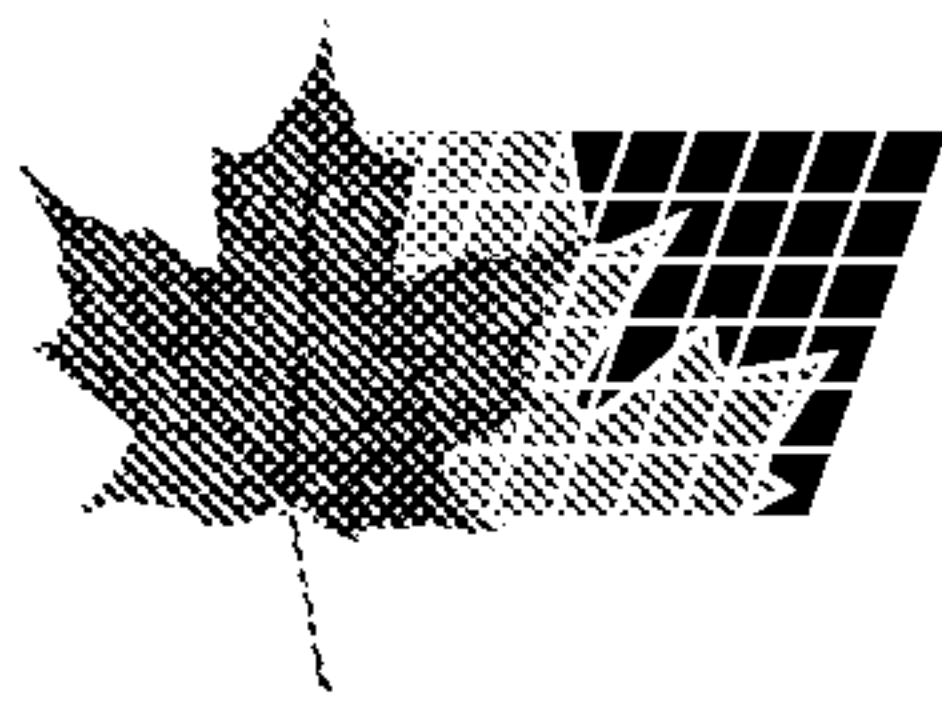




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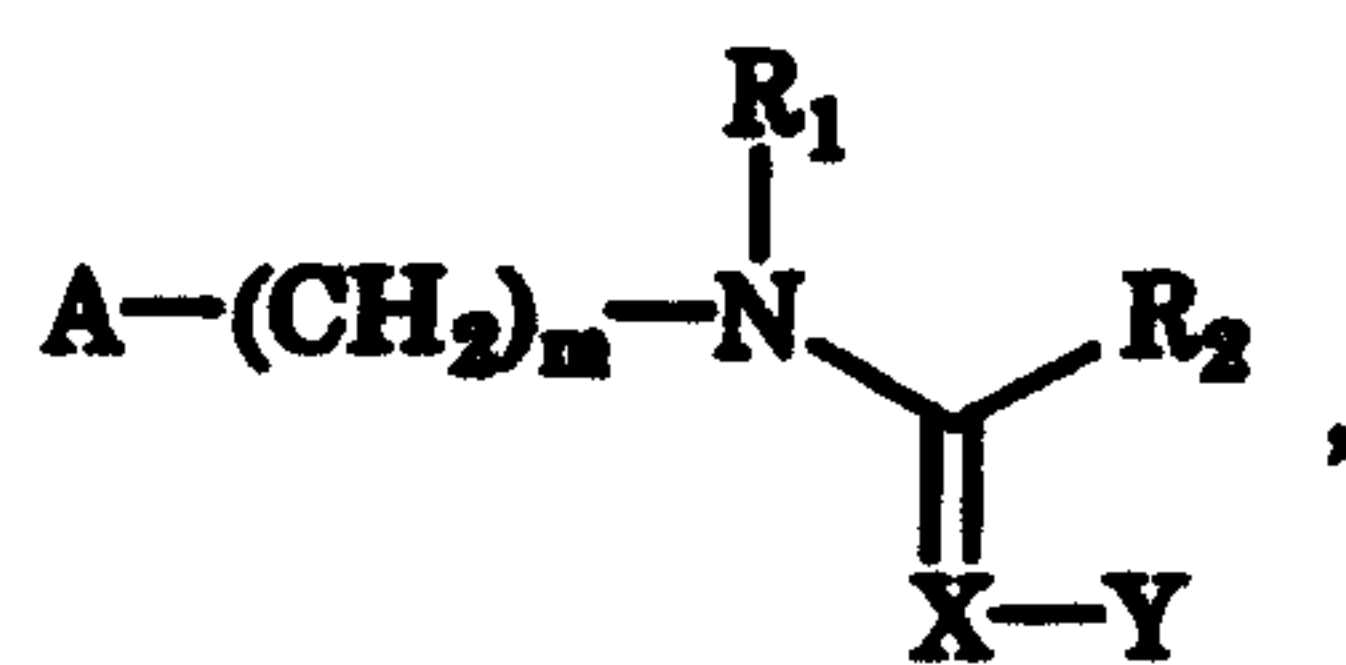
(71) SUMITOMO CHEMICAL COMPANY, LIMITED, JP

