

---

(12) **UK Patent Application** (19) **GB** (11) **2 132 482 A**

---

- (21) Application No **8330064**  
(22) Date of filing **10 Nov 1983**  
(30) Priority data  
(31) **57/199361**  
**57/199362**  
**58/101469**  
(32) **12 Nov 1982**  
**12 Nov 1982**  
**7 Jun 1983**  
(33) **Japan (JP)**  
(43) Application published  
**11 Jul 1984**  
(51) **INT CL<sup>3</sup>**  
**A01N 43/42**  
(52) Domestic classification  
**A5E 231 233 234 246 260**  
**269 272 300 311 324 326**  
**AB BB CC**  
**U1S 1276 1290 1308 A5E**  
(56) Documents cited  
**EPA 0069310**  
**GB 1270123**  
**GB 0849275**  
**GB 0598648**  
**GB 0474433**  
**Pesticide Manuel pp 396,**  
**556 (6)**  
(58) Field of search  
**A5E**  
(71) Applicant  
**Showa Electric Wire &**  
**Cable Co. Ltd.**  
**(Japan),**  
**1—1 Odasakae 2-chome,**  
**Kawasaki-ku, Kawasaki-**  
**shi, Kanagawa-ken, Japan**  
(72) Inventors  
**Misao Hanai,**  
**Fumio Aida,**  
**Hiroshi Ishiwata,**  
**Shinji Nakazawa**  
(74) Agent and/or Address for  
Service  
**Batchellor, Kirk & Eyles,**  
**2, Pear Tree Court,**  
**Farringdon Road, London**  
**EC1R 0DS**

- (54) **Anti-termitic composition**  
  
(57) An anti-termitic composition  
comprises at least one 8-  
hydroxyquinoline metal complex as an  
active component thereof, preferably  
dispersed in a synthetic resin

composition for example represented  
by a polyvinyl resin composition as a  
material thereof and optionally contains  
additionally 8-hydroxyquinoline. The  
metal moiety of the complex may be  
selected from the group consisting of  
Sn, Ba, Sr, Ca, Mg, and Fe.

**GB 2 132 482A**

FIG. 1

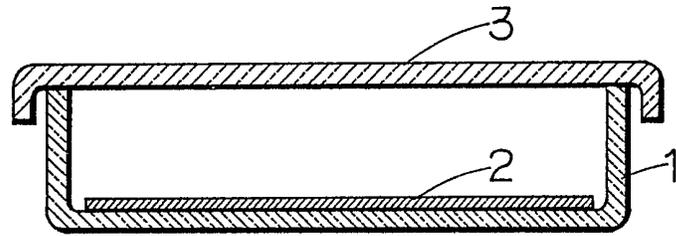


FIG. 2

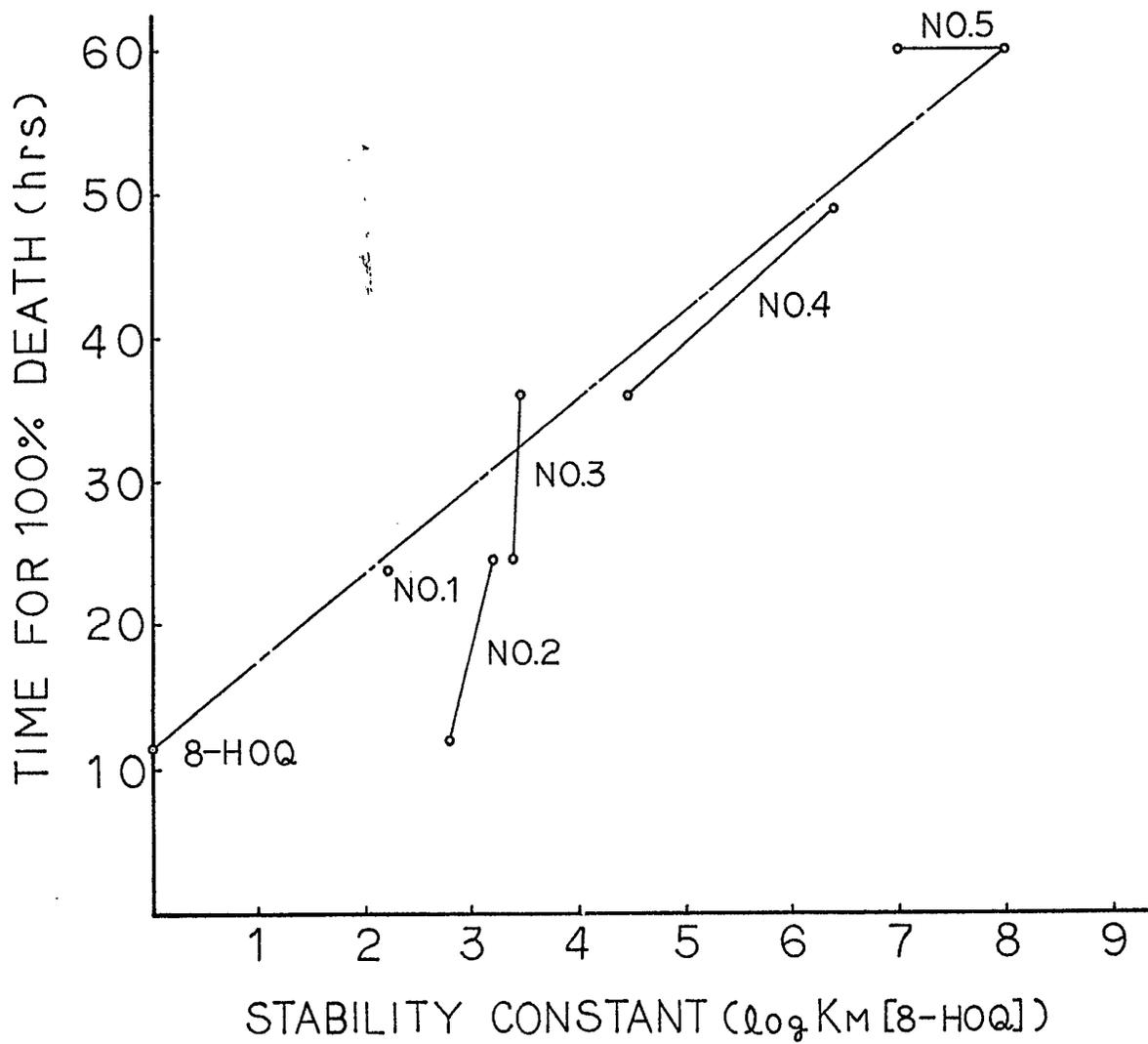
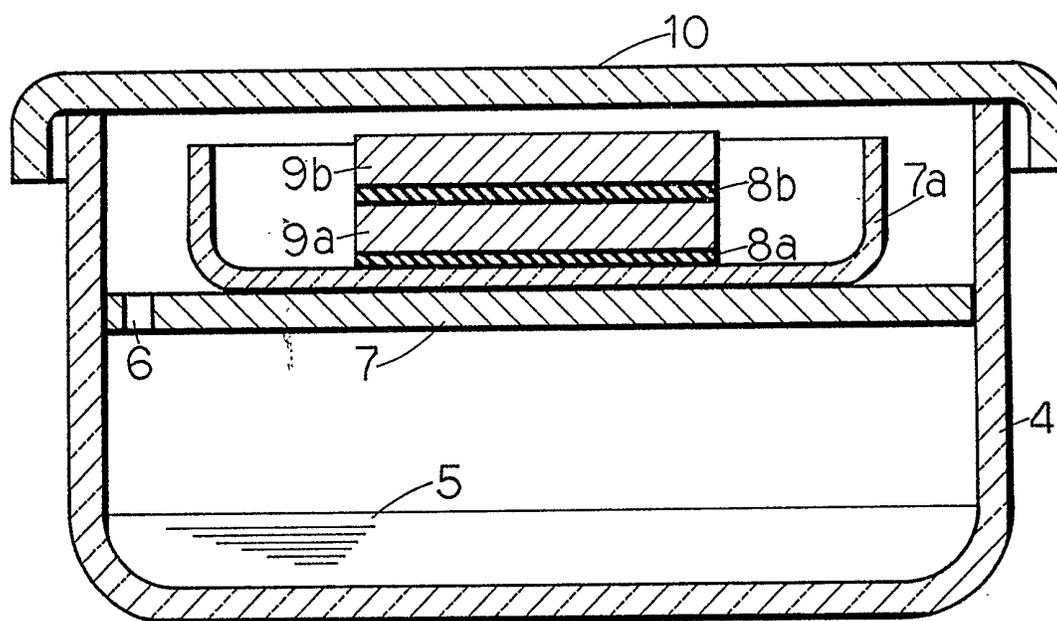


FIG. 3



## SPECIFICATION

**Anti-termitic composition.**

1. This invention relates to an anti-termitic composition, and more particularly to an anti-termitic composition which has little toxic effect on human system and manifests sufficiently persistent efficacy.

5 In most areas having a warm climate, wooden structures are susceptible of termitic injuries. In the case of cable buried directly in soil, not only outer layers of synthetic resin and rubber but also metallic sheaths of aluminum and iron have a possibility of sustaining holes formed by the action of formic acid excreted by termites. 5

As a measure to protect structures and underground cables against such termitic damages, the practice of applying an antitermitic agent to the surface of structures and incorporating the anti-termitic agent into rubber and synthetic resin used in the outer layers of cables has found widespread acceptance. 10

Heretofore, organic chlorinated compounds have been predominantly used as anti-termitic agents. These compounds, however, have a disadvantage that since they persist in their undecomposed form, they are suffered to accumulate in living organisms and deposit on environs of sites of application of such agents to jeopardize the health of workers exposed to the agents and bring about environmental pollution. 15

Lewis et al, "Hydroxyquinoline and Naphthol Termiticides", published in pages 818—822 of the October 1978 issue of the "Entomological Society of America," discloses the results of the test conducted on anti-termitic property of 8-hydroxyquinoline and 1-naphthol incorporated in soil. 20

From the results, it is noted that i-hydroxyquinoline showed outstanding anti-termitic property and manifested very little toxic effect. This compound, however, has a disadvantage that it boils at a relatively low temperature of 266.6°C (752 mmHg) and is slightly soluble even in water (solubility in water 0.05 at 18°C and 0.35 at 90°C) and, therefore, fails to provide the desired anti-termitic property for a long period. 25

This invention, therefore, seeks to provide an anti-termitic composition which neither pollutes the environment nor adversely affects the health of workers exposed to the composition.

This invention also seeks to provide an anti-termitic composition which provides a high anti-termitic effect for a long time.

30 According to this invention, we provide an anti-termitic composition containing an 8-hydroxyquinoline metal complex as an active component thereof. 30

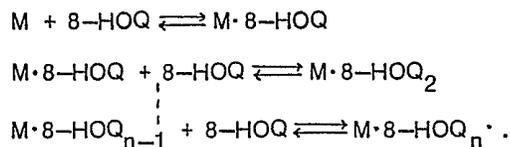
The invention will now be further described by way of example with reference to the accompanying drawings, wherein:—

FIG. 1 is a cross section illustrating an apparatus to be used for testing the effect of the active composition in the anti-termitic composition of the present invention. FIG. 2 is a graph showing the relation between the stability constant and the anti-termitic effect of 8-hydroxyquinoline metal complex. FIG. 3 is a cross section illustrating an apparatus to be used for testing the effect of a synthetic resin sheet incorporating the active component of the present invention. 35

The anti-termitic composition of this invention contains an 8-hydroxyquinoline metal complex as an active component thereof. 40

Examples of the metal moiety of the 8-hydroxyquinoline metal complex include Sn, Ba, Sr, Ca, Mg, Fe, Cu, Ni, Zn, Mn, and Co. Among other metals, Sn, Ba, Sr, Ca, Mg, and Fe are particularly suitable for the purpose of this invention.

45 Although 8-hydroxyquinoline metal complexes generally possess very low dissociation constants in water, they slightly undergo dissociation and assume the following states of equilibrium. 45



(wherein M stands for a metal ion, 8—HOQ for an 8-hydroxyquinoline, and n for a positive integer; which apply hereinafter). 50

The equilibrium constants  $k_1, k_2, \dots, k_n$ , therefore, assume the following values.

$$k_1 = \frac{[M \cdot 8HOQ]}{[M] [8-HOQ]}$$

$$k_2 = \frac{[M \cdot 8HOQ_2]}{[M \cdot 8-HOQ] [8-HOQ]}$$

$$\vdots$$

$$k_n = \frac{[M \cdot 8HOQ_n]}{[M \cdot 8-HOQ_{n-1}] [8-HOQ]}$$

5 (wherein the brackets [ ] designate the concentration of the compound indicated). 5

The overall stability constant,  $K$ , is expressed as follows.

$$k_1 \cdot k_2 \cdot \dots \cdot k_n = K = \frac{[M \cdot 8-HOQ_n]}{M [8-HOQ]^n}$$

10 The anti-termitic effect of the 8-hydroxyquinoline metal complex of the present invention issues preponderantly from the 8-hydroxyquinoline produced in consequence of the dissociation of the 8-hydroxyquinoline metal complex. 10

The notable persistancy of this anti-termitic effect is mainly ascribable to the very high stability constant of the metal complex.

