CLAIMS:

1. Apparatus for cleaning semiconductor packages, comprising:

a pickhead that is configured to hold the semiconductor packages in an array arrangement;

a plurality of nozzles, each of which is constructed and arranged to project a separate jet of cleaning fluid upwardly against the semiconductor packages;

a megasonic energy generator for imparting megasonic energy to the cleaning fluid; and

a driving device for driving relative movement between the plurality of nozzles and the pickhead to direct the said jets to clean the array of packages on the pickhead.

2. Apparatus as claimed in claim 1, further comprising a first linear driving device coupled to the pickhead that is operative to drive the pickhead along one linear axis and second linear driving device coupled to the plurality of nozzles for driving the nozzles in another linear axis perpendicular to the said linear axis movable by the pickhead.

3. Apparatus as claimed in claim 1 and claim 2, further comprising a chamber wherein the nozzles are housed.

4. Apparatus as claimed in claim 3, further comprising a slider mechanism for supporting the pickhead on the chamber, the slider mechanism being operative to change a position of the pickhead relative to the nozzles.

5. Apparatus as claimed in claim 4, further comprising a cover adjacent to the slider mechanism for enclosing the chamber and preventing cleaning fluid from jetting out of the chamber.

6. Apparatus as claimed in any one of claims 3 to 5, further comprising a dry air tube located in the chamber that is operative to blow air onto the semiconductor packages on the pickhead to dry them.

7. Apparatus as claimed in claim 6, further comprising a second dry air tube located outside the chamber that is operative to blow air onto the semiconductor packages on the pickhead to dry them.

8. Apparatus as claimed in any one of claims 3 to 7, further comprising a drainage arrangement at a base of the chamber for collecting and draining used cleaning fluid.

9. Apparatus as claimed in any one of the preceding claims, wherein the nozzles are inclined substantially at an angle of 30° to a surface of the pickhead holding the semiconductor packages.

10. Apparatus as claimed in any one of the preceding claims, wherein the plurality of nozzles is arranged in a single row.

11. Apparatus as claimed in any one of the preceding claims, wherein a cross-sectional diameter of the jet of cleaning fluid is between 4mm and 5mm.

12. Apparatus as claimed in claim 1, wherein the jet of cleaning fluid from each nozzle is projected at a flow rate of 0.5 to 1 liter per minute.

13. Apparatus as claimed in any one of the preceding claims, wherein the pickhead is oriented horizontally in use and the semiconductor packages are arranged on a surface of the pickhead facing downwards.

14. Method for cleaning semiconductor packages, comprising the steps of:

providing a pickhead which holds the semiconductor packages in an array arrangement during cleaning;

projecting separate jets of cleaning fluid generated from a plurality of nozzles upwardly against the semiconductor packages;

imparting megasonic energy to the jets of cleaning fluid with a megasonic energy generator during said projection; and

driving relative movement between the plurality of nozzles and the pickhead to direct the said jets to clean the array of semiconductor packages on the pickhead.

15. Method for cleaning semiconductor packages as claimed in claim 14, wherein the step of driving relative movement between the nozzles and the pickhead further comprises the step of driving the pickhead along one linear axis and driving the nozzles in another linear axis perpendicular to the said linear axis movable by the pickhead.

16. Method for cleaning semiconductor packages as claimed in claim 14 or claim 15, wherein the plurality of nozzles is housed in a chamber, the method further comprising the step of drying the semiconductor packages with air blown from a dry air tube located in the chamber.

17. Method for cleaning semiconductor packages as claimed in claim 16, further comprising the step of lifting the pickhead and further drying the semiconductor packages with air blown from a second dry air tube located outside the chamber.

18. Method for cleaning semiconductor packages as claimed in any one of claims 14 to 17, wherein the jets of cleaning fluid are projected towards the pickhead substantially at an angle of 30° to a surface of the pickhead holding the semiconductor packages.

19. Method for cleaning semiconductor packages as claimed in any one of claims 14 to 18, wherein the pickhead is oriented horizontally in use and the semiconductor packages are arranged on a surface of the pickhead facing downwards.

20. Method for cleaning semiconductor packages as claimed in any one of claims 14 to 19, wherein the jets of cleaning fluid are projected from each nozzle at a flow rate of 0.5 to 1 liter per minute.

