Claims

1. A clamping apparatus for securing a substrate within a substrate carrier during an ultrasonic mounting process, the apparatus comprising:

a substrate carrier having a top plate and a bottom plate, the top plate and the bottom plate forming a cavity dimensioned to hold a substrate within the cavity; and

a clamping plate positioned on a side of the top plate opposite the bottom plate, the clamping plate having an opening aligned with the cavity and a pair of clamping members, each of the pair of clamping members extending toward a center of the opening and through the cavity such that when a substrate is positioned within the cavity, the clamping member presses portions of the substrate exposed through the opening against the bottom plate.

2. The apparatus of claim 1 wherein each of the pair of clamping members have a resilient arm individually attached to the clamping plate.

3. The apparatus of claim 1 wherein the clamping plate comprises a different material than the pair of clamping members.

4. The apparatus of claim 1 wherein the clamping members are made of copper beryllium.

5. The apparatus of claim 1 wherein each of the pair of clamping members have a first portion mounted to a bottom side of the clamping plate, a second portion positioned within the cavity and a bent portion between the first portion and the second portion.

6. The apparatus of claim 1 wherein each of the pair of clamping members are mounted to portions of the clamping plate along opposite sides of the opening.

7. The apparatus of claim 1 wherein the cavity comprises a substrate opening positioned between a first clamping member opening and a second clamping member opening, the substrate opening dimensioned to expose opposing sides of a substrate positioned therein, and the first and second clamping member openings dimensioned to receive portions of the pair of clamping members.

8. A method of assembling a clamping apparatus for securing a substrate within a substrate carrier for use during an ultrasonic mounting process, the method comprising:

providing a clamping plate having an opening configured for alignment with a cavity formed in a substrate carrier; and

mounting a pair of resilient arms to the clamping plate, wherein each of the pair of resilient arms have a mounting portion dimensioned to attach to the clamping plate and a clamping portion dimensioned to extend toward a center of the opening and through the cavity in the substrate carrier to clamp a substrate to the substrate carrier when the clamping plate is positioned on the substrate carrier.

9. The method of claim 8 wherein each of the pair of resilient arms are individually mounted to the clamping plate.

10. The method of claim 8 wherein each of the pair of resilient arms are positioned along opposing sides of the opening.

11. The method of claim 8 wherein each of the pair of resilient arms has a bend between the mounting portion and the clamping portion.

12. The method of claim 8 wherein each of the pair of resilient arms are made of copper beryllium.

13. The method of claim 8 further comprising:

positioning a substrate within the cavity of the substrate carrier; and

positioning the clamping plate on the substrate carrier such that the clamping portion presses the substrate against the substrate carrier.

14. The method of claim 8 wherein the substrate carrier comprises a top plate and a bottom plate and the cavity is formed between the top plate and the bottom plate.

15. The method of claim 14 wherein the clamping plate is positioned on a side of the top plate opposite the bottom plate.

16. The method of claim 14 wherein when the substrate is positioned within the cavity, the clamping portion presses portions of the substrate exposed through the opening against the bottom plate.

17. A method for securing a substrate within a substrate carrier during an ultrasonic mounting process:

positioning a substrate within a cavity of a substrate carrier, wherein the cavity is formed between a top carrier plate and a bottom carrier plate; and

positioning a clamping plate over the substrate carrier to secure the substrate within the substrate carrier during an ultrasonic mounting process, wherein the clamping plate comprises an opening aligned with the cavity and a pair of resilient arms extending toward a center of the opening and through the cavity to press the substrate against the bottom carrier plate.

18. The method of claim 17 wherein the cavity comprises a substrate opening positioned between a first resilient arm opening and a second resilient arm opening, the substrate opening dimensioned to expose opposing sides of a substrate positioned therein, and the first and second resilient arm openings dimensioned to receive portions of the pair of resilient arms.

19. The method of claim 17 wherein each of the pair of resilient arms are separately mounted to a bottom side of the clamping plate.

20. The method of claim 17 wherein each of the pair of resilient arms are made of a different material than the clamping plate.

