Claims

1. A hazard suppression system, comprising:

a vessel adapted to contain hazard suppression material under pressure, and a selectively openable outlet;

apparatus operably coupled with said outlet for delivery of said hazard suppression material to an area to be protected against hazard; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and pressure of said hazard suppression material within said vessel, a digital processor configured to access a library of empirical data including normalized linear pressure curves for the hazard suppression material at different temperatures and nonlinear pressure curves representative of pressures experienced during rapid temperature changes of the hazard suppression material, the digital processor being configured to compare sensed temperature and pressure values with said library of empirical data for said hazard suppression material to determine if the sensed temperature and pressure values are consistent with said library of empirical data , and provide an output in conformity with the comparison.

2. The system of claim 1, said vessel adapted to hold material selected from the group consisting of HFC-125, HFC-227ea, FK-5-1-12, HFO-1233zd (E), IG-55, IG-541, IG-100, and IG-01, and mixtures thereof.

3. The system of claim 1, said gauge assembly comprising a strain gauge pressure-sensing component.

4. The system of claim 1, said gauge assembly having memory which stores said library of empirical data for said material .

5. The system of claim 4, said memory resident on a circuit board including

said digital processor.

6. The system of claim 1, said gauge assembly further including structure operable to generate said output as a wireless signal.

7. The system of claim 1, said gauge assembly including a visual screen operable to display said output.

8. A combination comprising:

a vessel adapted to contain hazard suppression material under pressure, and a selectively openable outlet for delivery of said material from the vessel; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and pressure of said hazard suppression material within said vessel, a digital processor configured to access a library of empirical data including normalized linear pressure curves for the hazard suppression material at different temperatures and nonlinear pressure curves representative of pressures experienced during rapid temperature changes of the hazard suppression material, the digital processor being configured to compare sensed temperature and pressure values with said library of empirical data for said material to determine if the sensed temperature and pressure values are consistent with said library of empirical data , and provide an output in conformity with the comparison.

9. The combination of claim 8, said vessel adapted to hold material selected from the group consisting of HFC-125, HFC-227ea, FK-5-1-12, HFO-1233zd (E), IG-55, IG-541, IG-100, and IG-01, and mixtures thereof.

10. The combination of claim 8, said gauge assembly comprising a strain gauge pressure-sensing component.

11. The combination of claim 8, said gauge assembly having memory which stores said library of empirical data for said material .

12. The combination of claim 11, said memory resident on a circuit board including said digital processor.

13. The combination of claim 8, said gauge assembly further including structure operable to generate said output as a wireless signal.

14. The combination of claim 8, said gauge assembly including a visual screen operable to display said output.

15. A gauge assembly adapted for coupling with a vessel designed to contain hazard suppression material under pressure, said gauge assembly including structure operable to repeatedly sense temperature and pressure of the material within said vessel, a digital processor configured to access a library of empirical data including normalized linear pressure curves for the hazard suppression material at different temperatures and nonlinear pressure curves representative of pressures experienced during rapid temperature changes of the hazard suppression material, the digital processor being configured to compare sensed temperature and pressure values with said library of empirical data to determine if the sensed temperature and pressure values are consistent with said library of empirical data , and provide an output in conformity with the comparison.

16. The assembly of claim 15, said vessel adapted to hold material selected from the group consisting of HFC-125, HFC-227ea, FK-5-1-12, HFO-1233zd (E), IG-55, IG-541, IG-100, and IG-01, and mixtures thereof.

17. The assembly of claim 15, said gauge assembly comprising a strain gauge pressure-sensing component.

18. The assembly of claim 15, said gauge assembly having memory which stores said library of empirical data for said material and a time at which the temperature and

pressure values were taken .

19. The assembly of claim 18, said memory resident on said circuit board including a digital processor.

20. The assembly of claim 15, said gauge assembly further including structure operable to generate said output as a wireless signal.

21. The assembly of claim 15, said gauge assembly including a visual screen operable to display said output.

22. A method of monitoring a vessel containing hazard suppression material under pressure, said method comprising steps of:

repeatedly sensing temperature and pressure of the material within said vessel;

comparing sensed temperature and pressure values of the material within said vessel with a library of empirical data including normalized linear pressure curves for the hazard suppression material at different temperatures and nonlinear pressure curves representative of pressures experienced during rapid temperature changes of the hazard suppression material , and determining if said sensed temperature and pressure values are consistent with said library of empirical data ; and

providing an output in conformity with said comparison.

