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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Insecticidal Baits and process for their production

We, FARBENFABRIKEN BAYER AKTIENGESELLSCHAFT, a body corporate organised under the laws of Germany, of Leverkusen, Germany, 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:—

The present invention is concerned with new insecticidal baits, as well as a process for the production of the baits.

Insecticidal baits are already known which consist mainly of a carrier material, in which the insecticidal active compound, the luring substance and, when present, the attracting colour, are substantially on the surface (cf. for example German Gebrauchsmuster 1,708,559, German Patent Specification 818,435).

As carrier materials for these baits there have been used, in the main, paper, cardboard, mechanical wood-pulp, fibre materials, textiles, synthetic substances, wool, wadding and rubber.

As insecticidal active compounds, chlorinated hydrocarbons have mainly been used, as well as phosphoric acid esters and carbamates.

As luring substances there have been used monosaccharides and disaccharides such as cane sugar, fructose and galactose, and also proteins, such as yeast, powdered egg and powdered milk. Also known is the strong attracting effect of water. For this reason, hydrophilic carrier materials are particularly suitable and various methods have been developed for moistening them and keeping them moist (German Gebrauchsmuster 1,708,559, 1,746,283, 1,756,939). As attracting colours, in these baits, red and black have given particularly good results.

The production of these baits is, in principle, carried out in two steps. In the first step, the carrier material is produced; in the second step, the carrier material is soaked with solutions of the active compounds, the luring substances and the attracting colours, optionally in several individual operations such as when the individual substances are not soluble in the same solvent.

These methods of production have a number of disadvantages. Much work is involved in undertaking the entire manufacture in two or more different operations. Solvents have to be used; after every impregnation, the baits have to be dried, for which purpose considerable drying energies are required and, moreover, the solvents have to be wholly removed and at least partially recovered. In addition, when working with combustible and explosive solvents suitable safety precautions have to be taken.

The baits themselves also exhibit certain disadvantages. They have only a relatively small surface. Their effectiveness rapidly diminishes and we have found that this is because the active compounds and luring substances are present chiefly on the surface of the carrier material, and are not uniformly distributed within it.

Insecticidal baits are also known which consist essentially of a carrier material in which the active compounds, the luring substances and the dyestuffs are uniformly embedded (cf. for example German Patent Specification 818,435 and German Published Specification 1,182,468). The carrier materials are, for example, paper and cardboard. In this case, the active compounds and other additives have to be added (possibly with the aid of solvents and emulsifiers) direct to the aqueous paper pulp from which the paper or board is made. This type of manufacture has the considerable disadvantage that sizable amounts of active compounds and additives are lost. Moreover, only active compounds which do not hydrolyse can be used. The water and the other organic solvents have to be removed or dried out.

Other baits use sugar as the carrier mater-

[*Price 4s. 6d.*]

ial. In this case, all the constituents are compressed into tablets under very high pressure. A disadvantage of this method of manufacture is that special compressing devices which work with very high pressure are required. Moreover, the tablets, when appreciably moistened, dissolve, smear and become unsightly.

Independently of the method of manufacture, baits of these types have the disadvantage that their surface is relatively small in proportion to their weight.

From the multiplicity of previously known baits, those which have gained the greatest importance in practice are those in which the carrier material, in general cellulose or mechanical woodpulp, is first produced and this is then soaked with the active compounds and, as the case may be, other additives. The baits are, in general, put on the market as spheres, circular plates or as strips.

The exploitation of the insecticidal potency of the active compounds used is by no means optimum in such baits.

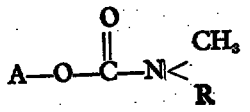
The present invention provides insecticidal baits having a particularly good immediate activity and a particularly long lasting activity (and thus ensures particularly favourable utilisation of the insecticidal potency of the active compounds). These new baits consist essentially of a non-thermoplastic hydrophilic polyurethane foam and contain insecticidal carbamates and/or insecticidal phosphoric acid esters, as well as insect-luring substances (and, optionally, insect-attracting colouring matter), substantially uniformly embedded in the cell framework of the polyurethane foam.

It has further been found that the baits of the invention are obtained in a one-step process in particularly simple manner when (1) an insecticidal carbamate and/or insecticidal phosphoric acid ester and (2) an insect-luring substance, together with (3) either a hydrophilic polyol or a non-hydrophilic polyol and hydrophilic additive, (4) a polyisocyanate and (5) an activator mixture are foamed into a hydrophilic polyurethane foam the polyurethane foam so obtained "may be used directly as bait or, if not convenient for immediate use (for example if it is made in a large mass) may be brought into a foam suitable for baits for example by being cut up into smaller portions". Further ingredients such as (6) an insect-attracting colouring matter and (7) other additives may if desired be included in the foaming step.

