

TAMPER-EVIDENT CONTAINER

TECHNICAL FIELD

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This disclosure concerns a tamper-evident container such as that used as a portable security box in transporting cash, valuables, securities documents, playing cards, etc. whereby any tampering or pilferage of the contents would be easily noticed or is self-evident from the container. More specifically, our container is of the type having a base body and a cover
10 slidable over the body opening.

BACKGROUND ART

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Many prior art exists in the field of security boxes as represented by the following patents on various types of box configurations. U.S. Patent No. 7,305,858 (Wu) discloses a portable security box comprising an outer box into which an inner box may be inserted and locked by way of mortise locks through both boxes' walls and secured via a lock cable to a vehicle part. U.S.
20 Patent No. 4,573,332 (Ma) discloses a container having a clamp-like configuration wherein a top and bottom parts of the container are hinged at one end and provided at the other end with lock means. U.S. Patent No. 6,581,424 discloses a floatable modular configuration of a security box for private use in a public place such as a swimming pool. Buoyancy is provided
25 by each of assembly member's ballast walls.

Closer to our type of security box is shown in U.S. Patent no. 6,364,096 (De Baets) which discloses a tray configuration in which a lid is used to securely close the open top tray which may be partitioned into
30 multiple compartments for storage of banknotes or coins of different

denominations, cheques, papers, etc. A peripheral flange is provided around the tray's open top to be integrally connected to a security flange and overlay by a cover flange. More relevant to our invention is U.S. Patent No. 4,470,518 (Stein) concerning a security box having a sliding lid wherein
5 interfitting structures, such as flanges and flange-engaging hooks are provided between the lid and the container.

SUMMARY OF DISCLOSURE

10 Most of the aforementioned prior art does not take into account the tolerances between movable parts of the security box and the pliability of material of the box and parts which may be exploited by careful stress or bending to cause a temporary breach or opening in which tampering or pilferage may occur without leaving any signs behind. It is known that
15 polymeric materials, in particular thermoplastics, have tensile strength that has varying capacity to be bent without breaking or cracking when cool. When heated, they become soft and mouldable.

As a result, there are two major concerns of security box design in
20 the use of thermoplastics for making the containers. Firstly, in the completed box, given a sufficient length of a part of the box, that part may be bent slightly without breaking or cracking. The bending might be enough to open a gap in the container for tampering or pilfering to occur without trace. Secondly, with the use of heat (e.g. hot air blower or focused microwave
25 beam), a particular part of the thermoplastic box may be rendered soft enough or malleable and a gap opened before returning it to its original shape and allowed to cool down without leaving a trace. Our invention endeavours to provide features to guard against these two problems.

30 According to a broad, general embodiment of our invention, a tamper-evident container is provided as comprising a body and a slidable lid

complementary to cover body opening. The body opening comprises a peripheral flange extending from at least substantially along opposing longitudinal walls of the body. The slidable lid comprises a plurality of U-shape flanges slidably fitting over the peripheral flange. A locking chamber is complementarily formed by and mutually provided on each of the body and
5 slidable lid upon complete closure of said body opening by the slidable lid, whereupon a slot is formed by the complementary matching parts of the container body and lid for insertion of a tamper-evident seal, such as one with a frangible portion which may be irreversibly inserted through the slot
10 to lock the slidable lid onto said body. A plurality of ribs protrudes from the underside of the slidable lid such that upon closure of the opening, the ribs are adjacent inside of body wall.

In one aspect of the invention, the slidable lid's U-shape flanges is
15 provided to slide over the body opening's peripheral flange in a snug fit upon complete closure of said body opening by said slidable lid. Preferably, the slidable lid's U-shape flanges slide over snugly all along the body opening's peripheral flange. Corresponding grooves are preferably provided at the insertion end of the body opening wall for the ribs to slide therethrough upon
20 the slidable lid's insertion over the body opening.

In another aspect of the invention, the ribs are provided parallel to and adjacent a substantial length of each side of the opposing walls of the body. Preferably, the ribs are provided abutting inside surface of body wall.

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Yet another aspect of the invention provides the peripheral flange to be all round the body opening save for a portion of insertion end where the locking chamber is formed. Preferably, the peripheral flange is provided all around the body opening save for a portion of insertion end where access to
30 slot is required for insertion of tamper-evident seal.

One other aspect concerns the protuberance which may be provided with sufficient height at the terminal end of the body to stop the slidable lid upon reaching complete closure. The protuberance may be provided at a height sufficient to prevent the slidable lid from being inserted to cover the body from the terminal end. Alternatively, the peripheral flange may be provided to extend over the terminal end and the protuberance is provided thereon to stop the sliding.

