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(54) **Package for pesticides.**

(57) A package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material defining a concavity enclosing the pesticidal composition and a second sheet of water soluble or water dispersible material sealed to the first sheet by a continuous closed water soluble or water dispersible seal.

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This invention relates to a water soluble or water dispersible package containing an agrochemical, eg a pesticidal composition, and to a process for producing such a package.

Agrochemicals include pesticides, e.g. herbicides, which are often potentially harmful materials and are commonly produced as a concentrated solution or dispersion in an organic liquid, as a gel or in solid form. Such chemicals are typically supplied in a metal or blow-moulded plastics container. To use chemical pesticides, e.g. herbicides, a quantity of the pesticide is measured out of the container in concentrated form and then mixed with a large volume of water before being sprayed onto a locus to be treated or onto plants. Such concentrated materials are frequently highly toxic so great care must be taken in measuring and mixing them to avoid spillage and to avoid human or animal contact with the concentrated pesticide.

Efforts have been devoted to the design of containers to minimise the risk of accidental spillage of their contents when used and also to reduce residues remaining in the containers after use. Plastics containers with wide necks to facilitate pouring of their contents have been used. Blow moulded plastics containers having hollow handles have been made in which the hollow handles are isolated from the body of the container to avoid retention of material in the handle.

Nevertheless, with present packages it is relatively easy to spill the contents during the mixing process with the resulting risk of contamination of the environment and risk of contact with humans or animals. Also, it is relatively rare to empty containers so that farmers, and other users, tend to have partly full containers left around. These represent a further hazard. Even when all of the contents have been used it is difficult to dispose of the empty container. It is also difficult to wash adequately the containers and measuring instruments in which the concentrated pesticides are handled. These devices represent a further hazard to personnel and to the environment.

It has been proposed to package agricultural chemicals in a container comprising a screw fitting adapted to screw onto a corresponding fitting on a spray tank. The contents of the container should be released only when a satisfactory seal exists between the tank and the container. Practical difficulties exist in securing widespread use of such a system in view of the need for standardisation of screw fitting sizes and the possibility of leakage if a satisfactory tight seal is not achieved.

It has also been proposed to package chemicals in a water soluble container which releases the packaged chemical only after contact with water. Thermoplastic polyvinyl alcohol compositions which are resistant to strong acids are described in European Patent No 155606. Such applications have however been limited by the capabilities of known water soluble containers which are often too prone to rupture. It has also proved difficult to avoid pinholes at heat-sealed joints in containers leading to leaking of the contents and unacceptable weakness in the material of the container adjacent to heat sealed joints.

The present invention seeks to overcome the disadvantages of known packages and to provide a package which contains an agrochemical such as a pesticidal composition and has one or more of the following advantageous features:

the packaged chemical is released only after contact with water in which it is to be dissolved or dispersed, minimising the possibility of accidental contact of the undiluted material with the environment or with humans or animals;

the chemical can be provided in unit dosage form suitable for dilution with a predetermined amount of water removing the need for undiluted chemical to be measured out;

the packaged chemical is easy to use : the packaged chemical can be simply placed in water prior to use of the chemicals; and

the need for washing out of the residual chemical from containers to render them safe for disposal is removed: containers which have been in contact with the packaged chemical remain uncontaminated which facilitates their disposal.

We have now devised a new package which dissolves in water, may be cheaply and easily produced and is unexpectedly strong and resistant to rupture or breakage.

Accordingly the present invention provides a package containing an agrochemical, eg a pesticidal composition, which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water-dispersible material superposed on the first sheet and sealed to it by a continuous closed water soluble or water dispersible seal along a continuous region of the superposed sheets. The seal may be produced using a solvent, eg water, or using eg ultrasound but is preferably a heat seal. The continuous region of the superposed sheets is preferably substantially planar.

The invention further provides a process for producing such a package which comprises:

moulding a first, sheet of water soluble or water dispersible material to form a non-planar sheet comprising at least one recess adapted to retain an agrochemical, eg a pesticidal composition, said recess being bounded by a flange, which flange is preferably substantially planar;

placing an agrochemical, eg a pesticidal composition in the at least one recess;

placing a second sheet of water soluble or

water dispersible material on the flange and across the or every recess; and

sealing (preferably heat sealing) the first and second sheets along the flange to form a continuous closed water soluble or water dispersible seal.

