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(54) Title: "CONTAINERIZATION SYSTEMS FOR AGRICULTURAL COMPOSITIONS"

(57) Abstract:

Containerisation system for agriculturally active material, characterised in that it comprises:

a) a bag whose wall is a film comprising a film-forming material which is soluble or dispersible in water

b) an effervescent composition in the pulverulent form comprising an effervescent agent and one or more materials which can present a danger to the environment, especially an active material, for example an agriculturally active material,

the said bag being closed and containing the said composition.

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(56) Documents cited: US-4844828 EP-0368285 DE- 4002257

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CONTAINERISATION SYSTEMS FOR AGRICULTURAL COMPOSITIONS

TECHNICAL FIELD OF THE INVENTION

1. Subject of the invention

The present invention relates to a new system for the containerisation of materials which can present a danger to the environment, especially active materials, for example agriculturally active materials, with the help of water-soluble sachets or bags.

2. Prior art

Many agriculturally active materials are used for the purpose of obtaining better results and better crop yields.

In the present invention, agriculturally active materials means any kind of active materials used in agriculture (including the cultivation of gardens and green spaces), such as plant protection agents, agrochemical products, pesticides, growth regulators or plant nutrition agents. The pesticides are more particularly herbicides, insecticides, fungicides, nematocides and acaricides.

These active materials are generally manufactured, transported and sold in a concentrated form. The user, that is to say the farmer, then dilutes them in water for the purpose of spraying and/or dispersing them homogeneously over the entire surface which he wishes to treat, whether the surface is a ground surface where there is already a crop, or else a surface where it is intended

to plant a crop, or yet again an uncultivated surface which it is desired to clear of all vegetation or other undesirable parasite.

Due to the heavy workload of farmers, it is of course desirable for the active material under consideration to disperse as rapidly as possible in water. Moreover, it is always desirable for this dispersion in water to be as homogeneous as possible.

A good many active materials, have been used in the form of powder formulations, or even of powders in soluble sachets, but this type of presentation still has the following disadvantages:

* mixing time increased especially by the time taken to wet and disperse in water

* pollution of the atmosphere surrounding the mixing tank due to a part of the powder being carried away by the air

* risk of the formation of lumps. This problem has to be solved with anticaking agents, but their effect is not always satisfactory.

These are some of the reasons which have made the use of effervescent compositions particularly attractive.

On a practical level, the direct use of powders, especially effervescent powders, encounters various difficulties. Thus, the phenomenon of compacting makes it impossible, for an accurate dosage, to use a volume measurement and necessitates resorting to a weighing; and

even in this case, the problem of the behaviour of the powders with respect to flow makes this weighing difficult. Another difficulty connected to the use of powders follows from the latter always containing a certain quantity of dust capable of coming into contact with the people who are handling or manufacturing or using them, in such a way that they are harmful from the environmental, safety and health viewpoints.

It is to overcome these disadvantages that preference has been given to using the effervescent compositions in the form of pellets or tablets, for example according to the applications EP 391851 and WO 90/00007. These pellets must be relatively large in order to correspond to the dose (in g/ha) of active material which must be applied. Unfortunately, these pellets also have significant disadvantages, some of which are referred to in European Application No. 391851. The effervescent tablets are particularly easy to use when the active materials are soluble in water. When the active materials are insoluble in water and the effervescent agent consists of sodium carbonate and an acid, there often occurs a kind of passivation of the tablet which makes the dispersion of the tablet in water difficult or at the very least very slow. The use of potassium carbonate as effervescent agent in place of sodium carbonate does not completely remedy this difficulty; indeed, its high hygroscopicity tends to make it consolidate and to make it lose its effervescent

activity by premature reaction under the effect of moisture. It is for this reason that European Patent Application 391851 proposes the production of special tablets containing special additives capable of forming bonds with water in order to suppress the passivation of the tablets.

These compositions notwithstanding, it nevertheless remains the case that effervescent tablets or pellets have various disadvantages:

* it is necessary to individually handle and compress each pellet separately. Even if this is obviously automated, it is nevertheless necessary to use fairly complicated machines which are therefore expensive and require a special investment.