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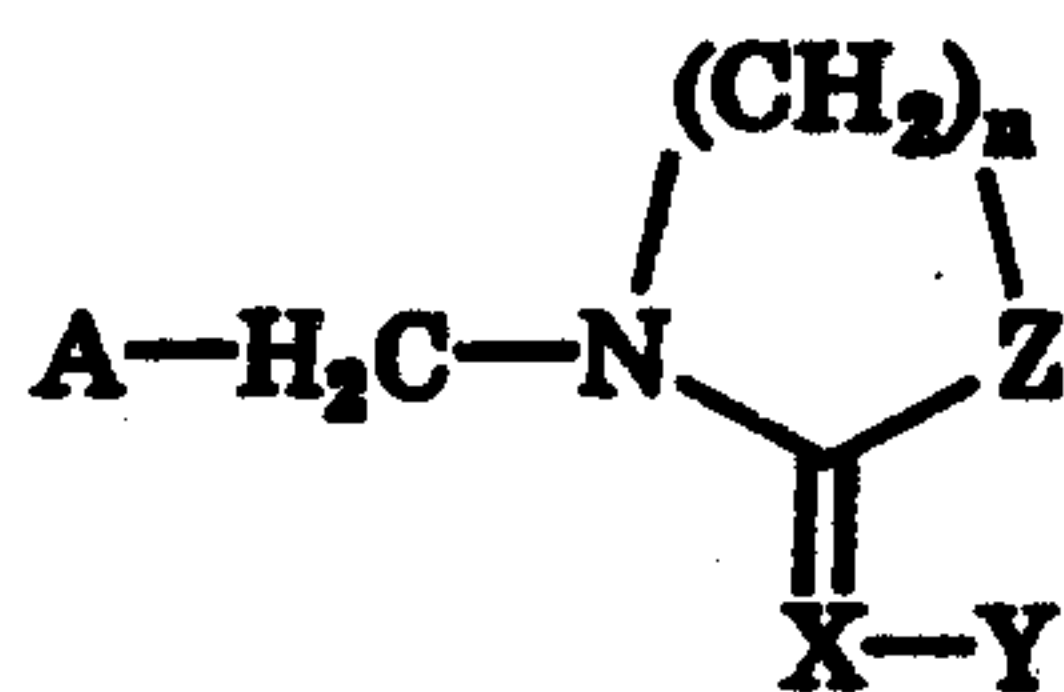
(30) 1998/06/26 (180374/1998) JP

