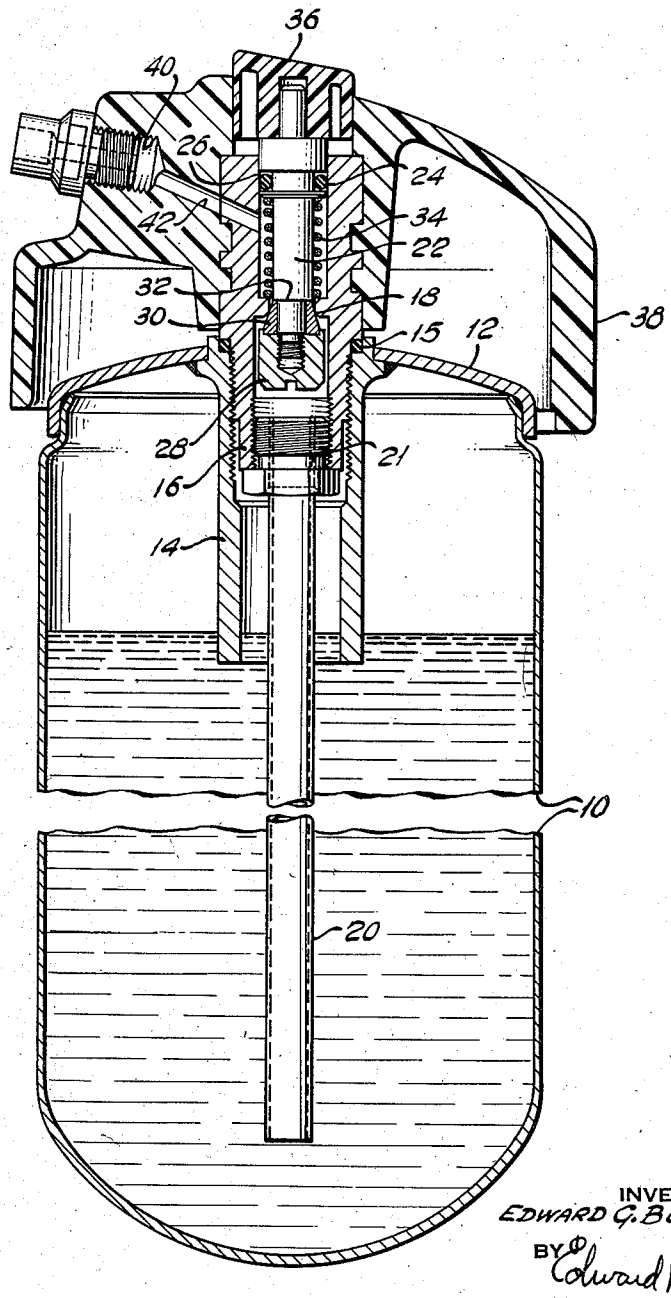
Jan. 28, 1958 E. G. BUCKLEY 2,821,257

NON-CORROSIVE BROMOCHLOROMETHANE FIRE EXTINGUISHER COMPOSITION AND FIRE EXTINGUISHER CONTAINING THE COMPOSITION

Filed Dec. 9, 1955



INVENTOR
EDWARD G. BUCKLEY
BY Edward F. Connors
ATTORNEY

United States Patent Office 2,821,257 Patented Jan. 28, 1958

2,821,257

NON-CORROSIVE BROMOCHLOROMETHANE FIRE EXTINGUISHER COMPOSITION AND FIRE EXTINGUISHER CONTAINING THE COMPOSITION

Edward G. Buckley, Morris Plains, N. J., assignor, by mesne assignments, to The Fyr-Fyter Company, Dayton, Ohio, a corporation of Ohio

Application December 9, 1955, Serial No. 552,052

7 Claims. (Cl. 169—31)

This invention relates to fire-extinguishing compositions and is more particularly concerned with a fire-extinguishing composition which is passive toward metals such as stainless steels.

The effectiveness of halogenated hydrocarbons as fire-extinguishing fluids is well known and liquid fire-extinguishing compositions consisting of one or more halogenated hydrocarbons have been extensively used. It is also known, however, that such liquids tend to undergo decomposition during storage, particularly in the presence of small traces of water, with the formation of acidic substances which readily corrode metals. Over the years many compounds have been tested for their corrosion inhibiting activity when used with halogenated hydrocarbons and some of these compounds have been found to be somewhat effective. It has been found, however, that corrosion inhibitors are specific in their activity and that compounds which are effective when used with one type of halogenated hydrocarbon are not necessarily effective with other types. Furthermore, while such inhibitors may prevent or retard corrosion of some metals or alloys, they have little or no effect upon more readily corroded metals. Brass is generally the best protected by conventional inhibitors since this alloy has a certain degree of natural resistance to corrosion by halogenated hydrocarbons. As a result, containers commonly used for halogenated hydrocarbon fire-extinguishing compositions have been made of brass. Brass is, however, a relatively soft alloy and is comparatively expensive, particularly when it has to be of heavy gauge to withstand gas pressures in pressure-operated extinguishers. Furthermore, such extinguishers have moving parts to provide the necessary valves and even slight corrosion tends to interfere with proper operation of these parts.

