CLAIMS

1. A canister, comprising:

an elongate body comprising a barrel region defining a first diameter, an enclosed first end, and a neck region extending from the barrel region to an open second end defining an end wall, the elongate body defining a central axis extending between the first end and the second end; and

a cap comprising an annular portion including a closed first end and an open second end, a penetrable or separable septum formed in the first end of the cap, and an annular flange extending radially from the second end of the annular portion of the cap, thereby defining a lower surface defining a plane substantially perpendicular to the central axis, the septum comprising a central region and a relatively-thin perimeter at least partially surrounding the central region for preferentially tearing to at least partially separate the central region from the cap,

the first end of the annular portion of the cap inserted into the open second end of the elongate body such that the annular portion is spaced from an interior surface of the neck region and the septum is disposed within the neck region, the annular flange secured to the end wall of the second end of the elongate body, thereby enclosing a cavity,

the cavity filled with pressurized and/or at least partially liquefied gas.

2. A canister, comprising:

an elongate body comprising a barrel region defining a first diameter, an enclosed first end, and a neck region defining a second diameter smaller than the first diameter and extending from the barrel region to an open second end defining an end wall, the elongate body defining a central axis extending between the first end and the second end; and

a cap comprising an annular portion including a closed first end and an open second end, a penetrable or separable septum formed in the first end of the cap, and an annular flange extending radially from the second end of the annular portion of the cap, thereby defining a lower surface defining a plane substantially perpendicular to the central axis, and an annular chamfer extending from the lower surface to the second end of the annular portion,

the first end of the annular portion of the cap inserted into the open second end of the elongate body such that the annular portion is spaced from an interior surface of the neck region and the septum is disposed within the neck region, the annular flange secured to the end wall of the second end of the elongate body, thereby enclosing a cavity,

the cavity filled with pressurized and/or at least partially liquefied gas.

3. A canister, comprising:

an elongate body comprising a barrel region defining a first diameter, an enclosed first end, and a neck region extending from the barrel region to an open second end defining an end wall, the elongate body defining a central axis extending between the first end and the second end; and

a cap comprising an annular portion including a closed first end and an open second end, a penetrable or separable septum formed in the first end of the cap, and an annular flange extending radially from the second end of the annular portion of the cap, thereby defining a lower surface defining a plane substantially perpendicular to the central axis,

the first end of the annular portion of the cap inserted into the open second end of the elongate body such that the annular portion is spaced from an interior surface of the neck region and the septum is disposed within the neck region, the cap enclosing a cavity within the elongate body,

the cavity filled with pressurized or at least partially liquefied gas.

4. A canister, comprising:

an elongate body comprising a barrel region defining a first diameter, an enclosed first end, and a neck region defining a second diameter smaller than the first diameter and extending from the barrel region to an open second end defining an end wall, the elongate body defining a central axis extending between the first end and the second end; and

a cap comprising an annular portion including a closed first end and an open second end, a penetrable or separable septum formed in the first end of the cap, and an annular flange extending radially from the second end of the annular portion of the cap, thereby defining a lower surface defining a plane substantially perpendicular to the central axis, and an annular projection extending from the lower surface,

the first end of the annular portion of the cap inserted into the open second end of the elongate body such that the annular portion is spaced from an interior surface of the neck region and the septum is disposed within the neck region, the projection secured to the end wall of the second end of the elongate body, thereby enclosing a cavity,

the cavity filled with pressurized or at least partially liquefied gas.

5. A canister according to any preceding claim, in which the second end of the annular portion of the cap comprises a plurality of radial projections for supporting the cap within the neck region.

6. A canister according to any of Claims 1 to 4, in which the annular portion further comprises one or more passages in an outer surface extending between the first and second ends to provide a path for gas to enter the interior during filling.

7. A canister according to any of Claims 2 to 4, in which the septum comprises a relatively thin-walled region configured to be penetrated to deliver gas from the canister.

8. A canister according to any of Claims 2 to 4, in which the septum comprises a central region and a relatively-thin perimeter at least partially surrounding the central region for preferentially tearing to at least partially separate the central region from the cap.

9. A canister according to any of Claims 2 to 4, in which the septum comprises a relatively thin-walled region configured to be penetrated to deliver gas from the canister.

10. A canister according to any of Claims 2 to 4, in which the septum comprises a central region and a relatively-thin perimeter at least partially surrounding the central region for preferentially tearing to at least partially separate the central region from the cap.

11. A canister according to Claim 1, in which the perimeter completely surrounds the central region.

12. A canister according to Claim 1, in which the perimeter extends partially around the central region to define a preferential hinge.

13. A canister according to Claim 1, in which the central region has a dome shape.

14. A canister according to any of Claims 1 to 4, in which the elongate body and cap are formed from stainless steel.

15. A canister according to any of Claims 1 to 4, in which the septum has a thickness between about 0.10-0.25 mm.

16. A canister according to any of Claims 1 to 4, in which the septum has a thickness of not more than about 0.16 mm.

17. A canister according to any of Claims 1 to 4, in which the septum has a diameter between about 0.80-1.20 mm.

18. A canister according to any of Claims 1 to 4, in which the septum has a diameter of not more than about 1.0 mm.

19. A canister according to any of Claims 1 to 4, in which the elongate body has a length between the first end and the end wall of the second end that is less than about thirty millimeters (30 mm).

