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(54) **Title:** SEED TREATMENT MACHINE FOR TREATING PRE-GERMINATED SEEDS AND METHOD FOR TREATING PRE-GERMINATED SEEDS

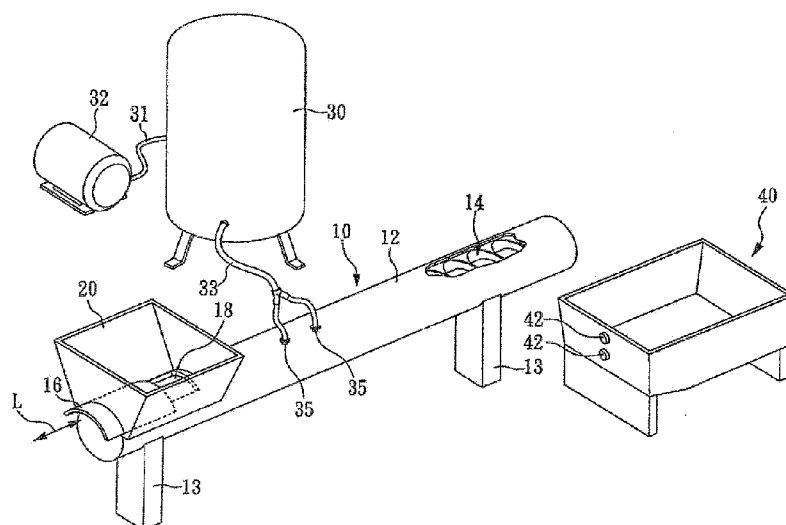


Fig. 2

(57) **Abstract:** The present invention provides a rice seed treatment machine (10) and method for treating rice seeds which enable the pre-germinated rice seed to be treated continuously while ensuring treatment quality is not compromised. The germinated rice seeds will be treated with agrochemicals in the machine (10), and then the treated germinated rice seeds will be automatically planted into seedling boxes.

SEED TREATMENT MACHINE FOR TREATING PRE-GERMINATED SEEDS AND METHOD FOR TREATING PRE-GERMINATED SEEDS

5 FIELD OF THE INVENTION

The present invention relates to a seed treatment machine for treating pre-germinated seeds and a method for treating pre-germinated seeds, in particular to a pre-germinated rice seed treatment machine and method for treating pre-germinated rice seeds.

10 BACKGROUND OF THE INVENTION

Seed treatment today occurs in many crops where the seed is treated with agrochemicals (e.g., pesticides and/or germicides) under a "dry" condition prior to sowing. This gives the seed, the seedling and also the plant which emerges from the seed protection from early season
15 pests and diseases.

Many seed treatment machines have been developed to treat the "dry" seeds with agrochemicals. The machines generally are equipped with auger systems. For instance, Fig. 1 shows an on-farm machine 2 comprising an auger system 4 having an auger 4a, which is widely used
20 by wheat farmers in Canada, US and Australia. The dry seeds 5 are fed into the auger 4a and then mixed with agrochemicals (not shown) supplied from tank 6 so as to obtain the treated seeds 8. The machines for treating "dry" seeds are, however, not suitable to be used with pre-germinated seeds as they would heavily injure the vulnerable buds
25 of the pre-germinated seeds.

Pre-germinated seeds play an important role in the rice cultivation. For example, in the nursery centers of Taiwan, all rice seeds are *soaked* and *pre-germinated* prior to sowing. Using "dry" rice seeds which have been treated with agrochemicals would be a waste of resources, since if
30 the dry rice seed which is treated with agrochemical(s) is soaked prior to sowing, the agrochemical(s) will be "washed" from the seed. This results in no protection for the crop, here rice, to be cultivated as well as an environmental issue with the agrochemical(s) in the soaking water potentially entering the environment. Therefore, when pre-germinated
35 seeds are used in the cultivation of the respective crop seeds treated with agrochemical under a "dry" condition prior to sowing is not advantageous. This applies in particular for the rice cultivation in

Taiwan.

In order to reduce the yield loss due to the damage caused by early season pests or disease, the farmers who are working with pre-germinated seeds need to treat the respective crops with agrochemical(s) numerous times. This is usually done by foliar spray. Often the treatment is not done at the optimum timing for spraying and thus results in a less effective protection of the seeds and/or the crops (i.e. the seedlings or the plants emerging from the seeds).

Beside the fact that the frequent treatment is labor intensive, it is also costly and environmentally disadvantageous. So there is a need to enable the farmers who are cultivating crops by planting pre-germinated seeds to get the same protection for the seeds and/or the crops as the farmers get who are using dry seeds treated with agrochemical(s). It is obvious that a farmer cultivating crops with pre-germinated seeds could omit several sprays and thus the farmer could save money and time.