* the machines necessary for the production of tablets are all the more expensive because it is necessary to work under a pressure which is very markedly greater than atmospheric pressure.

* the compression of ordinary powders, very especially very fine powders, causes certain difficulties regarding the production of correct tablets. Indeed, during the stage of compressing the tablet, which is carried out in the pelleting die, a certain quantity of air remains trapped in the bulk of the powder. At the end of the compression operation, and during the expulsion of the tablet thus obtained from the pelleting die, the air thus trapped expands and can lead to splitting of the tablet.

This is why it is generally necessary in practice to produce the tablets from granules but it is, of course, then necessary to introduce a supplementary stage in the production of the tablets.

* the production of pellets or tablets requires the mixing of solid ingredients with a liquid solvent, followed by a drying operation. In addition to the practical problems which this causes, this is harmful to the economics of the process.

* finally, it can happen that the effervescent tablets or pellets break during storage or transportation, giving rise to a small quantity of powder capable of staying in the packaging and thus giving it a polluting nature even when it has been emptied of its normal contents.

In the patent US 2,506,649, cleaning and effervescent compositions were proposed comprising a two-layer bag, this bag containing an effervescent cleaning composition. The first layer of the bag is the internal layer and is capable of allowing the carbon dioxide gas and the aqueous solutions released by the effervescence to pass through. The second layer of the bag is advantageously made of material such as cotton or other cellulose material and has an irregular surface with an abrasive nature which enables it to clean the tanks in which it is found. Such a system cannot be used in the tanks of the spraying appliances used by farmers.

AIMS OF THE INVENTION

One aim of the present invention is to remedy the disadvantages of the known compositions.

Another aim of the invention is to provide a system for the presentation of agriculturally active materials using effervescent formulations.

Another aim of the present invention is to avoid the use of pellets or tablets having the known disadvantages.

Another aim of the present invention is to make the effervescent compositions usable in a more general, easier and more efficient way.

Another aim of the present invention is to provide a system for the presentation of agrochemical products which is insensitive to moisture.

Another aim of the invention is to provide a system for the presentation of agrochemical products having an improved stability on storage.

Another aim of the invention is to provide a containerisation system which offers a better resistance to impact, especially in the case of falls.

Another aim of the invention is to provide a containerisation system which includes an active material such as plant protection agents, agrochemical products, pesticides or growth regulators. Containerisation denotes the action of containing; containerisation system means a system comprising contents and their container.

Another aim of the invention is to provide a containerisation system comprising plant protection agents having one or more of the following advantages:

* contact between the agrochemical product and the user, manufacturer or handler of the product is avoided.

* the agrochemical product is left in contact with the water in which it is to disperse and/or dissolve, avoiding accidental contact between the concentrated product and either the environment or human beings or animals.

* the chemical product can be provided in units which have a predetermined quantity of active material, avoiding the necessity of measuring out active materials and toxic or potentially toxic product.

Another aim of the present invention is to provide a system of dispersing active materials in agriculture which has, simultaneously, the following properties:

* it is autodispersible, that is it requires a minimum of energy and time in order to be dispersed and diluted in a spray tank (containing water)

* contact of the active material with the user (e.g. farmer, carrier, technician) is non-existent

* the packaging remaining after use of the product contains no trace of residue

* after use, there is no need to clean the

packagings which have contained agrochemical products.

Another aim of the present invention is to make the effervescent compositions usable even when they contain no additive of special and specific nature.

Another aim of the present invention is to provide compositions which are very easily and very rapidly dispersible in water, especially in the water of the tanks of spraying appliances used by farmers.

Another aim of the invention is to provide compositions which are easy and inexpensive to produce, and in particular to avoid the expense and difficulties of compression and/or of pelleting and/or of drying.

Another aim of the invention is to provide systems for the containerisation of active materials for agriculture which can be implemented in a simple way, without requiring the use of excessive pressures.

