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DIRECCIÓN DE NUEVAS CREACIONES
Procedimiento acelerado de exámenes de patente (PPH)

1	NÚMERO DE SOLICITUD ANTE LA SIC NC2020/0016519		
2	GLOBAL - PPH ☐ PAÍS	3	PCT – PPH ☐ PAÍS
4	PROSUR ☐ PAÍS	5	Alianza del Pacífico (AdP) ☐ PAÍS
6	OFICINA DE PRIMERA PRESENTACIÓN (OPP) ☐	7	OFICINA DE EXAMEN ANTERIOR (OEA) ☒
8	NÚMERO DE SOLICITUD O PUBLICACIÓN DE LA SOLICITUD (OPP) ☐ NÚMERO DE SOLICITUD EN OFICINA DE EXAMEN ANTERIOR (OEA): ☒ NÚMERO DE SOLICITUD PCT: ☒		1. PCT/IB2019/054628
9	☐ REPRESENTANTE LEGAL ☒ APODERADO		
APELLIDOS DAZA MONTALVO		NOMBRES CAROLINA MERCEDES	IDENTIFICACIÓN C.C. 66783790 T.P. 141563 CSJ
DIRECCIÓN	Carrera 11 No. 86-53 Piso 3		No. TELÉFONO 6181088
CIUDAD	Bogotá		CORREO ELECTRÓNICO notificaciones@clarke modet.com.co
PAÍS	Colombia		No. RADICACIÓN O PROTOCOLO DE PODER GENERAL
10	CONDICIONES PARA ACCEDER A ESTE PROCESO:		
10.1. DATOS DE PRIORIDAD ☒ SI ☐ NO			
(33) PAÍS DE ORIGEN 1. ESTADOS UNIDOS DE AMÉRICA 2. EUROPEAN PATENT ORGANIZATION (EPO)		CÓDIGO PAÍS US EP	(31) NÚMERO 62/680,193 18177506.5 (32) FECHA (AAAA/MM/DD) 2018/06/04 2018/06/13
10.2. DATOS SOLICITUD INTERNACIONAL PCT ☒ SI ☐ NO			
Solicitud Internacional No.		PCT/IB2019/054628	Fecha 2019/06/04
Publicación Internacional No.		WO/2020/016672	Fecha 2020/01/23
*El solicitante presenta una copia de la(s) reivindicación(es) patentable(s) u otorgable(s) de la solicitud de la Oficina de Primera Presentación que profirió el examen de patentabilidad, junto con una traducción al castellano. ☒ SI ☐ NO			
*El solicitante presenta los resultados de búsqueda de la Oficina de Examen Anterior, junto con una traducción al castellano. ☒ SI ☐ NO			
REQUISITOS PARA EL RECONOCIMIENTO DE LOS RESULTADOS DE EXÁMENES DE PATENTABILIDAD EFECTUADOS A SOLICITUDES EXTRANJERAS			
Para que la Superintendencia de Industria y Comercio pueda reconocer los resultados de exámenes de patentabilidad producidos por otras Oficinas de Propiedad Industrial se debe cumplir con las siguientes condiciones:			
(a) Al momento de solicitar el examen de patentabilidad, si el solicitante pide que se reconozcan exámenes de patentabilidad de otras oficinas extranjeras, deberá aportar junto con el pago de la tasa correspondiente, los siguientes anexos:			
(i) Copia de las resoluciones, fallos o decisiones que han sido relevantes para la determinación de la patentabilidad de la(s) solicitud(es) en la Oficina que haya proferido el examen de patentabilidad que contienen reivindicaciones patentables u otorgables que son la base de la petición, y si es del caso, su traducción al castellano. ☒ SI ☐ NO			
(ii) Copia de todas las reivindicaciones determinadas como patentables u otorgables en la Oficina que profirió el examen de patentabilidad y, si es del caso, su traducción al castellano. ☒ SI ☐ NO			
(iii) Copia de los antecedentes, información o documentos citados por el examinador de la Oficina de Primera Presentación del examen de patentabilidad, en las resoluciones, fallos o decisiones correspondientes, incluyendo la literatura no patente. Los documentos de patente deberán presentarse siempre y cuando no estén disponibles para la Superintendencia de Industria y Comercio mediante el simple acceso a bases de datos gratuitas. ☒ SI ☐ NO			
(iv) Una tabla de correspondencias de las reivindicaciones que han sido determinadas como patentables u otorgables en la solicitud de la Oficina que haya proferido el examen de patentabilidad. ☒ SI ☐ NO			
11	FIRMA DEL SOLICITANTE, DEL APODERADO O DEL REPRESENTANTE LEGAL <i>Junto a cada firma, indicar el nombre del firmante y su calidad (si tal calidad no es obvia al leer el petitorio)</i>		
 CAROLINA DAZA MONTALVO			

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

To:

ELMORE, T.J.
V.O.
P.O. Box 87930
2508 DH Den Haag
PAYS-BAS

Date of mailing
(day/month/year)

21.08.2020

Applicant's or agent's file reference
P119252PC00

IMPORTANT NOTIFICATION

International application No.
PCT/IB2019/054628

International filing date (day/month/year)
04.06.2019

Priority date (day/month/year)
04.06.2018

Applicant
Pursell Agri-Tech, LLC

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
preliminary examining authority:



European Patent Office P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040
Fax: +31 70 340 - 3016

Authorized Officer

Muñoz-Manneken, Toñi

Tel. +31 70 340-2310



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P119252PC00	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/IB2019/054628	International filing date (day/month/year) 04.06.2019	Priority date (day/month/year) 04.06.2018	
International Patent Classification (IPC) or national classification and IPC INV. C05C9/00			
Applicant Pursell Agri-Tech, LLC			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>4</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☒ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application			
Date of submission of the demand 02.09.2019		Date of completion of this report 21.08.2020	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Agra-Gutierrez, C Telephone No. +31 70 340-1960	



Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-29 as originally filed

Claims, Numbers

1-15 as originally filed

Drawings, Sheets

1, 2 as originally filed

☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IB2019/054628

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 14.04.2020 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-15</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-15</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-15</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

D1 US 2015/376077 A1

D2 US 2014/298873 A1

D3 US 4 854 715 A

D4 JP H11 228271 A

D5 JP H08 277191 A

1 Novelty - Article 33(2) PCT

None of the documents cited above describing the state of the art disclose all technical features of independent claims 1 or 15 in combination. Therefore the subject-matter of claims 1-15 is novel within the meaning of Article 33(2) PCT.

2 Inventive step - Article 33(3) PCT

The present application meets the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15 can be considered as to involve an inventive step in the sense of Article 33(3) PCT.

2.1 Document D4 is regarded as being the prior art closest to the subject-matter of independent claims 1 and 15 and discloses a method of coating fertilizer particles as described in previous communications. In particular, D4 further discloses that the coating apparatus 1 may be a Henschel or a Nauta mixer mixer (see paragraph [0040]).

In the letter dated 21.07.2020 the applicant indicated that D4 did not directly and unambiguously disclosed that the Henschel or Nauta mixers comprised a stationary container frame with one rotor on the central axis including several blades as movable elements or a stationary container frame with two rotors on two axes displaced from the axis of the container at a distance and forming an angle. The examining division respectfully disagrees with this statement

because the construction of a Henschel or Nauta mixer constitutes common knowledge in the field of coating apparatus and it is therefore readily available to the skilled person.

As confirmed by the applicant in page 2 lines 22-25 of the letter dated 21.07.2020, the subject-matter of claims 1 and 15 therefore differs from this known method and urea finishing plant in at least partially curing or hardening the coating layer, wherein said curing or hardening involves a chemical reaction of said coating component.

The applicant has provided, in page 2 line 27 to page 3 line 30, technical arguments in support of a technical effect of the above differences with respect to the disclosure of D4. In this respect, conventional processes for coating fertilizer particles, such as the process of D4, are based on coating the fertilizer particles with a coating agent comprising a polymer and a solvent. After coating the particles with this coating agent, the solvent has to be evaporated in order to obtain the particles coated with the polymer. This evaporation is an essentially physical process in which no chemical reaction takes place, and the efficiency of this evaporation process determines the design of the coating units to provide sufficient transport of heat and gases and to achieve efficient and fast evaporation of the solvent.

In the process of the invention, curing or hardening of the coating layer involves a chemical reaction, which is fundamentally different from the essentially physical process of evaporation. Therefore, for an efficient chemical curing or hardening process, other factors play a role in determining optimal design than those for efficient evaporation processes. For instance, the change in viscosity of the coating layer over time is typically much faster in case of curing or hardening involving chemical reaction compared to the change in viscosity over time during evaporation. In particular, during the chemical reaction there is the so called gel phase in which the viscosity may increase very rapidly in a very short time. During this gel phase, the particles can temporarily become sticky.

The coating unit used in the process of the present invention should therefore preferably be suitable for keeping the particles in suspension and preventing sticking together of the particles (present application, page 12, lines 3-8).

The problem to be solved by the present invention may therefore be regarded as to how to provide an efficient method of curing or hardening polymer coatings on fertilizer particles.

Due to the specific requirements of a coating unit designed for providing a cured or hardened polymer coating on fertilizer particles, it would not be obvious how to modify the method and urea finishing plant known from D4 when faced with the above objective technical problem in such a way that the method and apparatus according to claims 1 and 15 are obtained. Therefore, the skilled person would not apply coating units that are suitable for evaporation to a coating process that involves curing or hardening by chemical reaction with a reasonable expectation of success.

Consequently, the subject-matter of claims 1-15 can be considered as to involve an inventive step (Article 33(3) PCT).

- 2.2 It is also noted that similar arguments would apply *mutatis mutandis* if document D5 were to be considered the prior art closest to the subject-matter of claims 1-15. The subject-matter of claims 1-15 can also be considered as to involve an inventive step in the sense of Article 33(3) PCT.

3 Industrial applicability - Article 33(4) PCT

The subject-matter of claims 1-15 is useful in the technical field of coating fertilizer particles and fulfils therefore the requirements of Article 33(4) PCT.

Re Item VII

4 Certain defects in the international application

- 4.1 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 4.2 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D4 and D5 is not mentioned in the description, nor are these documents identified therein.
- 4.3 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).



Patents & Trademarks

European Patent Office
acting as IPEA

Vereenigde Octrooibureaux N.V.
Carnegieplein 5
P.O. Box 87930
2508 DH The Hague
The Netherlands

Telephone +31 70 416 67 11
Telefax +31 70 416 67 99

P.deLange@vo.eu
www.vo.eu

Your ref. PCT/IB2019/054628/
Our ref. PJP/P119252PC00

The Hague,
21 July 2020

Re: International Patent Application No. PCT/IB2019/054628
Pursell Agri-Tech, LLC
Huntsman International LLC

This is in response to your written opinion dated 21 April 2020 in the above-mentioned case.

No claim amendments are made.

5

Further to my letter of 24 April 2020, a translation of the full text of D4 (JP H11228271) and D5 (JP H08277191) is still requested.

The following comments are proffered without making any representation as to the content of D4 and D5 or as to the accuracy of the translation used and without waiving applicant's right to request translations of these documents in the procedure before the EPO as elected Office.

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In the written opinion, you indicate that D4 discloses a method of coating fertilizer particles with a polymer in a coating apparatus, wherein the coating apparatus may be a Henschel mixer or a Nauta mixer. You considered that a Henschel mixer is a stationary container frame with one rotor on the central axis including several blades as movable elements, and that a Nauta mixer is a stationary container frame with two

rotors on two axes displaced from the axis of the container at a distance and forming an angle.

However, applicant respectfully submits D4 provides *no* information about the

5 allegedly used Henschel or Nauta mixers apart that stirring blades are used.

Therefore, D4 does not *directly and unambiguously* disclose a coating unit comprising a stationary frame and at least two movable elements, wherein said movable elements are *independently* movable with respect to the frame, as required by present claim 1.

10 Similarly, D5 does not provide detailed information regarding the moveable elements in the Henschel or Nauta mixers.

Therefore, D5 does not *directly and unambiguously* disclose a coating unit comprising a stationary frame and at least two movable elements, wherein said movable elements are independently movable with respect to the frame, as required by present claim 1.

15 Because neither D4 nor D5 disclose directly and unambiguously a coating unit comprising a stationary frame and at least two movable elements, wherein said movable elements are independently movable with respect to the frame, the skilled person would not arrive at the subject-matter of present claim 1 based on the
20 disclosure of D4 or D5.

Applicant appreciates that it is acknowledged in the written opinion that the subject-matter of claim 1 differs from method of D4 at least in that claim 1 involves at least partially curing or hardening the coating layer, wherein said curing or
25 hardening involves a chemical reaction of said coating component.