(54) **MATIERE DE BOIS DE CONSTRUCTION TRAITEE**

(54) **PROCESSED LUMBER MATERIAL**

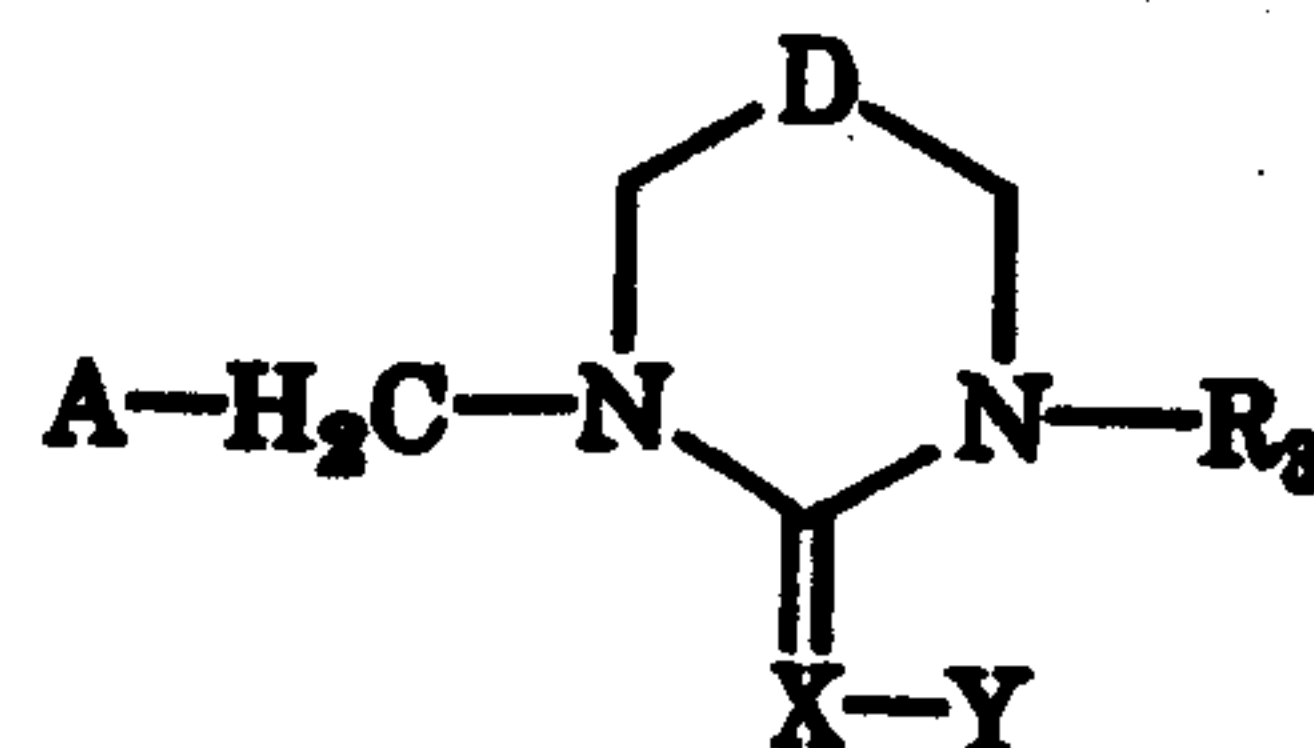


I



II

or



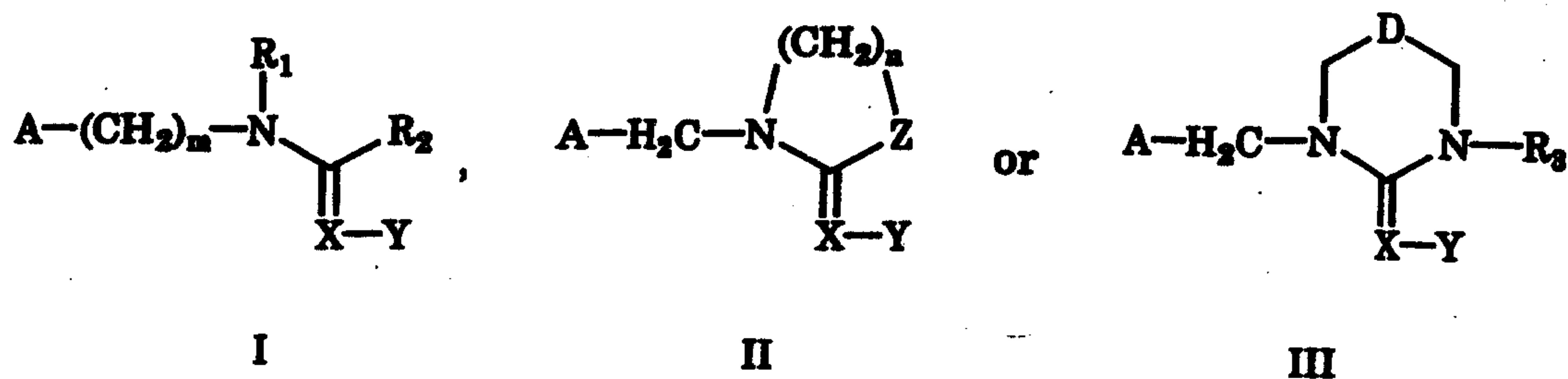
III

(57) The present invention is directed to a processed lumber material containing a compound of the formula: (see formula I, II, or III) wherein A is 6-chloro-3-pyridyl, 2-chloro-5-thiazolyl, tetrahydrofuran-3-yl or the like; R₁ is hydrogen, methyl, ethyl or the like; R₂ is methyl, methylamino or the like; R₃ is methyl or the like; X is nitrogen or CH; Y is cyano, vitro or trifluoroacetyl; Z is NH or sulfur; D is oxygen or -N(CH₃)-; m is 0 or 1; and n is 2 or 3. The processed lumber material of the present invention is extremely insect-proof.



ABSTRACT

The present invention is directed to a processed lumber material containing a compound of the formula:



wherein A is 6-chloro-3-pyridyl, 2-chloro-5-thiazolyl, tetrahydrofuran-3-yl or the like;
 5 R₁ is hydrogen, methyl, ethyl or the like; R₂ is methyl, methylamino or the like; R₃ is methyl or the like; X is nitrogen or CH; Y is cyano, nitro or trifluoroacetyl; Z is NH or sulfur; D is oxygen or -N(CH₃)-; m is 0 or 1; and n is 2 or 3. The processed lumber material of the present invention is extremely insect-proof.

PROCESSED LUMBER MATERIAL

The present invention relates to processed lumber materials such as plywood and woodboard; adhesives for use in processed lumber materials; and insect-proofing methods for processed lumber materials.

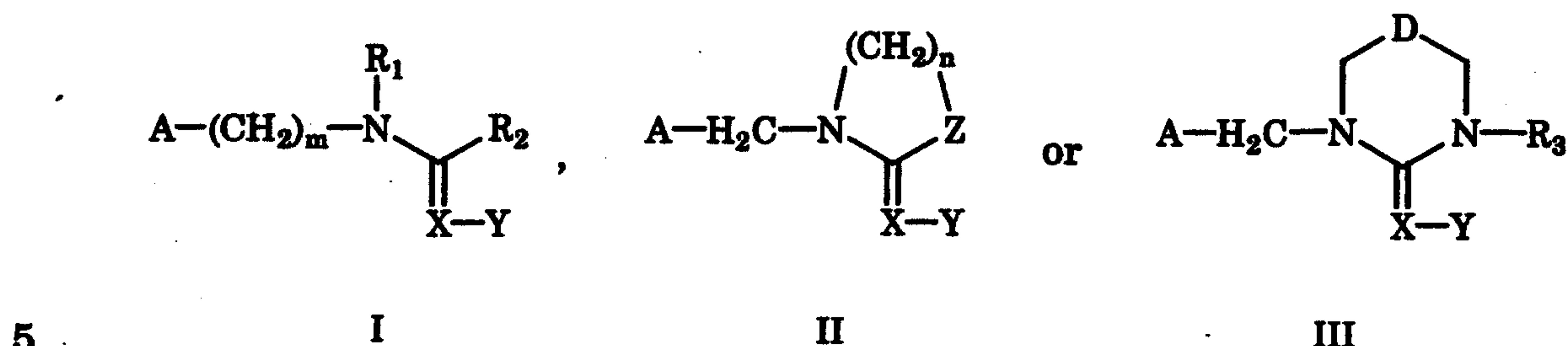
In general, plywood is characteristic of having a small difference in strength between the lengthwise and widthwise directions thereof. Plywood is practically not susceptible to wet and dry conditions. Plywood also has the great advantages that wide boards, without knots, flaws, and any other defects, can easily be prepared, and a high yield from raw wood can be attained. From the viewpoint of conservation of natural resources, much attention has been drawn to woodboard such as particleboard and fiberboard, which are formed of small wood pieces or wood fibers with an adhesive and then hot-pressed.

These processed lumber materials such as plywood and woodboard have been used for building, furnishing and furniture materials. Since they are liable to suffer damage from wood harmful insects such as termites and wood-boring insects, they need to undergo insect-proofing treatment. However, it is difficult to avoid exposure to high heat and high pressure during the production of these processed lumber materials, and the adhesives used are limited to those containing specific insecticides as disclosed in JP-A-9-136304.

The present invention attains excellent insect-proofness of processed lumber materials by the application of specific neonicotinoid compounds with

a structure as described below, e.g., cyanated, nitrated or trifluoroacetylated amidine or guanidine.

Thus, the present invention provides a processed lumber material comprising an effective amount of a compound of the formula:



wherein A is 6-chloro-3-pyridyl, 2-chloro-5-thiazolyl, tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, 5-methyltetrahydrofuran-3-yl, 3-pyridyl, 6-bromo-3-pyridyl, 3-cyanophenyl, 2-methyl-5-thiazolyl, 2-phenyl-5-thiazolyl or 2-bromo-5-thiazolyl; R₁ is hydrogen, methyl, ethyl, formyl or acetyl; R₂ is methyl, amino, methylamino, N,N-dimethylamino, ethylamino, N,N-diethylamino, N-methyl-N-ethylamino, 1-pyrrolidinyl, (6-chloro-3-pyridyl)methylamino or N-methyl-N-(6-chloro-3-pyridyl)methylamino; R₃ is methyl, ethyl, propyl, propenyl or propynyl; X is nitrogen or CH; Y is cyano, nitro or trifluoroacetyl; Z is NH or sulfur; D is oxygen or -N(CH₃)-; m is 0 or 1; and n is 2 or 3; an insect-proofing adhesive comprising such a compound of formula I, II or III; and an insect-proofing method for processed lumber materials with such an insect-proofing adhesive.

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15

The compounds of formula I, II or III are known as active agents for pesticides and are disclosed in, for example, USP-5532365, USP-4742060, USP-4849432, USP-5034404, USP-5750548, USP-5304566 and EP-428941A.

20

The compounds of formula I may include, for example, N¹-[(6-chloro-3-pyridyl)methyl]-N²-cyano-N¹-methylacetamidine, N-[(6-chloro-3-pyridyl)-

methyl]-N-ethyl-N'-methyl-2-nitro-1,1-ethylenediamine, 1-(6-chloro-3-pyri-
 dyl)methyl-3-methyl-2-cyanoguanidine, 1-(6-chloro-3-pyridyl)methyl-1,3-
 dimethyl-2-cyanoguanidine, 1-(6-chloro-3-pyridyl)methyl-1-ethyl-3-methyl-
 2-cyanoguanidine, 1-(6-chloro-3-pyridyl)methyl-1,3-dimethyl-3-(6-chloro-3-
 5 pyridyl)methyl-2-cyanoguanidine, 1-(6-chloro-3-pyridyl)methyl-3-methyl-2-
 nitroguanidine, 1-(6-chloro-3-pyridyl)methyl-3,3-dimethyl-2-nitroguanidine,
 1-(6-chloro-3-pyridyl)methyl-1-methyl-2-nitroguanidine, 1-(6-chloro-3-pyri-
 dyl)methyl-1,3-dimethyl-2-nitroguanidine, 1-(6-chloro-3-pyridyl)methyl-3-
 ethyl-2-nitroguanidine, 1-(6-chloro-3-pyridyl)methyl-3-(6-chloro-3-pyridyl)-
 10 methyl-2-nitroguanidine, 1-(6-chloro-3-pyridyl)methyl-3-methyl-2-trifluoro-
 acetylguanidine, 1-(6-chloro-3-pyridyl)methyl-1-ethyl-3-methyl-2-nitro-
 guanidine, 1-(6-chloro-3-pyridyl)methyl-1,3,3-trimethyl-2-nitroguanidine,
 1-(6-chloro-3-pyridyl)methyl-2-nitroguanidine, 1-(6-chloro-3-pyridyl)methyl-
 1-ethyl-2-nitroguanidine, 1-(3-pyridyl)methyl-3-methyl-2-nitroguanidine,
 15 1-(6-bromo-3-pyridyl)methyl-3-methyl-2-nitroguanidine, 1-(2-chloro-5-thia-
 zolyl)methyl-3-methyl-2-nitroguanidine, 1-(3-cyanophenyl)-3-methyl-2-nitro-
 guanidine, 1-(4-chlorophenyl)methyl-3-methyl-2-nitroguanidine, 1-(6-chloro-
 3-pyridyl)methyl-3,3-dimethyl-1-formyl-2-nitroguanidine, 1-(6-chloro-3-pyri-
 dyl)methyl-3,3-dimethyl-1-acetyl-2-nitroguanidine, 1-(6-chloro-3-pyridyl)-3-
 20 methyl-2-cyanoguanidine, 1-(2-chloro-5-thiazolyl)methyl-3,3-dimethyl-2-
 nitroguanidine, 1-(2-chloro-5-thiazolyl)methyl-1-ethyl-3-methyl-2-nitro-
 guanidine, 1-(2-chloro-5-thiazolyl)methyl-1-acetyl-3,3-dimethyl-2-nitro-
 guanidine, 1-(6-chloro-3-pyridyl)methyl-1-methyl-2-trifluoroacetylguanidine,
 1-(2-chloro-5-thiazolyl)methyl-1,3-dimethyl-2-nitroguanidine, 1-(2-chloro-5-
 25 thiazolyl)methyl-1-methyl-2-nitroguanidine, 1-(5-thiazolyl)methyl-3-methyl-
 2-nitroguanidine, 1-(2-methyl-5-thiazolyl)methyl-3,3-dimethyl-2-nitro-
 guanidine, 1-(2-methyl-5-thiazolyl)methyl-3-methyl-2-nitroguanidine, 1-(2-
 phenyl-5-thiazolyl)methyl-3-methyl-2-nitroguanidine, 1-(2-chloro-5-thia-

zolyl)methyl-3,3-diethyl-2-nitroguanidine, 1-(2-chloro-5-thiazolyl)methyl-3-methyl-3-ethyl-2-nitroguanidine, 1-(2-chloro-5-thiazolyl)methyl-3-(1-pyrrolidinyl)-2-nitroguanidine, 1-(2-chloro-5-thiazolyl)methyl-1,3,3-trimethyl-2-nitroguanidine, 1-(2-bromo-5-thiazolyl)methyl-3-methyl-2-nitroguanidine,
 5 1-(2-bromo-5-thiazolyl)methyl-3,3-dimethyl-2-nitroguanidine, 1-(2-chloro-5-thiazolyl)methyl-3-methyl-2-cyanoguanidine, 1-(tetrahydrofuran-3-yl)-methyl-3-methyl-2-nitroguanidine and 1-(tetrahydrofuran-2-yl)methyl-3-methyl-2-nitroguanidine.

