



SPECIFICATION

TITLE OF THE INVENTION

FLUID FIRE EXTINGUISHING AGENT SHELL FOR THROWING

FIELD OF THE INVENTION

The present invention relates to a fluid fire extinguishing agent shell for throwing, comprising a mixed aqueous solution of a potassium compound, a sodium compound, and an ammonium compound mold packed by a synthetic resin material.

BACKGROUND OF THE INVENTION

There are many instances that conventional installed fire extinguishers are of no use to the initial fire extinction for a reason that a person who uses a fire extinguisher in case of emergency is seized with sudden abnormal fear and loses his or her presence of mind so that he or she can not precisely operate it, or a fire extinguishing agent in the container changes with a lapse of time such that it does not effectively act, or for other reasons. In general, we still have various problems today with respect to the fire prevention and protection means.

In order to solve these problems, the present inventor previously developed a fluid fire extinguishing agent shell for throwing, comprising a solution having a specific gravity of 1.12 sealed in a resin container formed such that it can be readily thrown, said solution being obtained by dissolving a mixture comprising 57% of ammonium chloride, 6% of sodium bicarbonate, 27% of anhydrous sodium carbonate, and 10% of ammonium secondary phosphate in a suitable amount of water and reacting with each other (see Japanese Patent Application No. Sho. 57-11101). When such a fluid shell is thrown into the origin of a fire, the decomposition and diffusion of the fluid fire extinguishing agent take place at the same time of the rupture of the



container, so that a heat and oxygen get away from the burnt materials to thereby enable to make the flame disappear. However, the development of a fluid fire extinguishing agent shell with more superior fire extinction performance has been demanded.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a simple fire extinguishing appliance that anyone can easily use at the time of occurrence of a fire and which is effective even after the storage for a long period of time.

Another object of the present invention is to provide a fluid fire extinguishing agent shell for throwing with superior extinction performance than that of the above-described fluid fire extinguishing agent shell developed by the present inventor.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

FIG. 1 is a front view of the fluid fire extinguishing agent shell according to the present invention.

FIG. 2 is a bottom view of the fluid fire extinguishing agent shell shown in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

The present inventor further made investigations with respect to a fluid fire extinguishing agent for many years. As a result, it has been found that not only the fire extinguishing efficiency is markedly improved, but also the fire extinguishing time is shortened if potassium carbonate (K_2CO_3) is used in place of the anhydrous sodium carbonate in the fluid fire extinguishing agent. Also, it has been discovered that in comparison with the previous fluid fire extinguishing agent, if the fire extinguishing agent concentration is increased by from about 12 to 17%, and particularly from about 13 to 15%, and the specific gravity is set up at 1.20 or higher, preferably from 1.25 to



1.29, and particularly from 1.27 to 1.28, the fire extinguishing efficiency is further improved.

That is, the present invention provides a fluid fire extinguishing agent shell for throwing, comprising a fluid fire extinguishing agent sealed in a thin-walled resin container having such a size that one can throw, which is breakable by a shock, said fluid fire extinguishing agent being a mixture comprising from about 48% to approximately the saturation point, preferably from about 49% to about 55%, and particularly about 51% of ammonium chloride (NH_4Cl); from about 28% to about 38%, preferably from about 30% to about 36%, and particularly about 33% of potassium carbonate (K_2CO_3); from about 8% to about 14%, preferably from about 9% to about 12%, and particularly from about 10% to about 11% of ammonium secondary phosphate ($(\text{NH}_4)_2\text{HPO}_4$); and from about 4% to about 8%, preferably from about 5% to about 7%, and particularly about 6% of sodium bicarbonate (NaHCO_3) all in terms of by weight, dissolved in a suitable amount of water.

Usually, it is preferable that the fluid fire extinguishing agent has a specific gravity of 1.20 or higher, preferably from 1.25 to 1.29, and particularly from 1.27 to 1.28 by dissolving the above-described mixture in water in an amount of from about 2.8 times to about 3.0 times.

The above-described resin container is of a thin-walled rectangular cylinder as shown in, for example, FIG. 1 and conveniently has a volume of from about 500 to 1,200 ml, and particularly from about 800 to 1,000 ml. The material of the container can be, for example, polyvinyl chloride, low-pressure polyethylene, high-pressure polyethylene, polypropylene, or the like.

In case of emergency that a person fights the clock, if he or she grasps the fluid fire extinguishing agent shell of the present invention and throws it

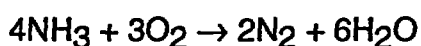


into the origin of a fire, the container is ruptured, the diffused fluid fire extinguishing agent causes a chemical reaction by a heat of the burnt material, to thereby take the heat and oxygen away, and the burnt material is cut off from air by emission of a water vapor, to thereby make the flame disappear. The function of each of the components of the fluid fire extinguishing agent is as follows.

(1) Ammonium chloride and potassium carbonate react with each other slightly even at the ordinary temperature, to thereby emit a weakly ammoniacal odor in the following manner.



