Claims

1. A foam production unit comprising a chamber, inlet means to said chamber for oxygenated air and liquid, and means for controlling the flow of said oxygenated air and liquid through or from said chamber to thereby create a liquid foam.

2. A foam production unit as claimed in claim 1, wherein the chamber of the foam production unit comprises a mixing chamber in which liquid and oxygenated air supplied to the chamber are mixed.

3. A foam production unit as claimed in claim 1, wherein the inlet means comprises one or more inlets for oxygenated air and one or more inlets for liquid.

4. A foam production unit as claimed in any one of claims 1 to 3, wherein the chamber has one or more outlets and the means for controlling the flow is provided for controlling or restricting flow from the one or more inlets of oxygenated air and liquid to or through the one or more outlets.

5. A foam production unit as claimed in claim 4, wherein the means for controlling flow comprises means in the chamber which provide a controlled directional path for oxygenated air and liquid from the oxygenated air and liquid inlet means to the outlet.

6. A foam production unit as claimed in claim 4 or claim 5, wherein the means for controlling or restricting flow comprises a plurality of discrete elements within the chamber, wherein the discrete elements comprise a plurality of spherical members or members of any other shape.

7. A foam production unit as claimed in claim 6, wherein the discrete elements substantially fill the mixing chamber.

8. A foam production unit as claimed in claim 6, wherein the discrete elements only partially fill the chamber, wherein the discrete elements are free for movement in the chamber so as to mix liquid and oxygenated air in the chamber to enhance liquid foam production.

9. A foam production unit as claimed in any one of the preceding claims, wherein the controlling means within the chamber comprises an organic or other solid permeable material.

10. A foam production unit as claimed in claim 9, wherein the permeable material comprises a solid foam, wherein the solid foam is a flexible open cell solid foam such as an organic or other foam.

11. A foam production unit as claimed in claim 10, wherein the permeable material is any other organic or inorganic material such as fibrous material which has similar flow controlling or restricting properties to foam.

12. A foam production unit as claimed in any one of claims 1 to 5, wherein the one or more outlets from the chamber comprise one or more openings or slots in a wall of the chamber.

13. A foam production unit as claimed in claim 12, wherein the one or more outlets from the chamber are limited such that the oxygenated air and liquid mixed in said chamber can exit from said chamber through the outlet as liquid foam.

14. A foam production unit as claimed in claim 12 or claim 13, wherein the one or more outlets comprise a permeable material or member, wherein the permeable material may comprise a solid foam.

15. A foam production unit as claimed in claim 14, wherein the foam is a flexible open cell solid foam such as an organic or other foam.

16. A foam production unit as claimed in 14, wherein the permeable material is selectively compressed to vary its permeability and thus the foam production.

17. A foam production unit as claimed in claim 14, wherein the one or more outlets comprise a permeable member or wall for example a member or wall having a plurality of fine perforations.

18. A foam production unit as claimed in claim 2, wherein the mixing chamber is defined by an outer elongated housing or tube.

19. A foam production unit as claimed in claim 18, wherein at least one oxygenated air supply tube extends into the mixing chamber for supply of oxygenated air thereto.

20. A foam production unit as claimed in claim 18, wherein at least one liquid supply tube extends into the mixing chamber for supply of liquid thereto.

21. A foam production unit as claimed in caim 19 or claim 20, wherein the oxygenated air supply tubes and liquid supply tubes are formed so as to allow the directional flow of oxygenated air and/or liquid, wherein the tubes have their side walls perforated.

22. A foam production unit as claimed in any one of claims 18 to 21, wherein the outer elongated housing or tube is covered by a layer of permeable material which restricts the passage of liquid and oxygenated air and therefore enhances the production of foam.

23. A foam production unit as claimed in claim 2, wherein the mixing chamber is defined by the annular space between the oxygenated air supply tube and outer housing or chamber and the solution is supplied to the annular space.

24. A foam production unit comprising a nozzle, wherein the nozzle comprises a housing to which liquid and oxygenated air are supplied, the housing having an outlet which is restricted by a solid permeable material, wherein the nozzle controls the flow of said oxygenated air and liquid through or from said foam production unit to thereby create a liquid foam.

25. A foam production unit as claimed in claim 24, wherein the solid permeable material is in the form of a layer of such material.

26 A foam production unit as claimed in claim 24 or claim 25 wherein the permeable material comprises a perforated member.

27. A foam production unit as claimed in any one of the preceding claims, wherein the foam comprises a foam which contains a plant nutrient or nutrients to promote the growth of plants.