15 The anti-termitic composition of this invention, therefore, can be made to manifest a powerful anti-termitic effect evenly throughout the entire length of its life from the time of application by incorporating in the composition a plurality of 8-hydroxyquinoline metal complexes having dissimilar stability constants and further by incorporating therein 8-hydroxyquinoline. 15

20 Most 8-hydroxyquinoline metal complexes have very high decomposition temperatures and do not experience any sharp loss of weight at temperatures below 300°C. They have substantially no toxic effect upon human system. When they are to be incorporated in synthetic resin or rubber materials they do not impair the working environment. 20

25 An 8-hydroxyquinoline metal complex manifests its anti-termitic effect when it is contained in the material in a concentration of only 0.1% by weight. This effect increases in proportion as the content of this metal complex in the material increases. When the content exceeds 10% by weight, however, the anti-termitic effect is no longer increased appreciably. Particularly when the metal complex is contained in a material of synthetic resin or rubber, such a high content of the metal complex goes to degrading the properties of the carrier. Thus, the upper limit of the metal complex content in the anti-termitic composition is desired to be not more than 10% by weight. The range of the content of this metal complex is desired to be from 0.5 to 5% by weight, preferably from 1 to 4% by weight. 25

30 The anti-termitic composition of this invention is generally formed by mixing an 8-hydroxyquinoline metal complex, or a mixture of two or more 8-hydroxyquinoline metal complexes, or a mixture of an 8-hydroxyquinoline metal complex with 8-hydroxyquinoline, and a material of synthetic resin or rubber. 30

A polyvinyl chloride resin composition and a polyethylene composition are particularly suitable examples of the synthetic resin to be used as the material.

35 Nylon is no suitable synthetic resin for use as the carrier because it has an anti-termitic property in itself. 35

In the inclusion of the active component in the synthetic resin as the material, the dispersibility of the active component in the material can be improved by having the active component treated in advance with a coupling agent.

40 The anti-termitic effect of the composition of this invention is heightened by using the active component having its dispersibility in the carrier improved as described above. 40

Examples of the coupling agent include silane coupling agents and titanate coupling agents.

45 Examples of the silane coupling agents include, for example, vinyltriethoxysilane, vinyltrimethoxysilane, vinyltris(methoxyethoxy)silane, vinyltrichlorosilane,  $\gamma$ -chloropropyltrimethoxysilane,  $\gamma$ -mercapto-propyl-trimethoxysilane,  $\gamma$ -glycidoxypropyltrimethoxysilane,  $\gamma$ -aminopropyltriethoxysilane,  $N$ - $\beta$ -(aminoethyl)- $\gamma$ - 45

aminopropyltrimethoxysilane,  $\gamma$ -ureidopropyltriethoxysilane,  $\gamma$ -methacryloxypropyltrimethoxysilane and the like.

And, examples of the titanate coupling agents include, for example, isopropyltriisostearoyl-titanate, isopropylcapryloyltitanate, isopropylidiisostearoylcumylphenyltitanate, isopropyltridodecyl-  
5 benzenesulfonyltitanate, isopropyltris(dioctylpyrophosphate)titanate, tetrakis(2,2-diatlyloxymethyl-1-  
butyl)bis(ditridecylphosphite)titanate, tris(dioctylpyrophosphate)ethylenetitanate and the like. 5

Besides the above coupling agents, it is effective to use fatty acids such as stearic acid, palmitic acid and others.

The amount of the coupling agent or fatty acids to be advantageously used is in the range of from  
10 2 to 3% by weight based on the combined amount of the active component. 10

Examples of the form in which the anti-termitic composition of this invention is advantageously used include a paint prepared by dispersing the active component(s) in a suitable binder and a blend prepared by mixing the active component(s) with soil.

Now, the present invention will be described more specifically below with reference to working  
15 examples. 15

#### EXAMPLE 1

From 100 cc of acetone, 5 g of a varying 8-hydroxyquinoline metal complex indicated in Table 1 was repeatedly extracted.

TABLE 1

Sample No.	8-Hydroxyquinoline metal complex
1	Ba-complex of 8-hydroxyquinoline
2	Sr-complex of 8-hydroxyquinoline
3	Ca-complex of 8-hydroxyquinoline
4	Mg-complex of 8-hydroxyquinoline
5	Fe-complex of 8-hydroxyquinoline

20 In each resultant extract was immersed two filter papers, removed from the extract to dry, and  
then each filter paper was placed in respective petri dish 1 illustrated in Fig. 1. On the residue in the  
petri dish, 100 termites were placed and covered with a lid 3. The length of time required for all the  
termites to be killed was clocked. The relation between the stability constant and the time for 100%  
death obtained of each sample is shown in FIG. 2. 20

#### 25 EXAMPLE 2

The ingredients of a varying sample indicated in Table 2 (From No. 14 to No. 18 are comparative  
tests) were kneaded in an electric hot roll and then molded through a press to produce a sheet  
5 cm x 5 cm in width and 0.5 mm in thickness. 25

(After 3 months)

TABLE 2

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PVC, $\bar{P} = 1300$ *1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DOP *2	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Tribasic lead sulfate	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Barium stearate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Calcium carbonate (powder)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ca-complex of 8-hydroxyquinoline	5										2							
Sr- "		5										0.2						
Mg- "			5															
Fe- "				5				2.5										
Cu- "					5					2.5								
Ni- "						5												
8-hydroxyquinoline									2.5									
Chlordane														5				
Chloropyriphos *3															5			
1-naphthol																		5

Notice:

\*1 Trade mark TOYO SODA CO.