Surprisingly, the baits of the invention, compared with the best baits known from the prior art, show a better immediate activity and a longer lasting activity. It is, however, quite especially surprising that the insecticidal carbamates and phosphoric acid esters can wholly retain their insecticidal potency during the manufacture of the foams, although it is known on the one hand that carbamates and phosphoric acid esters hydrolyse readily, and on the other hand that the manufacture of foam is carried out in the presence of bases and basic catalysts at high temperatures, in general over 100°C.

As insecticidal carbamates, all carbamates can be used which have a sufficient insecticidal effect on the insects which are to be destroyed, that is, chiefly on Diptera, such as flies (for example Musca domestica, Fannia canicularis, Calliphora erythrocephala, Lucilia sericata, Chrysomyia putoria), mosquitoes (for example Aedes, Culex and Anopheles species), cockroaches (for example Blattella germanica, Blatta orientalis, Periplaneta americana), crickets (for example Acheta domesticus) and ants (for example Lasius niger).

Carbamates of the general formula



have given particularly good results.

In this formula,

R stands for hydrogen or an acyl radical, in particular acetyl or propionyl,

A stands for phenyl or a phenyl radical with condensed heterocyclic rings which contain oxygen, nitrogen or sulphur, such as coumaranyl and chromanyl.

All these radicals may be substituted by 1 to 3 substituents of the following nature: alkyl with 1 to 6 carbon atoms, such as methyl, ethyl, isopropyl or sec.butyl; alkoxy with 1 to 6 carbon atoms, such as methoxy, ethoxy, isopropoxy, or sec.-butoxy; alkenyl with 2 to 6 carbon atoms, such as allyl or methallyl; alkinyl with 2—6 carbon atoms, such as propargyl; dialkylamino groups, such as dimethylamino, dialkenylamino groups, such as diallylamino; alkyl-alkenylamino groups, such as allyl methylamino.

Insecticidal carbamates which can be used in the baits of the invention are mentioned for example in German Patent Specifications 1,108,202, 1,159,929, 1,145,162, 1,162,352 and 1,153,012 and in Belgian Patent Specifications 649,260 and 681,442.

As particularly effective insecticidal carbamates there may be mentioned: 2-isopropoxyphenyl-N-methylcarbamate; 2-methylcoumaran - 7 - yl - N - methylcarbamate, 2,2-dimethyl - coumaran - 7 - yl - N - methylcarbamate as well as the N-acetyl derivatives of these two coumaranyl compounds and 2-dimethylaminophenyl - N - methylcarbamate, 3,5 - dimethyl - 4 - allylmercapto - phenyl-N-methyl-carbamate, 2-propargyl-oxyphenyl-N - methyl - carbamate, 2 - (methyl - allyl)-phenyl - N - methyl carbamate, 2 - trimethylaminophenyl - N - methyl - carbamate, 2-(β-methyl - allyl) - phenyl - N - methyl - carbamate.

As insecticidal phosphoric acid esters, all

phosphoric acid esters are suitable which have an adequate insecticidal effectiveness against the above-mentioned insects which are to be destroyed. The term "insecticidal phosphoric acid esters" is used here in the comprehensive meaning in which it is used in the hygiene-insecticide field. It therefore includes phosphoric acid esters in the narrower sense, thiophosphoric acid esters, thiophosphonic acid esters. There may be mentioned in particular: O,O - dimethyl - 2,2 - dichlorovinyl - phosphate, O,O - dimethyl - (1 - hydroxy - 2,2,2-trichloroethyl)-phosphonate, O,O-dimethyl-O - 3 - methyl - 4 - nitrophenyl - thiophosphate, dimethyl - 2,2 - dichlorvinyl - phosphate and O,O - dimethyl - O - 3 - nitrophenyl-thiophosphate.

For the baits, individual carbamates as well as individual phosphoric acid esters are suitable, but mixtures of representatives of these two groups of active compounds are also suitable.

The concentration of active compound in the baits can vary within a wide range. In general, it is from 0.01 to 20, preferably from 0.1 to 5, per cent by weight.

As luring substances, the usual insect lures may be used (Wiesmann, Schweizer Archiv für Tierheilkunde *102* 1960, p. 134; Gebrauchsmusterschutz 1,708,559; Wiesmann, Z. f. angew. Zool *47*, 1960, p. 159). Particularly favourable are sugars, such as disaccharides and monosaccharides, for example cane sugars, glucose, lactose, galactose and fructose. However, proteins can be used, in particular yeast, yeast hydrolysate, powdered egg and powdered milk.

The concentration of the luring substances in the bait may also vary within fairly wide ranges. In general, it is from 0.1 to 80, preferably from 1 to 50, per cent by weight.