The agrochemical may be, for example, a plant protection agent, a plant growth regulator or a plant nutrient. An example of a plant protection agent is a pesticide (such as an insecticide, fungicide, herbicide, acaricide or nematocide).

The pesticidal composition may be in liquid form, or solid form, or gel form. It may comprise any conventional carrier or diluent or surfactant. Where the composition is in liquid form it may be in the form of a solution or of a dispersion in an organic liquid. e.g. an emulsion or a suspension. Similarly in gel form, the composition may contain pesticide either dissolved or dispersed in the substantially dry medium.

The packages of the present invention generally contain from 0.1 grams to 7kg, preferably 1g to 5kg, where the composition is in solid form. Where the composition is in liquid or gel form, the package typically contains from 1ml to 10 litres, preferably from 0.5 to 5 litres (0.1 litres to 1.5 litres is especially preferred); on a smaller scale a range of 5ml to 1 litre is also useful.

Generally the package will contain at least a small amount of space, eg at least about 5% by volume, so as to minimise the likelihood of spillage of the composition during the production of the package.

Particularly when the contents of the package are solid, for example as a powder or granules, it may be advantageous to ensure that the package produced is evacuated of air or the contents are under reduced pressure. The package thus produced has a number of advantages, for example substantially increased resistance to shock. A powder or granules in such a package is compacted and is, effectively, skin-packaged within the film. Compaction of the product makes the package more likely to sink when dropped into water and the package occupies less space during storage. Thus, the advantages of packaging under reduced pressure include:

a) the absence of gas surrounding the agrochemical composition reduces the possibility of the package failing for example, at low temperatures. Normally at low temperatures, eg close to 0 °C, water soluble plastics films, for example polyvinyl alcohol, forming a package become brittle and therefore the package becomes more likely to fail. Reducing the space in which the agrochemical composition contained by the package can move about reduces the likelihood of the package failing;

b) where the agrochemical composition is in the form of granules, the likelihood of the granules breaking down into dust within the package (which can lead for example to the active ingredient decomposing) is reduced when the package is skin-tight;

c) the density of the package can be altered according to the extent to which the package is under reduced pressure. This offers further advantages, for example in increasing the speed of dissolution of the package by ensuring that the package sinks when placed for example in a spray tank;

d) where the agrochemical is a particulate solid which does not comprise a binding agent, such as a plasticiser, it may be advantageous for the package to hold the agrochemical substantially rigid within the package to prevent segregation and possible decomposition of the agrochemical (which may be incompatible with certain plasticisers: the plasticiser in the agrochemical may also be incompatible with the film).

Typically the two sheets of water soluble or water dispersible material are of the same material, but they may be different. One sheet of the water soluble or water dispersible material may be easy to print upon.

When the pesticidal composition is in liquid or gel form and comprises an organic solvent the water soluble or water dispersible material will be one which is insoluble in the organic solvent.

Suitable water soluble or dispersible materials are polyethylene oxide and methyl cellulose. More preferably a polyvinyl alcohol (PVOH) film is used. Such a PVOH film may be a partially or fully alcoholised or hydrolysed e.g.40-99%, preferably 70-92% alcoholised or hydrolysed, polyvinyl acetate film. The film may be a cast film or, more preferably, a blown or extruded film.

The polyvinyl alcohol film may be unoriented, mono-axially oriented or bi-axially oriented. Water soluble materials are preferred since they provide less disposal problems. The materials used will generally be cold water soluble; cold water soluble polyvinyl alcohol is preferred. It will be understood that other materials may be used when the package is to be dissolved or dispersed in water or hot water. Generally the water soluble or water dispersible material will be flexible.

The maximum tensile strength of the material of the envelope is preferably at least 20, more preferably from 30 to 80, N/mm^2 and may be as much as $200N/mm^2$ or more; and the elongation at break is preferably 200 to 380%, more preferably from 220 to 350% and may be as much as 500 per cent or more. Testing for these values is generally carried out at 23 °C and 50% relative humidity.