The compounds of formula II may include, for example, 1-(2-chloro-5-pyridylmethyl)-2-cyanoiminothiazoline and 1-[(6-chloro-3-pyridyl)methyl]-
 10 N-nitrotetrahydropyrimidin-2-imine.

The compounds of formula III may include, for example, 3-[(2-chloro-5-thiazolyl)methyl]-5-methyl-4-nitroiminotetrahydro-1,3,5-oxadiazine, 3,5-dimethyl-1-[(6-chloro-3-pyridyl)methyl]-N-nitrohexahydro-1,3,5-triazin-2-
 15 imine, 3,5-dimethyl-1-[(2-chloro-5-thiazolyl)methyl]-2-nitroiminohexahydro-1,3,5-triazine, 3-ethyl-5-methyl-1-[(6-chloro-3-pyridyl)methyl]-N-nitrohexahydro-1,3,5-triazin-2-imine, 3-n-propyl-5-methyl-1-[(6-chloro-3-pyridyl)-methyl]-N-nitrohexahydro-1,3,5-triazin-2-imine, 3-n-propyl-5-methyl-1-[(2-chloro-5-thiazolyl)methyl]-N-nitrohexahydro-1,3,5-triazin-2-imine, 3-(2-
 20 propenyl)-5-methyl-1-[(6-chloro-3-pyridyl)methyl]-N-nitrohexahydro-1,3,5-triazin-2-imine and 3-(2-propynyl)-5-methyl-1-[(6-chloro-3-pyridyl)methyl]-N-nitrohexahydro-1,3,5-triazin-2-imine.

The wood harmful insects which can be effectively controlled by the present invention may include, for example, those belonging to the following
 25 orders, families and genera:

Isoptera: Mastotermitidae, Termopsidae (e.g., *Zootermopsis*, *Archotermopsis*, *Hodotermopsis*, *Porotermes*, *Stolotermes*), *Kalotermitidae* (e.g., *Kalotermes*, *Neotermes*, *Cryptotermes*, *Incisitermes*, *Glyptotermes*), *Hodo-*

termitidae (e.g., *Hodotermes*, *Microhodotermes*, *Anacanthotermes*), *Rhino-*
termitidae (e.g., *Reticulitermes*, *Heterotermes*, *Coptotermes*, *Schedolino-*
termes), *Serritemitidae*, and *Termitidae* (e.g., *Amitermes*, *Drepanotermes*,
Hopitalitermes, *Trinervitermes*, *Mactotermes*, *Odontotermes*, *Microteremes*,
5 *Nasutitermes*, *Pericapritermes*, *Anoplotermes*).

Coleoptera: Scolytidae (e.g., *Xyleborus*, *Scolytoplatypus*), *Ceramby-*
cidae (e.g., *Monochamus*, *Hylotrupes*, *Hesperophanus*, *Chlorophorus*,
Palaeocallidium, *Semanotus*, *Purpuricen*, *Stromatium*), *Rynchophoridae*
(e.g., *Sipalinus*), *Platypodidae* (e.g., *Crossotarsus*, *Platypus*), *Lyctidae* (e.g.,
10 *Lyctus*), *Bostrychidae* (e.g., *Dinoderus*, *Bostrychus*, *Sinoderus*), *Anobiidae*
(e.g., *Ernobius*, *Anobium*, *Xyletinus*, *Xestobium*, *Ptilinus*, *Nicobium*,
Ptilineurus), and *Buprestidae*.

The term "processed lumber material" as used herein refers to wood
materials including woodboard, plywood, bonded wood and laminated veneer
15 lumber (LVL), which are produced by the integration of veneers or small
wood pieces such as chips, residual sawn lumber, sawdust and pulp sillage.

The term "woodboard" as used herein refers to particleboard which is
reconstituted from small wood pieces with an adhesive or fiberboard which is
reconstituted from wood fibers with an adhesive, such as stick lumber,
20 parallel strand lumber (PSL), stick ply, oriented strand lumber (OSL),
waferboard, strand-board, oriented particleboard, flakeboard, particleboard,
oriented medium-density fiberboard, insulation board, medium-density
fiberboard and hard board. The small wood pieces which can be used herein
may include, for example, chips, flakes, semi-flakes, wafers, fines, shavings,
25 strands, sticks and particles. The kind of wood may include, for example,
lumber from Southeast Asia such as lauan; broadleaf trees such as aspen;
and needleleaf trees such as southern pine. The wood fibers which can be
used herein may be obtained from, for example, albizia or radiata pine.

The term "plywood" as used herein refers to wood boards obtained by the lamination of wood veneers of an odd number so that adjacent veneers have fiber directions lying at right angles to each other. The number of veneers is usually three at least, and various boards can be found, such as five-ply or seven-ply veneer plywood.

5 In general, plywood is produced by coating an adhesive on the surface of veneers, and then laminating, heating and bonding these veneers under pressure. The kind of wood may include, for example, lauan, linden, Japanese oak, Japanese ash, birch, beech and Japanese cedar. The bonding temperature is usually in the range of 100°C to 250°C, and the bonding pressure is usually in the range of 5 to 40 kg/cm².

