CLAIMS:

1. A ballast tank for a marine vessel comprising gas lift pump apparatus, the apparatus comprising a column through which a liquid medium is arranged to be pumped by gas lift, the apparatus comprising a fluid delivery device for delivering a flow of a gaseous fluid into the liquid medium, the device comprising means for generating ultrasonic energy therein by the flow of gaseous fluid therethrough, the device being arranged to launch the ultrasonic energy into the liquid medium in the column.

2. A tank as claimed in claim 1 wherein gaseous fluid flowing through the fluid delivery device is arranged to pass into the column of the gas lift pump apparatus thereby to cause pumping of the liquid medium through the column.

3. A tank as claimed in claim 1 or claim 2 wherein the column provides a conduit through which liquid medium is pumped, the conduit having at least one aperture provided in a wall thereof to allow liquid medium to flow out from the column thereby to allow recirculation of liquid medium in a volume of liquid medium in which the apparatus may be provided.

4. A tank as claimed in any preceding claim wherein the apparatus is operable to kill aquatic nuisance species (ANS) present in the liquid by means of the ultrasonic energy generated by the device.

5. A tank as claimed in any preceding claim wherein the means for generating ultrasonic energy comprises a resonance chamber, the fluid delivery device being operable to excite the resonance chamber at a resonant frequency of the apparatus due to flow of the gaseous fluid through the device thereby to launch the ultrasonic energy into the liquid medium in the column, the resonance chamber being provided with a receptor member, the receptor member being arranged to receive and deflect a flow of the gaseous fluid thereby to generate pressure waves in the gaseous fluid.

6. A tank as claimed in claim 5 wherein the receptor member is provided by at least a portion of a wall of the resonance chamber.

7. A tank as claimed in claim 5 or claim 6 wherein the receptor member is provided by a member within the resonance chamber.

8. A tank as claimed in claim 5 wherein the receptor member is provided on an outside of the resonance chamber.

9. A tank as claimed in any one of claims 5 to 8 wherein the receptor member comprises a cupped portion, the device being arranged to direct a flow of gaseous fluid into the cupped portion of the receptor member, the receptor member being arranged in turn to redirect the flow of gaseous fluid out from the cupped portion.

10. A tank as claimed in any one of claims 5 to 9 operable wherein impingement of gaseous fluid on the receptor member causes heating of the receptor member.

11. A tank as claimed in claim 10 operable wherein heating of the receptor member is arranged to cause heating of the liquid medium.

12. A tank as claimed in any one of claims 5 to 11 wherein the receptor member is in thermal communication with a surface of the device that is in turn arranged to be in thermal communication with the liquid medium.

13. A tank as claimed in in any one of claims 5 to 11 wherein the apparatus comprises a nozzle member, the nozzle member being arranged to deliver the flow of gaseous fluid into the receptor member.

14. A tank as claimed in claim 13 wherein the apparatus is operable to cause an ultrasonic standing wave to be established between the nozzle member and the receptor member.

15. A tank as claimed in any preceding claim wherein the apparatus is operable to change a resonant frequency of the device from a first value to a second value.

16. A tank as claimed in claim 15 depending through claim 13 wherein the apparatus is operable to change the resonant frequency of the device by changing a position of the receptor member with respect to the nozzle member.

17. A tank as claimed in any preceding claim wherein the apparatus is provided with amplification means for increasing an amplitude of the ultrasonic energy launched into the medium.

18. A tank as claimed in claim 17 wherein the amplification means comprises means for reducing a mismatch between an impedance of the fluid delivery device and an impedance of the liquid medium.

19. A tank as claimed in claim 17 or 18 wherein the amplification means comprises an amplification chamber, the amplification chamber being acoustically coupled to the device.

20. A tank as claimed in claim 19 wherein the amplification chamber comprises a gas filled chamber.

21. A tank as claimed in claim 19 or 20 wherein the amplification chamber has a cross-sectional area that increases as a function of distance from the device.

22. A tank as claimed in any one of claims 19 to 21 wherein the amplification chamber has a substantially tapered cross-section.

