CLAIMS

1. A microelectronic circuit testing pack, comprising:

a portable supporting structure including first and second components for holding a substrate therebetween, the substrate carrying a microelectronic circuit and having a plurality of terminals connected to the microelectronic circuit;

a plurality of contacts on the second component, the contacts matching the terminals for making contact to the terminals;

a pressure differential cavity seal between the first and second components, the pressure differential cavity seal forming an enclosed pressure differential cavity together with surfaces of the first and second components;

a pressure reduction passage formed through one of the first and second components, the pressure reduction passage having an inlet opening at the pressure differential cavity and an outlet opening outside the pressure differential cavity;

a pressure reduction valve connected to the pressure reduction passage, opening of the pressure reduction valve allowing air out of the pressure differential cavity to move the first and second components relatively towards one another for ensuring proper contact between the contacts and the terminals, and closing of the pressure reduction valve keeping air from entering the pressure differential cavity;

a first interface, on the portable supporting structure and connected to the contacts, for connection to a second interface on a stationary structure when the portable supporting structure is removably held by the stationary structure; and

a latch system that includes a first latch assembly having:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively to form a locking arrangement; and

an engaging mechanism connected to the locking arrangement and operable to move the locking arrangement between a locking position wherein the locking arrangement maintains the first and second components locked in a closed position and an unlocked position wherein the locking arrangement permits movement of the first and second components from a closed relationship into a spaced relationship, wherein the engaging mechanism causes the second component to move between the locking position and the unlocked position, wherein the second component rotates between the locking position and the unlocked position.

2. The microelectronic circuit testing pack of claim 1, wherein the engaging mechanism includes a surface on the first part that forms a seat for contacting with a surface on a jaw of a tool, the jaw of the tool being rotatable to rotate the first part and the first part rotating the second part through the connecting part to move between the locking position and the unlocked position.

3. The microelectronic circuit testing pack of claim 2, wherein the surface on the first part that forms the seat is an external surface of the first part.

4. The microelectronic circuit testing pack of claim 3, wherein the first part has a tool pin opening therein for aligning a pin of the tool with the first part.

5. The microelectronic circuit testing pack of claim 1, wherein the second part has a body and at least a first wing piece extending from the body, wherein the first wing piece moves over a shoulder of the first component when moving into a first locking position and off the shoulder when moving out of the first locking position towards the unlocked position.

6. The microelectronic circuit testing pack of claim 5, wherein the second part has a second wing piece extending from the body, wherein the second wing piece moves over the shoulder of the first component when moving into a second locking position and off the shoulder when moving out of the second locking position towards the unlocked position.

7. The microelectronic circuit testing pack of claim 6, wherein the latch system further includes:

a tuning block mounted in a stationary position relative to the first component, the tuning block having a levelling surface over which the second wing piece is located when the first wing piece is located over the shoulder, the second part being adjustable relative to the first part to adjust a gap between the levelling surface and the second wing piece.

8. The microelectronic circuit testing pack of claim 7, wherein the latch system further includes:

a locking nut that has thread that engages with a thread on the connecting part to adjust the second part rotationally relative to the connecting part.

9. The microelectronic circuit testing pack of claim 7, wherein the latch system further includes:

a shim between the tuning block and the first component, to adjust a distance between the levelling surface and the first component.

10. The microelectronic circuit testing pack of claim 7, wherein the latch system further includes:

a snap mechanism having a snap surface that snaps into a first snap depression to resist movement of the second component out of the locking position and into a second snap depression to resist movement of the second component out of the unlocked position.

11. The microelectronic circuit testing pack of claim 10, wherein the first and second snap depressions are located on the locking arrangement.

12. The microelectronic circuit testing pack of claim 11, wherein the first and second snap depressions are located on the second part.

13. The microelectronic circuit testing pack of claim 1, wherein the first component includes a backing plate and a signal distribution board, wherein a portion of the signal distribution board is located between the backing plate and the second component, the signal

distribution board having an opening through which the connecting part is inserted, the opening having a first dimension on an axis towards a center point of the signal distribution board that is larger than a second dimension transverse to the axis, the connecting part having a first portion that is smaller than the first dimension in a direction of the axis to allow for thermal expansion of the signal distribution board and the backing plate relative to one another and the first portion being dimensioned to slidably fit within the second dimension of the opening to prevent movement of the signal distribution board in a direction transverse to the axis relative to the backing plate.

14. The microelectronic circuit testing pack of claim 13, wherein the connecting part has a second portion with a first thickness that can fit through the opening in the direction of the axis during said insertion and is larger than the second dimension of the opening, and a second thickness transverse to the first thickness that can fit through the second dimension of the opening during said insertion.