Claims

1. A clamping apparatus for securing a substrate within a substrate carrier during an ultrasonic mounting process, the apparatus comprising:

a substrate carrier having a top plate and a bottom plate, the top plate having a first side and a second side, the first side facing a direction opposite to that of the second side, and wherein when the first side of the top plate is positioned on the bottom plate, the top plate and the bottom plate form a cavity dimensioned to hold a substrate within the cavity; and

a clamping plate dimensioned to be positioned on the second side of the top plate, the clamping plate having an opening that aligns with the cavity and a pair of clamping members, each of the clamping members of the pair of clamping members dimensioned to extend toward a center of the opening and through the cavity such that when a substrate is positioned within the cavity, the clamping members press portions of the substrate exposed through the opening against the bottom plate.

2. The apparatus of claim 1 wherein each of the clamping members have a resilient arm individually attached to the clamping plate.

3. The apparatus of claim 1 wherein the clamping plate comprises a different material than the pair of clamping members.

4. The apparatus of claim 1 wherein the clamping members are made of copper beryllium.

5. The apparatus of claim 1 wherein each of the clamping members have a first portion mounted to a bottom side of the clamping plate, a second portion positioned within the cavity and a bent portion between the first portion and the second portion.

6. The apparatus of claim 1 wherein each of the clamping members are mounted to portions of the clamping plate along opposite sides of the opening.

7. The apparatus of claim 1 wherein the cavity comprises a substrate opening positioned between a first clamping member opening and a second clamping member opening, the substrate opening dimensioned to expose opposing sides of a substrate positioned therein, and the first and second clamping member openings dimensioned to receive portions of the pair of clamping members.

8. A method of assembling a clamping apparatus for securing a substrate within a substrate carrier for use during an ultrasonic mounting process, the method comprising:

providing a clamping plate having an opening extending entirely through the clamping plate and configured for alignment with a cavity formed in a substrate carrier, the clamping plate having a top side and a bottom side; and

mounting a pair of resilient arms to the clamping plate, wherein each of the resilient arms of the pair of resilient arms comprises a mounting portion dimensioned to attach to the bottom side of the clamping plate and a clamping portion dimensioned to extend toward a center of the opening and through the cavity in the substrate carrier such that the clamping portion contacts a surface of a substrate that is below the top side of the clamping plate and clamps the substrate to the substrate carrier when the bottom side of the clamping plate is positioned on the substrate carrier.

9. The method of claim 8 wherein the resilient arms are individually mounted to the clamping plate.

10. The method of claim 8 wherein the resilient arms are positioned along opposing sides of the opening.

11. The method of claim 8 wherein at least one of the resilient arms has a bend between the mounting portion and the clamping portion.

12. The method of claim 8 wherein at least one of the resilient arms is made of copper beryllium.

13. The method of claim 8 further comprising:

positioning a substrate within the cavity of the substrate carrier; and

positioning the clamping plate on the substrate carrier such that the clamping portion presses the substrate against the substrate carrier.

14. The method of claim 8 wherein the substrate carrier comprises a top plate and a bottom plate and the cavity is formed between the top plate and the bottom plate.

15. The method of claim 14 wherein the clamping plate is positioned on a side of the top plate opposite the bottom plate.

16. The method of claim 14 wherein when the substrate is positioned within the cavity, the clamping portion presses portions of the substrate exposed through the opening against the bottom plate.

17. A method for securing a substrate within a substrate carrier during an ultrasonic mounting process:

positioning a substrate within a cavity of a substrate carrier, wherein the cavity is formed between a top carrier plate and a bottom carrier plate, the top carrier plate having a first side and a second side which face opposite directions, and the first side is positioned on the bottom plate to form the cavity; and

positioning a clamping plate on the second side of the top plate to secure the substrate within the cavity formed between the top carrier plate and the bottom carrier plate during an ultrasonic mounting process, wherein the clamping plate comprises an opening extending entirely through the clamping plate that aligns with the cavity and a pair of resilient arms extending toward a center of the opening and through the cavity to press portions of the substrate exposed through the opening against the bottom carrier plate.

18. The method of claim 17 wherein the cavity comprises a substrate opening positioned between a first resilient arm opening and a second resilient arm opening, the substrate opening dimensioned to expose opposing sides of a substrate positioned therein, and the first and second resilient arm openings dimensioned to receive portions of the pair of resilient arms.

19. The method of claim 17 wherein each of the resilient arms of the pair of resilient arms are separately mounted to a bottom side of the clamping plate.

20. The method of claim 17 wherein each of the resilient arms of the pair of resilient arms are made of a different material than the clamping plate.