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(54) FIRE EXTINGUISHING METHOD AND PRODUCT

(71) I, CELESTIN HERBLINE, a French Citizen, of Domaine Bracheux, Fouqenies, (Oise), France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of fire fighting and to a halogenous fire-extinguishing product, and in particular to such a product which can be thrown from a distance on to a fire. In addition, the method and product may be used preventively to stop the progression of a fire.

Fire-extinguishing powders are already known which are capable of being thrown from a distance on to a fire. These powders are generally dispensed from fire extinguishing apparatus which uses carbonic gas to throw the powder in the direction of the fire.

There are several drawbacks associated with the use of such known powders. The cloud generated by the powder considerably reduces the visibility where the powder is used. This generally prevents the person trying to extinguish the fire from locating the seat of the fire with accuracy. The reduced visibility caused by the cloud also reduces the ability of the person fighting the fire to escape rapidly from the area of the fire.

In addition, the known fire-extinguishing powders, if toxic, may cause poisoning upon being absorbed in the lungs. If non-toxic powders are selected, suffocation still remains a problem not only during use of the powder to extinguish fires, but also when filling the extinguisher.

The known fire-extinguishing powders have no damping effect upon light burning products, which may thus be propelled from the fire by the extinguishing powder, thereby resulting in the spread of the fire. This is particularly true when the extinguishing powder is ejected into the seat of the fire from a close distance. This problem cannot be easily overcome by moving away from the fire since the powders cannot be projected from a great distance.

In addition to the known fire-extinguishing powders, other extinguishing products are known which are specifically designed for use on hydrocarbon fires. One product of this type is "light water" disclosed in U.S. Patent No. 3,258,423 of Tuve et al., the disclosure of which is hereby incorporated herein by reference. Other information concerning "light water" is reported by R. Gouezec in "La Revue Technique du Feu" (1967).

"Light water" is a fire-extinguishing agent comprising an aqueous foam having a non-combustible gas phase and an aqueous liquid phase which contain in solution perfluorocarbon foaming compounds of the type disclosed in the aforementioned patent. It is frequently used with sea water, briny water or soft water, and is particularly effective in extinguishing hydrocarbon fuel fires (category B) as well as fires of category A because of its damping action and its excellent penetration. The excellent extinguishing characteristics of compositions containing "light water" result from the sheet of foam which quickly covers the whole surface to be extinguished, even when the density of the extinguishing product is greater than the density of the burning combustible product.

An aqueous solution of the fire-extinguishing composition flows from the foam and floats on the surface of the combustible product, such as hydrocarbon fuel. This allows the formation of a screen of vapour of the extinguishing composition which prevents the combustible product from re-igniting, even when the continuity of the sheet of foam is interrupted. Because of these properties, fire-extinguishing compositions containing "light water" can be applied to non-inflamed combustible materials to prevent them from burning in the first instance.

A fire-extinguishing composition of the

"light water" type is hereinafter referred to as a "tensio-active fluoro-carbon product". The fire-extinguishing efficiency of these tensio-active fluorocarbon products is very great, and greater than the fire-extinguishing efficiency of protein-type foams. Their very good resistance to re-firing seems to be due to the thickness of foam formed on the surface of a burning liquid. Nevertheless, it would be of great interest to increase the performance of tensio-active fluorocarbon products, in particular to notably increase the efficiency thereof when used with powdered fire-extinguishers. It is also desired to minimise the risks of re-igniting a combustible substance by increasing the thickness of the protecting layer which is formed on its surface.

Halogenated fire-extinguishing products are also known. These products are used by mixing them with a liquid, water for example, and by projecting the mixture at a distance onto the fire in the form of a frozen mud or foam.

In a particular case, the halogenated product is compressed chlorobromodifluoromethane which is then a liquid under the pressure of a gas, such as nitrogen for example. In use, the compressed chlorobromodifluoromethane product is mixed with a liquid, such as water or oil, contained in another vessel. Then the mixture is ejected into the air so that the chlorobromodifluoromethane evaporates, generating snow which turns into an ice product known as "Neve". Real blocks of ice containing the chlorobromodifluoromethane may be thrown on to a fire from very great distances.