A further increase of the attractiveness of the baits to insects may be achieved by attractive colouring matters (German Gebrauchsmuster 1,708,559). In particular, red, violet, and black colours have a significance in insect baits. As colouring matters there may be mentioned: the coupling product of 1,2-bis (3'-amino - 4' - methoxybenzenesulphonamido)-ethane on to the 2,4-di-methoxy-5-chlorophenylamide of β-hydroxynaphthoic acid, the coupling product of 1,2-bis(3'-amino-4'-methoxybenzenesulphonamido)ethane on to the 4-ethoxyphenyl-amide of β-hydroxynaphthoic acid, carbon black.

The concentration of the colouring matter in the bait can also vary within fairly wide ranges. In general, it is from 0.1 to 10, preferably from 0.5 to 5, per cent by weight.

As hydrophylic agents, the usual hydrophilic agents can be used which do not have any disturbing influence on the formation of polyurethane foam. These include, in the main, silica gel and polyhydroxy compounds, such as sugar.

The polyurethane foams may be produced in the usual manner. On this there exists a wide-ranging literature (compare for example J. J. Saunders, K. C. Frisch: Polyurethanes, Part I, Chemistry, Interscience-Wiley, New York (1962), Part II, Technology, Interscience-Wiley, New York (1964); R. Vieweg, A. Hoechtlen, Kunststoff-Handbuch, Vol. VII, Polyurethane, Carl Hanser (1966)).

According to the usual process, polyols are mixed with the polyisocyanates, with the addition of catalysts, foam stabilisers and other additives. Foam formation sets in automatically with an exothermic reaction. The temperatures occurring during foam production generally lie between 50 and 170°C, preferably above 100°C.

The carbamate and/or phosphoric acid ester, the insect luring substance and the hydrophilic agent are desirably first formed into a mixture and this is then mixed with the polyisocyanate and the activator". However, it is also possible to mix "the first three ingredients" with the other reaction components, in particular the activator mixtures.

During foam production the dyestuffs or other colouring matter are preferably used as dispersions in the usual plasticisers, such as polyadipates, polyphthalates, adipic acid di-n-butyl ester, triphenylphosphate or dioctyl-phthalate. However, addition in admixture with the additives customarily used in foam production, such as catalysts, emulsifiers or foam stabilisers, is also possible.

For the baits of the invention it has proved desirable to use hydrophilically adjusted polyurethane foams, because these are easy to moisten and, through the attraction of water from the atmosphere, always remain somewhat moist, whereby the insects are attracted to an increased extent.

For the production of these foams, the hydrophilic polyol may be a co-polymer of ethylene oxide, propylene oxide and glycerol. The copolymers should possess a functionality of at least 2 and are preferably triols. The molecular weight varies between 1000 and 4000. The ethylene oxide content in the polyethers should be higher than 10% of the total amounts of alkylene oxide. The polyols possess a very high content of primary hydroxyl groups.

For the production of the polyurethane foams the usual isocyanates, activators, foam stabilisers, foaming agents as well as other additives may be used.

As isocyanate, toluylenediisocyanate (80% 2,4- and 20% 2,6-isomer, or 65% 2,4- and 35% 2,6-isomer) is preferably used.

As activators, tertiary amines, such as dimethylbenzylamine, N - methyl - N' - dimethylaminoethylpiperazine and 2,2,4-trimethyl - 2 - silamorpholine, are particularly suitable. (2-silamorpholine is morpholine in which the two carbon is replaced by silicon).

The polyurethane foams containing the active compounds, luring substances and other additives are, in general, obtained (as in the production of polyurethane foams according to the prior art) in the form of blocks or thick slabs. From these, the baits of the invention can be produced by cutting up, sawing up or punching out.

The form of the baits according to the invention is entirely optional. They can be produced as small plates, ribbons, foils, films, spheres, cubes, rectangular parallelepipeds, cylinders or small, barrel-shaped bodies.

The baits of the invention may be used in the usual manner; it is particularly advantageous if they are moistened with water, since in this condition they exercise a particularly great attracting action.

Some of the advantages of the baits of the invention and their production as compared with the previously known baits (especially those which have hitherto been important in practice) may be summarised as follows:

(1) The active compounds are uniformly distributed in the bait material.

(2) The hydrophilic polyurethane foam ensures high hydrophilia and water absorbency.

(3) The active compounds are, through being embedded in the polyurethane foam structure, protected against too rapid a washing out, rapid hydrolysis and rapid mechanical wearing off.

(4) When used with smaller amounts of active compound, the baits show more rapid and longer lasting effectiveness than other baits and therefore exploit particularly well the insecticidal potency of the insecticidal active compounds.

