Abstract:

Title: MATERIAL FOR ZOO TECHNICAL USE

Perfected material for zootechnical use based on absorbent flours comprising one or more binding additives selected from among vegetable polysaccharides.
MATERIAL FOR ZOOTECHNICAL USE

FIELD OF THE INVENTION

The present invention concerns a perfected material for zootechnical use, to be used in animal litters or at the bottom of cages for small domestic animals such as cats, rabbits, guinea pigs, dogs, birds.

In particular the present invention concerns a material for zootechnical use such as pellets and or pellet granulate, containing additives with a perfected binding and absorbent effect.

BACKGROUND OF THE INVENTION


The material for zootechnical use must have a high absorbent capacity in order to absorb, as much as possible, the animal excreta.

Generally, for animals that can circulate freely in the domestic environment, such as cats and dogs, it is known to provide an open receptacle inside which the material for zootechnical use, such as a litter, is put.

On the contrary, in the case of animals that cannot circulate freely in the domestic environment, it is known to provide cages inside which the animals live, for example in the case of birds. The cages are generally provided with a bottom that is at least partly covered by the material for zootechnical use as above that is introduced.

It is known to use material for zootechnical use based on wood flour, which is suitably treated to have a specific shape, such as for example a micro-cylinder. The micro-cylinders break up in contact with the excreta, absorb the liquid fraction and incorporate the solid fraction.

Another known solution provides to make the material for zootechnical use directly in granules in order to improve its capacity to absorb the excreta.

One disadvantage of known materials for zootechnical use is that they have a low absorbency capacity and are quickly saturated, with the risk that the excreta...
are not absorbed, or only partly absorbed, with a consequent proliferation of unpleasant smells.

It is also known that domestic animals perform their bodily functions randomly in the litter or on the bottom of the cage, thus causing a non-homogeneous dispersion of the excreta; consequently the material for zootechnical use that has absorbed and incorporated the excreta, or used, is also dispersed non-homogeneously.

This causes difficulty in the selective removal of the material, since it can be complex to separate it from the remaining, unused material, causing it to remain for an extended period in the cage or litter.

Indeed it is known that, both because of the limited absorption, and also because of the dispersion of the excreta in the litter or the bottom of the cage, this condition leads to the proliferation of unpleasant smells, which persist until all the traces of excreta are removed or absorbed.

It is therefore known to regenerate the material for zootechnical use totally and frequently, in order to eliminate any residual trace of excreta with certitude, but this entails higher costs for the periodic purchase of new material for zootechnical use.


The material for zootechnical use is defined by a mixture of a powdered organic substance, such as wood flour, having maximum sizes of 0.25 mm, with 20-30% of finely powdered bentonite with sizes of about 0.074 mm, with 6-16% of powdered resin and about 5-15% of a powdered binder.

The extremely limited sizes of the particles defining the mixture causes a lot of dustiness inside the whole production plant and this also requires a specific binder to limit the dustiness once the granulate has been obtained.

Furthermore, such limited sizes of the particles that make up the mixture require high-speed pre-mixing of all the substances, after which follows granulation and subsequent drying.

The presence of mineral substances such as bentonite and powdered resins make the litter difficult to dispose of.
Moreover, the process for making the material requires an extrusion process that provides to mix the whole product with abundant water and/or steam to obtain a semiliquid dough which, worked in a series of zones of a cylinder by a worm screw divided into sectors with different shape and pitch, makes the starches gelatinize.

Extrusion requires high temperatures and pressures, for example from 130-180°C and from 30 bar to 60 bar, and a final stage of drying in the oven.

This process is therefore particularly complex and expensive in terms of both times and costs. In fact, the extrusion process requires very high temperatures and pressures and a quantity of water added at the beginning that can vary from 20% to 60%.

Document US-A-3.923.005 describes a solution for a litter with a base consisting of dried alfalfa and a starchy material, such as wheat bran which contains about 15-20% starch.

Sodium phosphate, which is a mineral additive, is added to the mixture of alfalfa and bran, with the function of increasing durability and reducing the final density of the product: it reacts with raw materials to improve the texture of the extruded product.

Sodium phosphate therefore has no specific function after production, and is only a technological additive in the course of the process.

The litter described in US-A-3.923.005 is obtained with an extrusion process that provides, as described above, to make a dough by adding abundant water, about 20%-60%, after which follows baking and extrusion at high temperatures and pressures. However, this process is particularly complex and costly in terms of times and costs. The production process also provides a step of airing the pellets obtained, to eliminate the residual smell of alfalfa.