15. The microelectronic circuit testing pack of claim 1, wherein the latch system includes:

a second latch assembly, wherein each respective latch assembly having:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively to form a locking arrangement; and

an engaging mechanism connected to the locking arrangement and operable to move the locking arrangement between a locking position wherein the locking arrangement maintains the first and second components locked in the closed position and an unlocked position wherein the locking arrangement permits movement of the first and second components from the closed relationship into the spaced relationship.

16. The microelectronic circuit testing pack of claim 15, wherein the first and second latch assemblies have respective second parts that are on the same side of the second component.

17. The microelectronic circuit testing pack of claim 1, wherein the pressure differential cavity seal surrounds the contacts and the terminals.

18. The microelectronic circuit testing pack of claim 1, wherein the pressure differential cavity seal is secured to the first component when the first and second components are apart.

19. The microelectronic circuit testing pack of claim 1, wherein the pressure differential cavity seal is a lip seal.

20. The microelectronic circuit testing pack of claim 1, wherein the pressure reduction valve is a pressure reduction check valve, a vacuum release passage being formed through a component having the pressure reduction check valve, the vacuum release passage having an

inlet opening at the pressure differential cavity and an outlet opening outside the pressure differential cavity, further comprising:

a second valve, being a vacuum release valve connected to the vacuum release passage, opening of the vacuum release valve allowing air into the pressure differential cavity and closing of the vacuum release valve keeping air from escaping out of the pressure differential cavity.

21. The microelectronic circuit testing pack of claim 1, wherein the substrate is a wafer with a plurality of microelectronic circuits.

22. The microelectronic circuit testing pack of claim 1, wherein the contacts are pins, each pin having a spring that is depressed against a spring force thereof when the respective contact is depressed by a respective one of the terminals.

23. A tester apparatus, comprising:

a portable supporting structure including first and second components for holding a substrate therebetween, the substrate carrying a microelectronic circuit and having a plurality of terminals connected to the microelectronic circuit;

a plurality of contacts on the second component, the contacts matching the terminals for making contact to the terminals;

a pressure differential cavity seal between the first and second components, the pressure differential cavity seal forming an enclosed pressure differential cavity together with surfaces of the first and second components;

a pressure reduction passage formed through one of the first and second components, the pressure reduction passage having an inlet opening at the pressure differential cavity and an outlet opening outside the pressure differential cavity;

a pressure reduction valve connected to the pressure reduction passage, opening of the pressure reduction valve allowing air out of the pressure differential cavity to move the first and second components relatively towards one another for ensuring proper contact between the contacts and the terminals, and closing of the pressure reduction valve keeping air from entering the pressure differential cavity;

a first interface on the portable supporting structure and connected to the contacts;

a first latch assembly having:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively to form a locking arrangement; and

an engaging mechanism connected to the locking arrangement and operable to move the locking arrangement between a locking position wherein the locking arrangement maintains the first and second components locked in a closed position and an unlocked position wherein the locking arrangement permits movement of the first and second components from a closed relationship into a spaced relationship, wherein the engaging mechanism causes the second component to move between the locking position and the unlocked position, wherein the second component rotates between the locking position and the unlocked position;

a stationary structure, the portable supporting structure being receivable to be held by

the stationary structure and being removable from the stationary structure;

a second interface on the stationary structure, the second interface being connected to the first interface when portable supporting structure is held by the stationary structure, and being disconnected from the first interface when the portable supporting structure is removed from the stationary structure; and

an electrical tester connected through the second interface, the first interface, and the contacts to the terminals so that signals are transmitted between the electrical tester and the microelectronic circuit to test the microelectronic circuit.

24. The tester apparatus of claim 23, wherein the engaging mechanism includes a surface on the first part that forms a seat for contacting with a surface on a jaw of a tool, the jaw of the tool being rotatable to rotate the first part and the first part rotating the second part through the connecting part to move between the locking position and the unlocked position.

25. The tester apparatus of claim 24, wherein the surface on the first part that forms the seat is an external surface of the first part.

26. The tester apparatus of claim 25, wherein the first part has a tool pin opening therein for aligning a pin of the tool with the first part.

27. The tester apparatus of claim 23, wherein the second part has a body and at least a first wing piece extending from the body, wherein the first wing piece moves over a

shoulder of the first component when moving into a first locking position and off the shoulder when moving out of the first locking position towards the unlocked position.

28. The tester apparatus of claim 27, wherein the second part has a second wing piece extending from the body, wherein the second wing piece moves over the shoulder of the first component when moving into a second locking position and off the shoulder when moving out of the second locking position towards the unlocked position.

29. The tester apparatus of claim 28, wherein the latch system further includes:

a tuning block mounted in a stationary position relative to the first component, the tuning block having a levelling surface over which the second wing piece is located when the first wing piece is located over the shoulder, the second part being adjustable relative to the first part to adjust a gap between the levelling surface and the second wing piece.

