

PATENT SPECIFICATION

NO DRAWINGS

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International Classification: —A 01 n 17/00

COMPLETE SPECIFICATION

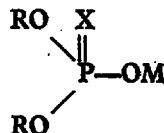
Insecticidal Compositions

We, SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ, N.V., a Company organised under the Laws of the Netherlands, of 30 Carel van Bylandtlaan, The Hague, the Netherlands, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

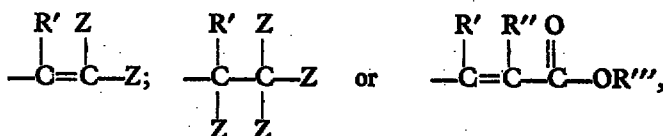
This invention relates to insecticidal compositions.

According to the invention an insecticidal composition comprises as active ingredient a

volatile insecticidal organic phosphorus compound having the general formula



in which the R groups are alkyl groups, X is oxygen or sulphur, and M is a group having the structure



in which R' is hydrogen or an alkyl group, Z is halogen, R'' is hydrogen, an alkyl group or halogen, and R''' is an alkyl, aryl, aralkyl or alkaryl group; together with a carrier and, if desired, one or more of the following additional ingredients, namely a dye, a pigment, a lubricant, a binder, a filler, an anti-oxidant, a stabilizer, a perfume and a deodorant; the composition being provided with an outer layer comprising a material through which the volatile insecticide can be emitted into the outside air.

The active ingredient in the composition may be absorbed in a thermoplastic material, e.g. a thermoplastic moulding, as the carrier. Preferably the volatile insecticidal organic phosphorus compound is present in solid solution in the thermoplastic material.

By allowing the insecticide to evaporate into a space such as a room through the surface of the thermoplastic moulding and through the outer layer, a concentration can

be obtained in that space which is fatal to insects but harmless to human beings, pets or cattle. The known commercially available polyvinyl chloride strips which contain dimethyl 2,2-dichlorovinyl phosphate (VAPONA strips; VAPONA is a trade mark) operate on this principle and are effective for a period of 3 months.

It has now been found that a higher degree of effectiveness can be obtained by means of the present insecticidal composition, which is provided with an outer layer comprising a material through which the volatile insecticide is emitted into the outside air. The rate of emission of insecticide from this composition drops less rapidly in the course of time, and since the high rate of emission at the beginning is considerably restrained, the active agent will be effective for a longer time than 3 months, viz. approximately 4 to 8 months, depending on the thickness and the structure of the outer layer.

[Price 4s. 6d.]

The thermoplastic moulding may have any shape which is suitable for emitting sufficient insecticide into the space. It may, for example, be plate-shaped, bar-shaped or strip-shaped. The moulding can be formed by means of injection moulding, extrusion or any other methods known in the plastics industry for the production of mouldings.

Preferred insecticides are dimethyl 2,2-dichlorovinyl phosphate; 1,2 - dibromo - 2,2 - dichloroethyl dimethyl phosphate; 2 - carbomethoxy - 1 - methylvinyl dimethyl phosphate; 2 - (1 - phenylcarbomethoxy) - 1 - methylvinyl dimethyl phosphate and its analogous diethyl compound. The preferred insecticides such as dimethyl 2,2-dichlorovinyl phosphate have a vapour pressure of at least 10^{-3} mm Hg at 20°C.

The amount of insecticidal organic phosphorus compound which is present in the thermoplastic material can vary considerably. For instance, compositions may be made which contain 5 to 75% by weight of volatile insecticide, based on the total composition. The percentage by weight is preferably in the range from 10 and 45%.

The insecticidal composition comprising the active ingredient and the carrier material can be subjected to shaping to form a shaped article. The mixture is processed, for example, by extrusion or moulding in a mould.

Examples of suitable thermoplastic materials for use as the carrier are polyethylene; polypropylene; copolymers of ethylene and propylene; regenerated cellulose; polyamides such as nylon; polyesters; polyacrylates such as polymers and copolymers of methylacrylate, ethylacrylate, methylmethacrylate, and ethylmethacrylate; polymers of vinyl compounds such as polystyrene and polymerized divinyl-

benzene; polyvinyl halides, for instance polyvinylchloride; polyvinyl acetals, for instance polyvinyl butyral; polyvinylidene compounds, such as polyvinylidene chloride, polyvinylacetate; ethylene-vinylacetate copolymers; copolymers of vinylchloride and vinylacetate; polyurethanes; polyaldehydes, cellulose derivatives and thermoplastic rubbers. Thermoplastics preferred for mouldings are polymers and copolymers of vinylchloride.

The outer layer may be made of any material which is permeable by the insecticide, preferably a thermoplastic material, as hereinbefore described for the carrier.

The preferably thermoplastic outer layer, which ensures regular emission of insecticide to the outside air, may be 10 to 200 microns thick, preferably between 15 and 50 microns, and may consist particularly of nylon, polyethylene, polypropylene or ethylene-vinyl acetate copolymer. The outer layer may be disposed round the thermoplastic moulding in the form of a film or shrunk film or in the form of a laminate, for example. The outer layer can be separate from the insecticide-containing mass, as in the case of a film, or be attached to it, as in the case of a laminate.

The thermoplastic insecticidal moulding, provided with an outer film or laminate, emits the insecticide regularly in approximately the same low concentration into the outside air. The following Table shows in milligrams the quantity of insecticide released per hour. A commercially available strip of polyvinylchloride and dimethyl 2,2-dichlorovinyl phosphate was used as the insecticidal thermoplastic mass. Thermoplastic films of the materials specified in the Table were used as outer layers.

TABLE

	Polystyrene	(thickness 25 microns)	7 mg/hr
	regenerated cellulose	(thickness 30 microns)	5 mg/hr
	polyethylene	(thickness 15 microns)	4 mg/hr
	"	(thickness 25 microns)	2 mg/hr
85	"	(shrink film 15 microns)	5.6 mg/hr
	"	(shrink film 25 microns)	2.5 mg/hr
	"	(thickness 40 microns)	0.7 mg/hr
	nylon	(thickness 25 microns)	9 mg/hr
	polyacrylamide	(thickness 25 microns)	8mg/hr
90	ethylene-vinylacetate copolymer	(thickness 50 microns)	8mg/hr

no film or laminate

~20 mg/hr to
< 2 mg/hr after
3 months.

The most suitable emission rates for a space measuring 3×3×3 metres are between 2 and 5 milligrams per hour. If the emission of the insecticide can be better controlled the strip will be effective for a longer period. A strip wrapped in polyethylene (25 microns

thick) showed no trace of exhaustion even after 4 months.

In another form of the composition the insecticide with low vapour pressure, such as dimethyl 2,2-dichlorovinyl phosphate, is incorporated in a powder of thermoplastic poly-

mer, particularly polyvinylchloride, and enclosed in a permeable envelope.

EXAMPLE

- 5 a) Dimethyl 2,2-dichlorovinyl phosphate was mixed with polyvinylchloride powder in a 1 to 3 ratio by weight. The polyvinylchloride powder, obtained by suspension polymeriza-
10 tion, had a particle size distribution of 5 to 150 microns. Mixing took place at 80°C for 10 minutes, and a dry, friable product was obtained. On exposure in a box with a bottom area of 150 cm², in which 50 g of the mixture was placed, a high concentration (18 mg/h) was released initially, but this became
15 less within the space of a few weeks.

- 20 With same mixture exposed over the same period but in this case enclosed in a 50-micron film of ethylenevinyl acetate copolymer, a constant low-level release was obtained over a long period (2 mg/h, constant for as long as eight weeks).

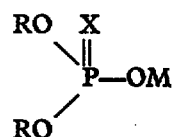
b) The insecticide was mixed at room temperature with the polyvinylchloride powder in a 2 to 1 ratio by weight to form a doughy

mass. Here too the same favourable result was obtained from packaging in the above-mentioned film: the release was also constant at 2 mg/h for 8 weeks.

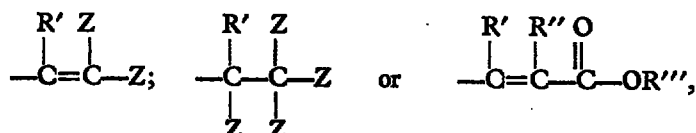
The invention also relates to a process for freeing a space from insects by subjecting them to vapour of the insecticide which has been emitted from a composition according to the invention as described above.

WHAT WE CLAIM IS:—

1. An insecticidal composition comprising as active ingredient a volatile insecticidal organic phosphorus compound having the general formula



in which the R groups are alkyl groups, X is oxygen or sulphur, and M is a group having the structure



- 45 in which R' is hydrogen or an alkyl group, Z is halogen, R'' is hydrogen, an alkyl group or halogen and R''' is an alkyl, aryl, aralkyl or alkaryl group; together with a carrier; the composition being provided with an outer layer comprising a material through which the volatile insecticide can be emitted into the outside air.

- 50 2. An insecticidal composition as claimed in Claim 1 which also includes at least one of the following: a dye, a pigment, a lubricant, a binder, a filler, an anti-oxidant, a stabilizer, a perfume and a deodorant.

- 55 3. An insecticidal composition as claimed in Claim 1 or Claim 2 wherein the active ingredient is absorbed in a thermoplastic material as the carrier.

- 60 4. An insecticidal composition as claimed in Claim 3 wherein the active ingredient is present in solid solution in the thermoplastic material.

- 65 5. An insecticidal composition as claimed in any of the preceding claims wherein the composition comprising the active ingredient and the carrier material has been subjected to shaping to form a shaped article.

- 70 6. An insecticidal composition as claimed in Claim 5 wherein the outer layer of the shaped article is a film or a shrunk film.

7. An insecticidal composition as claimed in Claim 5 wherein the outer layer of the shaped article is in the form of a laminate.

8. An insecticidal composition as claimed in Claim 6 or Claim 7 wherein the outer layer is a thermoplastic material.

9. An insecticidal composition as claimed in Claim 8 wherein the outer layer comprises nylon, polyethylene, polypropylene or ethylene-vinylacetate copolymer.

10. An insecticidal composition as claimed in Claim 8 or Claim 9 wherein the outer layer has a thickness of 10—200 microns.

11. An insecticidal composition as claimed in Claim 10 wherein the outer layer has a thickness of 15—50 microns.

12. An insecticidal composition as claimed in any of the preceding claims wherein a composition of dimethyl 2,2-dichlorovinyl phosphate and polyvinyl chloride has been shaped by extrusion or injection moulding and provided with a thermoplastic outer layer.

13. An insecticidal composition as claimed in Claim 1 and substantially as described with special reference to the Table or the Example.

14. A process for freeing a space from insects which comprises subjecting insects to

mer, particularly polyvinylchloride, and enclosed in a permeable envelope.

EXAMPLE

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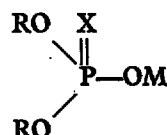
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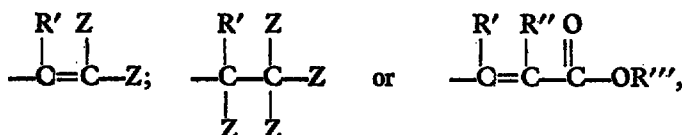
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14. A process for freeing a space from insects which comprises subjecting insects to



the vapour of the insecticide which has been emitted from a composition as claimed in any of the preceding claims.

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