PATENT SPECIFICATION

590,293

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PROVISIONAL SPECIFICATION

Improvements in or relating to Means for Fumigating with Pesticidal Compounds

We, ELWYN JONES, of 41, South Beach Road, Ardrossan, Ayrshire, and JOHN STOCK FLANDERS, of "Hillcrest", Bowfield Road, West Kilbride, Ayrshire, both British subjects, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1, a British Company, do hereby declare the nature of this invention to be as follows:—

The present invention relates to the art of fumigating with pesticidal compounds, and more particularly to the provision of simplified or improved means for the thermal production of fumes of pesticidal compounds that are capable of vaporisation when suitably heated. The invention is especially valuable for the purpose of fumigating with combustible pesticidal compounds or pesticidal compounds easily decomposed when overheated. The invention, for instance, facilitates the economical production of a fume comprising an aerosol of the condensed vapour of a pesticidal compound which can deposit on the bounding surfaces of a closed space in which the fume is generated so as to produce a thin layer of the pesticidal compound that will be active long after the atmosphere is clear of the actual fumes.

One example of a pesticide capable of depositing such a layer when a suitable fumigation method is applied to volatilise it, is the powerful insecticide alpha-alpha-di(para-chlorophenyl)-beta-beta-beta-trichloroethane. A further example is that the still more powerful insecticide gamma-benzene hexachloride can be applied in the form of a smoke by volatilisation from hot plates or by other heating methods.

A combustible candle fumigator, similar to the familiar sulphur candle, would be a very convenient means for producing the fumes of a vaporisable pesticidal compound, but in the case of many pesticides it would not be possible to make up a candle in which a pesticide is drawn into a flame for the purpose of volatilising it, since the pesticide would thereby be decomposed or burned with the formation of useless decomposition or combustion products, whereas in the case of the sulphur candle the active material is the sulphur dioxide produced by the burning of the sulphur.

According to the present invention the means for the thermal production of fumes of the thermally vaporisable pesticidal compound comprises a safety fuze cord wherein one or more of the textile yarn coverings around the powder core is coated or impregnated with the pesticide and the pesticidal compound is protected from direct contact with the powder core by at least one complete layer of the textile yarn covering. The pesticidal compound used may be for instance a solid compound of organic nature, for instance a benzene hexachloride or a chlorinated aromatic hydrocarbon derivative. The powder core of the safety fuze cord preferably comprises material yielding gaseous combustion products as it burns, for instance a black powder composition, preferably containing no sulphur.

The cord comprising the powder core and a textile covering, whether or not that in immediate contact with the core, or more than one of the textile coverings, may be coated with a paste comprising the powdered insecticide and an adhesive, or may be passed through the molten pesticide or a solution of the pesticide, and drawn through a die.

While the safety fuze core is burning there is a zone creeping along the length of the textile covering somewhat in advance of the actual burning surface of the core thereof, that will be at a temperature sufficient to vaporise the pesticide. Thus the conditions are favourable for the vaporisation of the pesticide into the atmosphere without actual contact between it and the approaching incandescent burning surface of the powder core. Moreover the outward expansion of the gaseous combustion products of the powder core and/or the charred textile layer in immediate contact with it permeate through the pesticide laden textile covering and produce turbulence in the atmosphere immediately around the fuze, thus assisting the dispersal of the pesticidal vapour.

The invention is illustrated in the

following examples, in which the percentages mentioned are by weight.

EXAMPLE 1.

A semi-fuze made in known manner by spinning a covering of four lea jute and a further covering of 3/12s cotton yarn around a sulphurless gunpowder core was coated with an insecticidal varnish of the following composition.

	per cent.
China Clay	13.7
Alpha - alpha - di(para - chlorophenyl) - beta - beta - beta-trichloroethane	54.5
Glue	4.5
Water	27.3

After application of this varnish the partly manufactured fuze cord was passed through a die and dried off. A countering with ten 30's/6 cottons was then applied, and then a final coating of a white colour varnish of the following composition, the fuze then being passed through a die and dried off:—

	per cent.
China clay	60.6
Glue	12.1
Water	27.3

The weight of the pesticidal compound per foot of the resulting safety fuze was approximately 0.5 gram. The fuze burned without side-sparking at a rate of about 2 feet per minute and effectively disseminated the insecticidal fume.