Recently, the inventors find that it would be advantageous to develop a method to treat pre-germinated seeds while achieving the same level of protection which would be achieved with conventional seed treatment using "dry" seeds. The inventors further find that it would be advantageous if the method could be automated by using an especially equipped seed treatment machine. The inventors find that it would be also advantageous to transplant the treated pre-germinated seeds into appropriate culture boxes (such as e.g. rice seed box). "Healthy Seedlings" can thus be produced.

The existing seed treatment machines can only be used for treating the "dry" seeds because they are liable to injure the vulnerable buds of the pre-germinated seeds during the mixing process.

Therefore, there is a need to provide a seed treatment machine for the treatment of pre-germinated seeds, so that seeds, in particular rice seeds, can be treated with agrochemicals without being injured and still get a good quality of the treatment with agrochemical(s).

SUMMARY OF THE INVENTION

The objective of the present invention is to develop a seed treatment machine capable of treating pre-germinated seeds (in particular rice seeds) and a method for treating pre-germinated seeds (in particular rice seeds).

The seed treatment machine according to the present invention

comprises a barrel with an inner diameter and an auger having a shaft and a flight spirally surrounding the shaft for mixing the seeds with at least one agrochemical. The auger is accommodated in the barrel and a tolerance is defined between the flight of the auger and the barrel. In order to treat the pre-germinated seeds without injuring their buds during the treatment (here: mixing process), a ratio of the tolerance to the inner diameter is determined.

In the present embodiment concerning a rice seed treatment machine, the ratio of the tolerance to the inner diameter of the barrel is set as 1:10.

The seed treatment machine of the present invention further comprises a tank for containing at least one agrochemical and an air compressor for pressurizing the at least one agrochemical to spray into the barrel. The at least one agrochemical may be sprayed into the barrel via at least one spray nozzle.

All suitable agrochemicals can be used in the seed treatment machine and the method according to the invention. Suitable agrochemicals include for example insecticides, acaricides, nematocides, fungicides, safeners, biological control agents and agents which induce a signal in the plants.

In particular agrochemicals which are selected from (but not limited to) the group consisting of Alanycarb, Aldicarb, Bendiocarb, Benfuracarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Ethiofencarb, Fenobucarb, Formetanate, Furathiocarb, Isoprocarb, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Propoxur, Thiodicarb, Thiofanox, Triazamate, Trimethacarb, XMC, and Xylcarb, Acephate, Azamethiphos, Azinphos-ethyl, Azinphos-methyl, Cadusafos, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos, Chlorpyrifos-methyl, Coumaphos, Cyanophos, Demeton-S-methyl, Diazinon, Dichlorvos/DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Disulfoton, EPN, Ethion, Ethoprophos, Famphur, Fenamiphos, Fenitrothion, Fenthion, Fosthiazate, Heptenophos, Imicyafos, Isofenphos, Isopropyl O-(methoxyaminothio-phosphoryl) salicylate, Isoxathion, Malathion, Mecarbam, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion, Parathion-methyl, Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phoxim, Pirimiphos-methyl, Profenofos, Propetamphos, Prothiofos, Pyraclofos, Pyridaphenthion, Quinalphos, Sulfotep, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Triclorfon, and

Vamidotion, Ethiprole, Fipronil, Acrinathrin, Allethrin, d-cis-trans Allethrin, d-trans Allethrin, Bifenthrin, Bioallethrin, Bioallethrin S-cyclopentenyl isomer, Bioresmethrin, Cycloprothrin, Cyfluthrin, beta-Cyfluthrin, Cyhalothrin, lambda-Cyhalothrin, gamma-Cyhalothrin, Cypermethrin, alpha-Cypermethrin, beta-Cypermethrin, theta-Cypermethrin, zeta-Cypermethrin, Cyphenothrin [(1R)-trans isomers], Deltamethrin, Empenthrin [(EZ)-(1R) isomers], Esfenvalerate, Etofenprox, Fenpropathrin, Fenvalerate, Flucythrinate, Flumethrin, tau-Fluvalinate, Halfenprox, Imiprothrin, Kadethrin, Permethrin, Phenothrin [(1R)-trans isomer], Prallethrin, Pyrethrine (pyrethrum), Resmethrin, Silafluofen, Tefluthrin, Tetramethrin, Tetramethrin [(1R) isomers]], Tralomethrin, and Transfluthrin, *Bacillus firmus* (BioNeem), sulfoxafloor, Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Nitenpyram, Thiacloprid, and Thiamethoxam, Spinetoram and Spinosad, Spirodiclofen, Spiromesifen, and Spirotetramat, Chlorantraniliprole, Cyantraniliprole, Ametoctradin, Amisulbrom, Azoxystrobin, Cyazofamid, Coumethoxystrobin, Coumoxystrobin, Dimoxystrobin, Enestroburin, Famoxadone, Fenamidone, Fenoxystrobin, Fluoxastrobin, Kresoxim-Methyl, Metominostrobin, Orysastrobin, Picoxystrobin, Pyraclostrobin, Pyrametostrobin, Pyraoxystrobin, Pyribencarb, Triclopyricarb, Trifloxystrobin, acibenzolar-S-methyl, Isotianil, Probenazole and Tiadinil.

