



(51) International Patent Classification:

A01C 1/04 (2006.01) A01G 22/15 (2018.01)
A01C 1/06 (2006.01) A01G 24/00 (2018.01)

(21) International Application Number:

PCT/AU2018/050626

(22) International Filing Date:

22 June 2018 (22.06.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2017902955 27 July 2017 (27.07.2017) AU

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

(54) Title: METHODS AND APPARATUS FOR SEEDED GROWTH MEDIA

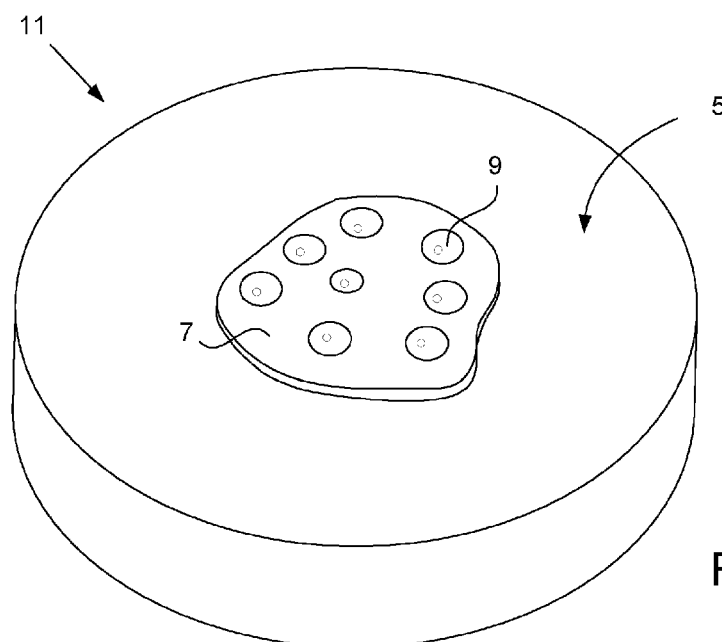


FIG. 5

(57) Abstract: A method for seeding a piece of growth media involves applying an adhesive to the piece of growth media and adhering seeds to the piece of growth media by means of the adhesive. The adhesive may be applied by spraying it onto the piece of growth media or by dipping a surface of the piece of growth media into the adhesive or alternatively by brushing the adhesive onto the piece of growth media. In one embodiment the piece of growth media comprises a coir pellet. The seeds may be seeds for salad vegetables such as lettuce varieties though almost all other types of plant seeds may be used.



Published:

— *with international search report (Art. 21(3))*

METHODS AND APPARATUS FOR SEEDED GROWTH MEDIA

TECHNICAL FIELD

- 5 The present invention relates to methods and apparatus for growing seedlings on growth media such as coir pellets and mineral wool pellets.

BACKGROUND

- 10 The discussion of any prior art documents, techniques, methods or apparatus is not to be taken to constitute any admission or evidence that such prior art forms, or ever formed, part of the common general knowledge.

- 15 In recent years there has been a trend for home owners and restaurateurs to meet a substantial proportion of their requirements for salad vegetables, e.g. edible leafy greens, by growing them on their premises. The vegetables may be grown in pots either indoors or outdoors. Alternatively, and for greater yield a dedicated cultivation apparatus may be used. For example, Figure 1 depicts a dedicated, prior art, grow unit 1 which is about the size of a domestic kitchen
20 refrigerator. Grow unit 1 includes a number of trays 3 for supporting growth media which are sown with seeds that germinate into plants. Grow units are typically fitted with growth lights and a temperature control system to actively encourage growth of the plants. Some types of growth units include a water supply to ensure regular plant watering.

- 25 The growth media may be a potting mix soil or a loose coir material, either of which create a lot of mess, may retain too much water, fail to aerate the roots of the plants during growing and cannot be re-used thereby presenting a solid waste problem. Furthermore, seeding the growth media is problematic since
30 the seeds are often very small. Consequently a higher level of horticultural skill may be required or spacing of the seeds may be uneven so that as the full size plants grow regions of crowding and sparseness appear.

It would be advantageous if an improved method and apparatus were provided for seeding growth media which overcomes at least one of the above described problems of the prior art.

5 SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a method for seeding a piece of growth media comprising the steps of:

- 10 applying seeds and adhesive to the piece of growth media whereby the seeds are retained on the piece of growth media for germination therefrom.

The adhesive may be applied by spraying it onto the piece of growth media. Alternatively, in other embodiments of the invention the adhesive may be applied by dipping a surface of the piece of growth media into the adhesive or
15 alternatively by brushing the adhesive onto the piece of growth media.

Preferably the piece of growth media comprises a coir pellet. However, other types of growth media may also be used. For example, and non-exhaustively, the piece of growth media could comprise a piece of mineral wool or a peat
20 pellet.

In one embodiment of the invention the method comprises passing a plurality of the pieces of growth media under an adhesive applicator and thence under a seed applicator.
25

In another embodiment an applicator may be provided that dispenses a mixture of seeds and liquid adhesive.

The adhesive may comprise any one of a range of suitably non-plant toxic
30 solutions. Other plant friendly adhesives based on proteins, natural rubber, starch, or cellulose may also be used. For example, the adhesive may comprise an organic adhesive starch solution such as a reserved carbohydrate most commonly encountered in plants such as potatoes, wheat, corn, rice and

the like. In a preferred embodiment of the invention corn starch is used as the adhesive.

5 Other possible organic adhesives may include guar gum, agar agar, gum arabic, xanthan gum, psyllium, or any other polymeric binder that may be suitable for binding the seeds to the growth medium.

The method may include a laminating step to ensure seeds are sufficiently covered in adhesive to prevent contact with air.

10

The adhesive mixture should be water-soluble so that the seeds are able to be subsequently wetted by capillary action of the piece of growth media for germination and are not isolated from it by the adhesive.

15 A germination accelerant or other suitable growth stimulant may be added to the adhesive mixture so that when wet the seed germination is promoted.

20 Preferably the seeds are totally embedded in the liquid adhesive in that they are covered by the adhesive, so that they are excluded from air and moisture to maintain their shelf life prior to use.

The method may include laminating the seeds with adhesive to ensure total embedding of the seeds therein.

25 According to another aspect of the present invention there is provided a seed and growth media combination comprising:

30 a piece of growth media;
an adhesive bonded to the piece of growth media;
one or more seeds bonded to the adhesive for growing from the piece of growth media.

The piece of growth media may comprise a coir pellet though other pieces of growth media, such as a block of mineral wool or a peat pellet may also be used.

The adhesive may comprise corn starch though other plant friendly adhesives may also be used.

5 A germination accelerant or other suitable growth stimulant may be added to the adhesive mixture so when wet the seed germination is promoted.

The seeds may be seeds for salad vegetables such as lettuce varieties though it is believed that almost all other types of plant seeds may be used.

10 According to a further aspect of the present invention there is provided a mixture comprising seeds disposed in a liquid adhesive solution. For example the seeds may comprise salad vegetable seeds mixed in a solution of corn starch.

BRIEF DESCRIPTION OF THE DRAWINGS

15

Preferred features, embodiments and variations of the invention may be discerned from the following Detailed Description which provides sufficient information for those skilled in the art to perform the invention.

20 The Detailed Description is not to be regarded as limiting the scope of the preceding Summary of the Invention in any way. The Detailed Description will make reference to a number of drawings as follows:

Figure 1 depicts a prior art leafy greens grower apparatus.

25 Figure 2 is a view of a coir pellet in an initial stage of a method according to a preferred embodiment of the present invention.

Figure 3 is a view of the coir pellet bearing an adhesive in a further stage of the method.

Figure 4 shows seeds being dropped onto the adhesive in a further stage of the method.

30 Figure 5 depicts a seeded pellet produced by the method in accordance with a preferred embodiment of the present invention.

Figure 6 is a top plan view of a tray bearing a plurality of the seeded pellets.

Figure 7 is a first arrangement for making the seeded pellets.

Figure 8 is a second arrangement for making the seeded pellets.

Figure 9 depicts a laminating arrangement.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

5 Methods according to preferred embodiments of the present invention will now be described with reference to Figures 2 to 9.

Figure 2 illustrates a piece of growth media in the form of a coir pellet 5. Coir pellets are made of material from coconut husks and have been found to be
10 highly suitable growth media for cultivating plants from seeds. The pellets are dry and compressed so that they present a stable surface.

As shown in Figure 3, a liquid, plant friendly (i.e. non-toxic) adhesive 7 is initially applied to the surface of the coir pellet 5. The adhesive 7 preferably comprises
15 an organic adhesive starch solution such as a reserved carbohydrate most commonly encountered in plants such as potatoes, wheat, corn, rice and the like. In the presently discussed preferred embodiment the adhesive comprises corn starch.

20 Other possible organic adhesives that are believed to be suitable include guar gum, agar agar, gum arabic, xanthan gum, psyllium, or any other polymeric binder that may be suitable for binding the seeds to the growth medium.

In the presently described preferred embodiment of the invention the adhesive
25 7 comprises corn starch which is dropped on to the coir pellet 5. However the adhesive can also comprise other non-toxic solutions. Furthermore, the adhesive 7 may be applied in any suitable manner including brushing, spraying or dipping. The adhesive mixture should be water-soluble so that the seeds are able to be subsequently wetted by the growth media capillary action for
30 germination and not isolated from it by the adhesive.

A germination accelerant or other suitable growth stimulant may be added to the adhesive mixture so seed germination is promoted when the piece of growth media is wetted.

Figure 3 shows seeds 9 being applied by dropping them onto the wet adhesive 7 to form a seeded pellet 11 as shown in Figure 5. The adhesive 7 is applied as a liquid so that it penetrates into the coir on application and makes a sturdy mechanical fastening to the pellet sufficient for the packing and planting of the pellets. Once the adhesive 7 has been allowed to set a plurality of the seeded pellets 11 can be shipped in boxes or other suitable packaging, for use. It will be realised that since the seeds 7 are adhered to the pellet 5 they remain firmly in place during handling and transportation.