Alternatively, a protrusion is provided on the underside of the slidable lid's leading edge and a groove is provided at the corresponding position of the body wall's terminal end. The protrusion may preferably be provided on the underside of the slidable lid's leading edge and a close-ended groove is provided at the corresponding position of the peripheral flange. Preferably, a pair of protrusions and a corresponding pair of grooves are provided.

The container may preferably be made of transparent material in form of a rectangular box and wherein the peripheral flange is provided along the opposing elongate sides. Preferably, the slidable lid is provided with 3 U-shape flanges on each side positioned respectively at the leading end, middle portion and locking chamber end.

Alternatively, the peripheral flange is provided to extend around the box opening save for a portion of insertion end where access to slot is required for insertion of tamper-evident seal, and wherein grooves, are respectively provided for the passage of ribs and protrusions.

In yet another aspect, the rectangular box walls comprising the container are provided tapered outwardly in elevation at a suitable degree to enable stacking of multiple units of the body without slidable lids. The slidable lids' bottom surface of the body is preferably provided with studs and

the top surface of the slidable lid is provided with corresponding embossment to enable stacking of multiple units of lid-closed containers.

5 LIST OF ACCOMPANYING DRAWINGS

The above features of our invention and the respective principles and advantages may be better understood with reference to the drawings accompanying herein which, when read together with the detailed
10 description hereinafter on specific embodiments, serves to illustrate an exemplary, non-limiting implementation of our tamper-evident container, in which:

FIGURE 1 shows a perspective view of an example of the tamper-
15 evident container (made of transparent material and hence showing some underlying features) according to our invention with its covering lid slidably ajar;

FIGURE 2 shows the container in the same view of FIG. 1 wherein
20 the lid is fully closed;

FIGURE 3 shows the lid, in isolation and detached from the container, in top plan view with the cover removed;

25 FIGURE 4 shows the lid of FIG. 3 in a cross-sectional end view;

FIGURE 5 shows the container body of FIG. 1, without the lid, in side elevation view;

30 FIGURE 6 shows the container body of FIG. 5 in top plan view;

FIGURE 7 shows the container body of FIG. 5 in front end elevation view; and

FIGURE 8 shows the container body of FIG. 5 in rear end elevation view.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

A specific embodiment of our tamper-evident container may be described in detail in the following. As all the drawings relate to the same specific embodiment, we shall refer to all the drawings collectively. Perspective views of the container are shown in FIGURE 1 and FIGURE 2 as comprising two main components, i.e. a container body 10 and a lid 40 which complementarily covers the body opening 20. The lid 40 is shown in different views in FIGURE 3 and FIGURE 4 while the container body 10 is shown in different views in FIGURE 5, FIGURE 6, FIGURE 7 and FIGURE 8. It should also be noted that the drawings have been made on the basis of the container being made of transparent materials with high impact-resistance and heat-resistant, such as polycarbonate, as is typically required of tamper-evident containers so that the container is tamper-resistant and if occurs it may be readily noticed. As such, many of the features of the container are shown clearly rather as “hidden” denoted by broken lines.

The body opening 20 has a peripheral flange 12 extending from opposing longitudinal walls of the body 10. Although our drawings may show that the peripheral flange 12 being provided all-round or nearly all around the opening 20 (except for the front end where a locking chamber 33 is formed) it should be noted that the main function of the flange 12 is to provide guidance for the slidable lid 40 to slide over and cover the opening 20 and as such is not necessary for the flange to be extended through out the

periphery of the lid. As long as the peripheral flange 12 is provided along the opposing parallel walls' top edges, it should be sufficient for guiding the sliding movement of the lid 40 over the opening 20. By the same token, the shape of the opening 20 need not be rectangular but may be any form of trapezoidal shape, i.e. with two parallel opposing sides, preferably forming the longitudinal sides of the opening for longer and therefore easier sliding movement of the lid 40.

The slidable lid 40 comprises a plurality of U-shape (or C-shape, depending on how one views the orientation of the alphabet) flanges 45 which would complementarily and slidably fit over the body's peripheral flange 12. A locking chamber 33 may be complementarily formed by mutual or matching end positioning of the respective ends of the body 10 and lid 40 such that, upon matched, a slot is formed for inserting a tamper-evident seal through the slot into the chamber 33. Thus, in one embodiment, the peripheral flange 12 may be provided all around the body opening 20 save for a portion of insertion end where access to slot 34 is required for insertion of tamper-evident seal.