10 The terms "bonded wood" and "laminated veneer lumber (LVL)" as used herein refer to wood boards obtained, respectively, by the lamination of swanwood boards, or scantlings, and of wood veneers so that they have fiber directions parallel to each other. These wood boards are produced from the same kind of tree using the same process as is used in the production of plywood.

15 These processed lumber materials are produced with an adhesive containing a compound of formula I, II or III. The compound can be incorporated into the processed lumber materials by the surface treatment of the processed lumber materials with the compound as such or in solution, by means such as soaking, coating or spraying; by the injection of the compound as such or in solution into the processed lumber materials
20 under pressure or reduced pressure; or by the addition of the compound in the surface finishing of the processed lumber materials.

When the compound of formula I, II or III is used in admixture with an adhesive, for example, the compound is mixed with a solid or liquid carrier, and surfactants and other auxiliary agents are added thereto, if necessary. The resulting
25 mixture is then formulated into an appropriate form such as emulsifiable concentrate, wettable powder, flowable (e.g., water

suspension, water emulsion), dust, foam, paste, or granule, and mixed with an ordinary adhesive to give an insect-proofing adhesive containing the compound.

The ordinary adhesive may include, for example, starch, glue, casein glue, soybean glue, Japanese lacquer, resorcinol resin adhesives, urea resin adhesives, vinyl acetate resin emulsion adhesives, cross-linked vinyl acetate resin emulsion adhesives, aqueous polymer-isocyanate adhesives, α -olefin-maleic anhydride copolymer adhesives, hotmelt adhesives, rubber adhesives, epoxy resin adhesives, cyanoacrylate resin adhesives, mastic adhesives, phenolic resin adhesives, melamine-urea co-condensation resin adhesives and melamine-phenolic co-condensation resin adhesives.

The amount of the compound of formula I, II or III contained in the processed lumber materials is usually in the range of 0.01 to 500 g/m³. For example, an insect-proofing adhesive, which previously contained the compound in an amount of 0.001% to 50% by weight, preferably 0.01% to 10% by weight, based on the total weight of the adhesive, is conveniently used for the production of the processed lumber materials according to the present invention.

The processed lumber materials of the present invention can be produced with an insect-proofing adhesive containing a compound of formula I, II or III by the ordinary methods which have been used in the production of conventional processed lumber materials such as plywood and woodboard, e.g., by the methods as disclosed in the text "Mokuzai-hozon-gaku Nyumon (Introduction to Wood Preservation)" which has been published by the Japan Wood Preserving Association.

The methods as disclosed in the above text may be used also in the surface treatment of processed lumber materials with the compound as such or in solution, by means such as soaking, coating or spraying; in the injection of the

compound as such or in solution into the processed lumber materials under pressure or reduced pressure; or in the addition of the compound in the surface finishing of the processed lumber materials. In these cases, the amount of the compound used in the treatment is usually in the range of
 5 0.003 to 200 g/m² for each surface of processed lumber materials.

The processed lumber materials may further contain, in addition to a compound of formula I, II or III, an insecticidal active agent for insect-proof woodboard, such as cyphenothrin, permethrin, cypermethrin or fenvalerate, which are disclosed in JP-A 9-136304, to have improved insect-proofing
 10 efficacy.

The processed lumber materials may further contain, in addition to a compound of formula I, II or III, at least one of the following microbicidal and/or antimicrobial compounds, making it possible to prevent the damage which will be caused by fungi, bacteria and/or algae.

15 Trihalosulphenyl compounds (e.g., dichlofluanid, trifluanid, folpet, fluorofolpet), Iodo compounds (e.g., IPBC, AmicalTM 48 (produced by Abbott), IF 1000 (produced by Nagase Sangyo), EBIP), phenol compounds (e.g., PCP-laurate, DCBP, tribromophenol), azole compounds (e.g., fenarimol, flurprimidol, fluorotrimazole, triadimefon, triadimenol, dichlorobtrazol, paclo-
 20 butrazol, diniconazole, uniconazole, triflumizole, flutriafol, flusilazole, penconazole, prochloraz, triarimol, fenarimol, bitertanol, imazalil, etaconazole, fenapanil, viniconazole, difenoconazole, bromuconazole, myclobutanil, hexaconazole, fluconazole-cis, fenethanil, tebuconazole, propiconazole, azaconazole, cyproconazole), carbamate compounds (e.g., zineb, maneb,
 25 benomyl, thiophanate-methyl, cypendazole, carbendazim, prothiocarb, diethofencarb), antibiotic compounds (e.g., validamycin A, kasugamycin, milbemycin), anilide compounds (e.g., mepronil, flutolanil, pencycuron, carboxin, oxycarboxin, pyracarbolid, mebenil, furcarbanil, cyclafuramid,

benodanil, metalaxyl, ofurace, benalaxyl, oxadixyl, cyprofuram, metsulfovax, tecloftalam), organic compounds (e.g., edifenphos, IBP, pyrazophos, Aliette, tolclofos-methyl), dicarboximide compounds (e.g., dichlozolin, iprodione, vinclozolin, procymidone, microzolin, fluoroimide), tin compounds (e.g.,
 5 tributyltin octylate, tributyltin oleate, bis-tributyltin oxide, tributyltin naphthenate, tributyltin phosphate, tributyltin benzoate), thiocyanate compounds (e.g., methylene bithiocyanate, 2-thiocyanomethylthiobenzo-thiazole), quaternary ammonium compounds (e.g., benzyldimethyltetradecylammonium chloride, benzyldimethyldodecylammonium chloride),
 10 benzimidazole compounds (e.g., fuberidazole, BCM, thiabendazole, benomyl), isothiazolinone compounds, morpholine compounds (e.g., tridemorf), pyridine compounds, N-cyclohexyldiadinium dioxy compounds, naphthenic acid compounds (e.g., zinc naphthenate, copper naphthenate), quinoline compounds, boron compounds (e.g., boric acid, borax, borates), urea
 15 compounds, and furan derivatives (e.g., furmecyclox).