Preferred agrochemicals to be used in the seed treatment machine or in the method according to the invention are Isotianil, Trifloxystrobin, Fipronil and Chlorantraniliprole. They are preferably used to treat pre-germinated rice seeds.

The agrochemicals specified herein by their "common name" are known and described, for example, in the Pesticide Manual ("The Pesticide Manual", 14th Ed., British Crop Protection Council 2006) or can be searched in the internet (e.g. <http://www.alanwood.net/pesticides>).

It is understood that the agrochemicals suitable to be used in the seed treatment machine or the method according to the invention may be used solo or as a mixture of agrochemicals. The skilled person in the art is able to choose the right agrochemicals for the protection of the specific pre-germinated seeds to achieve the desired result with the seed treatment machine or the method according to the invention.

The seed treatment machine of the present invention further comprises a seed flow rate restrictor for adjusting the seed flow rate into the barrel. The seed flow rate restrictor may take the form of a slidable

plate.

In the present embodiment, the seed flow rate is set within a range of 500 kg /hour to 3 tonnes/hour, preferably, 1.5 tonnes/hour.

5 In an embodiment [A], the seed treatment machine is a seed treatment machine according to the present invention for treating pre-germinated rice seeds which further comprises an interface for connecting the rice seed treatment machine and a rice seed box line. The interface may take the form of a container comprising manual buttons for controlling the operation of the rice seed machine. Alternatively, the
10 interface may comprise an electrical controller and at least one capacity sensor for connecting the rice seed treatment machine and the rice seed box line automatically.

15 In a broadest aspect, the present invention provides a method for treating seeds, comprising treating the pre-germinated seeds with at least one agrochemical.

In another aspect and as embodiment [B] the present invention provides a method for treating rice seeds, comprising treating the pre-germinated rice seeds with at least one agrochemical selected from above mentioned agrochemicals.

20 The present invention also provides a method for treating seeds (in particular rice seeds), comprising providing the seed treatment machine as claimed by the present invention.

25 The introduction of the seed treatment machine and method of the present invention will reduce the need for the farmer to apply foliar sprays while ensuring that the crop receives an optimum start. In the meantime, the cost of labor in the most countries is increasing significantly, and if the number of sprays can be reduced there is a significant saving to the farmer.

30 BRIEF DESCRIPTION OF THE DRAWINGS

Following figures only depict the correlations between elements, not conforming to the proportion of real dimension of the seed treatment machine. In addition, like numerals in the drawings present like elements or features.

35 Fig. 1 is a perspective view of an existing seed treatment machine;

Fig. 2 is a perspective view of a seed treatment machine according

to the present invention; and

Fig. 3 is a partial sectional view of Fig. 2 along the longitudinal direction.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As stated above, the inventors find that it would be advantageous to treat the *pre-germinated* seeds (in particular rice seeds) with agrochemical(s) so as to obtain the "healthy (rice) seedlings". Thus, in a broadest aspect, the present invention provides a method for treating the
10 seeds, comprising treating the *pre-germinated* seeds with at least one agrochemical which may be selected from (but not limited to) the group consisting of Isotianil, Trifloxystrobin, Fipronil and Chlorantraniliprole.

In a less broad aspect the present invention provides a method for treating the rice seeds, comprising treating the *pre-germinated* rice seeds
15 with at least one agrochemical which may be selected from (but not limited to) the group consisting of Isotianil, Trifloxystrobin, Fipronil and Chlorantraniliprole.

The treatment of the *pre-germinated* seeds (in particular rice seeds) may be accomplished by utilizing a seed treatment machine (in
20 particular rice seed treatment machine) provided by the present invention.

Referring to Fig. 2, a rice seed treatment machine 10 in accordance with the present invention is provided. The rice seed treatment machine 10, supported by foot stands 13, mainly comprises an auger 14 for
25 mixing the seeds with agrochemicals and a barrel 12 for containing the auger 14 and the rice seeds to be treated. The auger 14 may be driven by a motor (not shown) or other means.