10 It is beneficial if care is taken to ensure that the seeds are totally embedded in the liquid adhesive so that they are excluded from air and moisture to thereby maintain shelf life of the product with viable seeds.

An end user may place a plurality of the seeded pellets 11 seed-side up into a plastic growing tray 3 as shown in Figure 6. The end user does not have to be concerned about the seeds falling off the coir or about having to seed the coir, since the coir is already fitted with the adhered seeds 9.

The tray 3 that is shown in Figure 6 is formed with pockets for each pellet 11 so that the pellets 11, and thus the groups of seedlings which grow from seeds 9 are spaced apart. However, the pockets are inessential and the pellets 11 could be simply placed side by side in an open tray.

No particular care is required when watering the seeded pellets 11. A preferred method for watering is to flood each pocket of the tray 3 with water to a little under the height of each pellet periodically. The pellets 11 soak the water up but they could also be watered from the top or the side by mist or droplets, if required, in order to encourage germination of the seeds 9 from the pieces of growth medium, e.g. pellets 5.

30

The adhesive 7 may be applied by spraying or dripping it onto the piece of growth media. For example, an arrangement is shown in Figure 7 in which a tray 13 of the pellets 5 is passed (in the direction indicated by arrow 14) beneath a liquid adhesive applicator 15 which dispenses a drop of adhesive 7 onto the

topside of pellet 5. The pellet 5 with adhesive drop 7 then passes under a seed dispenser 17 which applies seeds 9 onto the adhesive 7 to thereby form seeded pellets 11.

- 5 A further arrangement is depicted in Figure 8 in which a dispenser 19 is loaded with a mixture 10 of seeds and liquid adhesive. Drops 17 of the mixture 10 of liquid adhesive 7 containing the seeds 9 are applied to the pellets 5 to thereby form seeded pellets 11.
- 10 As previously discussed, it is desirable that the seeds are embedded within the adhesive so that they are covered by the adhesive since doing so prolongs their storage life and provides a protective cover. If it is the case that the seeds are not embedded in the adhesive but instead have portions that stand proud of the adhesive then, as shown in Figure 9, a laminating step may be conducted.
- 15 Figure 9 shows seeded pellets 11a in which the adhesive initially applied according to either Figure 7 or Figure 8 has not covered the seeds 9. In order to fully cover the seeds the seeded pellets 11a are put in a tray 3 which is passed, in the direction indicated by arrow 14, under adhesive applicator 15. The adhesive applicator 15 applies a drop of adhesive 7 which falls on the
- 20 uncovered seeds and sets to form a laminate layer 6 that covers them to thereby produce laminated seeded pieces of growth media 11b.

Other methods of applying the adhesive or the adhesive and seed mixture include dipping and brushing.

25

- Preferably the piece of growth media 5 comprises a coir pellet. However, other types of growth media may also be used which have sufficient water absorbency and capillary action sufficient to germinate the seeds 9. For example the piece of growth media may comprise a block of mineral wool or a
- 30 peat pellet.

The adhesive 7 may comprise any one of a range of suitably non-plant toxic solutions. As previously discussed, in the preferred embodiment of the invention that has been described adhesive 7 comprises liquid corn starch.

Other plant friendly adhesives are also known however and have been mentioned. For example adhesives based on proteins, natural rubber, starch, or cellulose may also be used.

- 5 The seeds 9 may be seeds for salad vegetables such as lettuce varieties though almost all other types of plant seeds may be used too.

- As previously discussed, seeded pellets may be used by private home owners and restaurants. Furthermore they are also applicable to commercial growing
10 and can be used both indoors and outdoors with or without a growing chamber. Indeed the seeded pellets may be used in almost any situation where plants are usually grown.

- In compliance with the statute, the invention has been described in language
15 more or less specific to structural or methodical features. The term “comprises” and its variations, such as “comprising” and “comprised of” is used throughout in an inclusive sense and not to the exclusion of any additional features. It is to be understood that the invention is not limited to specific features shown or described since the means herein described comprises preferred forms of
20 putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted by those skilled in the art.

CLAIMS:

1. A method for seeding a piece of growth media comprising:
applying seeds and adhesive to the growth media whereby the seeds are adhesively retained on the growth media for germination therefrom.
2. The method of claim 1, wherein the adhesive is applied by spraying the adhesive onto the piece of growth media.
3. The method of claim 1, wherein the adhesive is applied by dipping a surface of the piece of growth media into the adhesive.
4. The method of claim 1 wherein the adhesive is applied by brushing the adhesive onto the piece of growth media.
5. The method of any one of the preceding claims, wherein the piece of growth media comprises a coir pellet.
6. The method of any one of claims 1 to 4, wherein the piece of growth media comprises a piece of mineral wool
7. The method of any one of claims 1 to 4, wherein the piece of growth media comprises a peat pellet.
8. The method of any one of the preceding claims, wherein a plurality of the piece of growth media are passed under an adhesive applicator and thence under a seed applicator.
9. The method of any one of claims 1 to 7, wherein a plurality of the piece of growth media are passed under an applicator that dispenses a mixture of seeds and liquid adhesive.
10. The method of any one of the preceding claims, wherein the adhesive comprises corn starch.

11. The method of any one of claims 1 to 9, wherein the adhesive is water-soluble.
12. The method of any one of the preceding claims including adding a germination accelerant or other growth stimulant to the adhesive mixture for promoting seed germination when wetted.
13. The method of any one of the preceding claims including totally embedding the seeds in the adhesive so that they are excluded from air and moisture to maintain their shelf life prior to use.
14. The method of claim 14, including laminating the seeds to ensure total embedding of the seeds in the adhesive.
15. A seed and growth media combination comprising:
 - a piece of growth media;
 - an adhesive bonded to the piece of growth media;
 - one or more seeds bonded to the adhesive for growing from the piece of growth media.
16. The combination of claim 15, wherein the piece of growth media comprises a coir pellet.
17. The combination of claim 15, wherein the piece of growth media, comprises a block of mineral wool or a peat pellet.
18. The combination of any one of claims 15 to 17, wherein the adhesive comprises corn starch.
19. The combination of any one of claims 15 to 17, wherein the adhesive is water soluble.

20. The combination of any one of claims 15 to 19 including a germination accelerant added to the adhesive mixture so when wet seed germination is promoted.

21. The combination of any one of claims 15 to 20 wherein the seeds comprise seeds for salad vegetables.

22. The combination of claim 21, wherein the seeds comprise seeds for lettuce varieties.

23. A mixture comprising seeds disposed in a liquid adhesive solution.

24. A mixture according to claim 24 wherein the seeds comprise salad vegetable seeds

25. A mixture according to claim 22 or claim 23 wherein the liquid adhesive solution comprises a solution of corn starch.