It has now been found that these aims can be achieved in all or in part by virtue of the systems for the containerisation of active materials according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The systems for the containerisation of active materials according to the invention are characterised in that they comprise:

a) a bag whose wall is a film comprising a film-forming material which is soluble or dispersible in water

b) an effervescent composition in the pulverulent

form, this composition comprising an effervescent agent and one or more materials which can present a danger to the environment, especially an active material, for example an agriculturally active material,

the said bag being closed and containing the said composition.

Material which is dispersible in water is to be understood as meaning a material which, under the effect of normal stirring (such as currently practised by farmers in spray tanks), leads to a dispersion of fine particles with a size less than 40 micrometres, preferably less than 15 micrometres. When the active material of the containerisation systems according to the invention is an agriculturally active material, it is understood that the said containerisation systems can be used for the purpose of treating surfaces both in cultivated regions and in uncultivated regions. These two types of application form part of the invention.

According to another advantageous aspect of the invention, the quantity of effervescent composition in the pulverulent form present in a containerisation system according to the invention is a quantity effective for treating a given region of cultivated or noncultivated ground.

According to another aspect of the invention, the effervescent composition in the pulverulent form, within the meaning of the present invention, comprises powders as

well as granules and pellets. Powder means a material whose constituent particles have a mean size generally of between 1 and 50 micrometres, and preferably between 5 and 20 micrometres. Granule means a body whose mean size is generally between 50 micrometres and 1 centimetre, and preferably between 150 micrometres and 5 millimetres. Pellets of greater size, for example ranging up to 5 centimetres, can also be used without, however, there being there any significant advantage in doing so. Granules are preferred as they generally exhibit better flow characteristics which reduces the time to fill water soluble bags. Moreover, the production of large tablets is more complicated than that of pellets.

According to another aspect of the invention, the effervescent composition in the pulverulent form, especially in the case of the powders, can advantageously result from a simple mixing of the ingredients, which avoids any agglomeration operation. This variant of the invention is preferred when the active material to be formulated presents a risk of explosion during the industrial manufacture of the product.

According to another aspect of the invention, the effervescent composition in the pulverulent form can also be provided in the form of granules. In this case, the introduction of the effervescent composition in the pulverulent form into the bag made of film-forming material has processing advantages for the manufacturer, such as

simplicity of manufacture, much greater ease of flowing and better industrial health.

A particularly suitable means for the production of such granules comprises carrying out a dry agglomeration (especially without solvent) of the constituents of the effervescent composition in the pulverulent form by a compaction, or sintering, technique, preferably at room temperature or at least below 50°C. The apparatus adopted for this technique is preferably composed of two rotating cylinders having parallel axes and applied very tightly against each other and each driven by a rotation movement in opposite directions. This process is particularly advantageous and gives the granules which result therefrom a preferential character in the implementation of the invention. The absence of a drying stage gives a particularly economical character to this aspect of the invention.

Granules (or pellets, although the granules are preferred) which are particularly suitable for the realisation of the invention are characterised by the existence of an interstitial and/or interparticular space. This space is generally between 0.05 and 20 % by volume with respect to the volume of a granule taken in isolation, preferably between 0.5 and 5 %.

According to another variant of the invention, the granules (or pellets, although the granules are preferred) are advantageously characterised in that their

porogram is essentially monomodal, that is to say that it contains only one maximum. The porogram is the curve which gives the distribution of the number of the pores of the granules as a function of the size of these pores.

This specific distribution corresponds to a homogeneity of structure and of physical properties of the granules which makes them particularly advantageous, especially as regards the quality of the subsequent dispersion in water of the said granules. This curve of the distribution of the pores is advantageously obtained by measurements using a mercury porosimeter according to techniques known per se.

According to another specific aspect of the invention, the density of the containerisation system according to the invention is generally greater than 1, preferably between 1.005 and 2, which makes it possible to obtain an improved and faster immersion after introduction into the spray tank (in the present description density is expressed in grams per centimetre cubed). In addition, the speed of dissolution or dispersion of the solid ingredients, especially of the active material, is particularly high, especially because contact between the water and the effervescent composition is improved, and also because the gas bubbles resulting from the effervescence contribute to the disintegration of the sachet.