Fig. 2 also indicates that a tank 30 containing the at least one agrochemical (not shown) is connected to the rice seed treatment machine 10 via a tube 33. An air compressor 32 connected to the tank 30
30 via a tube 31 is provided to pressurize the agrochemicals to enter the barrel 12 via spray nozzles 35 such that the agrochemicals can be sprayed on the rice seeds.

In the present embodiment, the at least one agrochemical used to treat the rice seeds may be selected from above mentioned agrochemicals, preferably (but not limited to) from the group consisting
35 of Isotianil, Trifloxystrobin, Fipronil and Chlorantraniliprole.

Referring to Fig. 3, the auger 14 comprises a shaft 14a and a flight 14b which spirally surrounds the shaft 14a. The barrel 12 has an inner diameter D. A tolerance t is configured between the dashed line 14c (i.e., the edge of flight 14b) and the inner wall of the barrel 12. A **ratio** of the tolerance t to the inner diameter D (hereinafter, the “**ratio**”) is thus defined.

In Rademacher’s paper (Rademacher, F.J.C. 1981, “*On Seed Damage in Grain Augers*”, Journal of Agricultural Engineering Research, 26 (1). pp. 87-96. ISSN 0021-8634), it has been disclosed that one factor to cause the damage of seeds in grain augers is the “jamming” of seeds occurring at the casing wall, and it has been proved theoretically that the “jamming” is promoted by higher coefficients of kinetic friction. That is, the seed flow rate is reduced by the increase in kinetic friction. In the case of the treatment for the pre-germinated seeds, the increase in coefficients of kinetic friction results from the increase in seed size.

Therefore, a machine capable of treating the pre-germinated seeds must satisfy the requirement – the machine should at least maintain or further increase the seed flow rate while causing no “jamming” of seeds. As the “jamming” of seeds is occurring at the casing (barrel) wall, the extent of “jamming” relates to the *tolerance* (between the flight of auger and the inner wall of casing) and the *size* of the inner wall of the casing. That is, the extent of “jamming” relates to the choice of the **ratio**.

For a traditional machine, the **ratio** (permitting no occurrence of “jamming” of seeds) is generally set as 1:12. Such **ratio**, though suitable for treating the “dry” seeds, is not suitable for treating the pre-germinated seeds because it would not only reduce the seed flow rate but is liable to injure the vulnerable buds of the pre-germinated seeds due to the “jamming” of seeds during the mixing process.

After many studies and experiments, the inventors adopt an optimum **ratio** of 1:10 for treating the pre-germinated rice seeds because such ratio can still maintain a good treatment quality without injuring the pre-germinated rice seeds (i.e., no occurrence of “jamming” of seeds) during the mixing process.

Although the before mentioned ratio refers to pre-germinated rice seeds, the optimum ratio can be found for using the machine on other *pre-germinated* seeds (e.g., vegetables, cereals).

Referring to Fig. 2, to facilitate the guidance of pre-germinated rice seeds, a hopper 20, aligned with an opening 18 of the barrel 12, is

provided on the barrel 12. Through the opening 18, pre-germinated rice seeds (not shown) are fed into the barrel 12. A seed flow rate restrictor takes the form of a plate 16 extending through a lower side of the hopper 20. The size of the opening 18 of the barrel 12 can be altered by
5 sliding the plate 16 along the direction L in either manual or electrical manner so as to control the seed flow rate into the barrel.

In practice, the seed flow rate is restricted by the diameter of the auger and the rotation speed of the flight. In the present embodiment, when the ratio is set as 1:10, the seed flow rate is set within a range of
10 500 kg /hour to 3 tonnes/hour, preferably, 1.5 tonnes/hour.

Referring to Fig. 2, the rice seed treatment machine 10 can also fit into the work process of a rice seed box process line (not shown) via an interface. The interface may take the form of a container 40 comprising two manual buttons 42, one for turning the machine on when the treated
15 pre-germinated seeds reach a low level and the other one for turning the machine off when the treated pre-germinated seeds reach a high level.

Instead of controlling by manual manner, an electrical controller and seed capacity sensor (not shown) may be utilized to automatically connect the seed treatment machine and, if rice seeds are used, a
20 traditional rice seed box process line.

Referring to Fig. 2, in operation, the pre-germinated rice seeds (not shown), guided by the hopper 20, are fed into the barrel 12 through the opening 18 at a specified seed flow rate, and the auger 14 rotates to uniformly mix the rice seeds with at least one agrochemical (not shown)
25 supplied from tank 30. Then the treated pre-germinated rice seeds are automatically delivered to a traditional rice seed box process line and planted into seedling boxes.