The characterizing feature of our invention lies in providing a plurality of ribs 46 protruding from the underside of the slidable lid 40 such that, upon closure of the opening, the ribs 46 are adjacent inside of the body wall 19. Although all the drawings of the specific embodiment illustrate a long continuous rib 46 which, upon closure, running in parallel with and substantially along the inner surface of the longitudinal walls 19, it should be pointed out that, in order to serve its purpose, such a continuous rib is not essential although it is preferred. In particular, the ribs may be provided as interspersed (intermittent or in a broken line comprising) short ribs, or even a single short rib at the middle of the longitudinal wall where flexure is at the maximum. The ribs 46 should be provided at a height or profiled high

enough to prevent the wall from slipping over the rib when pressed or flexed externally.

The distance of the rib 46 relative to the wall 19 may preferably
5 close enough or even abut the longitudinal wall 19 to prevent inward bending or flexing of the wall 19 when subjected to external pressure or physical depressing action. If the ribs 46 are provided so close as to abut the inside of the longitudinal body wall 19, it would have the advantage of tamper
evidence when means is used to soften the wall 19 (such as by hot air blowing
10 or spot microwaving) because such tampering method would tend to meld or fuse the abutting rib 46 to the wall 19.

The slidable lid's 40 U-shape or C-shape flanges 45 may optionally be provided to fit snugly over the peripheral flange 12 upon complete closure
15 of the body opening 20 by the slidable lid 40. Thus, the U-shape flanges 45 or alternatively the peripheral flange 12 may be designed in such way to allow for more tolerance or clearance at the beginning of the lid insertion and gradually reducing the tolerance until it becomes snugly fit upon complete covering of the opening 20. Such increase in the tolerance at the beginning of
20 the lid insertion would ease the placing and aligning of the lid 40 in order to slide the lid's U-shape flanges 45 over the body's guiding peripheral flanges 12.

Another variation to the U-shape flange 45 is providing it with a
25 plurality of discrete U-shape flange sections on each side rather than a continuous one along the longitudinal side of the lid 40. As shown in FIGURE 3, the slidable lid (40) may be provided with 3 U-shape flanges on each side and positioned respectively at the leading end (51), middle portion (52) and locking chamber end (53).

One preferred feature that may be added to the foregoing embodiment is providing grooves 22 at insertion end of the body opening 20 wall corresponding for the ribs 46 to slide therethrough upon the slidable lid 40's insertion over said body opening 20. As shown in FIGURE 6, the grooves 22 are provided in an embodiment of the container body 10 in which the peripheral flange 12 extends from the longitudinal wall to the front end wall. If such peripheral flange 12 does not extend to the front end wall, corresponding notches may be provided on the top edge of the front end wall to allow and guide the ribs 46 through when the lid 40 is inserted initially.

At the end of the insertion of the lid 40, i.e. upon complete covering of the container opening 20, protuberance 28 may be provided at the terminal end 29 of the body to stop the lid 40 from further slide, signifying the complete closure of the container. Preferably, the protuberance 28 profile is high enough to prevent the lid 40 from sliding over the terminal end 29 of the container body 10. Another function of the protuberance 28 is to prevent the lid 40 from being slided in from the terminal end 29 and thus compromising the covering and/or locking at the locking chamber 33 without being noticed. In other words, the protuberance 28 may also function to keep the sliding of the lid 40 to cover the body opening 20 in a single direction only.

In the specific embodiment as shown in FIGURE 5 and FIGURE 6, the peripheral flange 12 may be provided to extend over the terminal end 29 of the container body 10 such that the protuberance 28 is provided on the flange.

Another preferred feature of our tamper-evident container is a pair of protrusions 47 provided on the underside of the slidable lid 40 at the leading edge 57. A pair of grooves 27 may be provided at the corresponding positions at the point of entry of the slidable lid 40 over the flange 12 or wall (if the flange does not extend over to the front end wall). Corresponding pair

of grooves 27a may be provided at the end of the body wall's terminal end for accepting the protrusions 47 at the terminal end upon the lid's complete closure of the opening 20. Preferably, the grooves 27 provided on the peripheral flange 12 are closed ended so that the sliding into the grooves 27 by the protrusions 47 is stopped. While the drawings show a pair of protrusions 47 and a corresponding pair of grooves 27, any number and position of the protrusions and corresponding grooves may be provided.

While the containers may be designed generally in rectangular shapes with high impact-resistant transparent plastic material, such as polycarbonate, for ease of stacking up empty or unused containers, it is preferred that the rectangular box shape are provided with outward tapering at a suitable degree so that multiple units of the container body may be stacked up in a compact manner for ease of storage with the slidable lids stored or stacked separately. For ease of stacking up of closed containers, it is also preferred that the bottom surface of the container body 10 be provided with studs 14 and corresponding embossment 44 be provided on the lid's 40 top surface to facilitate multiple-storey stacking of the closed containers.

