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ARTHUR EICHENGRÜN, OF CHARLOTTENBURG, GERMANY.

METHOD OF PREVENTING EASILY-INFLAMMABLE ARTICLES FROM INFLAMING AND OF EXTINGUISHING FIRE.

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The invention relates to a method of preventing easily inflammable articles from inflaming and of extinguishing fire.

A number of substances have been proposed for preventing or minimizing the possibility of easily inflammable articles such as curtains and other textile fabrics, paper, straw, wood and the like, inflaming.

The fire-proofing or minimizing action of these substances is generally due to the fact that they provide the article to be protected with a coating, which prevents the spreading of the flames, or that when heated they evolve gases such as ammonia, carbon dioxide, sulphurous acid and the like, which either hinder free access of air to the articles, or mix with the gases produced by the action of the flames upon the articles thus preventing or minimizing the possibility of said gases, inflaming. Metallic salts, ammonium salts, boric acid, phosphoric acid, silicic acid, tungstic acid, titanitic acid and mixtures thereof, and many other chemicals have been proposed as fire-proofing agents. These chemicals are generally used in solution, and the articles to be fire-proofed are impregnated therewith. The hitherto known fire-proofing compositions have however certain disadvantages.

An ideal fire-proof composition should be colourless and odourless, should not unduly increase the weight of the articles treated, nor render them stiff, or otherwise influence their flexibility; it must not be hygroscopic, poisonous or corrosive; it must not attack the colours, nor be visible on the impregnated articles; and it should retain its action permanently, and must adhere so firmly to the fibre as to prevent its removal during ordinary usage, for instance, bending, or folding; it should not only prevent the article from burning when exposed to a flame but also from glowing; and it should be capable of being applied as a relatively dilute solution, not only to raw materials, but also to finished articles, such as carpets, curtains, upholstery and the like, in situ.

As far as I am aware, none of the known fire-proofing compositions possesses all these qualities. Generally, their action is too weak so that the articles have to be completely saturated with these preparations which has the disadvantage that they become too stiff

or too hard, or that the compositions gradually crystallize or sweat out and detract from the appearance of the article.

Salts of ammonia with strong acids such as ammonium sulphate and ammonium phosphate are liable to attack the colour or fibres of some articles especially when the articles are passed through hot rollers or ironed;

Boric acid salts, such as for example borax, form crusts and have an insufficient fire-proofing action. Moreover articles impregnated therewith glow after a flame has been applied;

Sodium phosphate also has an insufficient fire-proofing action whilst ammonium phosphate, although one of the most efficient fire-proofing agents, exhibits particularly the disadvantage of after-glowing;

Compounds of silicic acid, for example water-glass, in spite of possessing at the beginning a very good protective action, when exposed to great heat burn superficially, and moreover cause very great after-glowing;

Even the more expensive fire-proofing preparations, such as tungstic acid, titanitic acid and the like, although not possessing the above mentioned disadvantages to the same degree, are attended by the drawback that their application is cumbersome and that they are expensive.

The present invention aims at overcoming the aforesaid disadvantages.

I have found that ammonium bromide is especially suitable as a fire-preventing agent, because in contradistinction to any of the hitherto known compounds, not only does it fire-proof the articles, but also, on heating, gases are developed which have the property of smothering flames to an extraordinary degree.

It is true that other halogen ammonia compositions for example ammonium chloride have the property of being decomposed by heat and developing ammonia which smothers the flames, but in contradistinction to these known ammonium salts, ammonium bromide is not decomposed into ammonia when heated, but it forms gaseous decomposition products of an unknown nature, which have the property of smothering the flames to an extraordinary degree.

Although ammonium bromide has this ex-

traordinary property, it does not altogether prevent the after-glowing of the articles impregnated therewith when exposed to flames.

I have now found that the glowing of articles impregnated with ammonium bromide can be effectively prevented by treating the articles therewith in a certain way.

The present invention provides a method of producing in easily inflammable articles a condition adapted to prevent their flaming which consists in treating, for example by impregnating, coating, spraying or the like, the articles to be fire-proofed with or by enveloping or surrounding them with a composition comprising the combination of ammonium bromide and neutral or basic combustion impeding ammonium salts of organic or inorganic acids, or a mixture of acid salts with the addition of neutralizing alkalis or ammonia or ammonium salts (i. e., weaker acids e. g. the acid action of acid ammonium phosphate can be neutralized by ammonium carbonate), the quantities of the latter being in themselves insufficient to fire-proof the articles, but just sufficient to prevent glowing of the treated articles when exposed to a flame.

I have found that inflammable articles impregnated or containing such a combination of ammonium bromide with ammonium phosphate or the like are not only completely prevented from burning but moreover that a particular feature of the combination is that when exposed to a flame for a considerable time, the articles impregnated therewith are absolutely prevented from after-glowing, which is not the case with individual components alone. Moreover, under the influence of heat, gases are evolved which have an extraordinary effect in extinguishing or smothering the flames this property being considerably more marked than if ammonium bromide were used alone, because not only is the whole molecule of ammonium bromide decomposed but other ammonium salts are also decomposed into flame extinguishing gases and the vapours and fumes produced by the combined interaction of the various ammonium salts yield a thick white smoke, whereas in the case of ordinary ammonium salts only about a sixth of the ammonium salts is decomposed into ammonia gas.

