer to provide a visual indication that the container has been opened or potentially tampered with since its original sealing.

[0009] Other variations and exemplary embodiments are also presented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a perspective view of a tamper-resistant container with a tamper-resistant feature intact in accordance with an exemplary embodiment of the present invention.

[0011] FIG. 2 is a perspective view of the tamper-resistant container of FIG. 1 with a tamper-resistant feature broken, indicating that the container has been opened.

[0012] FIG. 3 is an enlarged top view of a portion of the container of FIG. 1.

[0013] FIG. 4 is an enlarged top view of a portion of the lid of the container of FIG. 1.

[0014] FIG. 5 is an enlarged top view of a portion of the tamper-resistant container of FIG. 1.

[0015] FIG. 6 is a cross-sectional view of a corner of the container of FIG. 3.

[0016] FIG. 7 is a cross-sectional view of a side of the container of FIG. 3

[0017] FIG. 8 is a cross-sectional view of a corner of the container of FIG. 1 showing a tamper-resistant feature intact.

[0018] FIG. 9 is a cross-sectional view of a corner of the container of FIG. 1 showing a tamper-resistant feature broken with a tubed portion of the lid pulled away from the container.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE INVENTION

[0019] The present invention is directed to a tamper-resistant container that provides a visible physical indication if the
container has been opened after its initial, original sealing. While the invention will be described in detail below with reference to several exemplary embodiments, it should be understood that the invention is not limited to the specific configurations of these embodiments. For example, although the tamper-resistant container is described primarily in the context of consumer-sized food containers, the invention could equally be used in connection with various other types of containers, such as containers for liquids or solids, or containers of other sizes. And, while the container in the figures is generally square in shape, the invention may equally be implemented in containers of other shapes, such as rectangular or round containers. In addition, although the exemplary embodiments are described as embodying numerous features, one skilled in the art will appreciate that the various features may be present in various combinations in various embodiments of the invention.

[0020] Referring first to FIG. 1, an exemplary tamper-resistant storage container is depicted generally by reference numeral 10. Tamper-resistant container 10 includes a container 12 configured to receive and hold a desired contents, such as a food product, with a lid 14 configured to attach securely to the container 12 to seal the contents therein. Container 12 includes a bottom 16 with walls 18 extending upwardly from the bottom to define a cavity 20 for receiving and storing any desired contents, such as solid or liquid food products. Corners 22 join walls 18 to form a smooth, integral transition between the sides of the container, the corners 22 and walls similarly smoothly transition to bottom 16. Walls 18 and corners 22 extend to an upper edge 24, forming a perimeter around the top of container 12 for receiving a lid.

[0021] Lid 14 is sized and shaped to cover the open top of container 12, with a generally flat upper surface 26 extending to a perimeter 28 that is configured generally to the shape of the upper perimeter 24 of the container. As will be described in more detail herein below, lid 14 and container 12 each include similar interlocking channels and surfaces around their perimeters such that the outer perimeter of the lid is tightly engaged to the upper perimeter of the container so that the lid cannot be removed from the container without deforming the lid or container material (providing evidence of tampering), or without breaking a tamper-resistant security feature on the lid as will be described in more detail herein below.

[0022] Looking still to FIG. 1, the outer perimeter of lid 14 is generally contiguous, having at least one generally rectangular open area 30 formed adjacent the outer edge of the lid. Open area 30 is spanned by a relatively narrow stringer 32 extending across the outermost side of the open area. Open area 30 and stringer 32 in combination define an area of weakness along the perimeter of the lid. Preferably, the area of weakness is formed near a corner of lid 14, where a tab 34 protrudes from the lid to provide a convenient handhold grip for removing the lid 14 from the container 12. Preferably, tab 34 extends approximately 1/4 inch from the perimeter of the lid to provide an easy grasp to a user. It should be understood that while open area 30 and stringer 32 are depicted and described, variations on this configuration are anticipated by the present invention. For example, open area 30 could in fact be an area defined by perforations in the perimeter of the lid such that the perforated area breaks away upon application of a removal force (i.e., a force capable of removing the lid from the container) to the lid. The area of weakness thus comprises an area having a shear strength less than that of the remainder of the lid so that the area of weakness is the first area to break when the lid is presented with a removal force.