From the standpoint of manufacture, efficiency and economy, stainless steel is a highly advantageous material from which to construct a fire-extinguisher. It has not been used, however, because none of the corrosion inhibitors heretofore proposed for use in fire-extinguishing compositions has been fully effective in protecting stainless steel against halogenated hydrocarbons. Furthermore, bromochloromethane is a particularly effective fire-extinguishing compound but it has a highly corrosive action upon metals, particularly stainless steel, in the presence of even very small quantities of water. Since the last traces of water cannot, from a practical standpoint, be removed from bromochloromethane suitable for fire-extinguishing purposes, the use of stainless steel containers for holding such bromochloromethane has not heretofore been possible because commonly employed corrosion inhibitors for fire-extinguishing compositions do not effectively protect stainless steels against corrosion by this halogenated hydrocarbon.

It is accordingly an object of the present invention to provide a halogenated-hydrocarbon fire-extinguishing composition which is passive toward stainless steel.

It is another object of the present invention to provide a bromochloromethane fire-extinguishing composition containing a corrosion inhibitor effective to suppress the corrosive action upon metal which is normally exhibited by this halogenated hydrocarbon.

In accordance with the invention, there is provided a fire-extinguishing composition which comprises bromochloromethane as the active fire-extinguishing ingredient and includes a small amount of ethylene oxide or propylene oxide. It has been discovered that these two "inner" oxides are highly effective in suppressing corrosion of metal, including stainless steel, by the bromochloromethane.

Bromochloromethane of commercial quality which is sold for fire-extinguishing purposes has the following general characteristics:

Specific gravity	1.910–1.940 @ 25° C.
Boiling range	5–95% distills in 2.0° C. temperature range including 67.8° C.
Acidity	Not more than 1.0 ml. of 0.01 N NaOH to neutralize 100 ml. of water shaken for 10 mins. with equal volume of bromochloromethane.
Free halogens	None.
Non-volatile residue	Not more than 0.004 g./100 ml.
Water	Not more than 0.04%.

To provide the non-corrosive fire-extinguishing composition of the invention there is added to bromochloromethane, e. g. the commercial product identified above, one-half to two percent, preferably one percent by weight of ethylene oxide or propylene oxide or mixtures thereof. Ethylene oxide and propylene oxide are soluble in bromochloromethane and are incorporated in it merely by simple mixing. While both ethylene oxide and propylene oxide are effective, propylene oxide is preferred because it is liquid at room temperature and can be handled somewhat more easily.

When bromochloromethane fortified against corrosive activity with ethylene oxide or propylene oxide in accordance with the invention is stored in a fabricated stainless steel fire-extinguisher casing, the corrosive action normally encountered when bromochloromethane is brought into contact with stainless steel is absent and the composition may be stored for long periods of time without damage to the casing and without clogging or plugging of movable parts such as valves. There is shown in the accompanying drawing a fabricated fire-extinguishing casing which is typical of the type which has caused difficulty in the past when made of stainless steel or other metal or alloy normally subject to corrosion by bromochloromethane in the presence of small quantities of water.

The single figure of the drawing is a sectional view taken on a vertical plane through the center of the extinguisher casing.

In the drawing there is shown a casing **10** having a welded top portion **12** formed with a central opening in which is secured a sleeve **14**. Threadedly engaged in sleeve **14** and sealed by a gasket **15** is a valve shell **16** defining a valve seat **18** and carrying at its lower end a downwardly-extending tube **20** formed with a head portion **21** threadedly engaged with shell **16**. Reciprocatable in shell **16** is a valve member having a stem portion **22** sealed in the shell, by means of an O-ring gasket **24** seated in a groove **26**, and provided with a head **28** holding a washer **30** in place against a shoulder **32**. A spring **34** normally urged the valve member outwardly to seat washer **30** against seat **18** to prevent escape of fluid from casing **10**.