The main drawbacks concerning halogenated fire-extinguishing products are the possibility of decomposition of the products obtained, the toxicity thereof, as well as their small density which, apart from in the case of Neve, makes it difficult to throw them on to a fire from a great distance. Most of these drawbacks do not exist when using the fire-extinguishing products of the present invention. In addition, the extinguishing efficiency of the halogenated extinguishing products may be significantly increased and possible evaporation of the product delayed as long as possible by using these products in conjunction with the extinguishing products of the present invention.

Numerous other extinguishing products are known, but the few examples discussed hereinbefore have been selected as representative of the type whose efficiency can be greatly increased by using them along with the extinguishing products according to the present invention.

According to the present invention there is provided a method of fighting or preventing the spread of a fire on a surface, which comprises directing a fire-extinguishing product at the surface, the product comprising a non-inflammable powder selected from the group consisting of silica, alumina, silico-sodium aluminate, silicates of soda and mixtures thereof and a non-inflammable liquid in which the powder is insoluble, the powder having an apparent density less than the density of the liquid and being capable of absorbing a substantial proportion of its own weight of water and still remain in powdered form.

By the term "a substantial proportion" I mean a quantity of powder can absorb in the order of its own weight of water, and the term shall not be construed as limiting the absorption of water to 100% or less of the weight of the powder.

The fire-extinguishing products used in the method of the present invention may be used in standard apparatus, and in particular, in apparatus in which standard extinguishing powders are used. This makes it possible to minimise costs incurred by industrial and individual users of the method. These products may be kept in closed vessels for several years without losing their extinguishing capacity and other properties.

The fire-extinguishing products used in the method of the present invention may be thrown upon a fire from a very great distance. In addition, they may be used in the vicinity of the seat of the fire without causing the burning particles to be propelled away from the fire due to their excellent damping capacity. The extinguishing products may be used to extinguish any type of fire. The products form a refractory layer on horizontal, vertical or oblique surfaces and may remain applied for several hours, days and even several months.

The fire-extinguishing products used in the method of the present invention contain components which do not evaporate or sublimate and which do not deteriorate in the absence of fire, so that the progression of a fire is stopped when the fire contacts the product. When the product is thrown on to the seat of a fire, a thick layer of the extinguishing product is formed thereon. The layer is thicker than that formed by the extinguishing tensio-active fluorocarbon products of the "light water" type alone and most of the other products already known, particularly when used on liquid hydrocarbon fires.

The fire-extinguishing products used in the method of the present invention are substantially non-toxic, capable of being easily mixed, have good damping characteristics, may be projected from a

great distance on to a fire by standard extinguishing equipment, and may be readily mixed with other fire-extinguishing products so that the extinguishing effect thereof can be optimised depending on the type of components therein and the type of fire to be extinguished.

A great number of powders can be used in the fire-extinguishing products according to the present invention, so long as the powders are non-inflammable, insoluble in the liquid to which they are added, are capable of absorbing a substantial proportion of their own weight of water, have an apparent or bulk density much less than the density of the liquid, and are selected from the aforementioned group.

Preferred powders from the group are anti-clodding agents which have a great absorbing power. An anti-clodding agent is a product which, at proportions of less than 3% of a hygroscopic product to which it is added, prevents or inhibits agglomeration and caking of such product.

The anti-clodding agents may also belong to the category of "packaging products" or "conditioning agents". These are powders which are capable of turning a liquid or pasty product into a powder when the conditioning agent is present in proportions ranging up to about 30% of the product to be processed.

Preferred anti-clodding and conditioning agents are powders such as silica, alumina and silica-sodium aluminates. Among the preferred anti-clodding and conditioning agents, commercially available silico-sodium aluminates sold under the Trade Marks "TIX.O.LEX 28" and "TIX.O.LEX 78" and precipitated silica sold under the Trade Mark "TIX.O.SIL 38" provide excellent results in the method of the present invention.

In addition to being anti-clodding and conditioning agents, these silico-sodium aluminates and precipitated silica are non-toxic, odourless, tasteless, do not become spoiled and are particularly stable. These characteristics have resulted in these powders being used as additives in some powdered food products.

Until now, these products have been applied in particular to ingredient industries for manufacturing rubber, plastics materials and resins, powdered chemical products, recovery products, fish wastes, sulphur, fertilizers, powdered foods for man and animals, casein, powdered soap, dentrifices, powdered products for automatic machines; but no application as components of extinguishing products has been contemplated.