The present invention promotes the protection of the treated pre-germinated rice seeds (the "Healthy Seedlings"), and to provide an
30 approximately 80 days long protection against pest and disease after transplanting such pre-germinated seeds. As a result, the traditional number of foliar sprays (2.89 times) is reduced to 1.25 times, the yield of rice crops is raised by 4.8% and the income of farmers is raised by 12.8% as well.

Trial Results

Several on-farm trials for the rice seed treatment according to the present invention have been given in the northern, central and southern areas of Taiwan. The following results indicate that:

- 5 I. The number of foliar sprays for rice crops is effectively reduced to 1.25 times and thus the total costs (wage and agrochemical cost) are significantly lowered as well;
- II. The yield of rice crops is effectively raised by 4.8%; and
- III. The income of farmers is noticeably raised by 12.8%.

10

I. Number of Foliar Sprays

Costs (NT\$) - Northern Areas									
Season	1st season of 2010								
Area	Changhua City	Lugang	Shengang	Huatan	Wuri	Shetou	Tianzhong	Pitou	
Without Rice Seed Treatment									Average
No. of sprays	3	3	4	3	2	2	3	2	2.75
Wage/spray	10,500	6,800	12,000	6,800	7,000	6,000	7,500	5,000	7,700
Agrochemical cost	3,060	4,900	6,720	4,570	3,530	4,000	5,280	5,380	4,680
Total Costs	13,560	11,700	18,720	11,370	10,530	10,000	12,780	10,380	12,380
Rice Seed Treatment of the Present Invention (Healthy Seedlings)									Average
No. of sprays	1	2	1	1	1	1	1	1	1.125
Wage/spray	3,500	6,000	3,000	3,000	3,500	3,000	2,500	2,500	3,375
Agrochemical cost	1,370	2,370	1,680	1,870	1,900	2,000	1,800	2,690	1,960
Total Costs	4,870	8,372	4,680	4,870	5,400	5,000	4,300	5,190	5,335

Costs (NT\$) - Central Areas											
Season	1st season of 2010										
Area	Citong	Xiluo (East)	Xiluo (West)	Tuku	Douliu	Mailiao	Xizhou	Wufeng	Caotun (East)	Caotun (West)	
Without Rice Seed Treatment											Average
No. of sprays	3	2	2	2	2	4	2	2	3	3	2.5
Wage/spray	4,800	4,000	4,000	4,000	5,000	6,000	6,000	7,000	9,000	9,000	5,880
Agrochemical cost	7,090	3,470	3,820	6,460	4,290	10,700	6,120	6,850	9,774	10,180	6,875
Total Costs	11,890	7,470	7,820	10,460	9,290	16,700	12,120	13,850	18,774	19,180	12,755
Rice Seed Treatment of the Present Invention (Healthy Seedlings)											Average
No. of sprays	2	0	1	2	1	2	1	1	1	1	1.2
Wage/spray	4,000	0	2,000	4,000	2,500	3,000	3,000	3,500	3,000	3,000	2800
Agrochemical cost	5,340	0	2,660	6,460	2,710	6,800	3,060	3,685	2,200	3,195	3611
Total Costs	9,340	0	4,660	10,460	5,210	9,800	6,060	7,185	5,200	6,195	6,411

Costs (NT\$) - Southern Areas								
Season	1st season of 2010							
Area	Houbi	Taibao	Liuja	Dalin	Xikou	Dounan	Dapi	
Without Rice Seed Treatment								Average
No. of sprays	3	2	3	4	5	3	4	3.4
Wage/spray	6,000	4,000	6,000	8,000	8,800	4,500	8,000	6,471
Agrochemical cost	8,760	3,220	7,120	8,100	17,080	6,070	10,429	8,683
Total Costs	14,760	7,220	13,120	16,100	25,880	10,570	18,429	15,154
Rice Seed Treatment of the Present Invention (Healthy Seedlings)								Average
No. of sprays	2	1	1	1	2	1	2	1.4
Wage/spray	4,000	2,000	2,000	2,000	4,000	1,500	4,000	2,786
Agrochemical cost	6,660	1,420	2,920	3,000	7,340	1,730	5,420	4,070
Total Costs	10,660	3,420	4,920	5,000	11,340	3,230	9,420	6,856

Costs (NT\$) - All Areas	
Season	1st season of 2010
Without Rice Seed Treatment	
Number of sprays	2.89
Wage	6,684
Agrochemical Cost	6,746
Total Costs	13,430
Rice Seed Treatment of the Present Invention (Healthy Seedlings)	
Number of sprays	1.25
Wage	2,987
Agrochemical Cost	3,214
Total Costs	6,201
Differences (Savings)	
Number of sprays	1.6
Wage	3,697
Agrochemical Cost	3,532
Total Costs	7,229