The upper end of valve stem **22** is provided with an actuating handle member **36** by means of which the valve

may be unseated by the user to cause discharge of the fire-extinguishing fluid. The upper portion of the valve shell **16** is surrounded by a hood **38** provided with an opening **40** communicating with a bore **42** which extends through hood **38** and the wall of shell **16** and opens into the interior of the valve shell. The extinguisher is pressurized by admitting compressed air or other compressed gas through opening **40** and bore **42**, and the extinguisher contents are discharged through these passageways under the action of the compressed gas when the valve is unseated.

It will be seen that an extinguisher such as described above has many threaded members and has a valve which must move freely if the extinguisher is to operate properly in an emergency. The serious consequences which may result from a jammed or "frozen" fire-extinguisher are obvious. The extinguisher must also be freely separable for recharging purposes and if the threads are corroded it is apparent that the necessary separation of parts may be impossible without damage or destruction of the extinguisher.

Corrosion tests, however, have shown that ethylene oxide and propylene oxide fully protect stainless steel against corrosion by moist bromochloromethane for long periods of time. The term "stainless steel" as used herein has its conventional meaning and includes the various alloys of iron and chromium which may also contain nickel and small percentages of silicon, molybdenum, tungsten, or copper. Stainless steels are classified and identified in accordance with their content of alloying metals and are grouped in numerically designated series such as the "300" series, e. g. 301, 304 and 310, and the "400" series, e. g. 410, 420 and 430. Typical stainless steels are described in detail and identified, for example, in Marks' "Mechanical Engineers' Handbook" (5th ed.), beginning at page 559.

Strips of welded 300 series, e. g. 310, stainless steels and strips of unwelded 400 series, e. g. 420, stainless steels were immersed in bromochloromethane containing about 2.5% water and corresponding strips were immersed in another portion of the same bromochloromethane to which 1% ethylene oxide had been added and in another portion to which 1% propylene oxide had been added. After two months' exposure to sunlight the strips immersed in the non-inhibited bromochloromethane were severely corroded whereas the strips immersed in the inhibited bromochloromethane samples showed no corrosion whatsoever.

In another test, strips of welded 300 series, e. g. 301, stainless steels were immersed in bromochloromethane containing 2–3% water and the samples were refluxed four hours a day for a month. In a comparative test, using strips of the same steels and using a portion of the same bromochloromethane to which 1% propylene oxide was added and a portion to which 1% ethylene oxide had been added, the samples were given the same reflux treatment. The strips were then examined and those exposed to the non-inhibited bromochloromethane were found to be severely corroded whereas the strips which had been exposed to the inhibited bromochloromethane portions showed no evidence of corrosion.

What I claim and desire to secure by Letters Patent is:

1. A fire-extinguisher composition consisting essentially of bromochloromethane and one-half of two percent by weight of a member of the group consisting of ethylene oxide and propylene oxide.

2. A fire-extinguishing composition consisting essentially of bromochloromethane and about one percent by weight of a member of the group consisting of ethylene oxide and propylene oxide.

3. A fire-extinguishing composition consisting essentially of bromochloromethane and one-half to two percent by weight of ethylene oxide.

4. A fire-extinguishing composition consisting essentially of bromochloromethane and one-half to two percent by weight of propylene oxide.

5. A fire-extinguishing composition consisting essentially of bromochloromethane containing at least traces of water and one-half to two percent by weight of a member of the group consisting of ethylene oxide and propylene oxide.

6. A fire-extinguishing composition consisting essentially of bromochloromethane containing up to 2.0% by weight water and one-half to two percent by weight of a member of the group consisting of ethylene oxide and propylene oxide.

7. A fire-extinguishing package comprising a valved casing of stainless steel containing a fire-extinguishing composition consisting essentially of bromochloromethane and one-half to two percent by weight of a member of the group consisting of ethylene oxide and propylene oxide.

References Cited in the file of this patent

UNITED STATES PATENTS

2,273,515	Dachlauer	Feb. 17, 1942
2,419,915	Priest et al.	Apr. 29, 1947
2,573,320	Eckelmann	Oct. 30, 1951

U. S. DEPARTMENT OF COMMERCE

PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,821,257

January 28, 1958

Edward G. Buckley

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 68, for "urged" read --urges--; column 4, line 14, for "of two percent" read --to two percent--.

Signed and sealed this 6th day of May 1958.

(SEAL)
Attest:
KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

U. S. DEPARTMENT OF COMMERCE

PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,821,257

January 28, 1958

Edward G. Buckley

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 68, for "urged" read --urges--; column 4, line 14, for "of two percent" read --to two percent--.

Signed and sealed this 6th day of May 1958.

(SEAL)
Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents