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(54) **Fugitive color fire retardant composition for aerial application**

Verblassende Farbe enthaltende flammende Zusammensetzung zur Anwendung aus der Luft

Composition ignifuge à colorants fugitifs pour application aérienne

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Description

[0001] This invention relates to fire retardant compositions which are specially adapted for aerial application, to combat or prevent the spread of wildfires.

[0002] More particularly, the invention concerns a fugitive color fire retardant composition, having improved aerial visibility after it is first aerially applied to ground vegetation, but which fades over time and under ambient conditions to another color (hue).

[0003] In the early 1960's aerial application of fire retardant compositions to prevent or retard the spread of forest fires, range fires, etc. became very widespread. Typically, these fire retardant compositions contained an electrolytic fire suppressing salt such as ammonium phosphate, ammonium sulfate, and the like and also included other components such as viscosity modifiers, corrosion inhibitors and coloring agents such as pigments or dyes. Typical fire retardant compositions of the type described above are disclosed in the patents to Nelson, U.S. 3,196,108, and to Langguth et al., U.S. 3,257,316 and 3,309,324. These compositions generally consisted of an aqueous slurry or solution of a fire suppressing salt such as ammonium phosphate or ammonium sulfate and a thickening agent such as attapulgite clay, guar gum or the like. Coloring agents such as red iron oxide were included to improve the visibility of the material after it was dropped. More recently, ammonium polyphosphate liquids, containing coloring agents and corrosion inhibitors, have been widely employed. Such liquid polyphosphate fire retardant compositions are disclosed in the patents to Nelson, U.S. 3,370,890 and to Lacey, U.S. 3,960,735.

[0004] Fire retardant compositions containing other thickeners, stabilizers and the like are disclosed in the patents to Strickland, U.S. 4,822,524; Morganthaler, U.S. 3,634,234; Kegler et al., U.S. 4,606,831; Vandersall, U.S 4,447,336; Adl et al., U.S. 4,447,338; and Vandersall, U.S. 4,839,065 and 4,983,326.

[0005] Fire retardant compositions are typically manufactured as dry or liquid "concentrates". These concentrates are shipped and stored in such form until just prior to use. Then, the concentrate is mixed with water to form the final diluted "mixed" fire retardant composition. This mixed retardant composition is then pumped in the tanker aircraft for transport to and dropping at the wildfire site. In some instances a dry concentrate is first mixed with an initial quantity of water to provide an intermediate liquid concentrate and this intermediate liquid concentrate is then further diluted just before use to the final diluted mixed form.

[0006] The active fire suppressing components employed in such retardant compositions include any of the well known electrolytic fire suppressing salts, e.g., such as are disclosed in the patent to Nelson U.S. 3,196,108, as well as the more recently employed liquid ammonium polyphosphate materials, as disclosed in the patent to Lacey U.S. 3,960,735; ammonium sulfate, as disclosed in the patent to Crouch U.S. 4,176,071; and mixtures of these salts with themselves and with other salts.

[0007] In general, the active fire retardant components are compounds or a mixture of compounds that degrade or decompose at temperatures below the ignition temperature of the fuels to be protected (e.g., cellulose), thereby releasing a mineral acid, such as phosphoric acid or sulfuric acid. Among the various fire retardants typically used in fire retardant mixtures and which might be used in the compositions of this invention are monoammonium orthophosphate, diammonium orthophosphate, monoammonium pyrophosphate, diammonium pyrophosphate, triammonium pyrophosphate, tetraammonium pyrophosphate, ammonium polyphosphate, substituted ammonium polyphosphate, amide polyphosphate, melamine polyphosphate, ammonium-alkali metal mixed salts of orthophosphate, ammonium-alkali metal mixed salts of pyrophosphate, ammonium-alkali metal mixed salts of polyphosphate, ammonium-alkaline earth metal mixed salts of orthophosphate, ammonium-alkaline earth metal mixed salts of pyrophosphate, ammonium-alkaline earth metal mixed salts of polyphosphate, ammonium sulfate, liquid ammonium polyphosphates and blends thereof. Some liquid ammonium polyphosphates may be too dilute in their commercial forms for application as fire retardants but, other retardants, such as those noted above, may be mixed with a liquid ammonium polyphosphate until a minimum acceptable concentration is obtained. Ammonium polyphosphate is often called polyammonium phosphate, and commonly contains other ammonium phosphate such as pyro and metaphosphates, and the alkali metal equivalents thereof, as well as a blend of phosphate polymers. Such polyammonium phosphates are often referred to as 10-34-0, 11-37-0, 12-40-0, 13-42-0 or the like, where the first number indicates the percentage of nitrogen in the blend, the middle number indicates the percentage phosphate in the blend and the last number indicates the percentage potash in the blend.

[0008] The fire retardant components may also include thickening agents, which include standard thickeners such as galactomannan guar gum compositions and derivatives thereof attapulgite clay, carboxymethylcellulose and derivaties thereof, and the like. The thickening agent is employed to maintain the viscosity of the diluted mixed fire retardant composition, for example, at between about 50 centipoise and about 2000 centipoise for aerial application. In addition, the fire retardant components, in the concentrate or in the final diluted mixed form, may also typically include various adjuvants such as corrosion inhibitors, flow conditioners, spoilage inhibitors, stabilizers and the like, and carriers for these adjuvants, in accordance with art recognized principles.

[0009] When such fire retardant compositions, in final diluted mixed form for aerial application, are applied by drop-

ping from fixed-wing or helicopter aircraft, successive "drops" are often made by the aircraft to form a fire-fighting line. Under these circumstances, it is important for the pilot of the aircraft to be able to visually determine where the preceding loads were dropped, such that the pilot can drop the load from the aircraft to form a continuation of this line. Since the fire retardant components (described above) may be colorless or may be of colors which do not contrast well with the ground or vegetation, it has been common practice to mix coloring agents with the fire retardant composition components. Coloring agents are used to give the fire retardant compositions a color (hue) which contrasts with the hue of the ground vegetation, thereby enhancing the ability of the aircraft pilot to determine where the last loads of fire retardants were dropped in constructing a fire-fighting line. Prior art coloring agents have included pigments which are dispersible in the liquid fire retardant compositions or soluble therein, most commonly red iron oxide or various water soluble dyes. Such coloring agents were remarkably effective in enhancing the aerial visibility of fire retardant compositions after they were applied. However, certain prior art coloring agents, especially red iron oxide, were very "colorfast", such that the ground and structures (if any) to which the prior art fire retardant compositions were applied, remained permanently or semi-permanently stained. Consequently, certain government fire-fighting agencies have, more recently, required that aerially applied fire retardant compositions have so-called "fugitive" coloring agents, such that the color of the compositions would fade over a short time, e.g., 30 days, to a color which did not objectionably contrast with the ground and ground vegetation.

[0010] Several dyes and pigments (encapsulated dyes) have been identified which impart a distinctive hue to fire retardant compositions, which contrasts with ground vegetation, but which fade in a short time to a "neutral" color, i.e., such that the fire retardant compositions exhibit the color they would have exhibited without the addition of such fugitive agents. However, although the fire retardant compositions themselves might be brilliantly colored by fugitive agents, after first application it was often difficult to locate the fire retardant drop zone. It has been found that the reduced visibility of these highly colored fugitive compositions is somewhat related to the viscosity of the fire retardant compositions themselves. Thus, more highly viscous fugitive compositions are somewhat easier to see on the vegetation, because they form a thicker coating. However, even highly viscous fugitive color compositions are sometimes difficult to visualize from an aircraft after dropping on various kinds of vegetation and under various lighting conditions.

[0011] It would be advantageous to provide fugitive color fire retardant compositions which exhibit improved aerial visibility after dropping. It would also be advantageous to achieve this result in an economical manner and without using any materials which are toxic to humans, animals, fish or to vegetation.

[0012] Briefly, we have discovered a fugitive color liquid fire retardant composition for aerial application to ground vegetation which achieves these objectives. Our composition comprises fire retardant components, a colorant and a liquid carrier, typically an aqueous carrier. The fire retardant components include a fire suppressing salt and has a first hue. The colorant comprises a fugitive component and a non-fugitive component.

[0013] The colorant initially colors the fire retardant composition components to a second hue which contrasts with the hue of the ground vegetation. This may be due solely to the color imparted by the fugitive component or the color imparted by the combined fugitive/non-fugitive components.