(5) The production of the carrier material, the introduction of the insecticidal active compound, the introduction of the luring substance as well as the introduction of any colouring matter are achieved in one single operation. Production can therefore be particularly simple and rapid. Solvents and drying energies are saved. Moreover, safety precautions which would be necessary with the use of combustible and explosive solvents are not required. Finally, no problems arise when readily volatile active compounds are used which would evaporate during the usual drying.

The production of baits of the invention is illustrated by the following Production Examples 1 and 2.

Production Example 1.

Production of foam:

100 parts by weight of a trifunctional hydrophilic polyether (hydroxyl number 56, average molecular weight 3000) which was obtained by addition of 45% ethylene oxide and 55% propylene oxide to glycerol as starting component are mixed with 40 parts by weight of powdered sugar (luring substance), 10 parts by weight of a red paste (dispersion of an azo red pigment in a conventional plasticiser (attracting colour)), 0.05 part by weight of 2,2,4-trimethyl-2-silamorpholine, 0.25 part by weight of tin-(II)-octoate (both as activators), 3 parts by weight of water (foaming agent), 1.0 part by weight of a water-soluble polyethersiloxane (stabiliser) as well as 2 parts by weight of O,O-dimethyl-(1-hydroxy-2,2,2-trichloroethyl)-phosphonate are intimately mixed. The mixture is then thoroughly stirred together with 39 parts by weight toluylene-diisocyanate (65% 2,4- and 35% 2,6-isomer). After about 5 seconds the mixture becomes turbid, and a foam forms which after a further 60 seconds has reached its final height. The red foam obtained is elastic, possesses a fine cell structure and is very hydrophilic; by gravimetric determination, after immersion in water the foam absorbs 1100 per cent by weight of water. Production of the bait:

From the foam so produced, 0.5 cm thick slabs are produced by means of a rotating knife (commercial polyurethane foam slitting installation). These slabs are cut into slabs with an edge length of 6.3 and 9 cm, with the same equipment. These slabs can be used directly as bait.

In the same manner, baits in any other desired shape can be produced from the foam.

Production Example 2.

Production of foam:

100 parts by weight of a trifunctional hydrophilic polyether (hydroxyl number 56, average molecular weight 3000) which was obtained as starting component by addition of 45% ethylene oxide and 55% propylene oxide to glycerol, are thoroughly mixed with 80 parts by weight of powdered sugar, 20 parts by weight of powdered egg, 2.175 parts by weight of 2-methylcoumaran-7-yl-N-methylcarbamate, 2.175 parts by weight of O,O-dimethyl-2,2-dichlorovinylphosphate and 10.0 parts by weight of a red paste (dispersion of an azo red pigment in a usual plasticiser). To this polyol mixture is added an activator solution of 0.05 part by weight 2,2,4-trimethyl-2-silamorpholine, 0.6 part by weight tin-(II)-octoate, 3 parts by weight of water and 1.75 parts by weight of a water-soluble polyethersiloxane. The mixture is then thoroughly stirred together with 43 parts by weight toluylenediisocyanate (65% 2,4- and 35% 2,6-isomer) and the polyurethane foam forming after about 5 seconds is filled into moulds, in which it reaches its maximum height after a further 60 seconds. The red coloured foam obtained is elastic and possesses a fine cell structure. The hydrophilia is measured by water absorption; the foam (with the air squeezed out) was immersed in water. The water absorption is 1480 per cent by weight.

Production of bait:

In the same manner as stated in Production Example 1, baits in the form of slabs or

any other form desired can be produced from the foam.

The effectiveness of the baits of the invention is illustrated by the following Use Examples A—F, in which all percentages are by weight.

Use Example A.

A bait according to the invention was compared with a bait of a previously known type. The bait according to the invention was a foam slab with edge lengths of 0.5×6.3×9 cm and a weight of 2.1 g.

It contained as active compound O,O-dimethyl - (1-hydroxy - 2,2,2 - trichloroethyl)-phosphate in an amount of 1.0%, as luring substance powdered sugar in an amount of 20.4%, and as attracting colour a red azo pigment dyestuff.

The bait was produced by a method according to Example 1.

The previously known bait had the same dimensions as the bait according to the invention, but weighed 6.8 g. It contained the same active compound and the same luring substance in the same concentration. The attracting colour was also red. This bait was produced from a mechanical wood-pulp board by impregnation with the individual substances.

In the comparison of the two baits, account must be taken of the fact that the previously known bait was more than 3 times as heavy as the bait according to the invention and therefore, in absolute terms, contained more than 3 times as much active compound and luring substance.