II. Yield of Rice Crops (kg/ha)

(2nd season of 2010)

No. of Areas	25	2	4
Rice Varieties	Tainan No. 11	Taikeng No. 9	Tainung No. 71
Seed Treatment of the Present Invention (Healthy Seedlings)	7,667	6,000	7,650
Traditional Cultivation (without Rice Seed Treatment)	7,368	5,700	7,275
% of Increase	4	5.2	5.2
Average % of Increase	4.8		

III. Income of Farmers (NT\$ 1,000/ha)

(2nd season of 2010)

No. of Areas	25	2	4
Rice Varieties	Tainan No. 11	Taikeng No. 9	Tainung No. 71
Seed Treatment of the Present Invention (Healthy Seedlings)	100	75	131
Traditional Cultivation (without Rice Seed Treatment)	93	62	118
% of Increase	7.5	20	11
Average % of Increase	12.8		

LIST OF REFERENCE NUMERIALS

10	rice seed treatment machine
12	barrel
13	foot stands
14	auger
14a	shaft
14b	flight
16	plate
18	opening
20	hopper
30	tank
31, 33	tube
32	air compressor
35	spray nozzles
40	container
42	button
D	diameter
L	direction
t	tolerance

We claim:

1. A rice seed treatment machine for treating pre-germinated rice seeds, comprising:

a barrel with an inner diameter; and

5 an auger having a shaft and a flight spirally surrounding the shaft for mixing the rice seeds with agrochemicals, the auger being accommodated in the barrel and a tolerance being defined between the flight and the barrel, wherein a ratio of the tolerance to the inner diameter is set as 1:10.

10 2. The rice seed treatment machine according to Claim 1, further comprising:

a tank for containing at least one agrochemical; and

an air compressor connected to the tank for pressurizing the at least one agrochemical into the barrel.

15 3. The rice seed treatment machine according to Claim 2, wherein the at least one agrochemical is sprayed into the barrel via at least one spray nozzle.

4. The rice seed treatment machine according to Claim 3, further comprising a seed flow rate restrictor for adjusting the seed flow rate into the barrel.

20 5. The rice seed treatment machine according to Claim 4, wherein the seed flow rate restrictor is a plate.

6. The rice seed treatment machine according to Claim 5, wherein the barrel further has an opening and a hopper aligned with the opening is further disposed on the barrel for guiding the rice seeds into the barrel through the opening.

7. The rice seed treatment machine according to Claim 6, wherein the plate extends through the hopper and the size of the opening can be altered by manually or electrically sliding the plate so as to control the seed flow rate into the barrel.

8. The rice seed treatment machine according to any one of Claims 1 to 7, further comprising an interface for connecting the rice seed treatment machine with a rice seed box line.

9. The rice seed treatment machine according to Claim 8, wherein

the interface comprises manual buttons for controlling the rice seed machine.

5 10. The rice seed treatment machine according to Claim 8, wherein the interface comprises an electrical controller and at least one capacity sensor for connecting the rice seed treatment machine and the rice seed box line automatically.

11. The rice seed treatment machine according to any one of Claims 1 to 7 wherein the seed flow rate is set within a range of 500 kg /hour to 3 tonnes/hour.

10 12. The rice seed treatment machine according to Claim 11, wherein the seed flow rate is set as 1.5 tonnes/hour.

13. The rice seed treatment machine according to Claim 2 or 3, wherein the at least one agrochemical is selected from the group consisting of Isotiani, Trifloxystrobin, Fipronil and
15 Chlorantraniliprole.

14. A method for treating rice seeds, comprising treating the pre-germinated rice seeds with at least one agrochemical.

15. The method for treating rice seeds according to Claim 14, wherein the at least one agrochemical is selected from the group consisting of Isotianil, Trifloxystrobin, Fipronil and
20 Chlorantraniliprole.

16. A method for treating rice seeds, comprising providing the rice seed treatment machine according to any one of Claims 1-13.