The fungi which can be controlled by the above microbicidal and/or antimicrobial compounds may include, for example, those belonging to the following families and genera:

Wood-discoloring fungi: *Ascomycetes* (e.g., *Caratocystis*), *Deuteromycetes* (e.g., *Aspergillus*, *Aureobasidium*, *Dactyleum*, *Penicillium*, *Aclerophoma*, *Scopularia*, *Tricoderma*), and *Zygomycetes* (e.g., *Mucor*).

Wood-destroying fungi: *Ascomycetes* (e.g., *Chaetomium*, *Humicola*, *Petriella*, *Trichurus*), *Basidiomycetes* (e.g., *Coniophera*, *Coriolus*, *Donbiopora*, *Glenospora*, *Gloeophyllum*, *Lentinus*, *Paxillus*, *Pleurotus*, *Poria*, *Serpula*,
 25 *Tyromyces*), and *Deuteromycetes* (e.g., *Cladosporium*).

Examples

The present invention will be further illustrated by the following Production Examples and Test Examples; however, the present invention is

not limited to these Examples.

Production Example 1

(a) Preparation of adhesive

5 A kneaded material was obtained by adding 100 g of melamine-urea resin (Ohshika™ Resin PWP-60 from Ohshika Shinkoh) to 18 g of flour and kneading thoroughly. Then, 0.1309 g of 1-(tetrahydrofuran-3-yl)methyl-3-methyl-2-nitroguanidine (hereafter referred to as compound A) or 0.6572 g of 20% N¹-[(6-chloro-3-pyridyl)methyl]-N²-cyano-N¹-methylacetamidine (hereafter referred to as compound B) solution (Mospilan™ SP from Nippon Soda) was mixed with 12 g of water, and the
10 mixture was added to the above kneaded material, followed by stirring. Further, 0.8 g of a hardener was added, which was uniformly mixed to give an adhesive.

(b) Preparation of plywood

Three red lauan veneers with an area of 30 x 30 cm and a thickness of 0.85, 2.4 and 0.85 mm, respectively, were laminated in this order with the adhesive prepared in
15 (a) above. At that time, the adhesive was applied to each side of the core veneer at an amount of 18 g (i.e., 36 g in total). The laminate was cold-pressed under a pressure of 10 kg/cm² at room temperature for 20 minutes and then hot-pressed under a pressure of 10 kg/cm² at 120°C for 2 minutes to give a desired piece of three-layered plywood with a thickness of 4.1 mm, containing an active agent (i.e., compound A or B) at a ratio of
20 100 g/m³.

Production Example 2

A glue was obtained by mixing 63 parts by weight of urea resin adhesive, 3 parts by weight of paraffin wax, 0.95 part by weight of hardener (ammonium chloride), and 0.63 part by weight of compound B. The glue was added by spraying to 630 parts by
25 weight of radiata pine chips, and the mixture was formed into a board shape, which was then compressed under

the maximum compressive pressure of 30 kg/cm² at 150°C for 4 minutes to give a particleboard with a thickness of 12 mm.

Production Example 3

A glue was obtained by mixing 63 parts by weight of phenol resin
5 adhesive, 0.95 part by weight of accelerator (sodium carbonate), 1.2 parts by weight of iodopropargyl butylcarbamate, and 0.63 part by weight of compound B. The glue was added by spraying to 630 parts by weight of radiata pine chips, and the mixture was formed into a board shape, which was then compressed under the maximum compressive pressure of 30 kg/cm²
10 at 170°C for 7 minutes to give a particleboard with a thickness of 12 mm.

Test Example 1

The plywood as prepared in Production Example 1 was cut at a width of about 1 cm on all sides, and then cut into squares with a size of 5 x 10 cm as eight test pieces of plywood. An aluminum plate with a size of 5 x 10 cm,
15 having 32 holes with a diameter of 3 mm, was attached on each test piece of plywood. In each hole was set free one mature larva of powder post beetle (*Lyctus brunneus*). Each of these holes was filled with artificial powdered feed (EBIOS : flour : powdered cellulose = 3 : 7 : 10), and another test piece of plywood was placed thereon and fixed with a rubber band. After one month,
20 the test pieces of plywood were examined for the number of through holes formed on the test pieces of plywood by the penetration of hatched imagoes through the test pieces of plywood. The results are shown in Table 1 below.

TABLE 1

Test agent	Amount of active agent (g/m ²)	Number of through holes
Compound A	100	0
20% solution of Compound B	100	0
Compound C	100	0
No addition	—	3

Compound A: 1-(tetrahydrofuran-3-yl)methyl-3-methyl-2-nitro guanidine

Compound B: N¹-[(6-chloro-3-pyridyl)methyl]-N²-cyano-N¹-methyl acetamidine

Compound C: 3-[(2-chloro-5-thiazolyl)methyl]-5-methyl-4-nitroimino-tetrahydro-1,3,5-oxadiazine

5

Test Example 2

The plywood as prepared in Production Example 1 was cut at a width of 1 cm on all sides, and then cut into a square with a size of 25 x 25 mm as a plywood test piece. A polyethylene cup with a diameter of 8 cm and a height of 4 cm, having 9 holes with a diameter of about 2 mm on the bottom, was charged with hard plaster for covering the bottom, and the plywood test piece was placed on the hard plaster. In the polyethylene cup were set free 150 workers and 15 soldiers of Formosa subterranean termite (*Coptotermes formosanus*), and on the polyethylene cup was placed a lid having 18 holes with a diameter of about 2 mm. The covered polyethylene cup was placed on a vessel containing moisten absorbent cotton over the bottom, and then allowed to stand at room temperature. After allowing three weeks to lapse, the plywood test piece was observed for chewing damage and

the number of surviving termites (survivability). The results are shown in Table 2 below.