The biological test was carried out as follows:

To test the bait activity, each bait was laid on a saucer, moistened with water up to the limit of the absorption time and then placed on the floor of a room of 3.7×3.8 metres lateral dimensions and a height of 2.9 metres, each in the middle of a sheet of white filter paper of 52 cm×52 cm size and at the same distance from the walls of the room. About 2000 flies of the species Musca domestica were then released into this room. The flies were able to choose completely freely between the two baits.

After 4 hours there was determined the number of dead flies which, in the case of each bait, lay on the saucer and on the sheet of filter paper. The other dead flies lying scattered around the room were not counted, since in their cases it was not certain by which of the two baits they were killed.

The flies on the two saucers, as well as the flies on the sheets of filter paper, were counted separately. There was then ascertained what percentage of the total of flies counted had been killed by one bait and what percentage had been killed by the other. These percentage figures represent the effectiveness index.

The results are stated in the following Table. It can be seen that the bait according to the invention has a much higher effectiveness index and, in addition, exercises a much more rapid action on the flies than does the previously known bait.

In the case of the bait according to the invention, a higher percentage of the flies lay on the saucer than in the case of the previously known baits, with reference respectively to the total number of flies evaluated.

TABLE

Bait	Number of flies killed: Saucer	Paper	Saucer and paper	Effectiveness index
According to the invention	548	739	1287	73
Previously known	98	384	482	27

Use Example B.

A bait according to the invention was compared with a previously known bait. The bait according to the invention was a slab with dimensions 0.5×6.3×9.0 cm. It weighed 2.5 g. As active compound it contained 2-methyl - coumaran - 7 - yl - N - methylcarbamate in an amount of 0.83% and O,O-dimethyl - 2,2 - dichloro - vinyl phosphate in an amount of 0.83%. As luring substance it contained powdered sugar in an amount of 30.4% and powdered egg in an amount of 7.6% and, as attracting colour, a red azo pigment dyestuff.

The bait had been prepared according to Production Example 2.

The previously known bait had the same dimensions as the bait according to the invention but weighed 7.5 g. It contained the same active compounds and the same luring substances in the same concentration. Its attracting colour was also red.

The bait was produced from a board of mechanical wood-pulp, and which was impregnated with the individual substances.

In the comparison of the two baits, account must be taken of the fact that the previously known bait, in absolute terms, contained 3 times the amount of active compounds and luring substances.

The activity of the two baits was compared according to the test stated in Use Example A. About 3000 flies of the species Musca domestica were used. After 4 hours, 2710 flies had been killed by the two baits.

TABLE

Bait	Effectiveness index
According to the invention	64
Previously known	36

Use Example C.

Two baits were compared. The bait according to the invention was a slab with the dimensions of 0.5×6.3×9 cm. It weighed 2.3 g.

As active compound, it contained 2-methylcoumaran-7-yl-N-methylcarbamate in an amount of 1.0%, as luring substance powdered sugar in an amount of 20.4% and as attracting colour a red azo pigment dyestuff.

The bait had been produced according to Production Example 1.

The previously known bait had the same dimensions as the bait according to the invention. However, it weighed 6.9 g. It contained the same active compounds and luring substances in the same concentration. The attracting colour was also red.

It had been produced in the usual manner from a board of mechanical wood-pulp by impregnation with the individual substances.

In the comparison of the two baits, account must be taken of the fact that the previously known bait, in absolute terms, contained 3 times more active compounds and luring substances than the bait according to the invention.

The activity of the two baits was determined according to the test described in Use Example A.

Of about 1500 flies, 1399 were killed in 4 hours. The results are listed in the following Table. In this connection it is particularly to be taken into account that the bait according to the invention has a higher immediate activity. Comparatively many flies lay on the saucer and relatively few on the paper.

TABLE

Bait	Number of flies killed on: Saucer	Paper	Saucer and paper	Effectiveness index
According to the invention	737	229	966	69
Previously known	261	172	433	31

Use Example D.

Two baits were compared with each other. The bait according to the invention corresponded exactly to the bait described in Example C.

The previously known bait corresponded generally to the previously known bait described in Example C but its size was reduced to one third, so that the weights of the two baits were equal.

The two baits therefore contained the same amounts of active and luring substances, not only in percentage terms but also in absolute terms.

The activity of the two baits was determined according to the test stated in Use Example A. The effectiveness indexes are given in the following Table.

TABLE

Bait	Effectiveness index
According to the invention	75%
Previously known	25%

Use Example E.

To baits were compared. The bait according to the invention corresponded generally to the bait of the invention according to Use Example A, but contained as active compound O,O-di-methyl-2,2-dichlorovinyl phosphate in an amount of 0.85% and as luring substance powdered sugar in an amount of 34%.