EXAMPLE 2.

The procedure was the same as in Example 1, except that in the insecticidal varnish there was employed in place of alpha - alpha - di(para - chlorophenyl)-beta-beta-beta-trichloroethane the same amount of gamma-benzene hexachloride. The resulting safety fuze cord burned in a similar fashion to that prepared according to Example 1, and effectively disseminated the insecticidal fume.

Dated the 19th day of April, 1945.

J. W. RIDSDALE,
Solicitor for the Applicants.

COMPLETE SPECIFICATION

Improvements in or relating to Means for Fumigating with Pesticidal Compounds

We, ELWYN JONES, of 41, South Beach Road, Ardrossan, Ayrshire, and JOHN STOCK FLANDERS, of "Hillcrest", Bowfield Road, West Kilbride, Ayrshire, both British subjects, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1, a British Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to the art of fumigating with pesticidal compounds, and more particularly to the provision of simplified or improved means for the thermal production of fumes of pesticidal compounds that are capable of vaporisation when suitably heated. The invention is especially valuable for the purpose of fumigating with combustible pesticidal compounds or pesticidal compounds easily decomposed when overheated. The invention, for instance, facilitates the economical production of a fume comprising an aerosol of the condensed vapour of a pesticidal compound which can deposit on the bounding surfaces of a closed space in which the fume is generated so as to produce a thin layer of the pesticidal compound that will be active long after the atmosphere is clear of the actual fumes.

One example of a pesticide capable of depositing such a layer when a suitable fumigation method is applied to volatilise it, is the powerful insecticide alpha-alpha-di(para - chlorophenyl) - beta - beta - beta-trichlorethane. A further example is that the still more powerful insecticide gamma - benzene hexachloride which can be applied in the form of a smoke by volatilisation from hot plates or by other heating methods. In Specification No. 584,853 there is claimed a process for fumigating articles which comprises treating them in an enclosed space with an aerosol containing a benzene hexachloride; and the method of burning within the said space a combustible composition of matter having the benzene hexachloride incorporated therewith, and combustible compositions for the purpose are also claimed.

A combustible candle fumigator, similar to the familiar sulphur candle, would be a very convenient means for producing the fumes of a vaporisable pesticidal compound, but in the case of many pesticides it would not be possible to make up a candle in which a pesticide is drawn into a flame for the purpose of volatilising it, since the pesticide would thereby be decomposed or burned with the formation of useless decomposition or combustion products, whereas in the case of the sul-

phur candle the active material is the sulphur dioxide produced by the burning of the sulphur.

It has previously been proposed to make a fumigator or candle in the form of a hollow cone or cylinder for diffusing in the air antiseptics, disinfectants, perfumes, medicaments and insect-destroying chemicals or compounds, of which the feature was the keeping the ignited material apart from volatile active inflammable ingredients by means of a thin partition of glass, metal, prepared cardboard or other material, so as to ensure the volatilisation of the active ingredient without flaming. When the active ingredient was a solid substance, it was suggested that the igniting material could be placed within the partition and the active ingredient could be coated on the exterior of the partition.

According to the present invention the means for the thermal production of fumes of the thermally vaporisable pesticidal compound consists of a safety fuze cord wherein one or more of the textile yarn coverings around the powder core is coated or impregnated with the pesticide and the pesticidal compound is preferably protected from direct contact with the powder core by at least one complete layer of the textile yarn covering. The pesticidal compound used may be for instance a solid compound of organic nature, for instance a benzene hexachloride or a chlorinated aromatic hydrocarbon derivative. The powder core of the safety fuze cord preferably comprises material yielding gaseous combustion products as it burns, for instance a black powder composition, preferably containing no sulphur.

By " powder core " is also included a coherent imperforate extruded core of plastic material having a deflagrating mixture of pulverulent oxidising and reducing agents as for example those used for the non-detonating fuzes disclosed in Specification No. 544,252 and as claimed in Specification No. 580,409.

The cord comprising the powder core and a textile covering, whether or not that in immediate contact with the core, or more than one of the textile coverings, may be coated with a paste comprising the powdered pesticide and an adhesive, or may be passed through the molten pesticide or a solution of the pesticide, and drawn through a die.