When the pesticidal composition is in liquid or gel form it is particularly important to avoid pinholes in the package through which leakage of the composition may occur. In such cases therefore the water soluble or water dispersible material will typically be a laminate, generally of two layers of different or preferably the same water soluble or water dispersible material, as pinholes are unlikely to coincide in two layers of material. Typically the laminates will consist of 2 layers of thickness from 20μm to 1mm, preferably about 40μm, each. Generally however the thickness of the layers will be kept to the minimum needed to prevent rupture of the package, so that the water soluble or dispersible material is dissolved or dispersed as quickly as possible and the pesticide then released.

When the pesticidal composition is in solid form, the sheets of water soluble or water dispersible material typically comprise a single layer of material. In such case the material will generally be from 20 to 500μm, preferably 30 to 100μm, thick. However, in cases where it is particularly desirable to avoid pinholes in the package, eg. to prevent the escape of unpleasant odours, a laminate material of the type described above may be used. As with packages containing liquids and gels, the thickness of the water soluble dispersible material will generally be kept to a minimum in packages containing solid compositions.

When the packages are produced by thermoforming, as is preferred, the thickness of the first sheet will generally not be less than 20μ and (to maintain ease of processing) generally not more than 1 mm. A preferred range is from 80-400μ, eg 100-400μ, most preferably about 250μ.

The thickness of the second sheet may be less than that of the first sheet as the second sheet will not generally be thermoformed so that localised thinning of the sheet will not occur. The thickness of the second sheet will generally not be less than 10μ, preferably not less than 20μ. For ease of processing the film will generally not be more than 1 mm thick, a preferred range being from 20μ to 250μ, most preferably about 150μ.

In a particular embodiment the package is provided with a region which will more readily dissolve in water than the rest of the package. This offers advantages, for example by speeding up the dispersion of the agrochemical contained in the package. The region may be provided for example by making one sheet of the water-soluble or water dispersible material thinner than the other, or by making one portion of the package thinner than the rest.

In the packages of the present invention, the package does not possess a seam running down the centre of one of the faces of the package. This offers advantages over known packages, for example by reducing the likelihood of failure occurring in the package when it is subjected to shock, because packages having a seam running down the centre of one of the faces of the packages necessarily have a point at which two or more seals intersect which will be more likely to fail under shock than the equivalent package not having this point of intersection.

The two water soluble or water dispersible sheets in the packages are sealed together by a closed continuous heat seal. Typically to ensure that the seal is water soluble and does not suffer from leakage, it is a single continuous seal and has no geometrical discontinuities, i.e. it does not comprise any angular intersections with itself. Therefore the heat seal will usually be curved, at least in portions, for instance at the corners of the package: the radius of curvature of the heat seal will generally not be less than 1mm, preferably not less than 5mm, and not more than half the width of the package.

Suitable pesticides which may be used in the package of the present invention include fungicides, insecticides and herbicides (for example hydroxybenzonitrile herbicides, e.g. bromoxynil or ioxynil or derivatives thereof such as salts or esters, e.g. heptanoates or octanoates). Molluscicides, suitable for addition to, for example, ponds or streams may also be employed.

The invention is not limited to specific agrochemicals. Agrochemicals which can be used in the invention include:

Fungicides such as Triadimefon, Tebuconazole, Prochloraz, Triforine, Tridemorph, Propiconazole, Pirimicarb, Iprodione, Metalaxyl, Bitertanol, Iprobenfos, Flusilazole, Fosetyl, Propyzamide, Chlorothalonil, Dichlone, Mancozeb, Anthraquinone, Maneb, Vinclozolin, Fenarimol, Bendiocarb, Captafol, Benalaxyl, Thiram, Captan, Fosetyl-Al, Zineb, Sulfur, Quintozene, Copper salts, Thiophanate-methyl, Tricyclazole, Dichloran, Chloroneb, Cyproconazole, Hexaconazole, Imazalil, Dodine, Diniconazole, Guazatine, Thiabendazole, Carboxin, Ferban, Glyodin, Fentin (triphenyltin), Terrachlor, Terrazole and Benomyl;