23. A tank as claimed in any one of claims 19 to 22 wherein the amplification chamber has a substantially conical shape.

24. A tank as claimed in any one of claims 19 to 23 wherein the amplification chamber has a substantially frusto-conical shape.

25. A tank as claimed in any one of claims 19 to 24 wherein at least one wall of the amplification chamber comprises a resiliently flexible membrane arranged to transmit at least a portion of the ultrasonic energy into the liquid medium.

26. A tank as claimed in claim 25 wherein the resiliently flexible membrane comprises at least one selected from amongst a metallic material and a polymer.

27. A tank as claimed in any preceding claim wherein the fluid delivery device is arranged to be provided in a flowstream of the liquid medium through the column, the device having an upstream portion and a downstream portion.

28. A tank as claimed in claim 27 wherein the downstream portion is tapered thereby to reduce an amount of drag experienced by the device in the flowstream.

29. A tank as claimed in claim 27 or 28 depending through claim 5 wherein the receptor member is provided upstream of the downstream portion of the device.

30. A tank as claimed in any one of claims 27 to 29 depending through claim 17 wherein the amplification means is arranged to direct the ultrasonic energy away from the downstream portion of the device.

31. A tank as claimed in any one of claims 27 to 30 depending through claim 17 wherein the amplification means is provided upstream of the downstream portion.

32. A tank as claimed in any one of claims 27 to 31 depending through claim 5 wherein the resonance chamber is arranged to contain liquid medium.

33. A tank as claimed in claim 32 wherein the resonance chamber is arranged to provide a conduit for flow of liquid medium therethrough.

34. A tank as claimed in claim 33 wherein the resonance chamber is provided by a portion of a length of the column.

35. A tank as claimed in any preceding claim wherein an aperture is provided through which gaseous fluid passes from the device into the liquid medium, the device being operable to generate ultrasonic energy by passage of the gaseous fluid through the aperture.

36. A tank as claimed in any preceding claim wherein the apparatus is provided in combination with a microbubble generator, the microbubble generator being arranged to generate microbubbles of gas in the liquid medium, the apparatus being operable to direct a flow of microbubbles entrained in the liquid medium towards the fluid delivery device.

37. A tank as claimed in claim 36 wherein the microbubble generator is arranged to generate microbubbles upstream of the fluid delivery device.

38. A tank as claimed in claim 36 or 37 wherein the microbubble generator is arranged to deliver microbubbles within the column of the apparatus.

39. A tank as claimed in any one of claims 36 to 38 wherein the generator comprises a venturi portion through which the liquid medium is forced to flow, the venturi portion having a converging section, a throat section and a diverging section.

40. A tank as claimed in any one of claims 36 to 39 arranged to provide a flow of the liquid medium into the venturi in the form of a vortex thereby to generate microbubbles in the liquid medium.

41. A tank as claimed in any one of claims 36 to 40 arranged to generate a flow of liquid medium into the venturi in the form of a vortex by injecting a flow of liquid medium into the column of the apparatus.

42. A tank as claimed in any one of claims 36 to 41 arranged to generate a flow of liquid medium into the venturi in the form of a vortex by injecting a flow of liquid medium into the column of the apparatus in a direction substantially tangential to an inner surface of the column.

43. A tank as claimed in any one of claims 36 to 42 arranged to generate microbubbles having a diameter in the range of at least one selected from amongst from around 1 micron to around 1000 microns, around 1 micron to around 500 microns, around 1 micron to around 100 microns, around 1 micron to around 10microns and around 10 microns to around 100 microns.

44. A vessel having a ballast tank as claimed in any preceding claim.

45. A method of treatment of a liquid medium comprising:

pumping the liquid medium through a column of a gas lift pump by means of gas lift;

generating ultrasonic energy in a fluid delivery device by passing gaseous fluid through the device; and

launching the ultrasonic energy into the liquid medium within the column,

whereby the method comprises treating ballast water of a vessel in a ballast tank of the vessel.

46. A method as claimed in claim 45 comprising pumping the liquid medium through the column by means of the gaseous fluid that passes through the fluid delivery device.

