



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : A61K 31/70, 31/715, A01N 25/08 A01N 25/00, 43/04</p>	A1	<p>(11) International Publication Number: WO 91/07972 (43) International Publication Date: 13 June 1991 (13.06.91)</p>
<p>(21) International Application Number: PCT/US90/06672 (22) International Filing Date: 13 November 1990 (13.11.90) (30) Priority data: 443,807 29 November 1989 (29.11.89) US (71) Applicant: S.C. JOHNSON & SON, INC. [US/US]; Patent Section, M.S. 077, 1525 Howe Street, Racine, WI 53403-5011 (US). (72) Inventors: DYKSTRA, Siebern ; 6014 Fayette Drive, Racine, WI 53402 (US). HAINZE, John H. ; 2822 North Wisconsin Avenue, Racine, WI 53402 (US). (74) Agents: DRABIAK, Jerome, D. et al.; Patent Section, M.S. 077, S.C. Johnson & Son, Inc., 1525 Howe Street, Racine, WI 53403-5011 (US).</p>		<p>(81) Designated States: AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i> <i>With amended claims.</i></p>
<p>(54) Title: GELLED AQUEOUS INSECT BAIT</p> <p>(57) Abstract</p> <p>A gelled, aqueous insect bait is disclosed. The gelled insect bait comprises water, an insecticidally-active ingredient, and an effective amount of carrageenan for causing the water and the insecticidally-active ingredient to form a gel. The carrageenan ingredient attracts insects to the insect bait for bait-ingesting purposes.</p>		

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GELLED AQUEOUS INSECT BAIT

Technical Field

The present invention is generally directed to a gelled aqueous insect bait. The gelled insect bait comprises a gelling agent that is also able to function as an insect-attracting agent.

The present invention, more particularly, is directed to such an insect bait that utilizes carrageenan not only as the bait gelling agent but also as the insect-attracting agent.

Background Art

Carrageenan is a sulfated polysaccharide, derived from red algae. Such algae is commonly known as Irish moss.

Carrageenan is reported in the literature as being composed principally of alpha-D-galactopyranose-4-sulfate units as well as 3,6-anhydro-alpha-D-galactopyranose units. Carrageenan can take a variety of forms in accordance with the relative orientation or location of these units to each other within the carrageenan structure.

At least five forms of carrageenan are known, respectively designated iota-carrageenan, kappa-carrageenan, lambda-carrageenan, mu-carrageenan, and nu-carrageenan. Kappa-carrageenan, moreover, is known to exhibit certain specific properties in the presence of certain monovalent cations (such as potassium).

Throughout this specification, whenever the term "carrageenan" is utilized, it is to be understood that such term generally refers to the so-called "kappa" form or variety of commercially-available carrageenan.

Inclusion of Irish moss into pesticidal compositions is well known. For example, U.S. Pat. No. 271,024 to Booth discloses a poison for squirrels and gophers that includes, among other ingredients, Irish moss.

U.S. Pat. No. 361,051 to Costello is generally directed to a medicated calcimine. The patent teaches that such a calcimine could include, among other ingredients, a so-called "corrosive" sublimate and Irish moss. The patent suggests that the corrosive sublimate ingredient might be effective for killing insects.

U.S. Pat. No. 4,615,883 to Nelsen et al. is generally directed to a method for using a hydrogel agent to encapsulate nematodes in a manner so as to sustain nematode viability for a specified period of time without impairing the ability of such nematodes to infect insect hosts. While Nelsen et al. suggest that carrageenan (combined with locust bean gum) might provide one such suitable hydrogel agent, it is clear that Nelsen et al. specifically teach inclusion of other ingredients (such as certain commercial formulations for the rearing of insects, certain chemical attractants, pheromones, and the like) for insect-attracting purposes.

