Aug. 28, 1962 J. W. OLANDT 3,051,652

PROPELLANT COMPOSITION

Filed Feb. 17, 1961

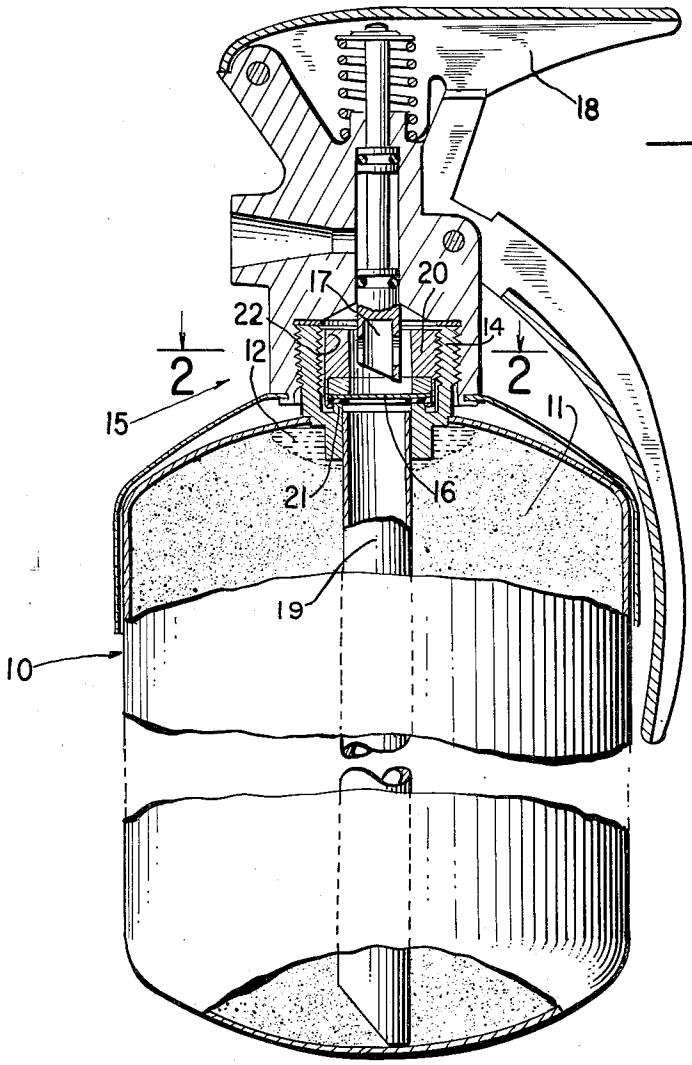


Fig. 1

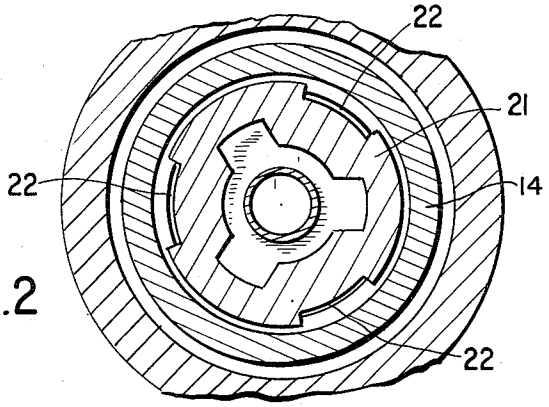


Fig. 2

INVENTOR
JOHN W. OLANDT
BY Ernest A. Jensen
ATTORNEY

United States Patent Office 3,051,652 Patented Aug. 28, 1962



3,051,652

# PROPELLANT COMPOSITION

John W. Olandt, North Arlington, N.J., assignor to Specialties Development Corporation, Belleville, N.J., a corporation of New Jersey

Filed Feb. 17, 1961, Ser. No. 90,013
8 Claims. (Cl. 252—7)

The present invention relates to compositions, and, more particularly, to a propellant for expelling free flowing dry powder from a container through a valve controlled discharge passage.

Heretofore, it has been customary to expell free flowing dry powder such as a fire extinguishing agent and the like from a container by pressurizing the containers with air or nitrogen to between 160 and 300 p.s.i.g. Such gases are inert and non-flammable, and have sufficient pressure at —40° F. to provide for discharge and have a pressure at 120° F. which lightweight containers can withstand. Portable dry powder fire extinguishers and the like are normally used within this range of temperatures.