47. A method as claimed in claim 45 or 46 further comprising circulating by means of the apparatus liquid medium passing through the column within a liquid medium storage tank in which the column is provided.

48. A method as claimed in claim 47 wherein the column is provided with at least one aperture in a sidewall thereof, the method comprising circulating liquid medium in the storage tank by pumping the liquid medium through the column and out from the column through the at least one aperture.

49. A method as claimed in any one of claims 45 to 48 comprising the step of killing aquatic nuisance species (ANS) present in the liquid medium by means of the ultrasonic energy generated by the device.

50. A method as claimed in any one of claims 45 to 49 comprising increasing a concentration of the gaseous fluid in the liquid medium to a level sufficiently high to cause death of at least one ANS present in the liquid medium.

51. A method as claimed in claim 50 comprising increasing a concentration of the gaseous fluid in the liquid medium thereby to cause a decrease in a concentration of a further gaseous fluid in the liquid medium thereby to cause death of at least one ANS present in the liquid medium.

52. A method as claimed in any one of claims 45 to 51 whereby the gaseous fluid comprises an inert gas.

53. A method as claimed in any one of claims 45 to 52 whereby the gaseous fluid comprises at least one selected from amongst carbon dioxide, nitrogen and oxygen.

54. A method as claimed in any one of claims 45 to 53 whereby the gaseous fluid substantially comprises carbon dioxide, nitrogen and oxygen.

55. A method as claimed in any one of claims 45 to 54 whereby the gaseous fluid consists essentially of carbon dioxide, nitrogen and oxygen.

56. A method as claimed in any one of claims 45 to 55 whereby the gaseous fluid consists essentially of carbon dioxide.

57. A method as claimed in any one of claims 45 to 56 whereby the gaseous fluid comprises combustion gases.

58. A method as claimed in claim 57 whereby the gaseous fluid comprises combustion gases from one selected from amongst an inert gas generator and an engine of a vessel.

59. A method as claimed in any one of claims 45 to 58 comprising producing microbubbles of gaseous fluid in the liquid medium and launching the ultrasonic energy into the liquid medium containing the microbubbles.

60. A method as claimed in claim 59 comprising the step of trapping aquatic nuisance species present in the liquid medium in or on a microbubble.

61. A method as claimed in claim 60 comprising killing ANS trapped in or on a microbubble by means of the ultrasonic energy.

62. A method as claimed in any one of claims 59 to 61 comprising the step of generating microbubbles of gaseous fluid in the liquid medium, the microbubbles having a diameter in the range of at least one selected from amongst from around 1 micron to around 1000 microns, around 1 micron to around 500 microns, around 1 micron to around 100 microns, around 1 micron to around 10microns and around 10 microns to around 100 microns,

63. A method of killing aquatic nuisance species (ANS) in a ballast tank of a vessel comprising the steps of:

pumping a liquid medium through a column of a gas lift pump by means of gas lift;

providing a flow of a gaseous fluid through a fluid delivery device, the device being arranged wherein the flow of gaseous fluid through the device causes the device to launch ultrasonic energy into the liquid medium thereby to kill ANS therein, the method comprising killing ANS by means of the ultrasonic energy.

64. A method as claimed in claim 63 whereby the gaseous fluid comprises an inert gas.

65. A method as claimed in claim 63 or 64 whereby the gaseous fluid comprises at least one selected from amongst carbon dioxide, nitrogen and oxygen.

66. A method as claimed in any one of claims 63 to 65 whereby the gaseous fluid substantially comprises carbon dioxide, nitrogen and oxygen.

67. A method as claimed in any one of claims 63 to 66 whereby the gaseous fluid consists essentially of carbon dioxide, nitrogen and oxygen.

68. A method as claimed in any one of claims 63 to 67 whereby the gaseous fluid is carbon dioxide.

69. A method as claimed in any one of claims 63 to 68, the gaseous fluid being selected whereby increasing a concentration of the gaseous fluid in the liquid medium by means of the apparatus causes death of aquatic nuisance species.

70. A method as claimed in claim 69 whereby increasing a concentration of the gaseous fluid in the liquid medium by means of the apparatus causes a reduction in a concentration of at least one chemical species in the liquid medium.