These preparations containing ammonium bromide are admirably adapted to extinguish fires.

In addition to the aforesaid advantages, such a combination has the property that the salts are less liable to crystallize out than when the individual components are used alone. This is probably explainable by the fact that salt solutions can be prevented from crystallizing by the addition of other salts. By making use of this phenomenon very highly concentrated solutions can be

used for impregnating inflammable articles without any risk of the salts crystallizing out upon the articles, which is especially advantageous in connection with the impregnation of very fine fabrics, having a soft or tender surface, such as velvet, velveteen, plush or the like, which cannot be treated with the hitherto known fire-proofing agents.

The flexibility of the articles is hardly altered at all. Nevertheless the flexibility may if desired be completely maintained, if at the same time substances are used which have a hygroscopic action without attacking the fibres, such as for instance small amounts of glucose, glycerine, glycol, lactic acid, lactic acid salts, and the like. Although these substances are inflammable per se, their capability of inflaming is entirely suppressed by the above combination of ammonium bromide and ammonium phosphate.

The new fire-proofing combination has the additional advantage that it can be applied not only to raw or unfinished materials, but also to finished articles. Thus, for example, when fire-proofing fabrics need only be moistened with a solution of the composition by means of a sponge, brush, spraying apparatus or the like. When fire-proofing carpets, it is sufficient to use an ordinary watering can or spray for this purpose. The whole carpet or other article to be fire-proofed may of course be passed through a bath containing a solution of the composition, the surplus solution being subsequently squeezed out.

The fire-proofing composition is so stable that the articles treated therewith may be ironed after treatment, or be steamed, for instance in the case of velvet or plush.

In all cases, the impregnation is completely invisible and cannot be detected from the feel, but only on trying to burn the articles. Any desired absorbent material can be fire-proofed such as textile fabrics, fibres, paper cardboards, and soft woods. It is moreover, possible to fire-proof wooden floors, for example in works, public buildings and dance-halls, roofs, structures or the like, by a mere spraying on of the fire-proofing agent.

It is of course immaterial whether the finished articles are impregnated with the composition of the present invention, or whether the material is impregnated prior to being worked up into the finished article. Thus, for instance, in the production of Chinese lanterns or other fairy lamps, it is possible to impregnate the paper or other material prior to the manufacture of the lamps.

It is also possible to protect articles by packing them in material such as wood shavings, sawdust or paper waste impregnated with the composition of the present invention, or the wooden boxes, cartons, or card-

board boxes may be impregnated with the fire-proofing composition.

As previously stated, a very remarkable property of the new fire-proofing composition is that it not only acts as a fire-preventative, but also as a fire-extinguisher, owing to the fact that under the action of heat, gases are evolved which hinder free access of air to the articles or which mix with the gases produced when the articles are being acted upon by the flames, thus hindering or minimizing the possibility of the gases inflaming and preventing the propagation of the fire. A further property is that the whole molecule of ammonium bromide is entirely decomposed into flame-extinguishing gases the volume of which gases is a multiple of that of the gases evolved by other known fire-extinguishing agents.

This latter property renders it possible by heating combustible articles such as fabrics, paper, wood or the like, partly or wholly impregnated with the new fire-proofing composition, to extinguish any fire which should start in the room. This property is of great importance for protecting, for instance merchandise in store-rooms, goods, wagons, ships' holds and the like, from fire, all that is necessary being to cover said goods with, for example sheets, sacking, saw dust or the like impregnated with the fire-proofing agent. As soon as a fire should break out, the heat of the fire will decompose the fire-proofing composition and the fire extinguishing gases evolved in large volumes will immediately extinguish the flames, thus preventing a spread of the fire. Thus, in addition to its fire-proofing action the new composition is also adapted to act as an automatic extinguishing means.

In addition to ammonium phosphate, other easily volatilizable substances may be added, more especially combustion impeding ammonium salts of organic or inorganic acids, such as molybdic acid, boric acid, tungstic acid, and the like. Only small amounts of such salts are necessary to prevent after-glowing of the ammonium bromide, the quantities being considerably less than would be the case if they were used alone.

Another important application of the invention is the extinction of coal and the like fires in grates, boilers or the like. If for example, impregnated combustible materials, such as paper waste, wood waste, wood shavings or sawdust are impregnated according to the process of the present invention, mixed with non-impregnated parts, and this mixture of impregnated materials and non-impregnated materials is placed beneath a coal fire in a domestic grate and ignited, the non-impregnated parts burn, the heat generated thereby decomposes the impregnating composition, and the ascending vapours ex-

tinguish the fire within a very short time, for example one minute.

It is thus possible to extinguish a fire in household grates at night instead of allowing the coals to burn out and consequently to effect a considerable economy in fuel.