\*2 Diocetyl phthalate

\*3 O,O-diethyl-O-3,5,6-trichloro-2-pyridyl phosphoro thioate

The sheet thus obtained was set in position in an incubator 4 illustrated in FIG. 3.

The incubator 4 held water in the bottom thereof. A gypsum partition plate 7 provided with holes 6 for passage of termites was disposed inside the incubator 4 over the bath of water 5.

On the gypsum plate 7 was placed a tray 7a, and in the tray 7a were placed in order a sample  
5 sheet 8a, a pine plate 9a, a sample sheet 8b and a pine plate 9b.

The test was conducted by placing 400 termites in the incubator 4 and leaving them therein under  
a lid 10 for three months and, at the end of the standing, examining the pine plates for marks of bites by  
termites. The results of this test are shown in Table 3.

TABLE 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Original sheet	2	1	1	3	6	5	2	1	0	0	1	5	0	0	0	1	0	8
Sheet heated at 90°C for 8 days	4	3	2	5	5	4	3	4	4	5	4	5	0	6	7	10	4	10
Sheet heated at 90°C for 20 days	4	4	4	4	3	4	3	3	2	2	4	6	1	7	8	8	7	10

In this table, the damage index represents the average of the points of evaluation rated by the following scale.

Index of damage	Appearance of injury	Degree of injury	
5	0: Absolute absence of visible sign of termitic excretion or bite	} No termitic bite	5
	00: Presence of sign of termitic excretion to sample and absolute absence of visible sign of termitic bite		
1:	Presence of sign of short termitic bites at leading ends of sharp corners of sheets	} Traces of bites	
2:	Presence of sign of long termitic bites at leading ends of sharp corners of sheets		
3:	Presence of sign of short termitic bites around sharp corners of sheets	} Slight injury	
4:	Presence of sign of long termitic bites around sharp corners of sheets		
5:	Presence of sign of short termitic bites in lateral cut sections of sheets	} Heavy injury	
6:	Presence of sign of long termitic bites in lateral cut sections of sheets		
7:	Presence of sign of shallow termitic bites into lateral cut sections of sheets	} Serious injury	
8:	Presence of sign of deep termitic bites into lateral cut sections of sheets		
10	9: Presence of sign of termitic bites in flat surface of sheets		10
	10: Presence of sign of deep termitic bites in flat surface of sheets		
15	*: Short — not more than 5 mm Long — over 5 mm		15

#### CLAIMS

1. An anti-termitic composition containing an 8-hydroxyquinoline metal complex as an active component thereof.
- 20 2. An anti-termitic composition according to claim 1, wherein said 8-hydroxyquinoline metal complex consists of 8-hydroxyquinoline and one or more metals selected from the group consisting of Sn, Ba, Sr, Ca, Mg and Fe. 20
3. An anti-termitic composition according to claim 1 or claim 2, which contains at least two 8-hydroxyquinoline metal complexes having dissimilar stability constants as active components thereof.
- 25 4. An anti-termitic composition according to claim 1, 2 or 3, which contains an 8-hydroxyquinoline metal complex and 8-hydroxyquinoline as active components thereof. 25
5. An anti-termitic composition according to claim 4, which contains at least two 8-hydroxyquinoline metal complexes having dissimilar stability constants and 8-hydroxyquinoline as active components thereof.
- 30 6. An anti-termitic composition according to any one of the preceding claims wherein said 8-hydroxyquinoline metal complex is contained in an amount of 0.1 to 10% by weight. 30
7. An anti-termitic composition according to any one of the preceding claims wherein said active component is dispersed in a synthetic resin composition.
8. An anti-termitic composition according to claim 7, wherein said synthetic resin composition is selected from a polyvinyl chloride resin composition and polyethylene.
- 35 9. An anti-termitic composition according to any one of the preceding claims wherein said active component is treated with a coupling agent in advance. 35

10. An anti-termite composition according to claim 1 substantially as described herein and exemplified.

---

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1984. Published by the Patent Office,  
25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.