The previously known bait corresponded in principle to the previously known bait according to Use Example A, but contained the same luring and active substances in the same amount as the bait according to the invention described in this Example.

For 5 weeks both baits were moistened daily with water to the limit of their absorbency and were, at intervals of one week, tested for their biological activity in the manner stated in Use Example A.

The results are listed in the following Table. From this Table it can be clearly seen that the bait according to the invention was, from the beginning of the experiment, distinctly superior to the comparative bait and became more and more superior in the course of time.

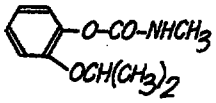
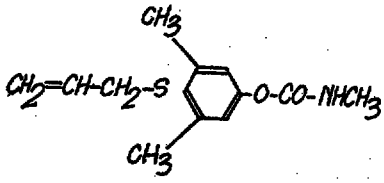
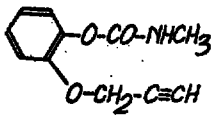
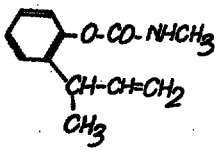
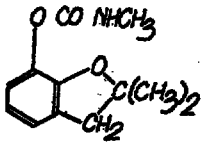
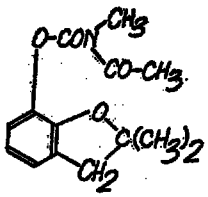
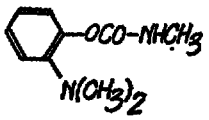
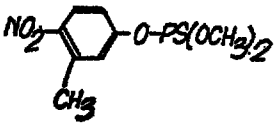
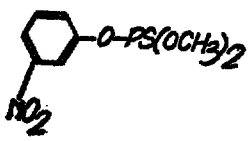
TABLE

Test time in weeks	Effectiveness index of the two baits	
	According to the invention	Previously known
0	60	40
1	62	38
2	65	35
3	70	30
4	84	16
5	91	9

Use Example F.

The comparative experiments according to Example C were repeated several times with baits which in each case contained, instead of 2 - methyl - 7 - coumaranyl - N - methyl-carbamate, the active compounds mentioned in the following Table. The effectiveness indexes for the pairs of baits of the invention and of the prior art are stated in the following Table:

TABLE

Active compound	Effectiveness indexes for the baits: According to the invention		Previously known
	66	:	34
	57	:	43
	62	:	38
	56	:	44
	67	:	33
	64	:	36
	63	:	37
	61	:	39
	60	:	40

For the production of the hydrophilic polyurethane foams, polyols with hydroxyl numbers below 250, especially below 100, are preferably used. When producing these polyols, more than 10% ethylene oxide, relative to the total amount of alkylene oxide, are used.

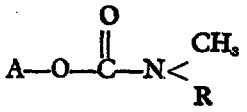
The invention also provides a method of combating insect pests which comprises applying to an area in which insect pests are to be controlled an insecticidal bait according to the invention.

WHAT WE CLAIM IS:—

1. Insecticidal baits which consist essentially of a non-thermoplastic hydrophilic polyurethane foam containing substantially uniformly embedded in the cell framework thereof an insecticidal carbamate and/or an insecticidal phosphoric acid ester as well as an insect-luring substance.

2. Insecticidal baits according to claim 1 which contain substantially uniformly embedded in the cell framework of the foam an insect-attracting colouring matter.

3. Insecticidal baits according to claim 1 or 2 containing an insecticidal carbamate of the formula:—



in which

R stands for hydrogen or an acyl radical,

A stands for phenyl or a phenyl radical with condensed heterocyclic rings which contain oxygen, nitrogen or sulphur, and these radicals may be substituted by 1 to 3 of the following substituents: alkyl radicals (each containing 1—6 carbon atoms), alkoxy radicals (each containing 1—6 carbon atoms), alkenyl radicals (~~each~~ containing 2—6 carbon atoms), alkinyl radicals (each containing 2—6 carbon atoms), dialkylamino radicals, dialkenylamino radicals and alkylalkenylamino radicals.

4. Insecticidal baits according to claim 1 or 2 containing one or more of the following: 2 - isopropoxy - phenyl - N - methyl - carbamate, 2 - methyl - coumaran - 7 - yl - N-methyl-carbamate, O,O - di - methyl - (1-hydroxy - 2,2,2 - trichloroethyl) - phosphonate, 3,5 - di - methyl - 4 - allylmercaptophenyl - N - methyl - carbamate, 2 - propargyl - oxyphenyl - N - methylcarbamate, 2 - (methyl - allyl) - phenyl - N - methylcarbamate, 2,2 - dimethylcoumaran - 7 - yl-N - methyl - N - acetylcarbamate, 2 - dimethylaminophenyl - N - methyl - carbamate, O,O - dimethyl - O - (3 - methyl - 4 - nitrophenyl) - thiophosphate, O,O - dimethyl-O - 3 - nitrophenylthiophosphate and dimethyl - 2,2 - dichlorvinylphosphate.