* * *

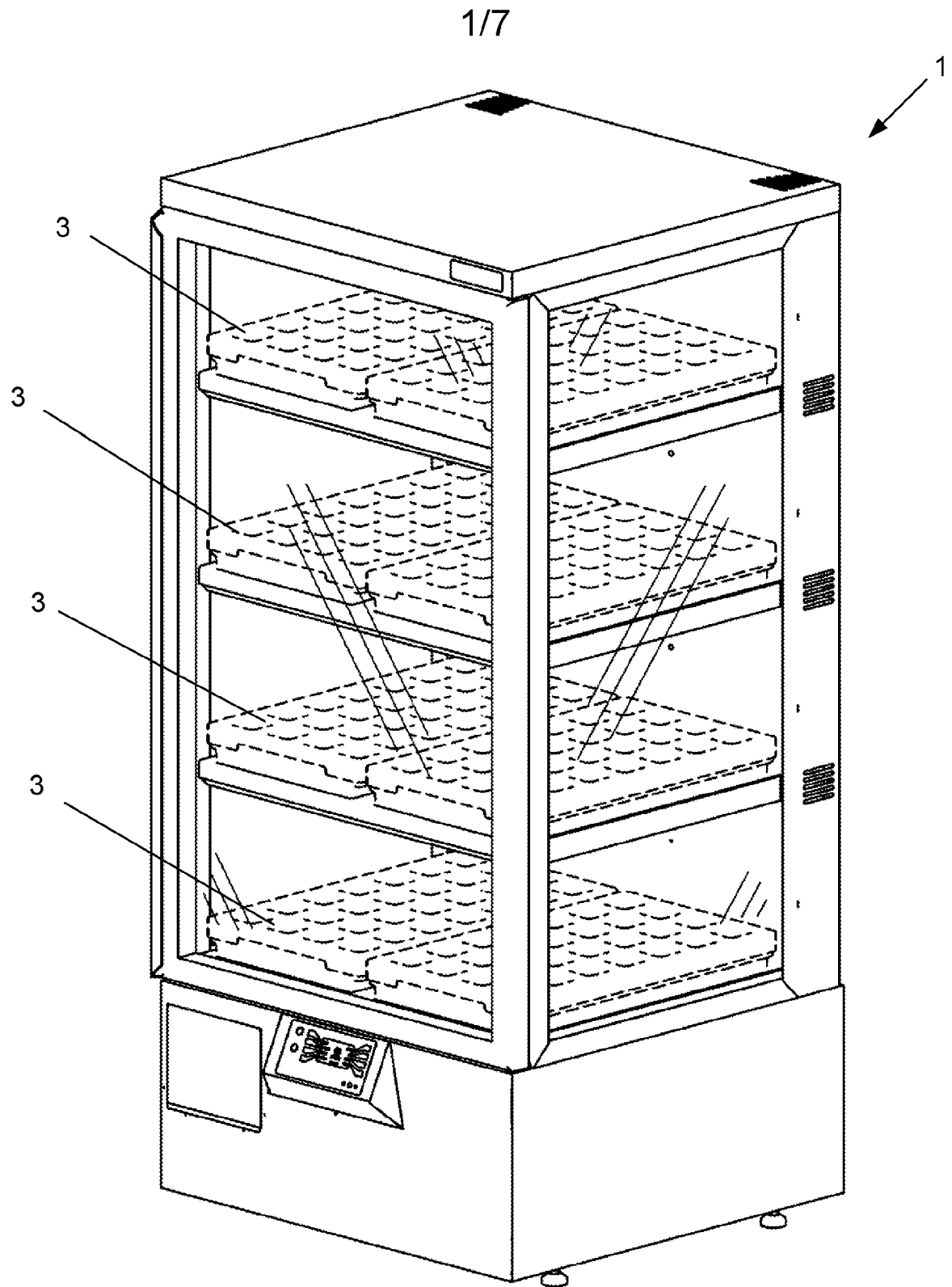


FIG. 1

2/7

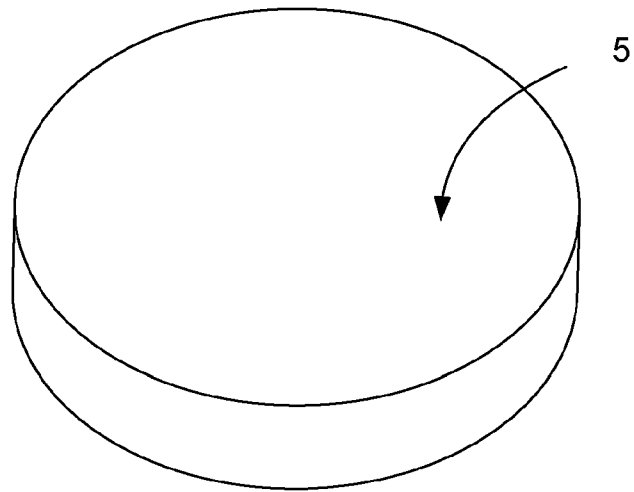