For the purpose of producing such

containerisation systems with a density greater than 1, containerisation systems are advantageously used which contain an effervescent composition in the pulverulent form itself advantageously comprising a densifying agent. Densifying agent is to be understood as meaning an inorganic or organic filler or vehicle with a density of between 1.2 and 8. Such fillers are preferably chosen from barium or titanium salts and, even more preferably, from one of the following compounds: barium sulphate and titanium monoxide.

For the purpose of improving contact between the water of the spray tank and the containerisation system according to the invention and/or the effervescent composition in the pulverulent form, containerisation systems which are free of gas pockets are preferably used. These containerisation systems are generally such that, when the bag is sealed, it is not possible to see the least space between the effervescent composition in the pulverulent form and the wall of the bag and/or that it is not possible manually to lift off the wall of the bag from the pulverulent material. This therefore corresponds to a maximum degree of filling. In practice, it is advantageous to fill the bags of the invention under an absolute pressure below 200 millibar, preferably below 150 millibar, so as to ensure adherence of the film to the effervescent composition at the time of packing into the bag and before final sealing of the bag, and even up to final use of the

containerisation systems according to the invention, even after storage.

According to another aspect of the invention, the bag comprising film-forming material contains the effervescent composition in the pulverulent form with an atmosphere such that the quantity of water present in this atmosphere is less than 4 mg per litre, and preferably less than 3 mg per litre. The volume of the atmosphere in the bag is equal to the internal volume of the bag less the volume of the powder without the interstices between grains.

According to another aspect of the invention, the quantity of effervescent composition in the pulverulent form contained in the bag is generally between 1 g and 3 kg, and preferably between 50 g and 1 kg. It is an advantage of the invention, compared with pellets and tablets, that it is possible to put, in the same packaging, much more significant quantities of active material into a unit handled by the farmer.

According to another aspect of the invention, the film-forming material, which is soluble or dispersible in water, comprising the wall of the bag can be of widely varying type. It is preferably soluble in water. It is generally a polymeric material, such as poly(ethylene oxide), poly(ethylene glycol), starch or modified starch; alkylcellulose or hydroxyalkylcellulose, such as hydroxymethylcellulose, hydroxyethylcellulose or

hydroxypropylcellulose; carboxymethylcellulose; poly(vinyl ethers), such as poly(methyl vinyl ether) or poly(2-methoxyethoxyethylene); poly(2,4-dimethyl-6-triazinylethylene); poly(3-morpholinylethylene); poly(N-1,2,4-triazolylethylene); poly(vinylsulphonic acid); polyanhydrides; low molecular weight melamine/formaldehyde or urea/formaldehyde resins; poly(2-hydroxyethyl methacrylate); poly(acrylic acid) and its homologues.

Preferably the bag comprises, poly(ethylene oxide), methylcellulose or poly(vinyl alcohol) (PVA), in particular poly(vinyl alcohol). When PVA is used, a poly(vinyl acetate) (or another vinyl ester), partially or totally hydrolysed or alcoholised, that is to say 40-100%, preferably 80-99% hydrolysed or alcoholised, is preferably used. Copolymers or other derivatives of these polymers can also be used.

According to another aspect of the invention, the bag containing the effervescent composition in the pulverulent form comprises a first nonplanar film comprising a material which is soluble or dispersible in water, this first film being joined to a second film comprising a material which is soluble or dispersible in water along a continuous seal uniting the two films; the said continuous seal comprises a closed loop which preferably does not comprise any angular intersections with itself and which defines an essentially planar region. The heat seal will generally be curved, at least in parts, for

instance at the corners of the package.

According to another aspect of the invention, the bag containing the effervescent composition in the pulverulent form comprises a single film, and preferably comprises at least three sealing regions, two of which are substantially rectilinear and coplanar and cut by the third into two substantially isolated regions.

The effervescent compositions in the pulverulent form which can be used in the invention generally comprise:

* an active, preferably agriculturally active, material, in the solid form or put into the solid form, such as a plant protection agent or an agrochemical material,

* an effervescent agent.