As it is plain from the foregoing description, there are many possible variations of the ribs for the purpose of preventing or minimising inward flexure of the longitudinal walls which may not have been specifically described. In addition, there may be many other alternative features which may be used in conjunction with the ribs to enhance or improve its effectiveness but may not have described herein. These and other modifications or equivalents not specifically mentioned are to be understood as encompassed within the scope and letter of the claims hereinafter.

CLAIMS

1. A tamper-evident container comprising a body (10) and a slidable lid
5 (40) complementary to cover body opening (20) wherein
 - said body opening (20) comprising peripheral flange (12) extending at least substantially along opposing longitudinal walls of said body (10);
 - said slidable lid (40) comprising a plurality of U-shape flanges (45) slidably fitting over said peripheral flange (12);
 - 10 - at least a locking chamber (33) is complementarily formed by and mutually provided on each of said body (10) and slidable lid (40) upon complete closure of said body opening (20) by said slidable lid (40), whereupon a slot is formed by respective complementary parts of said body (10) and lid (40) for insertion of a tamper-evident seal locking said slidable lid
15 onto said body (10); and wherein:
 - a plurality of ribs (46) protruding from underside of said slidable lid (40) such that upon closure of the opening (20), said ribs (46) are adjacent inside of body wall (19).
- 20 2. A tamper-evident container according to Claim 1 wherein the slidable lid's (40) U-shape flanges (45) slide over the body opening's (20) peripheral flange (12) in a snug fit upon complete closure of said body opening (20) by said slidable lid (40).
- 25 3. A tamper-evident container according to Claim 1 wherein the slidable lid's (40) U-shape flanges (45) slide over snugly all along the body opening's (20) peripheral flange (12), and corresponding grooves (22) are provided at insertion end of said body opening (20) wall for said ribs (46) to slide therethrough upon said slidable lid (40)'s insertion over said body opening
30 (20).

4. A tamper-evident container according to Claim 1 wherein the ribs (46) are provided parallel to and adjacent a substantial length of each side of the opposing walls of the body (10).
- 5 5. A tamper-evident container according to Claim 1 wherein the ribs (46) are provided abutting inside surface of body wall (19).
6. A tamper-evident container according to Claim 1 wherein the peripheral flange (12) is provided all round the body opening (20) save for a
10 portion of insertion end where the locking chamber (33) is formed.
7. A tamper-evident container according to Claim 1 wherein the peripheral flange (12) is provided all around the body opening (20) save for a portion of insertion end where access to slot (34) is required for insertion of
15 tamper-evident seal.
8. A tamper-evident container according to Claim 1 wherein a protuberance (28) of sufficient height is provided at the terminal end (29) of the body to stop the slidable lid (40) upon reaching complete closure.
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9. A tamper-evident container according to Claim 8 wherein the protuberance (28) is provided at a height sufficient to prevent the slidable lid (40) from being inserted to cover the body (10) from the terminal end (29).
- 25 10. A tamper-evident container according to any one of Claims 8 and 9 wherein the peripheral flange (12) extends over the terminal end (29) and the protuberance (28) is provided thereon accordingly.
11. A tamper-evident container according to Claim 1 wherein at least a
30 protrusion (47) is provided on the underside of the slidable lid's leading edge

(57) and a groove (27) is provided at the corresponding position of the body wall's terminal end (29).

12. A tamper-evident container according to any one of Claims 6 – 7
5 wherein at least a protrusion (47) is provided on the underside of the slidable lid's (40) leading edge (57) and a close-ended groove (27) is provided at the corresponding position of the peripheral flange (12).

13. A tamper-evident container according to Claim 12 wherein a pair of
10 protrusions (47) and a corresponding pair of grooves (27) are provided.

14. A tamper-evident container according to Claim 1 wherein the
container is made of transparent material in form of a rectangular box and
wherein the peripheral flange (12) is provided along the opposing elongate
15 sides.

15. A tamper-evident container according to Claim 14 wherein the slidable
lid (40) is provided with 3 U-shape flanges on each side positioned
respectively at the leading end (51), middle portion (52) and locking chamber
20 end (53).

16. A tamper-evident container according to Claim 14 wherein the
peripheral flange (12) extends around the box opening (20) save for a portion
of insertion end where access to slot (34) is required for insertion of tamper-
25 evident seal, and wherein grooves (22 and 37), are respectively provided for
the passage of ribs (46) and protrusions (47).

17. A tamper-evident container according to Claim 14 wherein the
rectangular box walls are tapered outwardly in elevation at a suitable degree
30 to enable stacking of multiple units of the body (10) without slidable lids (40).

18. A tamper-evident container according to Claim 14 wherein the bottom surface of the body (10) is provided with studs (14) and the top surface of the slidable lid (40) is provided with corresponding embossment (44) to enable stacking of multiple units of lid-closed containers.