FIG. 2

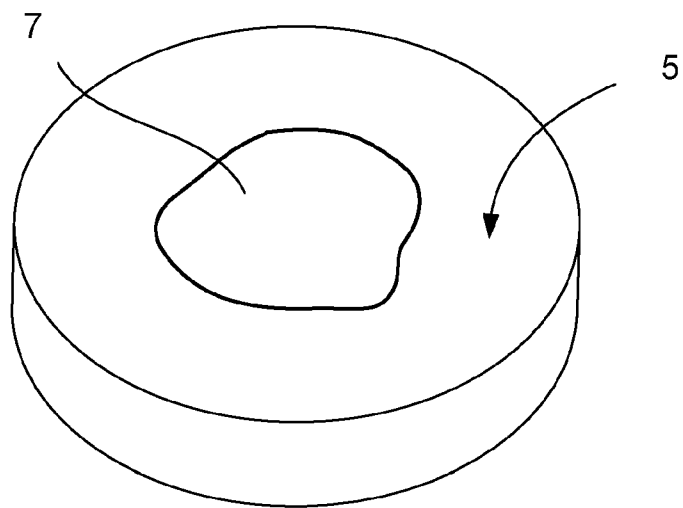


FIG. 3

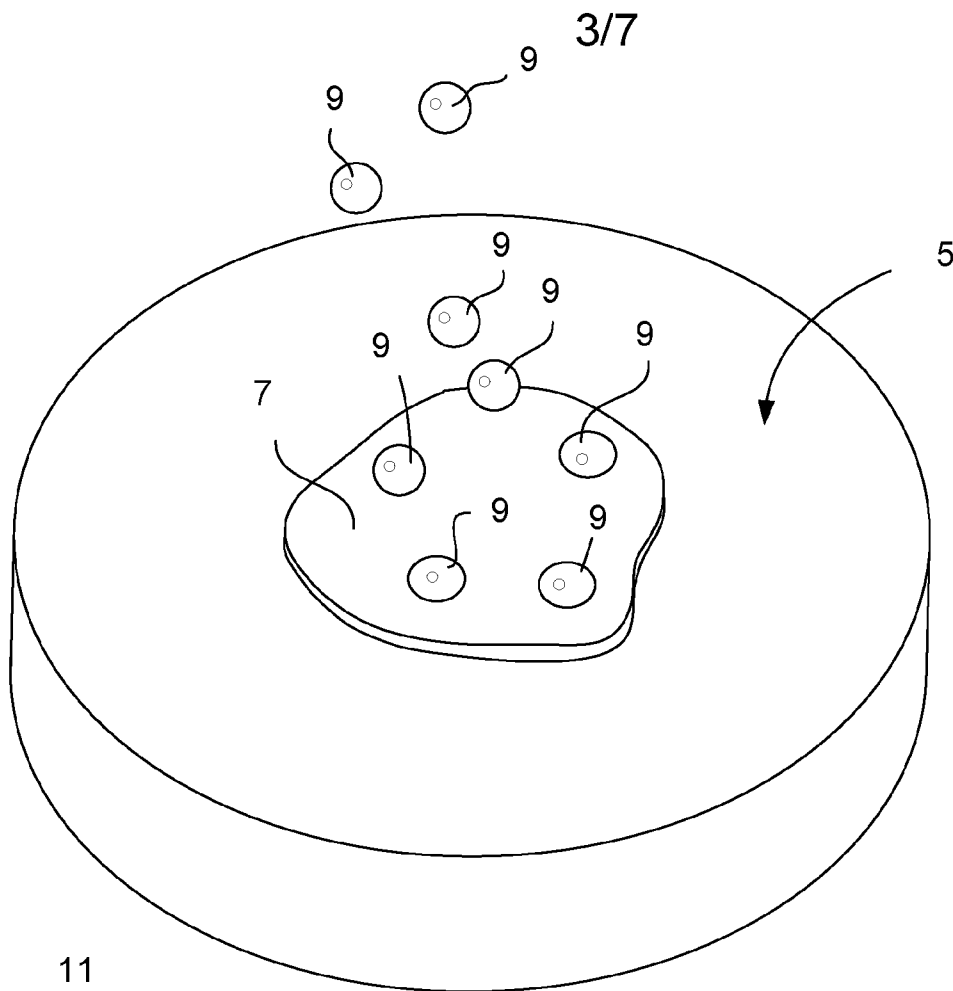