71. A method as claimed in any one of claims 63 to 70 comprising generating ultrasonic energy in the liquid medium by passage of gaseous fluid through an aperture from the device into the liquid medium.

72. A method as claimed in any one of claims 63 to 71 further comprising producing microbubbles in the liquid medium and launching the ultrasonic energy into the liquid medium containing the microbubbles.

73. A method as claimed in claim 72 comprising trapping ANS present in the liquid medium in or on a microbubble.

74. A method as claimed in claim 73 comprising killing the ANS by means of the ultrasonic energy.

AMENDED CLAIMS
received by the International Bureau on 30 November 2011 (30.11.2011)

CLAIMS:

1. Gas lift pump apparatus comprising a column through which a liquid medium may be pumped by gas lift, the apparatus comprising a fluid delivery device for delivering a flow of a gaseous fluid into the liquid medium, the device comprising means for generating ultrasonic energy therein by the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium in the column.

2. Apparatus as claimed in claim 1 wherein gaseous fluid flowing through the fluid delivery device is arranged to pass into the column of the gas lift pump apparatus thereby to cause pumping of the liquid medium through the column.

3. Apparatus as claimed in claim 1 or claim 2 wherein the column provides a conduit through which liquid medium is pumped, the conduit having at least one aperture provided in a wall thereof to allow liquid medium to flow out from the column thereby to allow recirculation of liquid medium in a volume of liquid medium in which the apparatus may be provided.

4. Apparatus as claimed in any preceding claim operable to kill aquatic nuisance species (ANS) present in the liquid by means of the ultrasonic energy generated by the device.

5. Apparatus as claimed in any preceding claim wherein the means for generating ultrasonic energy comprises a resonance chamber, the fluid delivery device being operable to excite the resonance chamber at a resonant frequency of the apparatus due to flow of the gaseous fluid through the device thereby to launch the ultrasonic energy into the liquid medium in the column, the resonance chamber being provided with a receptor member, the receptor member being arranged to receive and deflect a flow of the gaseous fluid thereby to generate pressure waves in the gaseous fluid.

6. Apparatus as claimed in claim 5 wherein the receptor member is provided by at least a portion of a wall of the resonance chamber.

7. Apparatus as claimed in claim 5 or claim 6 wherein the receptor member is provided by a member within the resonance chamber.

8. Apparatus as claimed in claim 5 wherein the receptor member is provided on an outside of the resonance chamber.

9. Apparatus as claimed in any one of claims 5 to 8 wherein the receptor member comprises a cupped portion, the device being arranged to direct a flow of gaseous fluid into the cupped portion of the receptor member, the receptor member being arranged in turn to redirect the flow of gaseous fluid out from the cupped portion.

10. Apparatus as claimed in any one of claims 5 to 9 operable wherein impingement of gaseous fluid on the receptor member causes heating of the receptor member.

11. Apparatus as claimed in claim 10 operable wherein heating of the receptor member is arranged to cause heating of the liquid medium.

12. Apparatus as claimed in any one of claims 5 to 11 wherein the receptor member is in thermal communication with a surface of the device that is in turn arranged to be in thermal communication with the liquid medium.

13. Apparatus as claimed in in any one of claims 5 to 11 comprising a nozzle member, the nozzle member being arranged to deliver the flow of gaseous fluid into the receptor member.

14. Apparatus as claimed in claim 13 operable to cause an ultrasonic standing wave to be established between the nozzle member and the receptor member.

15. Apparatus as claimed in any preceding claim operable to change a resonant frequency of the device from a first value to a second value.

16. Apparatus as claimed in claim 15 depending through claim 13 operable to change the resonant frequency of the device by changing a position of the receptor member with respect to the nozzle member.

17. Apparatus as claimed in any preceding claim provided with amplification means for increasing an amplitude of the ultrasonic energy launched into the medium.

18. Apparatus as claimed in claim 17 wherein the amplification means comprises means for reducing a mismatch between an impedance of the fluid delivery device and an impedance of the liquid medium.