Herbicides (or defoliants) such as quizalofop and its derivatives, Acetochlor, Metolachlor, Imazapur and Imazapyr, Glyposate and Gluphosinate, Butachlor, Acifluorfen or Acifluorfen-sodium, Oxyfluorfen, Butralin, Fluazifop-butyl, Bifenox, Bromoxynil and Ioxynil and esters thereof, Diflufenican, Phenmedipham, Desmedipham, Oxadiazon, Mecoprop MCPA, MCPB, Linuron, Isoproturon, Flamprop and its derivatives, Ethofumesate, Diallate, Carbetamide, Alachlor, Chorpyralid, 2,4-D, Tribufos, Triclopyr, Diclofop-methyl, Sethoxydim, Pendimethalin, Trifluralin, Ametryn, Chloramben, Amitrole, Asulam, Dicamba,

Bentazone, Atrazine, Cyanazine, Thiobencarb, Prometryn, 2-(2-chlorobenzyl)-4,4-dimethyl-1,2-oxazolidin-3-one, Fluometuron, Napropamide, Paraquat, Bentazone, Molinate, Propachlor, Imizaquin, Metribuzin, Tebuthiuron, Oryzalin, Pursuit, Norflurazon, Simazine, Linuron, Trichlopyr, Aclonifen, Flurtamone, Sulfonylureas eg Nicosulfuron, Chlorsulfuron, Sulfometuron-methyl, Metsulfuron-methyl, Bensulfuron-methyl, Chlorimuron-ethyl, Tribenuron-methyl, Thifensulfuron-methyl, Primisulfuron-methyl, Ethametsulfuron-methyl and Rimsulfuron,and Trialkoxydim and

Insecticides, miticides, acaricides or nematicides such as Ebufos, Carbosulfan, Amitraz, Vamidothion, Ethion, Triazophos, Propoxur, Phosalone, Permethrin, Cypermethrin, Parathion, Methylparathion, Diazinon, Metomyl, Malathion, Lindane, Fenvalerate, Ethoprophos, Endrin, Endosulfan, Dimethoate, Dieldrin, Dicrotophos, Dichloroprop, Dichlorvos, Azinophos and its derivatives, eg Azinophos-methyl, Aldrin, Cyfluthrin, Deltamethrin, Disulfoton, Chlordimeform, Chloropyrifos, Carbaryl, Dicofol, Thiodicarb, Propargite, Demeton, Phosalone, Acephate, Carbofuran, Methamidophos, Fenbutalin oxide, Trichlorfon, Abamectin, Aldicarb, Pyrethroids such as alpha-Cypermethrin and Bacillus thuringiensis.

Plant growth regulators such as gibberellic acid, ethrel or ethephon, cycocel, Chlormequat, Mephiquat, Thiadiazuron, Tribufos and Dimethipin.

Where the pesticidal composition is in liquid form then suitable organic solvents which may be used as carriers in the pesticidal composition include petroleum based solvents, e.g. petroleum ethers, mineral oils, aliphatic or aromatic hydrocarbons, e.g. hexane, octane, cyclohexane, benzene, xylene and naphthalene, halogenated aliphatic or aromatic hydrocarbons, e.g. carbon tetrachloride, chloroform, methylene chloride and chlorobenzene, esters e.g. amyl acetate, ketones, e.g. cyclohexanone, 1-methyl-2-pyrrolidinone (NMP), ethers, or a higher alcohol (lower alcohols may migrate through the water soluble or water dispersible materials described above: this can result in product appearing on the outside of the envelope). It will be understood that mixtures of solvents, e.g. mixtures of a hydrocarbon solvent with another solvent such as a ketone or a higher alcohol, may also be used. The organic liquid must be reasonably dry and typically contains less than 2 to 3% of water to ensure that it does not leak prematurely from the package.

Such compositions may comprise, in addition to, or in some cases instead of, an organic solvent as a carrier or diluent, a surfactant, which is reasonably dry in that it contains less than 2 to 3% water. Suitable surfactants may be of the ionic or non-ionic types: for example sulphoricinoleates, quaternary ammonium derivatives, products based on condensates of ethylene oxide with alkyl and polyaryl phenols, e.g. nonyl- or octyl-phenols, or carboxylic acid esters of anhydrosorbitols which have been rendered soluble by etherification of the free hydroxy groups by condensation with ethylene oxide, alkali and alkaline earth metal salts of sulphuric acid esters and sulphonic acids such as dinonyl- and dioctyl-sodium sulphonosuccinates and alkali and alkaline earth metal salts of high molecular weight sulphonic acid derivatives such as sodium and calcium lignosulphonates and sodium and calcium alkylbenzene sulphonates, and block ethylene oxide/propylene oxide copolymers.