[0014] The non-fugitive component of our colorant is present in an amount sufficient to improve the aerial visibility of the composition when it is first applied to the vegetation. However, the non-fugitive component is present in less than an amount which prevents the composition from thereafter fading to the first hue, i.e., the hue of the fire retardant composition components without the colorant.

[0015] According to another embodiment of our invention, we provide a concentrate composition for preparing the liquid composition described above by dilution thereof with the aqueous carrier. The concentrate composition comprises the fire retardant components and the colorant.

[0016] In one embodiment, the concentrate is a dry composition. In another embodiment the concentrate is a liquid, suitable for later dilution with water to form the final mixed liquid fire retardant composition.

[0017] These, other and further embodiments of the invention will be apparent to those skilled in the art from the following detailed description.

[0018] As used herein, the term "fire retardant components" means all of the components of the composition except the "colorant" and the liquid carrier, if any. The fire retardant components will include a fire retardant salt and may optionally include (and usually will include) other common ingredients of fire retardant formulations, e.g., corrosion inhibitors, spoilage inhibitors, flow conditioners, anti-foaming agents, foaming agents, stability additives and thickening agents.

[0019] The term "colorant" means a combination of at least two components, namely, a fugitive component and a non-fugitive component.

[0020] The "fugitive component" is a dye or a dye which is dispersed in a matrix (i.e., a pigment), which fades over time and under ambient field conditions to a colorless or less highly colored hue. A number of such dyes and pigments are well known in the art. For example, many water-soluble dyes fade rapidly and there are so-called fluorescent pigments (fluorescent dyes encapsulated in a resin integument) which are suspendable in the fire retardant compositions and which also fade rapidly to provide the "fugitive" effect. Typical examples of prior art fugitive dyes and pigments

include C.I. Basic Red I dye, 6BL dye, Basic Violet II dye, Basic Yellow 40 and encapsulated-dye pigments which are available commercially, e.g., the "AX" series pigments, supplied by Day-Glo Color Corp., Cleveland, Ohio. At present, we prefer to employ encapsulated-dye fugitive pigments without uv absorbers, rather than using water soluble dyes because the encapsulated-dye pigments are less likely to stain.

[0021] The colorant is present in an amount which provides a color ("second hue") to the composition which is different from the color of the composition without the colorant ("first hue"). The second hue contrasts with the hue of the vegetation (normally green and/or brown). Advantageously, the second hue is red, orange or pink.

[0022] The colorant also includes a "non-fugitive" component, i.e., a component which is insoluble in the carrier liquid and which, if colored, does not necessarily fade after aerial application of the fire retardant composition.

[0023] The non-fugitive component preferably has an index of refraction of at least 2.0. For example, prior art fire retardant compositions containing fugitive colorants and which also contain various clays and other insoluble materials, e.g., attapulgite clay, tricalcium phosphate, (components which have refractive indices below 2.0), do not have the improved aerial visibility exhibited by the compositions of the present invention unless the amounts of such lower-index materials are so large that the compositions are not "fugitive". To achieve improved aerial visibility smaller quantities of non-fugitive components can be employed if the refractive index is higher and larger quantities of lower-index materials are required to achieve desirable results.

[0024] The non-fugitive component is included in the colorant in an amount sufficient to provide improved aerial visibility of the composition when it is first aerially applied to the vegetation. However, the amount of the non-fugitive component is less than the amount which would prevent the fire retardant composition from fading to the first hue after application.

[0025] The non-fugitive component is dispersable or suspendable in the final fire retardant composition and in a liquid concentrate of such composition. The dispersability or suspendability of such a component is primarily dependent upon particle size and particle size distribution and the nature of the other components present in the fire retardant composition such as thickeners, etc.

[0026] Also, the chemical structure and characteristics of the non-fugitive pigment must be compatible with the other components, especially with the carrier liquid. It must be sufficiently chemically inert that it does not lose its functional capability when combined with the other components of the fire retardant composition. It should also be non-toxic, and, if colored, should not undesirably affect the hue established by the fugitive component.

[0027] For example, in the presently preferred practice of the invention we employ red iron oxide pigments as the non-fugitive component. Yellow iron oxide pigments and white pigments, such as titanium dioxide can also be employed. Although colored pigments such as red or yellow iron oxide do not fade appreciably, the amounts of such pigments in the fire retardant compositions are small enough that the overall composition ultimately fades to a neutral color, i.e., substantially the same color which the composition would have exhibited if no colorant had been added.

[0028] For example, if a red fugitive component and red iron oxide (non-fugitive component) are employed, the initial color (second hue) of the resultant fire retardant composition will be red. If a red fugitive component and yellow iron oxide (non-fugitive component) are employed, the second hue will be orange. If a red fugitive component and a white non-fugitive component are employed, the second hue will be pink. Any of these second hues may provide sufficient contrast with the hue of the ground vegetation to provide acceptable aerial visibility. At present, we prefer to employ red iron oxide in combination with a red fugitive component to form the colorant.

[0029] The maximum quantity of non-fugitive pigment which can be employed, which will still maintain the overall fugitive (fading) characteristics of the fire retardant composition, will vary, depending on the natural or "neutral" color of the fire retardant composition components and the natural colors of the terrain and vegetation. For example, if a blue-colored fire retardant composition such as that disclosed in the Lacey patent U.S. 3,960,735 is employed on darkly-colored vegetation, e.g., spruce fir, a greater quantity of a colored non-fugitive colorant, e.g., red iron oxide, can be employed. On the other hand, less of a colored non-fugitive component can be employed if the base composition is highly viscous or if the composition is applied on less highly colored vegetation or terrain, e.g., chapparal. It appears that the maximum quantity of colored non-fugitive component is higher when using a clay thickener than when using a gum thickener in the fire retardant composition. In general, it appears that the colored non-fugitive pigment can be no more than approximately 20-30 wt.% of the total colorant. The maximum amount of the total colorant employed will be less than the amount which would prevent the compositions from fading to a neutral color. These amounts can be determined by routine tests by persons skilled in the art having regard for this disclosure.

[0030] For example, the maximum amount of red iron oxide which can be employed, irrespective of the amount of fugitive component presently appears to be approximately 0.5 wt.% of the liquid concentrate formulations and about .10 wt.% in diluted mixed concentrate compositions. However, for any given base composition of fire retardant composition components (fire retardant salt, thickener, corrosion inhibitor, etc.), the optimum and maximum concentrations of colorant components can be determined by those skilled in the art without undue experimentation, having regard for the disclosure hereof. For example, suitable procedures for assessing the aerial visibility and fugitive fading characteristics of these compositions are set forth in Sections 3.8 and 4.3.7. of Specification 5100-304a, February 1986, U.S. Depart-

ment of Agriculture Forest Service Specification for Long Term Retardant, Forest Fire, Aircraft or Ground Application.

[0031] The use of both a dye and a pigment in the same fire retardant composition is disclosed by the U.S. Patent No. 3,960,735, issued June 1, 1976 to Kathleen P. Lacey. In the Lacey patent (Example III) both "red iron oxide" and "6BL dye" are included in a fire retardant concentrate composition. However, the primary coloring agent, red iron oxide, was present in an amount which was far in excess of that which would permit the composition to fade to the hue which it would exhibit if the dye/iron oxide had not been added, i.e., the Lacey '735 compositions were not "fugitive". The 6BL dye was added to the composition of Example III for the purpose of supplementing the red color of the iron oxide, i.e., making the composition "redder", because the iron cyanide blue corrosion inhibitor of Lacey (Col. 2, lines 5 et seq.) and the red iron oxide otherwise provided a "purplish" composition.

[0032] A prior art composition was known and used in the United States prior to our present invention which may have included a colorant consisting of a mixture of a dye and a small quantity of TiO_2, encapsulated in a polymeric matrix. This prior composition was manufactured and shipped as a dry powder "concentrate" which was then diluted with water for field application. The quantity of TiO_2 in this product was only about 40-50 ppm in the final diluted concentrate, far less than the amount required to provide the enhanced visibility achieved by the present invention.

[0033] The determination of whether the hue of the fugitive composition (second hue) fades to the hue of the composition without any colorant (first hue) can be determined by the method described in Section 4.3.7.2 of Specification 5100-304a (February 1986), "USDA Forest Service Specification for Specification for Long Term Retardant, Forest Fire Aircraft or Ground Application".

[0034] The following examples are presented to further illustrate principles of my invention to those skilled in the art. These examples do not, however, constitute limitations on the scope of the invention, which is defined only by the appended claims.