19. Apparatus as claimed in claim 17 or 18 wherein the amplification means comprises an amplification chamber, the amplification chamber being acoustically coupled to the device.

20. Apparatus as claimed in claim 19 wherein the amplification chamber comprises a gas filled chamber.

21. Apparatus as claimed in claim 19 or 20 wherein the amplification chamber has a cross-sectional area that increases as a function of distance from the device.

22. Apparatus as claimed in any one of claims 19 to 21 wherein the amplification chamber has a substantially tapered cross-section.

23. Apparatus as claimed in any one of claims 19 to 22 wherein the amplification chamber has a substantially conical shape.

24. Apparatus as claimed in any one of claims 19 to 23 wherein the amplification chamber has a substantially frusto-conical shape.

25. Apparatus as claimed in any one of claims 19 to 24 wherein at least one wall of the amplification chamber comprises a resiliently flexible membrane arranged to transmit at least a portion of the ultrasonic energy into the liquid medium.

26. Apparatus as claimed in claim 25 wherein the resiliently flexible membrane comprises at least one selected from amongst a metallic material and a polymer.

27. Apparatus as claimed in any preceding claim wherein the fluid delivery device is arranged to be provided in a flowstream of the liquid medium through the column, the device having an upstream portion and a downstream portion.

28. Apparatus as claimed in claim 27 wherein the downstream portion is tapered thereby to reduce an amount of drag experienced by the device in the flowstream.

29. Apparatus as claimed in claim 27 or 28 depending through claim 5 wherein the receptor member is provided upstream of the downstream portion of the device.

30. Apparatus as claimed in any one of claims 27 to 29 depending through claim 17 wherein the amplification means is arranged to direct the ultrasonic energy away from the downstream portion of the device.

31. Apparatus as claimed in any one of claims 27 to 30 depending through claim 17 wherein the amplification means is provided upstream of the downstream portion.

32. Apparatus as claimed in any one of claims 27 to 31 depending through claim 5 wherein the resonance chamber is arranged to contain liquid medium.

33. Apparatus as claimed in claim 32 wherein the resonance chamber is arranged to provide a conduit for flow of liquid medium therethrough.

34. Apparatus as claimed in claim 33 wherein the resonance chamber is provided by a portion of a length of the column.

35. Apparatus as claimed in any preceding claim wherein an aperture is provided through which gaseous fluid passes from the device into the liquid medium, the device being operable to generate ultrasonic energy by passage of the gaseous fluid through the aperture.

36. Apparatus as claimed in any preceding claim in combination with a microbubble generator, the microbubble generator being arranged to generate microbubbles of gas in the liquid medium, the apparatus being operable to direct a flow of microbubbles entrained in the liquid medium towards the fluid delivery device.

37. Apparatus as claimed in claim 36 wherein the microbubble generator is arranged to generate microbubbles upstream of the fluid delivery device.

38. Apparatus as claimed in claim 36 or 37 wherein the microbubble generator is arranged to deliver microbubbles within the column of the apparatus.

39. Apparatus as claimed in any one of claims 36 to 38 wherein the generator comprises a venturi portion through which the liquid medium is forced to flow, the venturi portion having a converging section, a throat section and a diverging section.

40. Apparatus as claimed in any one of claims 36 to 39 arranged to provide a flow of the liquid medium into the venturi in the form of a vortex thereby to generate microbubbles in the liquid medium.

41. Apparatus as claimed in any one of claims 36 to 40 arranged to generate a flow of liquid medium into the venturi in the form of a vortex by injecting a flow of liquid medium into the column of the apparatus.

42. Apparatus as claimed in any one of claims 36 to 41 arranged to generate a flow of liquid medium into the venturi in the form of a vortex by injecting a flow of liquid medium into the column of the apparatus in a direction substantially tangential to an inner surface of the column.

43. Apparatus as claimed in any one of claims 36 to 42 arranged to generate microbubbles having a diameter in the range of at least one selected from amongst from around 1 micron to around 1000 microns, around 1 micron to around 500 microns, around 1 micron to around 100 microns, around 1 micron to around 10microns and around 10 microns to around 100 microns.