In order to determine whether or not the contents of the container were maintained properly pressurized, a pressure gauge was connected to the upstream side of the valve which controlled the discharge passage. The use of a pressure gauge is objectionable because it increases the cost of the apparauts, and because, if it protrudes from the valve or container, it is thus subject to damage in the event the container is handled roughly. In the event special provision is made to encase or otherwise protect the gauge, the cost of the apparatus is further increased. Also, such gauges corrode with age and become unreliable.

It has therefore been proposed to omit the gauge and weigh the container from time to time to determine whether or not sufficient of the pressurizing medium was still within the container to assure effective discharge of its contents. However, this was not feasible because the amount of air or nitrogen required to pressurize even a large container of dry powder is only a small fraction of an ounce. Therefore, a small loss in weight could not be reliably attributed to a loss of the pressurizing gas, because the loss of a tag or part thereof on the container or chipped-off paint could be the cause for such loss of weight.

It has thus been suggested to utilize the vapor pressure of a gaseous propellant which is heavier and denser than air or nitrogen within the aforementioned operating range of temperatures, whereby a weighable amount, for example a minimum of about an ounce, of such propellant can be used. However, such propellants do not behave as "perfect gases" such is nitrogen or mixtures of "perfect gases" such as air, and have insufficient pressures at the lower end of the temperature range and have excessive pressures at the upper end of the temperature range.

Consequently, it has been proposed to use a weighable amount of a vapor pressure type propellant in a space sufficiently large so that the vapor pressure would not be excessive at the higher temperatures, and supplementing its pressure with a compressed gas such as nitrogen or air and the like to provide sufficient pressure at the lower temperatures. At present the only inert, non-flammable, economically feasible, propellant of this type which has the required vapor pressure characteristics is bromotrifluoromethane ($CF_3Br$), and this material when under a supplemented pressure at about or below —40° F. tends to liquify, whereby the droplets of liquid or moist vapors are formed at such temperatures and wet the dry powder to cause it to cake and thus impair the free flowing characteristics of the powder.

Accordingly, an object of the present invention is to provide a propellant which is usable in weighable amounts



and is suitable for expelling dry powder but is not subject to any of the foregoing difficulties and objections.

Another object is to provide such a propellant which has the desirable pressure characteristics within the normal range of operating temperature.

A further object is to provide such a propellant in a simple, practical and economical manner.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, it has been discovered that the foregoing objects can be generally accomplished by providing a propellant which consists essentially of a gaseous mixture of bromotrifluoromethane and sulphur hexafluoride which mixture is adapted to be pressurized or supplemented by a relatively small amount of a compressed, relatively inert, non-flammable gas or a mixture of such gases having the characteristics of a "perfect gas."

It has been found the proportions of these materials are fairly critical but can be varied plus or minus about five percent by using between about 35 and about 40 parts by weight of bromotrifluoromethane and between about 65 and about 60 parts by weight plus or minus 5% of sulphur hexafluoride in about 100 parts by weight of the mixture and yet prevent the formation of liquid at low temperatures.

The compressed gas may be air, argon, helium, krypton, neon or nitrogen and the like or mixtures of these gases, but air is preferred because of its low cost and availability. However, in certain applications where a slightly heavier charge is desirable, gases or gaseous compounds or gaseous compositions heavier than air are used, including also carbon dioxide, chlorotrifluoromethane and carbon tetrafluoride. The gas used should be completely dry so that no traces of moisture are introduced into the container which might adversely affect the free flowing characteristics of the dry powder. The amount of compressed gas may be varied to pressurize the propellant mixture to become about 160 and about 300 p.s.i.g. at 70° F.

The dry powder may be any of the many well known types heretofore used for extinguishing fires or for other purposes which powder usually contains one or more additives to maintain it free-flowing and non-caking.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

FIG. 1 is a fragmentary, longitudinal, sectional view of apparatus for discharging dry powder adapted to be pressurized by a propellant in accordance with the present invention.

FIG. 2 is an enlarged sectional view taken along the line 2—2 on FIG. 1.

Referring to the drawing in detail, apparatus is shown which generally comprises a container **10** for storing a charge **11** of dry powder and a charge **12** of propellant composition above and/or within the voids of the powder and having a spud **14** providing an opening at the upper end thereof; a valve **15** secured over the spud **14** and including a disc **16** for confining the charges **11** and **12** within the container and a cutter **17** for puncturing the disc **16** operated by a lever **18**; and a syphon tube **19** secured to the valve **15** below the disc **16** for directing the dry powder charge **11** under the influence of the propellant charge **12** through the valve when the disc is punctured.