FIG. 4

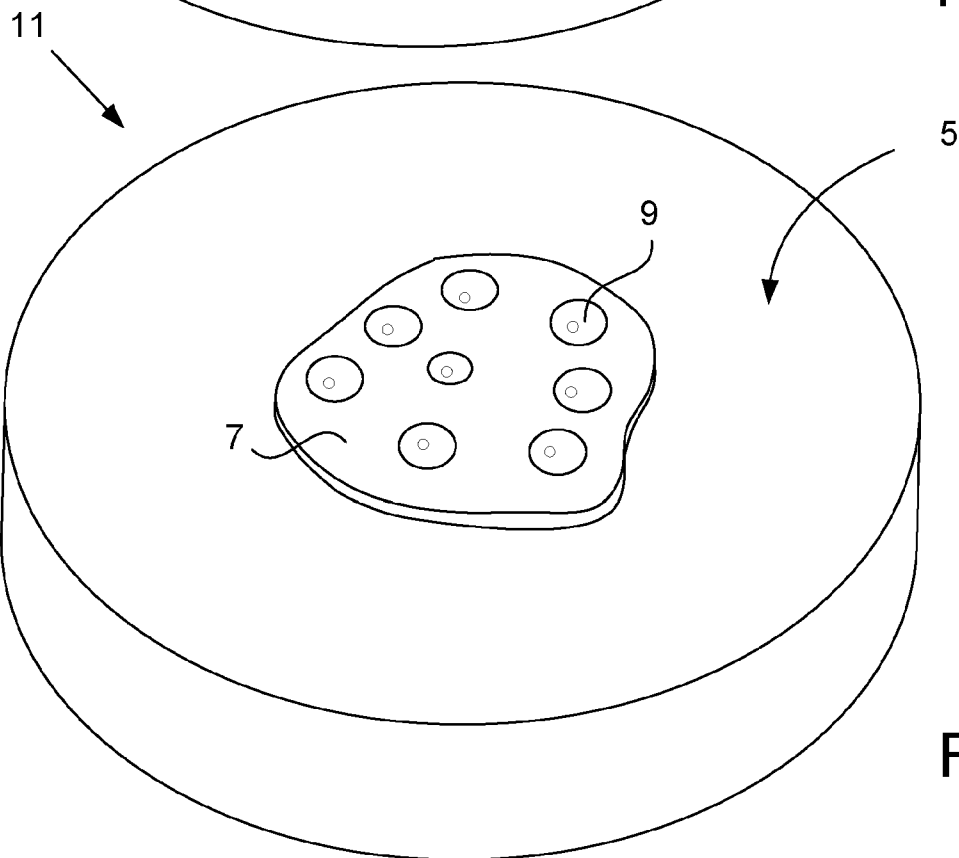
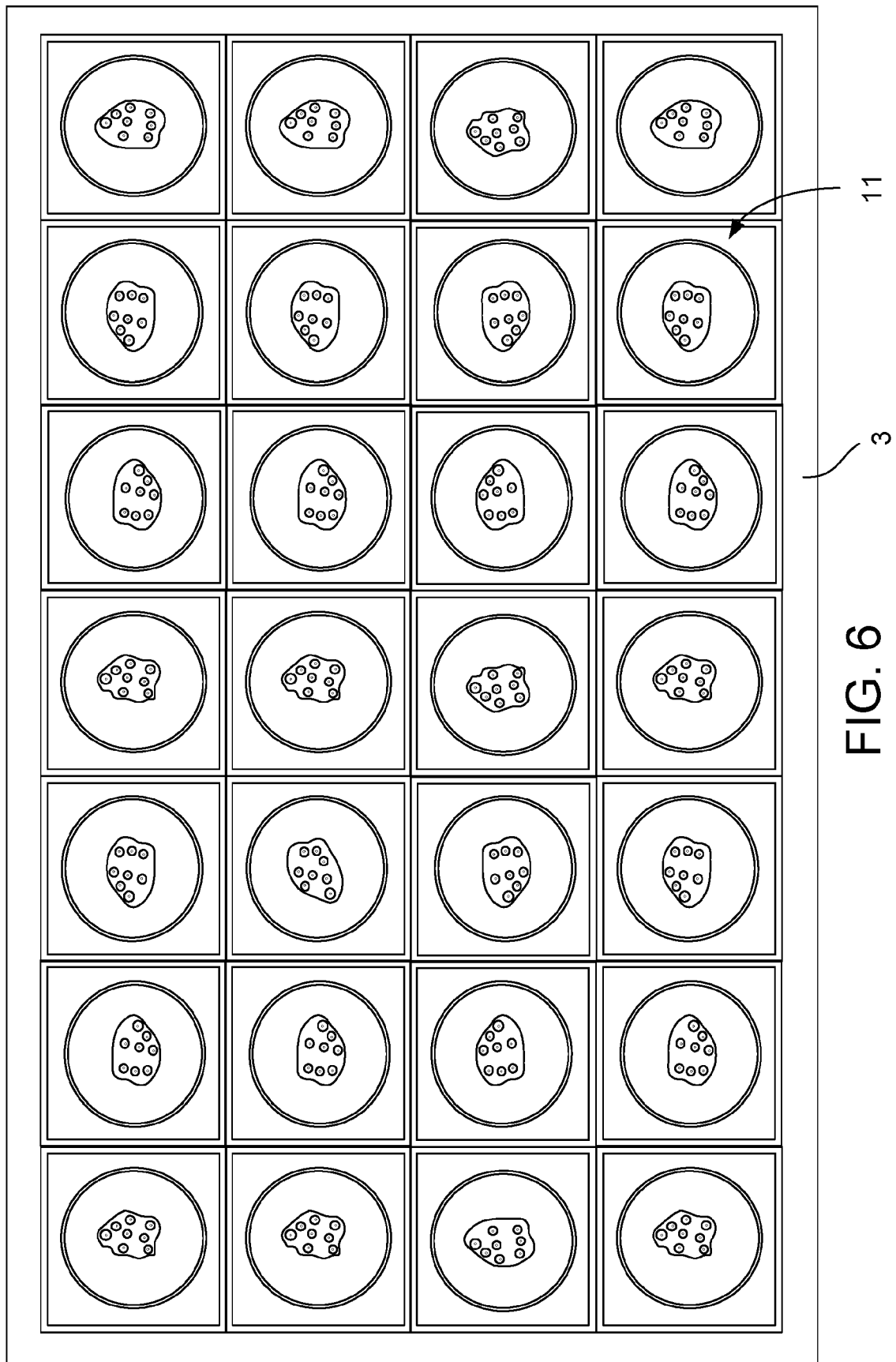