Some of the other characteristics of these powders which make them particularly suitable for use in the method of the present invention are that they are non-inflammable and insoluble in the desired liquid. They are also very light, so that they may be carried a great distance by the liquid component of the composition under the action of a force, such as a gas jet, for example. In addition, they prevent the product from forming a paste which is likely to harden so as to obstruct pipes. Thus, these powders can absorb a sufficient amount of liquid to be carried or ejected in powder form.

The surface characteristics, granularity and fineness of the powder particles enables them to be easily mixed together, as well as with additional components. Moreover, their surface characteristics enable them to strongly adhere to the products to be processed, so that the formation of dust is prevented during mixing. These characteristics also prevent loss of efficiency due to the settling of the powder at the bottom of packages during handling.

The great number of particles and their small diameter make it possible to coat the particles of the product to be packaged, so that a good adherence is obtained and the number of direct contacts between particles is limited. By this means, it is possible to reduce agglomeration or gathering of crystal particles together so that a mass is not formed. Of great importance is the ability of these powders to absorb a great deal of liquid. The particularly preferred silico-sodium aluminates and precipitated silica powders are known to be capable of absorbing in the order of their own weight of water and still retain good flow characteristics.

The aforementioned group of powders have the characteristics referred to hereinbefore. Each of the powders has an actual density of about 2, but because of their surface characteristics, they have a much lower apparent or bulk density. The preferred precipitated silica and silico-sodium aluminates have an apparent or bulk density of about 0.25 g/cc.

The liquid component of the fire-extinguishing products of the present invention is selected depending on the type of fire to which the product is to be applied. Almost any liquid can be used so long as it is non-inflammable and has a density greater than the apparent density of whatever powder is used to form the powdered component of the composition. By way of example, the liquid can be pure water, briny water, sea water, animal, vegetable or mineral oils, or halogenated hydrocarbon liquids, such as chlorobromo-difluoromethane.

The method of the present invention includes mixtures of liquids, as well as mixtures of powders. Thus, for example, mixtures of liquids of the type listed above

may contain a tensio-active fluorocarbon product, such as "light water". The combination of a liquid with a tensio-active fluorocarbon product is particularly preferred when the product is intended for use in extinguishing inflamed liquid hydrocarbons.

Where it is desired to extinguish burning metals, such as magnesium, aluminium etc., the extinguishing product is particularly effective if the liquid component is a mineral oil by itself having a high ignition point, or a mineral oil mixed with other liquids.

Even when the liquid component of the extinguishing product is water, the presence of a mineral oil in the extinguishing product aids in reducing evaporation of the water from the extinguishing product.

Depending on the type of fire to be extinguished, the tensio-active fluorocarbon product can be substituted by various adhesive products or any suitable damping product. The product obtained is always in the form of a powder due to absorption of the liquids by the powdered component which has a high absorption capability.

According to a further aspect of the present invention there is provided a liquid fire-extinguishing product comprising a halogenous compound, a non-inflammable powder selected from the group consisting of silica, alumina, silico-sodium aluminate, silicates of soda and mixtures thereof and water, the powder having an apparent density less than the density of water and being capable of absorbing a substantial proportion of its own weight of water and still remain in powdered form.

As previously mentioned the water may be, for example, soft water, briny water or sea water and the product may include non-inflammable animal, vegetable and/or mineral oils. The halogenous compound may be in the form of the aforedescribed tensio-active fluorocarbons such as light water and/or halogenated hydrocarbons such as chlorobromodifluoromethane.

The present invention will now be described in more detail with reference to the following specific, non-limiting examples of suitable fire-extinguishing compositions designed to constitute extinguishing products for 10 litre extinguishers, the volume being made up by any desired liquid.

Example 1

Ingredient	Amount
TIX.O.sil 38	4 Kg
Light water	0.5 litres
Mineral oil	50 cc

Example 2

TIX.O.SIL 38	4 Kg
Light water	0.5 litres
Mineral oil	30 cc

The ingredients in the Examples are mixed in any suitable container, which may be a portion of the extinguishing apparatus or a separate container. The volume of the balance liquid (which will usually be water or a mixture including water) may depend on the characteristics sought.

The powdered ingredients are placed in the container, followed by the mineral oil and light water or other additives. Then, the balance liquid ingredient, whether it is, for example, water, oil, halogenated liquid, or a mixture of liquids, is added to the container. The mixture is then agitated, and if not being mixed in the extinguisher apparatus, poured into the extinguisher apparatus. A bottle of carbonic gas is then positioned in the appropriate location on the extinguisher apparatus and the assembly closed. The device is then ready to operate.