TABLE 2

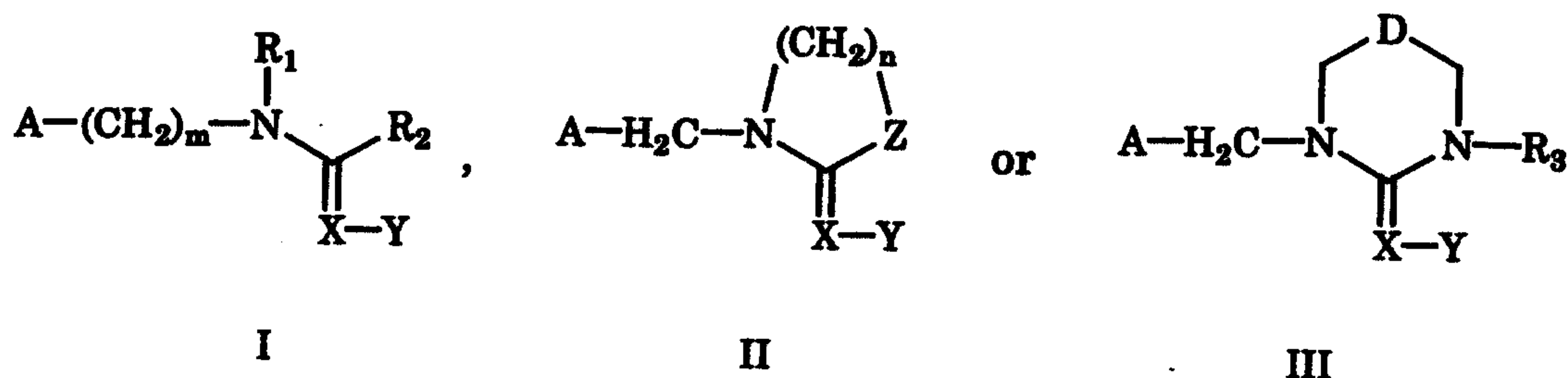
Test agent	Amount of active agent (g/m³)	Average survivability (%)	Average damage by chewing*
Compound A	100	4.8	0.4
No addition	—	92.7	4

Compound A: 1-(tetrahydrofuran-3-yl)methyl-3-methyl-2-nitro guanidine

*Average damage by chewing is rated from 0 (no damage by chewing) to 4 (substantially the same damage by chewing as in the non-treated area).

What is claimed is:

1. An insect-proof processed lumber material which comprises an effective amount of a compound of the formula:



- 5 wherein A is 6-chloro-3-pyridyl, 2-chloro-5-thiazolyl, tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, 5-methyltetrahydrofuran-3-yl, 3-pyridyl, 6-bromo-3-pyridyl, 3-cyanophenyl, 2-methyl-5-thiazolyl, 2-phenyl-5-thiazolyl or 2-bromo-5-thiazolyl; R₁ is hydrogen, methyl, ethyl, formyl or acetyl; R₂ is methyl, amino, methylamino, N,N-dimethylamino, ethylamino, N,N-diethylamino, N-methyl-N-ethylamino, 1-pyrrolidinyl, (6-chloro-3-pyridyl)-methylamino or N-methyl-N-(6-chloro-3-pyridyl)methylamino; R₃ is methyl, ethyl, propyl, propenyl or propynyl; X is nitrogen or CH; Y is cyano, nitro or trifluoroacetyl; Z is NH or sulfur; D is oxygen or -N(CH₃)-; m is 0 or 1; and n is 2 or 3.
- 15 2. The processed lumber material according to claim 1, which is plywood, particleboard or fiberboard.
3. The processed lumber material according to claim 1, which is plywood.
4. The processed lumber material according to claim 1, which is
- 20 particleboard or fiberboard.
5. The processed lumber material according to claim 1, wherein the compound of formula I, II or III is 1-(tetrahydrofuran-3-yl)methyl-3-methyl-2-nitroguanidine.

6. The processed lumber material according to claim 1, wherein the compound of formula I, II or III is N^1 -[(6-chloro-3-pyridyl)methyl]- N^2 -cyano- N^1 -methylacetamidine.

7. The processed lumber material according to claim 1, wherein
5 the compound of formula I, II or III is 3-[(2-chloro-5-thiazolyl)methyl]-5-methyl-4-nitroiminotetrahydro-1,3,5-oxadiazine.

8. A process for producing an insect-proof processed lumber material, which comprises forming veneers, small wood pieces or wood fibers into the processed lumber material with an adhesive containing a compound
10 of formula I, II or III as depicted and defined in claim 1.

9. The process according to claim 5, wherein the adhesive is selected from the group consisting of starch, glue, casein glue, soybean glue, Japanese lacquer, resorcinol resin adhesives, urea resin adhesives, vinyl acetate resin emulsion adhesives, cross-linked vinyl acetate resin emulsion
15 adhesives, aqueous polymer-isocyanate adhesives, α -olefin-maleic anhydride copolymer adhesives, hotmelt adhesives, rubber adhesives, epoxy resin adhesives, cyanoacrylate resin adhesives, mastic adhesives, phenolic resin adhesives, melamine-urea co-condensation resin adhesives and melamine-phenolic co-condensation resin adhesives.

20 10. An insect-proofing adhesive containing a compound of formula I, II or III as depicted and defined in claim 1.

11. Use of a compound of formula I, II or III as depicted and defined in claim 1 for producing an insect-proof processed lumber material.