FIG. 5

4/7



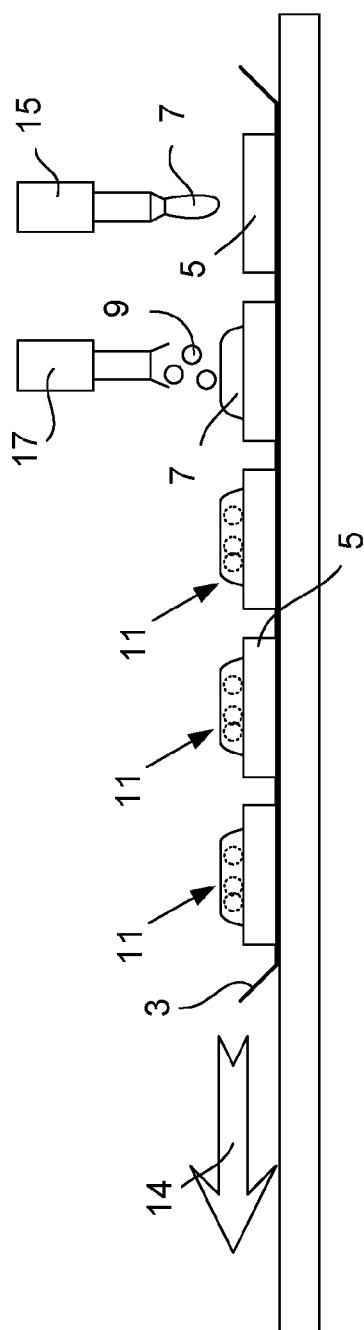


FIG. 7

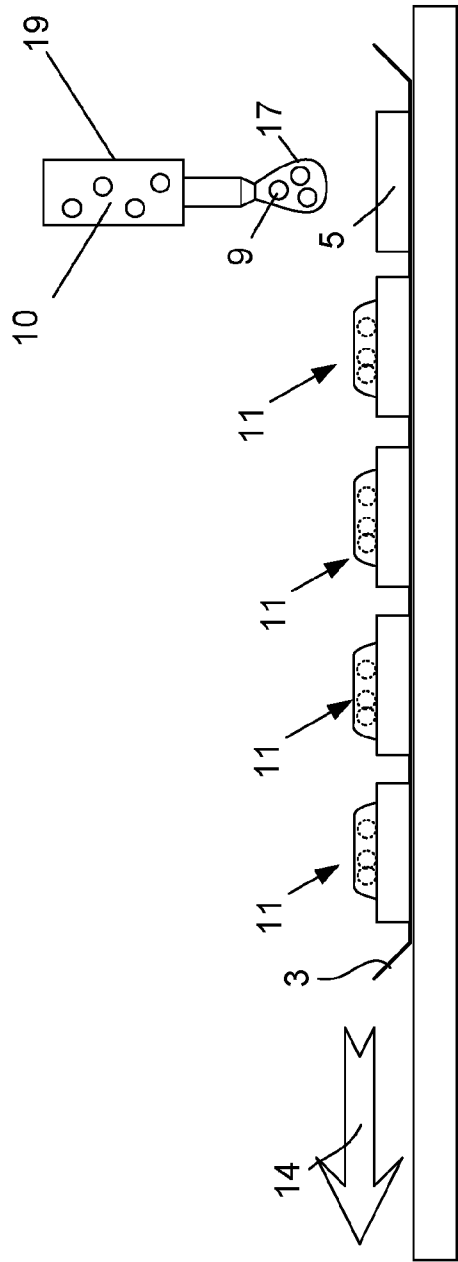


FIG. 8

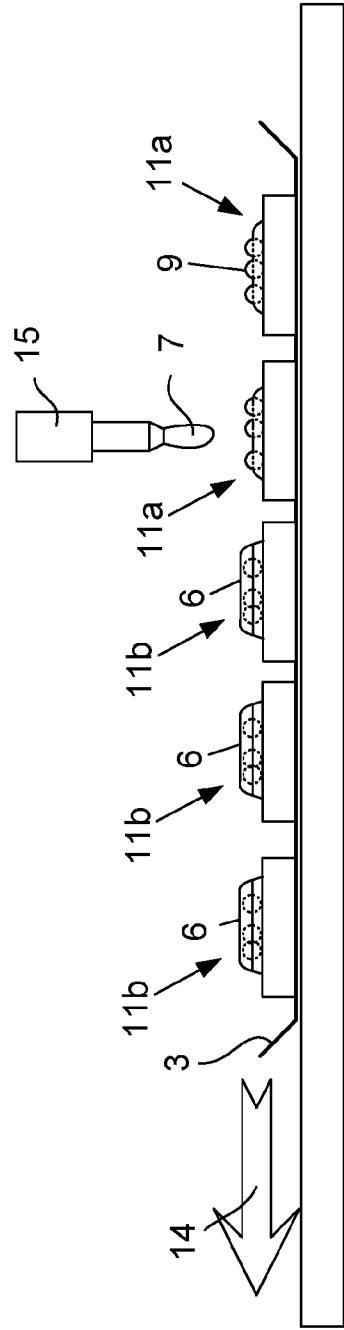


FIG. 9

INTERNATIONAL SEARCH REPORT

 International application No.
PCT/AU2018/050626

A. CLASSIFICATION OF SUBJECT MATTER

A01C 1/04 (2006.01) A01C 1/06 (2006.01) A01G 22/15 (2018.01) A01G 24/00 (2018.01)

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)

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)

PATENW, Google Patents, Espacenet: IPC/CPC: A01G24/00/LOW, A01C1/04/LOW, A01C1/06/LOW, A01G22/15/LOW, A01G20/20/LOW, A01G9/021/LOW, A01G9/0291/LOW, A01G9/033/LOW, A01G31/06/LOW, Y02P60/216/LOW and keywords growth, media, medium, material, mat, seed, adhesive, glue, peat, coir, mineral, wool, spray, dip, brush, water proof, air tight, bond and like terms. **Google Patents, Google Images:** keywords as above.

Applicant/Inventor name search in the above databases and Internal databases provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 23 July 2018	Date of mailing of the international search report 23 July 2018
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustalia.gov.au	Authorised officer Ivy Shum AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262832465

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/AU2018/050626
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2286650 A2 (Agritecno Yazaki Co., Ltd.) 23 February 2011 Figures 1-2 and corresponding text in the description	1-25
X	US 2009/0178334 A1 (HENDERSON) 16 July 2009 abstract, Figures 1-3 and 7 and corresponding text in the description	1-25
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X	KR 20130075856 A (BYUN) 08 July 2013 & Google Patents English translation abstract, Figures 1-5 and corresponding text in the description	1-25
X	CA 1151427 A (MAYR) 09 August 1983 abstract, Figures 1-2 and corresponding text in the description	1-25

Form PCT/ISA/210 (fifth sheet) (January 2015)

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Supplemental Box**Continuation of: Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

Claims 1-22 and claim 9 (in part) are directed to a seed and growth media combination comprising a piece of growth media, an adhesive and seeds for germination/growing and a method of making the same. The feature of the seeds are bonded or adhesively retained by the adhesive on the growth media for growing/germination therefrom is specific to this group of claims.

Claims 23-25, and claim 9 (in part) are directed to a mixture comprising seeds disposed in a liquid adhesive solution. The feature of the seeds disposed in a liquid adhesive solution is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions is seeds disposed in an adhesive. However, it is considered that this feature is generic in this particular art.

Therefore this common feature cannot be a special technical feature. Hence there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2018/050626	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
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End of Annex			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(January 2015)			