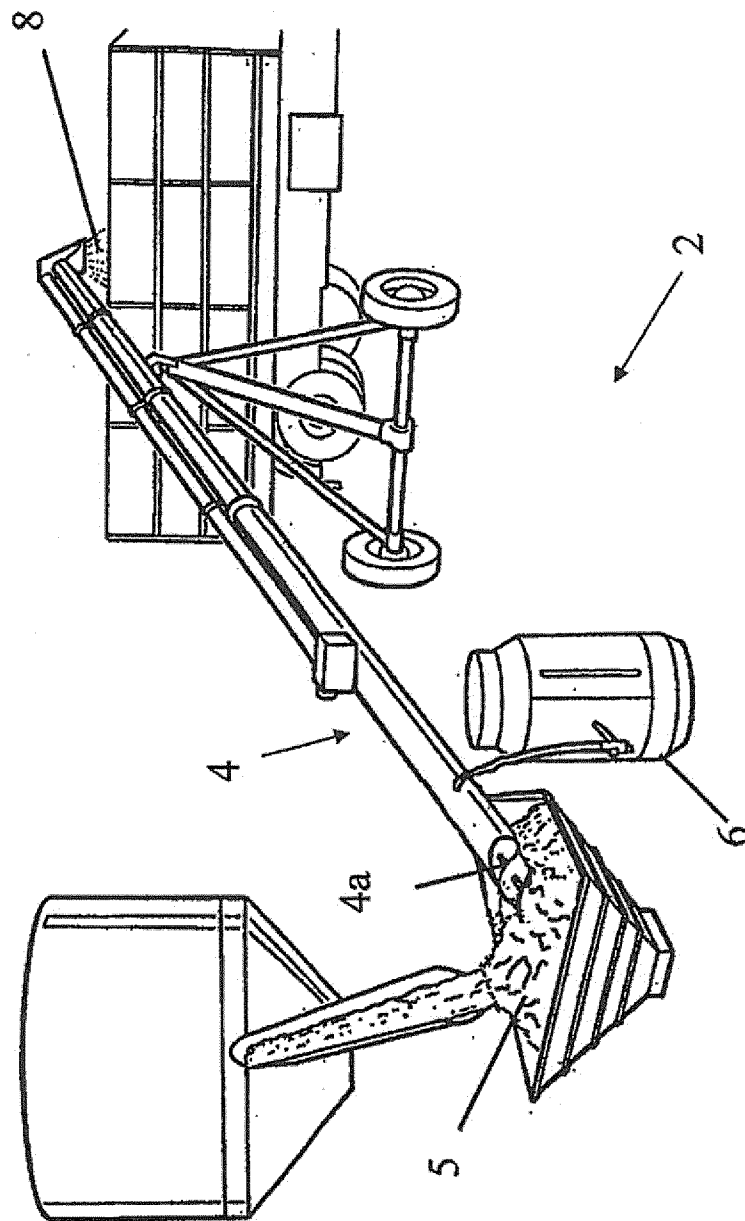


Fig. 1

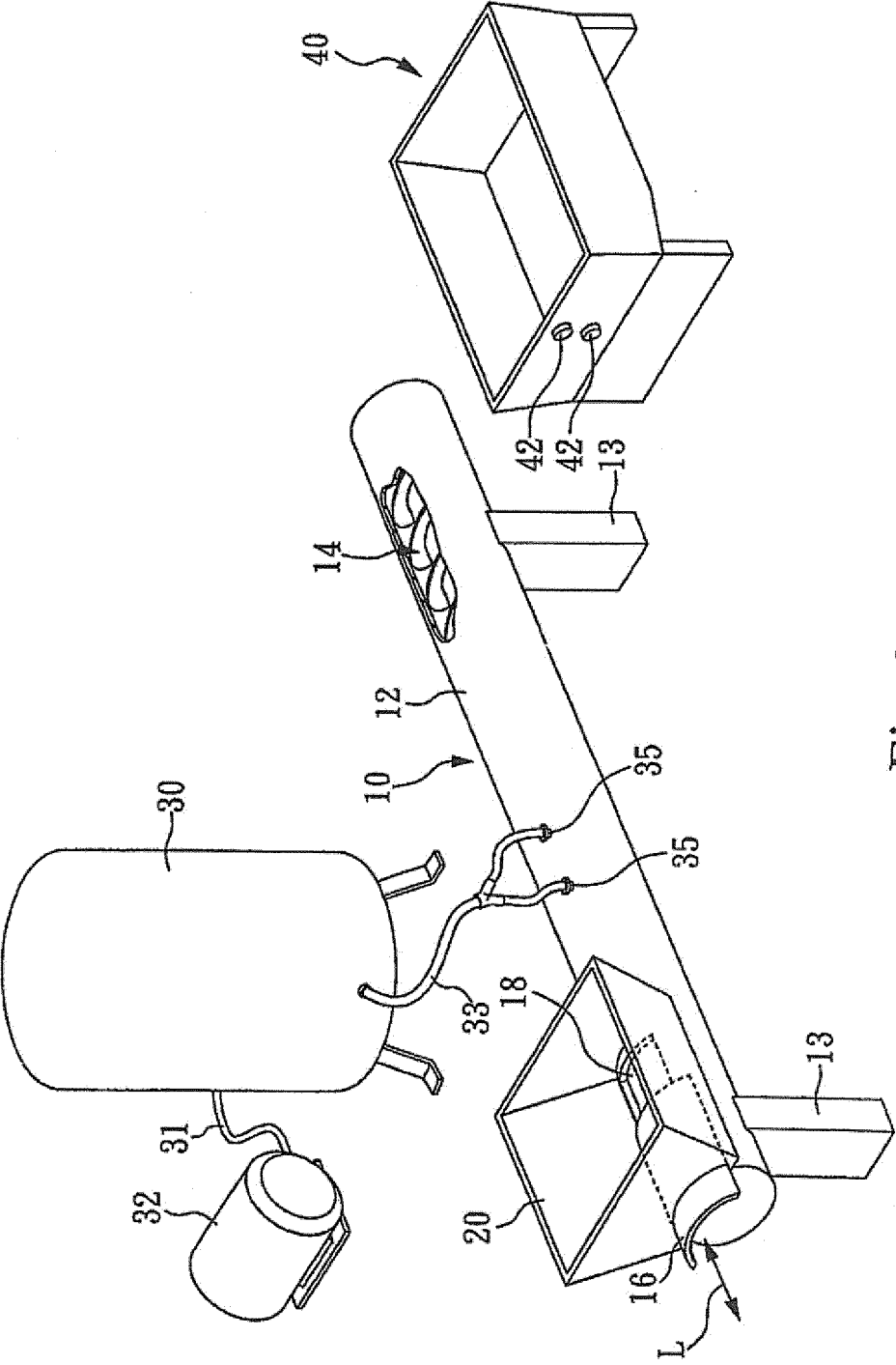


Fig. 2

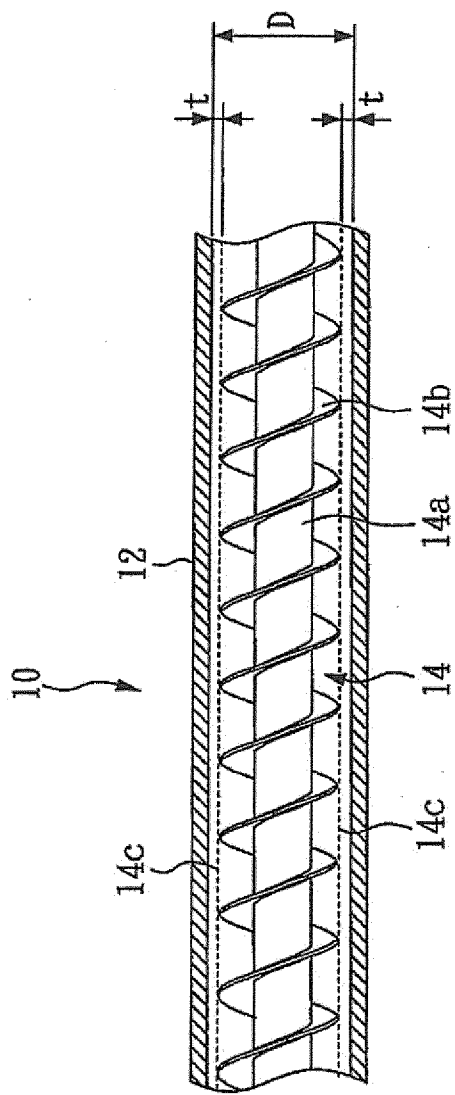


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/058927

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01C1/06 A01C15/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01C

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/004460 A1 (KLITTICH CARLA RASMUSSEN [US] ET AL) 21 June 2001 (2001-06-21) abstract	14, 15
A	page 5, paragraphs 117, 118, 119, 124 pages -; claims	1, 13
X	US 4 503 803 A (BARNES RONALD A [US]) 12 March 1985 (1985-03-12) abstract column 3, line 34 - line 41 column 5, line 8 - line 35 claims; figures	1, 8-13, 16
	----- -/-	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search

25 September 2012

Date of mailing of the international search report

02/10/2012

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/058927

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 157 429 A2 (AMAZONEN WERKE DREYER H [DE]) 9 October 1985 (1985-10-09) abstract page 19, line 13 - line 36 page 20, line 1 - line 13 claims; figures -----	1-16
A	FR 2 271 756 A1 (CHEVRON RES [US]) 19 December 1975 (1975-12-19) abstract column 1, line 65 - line 68 column 2, line 1 - line 11 claims; figures -----	2-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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