However, the applicant respectfully disagrees that this difference does not lead to a technical effect, as you considered in the written opinion.

30 Conventional processes for coating fertilizer particles, such as the processes in D4 and D5, are based on coating the fertilizer particles with a coating agent comprising a

polymer and a solvent. After coating the particles with this coating agent, the solvent has to be evaporated in order to obtain the particles coated with the polymer. This evaporation is an essentially physical process in which no chemical reaction takes place.

5

For efficient evaporation of a solvent, transport of heat is very important, as well as transport of evaporated solvent molecules away from the coated particles. For processes for coating of fertilizer particles, which are typically performed at a large scale, it is challenging to design coating units which provide sufficient transport of heat and gases in order to achieve efficient and fast evaporation of the solvent. Therefore, processes for applying a polymer coating onto fertilizer particles involving the evaporation of a solvent are often slow.

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In the process of the invention, curing or hardening of the coating layer involves a chemical reaction, which is fundamentally different from the essentially physical process of evaporation. Therefore, for an efficient chemical curing or hardening process, other factors play a role than for an efficient evaporation process. For instance, the change in viscosity of the coating layer over time is typically much faster in case of curing or hardening involving chemical reaction compared to the change in viscosity over time during evaporation. In particular, during the chemical reaction there is the so called gel phase in which the viscosity may increase very rapidly in a very short time. During this gel phase, the particles can temporarily become sticky.

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The coating unit used in the process of the present invention should therefore preferably be suitable for keeping the particles in suspension and preventing sticking together of the particles (present application, page 12, lines 3-8).

30

This requirement is very different from the requirements regarding transport of heat and gases for coating units that are used for processes involving evaporation. Due to these fundamental differences between evaporation and curing or hardening by chemical reaction, the skilled person would not apply coating units that are suitable for

evaporation to a coating process that involves curing or hardening by chemical reaction with a reasonable expectation of success.

In view of the above, claim 1 involves an inventive step.

5 Claim 2 involves an inventive step at least because of its dependence on claim 1. In addition, claim 2 specifies that the first movable element of the coating unit is a container, and the method involves spinning the container in a rotating motion around a rotation axis while the container holds the fertilizer particles during at least step b).

10 This step of spinning the container provides for instance for rolling of the fertilizer particles during step b) (present application page 12, lines 3-30). This can result in especially good mixing, as well as preventing the formation of clumps during the coating process.

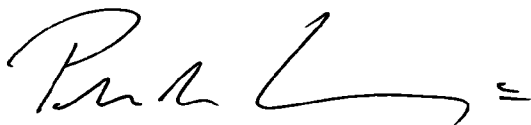
15 Neither D4 nor D5 discloses or suggests a coating unit comprising a container that spins in a rotating motion around a rotation axis.
It appears that 'Henschel' and 'Nauta' mixers do not operate by spinning a container.

20 Claims 3-14 involve an inventive step at least because of their dependence on claim 1 or 2.

Claim 15 also involves an inventive step, the same reasoning as for claim 1 applies.

25 Based on the above it is submitted that all present claims are directed to patentable subject-matter and a positive IPRP is therefore expected.

The agent,


P.J. de Lange

JPH08277191A - SLOW-RELEASE GRANULAR FERTILIZER AND ITS PRODUCTION

Translated: 12-8-2020 10:38 Family-Id: 14384353 Doc-Number: JP.H08277191.A

Abstract

PURPOSE: To safely and inexpensively obtain a slow-release granular fertilizer modestly releasing an active component for a long period of time by coating the surface with a water-insolubilized water-soluble polymer, or containing a water-insolubilized water-soluble polymer. **CONSTITUTION:** The objective slow-release granular fertilizer has a surface covered with a water-insolubilized water-soluble polymer or contains a water-insolubilized water-soluble polymer. The producing method is as follows; (1) the surface of a fertilizer granule is coated with a water-soluble polymer and the water-soluble polymer is water-insolubilized; (2) a water-soluble polymer is mixed with a fertilizer component, granulated, thereafter the water-soluble polymer is water-insolubilized; and (3) a water-soluble polymer is mixed with a fertilizer component, granulated, further the water-soluble polymer is applied, thereafter the water-soluble polymer is water-insolubilized; etc., are adopted. The water-insolubilization of the water-soluble polymer is performed by heating or crosslinking.

Description

- [0001] **BACKGROUND OF THE INVENTION** 1. Field of the Invention The present invention relates generally to fertilizers used in agriculture, forestry, fisheries, horticulture and the like, and more specifically to slow-release granular fertilizers in which the active ingredient is slowly released over a long period of time and the same. The present invention relates to a manufacturing method.
- [0002] Fertilizers used in agriculture, forestry, fisheries, horticulture, etc. are organic fertilizers such as compost and chicken manure, and chemically manufactured chemical fertilizers containing ammonia, phosphoric acid, potassium nitrate, etc. Is commonly used. In modern large-scale agriculture and the like, chemical fertilizers have been generally used because of the simplicity of fertilization and the high concentration of active ingredients.
- [0003] On the other hand, while these chemical fertilizers have a high concentration of active ingredients, the elution rate of the active ingredients in water and/or soil is not regulated, and the active ingredients are eluted in a short time and absorbed by plants. There is an outflow of components that are not stored and it is necessary to apply excess fertilizer. Moreover, there is a problem that the number of times of fertilization must be increased. Further, these excess active ingredients flow out into the surrounding environment other than the fields, and there is a problem of environmental destruction due to groundwater pollution and eutrophication such as red tide. In order to solve these problems, slow-release fertilizers in which active ingredients are slowly released over a long period of time have been proposed.
- [0004] As a specific example, for example, diisobutylidene urea, a slow-release fertilizer designed to dissolve an active ingredient in water only after being hydrolyzed in soil, or usually produced. Coated fertilizers and the like designed to cover the surface of fertilizer particles with a film of a polymer compound or the like and suppress dissolution of the active ingredient are commercially available. However, the above-mentioned types have problems such as expensive auxiliaries other than the active ingredient and an expensive production method, and the types described below generally require an organic medium when coating a polymer film. Since there is a risk of fire and explosion at the time, and environmental problems due to the dissipation of vapor of organic medium into the environment, a sufficiently satisfactory method has not been proposed.
- [0005] **SUMMARY OF THE INVENTION** In view of the above background, the object of the present invention is to solve the above-mentioned problems by introducing a novel material design concept which has not been completely satisfied by the conventionally known methods and the like. It tries to solve the point.
- [0006] As a result of various studies to solve such problems, it was found that the object can be achieved by using a water-insoluble water-soluble polymer, and the present invention was completed. ..That is, the gist of the present invention is a slow-acting granular fertilizer characterized by being surface-coated with a water-insoluble water-soluble polymer or containing the water-insoluble water-soluble polymer, and a method for producing the same.

- [0007] The details of the present invention will be described below. In the following, all % in the text mean % by weight. The fertilizer used in the present invention is not particularly limited. In addition to granular simple fertilizers such as urea, ammonium sulfate, ammonium chloride, potassium chloride, sulfuric acid, ammonium phosphate, etc., granular fertilizers containing multiple components such as N, K₂O and P₂O₅ are used as the raw fertilizer of the present invention. To be done. The particle size and shape of the fertilizer are not particularly limited, but granular particles having a size of 1 to 4 mm are generally applied, but particles having a spherical shape or a shape close to a spherical shape are more preferable than those having an angular shape or an irregular shape. Is preferred. Further, in the case of producing these particles and the like, as a binder component, an inorganic component such as talc, diatomaceous earth, clay or the like can be added, and in addition to the above components, a trace metal fertilizer component such as magnesium can be added. ...
- [0008] Further, in order to improve the soil quality and keep the active ingredient in the soil, organic ingredients such as oil cake and wood flour may be added. The present invention is characterized in that these fertilizer particles are coated with a water-insoluble polymer whose surface is water-insolubilized, or contain the water-insolubilized water-soluble polymer. A method of applying a water-soluble polymer to the surface of the particles, or blending a water-soluble polymer into the fertilizer component and granulating, or further applying a water-soluble polymer to the surface of the particles and then insolubilizing the water-soluble polymer in water is adopted. To be
- [0009] Specific examples of the water-soluble polymer include polyvinyl alcohol, polyacrylamide, polyacrylic acid, polymethacrylic acid, polyvinylamine, polyvinylpyrrolidone, and maleic anhydride-containing polymers. These polymers may be used alone or as a mixture of two or more kinds, and these water-soluble polymers contain the above-mentioned base monomer unless it is against the gist of the present invention. For example, vinyl alcohol-vinyl acetate, vinyl alcohol- It is a copolymer of ethylene, maleic anhydride-isobutylene and the like, and also includes a water-soluble polymer.
- [0010] Further, the water-soluble polymer in the present invention may be used in the presence of other inorganic substances or organic substances in addition to the water-soluble polymer as long as the purpose of coating is not impaired. For example, for the purpose of adjusting the dissolution property or increasing the amount of polymer, in addition to inorganic substances such as talc, calcium carbonate, clay, diatomaceous earth, silica, metal oxides, sulfur, etc., surfactants, organic substances such as wax, etc. are added. I don't mind.
- [0011] As a method of applying the water-soluble polymer to the surface of the fertilizer particles, for example, an aqueous solution of the water-soluble polymer can be applied by a method such as spray application or short-time immersion. When the fertilizer components are mixed and mixed, they can be contained by a method of blending and mixing an aqueous solution of a water-soluble polymer and then granulating.
- [0012] In the case of spray coating, as an industrially suitable apparatus, in addition to a general Henschel mixer or a Nauter mixer, a rotary drum type coater (see Japanese Patent Laid-Open No. 52-61216) and a rotary pan type coater (Japanese Laid-Open Patent Publication No. No. 5-85873), a rotary drop coater (see Japanese Patent Application Nos. 5-139376, 5-185612, and 5-342527), a vibrating flow device (see JP-A 1-245847), and a Wurster type coater. , A fluidized bed type coater (see Japanese Patent Publication No. 4-61840).
- [0013] The concentration of the water-soluble polymer is appropriately selected depending on the coating method, but in the case of spray coating, a specific example is 0.1 to 30% when polyvinyl alcohol is used as the polymer, and preferably 1 to 10%. %. Examples of the method for insolubilizing the water-soluble polymer in water include, for example, thermosetting by heating, crystallization, or the like, and a cross-linking agent, a crosslinking catalyst, or the like is added to an aqueous solution of the water-soluble polymer, and thermal crosslinking is performed during heating such as drying. By inducing a reaction, or in the case of insolubilizing the surface with water, a cross-linking reaction is caused. A cross-linking agent, a cross-linking catalyst, etc. are sprayed in a gas state or an aqueous solution onto particles after coating a water-soluble polymer. It can be carried out by diffusing into the coating film by a method such as the above and causing a thermal crosslinking reaction at the time of heating such as drying as in the above.
- [0014] By appropriately selecting the water-insolubilizing condition, the release rate of the active ingredient can be adjusted, which is industrially preferable. Specific examples of the crosslinking agent and the like include 2,2'-azobis(2-amidinopropane) dihydrate, 2,2'-azobis[2-(2-imidazolin-2-yl)propane] dihydrate, 4 -Radical generators such as polycondensates of diazodiphenylamine sulfate and formaldehyde, aldehydes such as formaldehyde, acetaldehyde and butyraldehyde, and ketones such as acetone.
- [0015] Specific examples of the crosslinking catalyst and the like include hydrochloric acid, sulfuric acid, ammonia, inorganic acids such as sodium borate, and alkali. The cross-linking agent, the cross-linking catalyst, etc. are appropriately used in

consideration of the water-insolubilizing reaction of the water-soluble polymer, may not be used at all, or may be used both. When the water-soluble polymer is insolubilized by heating, the temperature is usually 50 to 300°C, preferably 100 to 250°C. The heating time is 0.001 to 10 hours, preferably 0.01 to 1 hour. When the temperature is high, it becomes insoluble in water by heating for a relatively short time, but when it is low, heating for a relatively long time is required. The required temperature and time differ depending on the type of polymer used, and are appropriately selected and determined. As the heating device, an ordinary dryer or the above spray coating device can be used as it is.