Since the reaction rapidly proceeds as the temperature increases, in the case that the fire extinguishing agent is thrown into a fire, it vigorously reacts to emits NH_3 which reacts with oxygen and to be decomposed in the following manner.

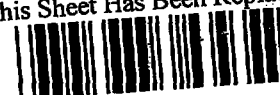


Accordingly, the air (oxygen) is rapidly eliminated by these gases (CO_2 , N_2 , NH_3 , H_2O), whereby the burning is suppressed.

(2) Ammonium secondary phosphate has been known as a fire extinguishing agent and has hitherto been used in a fire extinguisher. This substance contributes greatly to the fire extinguishing action by the synergistic effect with ammonium chloride and potassium carbonate.

(3) Sodium bicarbonate retards the reaction of (1) at the ordinary temperature and plays a role in the stabilization action. However, this substance is decomposed at high temperatures to emit CO_2 and performs a part of the fire extinguishing action.

(4) Since the fire extinguishing agent which has been thrown into a fire and diffused is not spread as a gas, and the remaining chloride and



phosphate and the like cover materials and prevent the spread of a fire, there is an effect for preventing re-ignition. Needless to say, the water itself has a fire extinguishing action based on a large amount of heat of evaporation (endothermic) and elimination of air by an emitted water vapor.

EXAMPLE 1

[A] Preparation of Fluid Fire Extinguishing Agent:

A stirrer-equipped dissolver having a volume of 1,000 liters is charged with 650 to 700 liters of water, and (1) 168.0 kg of NH_4Cl , (2) 108.5 kg of K_2CO_3 , (3) 34.5 kg of $(\text{NH}_4)_2\text{HPO}_4$, and (4) 20 kg of NaHCO_3 are gradually added into the dissolver in this order while keeping the temperature at the normal temperature (30°C to 40°C) and actuating the stirrer, followed by dissolving the mixture in water. After completion of the dissolution for 60 minutes to 180 minutes, 350 to 300 liters of water is added thereto for dilution. It takes about 50 to 60 minutes. The solution is colorless and transparent and has a specific gravity of 1.275 and a pH of 9.5 to 10.0.

[B] Production of Fluid Fire Extinguishing Agent Shell:

As shown in FIGs. 1 and 2, a container main body 1 is composed of red polyvinyl chloride (a trade name: Compound) having a thickness of 0.8 mm to 1.0 mm and is in a square bottle form in which a bottom face 4 is approximately a square of 80 mm x 80 mm, and a rectangular cylinder (full liquid part) having a height of 160 mm is subjected to front connection with a top bung hole 3 and a continuous L-type bent 2. The side periphery of the rectangular cylinder is laterally covered by convexes a, b, c, d, and e in a projected state of 2 mm from the periphery, and concaves d', e', etc. corresponding to these convexes are formed in the inside of the container. The width of the convexes is set in a different size such that it is 12 mm for a, 10 mm for b, 8 mm for c, 10 mm for d, and 12 mm for e, respectively. That is,

the convexes b, c, and d located in the center site of the cylinder are formed in a smaller width than that of the convexes a and e so as to enable a person to easily grip the cylinder and throw it. Further, the edges at which the convexes intersect the concaves are rounded to improve a touch, and in order to keep the harmony with interior decorations in normal times, the cylinder is provided with an aesthetic color (red). This is a design for the purpose of expectation such that a person who has it ready as a fire protection article always becomes intimate with the article and effectively uses it in case of emergency. Also, a consideration is given such that when confronted with an unexpected fire, anyone can hold and merely throws it, whereby the purpose of initial fire extinction can be achieved without needs of complicated operation. A cap is formed by white polypropylene (a trade name: Aron Compound), and a packing is formed by natural-colored polyethylene (a trade name: Softlon). Such one container is poured with 800 cc of the above-described fluid fire extinguishing agent and sealed to form a rectangular cylinder shell. The temperature range for use is from -10°C to 50°C. Since food additives are used in the fluid fire extinguishing agent of the present invention, it is non-toxic to human beings and materials and has an effect for preventing the spread of a fire to materials fully wetted by the fluid. Unless a strong physical shock is given to the container, the efficiency can be maintained for 6 years.

[C] Fire Extinction Test:

With respect to the performance of the fluid fire extinguishing agent shell according to the present invention, the test results (an extract) by Fire Protection Equipment and Safety Center of Japan (located in Nissho Building, Toranomom 2-chome, Minato-ku, Tokyo, Japan) are as follows.

**(1) Test Method:**

- (a) Ministerial ordinance to stipulate the technical standards of fire extinguisher (Ordinance No. 27, Article 3, Item 2 of the Ministry of Home Affairs of 1964)
- (b) Type of fire model: No. 2 model
- (c) Water contents of wood used in the model: 15.0%
- (e) Distance for most closely approaching to the model: 1 m
- (d) Precombustion time: 3 minutes

(2) Test Results:

The results of the fire extinction test are given in Table 1.

