

**TERMITE AND BORING INSECT GROUND
BARRIER FOR THE PROTECTION OF
WOODEN STRUCTURES**

**CROSS REFERENCE TO RELATED
APPLICATIONS**

The present application is a Continuation-in-Part of U.S. patent application Ser. No. 08/482,151 filed on Jun. 7, 1995, which is a Continuation-In-Part of U.S. patent application Ser. No. 08/348,774 filed on Dec. 1, 1994, now abandoned, which is a continuation of U.S. patent application Ser. No. 08/117,877 filed on Sep. 7, 1993, now abandoned, which is a continuation of U.S. patent application Ser. No. 07/893,970 filed on Jun. 4, 1992, now abandoned, which is a continuation of U.S. patent application Ser. No. 07/401,955, filed on Sep. 1, 1989, now abandoned.

FIELD OF THE INVENTION

The present invention is a method and apparatus for deterring insects, especially boring insects for example termites, from entering wooden objects. More specifically, the invention is a controlled release method and apparatus wherein a concentration of insecticide is maintained in a zone between soil and wood for several years.

BACKGROUND OF THE INVENTION

Wood which is in contact with concrete, such as in wooden building construction and wood which is in contact with soil for example fence posts, utility poles, railroad cross-ties and wooden supports, can be structurally degraded by the action of termites, ants and other boring insects. Insecticides are available to protect wood from the action of such pests.

Although insecticides are effective against the action of the boring insects, the insecticides must be repeatedly applied at intervals of from a few days to a few months or a year to remain effective. If insecticides are applied by themselves in sufficient quantity to be effective over a period of time, they pose ecological concerns, human health, and may present unpleasant odors, soil leaching and volatility of the insecticide.

A further disadvantage of conventional application methods is that the concentration of active ingredients resulting from a single application of insecticide starts out well above the minimum level necessary for effectiveness, but decreases rapidly and within a relatively short period of time drops below the minimal effective level necessary to maintain a barrier.

To this end, a number of techniques for the controlled release of chemicals such as insecticides have been developed in recent years. These methods employ polymer matrices and microcapsules to release insecticide.

Cardarelli U.S. Pat. No. 4,400,374 discloses the use of polymer matrices generally made of polyethylene, polypropylene, ethylene vinyl acetate, polyamide, polystyrene, polyvinyl acetate, or polyurethane to control the release of insecticides such as the insecticide commercially available under the tradename Dursban. The polymer matrices disclosed in U.S. Pat. No. 4,400,374, incorporate porosigen and a porosity reducing agent which upon contact with soil moisture or an aqueous environment dissolves the matrix.

Similarly, Caraderelli U.S. Pat. No. 4,405,360 relates to a polymer release matrix which can be composed of polyamide, polyurethane, polyethylene, polypropylene,

polystyrenes and other polymers. The control release mechanism works in combination with a porosigen to release a herbicide in a moist environment.

A disadvantage of the Caraderelli methods is the necessity of sufficient moisture to dissolve the matrix. Periods of dryness, while extending the life of the matrix, would result in a decrease in the insecticide concentration thereby permitting access to the insects. In addition, the longevity of the matrix is variable and dependent upon moisture content.

In addition, Wysong U.S. Pat. No. 4,435,383 teaches the use of a controlled release mechanism for insecticides including carbamates, organothiophosphates, organophosphates, perchlorinated organics and synthetic pyrethroids. The release mechanism comprises a hydrophobic barrier monomer namely styrene and/or methyl styrene in combination with a monomer selected from one or more unsaturated mono- or di-carboxylic acids.

Another reference, Tocker U.S. Pat. No. 4,282,209 discusses a process for the preparation of insecticide-polymer particles. The insecticide, methomyl, is used to control insects which attack a tobacco, cotton or agricultural crops. Methomyl is dissolved with polymers such as polyamides, urethanes and epoxies to provide extended residual insecticidal activity.

A second Tocker patent, U.S. Pat. No. 4,235,872, discloses the use of slow-release insecticide microcapsules having a core of methomyl surrounded by a cover of allaromatic, uncrosslinked polyurea. In the arrangement disclosed in this patent, methomyl is used to protect vegetables, field crops and fruit crops.

A sixth reference, Young et al. U.S. Pat. No. 4,198,441, discloses the use of insecticides such as Dursban in a controlled release matrix comprising an organopolysiloxane, a hydrolyzable silane and a hydrolyzable organic titanium.

Additionally, Young et al. U.S. Pat. No. 4,190,680 teaches the use of a controlled release device for insecticides such as Dursban utilizing a hydrolyzable organic titanium compound.

Finally, Von Kohorn et al. U.S. Pat. No. 4,160,335 discloses a mode of dispersing insect control substances by applying stripes to sheets of cellophane. The insect control substance which can include Dursban is placed in a polymer well.

Although the prior art does disclose the use of an insecticide incorporated into a polymer matrix as controlled release agents, none of the references teach the creation and maintenance of a completely effective exclusion zone lasting several years or more. It is desirable to create a zone so as to prevent any contact between the wood structure and insects capable of damaging such structures. A reliable exclusion zone is necessary to protect wood structures for periods of time substantially greater than one year.

Therefore, in view of the above, it is an object of this invention to provide a zone of insecticide to protect wooden structures. Such zone consisting of a long term low volatility barrier and a high volatility short term barrier to protect adjacent soil.

It is a further object of this invention to maintain an exclusion zone for relatively great lengths of time of about 10 to 20 years.

SUMMARY OF THE INVENTION

The present invention provides a delivery system and method for the controlled release of insecticide which lasts for a predetermined period of time at a minimal effective