Suitably, the pesticidal composition may comprise up to 10%, e.g. from 0.05% to 10% of surfactant but, if desired, it may comprise higher proportions of surfactant for example up to 15% in liquid emulsifiable suspension concentrates and up to 25% in water soluble concentrates.

The contents of the package may be thickened or rendered thixotropic to provide a gel. An increased viscosity in the contents can reduce the likelihood of rupture if the package is subjected to mechanical shock. The contents of the package may be rendered more viscous or thixotropic by the inclusion of additives, for example, a modified organophile, or bentonite, lecithin, polymethylene oxide or silica gel.

The concentrations of pesticide or herbicide dissolved or dispersed in the organic liquid or in the gel will generally be those conventionally used: in order to reduce the bulk of each package, however, concentrations may be increased. Each package will preferably contain 100ml to 1.5 litres, preferably at least about 500 ml and will preferably contain a convenient standard volume, for example 500 ml or 1 litre, although it will be appreciated that any convenient standard volume may be chosen.

When the pesticidal composition is in solid form then it may comprise any conventional carrier or diluent which is reasonably dry, in that it contains less than 2 to 3% of moisture. Examples of suitable solid diluents or carriers are aluminium silicate, talc, calcined magnesia, kieselguhr, tricalcium phosphate, powdered cork, adsorbent carbon black and clays such as kaolin and bentonite. Solid compositions may comprise surfactants, such as dispersing agents, for example those surfactants previously mentioned. In some cases such surfactants may also be used as diluents or carriers.

As with compositions in liquid form, the concentration of pesticide in the solid pesticidal compositions may be as conventionally used: concentrations may however be increased to reduce the bulk of the package.

The pesticidal compositions used in the package of the present invention may be prepared by

conventional means.

The packages of the present invention may be inside an additional outer container. Such a container may provide additional strength and if water resistant may serve to protect the package of the present invention from accidental exposure to water. The outer container is preferably sealed to avoid exposing the package of the present invention to undue moisture.

It will be appreciated that the package of the present invention may comprise more than one compartment containing the same or different pesticidal compositions. Such multi-compartment packages are particularly useful where a combination of components are to be employed together and where the components are incompatible for a prolonged period, for instance if they react chemically.

Preferably the packages according to the invention should release their contents in less than about 10 minutes. Typically the packages will be placed in the spray tank of a conventional sprayer. The tank will generally be partly filled with water, and the package added. When the tank is provided with means to agitate the water the contents of the bag will be released more rapidly. It is preferred that release should take place in less than about a minute, for example in 30 to 40 seconds. It will be understood that the time taken to release the pesticide will depend upon a number of factors apart from the nature of the bag, including the temperature of the water and the level of agitation.

The packages of the present invention may be obtained by first deforming a sheet of water soluble or dispersible material so as to form a recess adapted to retain a pesticidal composition. This may be achieved for example by vacuum forming where the sheet is deformed to conform to the shape of a suitable mould and may, if desired, be a thermoforming process to cause the sheet to retain its shape after release from the mould.

Where the deformation is by vacuum forming, the mould may be equipped with pinholes through which the space between the mould and the sheet can be evacuated.

Where deformation is by thermoforming, the sheet may be driven against the mould by vacuum forming, or by applying a superatmospheric pressure to the other side of the sheet (this may be effected using an operating pressure of, for example $4\frac{1}{2}$ to 6 bar) or by mechanical displacement of the sheet (plug forming). Thermoforming will generally be carried out using a temperature not less than 40 °C and not more than 110 °C. A temperature from 70-110 °C is preferred, most preferably about 90 °C.

After deforming the first sheet of water soluble or dispersible material, the pesticidal composition is placed in the recess formed by the deformation, and a second substantially planar sheet of water soluble or water dispersible material is then placed across the recess. The two sheets of water soluble or water dispersible material are then heat sealed so as to form a continuous closed heat seal. The width of the heat seal itself is preferably 1-10 mm, preferably about 5 mm. The dwell time for heat sealing will depend upon, for example, the material used, its thickness and the heat seal temperature. A dwell time of about 3 seconds is generally suitable when the thickness of the material is about 80μ. A sealed compartment is thus formed.