While the safety fuze core is burning, there is a zone creeping along the length of the textile covering somewhat in advance of the actual burning surface of the core thereof, that will be at a temperature sufficient to vaporise the pesticide. Thus the conditions are favourable for the vaporisation of the pesticide into the atmosphere without actual contact between it and the approaching incandescent burning surface of the powder core. Moreover, the outward expansion of the gaseous combustion products of the powder core and/or the charred textile layer in immediate contact with it permeate through the pesticide laden textile covering and produce turbulence in the atmosphere immediately around the fuze, thus assisting the dispersal of the pesticidal vapour. The invention is illustrated in the following examples, in which the percentages mentioned are by weight:—

EXAMPLE 1.

A semi-fuze made in known manner by spinning a covering of four lea jute and a further covering of 3/12s cotton yarn around a sulphurless gunpowder core was coated with an insecticidal varnish of the following composition.

	per cent.
China Clay	13.7
Alpha - alpha - di(para - chlorophenyl) - beta - beta - beta-trichloroethane	54.5
Glue	4.5
Water	27.3

After application of this varnish the partly manufactured fuze cord was passed through a die and dried off. A countering with ten 30's/6 cottons was then applied, and then a final coating of a white colour varnish of the following composition, the fuze then being passed through a die and dried off:—

	per cent.
China Clay	60.6
Glue	12.1
Water	27.3

The weight of the pesticidal compound per foot of the resulting safety fuze was approximately 0.5 gram. The fuze burned without side-sparking at a rate of about 2 feet per minute and effectively disseminated the insecticidal fume.

EXAMPLE 2.

The procedure was the same as in Example 1, except that in the insecticidal varnish there was employed in place of alpha - alpha - di(para - chlorophenyl-beta-beta-beta-trichloroethane the same amount of gamma-benzene hexachloride. The resulting safety fuze cord burned in a similar fashion to that prepared according to Example 1, and effectively disseminated the insecticidal fume.

EXAMPLE 3.

A homogeneous composition of 80 parts of pulverulent ingredients consisting of 70 parts red lead, 30 parts potassium nitrate and 20 parts silicon with 20 parts

of a thermoplastic binding agent consisting of 50 parts nitrocotton, 48 parts dibutyl phthalate and 2 parts diphenylamine is made up as follows. The silicon is worked into the thermoplastic binding agent contained in a steam jacketed Werner-Pfleiderer mixing machine, at a temperature of about a 100° C., until it is well distributed through the plastic. The red lead and potassium nitrate are worked into the plastic in two stages. The action of the machine is continued until the red lead mixture is well distributed and the mixing has a coherent plastic consistency. The resulting composition is extruded around a copper wire of 36 gauge so that the diameter of the extruded core is 0.048 inches.

The core so extruded is enclosed in a covering of jute yarn followed by a cotton counter.

This semi-fuze is coated with an insecticidal varnish of the following composition:—

	per cent.
China clay	13.7
Alpha - alpha - di(para - chlorophenyl) - beta - beta - beta-trichloroethane	54.5
Glue	4.5
Water	27.3

After the application of this varnish the partly manufactured fuze cord is treated as in Example 1.

The resulting safety fuze cord burns in a similar fashion to that prepared according to Example 1, and effectively disseminates the insecticidal compound.

EXAMPLE 4.

The procedure was the same as in Example 1 except that the varnish contained the fungicide pentachlorophenol instead of the insecticide alpha-alpha-di-(para - chlorophenyl) - beta - beta - beta-trichloroethane. The resulting safety fuze cord burned in a similar fashion to that prepared according to Example 1, and effectively disseminated the fungicidal compound.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A safety fuze cord wherein one or more of the textile yarn coverings around the powder core are coated or impregnated with a thermally vaporisable pesticidal compound.

2. A safety fuze cord as claimed in claim 1 wherein the said compound is protected from direct contact with the powder core by at least one complete layer of the textile yarn covering.

3. A safety fuze as claimed in claim 2 wherein the pesticidal compound is a solid compound of organic nature.

4. A safety fuze cord as claimed in claim 3 wherein the solid compound of organic nature is gamma-benzene hexachloride.

5. A safety fuze cord as claimed in claim 3 wherein the solid compound of organic nature is a chlorinated aromatic hydrocarbon derivative.

6. A safety fuze cord as claimed in any of the preceding claims wherein the powder core of the safety fuze cord comprises material yielding gaseous combustion products as it burns.