30. The tester apparatus of claim 23, wherein the latch system further includes:

a locking nut that has thread that engages with a thread on the connecting part to adjust the second part rotationally relative to the connecting part.

31. The tester apparatus of claim 29, wherein the latch system further includes:

a shim between the tuning block and the first component, to adjust a distance between the levelling surface and the first component.

32. The tester apparatus of claim 23, wherein the latch system further includes:

a snap mechanism having a snap surface that snaps into a first snap depression to resist movement of the second component out of the locking position and into a second snap depression to resist movement of the second component out of the unlocked position.

33. The tester apparatus of claim 32, wherein the first and second snap depressions are located on the locking arrangement.

34. The tester apparatus of claim 33, wherein the first and second snap depressions are located on the second part.

35. The tester apparatus of claim 23, wherein the first component includes a backing plate and a signal distribution board, wherein a portion of the signal distribution board is located between the backing plate and the second component, the signal distribution board having an opening through which the connecting part is inserted, the opening having a first dimension on an axis towards a center point of the signal distribution board that is larger than a second dimension transverse to the axis, the connecting part having a first portion that is smaller than the first dimension in a direction of the axis to allow for thermal expansion of the signal distribution board and the backing plate relative to one another and the first portion being dimensioned to slidably fit within the second dimension of the opening to prevent movement of the signal distribution board in a direction transverse to the axis relative to the backing plate.

36. The tester apparatus of claim 35, wherein the connecting part has a second portion with a first thickness that can fit through the opening in the direction of the axis during said insertion and is larger than the second dimension of the opening, and a second thickness transverse to the first thickness that can fit through the second dimension of the opening during said insertion.

37. The tester apparatus of claim 23, wherein the latch system includes:

a second latch assembly, wherein each respective latch assembly having:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively to form a locking arrangement; and

an engaging mechanism connected to the locking arrangement and operable to move the locking arrangement between a locking position wherein the locking arrangement maintains the first and second components locked in the closed position and an unlocked position wherein the locking arrangement permits movement of the first and second components from the closed relationship into the spaced relationship.

38. The tester apparatus of claim 37, wherein the first and second latch assemblies have respective second parts that are on the same side of the second component.

39. The tester apparatus of claim 23, wherein the pressure differential cavity seal surrounds the contacts and the terminals.

40. The tester apparatus of claim 23, wherein the pressure differential cavity seal is secured to the first component when the first and second components are apart.

41. The tester apparatus of claim 23, wherein the pressure differential cavity seal is a lip seal.

42. The tester apparatus of claim 23, wherein the pressure reduction valve is a pressure reduction check valve, a vacuum release passage being formed through a component having the pressure reduction check valve, the vacuum release passage having an inlet opening at the pressure differential cavity and an outlet opening outside the pressure differential cavity, further comprising:

a second valve, being a vacuum release valve connected to the vacuum release passage, opening of the vacuum release valve allowing air into the pressure differential cavity and closing of the vacuum release valve keeping air from escaping out of the pressure differential cavity.

43. The tester apparatus of claim 23, wherein the stationary structure includes a lower chuck, the second component of the portable supporting structure including an upper chuck contacting the lower chuck to allow for transfer of heat between the portable supporting structure and the lower chuck.

44. The tester apparatus of claim 23, wherein the substrate is a wafer with a plurality of microelectronic circuits.

45. The tester apparatus of claim 23, wherein the contacts are pins, each pin having a spring that is depressed against a spring force thereof when the respective contact is depressed by a respective one of the terminals.

46. A method of testing a microelectronic circuit held by a substrate, comprising:

holding the substrate between first and second components of a portable supporting structure, the second component having contacts against terminals of the substrate connected to the microelectronic circuit, wherein a pressure reduction passage is formed through one of the first and second components, the pressure reduction passage having an inlet opening at a pressure differential cavity and an outlet opening outside the pressure differential cavity;

locating a pressure differential cavity seal between the first and second components to form an enclosed cavity by surfaces of the first and second components and the pressure differential cavity seal;

opening a pressure reduction valve to allow air out of the pressure differential cavity and reducing a pressure within the pressure differential cavity to move the first and second components relatively towards one another to ensure proper contact between the contacts and the terminals;

closing the pressure reduction valve, keeping air from entering the pressure differential cavity;

operating an engaging mechanism to move a locking arrangement between a locking

position wherein the locking arrangement maintains the first and second components locked in a closed position and an unlocked position wherein the locking arrangement permits movement of the first and second components from a closed relationship into a spaced relationship, the locking arrangement including:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively, wherein the engaging mechanism causes the second component to move between the locking position and the unlocked position, wherein the second component rotates between the locking position and the unlocked position;

receiving the portable supporting structure by a stationary structure with a first interface on the portable supporting structure connected to a second interface on the stationary structure; and

transmitting signals between an electrical tester and the microelectronic circuit through the terminals, contacts, and first and second interfaces to test the microelectronic circuit.