In order to ensure optimum processability the heat sealing is generally carried out at 15 to 25 °C and 15 to 85% relative humidity (RH). The relative humidity is preferably 35 to 55%. Some routine experimentation may be required to obtain a suitable heat seal depending on the package material, e.g. the particular grade and thickness of PVOH chosen. The quality of the seal can be checked, for example by visual inspection for areas of opacity or for bubbles. Imperfections in the seal may give rise to a lack of water solubility or water dispersibility of the seal. The heat sealing process can be carried out on conventional heat sealing equipment which permits control variation of the sealing jaw temperature, jaw pressure and dwell time.

The following Examples illustrate the invention. In the Examples the values for tensile strength refer to a seal of 25 mm width with a jaw separation speed of 300 mm/min.

EXAMPLE 1

A first sheet of polyvinyl alcohol (Vinex 2144: thickness 225μ) is heated at 90 °C and then thermoformed into a mould, the draw depth being 80 mm, with a forming time of 6 seconds. The product to be packaged is placed in the recess thus formed. A second sheet of polyvinyl alcohol (Solublon KA40/KA40, a laminate of two layers each of 40μ thickness: total thickness 80μ) is placed across the recess thus formed and heat sealed using a sealing temperature of 180 °C with a dwell time of 8 seconds. The operating air pressure of the thermoforming apparatus is 4.5 bar.

The tensile strength of the seal in the water-soluble bags thus produced is 32.4 N (mean). The production of the water-soluble bags is carried out at 21 °C (room temperature) and a relative humidity of 38%.

EXAMPLE 2

A first sheet of polyvinyl alcohol (Vinex 2144: thickness 225μ) is heated at 90 °C and then thermoformed into a mould, the draw depth being 80

mm, with a forming time of 6 seconds. The product to be packaged is placed in the recess thus formed. A second sheet of polyvinyl alcohol (Vinex 2144: thickness 75μ) is placed across the recess thus formed and heat sealed using a sealing temperature of 200 °C with a dwell time of 6 seconds. The operating air pressure of the thermoforming apparatus is 4.5 bar.

The tensile strength of the seal in the water-soluble bags thus produced is 28.7 N (mean). The production of the water-soluble bags is carried out at 21 °C (room temperature) and a relative humidity of 38%.

Claims

1. A package containing a pesticidal composition which package comprises a first sheet of non-planar water soluble or water dispersible material and a second sheet of water soluble or water dispersible material superposed on the first sheet and sealed to it by a continuous closed water soluble or water dispersible seal along a continuous region of the superposed sheets.

2. A package according to claim 1 wherein the pesticidal composition comprises an insecticide, fungicide, acaricide or nematocide.

3. A package according to any one of the preceding claims wherein the water soluble seal is a water soluble heat seal.

4. A package according to any one of the preceding claims wherein the second sheet is sealed to the first sheet along a substantially planar continuous region of the superposed sheets.

5. A package according to any one of the preceding claims wherein the thickness of the second sheet is less than that of the first sheet.

6. A package according to any one of the preceding claims wherein the first and second sheets are made of the same material.

7. A package according to claim 6 in which the first and second sheets each comprise a laminate of at least two layers of water soluble or water dispersible material.

8. A package according to claim 7 which comprises two layers each having a thickness from 20 μm to 1mm.

9. A package according to any one of the preceding claims in which the pesticidal composition is in liquid or gel form.

10. A package according to claim 9 in which the pesticidal composition comprises a surfactant.

11. A package according to claim 10 wherein the surfactant is ionic.

12. A package according to claim 10 wherein the surfactant is non-ionic.

13. A package according to any one of claims 1 to 6 containing a pesticidal composition in solid form in which each of the first and second sheets comprises a single layer of water soluble or water dispersible material.

14. A package according to claim 13 in which each sheet has a thickness from 20 to 500 μm.

15. A package according to any one of the preceding claims which contains from 1ml to 10 litres of pesticidal composition in liquid or gel form or from 0.1 grams to 7kg of pesticidal composition in solid form.