CLAIMS:

1. Apparatus for cleaning semiconductor packages, comprising:

a chamber having a base;

a pickhead that is constructed and configured to generate a vacuum suction force to hold the semiconductor packages by vacuum suction on a surface of the pickhead in an array arrangement over the chamber, the surface of the pickhead holding the semiconductor packages being oriented to face the base of the chamber;

a plurality of nozzles located in the chamber, each of the nozzles being constructed and arranged to project a separate jet of cleaning fluid upwardly against the semiconductor packages, none of the separate jets overlapping with another separate jet and used cleaning fluid being collected at the base of the chamber;

a megasonic energy generator operable to impart megasonic energy to the cleaning fluid; and

a driving device operable to impart relative two-dimensional movement between the plurality of nozzles and the pickhead so as to direct the separate jets onto every one of the array of packages on the pickhead.

2. Apparatus as claimed in claim 1, wherein the driving device comprises a first linear driving device coupled to the pickhead that is operative to drive the pickhead along one linear axis and second linear driving device coupled to the plurality of nozzles for driving the nozzles in another linear axis perpendicular to the said linear axis movable by the pickhead.

3. Apparatus as claimed in claim 1 or claim 2, further comprising a slider mechanism for supporting the pickhead on the chamber, the slider mechanism being operative to change a position of the pickhead relative to the nozzles.

4. Apparatus as claimed in claim 3, further comprising a cover adjacent to the slider mechanism for enclosing the chamber and preventing cleaning fluid from jetting out of the chamber.

5. Apparatus as claimed in any one of the preceding claims, further comprising a dry air tube located in the chamber that is operative to blow air onto the semiconductor packages on the pickhead to dry them.

6. Apparatus as claimed in claim 5, further comprising a second dry air tube located outside the chamber that is operative to blow air onto the semiconductor packages on the pickhead to dry them.

7. Apparatus as claimed in any one of the preceding claims, further comprising a drainage arrangement at a base of the chamber for collecting and draining used cleaning fluid.

8. Apparatus as claimed in any one of the preceding claims, wherein the nozzles are inclined at an angle of 30° to a surface of the pickhead holding the semiconductor packages.

9. Apparatus as claimed in any one of the preceding claims, wherein the plurality of nozzles is arranged in a single row.

10. Apparatus as claimed in any one of the preceding claims, wherein a cross-sectional diameter of the jet of cleaning fluid is between 4mm and 5mm.

11. Apparatus as claimed in any one of the preceding claims, wherein the jet of cleaning fluid from each nozzle is projected at a flow rate of 0.5 to 1 liter per minute.

12. Apparatus as claimed in any one of the preceding claims, wherein the pickhead is oriented horizontally in use and the semiconductor packages are arranged on a surface of the pickhead facing downwards.

13. Method for cleaning semiconductor packages, comprising the steps of:

providing a chamber having a base;

providing a pickhead which generates a vacuum suction force to holds the semiconductor packages by vacuum suction on a surface of the pickhead in an array arrangement over the chamber, the surface of the pickhead holding the semiconductor packages being oriented to face the base of the chamber during cleaning;

projecting separate jets of cleaning fluid generated from a plurality of nozzles located in the chamber upwardly against the semiconductor packages, none of the separate jets overlapping with another separate jet and collecting used cleaning fluid at the base of the chamber;

imparting megasonic energy to the jets of cleaning fluid with a megasonic energy generator during said projection; and

driving relative two-dimensional movement between the plurality of nozzles and the pickhead so as to direct the separate jets onto every one of the array of semiconductor packages on the pickhead.

14. Method for cleaning semiconductor packages as claimed in claim 13, wherein the step of driving relative movement between the nozzles and the pickhead further comprises the step of driving the pickhead along one linear axis and driving the nozzles in another linear axis perpendicular to the said linear axis movable by the pickhead.

15. Method for cleaning semiconductor packages as claimed in claim 13 or claim 14, wherein the method further comprises the step of drying the semiconductor packages with air blown from a dry air tube located in the chamber.

16. Method for cleaning semiconductor packages as claimed in claim 15, further comprising the step of lifting the pickhead and further drying the semiconductor packages with air blown from a second dry air tube located outside the chamber.

17. Method for cleaning semiconductor packages as claimed in any one of claims 13 to 16, wherein the jets of cleaning fluid are projected towards the pickhead at an angle of 30° to a surface of the pickhead holding the semiconductor packages.

18. Method for cleaning semiconductor packages as claimed in any one of claims 13 to 17, wherein the pickhead is oriented horizontally in use and the semiconductor packages are arranged on a surface of the pickhead facing downwards.

19. Method for cleaning semiconductor packages as claimed in any one of claims 13 to 18, wherein the jets of cleaning fluid are projected from each nozzle at a flow rate of 0.5 to 1 liter per minute.