After the mixture is formed, there is no problem with degradation or decomposition of the product, although the powdered material will tend to settle at the bottom of the extinguishing apparatus. Due to the type of powders used, the settled material is not in the form of a hard, agglomerated mass. Rather, the deposit will be mixed with the surrounding liquid under the influence of the strong action of the carbonic gas when the extinguisher is used, the mixture being turned into a type of mud.

The product is preferably applied to a fire by an extinguisher carrying a Giffard, a type of injector located at the end of the pipe. Thanks to the air-intake, the action of the Giffard facilitated the formation of the product into an extinguishing foam or an extinguishing mastic, like a light plaster. The extinguishing product made in accordance with the aforementioned examples can be projected by the extinguisher from a distance of several feet and will adhere even on vertical walls for several months.

The layer formed on inflamed hydrocarbons by the product containing "light water" has a thickness 4 or 5 times that obtained with standard extinguishing products containing "light water".

Where the products are intended for use in cold environments, a suitable compatible anti-freeze ingredient, such as calcium chloride, can be added in an effective amount to prevent the products from freezing.

The fire-extinguishing products of the

present invention are substantially non-toxic, which means that they are not physiologically dangerous as used under the conditions normally encountered in extinguishing fires.

The present invention may be embodied in other specific forms without departing from the invention defined by the appended claims.

WHAT I CLAIM IS:—

1. A method of fighting or preventing the spread of a fire on a surface, which comprises directing a fire-extinguishing product at the surface, the product comprising a non-inflammable powder selected from the group consisting of silica, alumina, silico-sodium aluminate, silicates of soda and mixtures thereof and a non-inflammable liquid in which the powder is insoluble, the powder having an apparent density less than the density of the liquid and being capable of absorbing a substantial proportion of its own weight of water and still remain in powdered form.

2. A method according to claim 1 wherein the liquid is selected from the group consisting of water; briny water; sea water; non-inflammable animal, vegetable and mineral oils; and halogenated hydrocarbons.

3. A method according to claim 2 wherein the halogenated hydrocarbon is chlorobromodifluoromethane.

4. A method according to any one of claims 1 to 3 wherein the liquid is a mixture.

5. A method according to any one of claims 1 to 4 wherein the liquid includes a tensio-active fluorocarbon product.

6. A method according to any one of the preceding claims wherein the powder has an apparent density of about 0.25 g/cc.

7. A method according to any one of the preceding claims wherein the powder is capable of absorbing 100% of its own weight of water.

8. A method of fighting or preventing the spread of a fire on a surface, which comprises directing a fire-extinguishing product at the surface, the product being substantially as herein described with reference to Example 1 herein.

9. A method of fighting or preventing the spread of a fire on a surface, which comprises directing a fire-extinguishing product at the surface, the product being substantially as herein described with reference to Example 2 herein.

10. A liquid fire-extinguishing product comprising a halogenous compound, a non-inflammable powder selected from the group consisting of silica, alumina, silico-sodium aluminate, silicates of soda and mixtures thereof and water, the powder having an apparent density less than the density of water and being capable of absorbing a substantial proportion of its own weight of water and still remain in powdered form.

11. A product as claimed in claim 10 in which the water is briny water or sea water.

12. A product as claimed in claim 10 or claim 11 which includes non-inflammable animal, vegetable and/or mineral oils.

13. A product as claimed in any one of claims 10 to 12 in which the powder has an apparent density of about 0.25 g/cc.

14. A product as claimed in any one of claims 10 to 13 in which the powder is capable of absorbing 100% of its own weight of water.

15. A product as claimed in any one of claims 10 to 14 in which the halogenous compound comprises a tensio-active fluorocarbon product.

16. A product as claimed in any one of claims 10 to 15 in which the halogenous compound comprises a halogenated hydrocarbon.

17. A product as claimed in claim 16 in which the halogenated hydrocarbon is chlorobromodifluoromethane.

18. A liquid fire-extinguishing product substantially as herein described with reference to Example 1 herein.

19. A liquid fire-extinguishing product substantially as herein described with reference to Example 2 herein.

URQUHART-DYKES & LORD,
11th Floor,
St. Martin's House,
140 Tottenham Court Road,
London, W1P, 0JN.
and
3rd Floor,
Essex House,
27 Temple Street,
Birmingham, B2, 5DD.
Chartered Patent Agents.

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