16. A package according to claim 15 which contains from 0.1 litres to 1.5 litres of pesticidal composition in liquid or gel form.

17. A package according to any one of the preceding claims in which the heat seal is a single continuous seal not comprising any angular intersections with itself.

18. A package according to any one of the preceding claims wherein the seal is curved.

19. A package according to claim 18 wherein the seal is curved, with the radius of curvature of the seal being from 1 mm to half the width of the package.

20. A package according to claim 19 wherein the seal is curved, with the radius of curvature of the seal being from 5 mm to half the width of the package.

21. A package according to any one of the preceding claims in which the water soluble or dispersible material comprises polyethylene oxide, methyl cellulose or a polyvinyl alcohol.

22. A package according to claim 21 in which the water soluble or water dispersible material comprises a cold water soluble polyvinyl alcohol which is 40 to 99% hydrolysed or alcoholised polyvinyl acetate.

23. A package according to any one of the preceding claims in which the contents are released in less than 10 minutes after contact with water.

24. A package according to claim 23 in which the contents are released in less than 1 minute.

25. A package according to any one of the preceding claims which comprises a region which will more readily dissolve than the rest of the package.

26. A package according to any one of the preceding claims which is inside an additional outer container.

27. A package according to claim 26, wherein the outer container is sealed.

28. A process for producing a package as claimed in any one of the preceding claims which comprises: moulding a first sheet of water soluble or water dispersible material to form a non-planar sheet comprising at least one recess adapted to retain a pesticidal composition, said recess being bounded by a flange; placing a pesticidal composition in the at least one recess; placing a second sheet of water soluble or water dispersible material on the flange and across the or every recess; and sealing the first and second sheets along the flange to form a continuous water soluble or water dispersible seal.

29. A process according to claim 28 in which the recess is bounded by a substantially planar flange.

30. A process according to claim 28 or 29, in which the first water soluble or water dispersible sheet is deformed by vacuum-forming to conform to a mould.

31. A process according to claim 28 or 29, wherein the first water soluble or water dispersible sheet is deformed by thermo-forming.

32. A process according to any one of claims 28 to 31 in which the sealing of the first and second sheets is effected by heat sealing.

33. A process according to claim 32, in which the first and second sheets are heat sealed at a sealing temperature of from 140 to 220 °C.

34. A process according to claim 32 or 33, in which the first and second sheets are heat sealed at a sealing jaw pressure from 1×10^{-4} to 3.5×10^{-4} kg/m^2.

35. A process according to claim 32, 33 or 34, in which the first and second sheets are heat sealed with a dwell time from 0.2 to 1.5 seconds.

36. A process according to any one of claims 32 to 35 in which the first and second sheets are heat sealed at a relative humidity from 15 to 85%.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 10 3286

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 244 084 (BALL) * claims 1-3 * * column 2, line 31 - line 44 * * column 3, line 1 - line 7 * * column 7, line 31 - line 32 * * figure 4 *	1-4,6,9, 13,17, 26,27	B65D65/46
Y A		5,10-12 15,16, 21-25, 28-36	
Y	DE-B-12 87 502 (CLOUD MACHINE CORP.) * the whole document *	1-4,6,9, 15-17, 21-25, 28-36	
Y	WO-A-89 12587 (MAY & BAKER LIMITED) * the whole document *	1-4,6,9, 15-17, 21-25, 28-36	TECHNICAL FIELDS SEARCHED (Int.Cl.5) B65D
A		18	
Y	US-A-3 759 375 (NAPPI) * column 3, line 6 - line 8; figures 1,3 *	5	
Y	US-A-4 372 943 (PAPANU ET AL.) * column 1, line 67 - column 2, line 2 *	10-12	
A	US-A-3 661 695 (BERLINER) * column 1, line 62 - line 64 * * column 3, line 37 - line 38 *	7,8	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 May 1994	Bridault, A

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	EP-A-0 148 170 (MONSANTO COMPANY) * page 1, line 3 - line 20 * * page 9, line 14 *	13,14	
A	FR-A-2 171 705 (OSCAR MAYER) * figure 1 *	18-20	
A	US-A-4 498 588 (SCOTT) * figure 8 *	18-20	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)

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