Furthermore, the airing step requires the product to be stored for an extremely long time, requiring large spaces for its temporary storage.

Document US-A-3.921.581 describes a product to be mixed with a neutral or inert litter, consisting of an expanded and absorbent product, defined by a gelatinizable flour and alfalfa, which can be covered by mineral acids and their salts, or organic acids.
The mineral acids and organic acids are chosen to obtain a final product of the litter with a pH of about 2. Although it allows this type of litter to buffer the smell emitted by the volatile ammonia, this pH value, very low and acidic, could cause serious problems of irritation if it came into contact with particularly sensitive organs of the animal, such as the plantar pads, nose, skin or genitals.

The excipient that forms the product can be a powdered product with a cellulose base, or minerals comprising clays. The solid bases can be impregnated with acid to provide a strong neutralizing capacity.

Substances that have a binding effect in the dry production can be added to the excipient, such as substances with a mineral origin (bentonites, vermiculite), organic gums and polymers (guar gum, microcrystalline cellulose, pre-gelatinized starches), which are difficult to dispose of.

US-A-4.883.021 describes an absorbent composition obtained using as a base the working waste of cereals, vegetables, vegetable pulp, that is, cellulose material in general.

The base can be mixed with non-clay binders such as carbohydrates, proteins, flours and plant starches.

In this case too, it is provided to obtain pellets to be used as litter by transforming the starches with a process of baking, extrusion and drying, with the same disadvantages as mentioned above.

Special additives are added to the absorbent composition, such as cyclodextrin and/or acrylates. This known product too is difficult to dispose of in the environment.

One purpose of the present invention is therefore to obtain a material for zootechnical use with a binding and absorbent effect, in order to bind the material for zootechnical use and to improve the absorption of the excreta.

Another purpose of the present invention is to obtain a material for zootechnical use that can be produced with low costs and is biodegradable.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION
The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

In accordance with the above purposes, the present invention concerns a perfected material for zootechnical use based on absorbent flours comprising one or more binding additives selected from among vegetable polysaccharides. The vegetable polysaccharides are chosen from alginates, guar gum, tara gum, xanthan gum and modified celluloses.

The binding additives have rheological modification properties on the substance they come into contact with. For example in the case of urine, the action of the vegetable polysaccharides allows a binding thereof and therefore limits its dispersion on the material for zootechnical use. In this way, it is possible to selectively remove only the used material for zootechnical use, thus limiting the number of regenerations of material for zootechnical use and guaranteeing the removal of all traces of excreta.

According to one aspect of the present invention, the material for zootechnical use can comprise one or more absorbent additives selected from flours and sub-products from working cereals.

The presence of the additive allows to increase the capacity to absorb liquids, in particular excreta, and in this way to contain the proliferation of smells.

According to a possible variant form of embodiment, the absorbent flours are mixed with the binding additives in a quantity comprised between 1% and 12% and with absorbent additives in a quantity comprised between 1% and 10% in weight of the perfected material for zootechnical use. The quantities of materials identified allow to obtain an autonomous binding capacity of the product to be obtained, without requiring the addition of specific, non-vegetable binders.

The combination of these components, which are completely natural based, allows to obtain a material with a pH comprised between 5 and 6 and therefore has a buffer effect on the smells emitted by the evaporation of ammonia.

The combination of these components with a completely vegetable base allows the material for zootechnical use obtained, when in contact with liquids, to swell and form lumps that are easy to separate from the rest of the litter, without adding other components.
These and other aspects, characteristics and advantages of the present disclosure will be better understood with reference to the following description of specific forms of embodiment, supplied by way of non-restrictive example, and to the attached claims.

DETAILED DESCRIPTION OF SOME FORMS OF EMBODIMENT

We shall now refer in detail to the various forms of embodiment of the present invention, of which one or more examples are shown in the attached drawing. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insomuch as they are part of one form of embodiment can be adopted on, or in association with, other forms of embodiment to produce another form of embodiment. It is understood that the present invention shall include all such modifications and variants.

Forms of embodiment described here concern a perfected material for zootechnical use, used in litters or as the bottom inside cages for small domestic animals.

The material for zootechnical use according to the present invention is configured to incorporate and/or absorb animal excreta and determine the binding thereof that facilitates their removal.

In some forms of embodiment the material for zootechnical use can be configured to simultaneously contain the proliferation of unpleasant smells.