[0023] FIG. 3 depicts a top view of lid 14 having a substantially flat upper surface 26 with a stepped portion 27 extending adjacent the outer perimeter, providing a large stepped area near the corner of the lid. Open spaces 30 are positioned on opposite sides of the corner of the container such that an area of weakness exists on each side of tab 34 on the lid. FIG. 4 depicts lid 14 in place on a container such that the upper edge 24 of the walls 18 of the container are visible through the open spaces 30.

[0024] Container 12 and lid 14 are preferably formed of plastic, using a thermoform process wherein the raw plastic material is heated to approximately 250 to 300 degrees Fahrenheit and formed onto a mold using vacuum and air pressure. Most preferably, container 12 and lid 14 are formed of a transparent plastic having properties such that deformation or stress of the formed container or lid results in hazing, crazing, fogging, whitening, or other discoloration of the plastic material. Of course, other materials known in the art may be used for the lid and container, or the lid and container may be manufactured from dissimilar materials. These and other variations are within the scope of the present invention.

[0025] Looking now to FIG. 5, a top view of the tamper-resistant container of FIG. 1 depicts the curved walls 22 of the container providing a smooth integral transition between side walls 18. As also indicated in FIG. 5, a cross-sectional view of the curved corner portion of the container taken along line 6-6 is depicted in FIG. 6, with a cross-sectional view of the straight side of the container taken along line 7-7 depicted in FIG. 7.

[0026] Turning to FIG. 6, a cross-sectional view of the corner of the container of FIG. 1 shows lid 14 having a substantially flat upper surface 26 with a stepped portion 27 positioned atop the container 12, with the upper perimeter of the container and outer perimeter of the lid interlocked to form a tight seal between the two. Looking first to the upper perimeter of the container 12, corner wall 22 of the container extends upwardly to an outwardly projecting shelf 36 that quickly transitions to an upwardly extending stub 38, with a recessed area in the upwardly extending stub 38 forming an inwardly protruding tongue 40 in a portion of the stub. Upwardly extending stub 38 transitions to a substantially horizontal, outwardly extending upper wall 42, which quickly transitions to downwardly extending wall 44 and to outwardly protruding lip 46. The configuration of the upper perimeter of container 12 thus provides a tongue and groove arrangement to engage with similarly configured areas on lid 14.

[0027] Looking still to FIG. 6, in a manner similar to that just described for container 12, the substantially flat upper surface 26 of lid 14 steps upwardly to stepped surface 27. Stepped surface 27 extends to upwardly extending wall 48, which includes an inwardly extending channel 50 approximately midway up wall 48. Wall 48 extends upwardly to upward wall 52 which extends outwardly to the outer edge 54 of the lid, the edge extending downwardly along wall 56 with a sharp step 58 extending substantially horizontally and inwardly from wall 56, forming a channel 60 in wall 56. A lower wall 62 extends generally downwardly from channel 60 to tab 34 which provides an area for a user to grip and remove the lid.

[0028] As can be seen in FIG. 6, the upper perimeter of container 12 is shaped to conform closely to the outer perim-
eter of lid 14 such that the two interlock to form a tight seal. More specifically, upwardly extending stub 36 with inwardly protruding tongue 40 of the container conform and interlock with upwardly extending wall 48 with inwardly extending channel 50 of lid 14. In addition, outwardly projecting shelf 36 transitioning to upwardly extending stub 38 of the container conforms to the stepped surface 27 transitioning to upwardly extending wall 48 of the lid, as does the upwardly extending stub 38 and transition to outwardly extending upper wall 42 of the container conform to the upwardly extending wall 48 and transition to upper wall 52 of the lid. Also, looking closely to FIG. 6, sharp step 58 of the lid extends substantially horizontally and inwardly, undercutting the protruding lip 46 of the container.

The interlocking channels and surfaces of the outer perimeter of the lid 14 and upper perimeter of the container 12 as just described provide a tight seal between the lid and container to securely engage the lid to the container. In addition, as just described with respect to the corner portion of the container, sharp step 58 of the lid undercuts the protruding lip 46 of the container to provide an interference between the two such that lid 14 may not be removed from the container 12 without deforming the container or without breaking the tamper-resistant stringer as previously described.