44. A liquid storage tank comprising apparatus as claimed in any preceding claim.

45. A ballast tank for a marine vessel comprising apparatus as claimed in any one of claims 1 to 43.

46. A vessel having a ballast tank comprising apparatus as claimed in any one of claims 1 to 43.

47. A method of treatment of a liquid medium comprising:

pumping the liquid medium through a column of a gas lift pump by means of gas lift;

generating ultrasonic energy in a fluid delivery device by passing gaseous fluid through the device; and

launching the ultrasonic energy into the liquid medium within the column.

48. A method as claimed in claim 47 comprising pumping the liquid medium through the column by means of the gaseous fluid that passes through the fluid delivery device.

49. A method as claimed in claim 47 or 48 further comprising circulating by means of the apparatus liquid medium passing through the column within a liquid medium storage tank in which the column is provided.

50. A method as claimed in claim 49 wherein the column is provided with at least one aperture in a sidewall thereof, the method comprising circulating liquid medium in the storage tank by pumping the liquid medium through the column and out from the column through the at least one aperture.

51. A method as claimed in any one of claims 47 to 50 comprising the step of killing aquatic nuisance species (ANS) present in the liquid medium by means of the ultrasonic energy generated by the device.

52. A method as claimed in any one of claims 47 to 51 comprising increasing a concentration of the gaseous fluid in the liquid medium to a level sufficiently high to cause death of at least one ANS present in the liquid medium.

53. A method as claimed in claim 52 comprising increasing a concentration of the gaseous fluid in the liquid medium thereby to cause a decrease in a concentration of a further gaseous fluid in the liquid medium thereby to cause death of at least one ANS present in the liquid medium.

54. A method as claimed in any one of claims 47 to 53 whereby the gaseous fluid comprises an inert gas.

55. A method as claimed in any one of claims 47 to 54 whereby the gaseous fluid comprises at least one selected from amongst carbon dioxide, nitrogen and oxygen.

56. A method as claimed in any one of claims 47 to 55 whereby the gaseous fluid substantially comprises carbon dioxide, nitrogen and oxygen.

57. A method as claimed in any one of claims 47 to 56 whereby the gaseous fluid consists essentially of carbon dioxide, nitrogen and oxygen.

58. A method as claimed in any one of claims 47 to 57 whereby the gaseous fluid consists essentially of carbon dioxide.

59. A method as claimed in any one of claims 47 to 58 whereby the gaseous fluid comprises combustion gases.

60. A method as claimed in claim 59 whereby the gaseous fluid comprises combustion gases from one selected from amongst an inert gas generator and an engine of a vessel.

61. A method as claimed in any one of claims 47 to 60 comprising producing microbubbles of gaseous fluid in the liquid medium and launching the ultrasonic energy into the liquid medium containing the microbubbles.

62. A method as claimed in claim 61 comprising the step of trapping aquatic nuisance species present in the liquid medium in or on a microbubble.

63. A method as claimed in claim 62 comprising killing ANS trapped in or on a microbubble by means of the ultrasonic energy.

64. A method as claimed in any one of claims 61 to 63 comprising the step of generating microbubbles of gaseous fluid in the liquid medium, the microbubbles having a diameter in the range of at least one selected from amongst from around 1 micron to around 1000 microns, around 1 micron to around 500 microns, around 1 micron to around 100 microns, around 1 micron to around 10microns and around 10 microns to around 100 microns,

65. A method as claimed in any one of claims 47 to 64 comprising treating ballast water of a vessel.

66. A method as claimed in any one of claims 47 to 65 comprising treating ballast water of a vessel onboard the vessel.

67. A method as claimed in any one of claims 47 to 66 comprising treating ballast water of a vessel in a ballast tank of the vessel.

68. A method of killing aquatic nuisance species (ANS) comprising the steps of:
providing a flow of a gaseous fluid through a fluid delivery device, the device being arranged wherein the flow of gaseous fluid through the device causes the device to launch ultrasonic energy into the liquid medium thereby to kill ANS therein, the method comprising killing ANS by means of the ultrasonic energy.