The perfected material for zootechnical use can be based on absorbent flours and can comprise one or more binding additives. The one or more binding additives can be selected from among vegetable polysaccharides.

In some forms of embodiment, the vegetable polysaccharides can be chosen from alginates, guar gum, tara gum, xanthan gum, modified celluloses, such as for example carboxymethyl cellulose, hydroxypropyl cellulose, hydroxyethyl methyl cellulose and derivatives thereof.

In fact, vegetable polysaccharides, and in particular the gums cited above, have a rheological modification effect on the material they come into contact with. In this case, the action of the vegetable polysaccharides on urine causes its viscosity to be modified and consequently it can be agglomerated and the dispersion thereof can be contained.
According to possible forms of embodiment, each vegetable polysaccharide used can be provided between 1% and 12% w/w with respect to a total mass of material for zootechnical use, in particular between 4% and 10%.

In fact, under 4% the lumps of zootechnical material that have absorbed the excreta are crumbly, and are therefore difficult to separate from the mass of unused zootechnical material, whereas above 10% the lump tends to become elastic and sticky, making it difficult to dispose of for example through domestic sewers. Examples of quantities of vegetable polysaccharide are: 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 11%, 12%.

In forms of embodiment described here, the material for zootechnical use comprises only one type of vegetable polysaccharide.

According to other forms of embodiment of the present invention, the material for zootechnical use comprises several different types of vegetable polysaccharide, each present in the quantities indicated above.

In possible variant forms of embodiment, using different types of polysaccharides, for example with different influences on the speed of absorption of the excreta, can allow to modulate the use of the litter with lower consumption and expense for the regeneration of the material. This can be advantageous in the case of shelters for dogs and cats, where the number of animals can be high and the litters available can be limited.

In some forms of embodiment, the maximum quantity of vegetable polysaccharide, whether it is a mixture of vegetable polysaccharides or only one, contained in the material for zootechnical use is 12%.

In some forms of embodiment, which can be combined with all the forms of embodiment described here, the material for zootechnical use can comprise an absorbent additive provided to improve the absorbent capacity of the material for zootechnical use and its elasticity.

The absorbent additive can be a cereal flour, in particular flour of whole meal barley seeds, corn, wheat, rice, oats, rye and sub-products thereof such as brans, semolina, fibers, leaf meal, corncobs or a combination thereof.

According to a possible, preferential solution, the absorbent additive is a flour of whole meal barley seeds. Whole meal barley flour can have grain sizes comprised between 0.3 mm and 2 mm.
In some forms of embodiment, the absorbent additive can be provided between 1% and 10% in weight of the material for zootechnical use. Examples of the quantities of absorbent additive are: 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%.

The absorbent additive can be configured to mix and interact with the absorbent flours cited above, to obtain a lighter and more porous material for zootechnical use, and faster at absorbing the excreta.

In forms of embodiment described here, the material for zootechnical use comprises only one type of absorbent additive.

According to other forms of embodiment of the present invention, the material for zootechnical use comprises several different types of absorbent additive, each present in the quantities indicated above.

In possible variant forms of embodiment, it is possible to provide advantageous combinations of binding and absorbent additives, in terms of composition and chemical interaction and also dosage.

Advantageously, the fibers deriving from cereals, which make the final product more elastic, can allow a quicker binding action on the material used by the polysaccharides, and a rapid dissolution of the lumps in contact with excess water.

In some forms of embodiment, which can be combined with all the forms of embodiment described here, the material for zootechnical use can guarantee to control the smells deriving from the excreta, by the high capacity for absorption and binding supplied by the binding and absorbent additives described above.

In other forms of embodiment, which can be combined with all the forms of embodiment described here, the material for zootechnical use can also comprise one or more sanitizing additives to improve the control of the smells. The one or more sanitizing additives can be selected from sodium and/or potassium mineral salts.

In some forms of embodiment, it is possible to combine the choice of sanitizing additives, binding additives and absorbent additives to determine advantageous combinations for example for chemical compatibility and/or deodorant, binding and absorbent effect.
In some forms of embodiment, the sanitizing additives can be chosen from monosodium phosphate (NaH$_2$P$_2$O$_4$), sodium bisulfate (NaHSO$_4$), monopotassium phosphate (K$_2$HPO$_4$) or potassium bisulfate (KHSO$_4$).