Effervescent agent means an agent or compound capable of releasing a gas, such as CO_2, and, as a result, of giving rise to the dispersion of the powder in water. On a practical level, the effervescent agent advantageously comprises a pair of substances such as a carbonate (or, preferably alkaline, hydrogencarbonate) and an acid (preferably solid and weak). It is understood that in the case where one of the active materials of the effervescent composition has at least one acidic functional group, the effervescent agent can comprise solely a, preferably alkaline, carbonate or hydrogencarbonate. The mass ratio between the acid, or the active material of the effervescent composition possessing at least one acidic

functional group, and the carbonate is generally between 0.3 and 2, and preferably between 0.5 and 1.

The alkaline carbonate can be derived from an alkali metal (especially sodium or potassium) or alkaline-earth metal (calcium or magnesium), or from an ammonium or organoammonium group or cation (carbonate derived from a primary, secondary or tertiary amine or from a quaternary ammonium cation), but is preferably derived from an alkali metal.

The solid and weak acid is advantageously a carboxylic or polycarboxylic or phosphoric or phosphonic acid or one of their salts or esters containing an acidic functional group.

Active material put into the solid form means a liquid active material impregnated on a solid vehicle or a solid active material dissolved in a solvent, itself impregnated on a solid vehicle. Materials which are inert from the agricultural viewpoint are used as solid vehicles.

Compositions are preferentially used which additionally comprise:

a wetting agent, especially for the case where the agriculturally active material is insoluble in water,

a dispersing agent, especially for the case where the agriculturally active material is insoluble in water; this agent is capable of keeping the agriculturally active material in suspension in water by preventing its sedimentation,

a swelling agent or expanding agent; this is a compound capable of swelling in the presence of water,

a desiccant or desiccating agent, capable of absorbing possible residual moisture,

a densifying agent,

a vehicle or filler,

all these ingredients being agriculturally acceptable ingredients.

The quantities of constituents of the effervescent compositions used in the invention are generally (the percentages shown are percentages by weight):

between 1 % and 80 % of agriculturally active material,

between 10 % and 80 % of effervescent agent,

between 0 and 10 % of wetting agent, preferably between 0.1 and 8 %

between 0 and 20 % of dispersing agent, preferably between 3 and 15 %

between 0 and 20 % of swelling agent, preferably between 1 and 15 %

between 0 and 60 % of densifying agent, preferably between 5 and 20 %

between 0 % and 30 % for the desiccating agent, preferably between 5 and 20 %

between 0 and 50 % of vehicle, preferably between 0 and 30 %

According to a variant of the invention, the containerisation systems described above can additionally comprise an external container which is substantially impermeable to water vapour. For example, an external container having walls comprising a system of at least two layers adhesively bonded to each other, one comprising flexible cardboard paper, called "kraft-liner" in English, and the other comprising polyethylene may be used. This two-layer system can additionally comprise a third layer adhesively bonded to the polyethylene and comprising aluminium.

The containerisation systems according to the invention are used in practice by putting them into tanks containing water; these tanks can optionally be subjected to stirring. The mixture thus obtained, called spraying mixture, can be used as it is for applying to the cultivated or uncultivated surfaces to be treated.

The following examples, given as non-limiting, illustrate the invention and show how it can be implemented.

All the granules used in sachets, in the following examples, have a monomodal porogram.

Example 1

The following ingredients are mixed while dry in the form of pulverulent solids:

10.5 g of the fungicide Bromuconazole

33 g of citric acid

49 g of sodium hydrogencarbonate

6.5 g of dispersing agent (sodium naphthalene sulphonate condensed with formaldehyde)

1 g of wetting agent (sodium lauryl sulphate)

This mixture is introduced into a pouch consisting of a film of poly(vinyl alcohol) (88 % hydrolysed poly(vinyl acetate)) soluble in cold water. This film was thermoformed, that is to say that it was deformed by heat and that it was made to take up, by vacuum, the shape of a pouch, given by a die. A second film is placed on the said pouch and is fixed to the latter by heat sealing, simultaneously with the creation of vacuum by means of a pump giving rise to an absolute pressure of 100 millibar. No free space is observed between the pulverulent solids and the wall of the bag. The density of the bag is 1.1.