28. A method of growing plants using a growing medium which comprises a liquid foam, wherein the liquid foam is formed by one or more of the described apparatus as claimed in claims 1 to 27.

29. An apparatus for growing plants, said apparatus comprising a root chamber or compartment for containing the roots of said plants and means for supplying a liquid foam to said root chamber, wherein the liquid foam contains a plant nutrient or nutrients.

30. An apparatus for growing plants as claimed in claim 29, further comprising a foam production unit for forming the liquid foam from a solution of nutrients and a foaming agent.

31. An apparatus for growing plants as claimed in claim 30, wherein the foaming agent comprises a soluble organic emulsifying concentrate.

32. An apparatus for growing plants, the apparatus comprising:

an elongated chamber in the form of a pipe or tube;

a foam production unit extending inside the elongated chamber;

a plurality of spaced openings in the elongated chamber in which plants to be grown are located; and

wherein the foam production unit provides a liquid foam from a solution of nutrients and a foaming agent, wherein the liquid foam containing the nutrients is supplied to the plants to promote the growth of the plants.

33. An apparatus for growing plants as claimed in claim 32, wherein the foam production unit is located externally of the elongated chamber and the liquid foam is fed inside the chamber by a feed tube extending inside the elongated chamber.

34. An apparatus for growing plants as claimed in claim 32 or claim 33, wherein the elongated chamber may be oriented substantially horizontally or oriented substantially vertically.

35. An apparatus for growing plants as claimed in claim 34 wherein when oriented substantially vertically, the elongated chamber may be defined by a plurality of separate compartments, and the foam production unit extends through and be located within the chamber or compartments.

36. An apparatus for growing plants as claimed in claim 35, wherein the foam production unit is arranged externally with foam from the unit supplied to the respective compartments.

37. An apparatus for growing plants as claimed in any one of claims 32 to 36, wherein the elongated chambers are mounted on a rotatable carousel to be rotatable about a vertical axis.

38. An apparatus for growing plants as claimed in any one of claims 32 to 34, wherein the elongated chambers are mounted on a frame for rotation about a horizontal axis.

39. An apparatus for growing plants as claimed in any one of claims 32 to 38, wherein the elongated chamber is formed in any shape which allows the growth of plants.

40. An apparatus for growing plants comprising:

an open topped tray or compartment;

a foam production unit extending through the tray for supply of foam thereto for promoting the growth of plants.

41. An apparatus for growing plants as claimed in claim 40, wherein the trays are mounted on a rotatable frame for movement about a horizontal axis, wherein a pivot means is provided to support the trays to maintain the trays in a substantially horizontal orientation when rotated.

42. An apparatus for growing plants as claimed in claim 40 or claim 41, wherein the foam production unit is provided in the base of the tray or compartment.

43. An apparatus for growing plants comprising:

a foam producing unit having an axis, a peripheral wall extending about said axis and having axially spaced apart opposite ends, and end walls closing said peripheral wall at said opposite ends, said peripheral wall and said end walls providing said foam producing unit with an interior for receiving an oxygenated air and liquid;

a plurality of shaped projections extending outwardly from the peripheral wall of the foam production unit;

a root chamber comprising a top wall, a bottom wall and side walls enclosing the root chamber and spaced apart end walls, at least one end wall having a complimentary shaped projection to receive the shaped projection extending from the peripheral wall of the foam production unit, said top wall having an opening for receiving a plant; and

a means for controlling the flow of said oxygenated air and liquid through or from said foam producing unit and into said root chamber to thereby create a liquid foam which contains a plant nutrient or nutrients to promote the growth of plants.

44. An apparatus for growing plants as claimed in claim 43, wherein the peripheral wall of said foam producing unit is formed in the shape of a polygon.

45 An apparatus for growing plants as claimed in claim 43, wherein the peripheral wall of said foam producing unit is formed in the shape of a cylinder.

46. An apparatus for growing plants as claimed in claim 43, wherein the shaped projections extending from the peripheral wall are either in the shape of a polygon or a cylinder.

47. An apparatus for growing plants as claimed in any one of claims 43 to 46, wherein the foam production unit further comprises projections extending outwardly from said end walls to receive said oxygenated gas and liquid.

48. An apparatus for growing plants as claimed in claim 47, wherein said projections are used to mount said apparatus for growing plants in a vertical arrangement.

49. An apparatus for growing plants as claimed in claim 47, wherein said projections are mounted into a carousel for rotating the growing apparatus.

50. An apparatus for growing plants as claimed in any one of claims 43 to 49, further comprising at least one reflector mounted to an edge of side of said growing apparatus to reflect light to promote the growth of the plants.