These mineral salts advantageously cause a sanitizing and deodorant effect, lowering the pH of the excreta produced by the animals and creating acid conditions sufficient to limit bacterial proliferation.

In fact, when they enter into contact with liquid excreta, mineral salts break up, developing ions with weak acidity.

They are therefore able to neutralize the basic volatile ammonia present in the excreta (urine), responsible for the unpleasant smells.

The sanitizing additives described are salts of phosphorus and sulfuric acid, which can be used equally to control the development of bad smells and bacteria, but are not compatible for zootechnical use. In fact, these acids have high reactivity to organic substances, which makes them particularly dangerous for direct contact with animals.

In this way, the material for zootechnical use is able to perform a deodorant action and to counter unpleasant smells. Furthermore, the mineral salts, reacting with the ammonia, can form specific substances such as phosphates and sulfates of ammonia which, if discharged on fields, land or similar surfaces can also have a favorable fertilizing effect.

According to possible forms of embodiment, each sanitizing additive used can be provided between 0.5% and 5% w/w with respect to a total mass of material for zootechnical use. In particular, between 1% and 4% w/w since this range allows to maximize the action of the sanitizing additives in both high and low concentrations of excreta. Examples of quantities of mineral salts are 0.5%, 1%, 1.5%, 2%, 2.5%, 3%, 3.5%, 4%, 4.5%, 5%.

In forms of embodiment described here the material for zootechnical use comprises only one type of sanitizing additive.

According to other forms of embodiment of the present invention, the material for zootechnical use comprises several different types of sanitizing additive.

In some forms of embodiment, which can be combined with all the forms of embodiment described here, the material for zootechnical use can comprise, as
sanitizing additives, a mixture of sodium mineral salts, or a mixture of potassium mineral salts, or a mixture of sodium and potassium mineral salts.

In some forms of embodiment, each sanitizing additive can be present in the quantities indicated above.

The choice of the type of sanitizing additive to be used, and its quantity in the mixture, depends on the pH to which the material for zootechnical use is to operate. In fact the different sanitizing additives reported above are effective at different pH values, therefore they can react as a function of the variation in acidity given by the urine, its quantity during the day and the animal's health.

The quantity and/or type of mineral salts used can be chosen depending on the desired deodorant effect.

In some forms of embodiment of the present invention, the absorbent flour can be wood-based and can be produced starting from wood masses with high absorbent properties, for example determined by high porosity.

In some forms of embodiment, the absorbent flour can have a grain size comprised between 0.5 mm and 2 mm. Grain sizes smaller than 0.5 mm can cause dustiness in the environment, while grain sizes of more than 2 mm do not ensure a sufficient degree of absorption of the excreta for the purposes of the present invention.

According to some forms of embodiment, the finer flour, that is, smaller than 0.5 mm, is also removed from the absorbent flour. In some forms of embodiment, the absorbent flour can be chosen from a group with an absorption capacity of more than 300% in weight.

In this way, the material for zootechnical use is able to absorb great quantities of liquid, such as urine, which come into contact with the absorbent flour, to ensure that the litter and/or the bottom of the cages where the material for zootechnical use is disposed remain dry.

Merely by way of example, the wood-based absorbent flour can be obtained by suitably working beech wood, fir or a combination of the two.

In forms of embodiment described here, the material for zootechnical use comprises a combination of absorbent flours.

In possible forms of embodiment, the absorbent flours can be defined by a dry mixture of at least two types of wood with different grain size, with sizes bigger
than 500 µη, and suitably selected and de-powdered. The choice of two types of
wood with different grain size allows to obtain an absorption of the animal
excreta that is diversified over time and therefore allows a first type of wood
flour to absorb the excreta immediately, and a second type of flour to absorb the
excreta in a temporally diversified way, for example to absorb what is released
by the first type of wood flour.

Merely by way of example, the two types of wood can be fir and beech,
suitably combined. Merely by way of example the fir can have grain sizes
comprised between 1 mm and 2 mm, preferably about 1.5 mm, while the beech
can have grain sizes of about 0.5 mm.

The absorbent flour and the respective additives can be mixed together to
make a composition with a homogeneous mass that can subsequently be
pelletized, conferring a pellet shape on the material for zootechnical use.

In some forms of embodiment, the material for zootechnical use in the form of
pellets can be reduced into granules by crumbling and sieving, to eliminate the
powders or granules with sizes similar to dust, to obtain material for zootechnical
use in a granular or crumbled form.