7. A safety fuze cord as claimed in claim 6 wherein the powder core is a black powder composition.

8. A safety fuze cord as claimed in claim 7 wherein the black powder composition is free from sulphur.

9. A method for the manufacture of a safety fuze cord as claimed in any of the preceding claims which comprises coating a cord consisting of the fuze powder core and one or more of its textile coverings with a paste comprising the powdered pesticide and an adhesive, and drawing the so coated cord through a die.

10. A method for the manufacture of a safety fuze as claimed in any of claims 1 to 8 which comprises passing a cord consisting of the fuze powder core and one or more of its textile coverings through the molten pesticide, and drawing the so treated cord through a die.

11. A method for the manufacture of a safety fuze as claimed in any of claims 1 to 8 which comprises passing a cord consisting of the powder core and one or more of its textile coverings through a solution of the pesticide, and drawing the so treated cord through a die.

12. A safety fuze cord substantially as described and with reference to the foregoing examples.

Dated the 14th day of March, 1946.

J. W. RIDSDALE,
Solicitor for the Applicants.

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of a thermoplastic binding agent consisting of 50 parts nitrocotton, 48 parts dibutyl phthalate and 2 parts diphenylamine is made up as follows. The silicon is worked into the thermoplastic binding agent contained in a steam jacketed Werner-Pfleiderer mixing machine, at a temperature of about a 100° C., until it is well distributed through the plastic. The red lead and potassium nitrate are worked into the plastic in two stages. The action of the machine is continued until the red lead mixture is well distributed and the mixing has a coherent plastic consistency. The resulting composition is extruded around a copper wire of 36 gauge so that the diameter of the extruded core is 0.048 inches.

The core so extruded is enclosed in a covering of jute yarn followed by a cotton counter.

This semi-fuze is coated with an insecticidal varnish of the following composition:—

	per cent.
China clay	13.7
Alpha - alpha - di(para - chlorophenyl) - beta - beta - beta-trichloroethane	54.5
Glue	4.5
Water	27.3

After the application of this varnish the partly manufactured fuze cord is treated as in Example 1.

The resulting safety fuze cord burns in a similar fashion to that prepared according to Example 1, and effectively disseminates the insecticidal compound.

EXAMPLE 4.

The procedure was the same as in Example 1 except that the varnish contained the fungicide pentachlorophenol instead of the insecticide alpha-alpha-di-(para - chlorophenyl) - beta - beta - beta-trichloroethane. The resulting safety fuze cord burned in a similar fashion to that prepared according to Example 1, and effectively disseminated the fungicidal compound.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A safety fuze cord wherein one or more of the textile yarn coverings around the powder core are coated or impregnated with a thermally vaporisable pesticidal compound.

2. A safety fuze cord as claimed in claim 1 wherein the said compound is protected from direct contact with the powder core by at least one complete layer of the textile yarn covering.

3. A safety fuze as claimed in claim 2 wherein the pesticidal compound is a solid compound of organic nature.

4. A safety fuze cord as claimed in claim 3 wherein the solid compound of organic nature is gamma-benzene hexachloride.

5. A safety fuze cord as claimed in claim 3 wherein the solid compound of organic nature is a chlorinated aromatic hydrocarbon derivative.

6. A safety fuze cord as claimed in any of the preceding claims wherein the powder core of the safety fuze cord comprises material yielding gaseous combustion products as it burns.

7. A safety fuze cord as claimed in claim 6 wherein the powder core is a black powder composition.

8. A safety fuze cord as claimed in claim 7 wherein the black powder composition is free from sulphur.

9. A method for the manufacture of a safety fuze cord as claimed in any of the preceding claims which comprises coating a cord consisting of the fuze powder core and one or more of its textile coverings with a paste comprising the powdered pesticide and an adhesive, and drawing the so coated cord through a die.

10. A method for the manufacture of a safety fuze as claimed in any of claims 1 to 8 which comprises passing a cord consisting of the fuze powder core and one or more of its textile coverings through the molten pesticide, and drawing the so treated cord through a die.

11. A method for the manufacture of a safety fuze as claimed in any of claims 1 to 8 which comprises passing a cord consisting of the powder core and one or more of its textile coverings through a solution of the pesticide, and drawing the so treated cord through a die.

12. A safety fuze cord substantially as described and with reference to the foregoing examples.

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