TABLE 1

<u>Test</u>	<u>Number of Throwing</u>	<u>Throwing Time</u>	<u>Throwing Person</u>	<u>Result</u>
1	3	19 sec.	Male (75 years old)	Extinguished
2	3	14 sec.	Male (75 years old)	Extinguished

[D] Weathering Test:

The fluid fire extinguishing agent shell according to the present invention was allowed to stand outdoors for one month of from the 8th of September to the 7th of October and exposed to a light and air. The bursting pressure of the fluid shell before and after the exposure was measured. The results obtained are given in Table 2.

TABLE 2

<u>Sample</u>	<u>Bursting Pressure</u> (kg)
Sample 1 before exposure	2.8
Sample 2 before exposure	2.5
Sample 3 before exposure	3.0
Sample 1 after exposure	2.8
Sample 2 after exposure	2.8
Sample 3 after exposure	2.8

The above data show that the more is the figure of bursting pressure, is the better.

REFERENTIAL EXAMPLE 1

Fluid fire extinguishing agent shells were produced in the same procedures as in Example 1, except for dissolving a mixture of 180 g of NH_4Cl , 85 g of Na_2CO_3 , 30 g of $(\text{NH}_4)_2\text{HPO}_4$, and 20 g of NaHCO_3 in water to obtain a solution having a specific gravity of 1.12 and a pH of 10 to 11 and using this solution as a fluid fire extinguishing agent.

The thus produced fluid fire extinguishing agent shells were subjected to the fire extinction test in the same manner as in Example 1. The results obtained are given in Table 3.

TABLE 3

<u>Test</u>	<u>Number of Throwing</u>	<u>Throwing Time</u>	<u>Throwing Person</u>	<u>Result</u>
1	4	21 sec.	Male (75 years old)	Extinguished
2	4	22 sec.	Female (55 years old)	Extinguished
3	4	19 sec.	Male (72 years old)	Extinguished

It can be understood from the results of Example 1 and Referential Example 1 that the fluid fire extinguishing agent shell according to the present invention has made it possible to effect the fire extinction of the same model within a shorter period of time by a smaller number of the fluid fire extinguishing agent shells as compared with the previous ones.

The fluid fire extinguishing agent shell according to the present invention has the following characteristics.

(1) Since it has such size and shape that it can be easily thrown, the fire extinction can be effected only by throwing it into the origin of a fire by people of any age and sexes.

(2) The burnt materials are fire-extinguishable instantly by a chemical reaction (instant fire extinguishing action).

(3) The materials which have been once extinguished are never re-ignited (re-ignition protection action).



(4) Since the burnt materials can be rapidly cooled without oxygen, after the fire extinction, even if they are touched, they are not hot, and a burn can be prevented (rapid cooling action).

(5) A harmful smoke is vaporized (vaporization action).

(6) Since the aqueous solution itself is of no harm to humans or animals, even children can take part in the fire extinguishing activity.

(7) It is of low price so that each family can reserve it for a sudden need.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.



WHAT IS CLAIMED IS:

1. A fluid fire extinguishing agent shell for throwing, comprising a fluid fire extinguishing agent sealed in a thin-walled resin container having such a size that one can throw, said fluid fire extinguishing agent being a mixture comprising from about 48% to approximately the saturation point of ammonium chloride, from about 28% to about 38% of potassium carbonate, from about 8% to about 14% of ammonium secondary phosphate, and from about 4% to about 8% of sodium bicarbonate all in terms of by weight, dissolved in a suitable amount of water.
2. A fluid fire extinguishing agent shell for throwing as claimed in Claim 1, wherein said fluid fire extinguishing agent is a mixture comprising from about 49% to about 55% of ammonium chloride, from about 30% to about 36% of potassium carbonate, from about 9% to about 12% of ammonium secondary phosphate, and from about 5% to about 7% of sodium bicarbonate all in terms of by weight, dissolved in a suitable amount of water.
3. A fluid fire extinguishing agent shell for throwing as claimed in Claim 1, wherein said fluid fire extinguishing agent is a mixture comprising about 51% of ammonium chloride, about 33% of potassium carbonate, from about 10% to about 11% of ammonium secondary phosphate, and about 6% of sodium bicarbonate all in terms of by weight, dissolved in a suitable amount of water.
4. A fluid fire extinguishing agent shell for throwing as claimed in Claims 1, 2, or 3, wherein said mixture is dissolved in water in an amount such that said fluid fire extinguishing agent has a specific gravity of 1.20 or higher.
5. A fluid fire extinguishing agent shell for throwing as claimed in Claims 1, 2, or 3, wherein said mixture is dissolved in water in an amount such that said fluid fire extinguishing agent has a specific gravity of from 1.25 to 1.29.

This Sheet Has Been Replaced



6. A fluid fire extinguishing agent shell for throwing as claimed in Claims 1, 2, or 3, wherein said mixture is dissolved in water in an amount such that said fluid fire extinguishing agent has a specific gravity of from 1.27 to 1.28.