- [0016] The addition amount of the crosslinking agent and the crosslinking catalyst is usually 0.001 to 10%, preferably 0.1 to 2% with respect to the water-soluble polymer. The cross-linking agent such as formaldehyde is 1 to 90%, preferably 10 to 50%, based on the water-soluble polymer. This method is preferable because slow-release fertilizer particles can be produced inexpensively without using an organic medium having various problems when producing slow-release fertilizer particles. Further, it is preferable to select water-insolubilization conditions because the release rate of the active ingredient can be adjusted.
- [0017] **EXAMPLES** Next, the present invention will be described in more detail with reference to specific examples, but it goes without saying that the present invention is not limited by the examples unless it exceeds the gist. According to a conventional method, ammonium phosphate, potassium chloride, urea and diatomaceous earth were used as raw materials to produce spherical fertilizer particles having an active ingredient of 8% each of nitrogen, phosphorus and potassium and an average particle diameter of about 3 mm. A 4% aqueous solution of polyvinyl alcohol (manufactured by Wako Pure Chemical Industries, Ltd., weight average molecular weight: 88,000) was spray-coated on the fertilizer particles.
- [0018] The details of the coating method are as follows. Coating solution: polyvinyl alcohol 4% solution temperature 25°C Coating amount 20 kg/fertilizer particles 8 kg Apparatus: rotary ventilation coating apparatus (SRTA2-type manufactured by Okawara Seisakusho) Rotation speed 19 rpm Drying condition: Dry gas flow rate 335 m³ / h (120°C), temperature 120°C Wind direction; opposite direction to the spray direction of coating solution Spray speed of coating solution: 400 g/min Product temperature during coating: 60°C (rotation, direct temperature to fertilizer particles during spraying) Measured by inserting the sensor)
- [0019] After the coating was completed, the temperature of the dry gas was raised to 90° C. for 5 minutes, and the product temperature was heated to 200° C. for 5 minutes to carry out a water insolubilization treatment. 10 g of the particles were placed in 200 ml of water and examined for change in a thermostat at 25°C. As a result, all particles kept their original shape after 24 hours, and the elution rate of the active ingredient into water was 5% or less. Thereafter, the elution rate of the active ingredient was 10% on the 7th day, 25% on the 14th day, and 80% on the 49th day.
- [0020] Comparative Example 1 Fertilizer particles were produced in the same manner as in Example 1 except that the application of polyvinyl alcohol was omitted, and the immersion test in water was conducted. After the immersion, all the particles were disintegrated, the original shape was not maintained, and the elution rate of the active ingredient in water was 90% or more.
- [0021] Reference Example 1 Fertilizer particles were produced in the same manner as in Example 1 except that the heat treatment condition after coating polyvinyl alcohol was a product temperature of 80° C.-20 minutes, and an immersion test in water was conducted. In this case, the polyvinyl alcohol was not sufficiently insolubilized, all the particles disintegrated after the immersion, the original shape was not maintained, and the elution rate of the active ingredient into water was 90% or more.
- [0022] According to the present invention, a slow-acting granular fertilizer can be produced inexpensively without using an expensive solvent, without risk of fire or explosion at the time of production, without fear of deterioration of production environment. be able to.

Claims

- [0001] A slow-release granular fertilizer characterized by containing a water-insoluble water-soluble polymer surface-coated with the water-insoluble water-soluble polymer.
- [0002] The slow-release effect according to claim 1, wherein the water-soluble polymer is one kind or two or more kinds selected from polyvinyl alcohol, polyacrylamide, polyacrylic acid, polymethacrylic acid, polyvinylamine, polyvinylpyrrolidone, and maleic anhydride-containing polymer. Granular fertilizer.

- [0003] The method for producing a slow-release granular fertilizer according to claim 1 or 2, wherein a water-soluble polymer is applied to the surfaces of fertilizer particles, and the water-soluble polymer is then insolubilized with water.
- [0004] The method for producing a slow-acting granular fertilizer according to claim 1 or 2, wherein the water-soluble polymer is mixed with a fertilizer component, granulated, and then the water-soluble polymer is water-insolubilized.
- [0005] The method for producing a slow-acting granular fertilizer according to claim 1 or 2, wherein the water-soluble polymer is mixed with a fertilizer component, granulated, the water-soluble polymer is applied, and the water-soluble polymer is then insolubilized in water. .
- [0006] The method for producing a slow-release granular fertilizer according to claim 3, wherein the water-soluble polymer is used as an aqueous solution.
- [0007] The method for producing a slow-release granular fertilizer according to any one of claims 3 to 5, wherein the water-soluble polymer is heated to insolubilize it.
- [0008] The method for producing a slow-release granular fertilizer according to any one of claims 3 to 5, wherein the water-insoluble polymer is crosslinked to make it insoluble in water.
- [0009] The method for producing a slow-release granular fertilizer according to claim 3 or 5, wherein the water-soluble polymer is applied to the fertilizer particle surface by a spray method.

JPH11228271A - PRODUCTION OF COATED GRANULAR FERTILIZER

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Abstract

PROBLEM TO BE SOLVED: To provide a method suitable for the large-scale production in a method for coating the surface of a granular fertilizer with a film consisting essentially of a polymer and producing a coated granular fertilizer at a controlled dissolution rate. **SOLUTION:** Dust is removed from a used gas in a dust collector and the resultant gas is circulated for reuse in a method for producing a coated granular fertilizer comprising spraying a liquid containing a film material consisting essentially of a polymer and dissolved or suspended in a solvent on granular fertilizer grains under a gas stream, evaporating the solvent and forming a film on the surface of the granular fertilizer grains. Furthermore, in the method, a part of the circulating gas is used as a gas for back blowing of the dust collector.

Description

- [0001] **TECHNICAL FIELD** The present invention relates to a method for producing a coated granular fertilizer in which the surface of the granular fertilizer is coated with a film containing a polymer compound as a main component to control the dissolution rate.
- [0002] 2. Description of the Related Art Conventionally, various kinds of fertilizers have been used in the agricultural field. The form is solid granular or liquid, and the fertilization rate is from fast-acting to slow-acting. There are even things. Above all, the coating (coating) fertilizer obtained by coating (coating) granular fertilizer with a polymer compound (resin) has the characteristic that the fertilizer components are gradually released over a long period of time, and the number of times of fertilizer application is small. , Has attracted attention as a labor-saving fertilizer that can cope with the recent decrease in the agricultural population.
- [0003] Conventionally, various inexpensive resins have been used for this coating material, mainly including inexpensive and general-purpose polyolefin resins such as polyethylene and polypropylene, polyvinyl chloride and derivatives thereof.
- [0004] On the other hand, as a coating method, a coating solution obtained by dissolving a resin component in an organic solvent to form a solution is continuously sprayed on the granular fertilizer particles under a gas stream, and at the same time, the solvent is evaporated and dried to form a resin layer on the particle surface. (Hereinafter referred to as "spray coating".) The method is generally adopted.
- [0005] However, the method for producing such a coated fertilizer on a large scale and efficiently has not been studied so far.
- [0006] One of the problems in large-scale production is the handling of solvents. That is, in the case of small-scale production, the organic solvent vapor in the gas discharged by spray coating can be thrown away to the atmosphere as it is, adsorbed and removed, absorbed with water, or incinerated, but it can be disposable. In the case of large-scale production, such a method is uneconomical and causes problems such as solvent treatment.
- [0007] On the other hand, when using a flammable organic solvent as the solvent, it is possible to use an inert gas such as nitrogen as the solvent drying gas to prevent explosion and fire. It is necessary to study the efficient usage of the method and the prevention method of air mixing.
- [0008] The present invention has been made in view of the above-mentioned conventional circumstances, and in particular, is suitable for large-scale production of coated granular fertilizer, industrially, to provide an economically advantageous method for producing coated granular fertilizer. With the goal.
- [0009] The method for producing coated granular fertilizer according to the present invention comprises a coating liquid obtained by dissolving or suspending a coating material containing a polymer compound as a main component in a solvent to form granular fertilizer particles under a gas stream. In the method for producing a coated granular fertilizer in which the solvent is sprayed and the solvent is evaporated to form a film on the surface of the granular fertilizer particles, the used gas is dedusted by a dust collector and circulated and reused. It is characterized in that a part thereof is used as a gas for back blow of the dust collector.

- [0010] By circulating and reusing the gas used for spray coating, waste of solvent and waste of gas can be prevented, and efficient manufacturing can be performed.
- [0011] That is, the solvent can be recovered by circulating and reusing the used gas. In addition, since the device can be completely sealed, when using an inert gas such as nitrogen as the circulating gas, the gas usage efficiency is improved, air is prevented from mixing, and flammable solvents are used safely. You will be able to.
- [0012] By the way, in this way, when the used gas is circulated and reused, the used gas discharged from the coating device contains solids such as fine powder of fertilizer and fine powder of the coating material that was not attached to the fertilizer. Therefore, in order to prevent problems such as blockage of the gas circulation system pipes, it is necessary to remove them with a dust collector.
- [0013] A bag filter that uses a filter cloth is suitable as a dust collector for dust removal, but this dust collector regularly back blows the dust that has accumulated on the filter cloth during the dust removal process (the air flow from the back side of the filter cloth on which dust is attached. You have to send it) and get rid of it. When the back blow gas is taken from the outside (for example, the outside air), in the present invention, the system is hermetically closed in order to circulate and reuse the exhaust gas of the coating apparatus. It needs to be purged out. In this case, since the purge gas contains solvent vapor, a facility for continuously treating the vapor is required, which is not economical.
- [0014] In the present invention, since the used gas is also circulated and reused for this back blow gas, the gas purging to the outside of the system is unnecessary, and therefore, the solvent vapor processing equipment is also unnecessary.
- [0015] In the present invention, the dust-removed gas is then cooled, and it is preferable to remove the solvent in the gas by condensing, and then circulate and reuse. In this case, it is also preferable to collect and reuse the condensed solvent. ..Further, it is preferable that the gas cooled to remove the solvent is heated and then circulated and reused.
- [0016] By the way, in general, as the type of liquid spray nozzle, one-fluid spray nozzle that atomizes by utilizing the pressure of the liquid itself to be sprayed and two-fluid that sprays the liquid and gas at the same time and atomizes the liquid by the pressure of the gas. There is a spray nozzle. In the case of the spray coating according to the present invention, it is preferable to use a two-fluid spray nozzle because the atomized droplet diameter can be freely controlled by the gas pressure. For example, when introduced from the outside air, gas purging and treatment of solvent vapor in the purge gas are required as in the case of the back blow gas.
- [0017] Therefore, in the present invention, it is preferable to circulate and reuse the used gas as the nozzle gas for spraying the coating liquid.
- [0018] The back blow gas and the coating liquid spraying gas are preferably used after dusting the used gas, and it is advantageous to use the back blow gas and the coating liquid spraying gas in common.
- [0019] In the present invention, the ventilation means for gas circulation is advantageously installed downstream of the gas cooling means for condensing and removing the solvent. Further, it is advantageous to separate the gas for back blow and the gas for spraying the coating liquid from the discharge side of the air circulation means for gas circulation.
- [0020] BEST MODE FOR CARRYING OUT THE INVENTION Embodiments of the present invention will be described in detail below.
- [0021] First, the overall configuration of the gas circulation reuse process according to the present invention will be described.
- [0022] FIG. 1 is a system diagram showing an embodiment of a gas circulation reuse process according to the present invention.
- [0023] In FIG. 1, reference numeral 1 denotes a coating device in which the coating liquid is sprayed from the two-fluid nozzle 1A while bringing the granular fertilizer particles into contact with the gas stream. Reference numeral 2 denotes a dust collector (bag filter) that removes solids such as fertilizer fine powder contained in the used gas discharged from the coating apparatus 1 and coating material fine powder not attached to the fertilizer. By removing the used gas from the dust collector 2, it is possible to prevent problems such as pipe clogging in the circulation path of the used gas.
- [0024] A condenser 3 cools the used gas here to condense and remove the solvent vapor in the gas and collect the solvent in the tank 4. In order to appropriately circulate and reuse the used gas, it is necessary to make the amount of the solvent condensed and removed by the condenser 3 equal to the amount of the solvent sprayed by the coating apparatus 1. The solvent recovered here can be reused for the preparation of the coating liquid.