Looking now to FIG. 7, a cross-sectional view of the side portion of the container of FIG. 1 depicts interlocking channels and surfaces of the outer perimeter of lid 14 and upper perimeter of lid 20 in a manner similar to that as just described with respect to the cross-sectional corner view of FIG. 6. FIG. 7 shows lid 14 having a substantially flat upper surface 26 with a stepped surface 27 portion positioned atop the container 12, with the upper perimeter of the container and outer perimeter of the lid interlocked to form a tight seal between the two. Wall 18 of the container extends upwardly to a slightly outwardly projecting shelf 37 that quickly transitions to an upwardly extending stub 38, with a recessed area in the upwardly extending stub 38 forming an inwardly protruding tongue 40 in a portion of the stub. Upwardly extending stub 38 transitions to a substantially horizontal, outwardly extending upper wall 42, which quickly transitions to downwardly extending wall 44 and to outwardly protruding lip 46. The substantially flat upper surface 26 of lid 14 steps to stepped surface 27 along the outer edge of lid 14. The stepped surface 27 extends to upwardly extending wall 48, which includes an inwardly extending channel 50 approximately midway up wall 48. Wall 48 extends upwardly to upper wall 52 which extends outwardly to the outer edge 54 of the lid, the edge extending downwardly along wall 56 with a gradual step 59 extending downwardly and inwardly to lower wall 62 which extends to an outer rim 65.

As just described, the configuration of the side wall portions of container 12 and lid 14 are substantially similar to the corresponding container wall portions as described previously, with the exception of the steepness of the step 58, 59 in the downwardly extending wall 56 of the outer portion of the lid defining the severity of the overlap with the protruding lip of the container. In the corner wall portion as depicted in FIG. 6, the step 58 in the downwardly extending wall 56 of lid 14 is a sharp, substantially 90 degree horizontal step undercutting the protruding lip 46 of the container. In the side wall portion as depicted in FIG. 7, the step 59 in the downwardly extending wall 56 of lid 14 gradually eases into the area under the protruding lip.

As will be apparent to those skilled in the art, the sharp step 58 of the corner wall portion of the lid extending under the protruding lip 46 of the container as depicted in FIG. 6 provides a positive engagement between the sharp step and lip such that the engagement makes it virtually impossible to remove or disengage the lid from the container without deforming or breaking either the lid or the container. By contrast, the gradually easing step 59 of the side wall portion as depicted in FIG. 7 provides some interference to removal of the lid, but allows the lid to be disengaged without necessity deforming or breaking the lid or container. Thus, the combination of the sharp step 58 on the corner wall portion of the container and the gradual step 59 on the side wall portion of the container provides a secure seal between the lid and the container that cannot be removed without breaking the tamper-resistant stringer portion of the lid, but, once broken, allows the lid to be removed without requiring unreasonable force.

As will be further apparent, the relative ease or difficulty in removing the lid 14 from the container 12 may be adjusted by varying the amount of lid perimeter having a sharp step versus the amount of lid perimeter having a gradual step. For example, the exemplary embodiment as just described includes sharp steps (as depicted in FIG. 6) positioned along the corner perimeter of the lid and at approximately the tangential points at the intersection with the side walls 18 to the corners 22, with a gradual step (as depicted in FIG. 7) extending along the side portion of the lid as seen in the cross-sectional views of FIGS. 4 and 7 and as described above. By varying the length of lid perimeter having a sharp step overlap, e.g., by extending the sharp step into the straight sidewall area, the engagement between the lid and the container is correspondingly increased such that the effort required to remove the lid is increased. Similarly, decreasing the length of lid perimeter having a sharp step overlap decreases the overall engagement between the lid and the container such that the lid is easier to remove from the container. Of course, various combinations of sharp step overlap, gradual overlap, and no overlap may be combined to provide a desired engagement between the lid and container and a corresponding required force to remove the lid.