In some forms of embodiment, which can be combined with all the forms of
embodiment described here, the material for zootechnical use can be in the form
of pellets or alternatively granular (crumbled).

In some forms of embodiment, the material for zootechnical use in the form of
pellets can have a diameter comprised between 2 and 8 mm, in particular from 4
to 6.5 millimeters, and a length from 3 to 40 mm, in particular from 5 to 20
millimeters.

In forms of embodiment described here, the material for zootechnical use in
granular or crumbled form can have a mean size between 500 µη and 5000 µη, in
particular between 800 µη and 4700 µη. Below this range, when the
zootechnical material is introduced into the litter or bottom of the cage, a cloud of
zootechnical material could form, defined by its light and small fraction, which
can cause inconvenience: this effect is known as "smoking dust". On the
contrary, above this range, almost whole pieces of pellet may be seen, which
have a negative esthetic appearance and absorb the excreta more slowly.
Examples of grain sizes are 500 µη, 800 µη, 1100 µη, 1400 µη, 1700 µη,
2000 µη, 2300 µι, 2600 µηι, 2900 µηι, 3200 µιη, 3500 µιη, 3800 µιη, 4100 µιη, 4400 µιη, 4700 µΗ, 5000 µιη.

The mean size of the material for zootechnical use can therefore be such as to maximize the absorbent effect and at the same time to allow easy removal and binding after use.

Furthermore, the size of the material for zootechnical use is such as to guarantee easy disposal, for example in domestic sewers, which are then treated in specific plants for sewage, without causing any damage.

In some forms of embodiment, which can be combined with all the forms of embodiment described here, the perfected material for zootechnical use, in this case if consisting only of absorbent flour, binding additives and absorbent additives, can be exclusively vegetable, and can therefore be eliminated through the domestic sewers without in any way damaging the sewers and/or the sewage treatment plants located downstream. In fact, the used material for zootechnical use, in which there are lumps due to the binding of excreta, can be completely broken up when it comes into contact with the water of the sewers, thus facilitating the elimination thereof.

The material for zootechnical use according to the present invention can also have a mean apparent density between 420 g/l and 680 g/l. Examples of mean apparent density are 420 g/l, 440 g/l, 460 g/l, 480 g/l, 500 g/l, 520 g/l, 540 g/l, 560 g/l, 580 g/l, 600 g/l, 620 g/l, 640 g/l, 660 g/l, 680 g/l.

Some forms of embodiment of the present invention also concern a method to make material for zootechnical use as described above, which provides at least to mix the binding additives with the absorbent flours.

During mixing the combined mixing can be provided of wood flours, for example of fir and/or beech, with natural absorbent additives such as cereal flours.

According to another aspect of the present invention, the mixing is carried out dry, that is, without the addition of water. This prevents complex and expensive operations to dry the product for subsequent packaging.

According to a possible variant form of embodiment, during the mixing it is possible to provide that sanitizing additives are also added to the binding additives and the absorbent flours.
According to a possible solution, the compound obtained by mixing the absorbent flours and the binding additives can be subjected to pelletizing, to obtain the material for zootechnical use in the form of pellets or granules.

In this case the production process starts from low-humidity flours (on average 10%-12%) which, either alone or in a mixture, enter into a machine usually called "pellet mill" which compresses them dry and makes the pellets come out through a circular draw-plate comprising hundreds of holes, almost always round.

In its passage through the draw-plate the temperature of the product can reach 90-100°C for 1-2 seconds, then the product is simply cooled in a silo in a current of air and already after one hour it can be packed. The process is therefore carried out substantially at ambient temperature and the pellet itself is subjected to extremely high heating only on the surface, not in depth.

According to a possible solution, the pellets can also be obtained with a combination of the techniques of pressing and pelletizing and/or subsequent cold granulation.

The method according to the present invention can also include sieving the pellets or granules obtained, to remove from them parts with sizes smaller than desired. The method can also include an action to depowder the pellets or granules, to remove the powders from them and prevent the supply of a material for zootechnical use with a high powder content. Depowdering can be effected through suction. Depowdering allows to remove the volatile powder that forms due to chafing during the transport steps.

The zootechnical material obtained from pelletizing and/or subsequent granulation, and possibly sieved and/or depowdered, is subsequently packed.

According to a possible solution, the mixing, pelletizing, cooling and subsequent packing operations are carried out continuously inside the same production plant. In this case no intermediate storage zones are provided for the temporary storage and cooling of materials as provided in solutions known in the state of the art.

