BRIEF SUMMARY OF THE INVENTION

It is an object of the semiconductor wafer container that has an overlapping double wall. The wall structure comprises multiple outer walls and multiple inner walls. The overlapping double containment wall increases semiconductor wafer protection during impact or shipping. Each inner wall shares a minimal percentage of a common angular sector with each adjacent outer wall. The inner wall is generally very stiff and does not absorb and cushion the wafers if the container is dropped or subject to impact. On the bottom assembly, the inner walls and outer walls are positioned in an offset and overlapping configuration provides maximum protection to the semiconductor wafers.

It is an object of the semiconductor wafer container to improve alignment of the top cover with the base. The alignment system includes reference tabs that are received by the cover and a visual identifier for guiding an operator in the proper alignment of the two halves of the container. The top cover orientation features prevent improper installation of the top cover to the bottom member. The top cover orientation feature is incorporated into the top cover that mates with the features of the double locking location feature. This orientation feature prevents installation of the top cover in plus or minus 90 degree locations about the central axis.

It is an object of the semiconductor wafer container to provide an improved locking mechanism for securing two halves of a wafer container together. The bottom half comprises a wall structure perpendicular to the base. The wall structure comprises segmented inner and outer walls, where each portion of the wall structure has a distinctive arc length. The arc length of each inner wall does not completely overlap with the arc length of any outer wall.

It is an object of the semiconductor wafer container to provide an improved engagement feature for the locking tabs. These improved tabs include a cover for a wafer container that engages to a base. The cover includes one or more notches, each having a ramp that easily receive latches from the base.

It is another object of the semiconductor wafer container to incorporate bi-directional rotation locking feature(s). These features improve orienting, the top member on the bottom member that decreases the amount of top cover rotation and movement with respect to the bottom member. This feature creates a double locking location that securely locates and locks the top cover in place during top cover assembly. The bi-directional rotation locking feature is located on both sides of the perpendicular top cover surfaces of a single wall on both the interior and the exterior simultaneously. This improvement provides bi-directional locking of the captured surface decreases the amount of top cover rotation and movement with respect to the bottom member and increases the rigidity of the containment device when the members are assembled.

It is still another object of the semiconductor wafer container to include an improved holding and clamping feature to allow for automated machinery to latch onto and hold the bottom member and secure it firmly to the machinery nesting locations. This mechanism is comprised of a single piece feature that is molded into the bottom member. The holding and clamping feature on the bottom member improves equipment interface where these containers are used. The feature is a holding mechanism to allow for automated machinery to latch onto and hold the bottom member and secure it firmly to the machinery nesting locations.

It is still another object of the semiconductor wafer container to include an improved curved latch recess for improved closure and retention of the containment device latches. In the improved latch and latch recess the height of the latch is equal to or lower than the inner wall structure. This allows equipment to interface with the bottom member of the container without interference with the equipment and latch height. A curvature on the mating surface provides superior holding and self centering and gripping during handling and after impact. This recessed feature also protects the mating surface from damage when the top cover is disassembled from the bottom member. The latch recess and curved surface also provides increased latch retention and container integrity during impact or shipping. This includes a lowered latch equal to or less than the inner wall height.

CLAIMS

1. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with a plurality of inner and outer arc sector ribs that extend perpendicular from said base wherein said inner and outer arc sectors ribs are arranged concentric with said at least one rib that extends perpendicular from said base of said top housing, and

said inner and outer arc sector ribs are formed such that the arc sector of at least one inner rib overlaps the arc sector of at least one outer rib.

2. The wafer container according to claim 1 wherein said overlap of said at least one inner rib and said at least one outer rib is an overlap of between 5 and 15 degrees.

3. The wafer container according to claim 1 wherein said at least one inner rib and said at least one outer rib extend from said essentially planar rectangular base the same height.

4. The wafer container according to claim 1 wherein said at least one inner rib and said at least one outer rib extend from said essentially planar rectangular base different heights.

5. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base wherein said at least one rib on said bottom housing is arranged concentric and at a different radius from said at least one rib that extends perpendicular from said base of said top housing;

at least one additional rib that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom;

a bi-directional locking feature having at least one set of locating ribs that extend from said essentially planar base of said bottom housing that locate and capture opposing sides of said at least one additional rib that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom, wherein

said locking feature creates a bi-directional lock of said top and said bottom housing to minimize rotation there between.

6. The wafer container according to claim 5 wherein said at least one additional rib that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom is "U" shaped and is orthogonal to three sides of said bottom.

7. The wafer container according to claim 6 wherein there are four sets of said "U" shaped rib.

8. The wafer container according to claim 6 wherein said bi-directional locking feature captures at least two sides of said "U" shaped rib.

9. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base wherein said at least one rib on said bottom housing is arranged concentric and at a different radius from said at least one rib that extends perpendicular from said base of said top housing;

said at least one rib on said top housing having an orientation tab that extends normal to said rib on an outward direction of said circular orientation, and

said at least one rib on said bottom housing is configured to only clear said orientation tab when said top housing and said bottom housing are correctly oriented.

10. The wafer container according to claim 9 wherein there are at least four orientation tabs.

11. The wafer container according to claim 9 wherein said orientation tabs prevent improper assembly of said top housing and said bottom housing members from being installed 90 degrees out of alignment.

12. The wafer container according to claim 9 wherein said orientation tab is protectively located a "U" shaped rib that extends from said essentially circular oriented rib.

13. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base wherein said at least one rib on said bottom housing is arranged concentric and at a different radius from said at least one rib that extends perpendicular from said base of said top housing;

said bottom housing further having an undercut recessed pocket with a latch surface for a retention mechanism;

said latch surface being formed in a molding process with the molding of said bottom housing.

14. The wafer container according to claim 13 wherein said latch surface is located at a height that is equal to or lower than the planar bottom surface of said bottom housing.

15. The wafer container according to claim 13 wherein said latch surface further has an angled or curved entry surface.

16. The wafer container according to claim 13 wherein said pocket further has at least two essentially vertical side walls to self center said bottom housing on said retention mechanism.

17. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell

housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base wherein said at least one rib on said bottom housing is arranged concentric and at a different radius from said at least one rib that extends perpendicular from said base of said top housing;

said bottom housing having at least one latch that engages in a corresponding notch located on said top housing, wherein

said a top surface of said latch is located at a height that is below the top surface of said at least one rib.

18. The wafer container according to claim 17 wherein said at least one latch includes at least four latches and four corresponding notches located in each corner region of said top housing or said bottom housing.

19. The wafer container according to claim 17 wherein said notch has a curve entry ramp and recess that elevates said latch above said entry ramp and lowers said latch into said recess to retain said latch in said recess.

20. The wafer container according to claim 17 wherein said notch is located in a pocket that protects said latch during handling and impact.

21. A wafer container comprising:

a top housing and a bottom housing that nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base wherein said at least one rib on said bottom housing is arranged concentric and at a different radius from said at least one rib that extends perpendicular from said base of said top housing;

said bottom housing having an outer annular lip;

said top housing having an outer annular lip that is configured to nest and fit within said outer annular lip of said bottom housing, and

said bottom housing further having a plurality of bearing ribs that extend from said essentially rectangular base to support said annular lip on said top housing.

22. The wafer container according to claim 21 wherein said plurality of bearing ribs exist in at least four per quadrant on said bottom housing.

23. The wafer container according to claim 21 wherein said plurality of bearing ribs create a bearing surface of greater than 2.25 mm^2.

24. The wafer container according to claim 21 wherein said plurality of bearing ribs reduce damage to stacking pads and or the top rim of the housings.