5. Insecticidal baits according to any of claims 1—4 containing from 0.01 to 20% of the carbamate and/or phosphoric acid ester, by weight of the baits.

6. Insecticidal baits according to claim 5 containing from 0.1 to 5% of the carbamate and/or phosphoric acid ester, by weight of the baits.

7. Insecticidal baits according to any of claims 1—6 in which the insect-luring substance is sugar or protein.

8. Insecticidal baits according to any of claims 1—7 containing from 1 to 50% of the insect-luring substance, by weight of the baits.

9. Insecticidal baits according to claim 2 or any of claims 3—8 as dependent on claim 2 containing from 0.5 to 5% of the colouring matter, by weight of the baits.

10. Insecticidal baits according to claim 1, substantially as hereinbefore described in any of the Examples.

11. A process for the production of insecticidal baits which comprises forming a mixture of (1) an insecticidal carbamate and/or insecticidal phosphoric acid esters, (2) an insect-luring substance, (3) a hydrophilic polyol, or a non-hydrophilic polyol and hydrophilic additive, (4) a polyisocyanate and (5) an activator, and foaming the mixture to form a hydrophilic polyurethane foam containing embedded in the cell frame-work thereof the carbamate and/or phosphoric acid ester and the insect-luring substance.

12. A process according to claim 11 in which the mixture also contains an insect-attracting colouring matter.

13. A process according to claim 11 or 12 in which the carbamate and/or phosphoric acid ester, the insect-luring substance and the hydrophilic additive are first formed into a mixture and this is then mixed with the polyisocyanate and the activator.

14. A process according to claim 11 or 12 in which the hydrophilic polyol is a copolymer of ethylene oxide, propylene oxide and glycerol.

15. A process according to any of claims 11—14 in which the polyisocyanate is toluylenediisocyanate.

16. A process according to any of claims 11—15 in which the carbamate and/or phosphoric acid ester is one or more of the following:— 2 - isopropoxy - phenyl - N - methylcarbamate, 2-methyl-coumaran-7-yl-N-methylcarbamate, O,O-dimethyl-(1-hydroxy-2,2,2-trichloroethyl)-phosphonate, 3,5-dimethyl-4-allylmercapto-phenyl-N-methyl-carbamate, 2-propargyl-oxyphenyl - N - methylcarbamate, 2 - (β - methyl - allyl) - phenyl - N - methylcarbamate, 2,2 - dimethylcoumaran - 7 - yl-N - methyl - N - acetylcarbamate, 2 - dimethylaminophenyl - N - methyl - carbamate, O,O - dimethyl - O - (3 - methyl - 4 - nitrophenyl) - thiophosphate, O,O - dimethyl - O - 3-nitrophenylthiophosphate and dimethyl-2,2-dichlorvinylphosphate.

17. A process according to any of claims 11—16 in which there is used an amount of the carbamate and/or phosphoric acid ester

For the production of the hydrophilic polyurethane foams, polyols with hydroxyl numbers below 250, especially below 100, are preferably used. When producing these polyols, more than 10% ethylene oxide, relative to the total amount of alkylene oxide, are used.

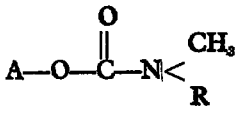
The invention also provides a method of combating insect pests which comprises applying to an area in which insect pests are to be controlled an insecticidal bait according to the invention.

WHAT WE CLAIM IS:—

1. Insecticidal baits which consist essentially of a non-thermoplastic hydrophilic polyurethane foam containing substantially uniformly embedded in the cell framework thereof an insecticidal carbamate and/or an insecticidal phosphoric acid ester as well as an insect-luring substance.

2. Insecticidal baits according to claim 1 which contain substantially uniformly embedded in the cell framework of the foam an insect-attracting colouring matter.

3. Insecticidal baits according to claim 1 or 2 containing an insecticidal carbamate of the formula:—



in which

R stands for hydrogen or an acyl radical,

A stands for phenyl or a phenyl radical with condensed heterocyclic rings which contain oxygen, nitrogen or sulphur, and these radicals may be substituted by 1 to 3 of the following substituents: alkyl radicals (each containing 1—6 carbon atoms), alkoxy radicals (each containing 1—6 carbon atoms), alkenyl radicals (each containing 2—6 carbon atoms), alkinyl radicals (each containing 2—6 carbon atoms), dialkylamino radicals, dialkenylamino radicals and alkylalkenylamino radicals.