As shown in the drawing, the disc **16** is part of a bush-

ing assembly including a bushing **20** which is screw threaded into the bore or opening of the spud **14** to cause the disc **16** to engage a seat **21** formed within the bore of the spud. The bushing **20** is formed with slots **22** (FIG. 2) which enable the propellant to enter the container **10** when the bushing is partially threaded into the bore of the spud with the disc **16** spaced from its seat **21**.

As a specific example of practicing the present invention, a container **10** having a volume of 72 cubic inches is charged with 2.5 pounds of dry powder charge **11** consisting essentially of sodium bicarbonate and having a density to occupy about 31.5 cubic inches or 43.8% of the actual volume of the container; and with about 1.07 ounces of a propellant charge **12** which occupies about 40.5 cubic inches or 56.2% of the actual volume of the container provided by the voids in the powder. The ratio by weight of powder to propellant thus is about 40 to 1.

A propellant charge which so occupies the voids and provides a pressure of about 175 p.s.i.g. at about 70° F. comprises about 0.35 ounce bromotrifluoromethane, about 0.60 ounce sulphur hexafluoride, and about 0.12 ounce of a dry gaseous mixture of 70% air and 30% helium by volume. Helium is used in this composition as a tracer for the purpose of testing leakage by means of equipment capable of detecting helium escaping from the apparatus.

The apparatus shown herein is charged by introducing the powder **11** through the bore of the spud with the valve **15**, the syphon tube **19** and the bushing assembly removed. The syphon tube is then inserted into the container, the bushing **20** is partially threaded into the bore of the spud and a charging fitting (not shown) is attached to the spud for introducing propellant **12** into the container **10** by way of the slots **22**. Before the charging fitting is removed, the bushing **20** is further threaded into the bore of the spud to seat the disc and seal the container opening by means of a wrench arrangement associated with the charging fitting. Thereafter, the charging fitting is removed and the valve **15** is secured to the spud **14** to thereby assemble the apparatus as shown.

It has been found that the bromotrifluoromethane in the propellant composition does not liquify at −40° F. under a pressure of about 160 to about 300 p.s.i.g., and that any weight loss of the propellant charge could be readily detected because of the magnitude of the initial charge.

It will be understood that the details and examples hereinbefore set forth are illustrative only and that the invention as broadly described and claimed is in no way limited thereby.

I claim:

1. A composition for use in a propellant for expelling dry free flowing powder from a container, said composition consisting essentially of gaseous mixture of between about 35 and about 40 parts by weight of bromotrifluoromethane, and between about 65 and about 60 parts by weight of sulphur hexafluoride.

2. A propellant for expelling dry free flowing powder from a container, said propellant consisting essentially of gaseous mixture of between about 35 and about 40 parts by weight of bromotrifluoromethane, between about 65 and about 60 parts by weight of sulphur hexafluoride, and a sufficient amount of an inert, non-flammable compressed gas to pressurize the mixture to between about 160 and about 300 p.s.i.g. at 70° F.

3. A composition for use in a propellant for expelling dry free flowing powder from a fluid-tight storage container having a closure controlled discharge passage, said composition being a gaseous mixture consisting essentially of about 35 parts by weight of bromotrifluoromethane and about 60 parts by weight of sulphur hexafluoride.

4. A propellant for expelling dry free flowing powder from a container, said propellant being a gaseous mixture consisting essentially of about 0.35 ounce of bromotrifluoromethane, about 0.60 ounce of sulphur hexafluoride, and about 0.12 ounce of a non-flammable compressed gas, said gaseous mixture having a pressure of about 175 p.s.i.g. at about 70° F. when confined within a space of about 40.5 cubic inches.

5. A charge of fluid medium confined under pressure in a fluid-tight storage container having a closure controlled discharge passage, said charge comprising principally dry free flowing powder; and a much smaller but weighable amount by weight of a gaseous propellant for the powder consisting essentially of between about 35 and about 40 parts by weight of bromotrifluoromethane, between about 65 and about 60 parts by weight of sulphur hexafluoride, and a sufficient amount of inert, non-flammable compressed gas to pressurize the container to between about 160 and about 300 p.s.i.g. at 70° F.

6. A charge according to claim 5, wherein the ratio by weight of powder to propellant is about 40 to 1.

7. A charge according to claim 6, wherein the powder occupies about 43.8% of the container and the propellant occupies about 56.2% of the container.

8. A charge according to claim 7, wherein the powder consists essentially of sodium bicarbonate.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,668,419 | Mapes | Feb. 9, 1954 |
| 2,912,379 | McCracken et al. | Nov. 10, 1959 |