- [0025] Reference numeral 5 denotes a blower for gas circulation, and as shown in the figure, the blower 5 can be miniaturized by being provided on the downstream side of the condenser 3 to blow the gas that has been cooled and has a reduced capacity.
- [0026] Reference numeral 6 is a heater, which heats the gas once cooled in the condenser 3 and sends it to the coating apparatus 1. In this heater 6, it is necessary to provide the gas with an amount of heat sufficient to evaporate at least the solvent sprayed in the coating apparatus 1.
- [0027] Reference numeral 9 denotes a compressor, which raises the pressure of the gas collected from the discharge side of the blower 5 to the pressure necessary for spraying the coating liquid, and supplies the gas to the two-fluid spray nozzle 1A of the coating apparatus 1 and the back blow of the dust collector 2. Delivered as gas for use. That is, the back blow gas needs to have a higher pressure than the gas containing dust to be subjected to the dust removing process. In this embodiment, a part of the circulating gas is extracted and compressed by the compressor 9 is used. Reference numeral 7 is a coating liquid adjusting tank, and 8 is a pump for spraying the coating liquid into the coating apparatus 1.
- [0028] 1 shows an embodiment of a manufacturing process suitable for the present invention, and the present invention is not limited to the illustrated process as long as it does not exceed the gist thereof.
- [0029] For example, the blower 5 does not necessarily have to be located between the condenser 3 and the heater 6, but may be arranged between the dust collector 2 and the condenser 3 or between the heater 6 and the coating apparatus 1. Further, for the purpose of controlling the pressure inside the coating apparatus 1, a plurality of blowers can be installed at these locations.
- [0030] The extraction position of the nozzle gas for spraying the coating liquid is not limited to the discharge side of the blower 5 as shown in FIG. 1, but it may be compressed after the extraction, or the solvent vapor in the gas may be condensed at the time of compression. Therefore, it is preferable that the pressure is as high as possible and the concentration of solvent vapor in the gas is low in the circulating gas system passage, and for that purpose, it is preferable to be on the discharge side of the blower 5.
- [0031] The position at which the back blow gas is extracted from the gas circulation system path is not particularly limited as long as it is between the downstream side of the dust collector 2 and the coating device 1 because the back blow gas needs to contain at least dust. However, it is preferable to use the discharge side of the blower 5 for the same reason as the extraction of the nozzle gas for spraying the coating liquid, and as shown in FIG. It is efficient.
- [0032] Furthermore, in order to replace the gas in the gas circulation system passage with the outside gas, the gas suction port and the discharge port can be provided at appropriate places in the gas circulation system passage. In addition, a gas flow meter, a damper, a valve, a flow rate control device such as a thermometer, a measuring device, and the like can be installed at appropriate places in the gas circulation system path, if necessary.
- [0033] The invention is particularly suitable for batch-type coating processes, but it is equally applicable to continuous-type coating processes.
- [0034] Next, a method for producing coated granular fertilizer by this process, types of coated fertilizer, coating material, and the like, devices and equipment to be used will be described.
- [0035] (1) Manufacturing method A coating solution is prepared by dissolving a main component polymer, a surfactant, and other additives in a solvent described below in a preparation tank 7, and further adding inorganic powder if necessary. On the other hand, while charging the granular fertilizer as a raw material into the coating device 1 and keeping the product temperature at 30 to 100°C, preferably 40 to 80°C by the hot gas flow circulated from the heater 6 in the coating device 1, Coating is performed by spraying the coating solution supplied from the adjusting tank 7 by the pump 8 with the spray nozzle of the coating apparatus 1, preferably the two-fluid spray nozzle 1A. In addition, the product temperature here means a temperature measured by directly inserting a temperature detection terminal into the fertilizer particle group in a sprayed state. The temperature of the product is adjusted and maintained by a hot gas stream for removing the solvent by evaporation. The temperature of the hot gas flow is, of course, required to be higher than the product temperature, and is usually 50 to 150°C. The flow rate is determined in consideration of the solvent removal rate, the product temperature, the flow state of particles, and the like. The coating amount of the coating material (coverage) is 3 to 20% by weight, preferably 5 to 15% by weight, based on the raw material granular fertilizer. The spray coating time is usually 0.1 to 10 hours, preferably 0.2 to 3 hours, although it is determined by the concentration of the coating solution, the spray rate, the coverage, and the like. After the coating is completed, the fertilizer can be extracted from the coating apparatus 1 as it is to obtain a coated granular fertilizer.

- [0036] (2) Granular fertilizer as a raw material The granular fertilizer (raw fertilizer) is not particularly limited, and in addition to granular simple fertilizers such as urea, ammonium sulfate, ammonium chloride, potassium chloride, potassium sulfate, and ammonium phosphate, N, K₂O, etc. , Granular fertilizers containing multiple components such as P₂O₅ are used. The particle size and shape of the granular fertilizer are not particularly limited, but in general, particles having a particle size of 0.5 to 4 mm and having a spherical shape or a shape close to a spherical shape are preferable to those having an angular shape or an irregular shape.
- [0037] (3) Coating Material There is no particular limitation on the type of polymer compound as a coating material, and examples thereof include polyolefin, polyvinylidene chloride resin, polyvinyl chloride resin, polystyrene resin, polycarbonate, polyamide, polymethyl methacrylate. , Polyurethane, thermoplastic resin such as ethylene-vinyl acetate, alkyd resin, phenol resin, urea resin, thermosetting resin such as melamine resin, ABS resin, epoxy resin, silicone resin, other natural rubber, SBR, NBR, etc. Examples of the synthetic rubber include degradable polymers such as polycaprolactone, polybutyric acid, aliphatic polyester, polyglycolide, polyvinyl alcohol, and polyethylene oxide. Of these, a thermoplastic resin having a low moisture permeability and a high elution preventing effect even in a small amount is preferable, and a polyolefin resin such as polyethylene or polypropylene is particularly suitable. These resins can be used alone or as a mixture of two or more kinds. In addition to the polymer compound, other inorganic substances or organic substances may coexist as long as the purpose of coating is not impaired. For example, in the case of coating with a resin having high water permeability as described above, talc, calcium carbonate, clay, diatomaceous earth, silica, metal oxides, sulfur, etc. may be used for the purpose of adjusting elution and increasing the amount of resin. In addition to inorganic substances, organic substances such as surfactants, waxes and plasticizers may be added.
- [0038] (4) The solvent and the coating liquid solvent species are not particularly limited and are appropriately selected in consideration of various conditions. Examples of the judgment material include the dissolving power, the melting temperature, the handling property, the ease of recovery, the toxicity, the safety, the price, etc. of the polymer compound as the film material. For example, when a polyolefin resin, particularly low-density polyethylene, is used as the coating material, a hydrocarbon solvent such as hexane, octane, toluene, xylene, or tetralin, or a chlorinated hydrocarbon solvent such as trichloroethylene or perchloroethylene is preferable. ..
- [0039] The concentration of the coating liquid is also not particularly limited. It is preferable to increase the concentration of the coating liquid because the amount of solvent used is reduced and the processing time is shortened. Further, when the concentration of the coating liquid is lowered, the viscosity of the solution is lowered and the handling property is improved. However, in the case of spray coating, it is necessary to adjust the concentration according to the spray nozzle used and the spray pressure so that the viscosity is such that an appropriate spray state is obtained. As a specific example, when low density polyethylene is used as the coating material and perchlorethylene is used as the solvent, the concentration of the coating solution is 1 to 12% by weight, preferably 3 to 10% by weight. In general, many polymer compounds are insoluble in solvents at low temperatures, and therefore, heating and stirring are usually required for dissolution.
- [0040] (5) Coating Device The coating device is not particularly limited as long as it is a device having a structure and a function of mixing and agitating the granular substance and sufficiently contacting with the air flow. When classified by the mixing and agitation system, examples of the type of apparatus for mixing and agitation using an agitation blade include a Henschel mixer and a Nauta mixer. A rotary drum type coater (Japanese Unexamined Patent Publication No. 52-61216), a rotary pan type coater (Japanese Unexamined Patent Publication No. 5-85873), and a rotary falling type are used as a device for agitating particulate matter in association with the movement of the apparatus itself. Examples thereof include coaters (JP-A-7-8869, JP-A-7-31914). A vibrating and fluidizing device (Japanese Patent Laid-Open No. 1-245847) that is agitated by an oscillating force is preferable because a large amount of particulate matter can be vigorously agitated. Examples of the type that is agitated by energy include a Wurster type or spouted bed type coater in which particles are blown away and circulated and mixed, and a fluidized bed type coater (Japanese Patent Publication No. 4-61840) is used as a method of floating particles. ..
- [0041] The application of the coating liquid to the particulate substance is usually carried out by using a one-fluid or a two-fluid spray nozzle, preferably a two-fluid spray nozzle, and spraying at a suitable position in the agitated particles. The two-fluid spray nozzle is a nozzle having a double pipe structure, in which liquid flows in the inner pipe and gas flows in the outer pipe. As described above, the solvent is evaporated and dried and removed by a hot gas stream that is circulated and reused. As the gas, in addition to air, an inert gas such as nitrogen or carbon dioxide can be used in terms of safety.
- [0042] (6) Dust collector A normal dust collector is used as the dust collector. The type is not particularly limited, but examples thereof include a centrifugal dust collector such as a cyclone, a filter dust collector such as a bag filter, a cartridge filter, and a precoat filter, and an electric dust collector such as a Cottrell dust collector. In selecting the dust collector, it is necessary to consider the particle size of the fine powder to be collected, the amount thereof, the gas flow rate under the

use conditions, the pressure loss, the temperature, etc., but in the process of the present invention, a bag filter or a cyclone And a bag filter combination is preferable.(7) Condenser and heater A usual heat exchanger is used as the condenser and the heater. The type is not particularly limited, but examples thereof include a multi-tube heat exchanger, a double-tube heat exchanger, a spiral wound plate heat exchanger, a fin tube heat exchanger, a plate fin heat exchanger, a plate heat exchanger. A heat exchanger, a cascade type cooler, a tube flow type heat exchanger, a box cooler, a rectangular type heat exchanger, etc. are mentioned. The selection criteria include gas flow rate, exchange heat quantity, temperature, price, etc., but in the present invention, a multi-tube heat exchanger and a fin-tube heat exchanger are preferable. As the heat exchange heat medium, steam, hot water, oil, cold water, brine or the like can be appropriately used. Further, the used gas discharged from the coating device and the gas after dust removal and solvent removal introduced into the coating device may be heat-exchanged.

- [0043] (8) Blower As the blower, a blower such as an ordinary fan or blower or a compressor is used. The type thereof is not particularly limited, but examples thereof include a turbo type axial flow type or centrifugal type blower, a positive displacement type rotary type or reciprocating type compressor, and the like. When selecting, it is necessary to consider the nature, flow rate, required pressure, temperature, etc. of the gas to be handled, but in the present invention, a turbo centrifugal blower is suitable.
- [0044] (9) Compressor The type of the compressor is not particularly limited, but examples thereof include a positive displacement rotary or reciprocating compressor. The discharge pressure is 0.1 to 50 kg/cm², preferably 1 to 10 kg/cm². The flow rate of the nozzle gas for spraying the coating liquid is 50 to 1000 volume times, preferably 300 to 600 volume times the spray rate of the coating liquid. The flow rate of the back blowing gas is generally 1 to 10 L/min per 1 m² of filter area. In the present invention, a rotary roots blower or the like is suitable as the compressor. Further, when the circulating gas is compressed, the solvent vapor contained therein is condensed by the compression, so that a mechanism for extracting the solvent is required. When the compressor is commonly used as the nozzle gas for spraying the coating liquid and the gas for back blow, the gas pressure boosted by a pressure suitable for the nozzle gas for liquid spray is too high as the gas for back blow, or low. If it is too much, a pressure reducing valve or the like may be provided in the back blow gas supply system to adjust the pressure appropriately.
- [0045] EXAMPLES Next, the present invention will be specifically described by way of examples, but the present invention is not limited to the following examples unless it exceeds the gist thereof.
- [0046] Example 1 A coated granular fertilizer was produced using the equipment capable of circulating gas shown in FIG.
- [0047] In addition, the gas circulation reuse process of FIG. 2 is the same as the gas circulation reuse process shown in FIG. 1 except that the gas suction port and the exhaust port, gas flow meters, dampers, valves, thermometers, and other flow control devices 2 is different in that devices and the like are installed, and other basic configurations are the same. In FIG. 2, members having the same functions as those shown in FIG. 1 are designated by the same reference numerals.
- [0048] In this example, a fluidized bed type coating device (fluidized bed diameter 25 cm, height 150 cm) was used as the coating device 1. In this coating apparatus 1, one external mixing type two-fluid spray nozzle 1A was installed. As the dust collector 2, a pulse jet type bag filter having a filtration area of 1.5 m² was installed. As the condenser 3, a horizontal fin-tube type heat exchanger having a heat transfer area of 40 m² was used, and cold water of 5°C was circulated as a cooling liquid. A control valve V1 was installed at the inlet of the cold water so that the flow rate of the cold water could be controlled by the temperature controller 11 in accordance with the instruction of the thermometer 11A on the gas outlet side. Further, a tank 4 for collecting solvent having a capacity of 30 L was provided at the condensate outlet. For the blower 5, a single suction type single-stage turbo blower was used. As the heater 6, a horizontal fin-tube type heat exchanger having a heat transfer area of 9 m² was installed, and steam having a pressure of 1.5 kg/cm² was circulated as a heat medium. A control valve V2 was installed at the steam inlet so that the flow rate of the steam could be controlled by the temperature controller 12 on the gas inlet side of the coating apparatus 1 in accordance with the instruction from the thermometer 12A. Further, an orifice type gas flow meter 13 was provided on the downstream side of the heater 6 so that the gas flow rate could be controlled by the opening degree of a damper 14 installed after the blower 5. Further, a nitrogen gas suction port 14A and a nitrogen gas discharge port 14B were attached to both sides of the damper 14. An oxygen concentration meter 15 was installed between the blower 5 and the damper 14. Further, a part of the circulating gas was extracted from the discharge side of the blower 5, and the pressure was increased by the roots blower compressor 9 so that it could be supplied to the two-fluid spray nozzle 1A and the dust collector 2 of the coating apparatus 1. The back blown gas of dust adhering to the filter of the dust collector 2 is intermittently controlled by the solenoid valve 2A at the bag filter inlet of the dust collector 2 by controlling the pressure of the gas boosted by the roots blower compressor 9 with the pressure reducing valve 16. It was made to eject to (pulse jet). A 125 A steel pipe was used as a circulation system pipe connecting these respective devices.

