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(54) Title: METHODS AND SYSTEMS FOR GENERATING SHARED COLLABORATIVE MAPS

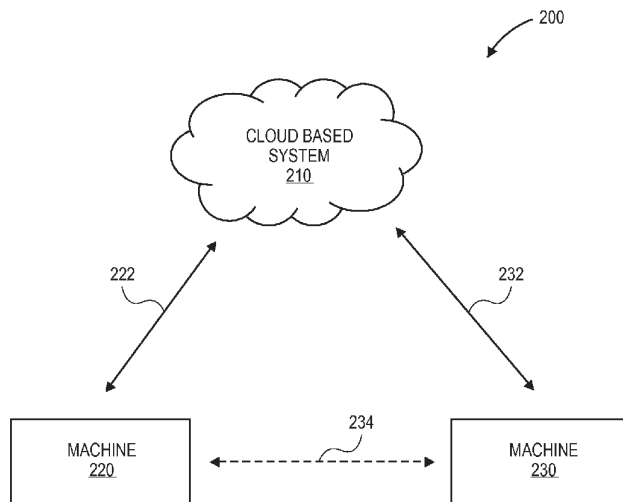


FIG. 2

(57) Abstract: Described herein are methods and systems for generating shared collaborative maps for planting or harvesting operations. A method of generating a collaborative shared map between machines includes generating a first map for a first machine based on a first set of data and generating a second map for a second machine based on a second set of data. The method further includes generating at least one shared collaborative map for at least one of the first and second machines based on the first and second maps.





SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
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— *of inventorship (Rule 4.17(iv))*

Declarations under Rule 4.17:

Published:

— *as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii))*

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

— *as to the applicant's entitlement to claim the priority of
the earlier application (Rule 4.17(iii))*

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 27151.10062WO01	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/US15/15252	International filing date (day/month/year) 10 February 2015 (10.02.2015)	Priority date (day/month/year) 10 February 2014 (10.02.2014)	
International Patent Classification (IPC) or national classification and IPC IPC: A01B 69/00 (2006.01) USPC: 709/204			
Applicant PRECISION PLANTING 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>3</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>8</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which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).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 electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3bis 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 and 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 10 December 2015 (10.12.2015)		Date of completion of this report 03 April 2016 (03.04.2016)	
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201		Authorized officer KIM T. NGUYEN Telephone No. 571-272-4441	

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US15/15252

Box No. I Basis of the report1. 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 English which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b)).
 - ☐ publication of the international application (Rule 12.4(a)).
 - ☐ international preliminary examination (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*):

- ☐ the international application as originally filed/furnished
- ☒ the description:
 pages 1-17 as originally filed/furnished
 pages* NONE received by this Authority on _____
 pages* NONE received by this Authority on _____
- ☒ the claims:
 pages NONE as originally filed/furnished
 pages* NONE as amended (together with any statement) under Article 19
 pages* 3-8 received by this Authority on 22 January 2016 (22.01.2016)
- ☒ the drawings:
 pages 1/8-8/8 as originally filed/furnished
 pages* NONE received by this Authority on _____
 pages* NONE received by this Authority on _____
- ☐ 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)).

6. ☒ With regard to top-up searches (Rules 66.1ter and 70.2(f)):

- ☒ A top-up search was carried out by this Authority on 03 April 2016 (03.04.2016)
- ☐ 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."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US15/15252**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)	Claims <u>1-20</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-20</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-20</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and Explanations (Rule 70.7)

Claims 1-20 meet the criteria set out in PCT Article 33(2)-(3), because

With respect to claim 1, the prior art does not teach or fairly suggest a method of generating a collaborative shared map between agricultural machines, comprising: generating a first map for a first agricultural machine based on a first set of agricultural data, said first map comprising a first coverage layer representing a first set of locations traversed by said first agricultural machine and a first set of operational criteria, said first set of operational criteria quantifying operations carried out by said first machine in each of said first set of locations; generating a second map for a second agricultural machine based on a second set of agricultural data, said second map comprising a second coverage layer representing a second set of locations traversed by said second agricultural machine and a second set of operational criteria, said second set of operational criteria quantifying operations carried out by said second machine in each of said second set of locations; and generating at least one shared collaborative map for at least one of the first and second agricultural machines based on the first and second maps, said shared collaborative map including said first coverage layer and said second coverage layer, which structurally arranged and functionally operated as claimed in claims 1.

With respect to claims 2-10, the claims also meet the criteria set out in PCT Article 33(2)-(3) as being depended on claim 1.

With respect to claim 11, the prior art does not teach or fairly suggest a method of generating a collaborative shared map between agricultural machines, comprising: receiving with a processing logic of a cloud based system a first map from a first agricultural machine, said first map comprising a first coverage layer representing a first set of locations traversed by said first agricultural machine and a first set of operational criteria, said first set of operational criteria quantifying operations carried out by said first machine in each of said first set of locations; receiving with said processing logic of said cloud based system second map from a second agricultural machine, said second map comprising a second coverage layer representing a second set of locations traversed by said second agricultural machine and a second set of operational criteria, said second set of operational criteria quantifying operations carried out by said second machine in each of said second set of locations; generating with said processing logic at least one shared collaborative map for at least one of the first and second agricultural machines based on the first and second maps; and sending said shared collaborative map to said first agricultural machine and said second agricultural machine, said shared collaborative map including said first coverage layer and said second coverage layer, which structurally arranged and functionally operated as claimed in claims 11.