51. An apparatus for growing plants as claimed in ant one of claims 43 to 50, further comprising at least one light source to promote the growth of plants.

52. A foam production method and apparatus as claimed in any one of claims 1 to 28 is also used for producing foam for fire suppression applications or any other applications where liquid foam is required.

53. A foam production method and apparatus as claimed in claim 52, wherein the liquid foam comprises a fire suppressant liquid.

Claims

1. A foam production unit comprising a chamber, inlet means to said chamber for oxygenated air and liquid, and means for controlling the flow of said oxygenated air and liquid through or from said chamber to thereby create a liquid foam.

2. A foam production unit as claimed in claim 1, wherein the chamber of the foam production unit comprises a mixing chamber in which liquid and oxygenated air supplied to the chamber are mixed.

3. A foam production unit as claimed in claim 1 or claim 2, wherein the inlet means comprises one or more inlets for oxygenated air and one or more inlets for liquid, and the chamber has one or more outlets and the means for controlling the flow is provided for controlling or restricting flow from the one or more inlets of oxygenated air and liquid to or through the one or more outlets.

4. A foam production unit as claimed in any one of claims 1 to 3, wherein the means for controlling flow comprises means in the chamber which provide a controlled directional path for oxygenated air and liquid from the oxygenated air and liquid inlet means to the outlet.

5. A foam production unit as claimed in any one of the preceding claims, wherein the means for controlling or restricting flow comprises a plurality of discrete elements within the chamber, wherein the discrete elements comprise a plurality of spherical members or members of any other shape, and the discrete elements substantially fill the mixing chamber.

6. A foam production unit as claimed in claim 5, wherein the discrete elements only partially fill the chamber, therefore the discrete elements are free for movement in the chamber so as to mix liquid and oxygenated air in the chamber to enhance liquid foam production.

7. A foam production unit as claimed in any one of the preceding claims, wherein the controlling means within the chamber comprises an organic or other solid permeable material, the permeable material comprises a solid foam, wherein the solid foam is a flexible open cell solid foam such as an organic or other foam.

8. A foam production unit as claimed in claim 7, wherein the permeable material is any other organic or inorganic material such as fibrous material which has similar flow controlling or restricting properties to foam.

9. A foam production unit as claimed in any one of claims 1 to 4, wherein the one or more outlets from the chamber comprise one or more openings or slots in a wall of the chamber, and are limited such that the oxygenated air and liquid mixed in said chamber can exit from said chamber through the outlet as liquid foam.

10. A foam production unit as claimed in claim 9, wherein the one or more outlets comprise a permeable material or member, wherein the permeable material may comprise a solid foam, and the foam is a flexible open cell solid foam such as an organic or other foam.

11. A foam production unit as claimed in 10, wherein the permeable material is selectively compressed to vary its permeability and thus the foam production.

12. A foam production unit as claimed in claim 10, wherein the one or more outlets comprise a permeable member or wall for example a member or wall having a plurality of fine perforations.

13. A foam production unit as claimed in any one of the preceding claims, wherein the mixing chamber is defined by an outer elongated housing or tube, and the at least one oxygenated air supply tube extends into the mixing

chamber for supply of oxygenated air thereto, and the at least one liquid supply tube extends into the mixing chamber for supply of liquid thereto.

14. A foam production unit as claimed in claim 13, wherein the oxygenated air supply tubes and liquid supply tubes are formed so as to allow the directional flow of oxygenated air and/or liquid, wherein the tubes have their side walls perforated.

15. A foam production unit as claimed in claim 13 or claim 14, wherein the outer elongated housing or tube is covered by a layer of permeable material which restricts the passage of liquid and oxygenated air and therefore enhances the production of foam.

16. A foam production unit as claimed in any one of the preceding claims, wherein the mixing chamber is defined by the annular space between the oxygenated air supply tube and outer housing or chamber and the solution is supplied to the annular space.

17. A foam production unit comprising a nozzle, wherein the nozzle comprises a housing to which liquid and oxygenated air are supplied, the housing having an outlet which is restricted by a solid permeable material, wherein the nozzle controls the flow of said oxygenated air and liquid through or from said foam production unit to thereby create a liquid foam.

18. A foam production unit as claimed in claim 17, wherein the solid permeable material is in the form of a layer of such material.

19 A foam production unit as claimed in claim 17 or claim 18 wherein the permeable material comprises a perforated member.

20. A foam production unit as claimed in any one of the preceding claims, wherein the foam comprises a foam which contains a plant nutrient or nutrients to promote the growth of plants.