- [0049] The coating solution was prepared by adding 1.5 kg of low-density polyethylene (density 0.92) having a melting point of 106° C. as a coating material to 15.2 kg of toluene as a solvent and dissolving it at 80° C. The coating solution was prepared in the coating liquid adjusting tank 7 of FIG. 2, and was sprayed from the two-fluid spray nozzle 1A attached to the coating apparatus 1 through the supply pipe using the pump 8.
- [0050] As a raw material fertilizer, 10 kg of granular urea having an average particle diameter of 2.5 mm was charged in the above fluidized bed coating apparatus 1. Next, the compressor 9 was started, and the nozzle gas for liquid spray was adjusted to be fed at 4 kg/cm². Further, the pressure of the back blow gas of the bag filter of the dust collector 2 was adjusted by the pressure reducing valve 16 to be 2 kg/cm², and the back blow interval was set to 10 seconds by the solenoid valve. Next, the damper 14 was closed, nitrogen gas was introduced into the gas circulation system from the nitrogen gas suction port 14A, and was discharged from the gas discharge port 14B to replace the air in the system with nitrogen gas. When the reading of the oxygen concentration meter 15 became 1% or less of oxygen concentration, the nitrogen gas suction/exhaust ports 14A and 14B were closed and the damper 14 was opened. Then, the blower 5 was started, and the opening degree of the damper 14 was adjusted so that the gas circulated through each device at a flow rate of 500 Nm³/hr. At this time, the fertilizer in the coating apparatus 1 was in a fluidized state. On the other hand, the outlet gas temperature of the condenser 3 is set to 10°C, and the inlet gas temperature of the coating device 1 is set to 75°C. The coating liquid was sprayed for 23 minutes at a flow rate of 30 kg/hr (1.04 kg as a coating material, 10.5 kg as a solvent). During this time, each set temperature was kept at the set value. The oxygen concentration in the circulating gas system was also kept below 1%. Further, it was observed that the continuously condensed solvent flowed into the recovery solvent tank 4 attached to the condenser 3. After stopping the pump 8 and the compressor 9, the nitrogen gas suction port 14A and the discharge port 14B were opened, the damper 14 was closed, and the solvent gas remaining in the gas circulation system was purged with nitrogen gas. Then, when the fertilizer was taken out, a coated fertilizer having a good appearance was obtained. As a result of measuring the weight and calculating the increase from the weight of the original fertilizer charged, it was confirmed that 99% of the sprayed coating material was coated. On the other hand, the recovered solvent was 10.1 kg, and 96% was recovered. In addition, when the bag filter was examined, about 30 g of urea powder and polyethylene powder were wiped off in the filter casing.
- [0051] In the manufacturing process of this coated granular fertilizer, since the system was closed, no air was mixed in and nitrogen could be efficiently circulated and reused. Further, the solvent recovered in the tank 4 could be effectively reused for the preparation of the coating liquid.
- [0052] As described in detail above, according to the method for producing a coated granular fertilizer of the present invention, the solvent can be recovered by recycling the used gas; the apparatus is completely sealed. Therefore, when an inert gas such as nitrogen is used as the circulating gas, it is possible to improve the gas usage efficiency, prevent the inclusion of air, and safely use the flammable solvent; Since the used gas is also used for the back blow gas of the dust collector for dust removal of the used gas, there is no need for gas purging or treatment of solvent vapor in the purge gas; It becomes possible to carry out industrially and economically advantageously.

Claims

- [0001] A coating liquid prepared by dissolving or suspending a coating material containing a polymer compound as a main component in a solvent is sprayed on the granular fertilizer particles under a gas stream and the solvent is evaporated to form a coating on the surface of the granular fertilizer particles. In the method for producing a coated granular fertilizer, the used gas is dedusted by a dust collector and circulated and reused, wherein a part of the circulating gas is used as a gas for back blow of the dust collector. Manufacturing method of granular fertilizer.
- [0002] The method for producing a coated granular fertilizer according to claim 1, wherein the dust-removed gas is cooled, the solvent in the gas is condensed and removed, and then the recycled dust is recycled.
- [0003] The method for producing a coated granular fertilizer according to claim 2, wherein the condensed solvent is recovered and reused.
- [0004] The method for producing a coated granular fertilizer according to claim 2 or 3, wherein the gas from which the solvent has been removed is heated and then recycled.
- [0005] The method for producing a coated granular fertilizer according to any one of claims 2 to 4, wherein a ventilation means for gas circulation is installed on the downstream side of the gas cooling means.
- [0006] The method for producing a coated granular fertilizer according to any one of claims 1 to 5, wherein the circulating gas is partially dusted and then used as the gas for spraying the coating liquid.

- [0007] 7. The method for producing a coated granular fertilizer according to claim 6, wherein the gas for spraying the coating liquid is collected from the discharge side of a blowing means for gas circulation.
- [0008] The method for producing a coated granular fertilizer according to claim 1, wherein the dust-removed gas is used as a gas for back blowing.
- [0009] The method for producing a coated granular fertilizer according to any one of claims 1 to 8, characterized in that the gas for backblowing is fractionated from the discharge side of the ventilation means for gas circulation.
- [0010] 10. The method for producing a coated granular fertilizer according to claim 6, wherein the gas for backblowing and the gas for spraying the coating liquid are commonly used.

TRATADO EN COOPERACION DE PATENTES

De la
AUTORIDAD DE EXAMEN PRELIMINAR INTERNACIONAL

Para:		PCT NOTIFICACION DE TRANSMISION DEL REPORTE DE EXAMEN PRELIMINAR SOBRE PATENTABILIDAD (Regla 71.1 del PCT)	
ELMORE, T.J. V.O. P.O. Box 87930 2508 DH Den Haag PAYS-BAS		Fecha de envío (día/mes/año)21.08.2020	
Referencia del agente o solicitante P119252PC00		INFORMACIÓN IMPORTANTE	
Solicitud Internacional No. PCT/IB2019/054628	Fecha de presentación internacional (día/mes/año) 04.06.2019	Fecha de prioridad (día/mes/año) 04.06.2018	
Solicitante Pursell Agri-Tech, LLC			
1. Por el presente se notifica al solicitante que esta Autoridad de Examen Preliminar Internacional transmite acá el reporte preliminar internacional sobre patentabilidad y sus anexos, si los hay, establecido en la solicitud internacional. 2. Una copia del reporte y sus anexos, si los hay, es transmitida a la Oficina Internacional para comunicación a todas las Oficinas elegidas. 3. Cuando se requiera por alguna de las Oficinas elegidas, la Oficina Internacional preparará una traducción al inglés del reporte (pero no de ningún anexo) y transmitirá dicha traducción a esas Oficinas. 4. RECORDATORIO El solicitante debe ingresar en la fase nacional ante cada Oficina elegida realizando ciertos actos (presentar traducciones y pagar las tasas nacionales) dentro de 30 meses desde la fecha de prioridad (o posterior en algunas Oficinas) (Artículo 39(1)) (ver también el recordatorio enviado por la Oficina Internacional con el Formulario PCT/IB/301). Cuando una traducción de la solicitud internacional deba ser presentada a una Oficina elegida, esa traducción debe contener una traducción de cualquier anexo al reporte preliminar internacional sobre patentabilidad. Es responsabilidad del solicitante preparar y presentar dicha traducción directamente a cada Oficina elegida en cuestión. Para mayores detalles sobre los límites de tiempo aplicables y los requerimientos de las Oficinas elegidas, ver el Volumen II de la Guía del Solicitante de PCT. Se dirige la atención del solicitante al Artículo 33(5), el cual indica que el criterio de novedad, nivel inventivo y aplicación industrial descritos en el Artículo 33(2) a (4) simplemente sirve para los propósitos del examen preliminar internacional y que “cualquier Estado Contratante puede aplicar criterios adicionales o diferentes para los propósitos de decidir si, en ese Estado, las invenciones reivindicaciones son patentables o no” (ver también el Artículo 27(5)). Dicho criterio adicional se puede relacionar, por ejemplo, con excepciones a la patentabilidad, requerimientos para permitir la divulgación, claridad y soporte para las reivindicaciones.			
Nombre y dirección de correo de la autoridad de examen preliminar internacional:		Oficial autorizado	
 Oficina Europea de Patentes P.B. 5818 Patentlaan 2, NL-2280 HV Rijswijk – Países Bajos Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Muñoz-Manneken, Toñi Teléfono No. +31 70 340-2310 	

TRATADO EN COOPERACIÓN DE PATENTES

PCT

REPORTE PRELIMINAR INTERNACIONAL SOBRE PATENTABILIDAD

(Capítulo II del Tratado en Cooperación de Patentes)

(Artículo 36 y Regla 70 del PCT)

Referencia de archivo del solicitante o agente P119252PC00	PARA ACCION ADICIONAL Ver Formulario PCT/IPEA/416	
Solicitud Internacional No. PCT/EP2019/054628	Fecha de presentación internacional (día/mes/año) 04.06.2019	Fecha de prioridad (día/mes/año) 04.06.2018
Clasificación Internacional de Patente (CIP) o clasificación nacional y CIP INV. C05C9/00		
Solicitante Pursell Agri-Tech, LLC		

1. Este reporte es el reporte de examen preliminar internacional, establecido por esta Autoridad de Examen Preliminar Internacional bajo el Artículo 35 y transmitido al solicitante de acuerdo con el Artículo 36 2. Este REPORTE consiste de un total de <u>6</u> hojas, incluyendo esta hoja de cubierta. 3. Este reporte también está acompañado por ANEXOS, que comprenden: a. ☒ (enviado al solicitante y a la Oficina Internacional) un total de <u>4</u> hojas, como se define a continuación: ☒ [X] hojas de la descripción, reivindicaciones y/o figuras las cuales han sido modificadas y/o hojas que contienen rectificaciones autorizadas por esta Autoridad, a menos que esas hojas fueran reemplazadas o canceladas, y cualquier carta acompañante (ver Reglas 46.5, 66.8, 70.16, 91.2, y Sección 607 de las Instrucciones Administrativas). ☐ hojas que contienen rectificaciones, donde la decisión fue hecha por esta Autoridad de no tomarlas en cuenta ya que ellas no fueron autorizadas por o notificadas a esta Autoridad al momento cuando esta Autoridad Empezó a realizar este reporte, y cualquier carta acompañante (Reglas 66.4bis, 70.2(e), 70.16 y 91.2) ☐ hojas reemplazadas y cualquier carta acompañante, donde esta Autoridad considera que las hojas que reemplazan contienen una enmienda que va más allá de la divulgación en la solicitud internacional como fue presentada, o las hojas de reemplazo no estaban acompañadas por una carta que indica la base para las modificaciones en la solicitud como fue presentada, como se indica en el ítem 4 del Recuadro No. I y el Recuadro Complementario (ver Regla 70.16(b)). b. ☐ (enviado a la Oficina Internacional únicamente) un total de (indicar el tipo y número de portadores electrónicos), que contiene un listado de secuencia, en la forma de un archivo de texto Anexo C/ST.25, como se indica en el Cuadro Complementario Relacionado con el Listado de Secuencias (ver párrafo 3ter del Anexo C de las Instrucciones Administrativas)	
4. Este reporte contiene indicaciones relacionadas con los siguientes ítems: ☒ Recuadro No. I Base del reporte ☐ Recuadro No. II Prioridad ☐ Recuadro No. III No establecimiento de opinión con relación a la novedad, nivel inventivo y aplicación industrial ☐ Recuadro No. IV Falta de unidad de invención ☒ Recuadro No. V Declaración razonada bajo el Artículo 35(2) con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración ☐ Recuadro No. VI Ciertos documentos citados ☒ Recuadro No. VII Ciertos defectos en la solicitud internacional ☐ Recuadro No. VIII Ciertas observaciones en la solicitud internacional	
Fecha de presentación de la demanda 02.09.2019	Fecha de finalización de este reporte 21.08.2020
Nombre y dirección de correo de la autoridad de examen preliminar internacional: Oficina Europea de Patentes P.B. 5818 Patentlaan 2,  NL-2280 HV Rijswijk – Países Bajos Tel. +31 70 340 – 2040 Fax: +31 70 340 - 3016	Oficial autorizado Agra-Gutierrez, C Teléfono No. +31 70 340-1960 