With respect to claims 12-20, the claims also meet the criteria set out in PCT Article 33(2)-(3) as being depended on claims 11.

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.

----- NEW CITATIONS -----

Article 34 Amendment
App. No.: PCT/US2015/015252
Atty Ref.: 27151.100062WO01

BEFORE THE INTERNATIONAL BUREAU OF WIPO

Int'l Application No.: PCT/US2015/015252

Int'l Filing Date: 10 February 2015

Applicant: PRECISION PLANTING LLC

Atty Ref. No.: 27151.10062WO01

Title: METHODS AND SYSTEMS FOR GENERATING SHARED COLLABORATIVE MAPS

ARTICLE 34 AMENDMENT

Applicant submits this Article 34 Amendment in response to the International Search Report and Written Opinion of the ISA dated 15 May 2015.

Letter Accompanying Article 34 Amendment: Begins on page 2 of this paper.

Amendments to the claims: Begin on page 3 of this paper. Replacement Sheets for the claims accompany this amendment.

Arguments: Begin on page 7 of this paper.

LETTER ACCOMPANYING ARTICLE 34 AMENDMENT

Original claims 1 and 11 are amended. All other claims are unchanged

(i) Claim 1 is amended to further define the first and second maps and the shared collaborative map. The basis for the amendments to claim 1 can be found at Par. [0036] - [0039] and FIGs.3-5.

(ii) Claim 11 is amended to further define the first and second maps and the shared collaborative map. The basis for the amendments to claim 11 can be found at Par. [0036] - [0039] and FIGs.3-5.

AMENDMENTS TO THE CLAIMS

1. A method of generating a collaborative shared map between agricultural machines, comprising:
 - generating a first map for a first agricultural machine based on a first set of agricultural data, said first map comprising a first coverage layer representing a first set of locations traversed by said first agricultural machine and a first set of operational criteria, said first set of operational criteria quantifying operations carried out by said first machine in each of said first set of locations; and
 - generating a second map for a second agricultural machine based on a second set of agricultural data, said second map comprising a second coverage layer representing a second set of locations traversed by said second agricultural machine and a second set of operational criteria, said second set of operational criteria quantifying operations carried out by said second machine in each of said second set of locations; and
 - generating at least one shared collaborative map for at least one of the first and second agricultural machines based on the first and second maps, said shared collaborative map including said first coverage layer and said second coverage layer.
2. The method of claim 1, further comprising:
 - generating said first set of agricultural data with a processing logic of said first agricultural machine; and
 - generating said second set of agricultural data with a processing logic of said second agricultural machine.
3. The method of claim 2, further comprising:
 - sending one of said first map and said first set of agricultural data to a cloud based system; and
 - sending one of said second map and said second set of agricultural data to said cloud based system.
4. The method of claim 3, further comprising:
 - receiving at said first agricultural machine one of said second map and said second set of agricultural data to said cloud based system; and
 - receiving at said second agricultural machine one of said first map and said first set of agricultural data to said cloud based system.

AMENDMENTS TO THE CLAIMS

5. The method of claim 4, further comprising:
providing said shared collaborative map to a cab monitor of said first agricultural machine.
6. The method of claim 5, wherein said first and second agricultural machines comprise seed planters including a plurality of seed sensors in data communication with said cab monitor, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted, and wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted.
7. The method of claim 5, wherein said first and second agricultural machines comprise seed planters including a plurality of seed sensors in data communication with said cab monitor, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted a first seed type, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted a second seed type hybrid, wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted said first seed type, and wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted said second seed type.
8. The method of claim 5, wherein said first and second agricultural machines comprise harvesters including a yield sensor in data communication with said cab monitor, wherein said shared collaborative map includes locations in the field wherein said first machine has already harvested, and wherein said shared collaborative map indicates locations in the field wherein said agricultural machine has already harvested.
9. The method of claim 5, further comprising:
triggering machine control of said first agricultural machine based on said shared collaborative map.
10. The method of claim 7, further comprising:
temporarily stopping a seed meter said of said first agricultural machine from planting in order to prevent planting in an area indicated as already planted by said second agricultural map according to said shared collaborative map.

AMENDMENTS TO THE CLAIMS

11. A method of generating a collaborative shared map between agricultural machines, comprising:

receiving with a processing logic of a cloud based system ~~one of a first set of agricultural data and a first map from a first agricultural machine, said first map comprising a first coverage layer representing a first set of locations traversed by said first agricultural machine and a first set of operational criteria, said first set of operational criteria quantifying operations carried out by said first machine in each of said first set of locations;~~

receiving with said processing logic of said cloud based system ~~one of a second set of agricultural data and a first second map from a second agricultural machine, said second map comprising a second coverage layer representing a second set of locations traversed by said second agricultural machine and a second set of operational criteria, said second set of operational criteria quantifying operations carried out by said second machine in each of said second set of locations;~~

generating with said processing logic at least one shared collaborative map for at least one of the first and second agricultural machines based on the first and second maps; and

sending said shared collaborative map to said first agricultural machine and said second agricultural machine, said shared collaborative map including said first coverage layer and said second coverage layer.