This bag is thrown into a tank containing 100 litres of unstirred water. The bag is totally wetted and passes below the surface of the water in less than 10 seconds. The PVA film dissolves in 3 minutes and releases the powder which rapidly and homogeneously disperses throughout the tank.

Example 2

Example 1 is reproduced but using potassium carbonate in place of sodium hydrogencarbonate.

Identical results are obtained.

Example 3

Example 2 is reproduced but using sodium dioctyl sulphosuccinate as wetting agent.

Identical results are obtained.

Example 4

The following ingredients are mixed while dry in the form of pulverulent solids:

21 g of the fungicide Bromuconazole

30 g of citric acid

27 g of sodium hydrogencarbonate + 3 g of sodium carbonate

5 g of sodium naphthalene sulphonate condensed with formaldehyde

5 g of swelling agent (carboxymethyl-cellulose)

3 g of sodium lauryl sulphate

6 g of desiccating agent (precipitated silica)

This mixture is introduced into a sachet made of poly(vinyl alcohol) (88 % hydrolysed poly(vinyl acetate)) soluble in cold water, according to a procedure identical to that of Example 1. Every surface element of the sachet is in contact with pulverulent solids of the composition, so that no air pockets are seen to be present. The density of the sachet is 1.1.

This bag is thrown into a tank containing 100 litres of unstirred water. The bag is totally wetted and passes below the surface of the water in less than 10

seconds. The PVA film dissolves in 3 minutes and releases the powder which disperses rapidly and homogeneously.

Example 5

The following ingredients are mixed while dry in the form of pulverulent solids:

10.5 g of the fungicide Bromuconazole

30 g of acidic pyrophosphate

30 g of sodium hydrogencarbonate

7.5 g of dispersing agent (sodium naphthalene sulphonate condensed with formaldehyde)

3 g of wetting agent (sodium dioctyl sulphosuccinate)

19 g of densifying agent (barium sulphate).

This mixture is agglomerated while dry and at room temperature by passing between two cylinders rotating in opposite directions and pressed against each other by exerting a force of 2 tonnes per linear centimetre. The mixture thus sintered is crushed and a mixture of granules is obtained whose mean size varies from 50 micrometres to 3 millimetres. The granules obtained are introduced into a sachet made of poly(vinyl alcohol) (88 % hydrolysed poly(vinyl acetate)) soluble in cold water. This sachet was obtained from a single rectangular film which received two perpendicular weld lines. After the granules have been introduced, the bag receives a third weld line by heat sealing.

This bag is thrown into a tank containing 100 litres of stirred water. As its density is greater than 1, this bag goes to the bottom of the tank in less than 10 seconds. Water enters the sachet in less than one minute and the effervescence produced causes the disintegration of the PVA film, which facilitates its complete dissolution in three minutes. The powder disperses rapidly and homogeneously throughout the whole of the tank.

Example 6

Example 5 is reproduced, but using adipic acid in place of the acidic pyrophosphate, and sodium carbonate in place of sodium bicarbonate.

Identical results are obtained.

Example 7

Example 5 is repeated but using:

30 g of iprodione

20 g of acidic pyrophosphate

20 g of sodium bicarbonate

7 g of sodium naphthalene sulphonate condensed with formaldehyde

3 g of wetting agent (dodecylbenzene-sulphonate)

20 g of densifying agent (barium sulphate)

Identical results are obtained.

Example 8:

There are mixed, while dry:

40 g of glyphosate

40 g of sodium bicarbonate

20 g of filler (lactose)

This mixture is introduced in the powder form into a sachet made of poly(vinyl alcohol) soluble in cold water. Vacuum is applied to this sachet using a pump which gives rise to an absolute pressure of 100 millibar. The bag is heat sealed.

This bag is thrown into a tank containing 100 litres of stirred water. As its density is greater than 1, this bag goes to the bottom of the tank in less than 10 seconds. Water enters the sachet after 30 seconds and the effervescence produced causes disintegration of the PVA film, which facilitates its complete dissolution in three minutes. The powder disperses rapidly and homogeneously.