BRIEF SUMMARY OF THE INVENTION

The invention is defined in the independent claim. Some optional features of the invention are defined in the dependent claims. An exemplary semiconductor wafer container has an overlapping double wall. The wall structure may comprise multiple outer walls and multiple inner walls. The overlapping double containment wall may increase semiconductor wafer protection during impact or shipping. Each inner wall may share a minimal percentage of a common angular sector with each adjacent outer wall. The inner wall may be generally very stiff and does not absorb and cushion the wafers if the container is dropped or subject to impact. On the bottom assembly, the inner walls and outer walls may be positioned in an offset and overlapping configuration to provide maximum protection to the semiconductor wafers.

An exemplary semiconductor wafer container improves alignment of the top cover with the base. The alignment system may include reference tabs that are received by the cover and a visual identifier for guiding an operator in the proper alignment of the two halves of the container. The top cover orientation features may prevent improper installation of the top cover to the bottom member. The top cover orientation feature may be incorporated into the top cover that mates with the features of the double locking location feature. This orientation feature may prevent installation of the top cover in plus or minus 90 degree locations about the central axis.

An exemplary semiconductor wafer container may provide an improved locking mechanism for securing two halves of a wafer container together. The bottom half may comprise a wall structure perpendicular to the base. The wall structure may comprise segmented inner and outer walls, where each portion of the wall structure has a distinctive arc length. The arc length of each inner wall may not completely overlap with the arc length of any outer wall.

An exemplary semiconductor wafer container may provide an improved engagement feature for the locking tabs. These improved tabs may include a cover for a wafer container that engages to a base. The cover may include one or more notches, each having a ramp that easily receive latches from the base.

An exemplary semiconductor wafer container may incorporate bi-directional rotation locking feature(s). These features may improve orienting, the top member on the bottom member that decreases the amount of top cover rotation and movement with respect to the bottom member. This feature may create a double locking location that securely locates and locks the top cover in place during top cover assembly. The bi-directional rotation locking feature may be located on both sides of the perpendicular top cover surfaces of a single wall on both the interior and the exterior simultaneously. This improvement may provide bi-directional locking of the captured surface decreases the amount of top cover rotation and movement with respect to the bottom member and increases the rigidity of the containment device when the members are assembled.

An exemplary semiconductor wafer container includes an improved holding and clamping feature to allow for automated machinery to latch onto and hold the bottom member and secure it firmly to the machinery nesting locations. This mechanism may be comprise of a single piece feature that is molded into the bottom member. The holding and clamping feature on the bottom member may improve equipment interface where these containers are used. The feature may be holding mechanism to allow for automated machinery to latch onto and hold the bottom member and secure it firmly to the machinery nesting locations.

An exemplary semiconductor wafer container may include an improved curved latch recess for improved closure and retention of the containment device latches. In the improved latch and latch recess the height of the latch may be equal to or lower than the inner wall structure. This may allow equipment to interface with the bottom member of the container without interference with the equipment and latch height. A curvature on the mating surface may provide superior holding and self centering and gripping during handling and after impact. This recessed feature may also protect the mating surface from damage when the top cover is disassembled from the bottom member. The latch recess and curved surface may also provide increased latch retention and container integrity during impact or shipping. This may include a lowered latch equal to or less than the inner wall height.

Claims

1. A wafer container comprising:

a top housing and a bottom housing arranged to nest together to form a clam shell housing with an inner cavity for storage for at least one semiconductor wafer;

said top housing having an essentially planar rectangular base with at least one rib that extends perpendicular from said base in an essentially circular orientation;

said bottom housing having an essentially planar rectangular base with a plurality of inner and outer arc sector ribs that extend perpendicular from said base wherein said inner and outer arc sectors ribs are arranged concentric with said at least one rib that extends perpendicular from said base of said top housing, and

said inner and outer arc sector ribs are formed such that the arc sector of at least one inner rib overlaps the arc sector of at least two outer ribs wherein said overlap of said at least one inner arc sector rib and said at least two outer arc sector ribs is an overlap of between 5 and 15 degrees when measured from a concentric origin of said arc sector ribs.

