CLAIMS

What is claimed is:

1. A spray device, comprising:

a liquid container including a first chamber operable to retain a first liquid and a second chamber operable to retain a second liquid;

a first pump in fluid communication with the first chamber operable to aspirate and retain the first liquid;

a second pump in fluid communication with the second chamber operable to aspirate and retain the second liquid;

a plurality of mixing spaces fluidly coupled to the first pump and the second pump and operable to allow mixing of the first liquid and the second liquid; and

a nozzle fluidly coupled to the plurality of mixing spaces.

2. The spray device of claim 1, wherein the plurality of mixing spaces is substantially empty between each actuation of the pumps.

3. The spray device of claim 1, wherein the plurality of mixing spaces includes:

a first mixing space; and

a second mixing space fluidly coupled between the first mixing space and the nozzle.

4. The spray device of claim 1, further comprising a connecting plate including a first inlet, a second inlet, a central abutment, an inner perimeter wall defining at least a part of a first mixing space, and an outer perimeter wall.

5. The spray device of claim 3, wherein the first mixing space is fluidly coupled to a first outlet from the first pump and a second outlet from the second pump.

6. The spray device of claim 3, wherein the plurality of mixing spaces further includes a nozzle mixing space comprising a vortex tip of the nozzle.

7. The spray device of claim 1, further comprising a connecting plate having a recess at least partially defining the first mixing space and openings fluidly coupling the first pump and the second pump to the first mixing space.

8. The spray device of claim 1, further comprising:
a post including:
a plurality of nozzle grooves; and
a plurality of channel-forming protrusions fluidly coupling a first mixing space to a second mixing space.

9. The spray device of claim 1, further comprising a top housing including:
a nozzle opening; and
defining:
a portion of a second mixing space; and
a portion of a nozzle mixing space.

10. The spray device of claim 1, further comprising a cap operable to be coupled to a top housing.

11. The spray device of claim 1, further comprising:
a pump housing coupled between: the liquid container, and an outlet tube of the first pump and an outlet tube of the second pump;
a first pump fitting configured to retain the first pump;
a second pump fitting configured to retain the second pump;
a base operable to connect to a connecting tongue of the liquid container; and
a collar.

12. The spray device of claim 1, further comprising a gasket coupled between the liquid container and a pump housing.

13. The spray device of claim 1, wherein the liquid container further comprises:
a divider separating the first chamber and the second chamber;
an outer housing;

a bottom forming a bottom of the first chamber and the bottom of the second chamber;

a connecting tongue operable to connect to a base of a pump housing.

14. The spray device of claim 1, wherein:

the first pump comprises:

a first inlet tube in fluid communication with the first chamber, wherein the first inlet tube includes a first inlet, a first piston, a first spring, and a first ball valve; and

a first outlet tube including a first outlet fluidly coupled to the first mixing space; and

the second pump comprises:

a second inlet tube in fluid communication with the second chamber, wherein the second inlet tube includes a second inlet, a second piston, a second spring, and a second ball valve; and

a second outlet tube including a second outlet fluidly coupled to the first mixing space.

15. The spray device of claim 1, wherein:

a tip portion of the top housing is configured to spray at an angle ranging from 0° to 90° relative to a flow path out of the second mixing space; or

the nozzle is configured to spray a predetermined pattern of liquid including one or more of a hollow cone, a full cone, a spiral cone, a solid stream, a mist, a fog, a flat fan, or combinations thereof.

16. The spray device of claim 1, wherein a viscosity of the first liquid or the second liquid, or a combination thereof is from 0.1 centipoise (cP) to 10,000 cP.

17. The spray device of claim 1, wherein:

a volume of the first chamber is from 1 ml to 100 ml; or

a volume of the second chamber is from 1 ml to 100 ml.

18. The spray device of claim 1, wherein a ratio of a volume of the first chamber a volume of the second chamber is from 1:10 to 10:1.

19. The spray device of claim 1, wherein a volume of the first chamber and a volume of the second chamber is substantially equal.

20. The spray device of claim 1, wherein the spray device is operable to spray a liquid amount of from 0.01 ml to 5 ml upon each actuation of the first and second pumps.

21. The spray device of claim 1, wherein:

a ratio of a volume of the first mixing space to a volume of the second mixing space is from 1:10 to 10:1; or

a ratio of a volume of the first mixing space to a volume of the third mixing space is from 1000:1 to 10:1; or

a ratio of a volume of the second mixing space to a volume of the third mixing space is from 1000:1 to 10:1.

22. The spray device of claim 1, wherein:

the first pump is operable to aspirate and retain a liquid amount of from 0.01 ml to 5 ml; or

the second pump is operable to aspirate and retain a liquid amount of from 0.01 ml to 5 ml.

23. The spray device of claim 1, wherein:

a ratio of a volume of: a capacity of the first pump or the second pump, and a volume of a first mixing space or a second mixing space is from 100:1 to 1:1; or

a ratio of a volume of: a capacity of the first pump or the second pump, and a volume of a nozzle mixing space is from 10000:1 to 10:1.

24. The spray device of claim 1, wherein an exit velocity from the nozzle is from 6.5 m/s to 19.5 m/s.