23. The method of claim 22, including the step of measuring the pressure of said material within said vessel using a strain gauge pressure-sensing component.

24. The method of claim 22, including steps of storing said library of empirical data in memory, storing said sensed temperature and pressure values in memory along with a time at which said sensed temperature and pressure values were taken, and comparing said library of empirical data with said sensed values.

25. The method of claim 22, including the step of generating a wireless signal

of said output.

26. The method of claim 22, including the step of generating a visual display of said output.

27. A hazard suppression system, comprising:

a vessel adapted to contain a liquid hazard suppression material including a gaseous propellant under pressure, and a selectively openable outlet;

apparatus operably coupled with said outlet for delivery of said hazard suppression material to an area to be protected against hazard; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and pressure of said hazard suppression material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for said hazard suppression material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison,

at least certain of the previously determined values representing pressure conditions resulting from the sorption of the gaseous propellant into the liquid hazard suppression material or desorption of the gaseous propellant from the liquid hazard suppression material due to a rapid change in temperature of the liquid hazard suppression material.

28. A combination comprising:

a vessel adapted to contain a liquid hazard suppression material including a gaseous propellant under pressure, and a selectively openable outlet for delivery of said material from the vessel; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and

pressure of said hazard suppression material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for said material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison,

at least certain of the previously determined values representing pressure conditions resulting from the sorption of the gaseous propellant into the liquid hazard suppression material or desorption of the gaseous propellant from the liquid hazard suppression material due to a rapid change in temperature of the liquid hazard suppression material.

29. A gauge assembly adapted for coupling with a vessel designed to contain a liquid hazard suppression material including a gaseous propellant under pressure, said gauge assembly including structure operable to repeatedly sense temperature and pressure of the material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for the material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison, at least certain of the previously determined values representing pressure conditions resulting from the sorption of the gaseous propellant into the liquid hazard suppression material or desorption of the gaseous propellant from the liquid hazard suppression material due to a rapid change in temperature of the liquid hazard suppression material.

30. A method of monitoring a vessel containing liquid hazard suppression material including a gaseous propellant under pressure, said method comprising steps of:

repeatedly sensing temperature and pressure of the material within said vessel;

comparing sensed temperature and pressure values of the material within said vessel with previously determined expected temperature and pressure values for said material, and determining if said sensed temperature and pressure values are consistent with said expected values, at least certain of the expected values representing pressure conditions resulting from the sorption of the gaseous propellant into the liquid hazard suppression material or desorption of the gaseous propellant from the liquid

hazard suppression material due to a rapid change in temperature of the liquid hazard suppression material; and

providing an output in conformity with said comparison.

31. A hazard suppression system, comprising:

a vessel adapted to contain hazard suppression material under pressure, and a selectively openable outlet;

apparatus operably coupled with said outlet for delivery of said hazard suppression material to an area to be protected against hazard; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and pressure of said hazard suppression material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for said hazard suppression material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison, said gauge assembly having memory operable to store information about a true internal volume of said vessel.

32. A combination comprising:

a vessel adapted to contain hazard suppression material under pressure, and a selectively openable outlet for delivery of said material from the vessel; and

a gauge assembly operable to monitor temperature and pressure of said hazard suppression material within said vessel over time,

said gauge assembly including structure operable to repeatedly sense the temperature and pressure of said hazard suppression material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for said material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison, said gauge assembly having memory

operable to store information about a true internal volume of said vessel.

33. A gauge assembly adapted for coupling with a vessel designed to contain hazard suppression material under pressure, said gauge assembly including structure operable to repeatedly sense temperature and pressure of the material within said vessel, compare sensed temperature and pressure values with previously determined temperature and pressure values for the material to determine if the sensed temperature and pressure values are consistent with the previously determined values, and provide an output in conformity with the comparison, said gauge assembly having memory operable to store information about a true internal volume of said vessel.

34. A method of monitoring a vessel containing hazard suppression material under pressure, said method comprising steps of:

repeatedly sensing temperature and pressure of the material within said vessel;

comparing sensed temperature and pressure values of the material within said vessel with previously determined expected temperature and pressure values for said material, and determining if said sensed temperature and pressure values are consistent with said expected values;

providing an output in conformity with said comparison; and

storing information about a true internal volume of said vessel in said memory.