2. The wafer container according to claim 1 wherein said at least one inner rib and said at least one outer rib extend from said essentially planar rectangular base the same height.

3. The wafer container according to claim 1 wherein said at least one inner arc sector rib and said at least one outer arc sector rib extend from said essentially planar rectangular base different heights.

4. The wafer container according to claim 1 that further includes:

at least one additional rib that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom;

a bi-directional locking feature having at least one set of locating ribs that extend from said essentially planar base of said bottom housing for locating and capturing opposing sides of said at least one additional rib that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom, wherein

said locking feature being for creating a bi-directional lock of said top and said bottom housing to minimize rotation there between.

5. The wafer container according to claim 4 wherein said at least one additional rib

that extends from said bottom of said essentially rectangular base that is orthogonal to at least one side of said bottom is U-shaped and is orthogonal to three sides of said bottom.

6. The wafer container according to claim 5 wherein there are four sets of said U-shaped rib.

7. The wafer container according to claim 5 wherein said bi-directional locking feature captures at least two sides of said U-shaped rib.

8. The wafer container according to claim 1 wherein said at least one rib on said top housing has an orientation tab that extends normal to said rib on an outward direction of said circular orientation, and

said at least one rib on said bottom housing is configured to only clear said orientation tab when said top housing and said bottom housing are placed in only one orientation.

9. The wafer container according to claim 8 wherein there are at least four orientation tabs.

10. The wafer container according to claim 8 wherein said orientation tabs prevent improper assembly of said top housing and said bottom housing members from being installed 90 degrees out of alignment.

11. The wafer container according to claim 8 wherein said orientation tab is protectively located adjacent to a U-shaped rib that extends from said essentially circular oriented rib.

12. The wafer container according to claim 1 wherein said bottom housing has an undercut recessed pocket with a latch surface for a retention mechanism wherein said latch surface exists below said wafer supporting wall;

said latch surface being formed in a molding process with the molding of said bottom housing.

13. The wafer container according to claim 12 wherein said latch surface is located at a height that is equal to or lower than the planar bottom surface of said bottom housing.

14. The wafer container according to claim 12 wherein said latch surface further has an angled or curved entry surface.

15. The wafer container according to claim 12 wherein said pocket further has at least two essentially vertical side walls to self-center said bottom housing on said retention mechanism.

16. The wafer container according to claim 1 wherein said bottom housing has at least one latch for engaging in a corresponding notch located on said top housing, wherein said at least one latch surface exists below said wafer supporting wall, and

said a top surface of said latch is located at a height that is below a top surface of said at least one rib.

17. The wafer container according to claim 16 wherein said at least one latch includes at least four latches and four corresponding notches located in each corner region of said top housing or said bottom housing.

18. The wafer container according to claim 16 wherein said notch has a curve entry ramp and recess arranged to elevate said latch above said entry ramp and to lower said latch into said recess to retain said latch in said recess when normal forces are applied to said top housing and said bottom housing.

19. The wafer container according to claim 16 wherein said notch is located in a pocket that protects said latch during handling and impact.

20. The wafer container according to claim 1 wherein:

said bottom housing having an outer annular lip;

said top housing having an outer annular lip that is configured to nest and fit within said outer annular lip of said bottom housing, and

said bottom housing further having a plurality of bearing ribs that extend from said essentially rectangular base to support said annular lip on said top housing.

21. The wafer container according to claim 20 wherein said plurality of bearing ribs exist in at least four per quadrant on said bottom housing.

22. The wafer container according to claim 20 wherein said plurality of bearing ribs create a bearing surface of at least 2.25 mm^2.

23. The wafer container according to claim 20 wherein said plurality of bearing ribs reduce damage to at least one of stacking pads and the top rim of the housings.