20. A method for making a canister, comprising:

providing an elongate body comprising a barrel region defining a first diameter, an enclosed first end, and a neck region extending from the barrel region to an open second end defining an end wall, the elongate body defining a central axis extending between the first end and the second end;

providing a cap comprising an annular portion including a closed first end and an open second end, a penetrable or separable septum formed in the first end of the cap, and an annular flange extending radially from the second end of the annular portion of the cap, thereby defining a lower surface defining a plane substantially perpendicular to the central axis, and an annular projection extending from the lower surface;

inserting the first end of the annular portion of the cap into the open second end of the elongate body such that the annular portion of the cap is spaced from an interior surface of the neck region of the elongate body and the septum is disposed within the neck region of the elongate body;

introducing pressurized gas into an interior of the elongate body; and

welding the projection to the end wall of the second end of the elongate body, thereby enclosing a cavity of the canister with the pressurized gas therein.

21. A method according to Claim 20, in which the cavity of the canister has a volume of not more than about 1.8 milliliters (1.8 mL).

22. A method according to Claim 20 or 21, in which introducing pressurized gas into the interior of the elongate body comprises:

providing the cylindrical body and cap within a filling chamber;

introducing gas into the filling chamber;

controlling the filling chamber temperature to a temperature below the saturation temperature of the gas at the filling pressure to condense the gas within the interior of the elongate body.

23. A method according to Claim 22, in which welding the projection to the end wall comprises:

coupling the elongate body to a first electrode; and

coupling a second electrode to the cap with the projection contacting the end wall; and

delivering electrical current between the electrodes to weld the projection to the end wall.

24. A method according to any of Claims 20 to 23, in which the elongate body is formed by:

deep drawing a round blank of stainless steel to form the barrel region, the first end of the elongate body, and an extension opposite the first end; and

necking down the extension to define the neck region.

25. A method according to any of Claims 20 to 23, in which the cap is formed by drawing a round blank of stainless steel.

26. A method according to Claim 25, in which the cap is formed such the septum comprises a central region and a relatively-thin perimeter at least partially surrounding the central region for preferentially tearing to at least partially separate the central region from the cap.

27. A method according to any of Claims 20 to 23, further comprising weighing the canister to determine at least one of the mass and the density of the pressurized gas enclosed within the cavity.

28. A method according to Claim 27, further comprising, during a shelf life of the canister, weighing the canister to confirm that a minimum amount of pressurized gas remains enclosed within the cavity.

29. A method for preparing a gas-actuated device for a procedure, comprising:

providing a canister comprising an elongate body comprising an enclosed first end and an open second end, a cap welded to the open second end of the elongate body including a septum, thereby defining an interior cavity filled with pressurized gas;

loading the canister into a housing of the device; and

actuating the device to cause a pin in the housing to open the septum, thereby releasing pressurized gas from the canister into one or more passages within the device.

30. A method according to Claim 29, in which the pin has a blunt, beveled tip that applies localized force to the septum to facilitate opening the septum.

31. A method according to Claim 30, in which the septum comprises a central region and a relatively-thin perimeter at least partially surrounding the central region that preferentially tears when the pin applies the localized force to the central region to at least partially separate the central region from the cap.

32. A method according to Claim 29, in which actuating the device comprises causing a carriage carrying the pin to move within the housing from a first position in which the pin is adjacent the septum to a second position in which the pin penetrates the septum.

33. A method according to Claim 29, in which actuating the device comprises causing a carriage carrying the pin to move within the housing from a first position in which the pin is adjacent the septum to a second position in which the pin presses against a central region of the septum to cause a perimeter of the septum to at least partially separate from the cap.

34. A method for preparing a medical device for a procedure, comprising:

providing a medical device comprising a housing including a chamber with a canister therein, an actuator, and a carriage in a first position within the housing, the canister comprising an elongate body comprising an enclosed first end and an open second end, a cap welded to the open second end of the elongate body including a septum, thereby defining an interior cavity filled with pressurized gas; and

actuating the actuator to cause the carriage to move from the first position to a second position such that a pin on the carriage opens the septum, thereby releasing pressurized gas from the canister into one or more passages within the medical device.

35. A medical device, comprising:

a housing comprising a treatment portion and an actuator portion including a chamber;

a canister within the chamber comprising an elongate body comprising an enclosed first end and an open second end, a cap welded to the open second end of the elongate body and including a septum, thereby defining an interior cavity filled with pressurized gas;

a carriage movable within the housing from the first position, the carriage comprising a pin disposed adjacent the septum; and

an actuator on the actuator portion coupled to the carriage such that initial activation of the actuator causes the carriage to move from the first position to a second position such that the pin opens the septum, thereby releasing pressurized gas from the canister into one or more passages within the medical device.

36. A medical device according to Claim 35, in which the actuator portion further comprises an incompressible fluid pressurized by the pressurized gas when the pin opens the septum to release the pressurized gas from the canister, and in which the actuator is subsequently actuatable to cause the incompressible liquid to flow and deliver one of an agent and an implant from the treatment portion.

37. A gas-actuated tool, comprising:

a housing comprising a functional portion and an actuator portion including a chamber;

a canister within the chamber comprising an elongate body comprising an enclosed first end and an open second end, a cap welded to the open second end of the elongate body and including a septum, thereby defining an interior cavity filled with pressurized gas, the septum comprising a central region and a relatively-thin perimeter at least partially surrounding the central region;

a carriage movable within the housing from the first position, the carriage comprising a pin disposed adjacent the septum, the pin including a blunt, beveled tip; and

an actuator on the actuator portion coupled to the carriage such that initial activation of the actuator causes the carriage to move from the first position to a second position such

that the beveled tip of the pin applies localized force to the septum to at least partially separate the septum from the cap, thereby releasing pressurized gas from the canister into one or more passages within the housing.