21. An apparatus for growing plants comprising:

a foam producing unit having an axis, a peripheral wall extending about said axis and having axially spaced apart opposite ends, and end walls closing said peripheral wall at said opposite ends, said peripheral wall and said end walls providing said foam producing unit with an interior for receiving an oxygenated air and liquid;

a plurality of shaped projections extending outwardly from the peripheral wall of the foam production unit;

a root chamber comprising a top wall, a bottom wall and side walls enclosing the root chamber and spaced apart end walls, at least one end wall having a complimentary shaped projection to receive the shaped projection extending from the peripheral wall of the foam production unit, said top wall having an opening for receiving a plant; and

a means for controlling the flow of said oxygenated air and liquid through or from said foam producing unit and into said root chamber to thereby create a liquid foam which contains a plant nutrient or nutrients to promote the growth of plants.

22. An apparatus for growing plants as claimed in claim 21, wherein the peripheral wall of said foam producing unit is formed in the shape of a polygon.

23. An apparatus for growing plants as claimed in claim 21 or claim 22, wherein the peripheral wall of said foam producing unit is formed in the shape of a cylinder.

24. An apparatus for growing plants as claimed in any one of claims 21 to 23, wherein the shaped projections extending from the peripheral wall are either in the shape of a polygon or a cylinder.

25. An apparatus for growing plants as claimed in any one of claims 21 to 24, wherein the foam production unit further comprises projections extending outwardly from said end walls to receive said oxygenated gas and liquid, and said projections are used to mount said apparatus for growing plants in a vertical arrangement.

26. An apparatus for growing plants as claimed in claim 25, wherein said projections are mounted into a carousel for rotating the growing apparatus.

27. An apparatus for growing plants as claimed in any one of claims 21 to 26, further comprising at least one reflector mounted to an edge of side of said growing apparatus to reflect light to promote the growth of the plants, and at least one light source to promote the growth of plants.

28. A foam production and unit as claimed in any one of claims 1 to 27 also used for producing foam for fire suppression applications or any other applications where liquid foam is required.

29. A foam production unit as claimed in claim 28, wherein the liquid foam comprises a fire suppressant liquid.

30. An apparatus for growing plants as claimed in claim 27, wherein said apparatus comprises a root chamber or compartment for containing the roots of said plants and means for supplying a liquid foam to said root chamber, wherein the liquid foam contains a plant nutrient or nutrients.

31. An apparatus for growing plants as claimed in claim 30, further comprising a foam production unit for forming the liquid foam from a solution of nutrients and a foaming agent, the foaming agent comprises a soluble organic emulsifying concentrate.

32. An apparatus for growing plants, the apparatus comprising:

an elongated chamber in the form of a pipe or tube;

a foam production unit extending inside the elongated chamber;

a plurality of spaced openings in the elongated chamber in which plants to be grown are located; and

wherein the foam production unit provides a liquid foam from a solution of nutrients and a foaming agent, wherein the liquid foam containing the nutrients is supplied to the plants to promote the growth of the plants.

33. An apparatus for growing plants as claimed in claim 32, wherein the foam production unit is located externally of the elongated chamber and the liquid foam is fed inside the chamber by a feed tube extending inside the elongated chamber.

34. An apparatus for growing plants as claimed in claim 32 or claim 33, wherein the elongated chamber may be oriented substantially horizontally or oriented substantially vertically.

35. An apparatus for growing plants as claimed in claim 34 wherein when oriented substantially vertically, the elongated chamber may be defined by a plurality of separate compartments, and the foam production unit extends through and be located within the chamber or compartments, the foam production unit is arranged externally with foam from the unit supplied to the respective compartments.

36. An apparatus for growing plants as claimed in any one of claims 32 to 35, wherein the elongated chambers are mounted on a rotatable carousel to be rotatable about a vertical axis.

37. An apparatus for growing plants as claimed in any one of claims 32 to 34, wherein the elongated chambers are mounted on a frame for rotation about a horizontal axis.

38. An apparatus for growing plants as claimed in any one of claims 32 to 37, wherein the elongated chamber is formed in any shape which allows the growth of plants.

39. An apparatus for growing plants as claimed in claim 38 further comprising an open topped tray or compartment and a foam production unit extending through the tray for supply of foam thereto for promoting the growth of plants.

40. An apparatus for growing plants as claimed in claim 39, wherein the trays are mounted on a rotatable frame for movement about a horizontal axis, wherein a pivot means is provided to support the trays to maintain the trays in a substantially horizontal orientation when rotated.

41. An apparatus for growing plants as claimed in claim 40, wherein the foam production unit is provided in the base of the tray or compartment.