[0005] There is a continuing need for methods and systems to fill and pressurize container assemblies for firefighting suppression systems without the logistic complexity and requirements of mechanized mixing used in the conventional charging operations. Adding to the problems in the currently known filling process is the difficulty in measuring the amount of nitrogen by weight that is required to saturate the Novec 1230 and pressurize the container. The weighing process is difficult because very accurate weighing scales are required. Scales capable of such accuracy can be easily damaged and are therefore not ideal for onsite filling where they would be subject to shock during transportation, etc. Moreover, the gas pressure during the fill process can cause the liquid suppressant to move within the container, which can generate undesirable excessive fluctuations in the weigh scale read out.

Disclosure of the Invention

[0006] Preferred methods and systems are provided for a container of saturated liquid suppressant, preferably Novec 1230, at an operative pressure for a firefighting suppression system. The preferred method and systems provide for a charged container in which the need for mechanized mixing is eliminated. By eliminating mechanized mixing from the filling process, the preferred systems and methods can provide for a filled and pressurized container within a commercially comparable and more preferably an advantageous time period.

[0007] According to a first aspect of the present invention, there is provided a method of charging a container with firefighting liquid suppressant, the method comprising: providing a pressurized receiving container defining a volume and containing nitrogen gas at a predetermined pressure; and adding an amount of the firefighting liquid suppressant to the pressurized receiving container to define a nominal operating head space pressure within the pressurized receiving container, wherein providing the pressurized receiving container includes predetermining the pressure of the nitrogen gas from a calculated weight of nitrogen to saturate a predetermined weight of the firefighting liquid suppressant within the volume and provide the nominal operating head space pressure at ambient temperature. Preferred embodiments of the fill method include first filling the receiving container with nitrogen and adding liquid suppressant to the container last.

[0008] According to a second aspect of the present invention, there is provided a system is provided for filling and pressurizing a container with firefighting liquid suppressant, the system comprising a receiving container defining an internal volume; a supply of nitrogen gas coupled to the receiving container for pressurizing the internal volume of the receiving container to an internal pressure; a supply of liquid suppressant; a transfer pump coupled to the receiving container and the supply of liquid suppressant for transferring the liquid suppressant to the receiving container against the internal pressure to define a head space pressure; a first fitting configured to selectively isolate the supply of nitrogen gas; and a second fitting configured to selectively isolate the supply of liquid suppressant and the transfer pump. By monitoring the head space pressure in the container, the need for a weigh scale at the receiving container can be eliminated.

[0008a] According to a third aspect of the present invention, there is provided a method of charging a container with firefighting liquid suppressant, the method comprising: pressurizing a receiving container with a predetermined weight of nitrogen to provide a pressurized receiving container containing nitrogen gas at a predetermined pressure; and adding an amount of the firefighting liquid suppressant to the pressurized receiving container to define a nominal operating head space pressure within the pressurized receiving container, wherein the predetermined weight of nitrogen is a function of an internal volume of the pressurized receiving container, a predetermined weight of the firefighting liquid suppressant, and the nominal operating head space pressure.

Brief Descriptions of the Drawings

[0009] The accompanying drawings, which are incorporated herein and constitute part of this specification, illustrate exemplary embodiments of the invention, and, together with the general description given above and the detailed description given below, serve to explain the features of the invention.

[0010] FIG. 1 is a flow chart of a first embodiment of a preferred method of filling and pressurizing a container with liquid suppressant and nitrogen gas.

[0011] FIG. 2 is a flow chart of a second embodiment of a preferred method of filling and pressurizing a container with liquid suppressant and nitrogen gas.

[0012] FIG. 3 is a schematic view of a preferred system for carrying out the methods of FIGS. 1-2.

What is Claimed Is:

1. A method of charging a container with firefighting liquid suppressant, the method comprising:

providing a pressurized receiving container defining a volume and containing nitrogen gas at a predetermined pressure; and

adding an amount of the firefighting liquid suppressant to the pressurized receiving container to define a nominal operating head space pressure within the pressurized receiving container,

wherein providing the pressurized receiving container includes predetermining the pressure of the nitrogen gas from a calculated weight of nitrogen to saturate a predetermined weight of the firefighting liquid suppressant within the volume and provide the nominal operating head space pressure at ambient temperature.

2. The method of claim 1, wherein the nominal operating head space pressure within the pressurized receiving container ranges from at least 25 bar to less than 45 bar.

3. The method of claim 1, wherein adding the liquid suppressant includes transferring the liquid suppressant from a supply container and measuring a loss in weight of the supply container until the measured loss equals a predetermined weight value.

4. The method of any one of the above claims, wherein adding the liquid suppressant includes transferring an amount of NOVEC™ 1230 extinguishing agent to the receiving container.

5. A system for filling and pressurizing a container with firefighting liquid suppressant, the system comprising:

a receiving container defining an internal volume;

a supply of nitrogen gas coupled to the receiving container for pressurizing the internal volume of the receiving container to an internal pressure;

a supply of liquid suppressant;

a transfer pump coupled to the receiving container and the supply of liquid suppressant for transferring the liquid suppressant to the receiving container against the internal pressure to define a head space pressure;

a first fitting configured to selectively isolate the supply of nitrogen gas; and

a second fitting configured to selectively isolate the supply of liquid suppressant and the transfer pump.

6. The system of claim 5, wherein the supply of liquid suppressant is a supply container having a fixed volume of liquid suppressant.

7. The system of any one of claims 5-6, further comprising a pressure sensor to determine the head space pressure within the internal volume of the receiving container during transfer of the liquid suppressant.

8. The system of any one of claims 5-7, wherein the transfer pump transfers the liquid suppressant to the receiving container against the head space pressure, the head space pressure ranging from 25-45 bar.

9. The system of any one of claims 5-8, wherein the liquid suppressant is NOVEC™ 1230 extinguishing agent.

10. The system of claim 5, wherein the first fitting and the second fitting are valves.

11. A method of charging a container with firefighting liquid suppressant, the method comprising:

pressurizing a receiving container with a predetermined weight of nitrogen to provide a pressurized receiving container containing nitrogen gas at a predetermined pressure; and

adding an amount of the firefighting liquid suppressant to the pressurized receiving container to define a nominal operating head space pressure within the pressurized receiving container,

wherein the predetermined weight of nitrogen is a function of an internal volume of the pressurized receiving container, a predetermined weight of the firefighting liquid suppressant, and the nominal operating head space pressure.

12. The method of claim 11, wherein the nominal operating head space pressure within the container ranges from at least 25 bar to less than 45 bar.

13. The method of claim 11, wherein adding the liquid suppressant includes transferring the liquid suppressant from a supply container and measuring a loss in weight of the supply container until the measured loss equals a predetermined weight value.

14. The method of claim 11, wherein adding the liquid suppressant includes transferring an amount of NOVEC™ 1230 extinguishing agent to the receiving container.