Use of carrageenan as a gelling agent is well known. For example, U.S. Pat. No. 3,956,173 to Towle is generally directed to the preparation of firm, elastic gels that are based on carrageenan. See also U.S. Pat. No. 4,661,475 to Bayerlein et al.

Gelled insect baits are desirable for a number of reasons. One such reason involves processing considerations. For example, the manufacture of a gelled bait typically does not give rise to a dusty or a powdery residue; and the packaging of such a gelled insect bait is accordingly viewed as a relatively "cleaner" operation than another manufacturing procedure which involves insect baits that e.g. take the form of tablets and/or powder mixtures.

One particularly notable benefit or advantage that we observed when utilizing carrageenan as our insect bait-gelling agent, is that carrageenan can be heated in a manner so as to become a pourable liquid, provided that a requisite minimal level of heat is maintained, so that the temperature of the carrageenan-containing composition is maintained at or below a predetermined value. At such a temperature, the thus-heated carrageenan can then be poured without gelling while it is being poured.

In particular, the carrageenan-containing composition is generally heated to a temperature of 180°F for a specified period of time. Thereafter, the carrageenan-containing composition is allowed to cool to a suitable, desired pouring temperature. Such a temperature generally ranges between about 140 to about 150°F, depending upon the presence or

absence of certain other ingredients in the carrageenan-containing composition. Generally however, at a temperature of less than about 140°F, the carrageenan-containing composition tends to gel and thus is no longer pourable, which is undesirable.

Another benefit that we discovered, from utilizing carrageenan as the gelling ingredient, is that carrageenan, a natural product, demonstrates an observable stimulatory effect on certain insect feeding habits or mechanisms. We found this observation to be quite surprising because, indeed, we could find no teaching -- or even a suggestion -- in the literature that carrageenan possesses the kinds of insect-attracting properties that we observed.

Summary Disclosure Of Invention

Accordingly, our invention, can briefly be summarized as a gelled, aqueous insect bait. Such a gelled insect bait comprises water, an insecticidally-active chemical ingredient, and an effective amount of carrageenan for causing the water and the insecticidally-active chemical ingredient to form a gel. Our gelled insect bait is more particularly characterized in that the carrageenan component or ingredient (of our gelled, aqueous insect bait) causes insects to be attracted to the insect bait, for bait-ingesting purposes.

At this juncture, brief mention is made to point out that while the present invention is susceptible to embodiment in various forms, there is hereinafter described in detail a number of examples embodying the principles of our invention. The present disclosure, therefore, is to be considered as merely an exemplification of our invention, without limitation to the specific embodiments or examples discussed hereinbelow.

Detailed Description Of The Invention

The gelled, aqueous insect bait of the present invention comprises water, an insecticidally-active chemical ingredient, and an effective amount of carrageenan for causing the water and the insecticidally-active chemical ingredient to form a gel. In the insect bait of the present invention, it is the carrageenan ingredient which not only

causes the insect bait to form a gel but also causes insects to be attracted to the gelled bait for bait-ingesting purposes.

Industrial Applicability

5 The insect-ingestible, gelled bait of the present invention is particularly effective against ants, cockroaches, crickets, fruit flies, house flies, and the like.

Best Mode For Carrying Out The Invention

10 Throughout this specification, wherever the term "carrageenan" is utilized, it is to be understood that such term generally refers to the so-called "kappa" form of commercially-available carrageenan. Such carrageenan is presently available from the FMC Corporation, under the
15 "Gelcarin PS 402" brand. More particularly, the carrageenan which we utilized in connection with our below-presented examples had a particle size such that more than about 95.0 weight percent passed through a Series No. 80 U.S. Standard Sieve (about 180 microns), had an "as-is" pH of about 8.5 to
20 about 10.5, and had a moisture content of less than about 12.0% (meaning that the carrageenan which we utilized was about 88 percent dry substance). Such dry substance, still more particularly, consisted of about 65 weight percent to about 75 weight percent kappa carrageenan; and the remainder
25 of the dry substance consisted of locust bean gum and salts such as sodium chloride and potassium chloride.

As used herein, the term "insect bait" is understood to mean an insecticidally-active composition-of-matter specifically formulated (1) to attract insects (to such a
30 composition) and (2) to induce such bait-attracted insects either (a) to ingest at least a portion of such a composition, thereby directly causing the death of such insects, or (b) to transport at least a portion of such a composition to an insect colony, for the purpose of
35 destroying such a colony.

The insecticidally-active chemical ingredient of the present invention can be water soluble or can be water insoluble; and, if water-insoluble, the insect bait of the

present invention further preferably comprises a surfactant (or emulsifier).

Suitable water-soluble insecticidally-active chemical ingredients, for purposes of the present invention, include
5 O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate (also known as Trichlorfon and/or Dipterex), acetylphosphoramidothioic acid O,S-di-methyl ester (also known as Acephate and/or Orthene), sodium fluoride, boric acid, sodium borate, and combinations thereof.

10 Suitable water-insoluble insecticidally-active chemical ingredients, for purposes of the present invention, include N-ethyl perfluorooctanesulfonamide (also known as Sulfluramid), phosphorothioic acid O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) ester (also known as Chlorpyrifos
15 and/or Dursban), 2-(1-methylethoxy) phenol methylcarbamate (also known as propoxur and/or Baygon), Hydramethylnon, Avermectin, and combinations thereof.

Suitable surfactants for purposes of the present invention, include ethoxylated sorbitan esters capable of
20 producing an oil-in-water emulsion. Such esters have an HLB value that is greater than 10. The preferred HLB value is between about 12 to 17. (The terms "surfactant" and "emulsifier" are herein utilized in an equivalent sense.) The preferred surfactants, for purposes of the present
25 invention, include a variety of commercially available non-ionic surfactants, disclosed in greater detail hereinbelow.

The gelled insect bait of the present invention may further include, as optional additional ingredients, certain specified insect-feeding co-stimulants and/or insect co-
30 attractants. Suitable co-stimulants and/or co-attractants include, but are not limited to, proteins, oils, and carbohydrates such as sugars, honey and molasses. Still further, any such co-stimulant and/or co-attractant, may further function as a humectant, in accordance with the
35 principles of the present invention. As used herein, the term "humectant" is any ingredient which, when incorporated into the insect bait of the present invention, tends to attract and retain environmental moisture.

The gelled insect bait of the present invention may further include, as yet another optional ingredient, a suitable filler material such as an agricultural product or an agricultural by-product. Suitable, for purposes of the present invention, as such a product or by-product, is corn meal, wheat bran, corn bran, wheat germ, and the like.

Our present invention will now be described in greater detail in the following below-presented examples which are given here for illustrative purposes only and are by no means intended to limit the scope of this invention.

Examples

The following examples present the best mode contemplated by the inventors for disclosing the various principles as well as other aspects, features, advantages and applications of the present invention.

EXAMPLE 1: Ant Bait

<u>Ingredient</u>	<u>Function</u>	<u>Wt.-%</u>
Water	- - - - -	50
Sucrose	Co-attractant	20
20 Honey	Co-attractant	20
Boric acid	Chemical insecticide	5
Yeast extract	Filler material	3
Carrageenan	Insect attractant and gelling agent	2

The ant bait of Example 1 was made as follows. Water of moderate temperature, namely about 60 to about 80°F, was agitated; and into this agitated water was added the carrageenan at such a rate, while maintaining sufficient agitation, so as to form a carrageenan-in-water dispersion.

The carrageenan-in-water dispersion was then heated, while maintaining agitation, to a temperature of 180°F. While it is possible, in accordance with the principles of the present invention, to incorporate the remainder of the Example 1 ingredients into the agitated dispersion prior to heating the carrageenan-in-water dispersion to 180°F, we prefer to incorporate the remainder of these ingredients at the time when the agitated dispersion achieves a temperature of 180°F.

Accordingly, upon achieving 180°F, and while maintaining agitation, the remainder of the Example 1 ingredients were

added to the carrageenan-in-water dispersion and the 180°F temperature was maintained until the resultant dispersion viscosity became noticeably more pronounced. (Utilizing a laboratory beaker-sized quantity of such a dispersion, the
 5 noticeable increase in viscosity occurred in the range of between about 5 to about 10 minutes, while such dispersion was maintained at 180°F after inclusion of the additional, above-mentioned ingredients.)

As soon as a noticeable viscosity increase was achieved,
 10 while maintaining agitation and a temperature of 180°F, the carrageenan-in-water dispersion was allowed to cool to a suitable dispersion-pouring temperature, which, in Example 1, was 150°F. The pourable, carrageenan-containing dispersion was then poured into a preselected container and was allowed
 15 to cool further, to form an insecticidally-active gel.

The gelled bait of Example 1 was observed to be effective against ants.

EXAMPLE 2: Roach Bait

	<u>Ingredient</u>	<u>Function</u>	<u>Wt.-%</u>
20	Molasses	Co-attractant	30.5
	Water	- - - - -	25
	Sucrose	Co-attractant	20
	Corn meal	Filler material	20
	Carrageenan	Gelling agent and insect attractant	3
25	Tween 80	Surfactant	1
	Dursban	Chemical insecticide	.5

The roach bait of Example 2 was made as follows. Water of moderate temperature, namely about 60 to about 80°F, was agitated; and into this agitated water was added the
 30 carrageenan at such a rate, while maintaining sufficient agitation, so as to form a carrageenan-in-water dispersion.

The Dursban insecticide and Tween 80 brand surfactant were combined and heated to a temperature effective for forming an insecticide-in-surfactant solution. Such
 35 temperature was 120°F. Tween 80 is a commercially-available general-purpose sorbitan monooleate-based nonionic surfactant having an HLB value of 15.

The carrageenan-in-water dispersion was heated, while maintaining agitation, to a temperature of 180°F. While it

is possible, in accordance with the principles of the present invention, to incorporate the remainder of the Example 2 ingredients (i.e., the molasses and sucrose co-attractants as well as the corn meal filler material) into the agitated
5 dispersion prior to heating the carrageenan-in-water dispersion to 180°F, we prefer to incorporate such remainder of ingredients into such dispersion at the time when the agitated dispersion achieves a temperature of 180°F.

Accordingly, upon achieving 180°F, and while maintaining
10 agitation, the molasses and sucrose co-attractants as well as the corn meal filler material were added to the carrageenan-in-water dispersion and the 180°F temperature was maintained until the resultant dispersion viscosity became noticeably more pronounced.

15 As soon as a noticeable viscosity increase was achieved, while maintaining agitation and a temperature of 180°F, the carrageenan-in-water dispersion was allowed to cool to about 150°F.

While maintaining agitation of the carrageenan-in-water
20 dispersion, the above-mentioned heated insecticide-in-surfactant solution (at 120°F) was incorporated into the 150°F dispersion; and agitation was maintained for an amount of time effective for forming a mixture. (Utilizing a laboratory beaker-sized quantity of such mixture components,
25 the amount of time necessary to thus form a mixture was no more than about 1/2 hour.) Moreover, during such agitation, the temperature of the dispersion was maintained at 150°F to enable the mixture components to be pourable upon formation of the mixture.

30 The thus-formed pourable carrageenan-containing mixture was then poured into a preselected container and was allowed to cool further, to form a gelled insecticidally-active mixture.

The gelled bait of Example 2 was observed to be
35 effective against cockroaches.

EXAMPLE 3: Carrageenan-Containing Gelled Insect Bait

<u>Ingredient</u>	<u>Function</u>	<u>Wt.-%</u>
Water	- - -	98
Carrageenan	Insect attractant and gelling agent	1.5
5 Acephate	Chemical insecticide	0.5

The gelled bait of Example 3 was made as follows. Water of moderate temperature, namely about 60 to about 80°F., was agitated; and into this agitated water was added the carrageenan at such a rate, while maintaining sufficient
 10 agitation, so as to form a carrageenan-in-water dispersion. The carrageenan-in-water dispersion, while maintaining agitation, was heated to a temperature of 180°F. Upon achieving 180°F., the temperature was maintained until the dispersion viscosity became noticeably more pronounced. As
 15 soon as a noticeable viscosity increase was achieved, while maintaining agitation, the carrageenan-in-water dispersion was allowed to cool to a temperature of about 150°F. At this temperature, while maintaining agitation, the acephate insecticide was added to the carrageenan-in-water dispersion.
 20 Agitation was maintained for an amount of time effective for forming a mixture. (Utilizing a laboratory beaker-sized quantity of such mixture components, the amount of time necessary to thus form a mixture was no more than about 1/2 of an hour.) The pourable insecticidally-active carrageenan-
 25 containing dispersion was then poured into a number of preselected containers and thereafter allowed to cool further, to form a respective number of insecticidally-active gelled insect baits.

The insecticidal properties of the Example 3 gel were
 30 established as follows.

We placed 25 adult male German cockroaches ("Blattella germanica") into a plastic tray. The plastic tray included a "hide", food, and water. (The term "hide" is hereby defined as an insect-harborage structure.) The cockroaches were
 35 given 24 hours to acclimate themselves to these new surroundings. Thereafter, a portion of the gelled bait of Example 3 was placed into the plastic tray. Counts of dead cockroaches were subsequently made at 24-hour, 48-hour, and

72-hour intervals, following placement of the gelled bait of Example 3 into the plastic tray.

The procedure described in the above paragraph was repeated eight (8) times; and the mean percent mortality from 5 eight (8) replicates of the procedure described in the above paragraph is presented in the following Table.

Table: Mean Percent Mortality Data

Based on	24-Hour	48-Hour	72-Hour
<u>8 Replicates</u>	<u>Interval</u>	<u>Interval</u>	<u>Interval</u>
10 % Mortality	52.5%	84.5%	95.5%

The above-presented data indicates that the cockroaches were attracted to and were induced to feed on the insecticidally-active gelled bait of Example 3 despite the presence of readily available alternative food and water 15 sources.

Thus, yet another aspect or feature of our present invention is directed to a method for attracting insects to a situs (or preselected location). Such a method, in accordance with Example 3, comprises applying an effective 20 amount of carrageenan to the situs for the purpose of attracting insects to such a situs.

What has been described herein is a novel, aqueous, gelled insect bait. While the aqueous, gelled insect bait of the present invention has been described with reference to 25 several preferred embodiments, the present invention is not limited thereto. On the contrary, alternatives, changes and modifications will become apparent to those skilled in the art upon reading the foregoing description. Accordingly, such alternatives, changes and modifications are to be 30 considered as forming a part of the present invention insofar as they fall within the spirit and scope of the appended claims.

We Claim:

1. A gelled, aqueous insect bait comprising: water; an insecticidally-active ingredient; and an effective amount of carrageenan for causing the water and the insecticidally-
5 active ingredient to form a gel, wherein the carrageenan is characterized as attracting insects to the insect bait for bait-ingesting purposes.
2. The gelled insect bait of claim 1 wherein the insecticidally-active ingredient is water soluble and is
10 selected from the group consisting of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate, acetylphosphoramidothioic acid O,S-di-methyl ester, sodium fluoride, boric acid, sodium borate, and combinations thereof.
- 15 3. The gelled insect bait of claim 1 further including a surfactant.
4. The gelled insect bait of claim 3 wherein the insecticidally-active ingredient is water insoluble and is selected from the group consisting of N-ethyl
20 perfluorooctanesulfonamide, phosphorothioic acid O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) ester, 2-(1-methylethoxy) phenol methylcarbamate, and combinations thereof.
5. The gelled insect bait of claim 1 further including an insect co-attractant.
- 25 6. The gelled insect bait of claim 1 further including a filler material.
7. A method of attracting insects to a situs comprising applying an effective amount of carrageenan to said situs for attracting insects thereto.

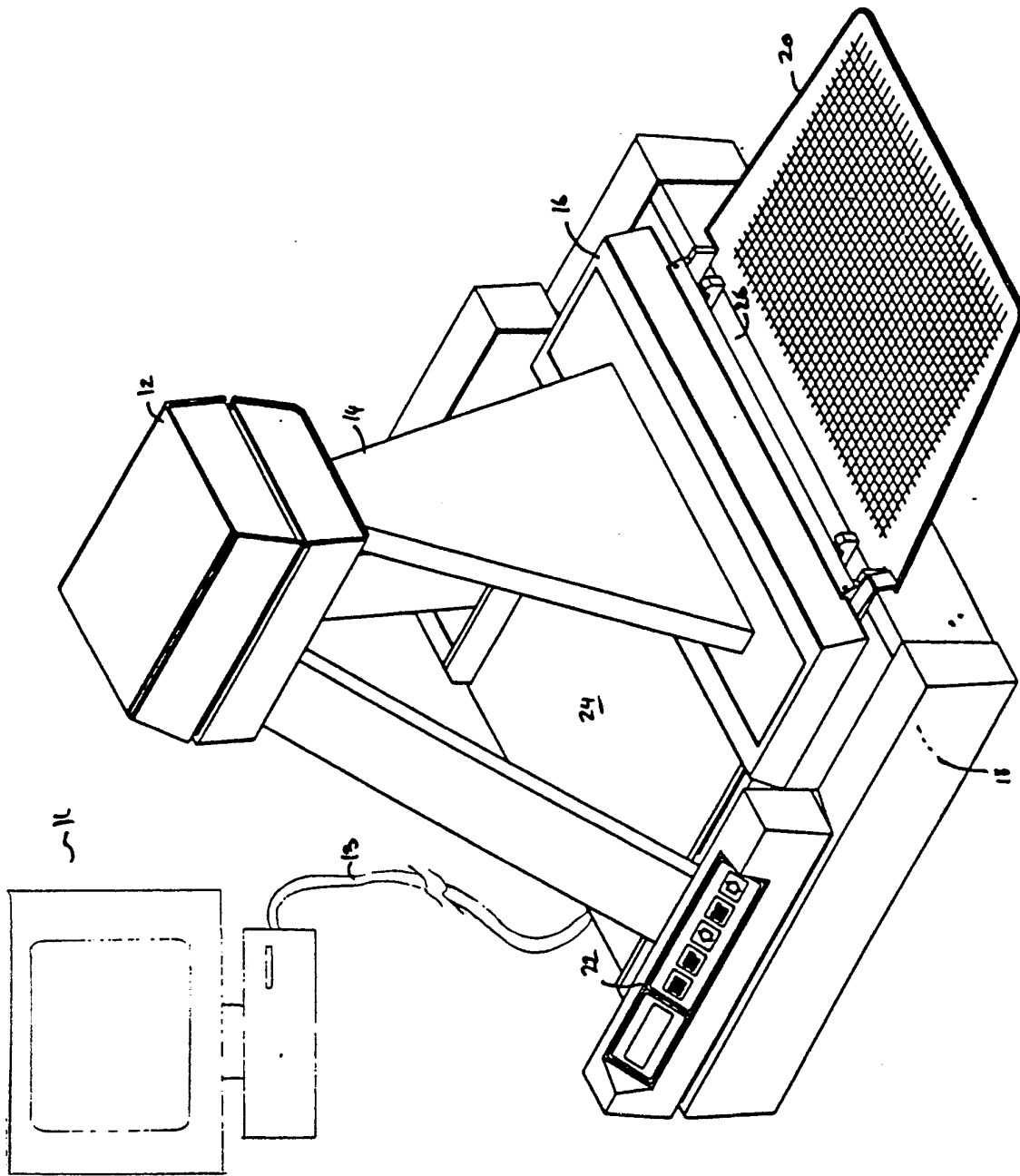
AMENDED CLAIMS

[received by the International Bureau on 22 April 1991 (22.04.91); original claims 3 and 5-7 amended; other claims unchanged (1 page)]

1. A gelled, aqueous insect bait characterized as
5 including: water; an insecticidally-active ingredient; and carrageenan, in an amount that is effective for purposes of causing the water and the insecticidally-active ingredient to form a gel, wherein the carrageenan is further characterized as also being present in an amount that is effective for
10 attracting insects to the insect bait, for bait-ingesting purposes.
2. The gelled insect bait of claim 1 wherein the insecticidally-active ingredient is water soluble and is selected from the group consisting of O,O-dimethyl 2,2,2-
15 trichloro-1-hydroxyethyl phosphonate, acetyl phosphoramidothioic acid O,S-di-methyl ester, sodium fluoride, boric acid, sodium borate, and combinations thereof.
3. The gelled insect bait of claim 1 further characterized
20 as including a surfactant.
4. The gelled insect bait of claim 3 wherein the insecticidally-active ingredient is water insoluble and is selected from the group consisting of N-ethyl perfluoro octanesulfonamide, phosphorothioic acid O,O-diethyl O-(3,5,6-
25 trichloro-2-pyridinyl) ester, 2-(1-methylethoxy) phenol methylcarbamate, and combinations thereof.
5. The gelled insect bait of claim 1 further characterized as including an insect co-attractant.
6. The gelled insect bait of claim 1 further characterized
30 as including a filler material.
7. A method of attracting insects to a situs, the method being characterized by the step of applying an effective amount of carrageenan to said situs for attracting insects thereto.

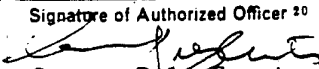
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Fig. 1



INTERNATIONAL SEARCH REPORT

International Application No **PCT/US90/06672**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): A61K 31/70, 31/715; A01N 25/08, 25/00, 43/04 U.S. Cl.: 424/488, 410, 84, 485, 405; 426/1; 514/54		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S	424/488, 485, 405, 410, 84; 514/54; 426/1	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category [*]	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
Y	US, A, 4,615,883 (Nelsen et al.) 07 October 1986, see entire document.	1-7
Y	US, A, 4,434,231 (Jung) 28 February 1984, col. 2, lines 13-16.	see 1-7
Y	US, , 4,520,015 (Pesche) 28 May 1985, see entire document.	1-7
Y	WO, A 85/04074 (Flashinski) 26 September 1985, see entire document.	1-7
Y	AU, A, 73766 (American Cyanamid Company) June 1987, see page 5, lines 9-38; page 6, lines 1-38; page 8, lines 18-38.	03 1-7
<p>[*] Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ²		Date of Mailing of this International Search Report ²
16 January 1991		21 FEB 1991
International Searching Authority ¹		Signature of Authorized Officer ²⁰
ISA/US		 Carmen P. Curtis

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
Y	JP, 59,198,947 (Taiyo) 26 April 1983 see abstract.	1-7
Y	JP. A, 58,162,247 (Nisshin) 26 September 1983, see abstract.	1-7
Y	Condensed Chemical Dictionary, 8th edition published 1971, Van Nostrand Reinhold Co., (N.Y.) p.174.	1-7
Y	US, A, 3,655,384, (Wood) 11 April 1972, see entire document.	7
Y	US, A, 3,645 757, (Gordon et al), 29 February 1972, see entire document.	7