Recuadro No. I

Base del reporte

1. Con relación al **idioma**, este reporte se basa en
- [X] la solicitud internacional en el idioma en el cual fue presentada
- una traducción de la solicitud internacional en , el cual es el idioma de una traducción presentada para los propósitos de:

☐ búsqueda internacional (bajo Reglas 12.3(a) y 23.1(b))

☐ publicación de la solicitud internacional (bajo Regla 12.4(a))

☐ examen preliminar internacional (bajo Reglas 55.2(a) y/o 55.3(a) y (b))
2. Con relación a los **elementos*** de la solicitud internacional, este reporte se basa en *(las hojas de reemplazo que han sido presentadas a la Oficina receptora en respuesta a una invitación bajo el Artículo 14 son referidas en este reporte como “originalmente presentadas” y no se anexan a este reporte):*

Descripción, Páginas

1-29

como se presentaron originalmente

Reivindicaciones, Números

1-15

como se presentaron originalmente

Figuras, Hojas

1,2

como se presentaron originalmente

[] un listado de secuencias – Ver Recuadro Complementario Relacionado con Listado de Secuencias.

3. ☐ Las modificaciones han resultado en la cancelación de:
- ☐ la descripción, páginas

☐ las reivindicaciones, Nos.

☐ las figuras, hojas/figs.

☐ el listado de secuencias (*especificar*):
4. [] Este reporte ha sido establecido como si (algunas de) las modificaciones anexadas a este reporte y enunciadas más adelante no se hubieran hecho, ya que se consideran que van más allá de la divulgación presentada, o no estaban acompañadas por una carta que indica la base para las modificaciones en la solicitud como se presentó, como se indica en el Recuadro Complementario (Reglas 70.2(c) y (c-bis)):
- ☐ la descripción, páginas

☐ las reivindicaciones, Nos.

☐ las figuras, hojas /figs.

☐ el listado de secuencias (*especificar*):

5. ☐ Este reporte ha sido establecido:
- ☐ tomando en cuenta la **rectificación de un error obvio** autorizado por o notificado a esta Autoridad bajo la Regla 91 (Reglas 66.1 (d-bis) y 70.2(e)).

☐ Sin tomar en cuenta la **rectificación de un error obvio** autorizado por o notificado a esta Autoridad bajo la Regla 91 (Reglas 66.4bis y 70.2(e)).
6. ☒ Con relación a búsquedas complementarias (Reglas 66.1ter y 70.2(f)):
- ☒ Una búsqueda complementaria fue llevada a cabo por esta Autoridad el 14.04.2020 (todos los documentos descubiertos se enuncian en el Recuadro Complementario Relacionado con Búsqueda Complementaria).

☐ Se han descubierto documentos adicionales relevantes durante la búsqueda complementaria

☐ No se llevó a cabo ninguna búsqueda complementaria por esta Autoridad porque ésta no serviría ningún propósito útil.
7. ☐ Se han recibido y tomado en cuenta reportes de búsqueda internacional complementarios de Autoridades al establecer este reporte (Regla 45bis.8(b) y (c)).
- * Si el ítem 4 aplica, algunas o todas de esas hojas se pueden marcar “reemplazadas”*

Recuadro No. V **Declaración razonada bajo el Artículo 35(2) con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración**

1. Declaración
- Novedad (N)

Sí: Reivindicaciones 1-15

No: Reivindicaciones

Nivel inventivo (NI)

Sí: Reivindicaciones 1-15

No: Reivindicaciones

Aplicación industrial (AI)

Sí: Reivindicaciones 1-15

No: Reivindicaciones
2. Citaciones y explicaciones (Regla 70.7):
- ver hoja separada

Recuadro No. VII **Ciertos defectos en la solicitud internacional**

Se han observado los siguientes defectos en la forma o el contenido de la solicitud internacional: ver hoja separada

Ad ítem V

Declaración razonada con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración

- D1 US 2015/376077 A1
D2 US 2014/298873 A1
D3 US 4 854 715 A
D4 JP H11 228271 A
D5 JP H08277191 A

1 Novedad – Artículo 33(2) del PCT

Ninguno de los documentos citados anteriormente que describen el estado de la técnica describe todas las características técnicas de las reivindicaciones independientes 1 o 15 en combinación. Por lo tanto, el objeto de las reivindicaciones 1 a 15 es nuevo en el sentido del artículo 33 (2) del PCT.

2 Nivel Inventivo – Artículo 33 (3) del PC

La presente solicitud cumple los criterios del artículo 33(1) del PCT, porque se puede considerar que el objeto de las reivindicaciones 1 a 15 implica una actividad inventiva en el sentido del artículo 33(3) del PCT.

- 2.1 Se considera que el documento D4 es el estado de la técnica más cercano al objeto de las reivindicaciones independientes 1 y 15 y describe un método de recubrimiento de partículas fertilizantes como se describe en comunicaciones anteriores. En particular, D4 describe además que el aparato de revestimiento 1 puede ser un mezclador Henschel o Nauta (véase el párrafo [0040]).

En la carta de fecha 21.07.2020, el solicitante indicó que D4 no reveló directa e inequívocamente que las mezcladoras Henschel o Nauta comprendían un marco de contenedor estacionario con un rotor en el eje central que incluye varias cuchillas como elementos móviles o un marco de contenedor estacionario con

dos rotores sobre dos ejes desplazados del eje del contenedor a distancia y formando un ángulo. La división examinadora discrepa respetuosamente con esta afirmación porque la construcción de un mezclador Henschel o Nauta constituye un conocimiento común en el campo de los aparatos de recubrimiento y, por lo tanto, está fácilmente disponible para los expertos.

Como confirma el solicitante en la página 2, líneas 22-25 de la carta de fecha 21.07.2020, el objeto de las reivindicaciones 1 y 15 difiere, por lo tanto, de este método y planta de acabado de urea conocidos en el curado o endurecimiento al menos parcialmente de la capa de recubrimiento, en el que dicho curado o endurecimiento implica una reacción química de dicho componente de recubrimiento.

El solicitante ha proporcionado, en la página 2, línea 27 a la página 3, línea 30, argumentos técnicos en apoyo de un efecto técnico de las diferencias anteriores con respecto a la divulgación de D4. A este respecto, los procesos convencionales para recubrir partículas de fertilizante, como el proceso de D4, se basan en recubrir las partículas de fertilizante con un agente de recubrimiento que comprende un polímero y un disolvente. Después de recubrir las partículas con este agente de recubrimiento, el disolvente debe evaporarse para obtener las partículas recubiertas con el polímero. Esta evaporación es un proceso esencialmente físico en el que no tiene lugar ninguna reacción química, y la eficiencia de este proceso de evaporación determina el diseño de las unidades de recubrimiento para proporcionar un transporte suficiente de calor y gases y lograr una evaporación rápida y eficiente del solvente.

En el proceso de la invención, el curado o endurecimiento de la capa de recubrimiento implica una reacción química, que es fundamentalmente diferente del proceso esencialmente físico de evaporación. Por lo tanto, para un proceso de curado o endurecimiento químico eficiente, otros factores juegan un papel en la determinación del diseño óptimo además de los de los procesos de evaporación eficientes. Por ejemplo, el cambio en la viscosidad de la capa de recubrimiento con el tiempo suele ser mucho más rápido en el caso de curado o

endurecimiento que implica una reacción química en comparación con el cambio de viscosidad sobre el tiempo durante la evaporación. En particular, durante la reacción química existe la denominada fase de gel en la que la viscosidad puede aumentar muy rápidamente en muy poco tiempo. Durante esta fase de gel, las partículas pueden volverse temporalmente pegajosas.

Por lo tanto, la unidad de recubrimiento usada en el proceso de la presente invención debería ser preferiblemente adecuada para mantener las partículas en suspensión y evitar que las partículas se peguen entre sí (presente solicitud, página 12, líneas 3-8).

Por tanto, el problema a resolver por la presente invención puede considerarse cómo proporcionar un método eficaz para curar o endurecer recubrimientos poliméricos sobre partículas de fertilizante.

Debido a los requisitos específicos de una unidad de recubrimiento diseñada para proporcionar un recubrimiento de polímero curado o endurecido en partículas de fertilizante, no sería obvio cómo modificar el método y la planta de acabado de urea conocidos de D4 cuando se enfrenta al problema técnico objetivo anterior de tal manera que se obtenga el método y el aparato según las reivindicaciones 1 y 15. Por lo tanto, el experto en la materia no aplicaría unidades de recubrimiento que sean adecuadas para la evaporación a un proceso de recubrimiento que implique curado o endurecimiento por reacción química con una expectativa razonable de éxito.

En consecuencia, se puede considerar que el objeto de las reivindicaciones 1-15 implica una actividad inventiva (Artículo 33(3) del PCT).

- 2.2 También se observa que se aplicarían argumentos similares *mutatis mutandis* si el documento D5 fuera considerado el estado de la técnica más cercano al objeto de las reivindicaciones 1-15. También se puede considerar que el objeto de las reivindicaciones 1 a 15 implica una actividad inventiva en el sentido del Artículo 33 (3) del PCT.

3 Aplicabilidad Industrial – Artículo 33(4) del PCT

El objeto de las reivindicaciones 1 a 15 es útil en el campo técnico de recubrimiento de partículas de fertilizantes y por tanto, cumple los requisitos del artículo 33(4) del PCT.

Ad Ítem VII

4 Ciertos defectos en la solicitud internacional

- 4.1 La reivindicación independiente 1 no está en forma de dos partes de acuerdo con la Regla 6.3(b) del PCT, que en el presente caso sería apropiado, con las características conocidas en combinación del estado de la técnica para ser colocadas en el preámbulo (Regla 6.3(b)(i) del PCT) y las características restantes se incluyen en la parte caracterizante (Regla 6.3(b)(ii) del PCT).
 - 4.2 Contrario a los requisitos de la Regla 5.1(a)(ii) del PCT, el arte previo relevante divulgado en D4 y D5 no se menciona en la descripción, ni estos documentos se identifican en ella.
 - 4.3 Las características de las reivindicaciones no se proporcionan con signos de referencia entre paréntesis (Regla 6.2(b) del PCT).
-

PATENTABLE CLAIMS

1. A method of coating fertilizer particles with a coating, wherein the method comprises:

- a) providing fertilizer particles in a coating unit,
- b) a step of applying a coating layer comprising:
 - applying one or more coating components to the fertilizer particles in the coating unit to provide coated fertilizer particles comprising a coating layer and the fertilizer particles,
 - and at least partially curing or hardening the coating layer, wherein said curing or hardening involves a chemical reaction of said one or more coating components,

wherein step b) is performed one or more times to provide coated fertilizer particles, and

- c) discharging the coated fertilizer particles from the coating unit, or performing a final cure or hardening of the coated fertilizer particles in the coating unit and subsequently releasing the fertilizer particles from the coating unit, wherein the discharged fertilizer particles comprise said coating, wherein the coating comprises a polymer,

wherein the coating unit comprises a stationary frame and at least two movable elements, wherein said movable elements are independently movable with respect to the frame, and wherein the method comprises moving said at least two movable elements with respect to the frame during at least step b).

2. A method according to claim 1, wherein a first movable element of said movable elements is a container having a wall and an interior space for accommodating fertilizer particles, wherein the method comprises spinning the container in a rotating motion around a rotation axis while the container holds the fertilizer particles during at least step b).