Example 9

There are mixed, while dry:

250 g of dinoterb

100 g of citric acid

100 g of potassium carbonate

100 g of wetting agent (sodium poly-naphthalene sulphonate)

30 g of dispersing agent (sodium lignosulphonate)

420 g of densifying agent (barium sulphate)

This mixture is introduced in the powder form into a PVA sachet soluble in cold water. The bag is heat sealed. The appearance of this bag and its behaviour in a tank containing 100 litres of water are identical to those described in the above examples.

having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed I/we declare that what I/we claim is :—

CLAIMS

1. Containerisation system, characterised in that it comprises:

a) a bag whose wall is a film comprising a film-forming material which is soluble or dispersible in water

b) an effervescent composition in the pulverulent form comprising an effervescent agent, and one or more materials which can present a danger to the environment,

the said bag being closed and containing the said composition.

2. Containerisation system according to Claim 1, characterised in that the material which can present a danger to the environment is an agriculturally active material, especially an agent for the protection of plants, an agrochemical product, a pesticide, a growth regulator, or a plant nutrition agent.

3. Containerisation system according to Claim 2, characterised in that the pesticide is a herbicide, an insecticide, a fungicide, a nematocide or an acaricide.

4. Containerisation system according to one of Claims 1 to 3, characterised in that the quantity of effervescent composition in the pulverulent form is a quantity effective for treating a given region of cultivated or uncultivated ground.

5. Containerisation system according to one of

Claims 1 to 4, characterised in that the effervescent composition in the pulverulent form is in the powder form, or in the form of granules or pellets.

6. Containerisation system according to Claim 5, characterised in that the constituent particles of the powder have a mean size of between 1 and 50 micrometres, and preferably between 5 and 20 micrometres.

7. Containerisation system according to Claim 5, characterised in that the granules have a mean size of between 50 micrometres and 1 centimetre, and preferably between 150 micrometres and 5 millimetres.

8. Containerisation system according to either of Claims 5 and 7, characterised in that the granules result from a compaction operation, carried out without solvent or drying, at a temperature below 50°C, preferably at room temperature.

9. Containerisation system according to one of Claims 5, 7 and 8, characterised in that the granules have an interstitial and/or interparticular space between 0.05 and 20 % by volume with respect to the volume of the granule taken in isolation, and preferably between 0.5 and 5 %.

10. Containerisation system according to one of Claims 5, 7 and 8, characterised in that the porogram of the granules is essentially monomodal.

11. Containerisation system according to one of Claims 1 to 10, characterised in that its density is

greater than 1, and preferably between 1.005 and 2.

12. Containerisation system according to one of Claims 1 to 11, characterised in that the effervescent composition in the pulverulent form contains a densifying agent.

13. Containerisation system according to Claim 12, characterised in that the densifying agent is chosen from barium or titanium salts, and preferably from barium sulphate and titanium monoxide.

14. Containerisation system according to one of Claims 1 to 13, characterised in that it is free of gas pockets.

15. Containerisation system according to one of Claims 1 to 14, characterised in that, when the bag is sealed, it is not possible to manually lift off the wall of the bag from the effervescent composition in the pulverulent form, and/or it is not possible to see the least space between the two.

16. Containerisation system according to one of Claims 1 to 15, characterised in that the bags are filled at an absolute pressure below 200 millibar, and preferably below 150 millibar.

17. Containerisation system according to one of Claims 1 to 16, characterised in that the bag comprising film-forming material contains the effervescent composition in the pulverulent form with an atmosphere such that the quantity of water present in this atmosphere is less than 4

mg per litre, and preferably less than 3 mg per litre.

18. Containerisation system according to one of Claims 1 to 17, characterised in that the quantity of effervescent composition in the pulverulent form contained in the bag is between 1 g and 3 kg, and preferably between 50 g and 1 kg.

19. Containerisation system according to one of Claims 1 to 18, characterised in that the film-forming material is chosen from the group consisting of: poly(ethylene oxide), poly(ethylene glycol), starch or modified starch, alkylcellulose or hydroxyalkylcellulose, such as hydroxymethylcellulose, hydroxyethylcellulose or hydroxypropylcellulose; carboxymethylcellulose; poly(vinyl alcohol); poly(vinyl ethers), such as poly(methyl vinyl ether) or poly(2-methoxy-ethoxyethylene); poly(2,4-dimethyl-6-triazinylethylene); poly(3-morpholinylethylene); poly(N-1,2,4-triazolylethylene); poly(vinylsulphonic acid); polyanhydrides; low molecular weight melamine/formaldehyde or urea/formaldehyde resins; poly(2-hydroxyethyl methacrylate); poly(acrylic acid) and its homologues.