Additionally, the specific placement of a sharp step overlap region and a gradual overlap region along the perimeter likewise affects the force necessary to remove the lid. For example, a sharp step overlap along the straight side of the container would result in a much more difficult removal than that same overlap located at a rounded corner of the container. Finally, the amount of the overlap between the sharp step 58 and the lip 46 may be varied to increase or decrease the engagement force—by varying the length of the sharp step 58 portion of lid 14, the length of the protruding lip 46 portion of the container, or combinations thereof. Preferably, the overlap between sharp step 58 and protruding lip 46 is approximately 1/16 inch to approximately 1/2 inch.

Looking now to FIGS. 1-2 and 8-9 in conjunction, the operation of the tamper-resistant container will be described with reference to the two perspective views of the tamper-resistant container 10 and two corresponding cross-sectional views of the corner portion of the tamper-resistant container.

Looking first to FIGS. 1 and 8, with a new, unbroken lid 14 securely engaged onto the container 12, the outer perimeter of the lid engages with the upper perimeter of the container, with the channels and surfaces formed in the outer
perimeter of the lid engaging with the channels and surfaces formed in the upper perimeter of the container, with the sharp step 58 of the lid under lapping protruding lip 46. As described in more detail previously, the engagement between the channels and surfaces of the lid with the channels and surfaces of the container, in combination with the overlap between sharp step 58 of the lid and protruding lip 46 of the container, provides a tight seal between the lid 14 and the container 12 such that the lid cannot be removed without deforming or breaking the lid and/or container. As depicted in FIG. 1, the new, unbroken lid is secured on the container with stringers 32 intact and tab 34 in place at the corner of the tamper-resistant container. The state of the lid and container as depicted in FIGS. 1 and 8 corresponds to the condition of an originally sealed container—such as a food container into which food has been placed and the lid affixed and engaged. As is apparent in FIG. 1, the stringer 32 is unbroken and tab 34 is positioned in its original, attached orientation.

[0037] Looking now to FIGS. 2 and 8, lid 14 has been disengaged from the container by pulling tab 34 upwardly to:

(1) break stringer 32 to allow the tab to move, and
(2) disengage the surfaces and channels of lid 14 from the surfaces and channels of container 12. With tab 34 thus lifted and the corner portion of lid 14 disengaged from the corner portion of container 12, the force required to remove the lid has been decreased such that the lid may be removed from the container by continuing to pull upon tab 34 to pull the lid away from the container. Broken stringers 32 and raised tab 34 provide a visual indication that the lid has been removed since its original sealing, thus a consumer selecting a container in such a condition has an immediate visual indication that the container is no longer originally sealed and may have been tampered with.

[0038] As described previously, container 12 and lid 14 are preferably formed from a plastic material that hases, crazes, or otherwise deforms or discolors upon being stressed. Thus, any attempt to open the container by circumventing the tamper-resistant stringer and tab would result in yet another visual indication in the form of crazing to indicate that the container may have been opened or tampered with since its original sealing.

[0039] Variations on the embodiments described herein are anticipated by, and within the scope of, the present invention. For example, while the tamper-resistant container in the exemplary embodiment depicted is generally square in shape, the invention described herein may be embodied in a tamper-resistant container of any shape, such as a rectangular, circular, or oval container. Similarly, while the tamper-resistant container depicted herein includes a pair of open areas 30 and stringers 32 defining areas of weakness adjacent a single corner of the container, other numbers and configurations of that arrangement are contemplated by the present invention. For example, a tamper-resistant container may include open areas and stringers adjacent every corner of the container, adjacent only opposite corners of the container, or positioned along a side of the container. Or in the case of circular or oval containers, open spaces and stringers may be positioned symmetrically or asymmetrically around the perimeter of the container. These and other arrangements fall within the scope of the present invention.

[0040] The term “substantially”, “approximately” or other modifying term as used herein may be applied to modify any quantitative representation which could permissibly vary without resulting in a change in the basic function to which it is related. For example, lid 14 is described as being substantially flat, but may permissibly vary from that qualification if the variance does not materially alter the capability of the invention.

[0041] While the present invention has been described and illustrated hereinabove with reference to an exemplary embodiment, it should be understood that various modifications could be made to this embodiment without departing from the scope of the invention. Therefore, the invention is not to be limited to the specific embodiment described and illustrated hereinabove, except insofar as such limitations are included in the following claims.