3. A method according to claim 2, wherein a second movable element of said movable elements is an agitating member, which is arranged in the interior space of the container, and wherein the method comprises moving the agitating member simultaneously with spinning the container, during at least step b).

4. A method according to claim 3, wherein the agitating member is a rotor, and wherein the method comprises rotating the rotor around a rotation axis of the rotor simultaneously with spinning the container, during at least step b).
5. A method according to claim 4, wherein said rotation axis of the rotor and said rotation axis of the container are parallel to each other or have an included angle of less than 30° with each other, and wherein said rotation axis of the rotor and said rotation axis of the container are spaced apart from each other, such that the rotor is mounted eccentrically in the interior space of the container.
6. A method according to claim 5, wherein said rotor comprises a shaft and one or more blades, wherein said shaft has a first end and a second end, wherein said first end is end is arranged in said interior space of said container, and wherein said second end is connected to an actuator, wherein said blades are connected to said shaft and extend from said shaft in said interior space of the container in a direction perpendicular to the length of the shaft.
7. A method according to any of claims 2-6, wherein the rotation axis of the container is inclined with respect to a vertical axis, wherein the vertical axis is defined with respect to gravity.
8. A method according to any of claims 2-7, wherein the container has a bottom and a wall, wherein the coating unit furthermore comprises a scraper, the scraper being stationary with respect to the frame during at least step b), wherein the scraper is arranged from scraping material from the wall and/or from the bottom of the container.
9. A method according to any of the preceding claims, wherein said coating of said discharged particles comprises a crosslinked or thermoset polymer.
10. A method according to claim 9, wherein in step b) a coating layer is applied in an amount of 0.50 – 4.0 wt.% based on the weight of the fertilizer particle to be coated without coating, and wherein step b) is carried out in 10 to 600 seconds, preferably in 30 to 240 seconds,

and wherein the final cure of step c), if carried out, is carried out in 60 seconds to 15 minutes.

11. A method according to any of the preceding claims, wherein steps a) and b) are carried out at a temperature of at least 50 °C, and wherein step c) comprises cooling the discharged particles from a temperature of at least 50°C to a lower temperature.

12. A method according to any of claims 9-11, wherein said coating is a polyurethane coating and wherein said coating components comprise a polyisocyanate component and a polyol.

13. A method according to claim 4, or according to claim 5 or 6, wherein said coating is a polyurethane coating, and wherein step b) comprises subsequently:

- B1) injecting a polyol into a bed of said fertilizer particles in said container,
- B2) mixing said polyol with said fertilizer particles for 5 to 120 seconds
- B3) injecting a polyisocyanate component into said bed of fertilizer particles in said container,
- B4) rolling the fertilizer particles in said container for at least 10 to 300 seconds, thereby allowing the polyol and the polyisocyanate component to react with each other, while the rotor is also being rotated,
- B5) injecting a liquid wax into the fertilizer bed,
and optionally repeating said steps B1 to B5,
- B6) optionally rolling the fertilizer in the container for at least 10 seconds thereby allowing the coating to cure further.

14. A method according to any of the preceding claims, wherein the coating comprises a water-insoluble polymer.

15. A urea finishing plant comprising:

- a urea finishing unit, such as a granulation unit or a prilling tower, wherein the urea finishing unit has an inlet for urea melt and an outlet for warm urea particles,
- a coating unit having an inlet connected to said outlet for warm urea particles, the coating unit comprising a stationary frames and at least two movable

elements, wherein said movable elements are independently movable with respect to the frame,

wherein a first movable element of said movable elements is a container having a wall and an interior space for accommodating fertilizer particles to be coated, wherein a second of said movable elements is an agitating member, arranged in the interior space of the container,

wherein the coating unit furthermore comprises an outlet for coated urea particles,
- and a cooling unit having an inlet connected to said outlet for coated urea particles, and further having outlet for cooled coated urea particles, and preferably furthermore having an inlet for cooling air and an outlet for waste air.

REIVINDICACIONES OTORGABLES EN EUROPA

1. Un método para recubrir partículas de fertilizante con un recubrimiento, caracterizado porque el método comprende:

- a) proporcionar partículas de fertilizante en una unidad de recubrimiento,
- b) una etapa para aplicar una capa de recubrimiento que comprende:
 - aplicar uno o más componentes de recubrimiento a las partículas de fertilizante en la unidad de recubrimiento para proporcionar partículas de fertilizante recubiertas que comprenden una capa de recubrimiento y las partículas de fertilizante,
 - y curar o endurecer al menos parcialmente la capa de recubrimiento, en donde el curado o endurecimiento implica una reacción química del uno o más componentes de recubrimiento,

en donde la etapa b) se realiza una o más veces para proporcionar partículas de fertilizante recubiertas, y

- c) descargar las partículas de fertilizante recubiertas desde la unidad de recubrimiento, o realizar un curado o endurecimiento final de las partículas de fertilizante recubiertas en la unidad de recubrimiento y posteriormente liberar las partículas de fertilizante desde la unidad de recubrimiento, en donde las partículas de fertilizante descargadas comprenden el recubrimiento, en donde el recubrimiento comprende un polímero,

en donde la unidad de recubrimiento comprende un bastidor fijo y al menos dos elementos móviles, en donde los elementos móviles son móviles

independientemente con respecto al bastidor, y en donde el método comprende mover los al menos dos elementos móviles con respecto al bastidor durante al menos la etapa b).

2. Un método de acuerdo con la reivindicación 1, caracterizado porque un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante, en donde el método comprende hacer girar el recipiente en un movimiento giratorio alrededor de un eje de rotación mientras el recipiente contiene las partículas de fertilizante durante al menos la etapa b).

3. Un método de acuerdo con la reivindicación 2, caracterizado porque un segundo elemento móvil de los elementos móviles es un miembro de agitación, que está dispuesto en el espacio interior del recipiente, y en donde el método comprende mover el miembro de agitación simultáneamente con el giro del recipiente, durante al menos la etapa b).

4. Un método de acuerdo con la reivindicación 3, caracterizado porque el miembro de agitación es un rotor, y en donde el método comprende hacer girar el rotor alrededor de un eje de rotación del rotor simultáneamente con el giro del recipiente, durante al menos la etapa b).

5. Un método de acuerdo con la reivindicación 4, caracterizado porque el eje de rotación del rotor y el eje de rotación del recipiente son paralelos entre sí o tienen un ángulo incluido de menos de 30° entre sí, y en donde el eje de rotación del rotor y el eje de rotación del recipiente están separados entre sí, de tal manera que el rotor está montado excéntricamente en el espacio interior del recipiente.

6. Un método de acuerdo con la reivindicación 5, caracterizado porque el rotor comprende un vástago y una o más cuchillas, en donde el vástago tiene un primer extremo y un segundo extremo, en donde el primer extremo es extremo está dispuesto en el espacio interior del recipiente, y en donde el segundo extremo está conectado a un accionador, en donde las cuchillas están conectadas al vástago y se extienden desde el vástago en el espacio interior del recipiente en una dirección perpendicular a la longitud del vástago.

7. Un método de acuerdo con cualquiera de las reivindicaciones 2-6, caracterizado porque el eje de rotación del recipiente está inclinado con respecto a un eje vertical, en donde el eje vertical se define con respecto a la gravedad.

8. Un método de acuerdo con cualquiera de las reivindicaciones 2-7, caracterizado porque el recipiente tiene una parte inferior y una pared, en donde la unidad de recubrimiento comprende además un raspador, el raspador está fijo

con respecto al bastidor durante al menos la etapa b), en donde el raspador se dispone para raspar el material de la pared y/o de la parte inferior del recipiente.

9. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento de las partículas descargadas comprende un polímero entrecruzado o termoestable.

10. Un método de acuerdo con la reivindicación 9, caracterizado porque en la etapa b) una capa de recubrimiento se aplica en una cantidad de 0.50 - 4.0 % en peso basado en el peso de la partícula de fertilizante que se recubrirá sin recubrimiento, y en donde la etapa b) se realiza en 10 a 600 segundos, preferentemente en 30 a 240 segundos,
y en donde el curado final de la etapa c), si se realiza, se realiza en 60 segundos a 15 minutos.

11. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque las etapas a) y b) se realizan a una temperatura de al menos 50 °C, y en donde la etapa c) comprende enfriar las partículas descargadas de una temperatura de al menos 50 °C a una temperatura más baja.

12. Un método de acuerdo con cualquiera de las reivindicaciones 9-11, caracterizado porque el recubrimiento es un recubrimiento de poliuretano y en

donde los componentes de recubrimiento comprenden un componente de poliisocianato y un poliol.

13. Un método de acuerdo con la reivindicación 4, o de acuerdo con la reivindicación 5 o 6, caracterizado porque el recubrimiento es un recubrimiento de poliuretano, y en donde la etapa b) comprende posteriormente:

- B1) inyectar un poliol en un lecho de las partículas de fertilizante en el recipiente,
- B2) mezclar el poliol con las partículas de fertilizante durante 5 a 120 segundos
- B3) inyectar un componente de poliisocianato en el lecho de partículas de fertilizante en el recipiente,
- B4) rodar las partículas de fertilizante en el recipiente durante al menos 10 a 300 segundos, permitiendo de esta manera que el componente de poliol y de poliisocianato reaccionen uno con el otro, mientras que el rotor también gira,
- B5) inyectar una cera líquida en el lecho de fertilizante,

y opcionalmente repetir las etapas B1 a B5,

- B6) opcionalmente rodar el fertilizante en el recipiente durante al menos 10 segundos permitiendo de esta manera que el recubrimiento se cure adicionalmente.

14. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento comprende un polímero insoluble en agua.

15. Una planta de acabado de urea que comprende:

- una unidad de acabado de urea, tal como una unidad de granulación o una torre de perlado, caracterizada porque la unidad de acabado de urea tiene una entrada para una fusión de urea y una salida para partículas de urea calientes,
- una unidad de recubrimiento que tiene una entrada conectada a la salida para partículas de urea calientes, la unidad de recubrimiento comprende un bastidor fijo y al menos dos elementos móviles, en donde los elementos móviles son móviles independientemente con respecto al bastidor,

en donde un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante que se recubrirán,

en donde un segundo de los elementos móviles es un miembro de agitación, dispuesto en el espacio interior del recipiente,

en donde la unidad de recubrimiento comprende además una salida para partículas de urea recubiertas,

- y una unidad de enfriamiento tiene una entrada conectada a la salida para partículas de urea recubiertas, y tiene además una salida para partículas de urea recubiertas enfriadas, y preferentemente tiene

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además una entrada para aire de enfriamiento y una salida para aire residual.