47. The method of claim 46, wherein the engaging mechanism includes a surface on the first part that forms a seat for contacting with a surface on a jaw of a tool, the jaw of the tool being rotatable to rotate the first part and the first part rotating the second part through the connecting part to move between the locking position and the unlocked position.

48. The method of claim 47, wherein the surface on the first part that forms the seat is an external surface of the first part.

49. The method of claim 48, wherein the first part has a tool pin opening therein for aligning a pin of the tool with the first part.

50. The method of claim 46, wherein the second part has a body and at least a first wing piece extending from the body, wherein the first wing piece moves over a shoulder of the first component when moving into a first locking position and off the shoulder when moving out of the first locking position towards the unlocked position.

51. The method of claim 50, wherein the second part has a second wing piece extending from the body, wherein the second wing piece moves over the shoulder of the first component when moving into a second locking position and off the shoulder when moving out of the second locking position towards the unlocked position.

52. The method of claim 51, wherein the latch system further includes:

a tuning block mounted in a stationary position relative to the first component, the tuning block having a levelling surface over which the second wing piece is located when the first wing piece is located over the shoulder, the second part being adjustable relative to the first part to adjust a gap between the levelling surface and the second wing piece.

53. The method of claim 52, wherein the latch system further includes:

a locking nut that has thread that engages with a thread on the connecting part to adjust the second part rotationally relative to the connecting part.

54. The method of claim 52, wherein the latch system further includes:

locating a shim between the tuning block and the first component, to adjust a distance between the levelling surface and the first component.

55. The method of claim 46, wherein the latch system further includes:

a snap mechanism having a snap surface that snaps into a first snap depression to resist movement of the second component out of the locking position and into a second snap depression to resist movement of the second component out of the unlocked position.

56. The method of claim 55, wherein the first and second snap depressions are located on the locking arrangement.

57. The method of claim 56, wherein the first and second snap depressions are located on the second part.

58. The method of claim 46, wherein the first component includes a backing plate and a signal distribution board, wherein a portion of the signal distribution board is located between the backing plate and the second component, the signal distribution board having an opening through which the connecting part is inserted, the opening having a first dimension on an axis towards a center point of the signal distribution board that is larger

than a second dimension transverse to the axis, the connecting part having a first portion that is smaller than the first dimension in a direction of the axis to allow for thermal expansion of the signal distribution board and the backing plate relative to one another and the first portion being dimensioned to slidably fit within the second dimension of the opening to prevent movement of the signal distribution board in a direction transverse to the axis relative to the backing plate.

59. The method of claim 58, wherein the connecting part has a second portion with a first thickness that can fit through the opening in the direction of the axis during said insertion and is larger than the second dimension of the opening, and a second thickness transverse to the first thickness that can fit through the second dimension of the opening during said insertion.

60. The method of claim 46, wherein the latch system includes:

a second latch assembly, each respective latch assembly having:

a first part that engages with the first component;

a second part that engages with the second component;

a connecting part having opposing ends secured to the first and second parts respectively to form a locking arrangement; and

an engaging mechanism connected to the locking arrangement and operable to move the locking arrangement between a locking position wherein the locking arrangement maintains the first and second components locked in the closed position and an

unlocked position wherein the locking arrangement permits movement of the first and second components from the closed relationship into the spaced relationship.

61. The method of claim 60, wherein the first and second latch assemblies have respective second parts that are on the same side of the second component.

62. The method of claim 46, wherein the pressure differential cavity seal surrounds the contacts and the terminals.

63. The method of claim 46, wherein the pressure differential cavity seal is secured to the first component when the first and second components are apart.

64. The method of claim 46, wherein the pressure differential cavity seal is created with a lip seal.

65. The method of claim 46, wherein the pressure reduction valve is a pressure reduction check valve, a vacuum release passage being formed through a component having the pressure reduction check valve, the vacuum release passage having an inlet opening at the pressure differential cavity and an outlet opening outside the pressure differential cavity, further comprising:

opening a second valve, being a vacuum release valve connected to the vacuum release passage, to allow air into the pressure differential cavity.

66. The method of claim 46, wherein the stationary structure includes a lower chuck, the second component of the portable supporting structure including an upper chuck.

67. The method of claim 46, wherein the substrate is a wafer with a plurality of microelectronic circuits.

68. The method of claim 46, wherein the contacts are pins, each pin having a spring that is depressed against a spring force thereof when the respective contact is depressed by a respective one of the terminals.