It is clear that modifications and/or additions of parts may be made to the material for zootechnical use as described heretofore, without departing from the field and scope of the present invention.
It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of material for zootechnical use, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.
CLAIMS

1. Perfected material for zootechnical use based on absorbent flours comprising one or more binding additives selected from among vegetable polysaccharides.

2. Material as in claim 1, wherein said binding additive is chosen from alginates, guar gum, tara gum, xanthan gum, modified celluloses.

3. Material as in claim 2, comprising a mixture of said binding additives.

4. Material as in any claim hereinbefore, wherein each binding additive is provided between 1% and 12% in weight of said perfected material for zootechnical use.

5. Material as in any claim hereinbefore, comprising one or more absorbent additives selected from cereal flours and/or their work substantially-products.

6. Material as in claim 5, wherein each absorbent additive is provided between 1% and 10% in weight of said perfected material for zootechnical use.

7. Material as in claim 1, wherein said absorbent flours are mixed with said binding additives in a quantity comprised between 1% and 12% and with absorbent additives in a quantity comprised between 1% and 10% in weight of said perfected material for zootechnical use.

8. Material as in any claim hereinbefore, comprising one or more sanitizing additives selected from sodium and/or potassium mineral salts.

9. Material as in claim 8, wherein said sanitizing additives are selected from monosodium phosphate, sodium bisulfate, monopotassium phosphate, potassium bisulfate.

10. Material as in any claim hereinbefore, having a density between 420 g/l and 680 g/l.

11. Material as in any claim hereinbefore, wherein said adsorbent flour is chosen from a group comprising fir wood or beech wood or a combination thereof.

12. Material as in any claim hereinbefore, in granular or pellet form.

13. Material as in claim 12, having in granular form a size between 500 μm and 5000 μm.

14. Material as in claim 12, having in pellet form a diameter between 2 and 8 mm and a length between 3 and 40 mm.
15. Method to make a material for zootechnical use described above that provides at least a mixing of binding additives, chosen from among vegetable polysaccharides, with absorbent flours.

16. Method as in claim 15, wherein said mixing is carried out dry, without the addition of water.

17. Method as in claim 15 or 16, wherein, during said mixing, sanitizing additives are added to said binding additives and said absorbent flours.

18. Method as in any of the claims from 15 to 17, wherein pelletizing is provided at least of binding additives and said absorbent flours in order to obtain said material for zootechnical use in pellet or granular form.

19. Method as in claim 18, wherein said pellet or granule is cooled and packed.

20. Method as in claim 19, wherein the mixing, the pelletizing, cooling and subsequent packing operations are carried out continuously in the same production plant.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

**INV. A01K1/015**

According to International Patent Classification (IPC) or to both national classification and IPC

**ADD.**

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols) A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 5 836 262 A (YASUKAWA YOICHI [JP])</td>
<td>1-7, 10-14</td>
</tr>
<tr>
<td>cited in the application</td>
<td></td>
</tr>
<tr>
<td>claims; example 1</td>
<td></td>
</tr>
<tr>
<td>US 3 923 005 A (FRY RAYMOND J ET AL)</td>
<td>1,4-10, 12-14</td>
</tr>
<tr>
<td>2 December 1975 (1975-12-02)</td>
<td></td>
</tr>
<tr>
<td>cited in the application</td>
<td></td>
</tr>
<tr>
<td>column 3, lines 42-65; claims</td>
<td></td>
</tr>
<tr>
<td>US 3 921 581 A (BREWER ANDREW L)</td>
<td>1-14</td>
</tr>
<tr>
<td>cited in the application</td>
<td></td>
</tr>
<tr>
<td>column 3, lines 45-63</td>
<td></td>
</tr>
<tr>
<td>column 5, lines 34-44; claims; example 6</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td></td>
</tr>
</tbody>
</table>

**Date of the actual completion of the international search** 30 September 2015

**Date of mailing of the international search report** 06/10/2015

**Authorized officer** Bi as, Valer i e

**Form PCT/ISA/210 (second sheet) (April 2005)**
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>DE 808563 T1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE 69527088 DI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE 69527088 T2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP 0808563 AI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JP 2947615 B2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 5836262 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wo 9714299 Al</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

US 3923005 A 02-12-1975 NONE

US 3921581 A 25-11-1975 CA 1038297 AI 12-09-1978
US 3921581 A 25-11-1975

US 4883021 A 28-11-1989 NONE