10 (iv)	TABLA DE CORRESPONDENCIA DE REIVINDICACIONES		
Reivindicaciones en la solicitud en Colombia (NOTA. LAS REIVINDICACIONES ACÁ INDICADAS CORRESPONDEN A AQUELLAS MODIFICADAS EN MODIFICACIÓN VOLUNTARIA EL 26 DE ABRIL DE 2020)		Reivindicaciones otorgables en la solicitud internacional	Explicación sobre la suficiente correspondencia ó Comentarios que explican la correspondencia
1. Un método para recubrir partículas de fertilizante con un recubrimiento, caracterizado porque el método comprende: a) proporcionar partículas de fertilizante en una unidad de recubrimiento, b) una etapa para aplicar una capa de recubrimiento que comprende: - aplicar un componente de recubrimiento o componentes de recubrimiento a las partículas de fertilizante en la unidad de recubrimiento para proporcionar partículas de fertilizante recubiertas que comprenden una capa de recubrimiento y las partículas de fertilizante, - y curar o endurecer parcial o enteramente la capa de recubrimiento, en donde el curado o endurecimiento implica una reacción química del componente de recubrimiento o componentes de recubrimiento, en donde la etapa b) se realiza una vez o múltiples veces para proporcionar partículas de fertilizante recubiertas, y c) descargar las partículas de fertilizante recubiertas desde la unidad de recubrimiento, o realizar un curado o endurecimiento final de las partículas de fertilizante recubiertas en la unidad de recubrimiento y posteriormente liberar las partículas de fertilizante desde la unidad de recubrimiento, en donde las partículas de fertilizante descargadas comprenden el recubrimiento, en donde el recubrimiento comprende un polímero, en donde la unidad de recubrimiento comprende un bastidor fijo y dos elementos móviles, en donde los elementos móviles son móviles independientemente con respecto al bastidor, y en donde el método comprende mover los dos elementos móviles con respecto al bastidor durante la etapa b).		1. Un método para recubrir partículas de fertilizante con un recubrimiento, caracterizado porque el método comprende: a) proporcionar partículas de fertilizante en una unidad de recubrimiento, b) una etapa para aplicar una capa de recubrimiento que comprende: - aplicar uno o más componentes de recubrimiento a las partículas de fertilizante en la unidad de recubrimiento para proporcionar partículas de fertilizante recubiertas que comprenden una capa de recubrimiento y las partículas de fertilizante, - y curar o endurecer al menos parcialmente la capa de recubrimiento, en donde el curado o endurecimiento implica una reacción química del uno o más componentes de recubrimiento, en donde la etapa b) se realiza una o más veces para proporcionar partículas de fertilizante recubiertas, y c) descargar las partículas de fertilizante recubiertas desde la unidad de recubrimiento, o realizar un curado o endurecimiento final de las partículas de fertilizante recubiertas en la unidad de recubrimiento y posteriormente liberar las partículas de fertilizante desde la unidad de recubrimiento, en donde las partículas de fertilizante descargadas comprenden el recubrimiento, en donde el recubrimiento comprende un polímero, en donde la unidad de recubrimiento comprende un bastidor fijo y al menos dos elementos móviles, en donde los elementos móviles son móviles independientemente con respecto al bastidor, y en donde el método comprende mover los al menos dos elementos móviles con respecto al bastidor durante al menos la etapa b).	Corresponde a la reivindicación 1 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.
2. Un método de acuerdo con la reivindicación 1, caracterizado porque un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante, en donde el método comprende hacer girar el recipiente en un movimiento giratorio alrededor de un eje de rotación mientras el recipiente contiene las partículas de fertilizante durante la etapa b).		2. Un método de acuerdo con la reivindicación 1, caracterizado porque un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante, en donde el método comprende hacer girar el recipiente en un movimiento giratorio alrededor de un eje de rotación mientras el recipiente contiene las partículas de fertilizante durante al menos la etapa b).	Corresponde a la reivindicación 2 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.
3. Un método de acuerdo con la reivindicación 2, caracterizado porque un segundo elemento móvil de los elementos móviles es un miembro de agitación, que está dispuesto en el espacio interior del recipiente, y en donde el método comprende mover el miembro de agitación simultáneamente con el giro del recipiente, durante la etapa b).		3. Un método de acuerdo con la reivindicación 2, caracterizado porque un segundo elemento móvil de los elementos móviles es un miembro de agitación, que está dispuesto en el espacio interior del recipiente, y en donde el método comprende mover el miembro de agitación simultáneamente con el giro del recipiente, durante al menos la etapa b).	Corresponde a la reivindicación 3 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.

4. Un método de acuerdo con la reivindicación 3, caracterizado porque el miembro de agitación es un rotor, y en donde el método comprende hacer girar el rotor alrededor de un eje de rotación del rotor simultáneamente con el giro del recipiente, durante la etapa b).	4. Un método de acuerdo con la reivindicación 3, caracterizado porque el miembro de agitación es un rotor, y en donde el método comprende hacer girar el rotor alrededor de un eje de rotación del rotor simultáneamente con el giro del recipiente, durante al menos la etapa b).	Corresponde a la reivindicación 4 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.
5. Un método de acuerdo con la reivindicación 4, caracterizado porque el eje de rotación del rotor y el eje de rotación del recipiente son paralelos entre sí o tienen un ángulo incluido de menos de 30° entre sí, y en donde el eje de rotación del rotor y el eje de rotación del recipiente están separados entre sí, de tal manera que el rotor está montado excéntricamente en el espacio interior del recipiente.	5. Un método de acuerdo con la reivindicación 4, caracterizado porque el eje de rotación del rotor y el eje de rotación del recipiente son paralelos entre sí o tienen un ángulo incluido de menos de 30° entre sí, y en donde el eje de rotación del rotor y el eje de rotación del recipiente están separados entre sí, de tal manera que el rotor está montado excéntricamente en el espacio interior del recipiente.	Corresponde a la reivindicación 5 de la solicitud colombiana.
6. Un método de acuerdo con la reivindicación 5, caracterizado porque el rotor comprende un vástago y una cuchilla o cuchillas, en donde el vástago tiene un primer extremo y un segundo extremo, en donde el primer extremo es extremo está dispuesto en el espacio interior del recipiente, y en donde el segundo extremo está conectado a un accionador, en donde la cuchilla o cuchillas están conectadas al vástago y se extienden desde el vástago en el espacio interior del recipiente en una dirección perpendicular a la longitud del vástago.	6. Un método de acuerdo con la reivindicación 5, caracterizado porque el rotor comprende un vástago y una o más cuchillas, en donde el vástago tiene un primer extremo y un segundo extremo, en donde el primer extremo es extremo está dispuesto en el espacio interior del recipiente, y en donde el segundo extremo está conectado a un accionador, en donde las cuchillas están conectadas al vástago y se extienden desde el vástago en el espacio interior del recipiente en una dirección perpendicular a la longitud del vástago.	Corresponde a la reivindicación 6 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.
7. Un método de acuerdo con cualquiera de las reivindicaciones 2-6, caracterizado porque el eje de rotación del recipiente está inclinado con respecto a un eje vertical, en donde el eje vertical se define con respecto a la gravedad.	7. Un método de acuerdo con cualquiera de las reivindicaciones 2-6, caracterizado porque el eje de rotación del recipiente está inclinado con respecto a un eje vertical, en donde el eje vertical se define con respecto a la gravedad.	Corresponde a la reivindicación 7 de la solicitud colombiana.
8. Un método de acuerdo con cualquiera de las reivindicaciones 2-7, caracterizado porque el recipiente tiene una parte inferior y una pared, en donde la unidad de recubrimiento comprende además un raspador, el raspador está fijo con respecto al bastidor durante la etapa b), en donde el raspador se dispone para raspar el material de la pared y/o de la parte inferior del recipiente.	8. Un método de acuerdo con cualquiera de las reivindicaciones 2-7, caracterizado porque el recipiente tiene una parte inferior y una pared, en donde la unidad de recubrimiento comprende además un raspador, el raspador está fijo con respecto al bastidor durante al menos la etapa b), en donde el raspador se dispone para raspar el material de la pared y/o de la parte inferior del recipiente.	Corresponde a la reivindicación 8 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.
9. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento de las partículas descargadas comprende un polímero entrecruzado o termoestable.	9. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento de las partículas descargadas comprende un polímero entrecruzado o termoestable.	Corresponde a la reivindicación 9 de la solicitud colombiana.
10. Un método de acuerdo con la reivindicación 9, caracterizado porque en la etapa b) una capa de recubrimiento se aplica en una cantidad de 0.50 - 4.0 % en peso basado en el peso de la partícula de fertilizante que se recubrirá sin recubrimiento, y en donde la etapa b) se realiza en 10 a 600 segundos, y en donde el curado final de la etapa c), si se realiza, se realiza en 60 segundos a 15 minutos.	10. Un método de acuerdo con la reivindicación 9, caracterizado porque en la etapa b) una capa de recubrimiento se aplica en una cantidad de 0.50 - 4.0 % en peso basado en el peso de la partícula de fertilizante que se recubrirá sin recubrimiento, y en donde la etapa b) se realiza en 10 a 600 segundos, preferentemente en 30 a 240 segundos, y en donde el curado final de la etapa c), si se realiza, se realiza en 60 segundos a 15 minutos.	Corresponde a la reivindicación 10 de la solicitud colombiana. Se modificó para eliminar características opcionales.
11. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque las etapas a) y b) se realizan a una temperatura de 50 °C o mayor, y en donde la etapa c) comprende enfriar las partículas descargadas de dicha temperatura a una temperatura más baja.	11. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque las etapas a) y b) se realizan a una temperatura de al menos 50 °C, y en donde la etapa c) comprende enfriar las partículas descargadas de una temperatura de al menos 50 °C a una temperatura más baja.	Corresponde a la reivindicación 11 de la solicitud colombiana. Se modificó para eliminar términos imprecisos.

12. Un método de acuerdo con cualquiera de las reivindicaciones 9-11, caracterizado porque el recubrimiento es un recubrimiento de poliuretano y en donde los componentes de recubrimiento comprenden un componente de poliisocianato y un poliol.	12. Un método de acuerdo con cualquiera de las reivindicaciones 9-11, caracterizado porque el recubrimiento es un recubrimiento de poliuretano y en donde los componentes de recubrimiento comprenden un componente de poliisocianato y un poliol.	Corresponde a la reivindicación 12 de la solicitud colombiana.
13. Un método de acuerdo con la reivindicación 4, o de acuerdo con la reivindicación 5 o 6, caracterizado porque el recubrimiento es un recubrimiento de poliuretano, y en donde la etapa b) comprende posteriormente: B1) inyectar un poliol en un lecho de las partículas de fertilizante en el recipiente, B2) mezclar el poliol con las partículas de fertilizante durante 5 a 120 segundos B3) inyectar un componente de poliisocianato en el lecho de partículas de fertilizante en el recipiente, B4) rodar las partículas de fertilizante en el recipiente durante 10 a 300 segundos, permitiendo de esta manera que el componente de poliol y de poliisocianato reaccionen uno con el otro, mientras que el rotor también gira, B5) inyectar una cera líquida en el lecho de fertilizante.	13. Un método de acuerdo con la reivindicación 4, o de acuerdo con la reivindicación 5 o 6, caracterizado porque el recubrimiento es un recubrimiento de poliuretano, y en donde la etapa b) comprende posteriormente: B1) inyectar un poliol en un lecho de las partículas de fertilizante en el recipiente, B2) mezclar el poliol con las partículas de fertilizante durante 5 a 120 segundos B3) inyectar un componente de poliisocianato en el lecho de partículas de fertilizante en el recipiente, B4) rodar las partículas de fertilizante en el recipiente durante al menos 10 a 300 segundos, permitiendo de esta manera que el componente de poliol y de poliisocianato reaccionen uno con el otro, mientras que el rotor también gira, B5) inyectar una cera líquida en el lecho de fertilizante, y opcionalmente repetir las etapas B1 a B5, B6) opcionalmente rodar el fertilizante en el recipiente durante al menos 10 segundos permitiendo de esta manera que el recubrimiento se cure adicionalmente.	Corresponde a la reivindicación 13 de la solicitud colombiana. Se modificó para eliminar términos imprecisos y características opcionales.
14. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento comprende un polímero insoluble en agua.	14. Un método de acuerdo con cualquiera de las reivindicaciones anteriores, caracterizado porque el recubrimiento comprende un polímero insoluble en agua.	Corresponde a la reivindicación 14 de la solicitud colombiana.
15. Una planta de acabado de urea que comprende: - una unidad de acabado de urea, caracterizada porque la unidad de acabado de urea tiene una entrada para una fusión de urea y una salida para partículas de urea calientes, - una unidad de recubrimiento que tiene una entrada conectada a la salida para partículas de urea calientes, la unidad de recubrimiento comprende un bastidor fijo y dos elementos móviles, en donde los elementos móviles son móviles independientemente con respecto al bastidor, en donde un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante que se recubrirán, en donde un segundo de los elementos móviles es un miembro de agitación, dispuesto en el espacio interior del recipiente, en donde la unidad de recubrimiento comprende además una salida para partículas de urea recubiertas, - y una unidad de enfriamiento tiene una entrada conectada a la salida para partículas de urea recubiertas, y tiene además una salida para partículas de urea recubiertas enfriadas.	15. Una planta de acabado de urea que comprende: - una unidad de acabado de urea, tal como una unidad de granulación o una torre de perlado, caracterizada porque la unidad de acabado de urea tiene una entrada para una fusión de urea y una salida para partículas de urea calientes, - una unidad de recubrimiento que tiene una entrada conectada a la salida para partículas de urea calientes, la unidad de recubrimiento comprende un bastidor fijo y al menos dos elementos móviles, en donde los elementos móviles son móviles independientemente con respecto al bastidor, en donde un primer elemento móvil de los elementos móviles es un recipiente que tiene una pared y un espacio interior para alojar partículas de fertilizante que se recubrirán, en donde un segundo de los elementos móviles es un miembro de agitación, dispuesto en el espacio interior del recipiente, en donde la unidad de recubrimiento comprende además una salida para partículas de urea recubiertas, - y una unidad de enfriamiento tiene una entrada conectada a la salida para partículas de urea recubiertas, y tiene además una salida para partículas de urea recubiertas enfriadas, y preferentemente tiene además una entrada para aire de enfriamiento y una salida para aire residual.	Corresponde a la reivindicación 15 de la solicitud colombiana. Se modificó para eliminar términos imprecisos y características opcionales.