4. Insecticidal baits according to claim 1 or 2 containing one or more of the following: 2 - isopropoxy - phenyl - N - methyl - carbamate, 2 - methyl - coumaran - 7 - yl - N-methyl-carbamate, O,O - di - methyl - (1-hydroxy - 2,2,2 - trichloroethyl) - phosphonate, 3,5 - di - methyl - 4 - allylmercaptophenyl - N - methyl - carbamate, 2 - propargyl - oxyphenyl - N - methylcarbamate, 2 - (methyl - allyl) - phenyl - N - methylcarbamate, 2,2 - dimethylcoumaran - 7 - yl-N - methyl - N - acetylcarbamate, 2 - dimethylaminophenyl - N - methyl - carbamate, O,O - dimethyl - O - (3 - methyl - 4 - nitrophenyl) - thiophosphate, O,O - dimethyl-O - 3 - nitrophenylthiophosphate and dimethyl - 2,2 - dichlorvinylphosphate.

5. Insecticidal baits according to any of claims 1—4 containing from 0.01 to 20% of the carbamate and/or phosphoric acid ester, by weight of the baits.

6. Insecticidal baits according to claim 5 containing from 0.1 to 5% of the carbamate and/or phosphoric acid ester, by weight of the baits.

7. Insecticidal baits according to any of claims 1—6 in which the insect-luring substance is sugar or protein.

8. Insecticidal baits according to any of claims 1—7 containing from 1 to 50% of the insect-luring substance, by weight of the baits.

9. Insecticidal baits according to claim 2 or any of claims 3—8 as dependent on claim 2 containing from 0.5 to 5% of the colouring matter, by weight of the baits.

10. Insecticidal baits according to claim 1, substantially as hereinbefore described in any of the Examples.

11. A process for the production of insecticidal baits which comprises forming a mixture of (1) an insecticidal carbamate and/or insecticidal phosphoric acid esters, (2) an insect-luring substance, (3) a hydrophilic polyol, or a non-hydrophilic polyol and hydrophilic additive, (4) a polyisocyanate and (5) an activator, and foaming the mixture to form a hydrophilic polyurethane foam containing embedded in the cell frame-work thereof the carbamate and/or phosphoric acid ester and the insect-luring substance.

12. A process according to claim 11 in which the mixture also contains an insect-attracting colouring matter.

13. A process according to claim 11 or 12 in which the carbamate and/or phosphoric acid ester, the insect-luring substance and the hydrophilic additive are first formed into a mixture and this is then mixed with the polyisocyanate and the activator.

14. A process according to claim 11 or 12 in which the hydrophilic polyol is a copolymer of ethylene oxide, propylene oxide and glycerol.

15. A process according to any of claims 11—14 in which the polyisocyanate is toluylenediisocyanate.

16. A process according to any of claims 11—15 in which the carbamate and/or phosphoric acid ester is one or more of the following:— 2 - isopropoxy - phenyl - N - methylcarbamate, 2-methyl-coumaran-7-yl-N-methylcarbamate, O,O-dimethyl-(1-hydroxy-2,2,2-trichloroethyl)-phosphonate, 3,5-dimethyl-4-allylmercapto-phenyl-N-methyl-carbamate, 2-propargyl-oxyphenyl - N - methylcarbamate, 2 - (β - methyl - allyl) - phenyl - N - methylcarbamate, 2,2 - dimethylcoumaran - 7 - yl-N - methyl - N - acetylcarbamate, 2 - dimethylaminophenyl - N - methyl - carbamate, O,O - dimethyl - O - (3 - methyl - 4 - nitrophenyl) - thiophosphate, O,O - dimethyl - O - 3-nitrophenylthiophosphate and dimethyl-2, 2-dichlorvinylphosphate.

17. A process according to any of claims 11—16 in which there is used an amount of the carbamate and/or phosphoric acid ester

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which is from 0.01 to 20%, by weight of the total ingredients.

18. A process according to claim 17 in which there is used an amount of the carbamate and/or phosphoric acid ester which is from 0.1 to 5%, by weight of the total ingredients.

19. A process according to any of claims 11—18 in which the hydrophilic polyol has a hydroxyl number below 250.

20. A process according to claim 19 in which the hydrophilic polyol has a hydroxyl number below 100.

21. A process according to claim 19 or 20 in which the hydrophilic polyol is derived from alkylene oxide of which more than 10% is ethylene oxide.

22. A process for the production of insecticidal baits, substantially as hereinbefore described in Example 1 or 2.

23. Insecticidal baits whenever produced by a process according to any of claims 11—22.

24. A method of combating insect pests which comprises applying to an area in which insect pests are to be controlled an insecticidal bait according to any of claims 1—10 or 23.

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