What is claimed and desired to be secured by Letters Patent is as follows:

1. A tamper-resistant storage container, comprising: a receptacle comprising a bottom with sidewalls extending upwardly to an upper perimeter, said bottom and sidewalls forming an inner cavity for receiving and storing a contents; and a lid configured to mate with said receptacle to seal said contents therein, said lid comprising at least one area of weakness positioned along a perimeter of said lid such that said area of weakness will break prior to other portions of said lid when presented with a removal force to said lid.

2. The tamper-resistant storage container of claim 1, wherein said area of weakness comprises at least one open area spanned by a stringer such that said stringer will break when presented with a removal force to said lid.

3. The tamper-resistant storage container of claim 1, comprising two areas of weakness on said lid positioned along corresponding adjacent sidewalls of said receptacle.

4. The tamper-resistant storage container of claim 1, wherein said receptacle is substantially rectangular in shape and wherein said lid comprises at least two areas of weakness positioned on adjacent sidewalks on opposite sides of a corner of said receptacle.

5. The tamper-resistant container of claim 4, wherein said receptacle is substantially square in shape.

6. A tamper-resistant storage container, comprising: a receptacle comprising a bottom portion with at least one wall extending upwardly to an upper perimeter, said upper perimeter comprising at least one channel configured to mate with a like-shaped on a lid; and a lid comprising an outer perimeter, said outer perimeter comprising at least one channel configured to mate with said channel of said receptacle such that said lid is securely held to said receptacle, wherein said lid comprises at least one area of weakness having a shear strength less than a shear strength of a remainder of said lid.

7. The tamper-resistant storage container of claim 6, wherein said receptacle comprises a protruding lip and wherein said lid comprises a stepped portion extending inwardly under said protruding lip such that said stepped portion engages said protruding lip upon a removal force applied to said lid.

8. The tamper-resistant storage container of claim 7, wherein said stepped portion extends under said protruding lip approximately at least ¾ inch.

9. The tamper-resistant storage container of claim 6, wherein said area of weakness comprises an open area spanned by a stringer.
10. The tamper-resistant storage container of claim 6, wherein said lid comprises a plurality of areas of weakness positioned around a perimeter of said lid.

11. The tamper-resistant storage container of claim 10, wherein at least two of said areas of weakness are positioned on opposite sides of a corner of said receptacle.

12. The tamper-resistant storage container of claim 6, wherein said receptacle is substantially circular in shape and wherein said at least one wall extends around a perimeter of said bottom.

13. A tamper-resistant storage container, comprising:
   a receptacle comprising a bottom with at least one sidewall extending upwardly to an upper perimeter, said bottom and sidewall defining an inner cavity for receiving and storing a contents, wherein said upper perimeter comprises at least one channel configured to receive a corresponding protrusion in a lid; and
   a lid configured to mate with said receptacle, said lid comprising an outer perimeter having a protrusion configured to mate with said channel in said receptacle, wherein said lid comprises at least one area of weakness positioned along a perimeter of said lid such that said area of weakness will break prior to other portions of said lid when presented with a removal force to said lid.

14. The tamper-resistant storage container of claim 13, wherein said receptacle comprises a protruding lip and wherein said lid comprises a step extending inwardly under said protruding lip.

15. The tamper-resistant storage container of claim 14, wherein said step extends under said protruding lip approximately at least 3/16 inch.

16. The tamper-resistant storage container of claim 13, wherein said area of weakness comprises an open area spanned by a stringer.

17. The tamper-resistant storage container of claim 13, wherein said lid comprises a plurality of areas of weakness positioned around a perimeter of said lid.

18. The tamper-resistant storage container of claim 17, wherein at least two of said areas of weakness are positioned on opposite sides of a corner of said receptacle.

19. The tamper-resistant storage container of claim 13, comprising a plurality of areas of weakness positioned around said perimeter of said lid.

20. The tamper-resistant storage container of claim 19, wherein said areas of weakness have a shear strength less than a shear strength of areas of said lid not comprising said areas of weakness.

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