EXAMPLE I

[0035] This example illustrates the practice of the invention in the manufacture of so-called "liquid concentrate"-type fire retardant products. The products are prepared in accordance with the procedure described in U.S. Patent 3,960,735 to Kathleen P. Lacey, except that the colorant of the present invention is substituted for the coloring agents described therein.

[0036] A concentrate composition is manufactured using two different types of ammonium polyphosphate liquid. The ingredients of each of these compositions are set forth in Tables A and B. Both of these compositions have improved aerial visibility in comparison to the same compositions which do not contain the red iron oxide pigment. However, these compositions have acceptable fading characteristics, i.e., fade to hues which are substantially the same as the compositions would exhibit without addition of the colorant.

TABLE A

	Wt. % in Concentrate	**Wt. % in Final Diluted (5:1) Composition**
FIRE RETARDANT COMPONENTS		
Ammonium Polyphosphate Liquid (11-37-0)	99.3 - 78.6	22.2 - 17.58
Attapulgite Clay (AA Special)	0 - 10.0	0 - 2.24
Corrosion Inhibitor Reagent(s), stabilizers, spoilage inhibitor(s), defoamer(s), etc.	0 - 10.0	0 - 2.24
COLORANT COMPONENTS		
Fugitive Pigment (Day-Glo 122-9180)	0.5 - 1.0	0.11 - 0.22
Non-Fugitive Pigment (Titanium Dioxide)	0.2 - 0.4	0.04 - 0.09
LIQUID CARRIER		
Water	None	Balance
TOTAL	100.00	100.00

TABLE B

	Wt. % in Concentrate	Wt. % in Final Diluted (4.25:1) Composition
FIRE RETARDANT COMPONENTS		
Ammonium Polyphosphate Liquid (10-34-0)	99.3 - 77.4	24.74 - 19.28
Attapulgite Clay (AA Special)	0 - 10.0	0 - 2.49
Corrosion Inhibitor Reagent(s), stabilizers, spoilage inhibitor(s), defoamer(s), etc.	0 - 10.0	0 - 2.49
COLORANT COMPONENTS		
Fugitive Pigment (Day-Glo 122-9180)	0.5 - 2.0	0.12 - 0.50
Non-Fugitive Pigment (Yellow Iron Oxide)	0.2 - 0.6	0.05 - 0.15
LIQUID CARRIER		
Water	none	balance
TOTAL	100.00	100.00

EXAMPLE II

[0037] This example illustrates the practice of the invention by the manufacture of so-called dry or powder concentrate compositions. These dry compositions are thereafter mixed with water to form a final diluted fire retardant composition suitable for aerial application. These compositions are manufactured in accordance with the methods disclosed in U.S. Patent No. 4,176,071. The ingredients in each composition are set forth in Tables C, D and E. Each of these compositions has acceptable aerial visibility and fugitive fading characteristics.

TABLE C

	Wt. % in Concentrate	Wt. % in Final Composition
FIRE RETARDANT COMPONENTS		
Ammonium Sulfate	78.20	14.5
Diammonium Phosphate	3.78	0.7
Guar Gum	4.20	0.8
Xanthan Gum	0.11	0.2
Corrosion Inhibitors	1.08	0.20
Spoilage Inhibitor	0.54	0.10
Defoamer/Anti-Oxidant	10.79	2.00
COLORANT COMPONENTS		
Fugitive Pigment	1.08	0.20
Non-Fugitive Pigment (Red Iron Oxide)	0.22	0.04
LIQUID CARRIER		
Water	none	balance
	100.00	100.00

TABLE D

	Wt. % in Concentrate	Wt. % in Final Composition
FIRE RETARDANT COMPONENTS		
Ammonium Sulfate	24.52	3.2
Diammonium Phosphate	65.90	8.6
Guar Gum	5.98	.8
Stabilizer/corrosion inhibitor	2.30	.3
COLORANT COMPONENTS		
Fugitive Pigment	1.00	0.13
Non-Fugitive Pigment (Red Iron Oxide)	0.30	0.04
LIQUID CARRIER		
Water	None	Balance
TOTAL	100.00	100.00