69. A method as claimed in claim 68 whereby the gaseous fluid comprises an inert gas.

70. A method as claimed in claim 68 or 69 whereby the gaseous fluid comprises at least one selected from amongst carbon dioxide, nitrogen and oxygen.

71. A method as claimed in any one of claims 68 to 70 whereby the gaseous fluid substantially comprises carbon dioxide, nitrogen and oxygen.

72. A method as claimed in any one of claims 68 to 71 whereby the gaseous fluid consists essentially of carbon dioxide, nitrogen and oxygen.

73. A method as claimed in any one of claims 68 to 72 whereby the gaseous fluid is carbon dioxide.

74. A method as claimed in any one of claims 66 to 71, the gaseous fluid being selected whereby increasing a concentration of the gaseous fluid in the liquid medium by means of the apparatus causes death of aquatic nuisance species.

75. A method as claimed in claim 74 whereby increasing a concentration of the gaseous fluid in the liquid medium by means of the apparatus causes a reduction in a concentration of at least one chemical species in the liquid medium.

76. A method as claimed in any one of claims 68 to 75 comprising generating ultrasonic energy in the liquid medium by passage of gaseous fluid through an aperture from the device into the liquid medium.

77. A method as claimed in any one of claims 68 to 76 further comprising producing microbubbles in the liquid medium and launching the ultrasonic energy into the liquid medium containing the microbubbles.

78. A method as claimed in claim 77 comprising trapping ANS present in the liquid medium in or on a microbubble.

79. A method as claimed in claim 78 comprising killing the ANS by means of the ultrasonic energy.

80. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium.

81. A device as claimed in claim 80 wherein the means for generating ultrasonic energy comprises a resonance chamber, the device being operable to excite the resonance chamber at a resonant frequency of the apparatus due to flow of the gaseous fluid through the device thereby to launch the ultrasonic energy into the liquid medium.

82. A device as claimed in claim 81 wherein the resonance chamber is provided with a receptor member, the receptor member being arranged to receive and deflect a flow of the gaseous fluid thereby to generate pressure waves in the gaseous fluid.

83. A device as claimed in claim 82 wherein the receptor member is provided by at least a portion of a wall of the resonance chamber.

84. A device as claimed in claim 82 or claim 83 wherein the receptor member is provided by a member within the resonance chamber.

85. A device as claimed in any one of claims 81 to 84 operable to cause the gaseous fluid to pass into the resonance chamber thereby to excite resonance of the resonance chamber.

86. A device as claimed in claim 82 or claim 83 wherein the receptor member is provided on an outside of the resonance chamber.

87. A device as claimed in claim 82 or any one of claims 83 to 86 depending through claim 85 wherein the receptor member comprises a cupped portion, the device being arranged to direct a flow of gaseous fluid into the cupped portion of the receptor member, the receptor member being arranged in turn to redirect the flow of gaseous fluid out from the cupped portion.

88. A device as claimed in claim 82 or any one of claims 83 to 87 depending through claim 3 operable wherein impingement of gaseous fluid on the receptor member causes heating of the receptor member.

89. A device as claimed in claim 88 operable wherein heating of the receptor member is arranged to cause heating of the liquid medium.

90. A device as claimed in claim 82 or any one of claims 83 to 89 depending through claim 85 wherein the receptor member is in thermal communication with a surface of the device that is in turn in thermal communication with the liquid medium.

91. A device as claimed in claim 82 or any one of claims 83 to 90 depending through claim 82 comprising a nozzle member, the nozzle member being arranged to deliver the flow of gaseous fluid into the receptor member.

92. A device as claimed in claim 91 operable to cause an ultrasonic standing wave to be established between the nozzle member and the receptor member.

93. A device as claimed in any one of claims 80 to 92 operable to change a resonant frequency of the device from a first value to a second value.

94. A device as claimed in claim 93 depending through claim 82 operable to change the resonant frequency of the device by changing a position of the receptor member.

95. A device as claimed in claim 94 depending through claim 91 operable to change the resonant frequency of the device by changing a position of the receptor member with respect to the nozzle member.

96. A device as claimed in any one of claims 80 to 95 provided with amplification means for increasing an amplitude of the ultrasonic energy launched into the medium.