20. Containerisation system according to Claim 19, characterised in that the film-forming material is poly(ethylene oxide), methylcellulose or poly(vinylalcohol).

21. Containerisation system according to either of Claims 19 and 20, characterised in that the film-forming material is poly(vinyl alcohol).

22. Containerisation system according to one of Claims 1 to 21, characterised in that the bag containing the effervescent composition in the pulverulent form comprises a first nonplanar film comprising of material which is soluble or dispersible in water, this first film being joined to a second film comprising a material which is soluble or dispersible in water along a continuous seal uniting the two films.

23. Containerisation system according to one of Claims 1 to 21, characterised in that the bag containing the effervescent composition in the pulverulent form comprises a single film, and preferably comprises at least three sealing regions, two of which are essentially rectilinear and planar and cut by the third into two substantially isolated regions.

24. Containerisation system according to one of Claims 1 to 23, characterised in that the effervescent agent comprises a carbonate or hydrogencarbonate, and of an acid.

25. Containerisation system according to Claim 24, characterised in that the carbonate or hydrogencarbonate are derivatives of an alkali metal or of an alkaline-earth metal or of an ammonium or organoammonium group.

26. Containerisation system according to either of Claims 24 and 25, characterised in that the carbonate or hydrogencarbonate are derivatives of sodium or potassium.

27. Containerisation system according to one of Claims 24 to 26, characterised in that the acid is a carboxylic or polycarboxylic or phosphoric or phosphonic acid or one of their salts or esters containing an acidic functional group.

28. Containerisation system according to one of Claims 24 to 27, characterised in that the mass ratio between the acid and the carbonate or hydrogencarbonate is between 0.3 and 2, and preferably between 0.5 and 1.

29. Containerisation system according to one of Claims 1 to 28, characterised in that the effervescent compositions in the pulverulent form additionally comprise:

a wetting agent

a dispersing agent

a swelling agent or expanding agent

a desiccant or desiccating agent

a densifying agent

a vehicle or filler.

30. Containerisation system according to one of Claims 1 to 29, characterised in that the effervescent compositions comprise:

between 1 % and 80 % of agriculturally active material

between 10 % and 80 % of effervescent agent

between 0 and 10 % of wetting agent, preferably between 0.1 and 8 %

between 0 and 20 % of dispersing agent,

preferably between 3 and 15 %

between 0 and 20 % of swelling agent,

preferably between 1 and 15 %

between 0 and 60 % of densifying agent,

preferably between 5 and 20 %

between 0 % and 30 % of desiccating agent,

preferably between 5 and 20 %

between 0 and 50 % of vehicle, preferably between 0 and 30 %.

31. Containerisation system according to one of Claims 1 to 30, characterised in that it additionally comprises an external container, comprising a layer of flexible cardboard paper and of a layer of polyethylene adhesively bonded to each other.

32. Containerisation system according to Claim 31, characterised in that the external container additionally comprises a layer of aluminium adhesively bonded to the polyethylene.

33. Process for the preparation of a mixture intended to be applied to the cultivated or uncultivated surfaces to be treated, characterised in that a containerisation system according to one of Claims 1 to 32 is put in water in a spray tank.

CONTAINERISATION SYSTEMS FOR AGRICULTURAL COMPOSITIONS

ABSTRACT

Containerisation system for agriculturally active material, characterised in that it comprises:

a) a bag whose wall is a film comprising a film-forming material which is soluble or dispersible in water

b) an effervescent composition in the pulverulent form comprising an effervescent agent and one or more materials which can present a danger to the environment, especially an active material, for example an agriculturally active material,

the said bag being closed and containing the said composition.

Dated this 30th day of November 1992

PATENT AGENT FOR THE APPLICANT