TABLE E

	Wt. % in Concentrate	Wt. % in Final Composition
FIRE RETARDANT COMPONENTS		
Ammonium Sulfate	64.15	8.5
Diammonium Phosphate	24.15	3.2
Guar Gum	6.00	.8
Spoilage inhibitor	0.75	.1
Stabilizer/corrosion inhibitor	0-3.77	

EXAMPLE 3

[0038] This example illustrates the practice of the invention in the manufacture of fugitive compositions of the general type disclosed in U.S. Patent No. 4,983,326. A blended dry powder concentrate is prepared in accordance with Example 4B of the '326 patent. The dry concentrate is mixed with water to form an intermediate low-viscosity liquid concentrate, which is then further diluted to form a high-viscosity final mixed fire retardant composition having improved aerial visibility in comparison to the same compositions without the iron oxide pigment and has acceptable "fugitive" fading characteristics. Table F depicts the weight percentages of the components of the dry concentrate, intermediate liquid or so-called "fluid" concentrate and the final diluted mixed retardant composition.

TABLE F

	Dry Conc	Liq Conc	Final Mix
FIRE RETARDANT COMPONENTS			
Monoammonium phosphate	52.24	24.46	5.62
Diammonium phosphate	34.81	16.30	3.74
guar gum	7.24	3.39	0.78
sodium molybdate	0.19	0.09	0.02
tricalcium phosphate	2.01	0.94	0.22
sodium silicofluoride	0.47	0.22	0.05
mercaptobenzothiazole	0.30	0.14	0.03
dimercaptothiadiazole	0.72	0.34	0.08
Polyalkylene derivatives of propylene glycol	0.13	0.06	0.01
COLORANT			
Fugitive component	1.61	0.75	0.17
Red Iron Oxide	0.28	0.13	0.03
LIQUID CARRIER			
Water	none	53.18	balance
Total	100	100	100

BEST MODE OF THE INVENTION

[0039] Example 4 illustrates the best mode presently known to us for practicing our invention. Each of the products described in Examples 4 and 5 has acceptable aerial visibility and fugitive fading. If the red iron oxide is deleted from the compositions or reduced below about 0.20 wt% in the concentrate, the compositions will not have acceptable aerial visibility, even if the red iron oxide deleted is replaced by equal amounts of the fugitive pigment. If the fugitive pigment is eliminated or reduced and the red iron oxide content is increased to provide sufficient aerial visibility, then the compositions do not have acceptable the fugitive fading.

EXAMPLE 4

[0040] The following compositions were prepared in accordance with method described in the U.S. Patent No. 3,960,735 to Kathleen P. Lacey, except that the colorant of the present invention is substituted for the coloring agents described therein. The ingredients used in preparing the liquid concentrates and the final diluted mixed fire retardant are listed in Table G, H and I.

TABLE G

	wt% in liquid concentrate	wt% in diluted mixed retardant
FIRE RETARDANT COMPONENTS		
Ammonium Polyphosphate Liquid (Arcadian 11-37-0)	90.60	20.29
Attapulgite Clay (Floridin AA Special)	3.50	0.78
Sodium Ferrocyanide (Wego Technical)	4.50	1.01
COLORANT		
Fugitive Pigment (Day-Glo #122-9180)	1.00	0.22
Non-Fugitive Pigment (Mobay Corp. Bayferrox Red Iron Oxide 130M)	0.40	0.09
LIQUID CARRIER		
Water	none	balance
TOTAL	100.00	100.00

TABLE H

	wt% in liquid concentrate	wt% in diluted mixed retardant
FIRE RETARDANT COMPONENTS		
Ammonium Polyphosphate Liquid (Simplot 10-34-0)	90.70	22.98
Attapulgite Clay (Floridin AA Special)	4.00	1.01
Sodium Ferrocyanide (Wego Technical)	3.90	0.99
COLORANT		
Fugitive Pigment (Day-Glo #122-9180)	1.00	0.25
Non-Fugitive Pigment (Mobay Corp. Bayferrox Red Iron Oxide 130M)	0.40	0.10
LIQUID CARRIER		
Water	none	balance
TOTAL	100.00	100.00