97. A device as claimed in claim 96 wherein the amplification means comprises means for reducing a mismatch between an impedance of the device and an impedance of the liquid medium.

98. A device as claimed in claim 96 or 97 wherein the amplification means comprises an amplification chamber, the amplification chamber being acoustically coupled to the device.

99. A device as claimed in claim 98 wherein the amplification chamber comprises a gas filled chamber.

100. A device as claimed in claim 98 or 99 wherein the amplification chamber has a cross-sectional area that increases as a function of distance from the device.

101. A device as claimed in any one of claims 98 to 100 wherein the amplification chamber has a substantially tapered cross-section.

102. A device as claimed in any one of claims 98 to 101 wherein the amplification chamber has a substantially conical shape.

103. A device as claimed in any one of claims 98 to 102 wherein the amplification chamber has a substantially frusto-conical shape.

104. A device as claimed in any one of claims 98 to 103 wherein at least one wall of the amplification chamber comprises a resiliently flexible membrane arranged to transmit at least a portion of the ultrasonic energy into the liquid medium.

105. A device as claimed in claim 104 wherein the resiliently flexible membrane comprises at least one selected from amongst a metallic material and a polymer.

106. A device as claimed in any one of claims 80 to 105 arranged to be provided in a flowstream of the liquid medium, the device having an upstream portion and a downstream portion.

107. A device as claimed in claim 106 wherein the downstream portion is tapered thereby to reduce an amount of drag experienced by the device in the flowstream.

108. A device as claimed in claim 106 or 107 depending through claim 85 wherein the receptor member is provided upstream of a downstream portion of the device.

109. A device as claimed in any one of claims 106 to 108 depending through claim 99 wherein the amplification means is arranged to direct the ultrasonic energy away from the downstream portion.

110. A device as claimed in any one of claims 106 to 109 depending through claim 96 wherein the amplification means is provided upstream of the downstream portion.

111. A device as claimed in claim 106 or any one of claims 107 to 110 depending through claim 106 wherein the resonance chamber is arranged to contain liquid medium.

112. A device as claimed in claim 111 wherein the resonance chamber is arranged to provide a conduit for flow of liquid medium therethrough.

113. A device as claimed in any one of claims 80 to 112 operable to kill aquatic nuisance species in the liquid medium by means of the ultrasonic energy.

114. A device as claimed in any one of claims 80 to 113 wherein an aperture is provided through which gaseous fluid passes from the device into the liquid medium, the device being operable to generate ultrasonic energy by passage of the gaseous fluid through the aperture.

115. A liquid storage tank comprising a fluid delivery device as claimed in any one of claims 80 to 114.

116. A ballast tank for a marine vessel comprising a fluid delivery device as claimed in any one of claims 80 to 114.

117. A vessel having a ballast tank comprising a fluid delivery device as claimed in any one of claims 80 to 114.

118. A fluid delivery device substantially as hereinbefore described with reference to the accompanying drawings.

119. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

120. A method substantially as hereinbefore described with reference to the accompanying drawings.

121. A liquid storage tank substantially as hereinbefore described with reference to the accompanying drawings.

122. A ballast tank for a marine vessel substantially as hereinbefore described with reference to the accompanying drawings.

123. A vessel substantially as hereinbefore described with reference to the accompanying drawings.

124. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium,

wherein at the nozzle exit the high velocity air (~300m/sec) forms a jet into the Resonance Chamber.

125. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium,

wherein the distance between the Nozzle tip and the Resonance Chamber sets the frequency generated.

126. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the

flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium,

wherein as the Ultrasonic Energy is produced in air, at a pre-determined specific frequency it is then easily transferred into the water surrounding the device.

127. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium,

wherein the excess air is vented to avoid over pressurising the device.

128. A fluid delivery device for delivering a flow of a gaseous fluid into a liquid medium, the device comprising means for generating ultrasonic energy therein under the flow of gaseous fluid therethrough, the device being operable to launch the ultrasonic energy into the liquid medium,

wherein the Ultrasonic Energy that is produced is tunable to the most effective frequency.