Not only is this method applicable to household purposes, but also to damping or extinguishing fires in locomotives, steam boilers, factories, central heating installations and the like. An additional advantage is that the fire can be extinguished in situ, so that it is no longer necessary to remove the ignited fuel before extinguishing it by water or other means.

The invention is also applicable to the fire-proofing of certain materials, such as for example wings of aeroplanes, hoods of motor-cars and the like. It is well known that linen, although it is only very slightly inflammable alone, when impregnated with rubber solution or with cellulose acetate, becomes more inflammable than before. In my British Patent No. 7418/1913 I have already called attention to this fact. I have mentioned therein that although cellulose acetate possesses little or no inflammability, when fibrous materials are impregnated or coated therewith, said cellulose acetate will burn strongly, and in some cases is liable, when the flames were once fairly started at any point, to burn more strongly and to be even more difficult to extinguish, than the individual materials.

I have found that when the process of the present invention is applied to the treatment of aeroplane fabrics, it not only makes the fabric fire-proof, but also smothers any fire that might start, for instance by the burning of benzene, petrol or the like. However, inasmuch as some of the salts used are water soluble they must be protected by a water-proof coating.

I claim:

1. Method of producing a condition adapted to prevent the flaming of easily inflammable articles which consists in treating the article to be fireproofed with a composition comprising the combination of ammonium bromide with sufficient quantities of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

2. Method of producing a condition adapted to prevent the flaming of easily inflammable articles which consists in treating the article to be fireproofed with a composition comprising the combination of ammonium bromide with sufficient quantities of ammonium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

3. Method of producing a condition adapt-

ed to prevent the continued flaming of easily inflammable articles which consists in enveloping the article to be protected with a composition comprising the combination of ammonium bromide with sufficient quantities of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

4. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles which consists in enveloping the article to be protected with a composition comprising the combination of ammonium bromide with sufficient quantities of ammonium phosphate to prevent, in combination with the ammonium bromide, the after glowing of the treated articles when exposed to a flame.

5. Method of producing a condition adapted to prevent the flaming of easily inflammable articles which consists in treating the article to be fireproofed with a composition comprising the combination of ammonium bromide with sufficient quantities of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame, and admixing with the treated article a hygroscopic substance, adapted to counteract the stiffening action of the fireproofing ingredients.

6. Method of producing a condition adapted to prevent the flaming of easily inflammable articles which consists in treating the article to be fireproofed with a composition comprising the combination of ammonium bromide with sufficient quantities of ammonium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame, and admixing with the treated article a hygroscopic substance adapted to counteract the stiffening action of the fireproofing ingredients.

7. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles over an increasing area which consists in surrounding the articles to be protected with a material wholly or partly treated with a composition comprising the combination of ammonium bromide with a sufficient quantity of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

8. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles over an increasing area which consists in surrounding the articles to be protected with a material wholly or partly treated with a composition comprising the combination of ammonium bromide with a sufficient quantity of am-

monium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

9. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles over an increasing area which consists in covering the articles to be protected with a combustible material wholly or partly treated with a composition comprising the combination of ammonium bromide with a sufficient quantity of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

10. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles over an increasing area, which consists in covering the articles to be protected with a combustible material wholly or partly treated with a composition comprising the combination of ammonium bromide with a sufficient quantity of ammonium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

11. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles which consists in treating the articles to be protected, with a solution of a composition comprising the combination of ammonium bromide with a sufficient quantity of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

12. Method of producing a condition adapted to prevent the continued flaming of easily inflammable articles which consists in treating the articles to be protected with a solution of a composition comprising the combination of ammonium bromide with a sufficient quantity of ammonium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated articles when exposed to a flame.

13. Method of producing a condition adapted to prevent the continued flaming of easily inflammable materials which consists in throwing into the fire material impregnated with a composition comprising the combination of ammonium bromide with a sufficient quantity of a combustion impeding ammonium salt to prevent, in combination with the ammonium bromide, the after-glowing of the treated material when exposed to a flame.

14. Method of producing a condition adapted to prevent the continued flaming of easily inflammable materials which consists in throwing into the fire material im-

pregnated with a composition comprising the combination of ammonium bromide with a sufficient quantity of ammonium phosphate to prevent, in combination with the ammonium bromide, the after-glowing of the treated material when exposed to a flame.

15. Method of producing a condition adapted to prevent the continued flaming of easily inflammable materials such as coal or the like fires in domestic grates, locomotives, boilers and central heating installations, which consists in causing vapours produced by heating a composition comprising the combination of ammonium bromide

and a combustion impeding ammonium salt to act upon said burning or glowing materials.

16. Method of producing a condition adapted to prevent the continued flaming of easily inflammable materials such as coal or the like fires in domestic grates, locomotives, boilers and central heating installations, which consists in causing vapours produced by heating a composition comprising the combination of ammonium bromide and ammonium phosphate to act upon said burning or glowing materials.

In testimony whereof, I affix my signature.

ARTHUR EICHENGRÜN.