TABLE I

	wt% in liquid concentrate	wt% in diluted mixed retardant
FIRE RETARDANT COMPONENTS		
Ammonium Polyphosphate Liquid (Macgregor 11-37-0)	90.60	21.10
Attapulgite Clay (Floridin AA Special)	3.50	0.82
Sodium Ferrocyanide (Wego Technical)	4.50	1.05
COLORANT		
Fugitive Pigment (Day-Glo #122-9180)	1.00	0.23
Non-Fugitive Pigment (Mobay Corp. Bayferrox Red Iron Oxide 130M)	0.40	0.09
LIQUID CARRIER		
Water	none	balance
TOTAL	100.00	100.00

EXAMPLE 5

[0041] This example illustrates the practice of the invention by the manufacture of liquid concentrate products from ammonium polyphosphate liquids, using non-fugitive components other than red iron oxide. These compositions have acceptable aerial visibility and fugitive fading characteristics. The compositions are prepared in accordance with the procedure of Example 1, with the components listed in Table J and Table K.

TABLE J

	Wt.% in concentrate	Wt.% in solution
Ammonium Polyphosphate (11-37-0)	90.6	20.26
Attapulgite Clay	3.5	0.78
Corrosion inhibitor	4.5	1.01
Water	None	balance
Fugitive pigment	1.0	0.22
Titanium dioxide	0.4	0.09

TABLE K

	Wt.% in concentrate	Wt. % in solution
Ammonium Polyphospate (10-34-0)	90.7	22.83
Attapulgite Clay	4.0	1.01
Corrosion inhibitor	3.9	0.99
Water	None	balance
Fugitive pigment	1.0	0.25
Yellow iron oxide	0.4	0.10

EXAMPLE 6

[0042] This example illustrates the practice of the invention by the manufacture of dry concentrate products from ammonium phosphate and ammonium sulfate, using non-fugitive components other than red iron oxide. These compositions have acceptable aerial visibility and fugitive fading characteristics. The compositions are prepared in accordance with the procedure Example 2, with the components listed in Tables L-O.

TABLE L

	Wt.% in concentrate	Wt.% in solution
Ammonium sulfate	94.47 - 82.21	14.70
Diammonium phosphate	4.56 - 3.97	0.71
Guar gum	0 - 4.47	0 - 0.8
Stabilizer(s)/corrosion inhibitor(s)/spoilage inhibitor(s), defoamer(s), etc.	0 - 8.40	0 - 1.5
fugitive pigment	0.84 - 0.73	0.13
yellow iron oxide	0.13 - 0.22	0.02 - 0.04
Water	None	84.44 - 82.14

TABLE M

	Wt.% in concentrate	Wt.% in solution
Ammonium sulfate	93.90 - 83.44	10.00 - 20.00
Diammonium phosphate	4.69 - 6.25	0.50 - 1.50
Guar gum	0 - 4.47	0 - 0.8
Stabilizer(s)/corrosion inhibitor(s)/spoilage inhibitor(s), defoamer(s), etc.	0 - 6.26	0 - 1.5
fugitive pigment	1.22 - 0.54	0.13
titanium dioxide	0.19 - 0.17	0.02 - 0.04
Water	None	89.35 - 76.03

TABLE N

	Wt.% in concentrate	Wt.% in solution
Ammonium sulfate	71.61 - 59.98	8.5
Diammonium phosphate	26.96 - 22.58	3.2
Guar gum	0 - 5.65	0 - 0.8
Stabilizer(s)/corrosion inhibitor(s)/spoilage inhibitor(s), defoamer(s), etc.	0 - 10.59	0 - 1.5
fugitive pigment	1.09 - 0.92	0.13
yellow iron oxide	0.34 - 0.28	0.04
Water	None	88.13 - 85.83

TABLE O

	Wt.% in concentrate	Wt.% in solution
Ammonium sulfate	69.47 - 53.53	14.00 - 5.00
Diammonium phosphate	29.78 - 20.02	6.0 - 1.87
Guar gum	0 - 4.47	0 - 0.8
Stabilizer(s)/corrosion inhibitor(s)/spoilage inhibitor(s), defoamer(s), etc.	0 - 16.06	0 - 1.5
fugitive pigment	1.65 - 1.40	0.13
titanium dioxide	0.10 - 0.43	0.02 - 0.04
Water	None	79.85 - 90.66

[0043] Having described our invention in such terms as to enable those skilled in the art to make and use it and, having identified the presently preferred embodiments and best modes thereof, we claim:

Claims

1. A fugitive color liquid fire retardant composition for aerial application to ground vegetation, said composition comprising:

   a) fire retardant components having a first hue, including a fire retardant salt;
   b) a colorant which initially colors said composition to a second hue which contrasts with the hue of said vegetation, said colorant comprising

      i) a fugitive color component, and
      ii) a non-fugitive component present in said composition in an amount which improves the aerial visibility of said composition, but in less than an amount which prevents said composition from fading to said first hue after aerial application.

   (c) an aqueous carrier.

2. A concentrate composition for preparing the composition of Claim 1 by dilution thereof with said aqueous carrier, comprising said fire retardant components and said colorant.

3. The concentrate composition of Claim 2 which is a dry composition.

4. The concentrate composition of Claim 2 which is a liquid concentrate composition.

5. The composition of Claim 1 in which said non-fugitive component is red iron oxide.

6. The concentrate composition of Claim 4 in which said fire retardant salt comprises a liquid ammonium polyphosphate and said non-fugitive component is red iron oxide.

Patentansprüche

1. Eine flüssige feuerhemmende Zusammensetzung mit flüchtiger Farbe zur Aufbringung aus der Luft auf Bodenvegetation, wobei die genannte Zusammensetzung folgendes umfaßt:

   a) feuerhemmende Komponenten mit einem ersten Farbton, einschließlich einem feuerhemmenden Salz;
   b) einen Farbstoff, der die genannte Zusammensetzung anfänglich auf einen zweiten Farbton verfärbt, der mit dem Farbton der genannten Vegetation kontrastiert, wobei der genannte Farbstoff folgendes beinhaltet:

i) eine flüchtige Farbkomponente und

ii) eine nichtflüchtige Komponente, die in der genannten Zusammensetzung in einer Menge vorhanden ist, die die Sichtbarkeit aus der Luft der genannten Zusammensetzung verbessert, aber in einer geringeren Menge als der, welche die genannte Zusammensetzung nach dem Aufbringen aus der Luft am Verblassen auf den genannten ersten Farbton hindert,

c) einen wäßrigen Träger.

2. Konzentratzusammensetzung zum Herstellen der Zusammensetzung nach Anspruch 1 durch Verdünnen dieser mit dem genannten wäßrigen Träger, die die genannten feuerhemmenden Komponenten und den genannten Farbstoff aufweist.

3. Konzentratzusammensetzung nach Anspruch 2, die eine trockene Zusammensetzung ist.

4. Konzentratzusammensetzung nach Anspruch 2, die eine flüssige Konzentratzusammensetzung ist.

5. Zusammensetzung nach Anspruch 1, bei der die genannte nichtflüchtige Komponente ein rotes Eisenoxid ist.

6. Zusammensetzungskonzentrat nach Anspruch 4, bei dem das genannte feuerhemmende Salz ein flüssiges Ammoniumpolyphosphat beinhaltet und die genannte nichtflüchtige Komponente rotes Eisenoxid ist.

Revendications

1. Composition ignifuge liquide de couleur fugitive pour une application aérienne à une végétation au sol, ladite composition comprenant :

a) des composants ignifuges ayant une première teinte, comportant un sel ignifuge ;
b) un colorant qui colore initialement ladite composition dans une deuxième teinte qui contraste avec la teinte de ladite végétation, ledit colorant comprenant

i) un composant de couleur fugitif, et
ii) un composant non fugitif présent dans ladite composition dans une quantité qui améliore la visibilité aérienne de ladite composition, mais inférieure à une quantité qui empêche ladite composition de se décolorer et de revenir à ladite première teinte après l'application aérienne.

(c) un agent véhiculeur aqueux.

2. Composition concentrée pour préparer la composition de la revendication 1 par dilution de celle-ci avec ledit agent véhiculeur aqueux, comprenant lesdits composants ignifuges et ledit colorant.

3. Composition concentrée selon la revendication 2, qui est une composition sèche.

4. Composition concentrée selon la revendication 2, qui est une composition concentrée liquide.

5. Composition concentrée selon la revendication 1, dans laquelle ledit composant non fugitif est de l'oxyde de fer rouge.

6. Composition concentrée selon la revendication 4, dans laquelle ledit sel ignifuge comprend un polyphosphate d'ammonium liquide et ledit composant non fugitif est de l'oxyde de fer rouge.