12. The method of claim 4, further comprising:

providing said shared collaborative map to a cab monitor of said first agricultural machine.

13. The method of claim 11, further comprising:

providing said shared collaborative map to a cab monitor of said first agricultural machine.

14. The method of claim 13, wherein said first and second agricultural machines comprise seed planters including a plurality of seed sensors in data communication with said cab monitor, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted, and wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted.

AMENDMENTS TO THE CLAIMS

15. The method of claim 13, wherein said first and second agricultural machines comprise seed planters including a plurality of seed sensors in data communication with said cab monitor, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted a first seed type, wherein said shared collaborative map indicates locations in the field wherein said first machine has already planted a second seed type hybrid, wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted said first seed type, and wherein said shared collaborative map indicates locations in the field wherein said second agricultural machine has already planted said second seed type.

16. The method of claim 13, wherein said first and second agricultural machines comprise harvesters including a yield sensor in data communication with said cab monitor, wherein said shared collaborative map includes locations in the field wherein said first machine has already harvested, and wherein said shared collaborative map indicates locations in the field wherein said agricultural machine has already harvested.

17. The method of claim 13, further comprising:
triggering machine control of said first agricultural machine based on said shared collaborative map.

18. The method of claim 14, further comprising:
temporarily stopping a seed meter said of said first agricultural machine from planting in order to prevent planting in an area indicated as already planted by said second agricultural map according to said shared collaborative map.

19. The method of claim 18, wherein said seed meter is driven by an electric motor drive.

20. The method of claim 15, further comprising:
temporarily stopping a seed meter said of said first agricultural machine from planting in order to prevent planting in an area indicated as already planted by said second agricultural map according to said shared collaborative map.

ARGUMENTS

I. ACKNOWLEDGEMENT OF NOVELTY

In the International Search Report (ISR) dated 15 May 2015, the International Searching Authority (ISA) acknowledged that claims 6-10, and 14-20 meet the criteria of novelty under PCT Articles 33(2).

II. ASSERTIONS OF LACK OF NOVELTY

The ISA asserts that claims 1-5 and 11-13 lack novelty under PCT Article 33(2) as being anticipated by US6216071 ("Motz").

Independent claims 1 and 11 recite first and second maps for first and second agricultural machines comprising "coverage layer[s]" that represent **both** (1) locations traversed by those respective agricultural machines, and (2) operational criteria that quantify operations carried out by each of the agricultural machines at those locations.

Motz discloses using one or more machines to generate a model "of the agricultural field" including "geographic information representing the topography of the field" (col. 3, ll. 14-19). Motz does not teach or suggest quantifying the operations carried out by a machine, much less a map including a coverage layer representing a set of locations traversed by a machine and operational criteria quantifying operations carried out by the machine in each of the set of locations. Moreover, not only does Motz not contemplate such coverage layers, Motz certainly does not teach or suggest a shared collaborative map including such coverage layers from multiple machines as recited in amended claims 1 and 11.

Accordingly, the ISA's assertion of lack of novelty based on Motz has been overcome.

III. ASSERTION OF LACK OF INVENTIVE STEP

The ISA asserts that claims 8-9 and 16-17 lack inventive step under PCT Article 33(3) as being obvious over Motz.

Claims 8-9 depend from independent claim 1 and add further limitations. Likewise, claims 16-17 depend from independent claim 11 and add further limitations. It has been

established above that Motz does not teach or suggest each of the limitations recited in independent claims 1 and 11. Accordingly, the ISA's assertions of lack inventive step over Motz of dependent claims 8-9 and 16-17 are likewise necessarily overcome.

The ISA asserts that claims 6-7, 10, 14-15 and 18-20 lack inventive step under PCT Article 33(3) as being obvious over Motz in view of US2003/009282 ("Upadhyaya").

Claims 1-7 and 10 depend from independent claim 1 and add further limitations. Likewise, claims 14-15 and 18-20 depend from claim 11 and add further limitations. Upadhyaya does not disclose, teach or suggest the limitations of independent claims 1 and 11 missing from Motz as identified above. Accordingly, the ISA's assertions of lack inventive step over Motz in view of Upadhyaya of dependent claims 1-7 and 10 and dependent claims 14-15 and 18-20 are likewise necessarily overcome.

IV. Conclusion

Based on the foregoing it is respectfully submitted that replacement claims 1-20 satisfy the novelty and inventive step requirements of PCT Article 33(2) and 33(3).

If, in the opinion of the IPEA, a favorable IPRP cannot be issued on the basis of the above amendments to the claims and arguments, Applicant expressly requests issuance of an additional written opinion under Rule 66.4 and/or institution of a telephone interview under Rule 66.6. It is submitted that such additional communication, if needed, will facilitate the issuance of a favorable IPRP, and provide efficiencies in subsequent regional and national phase examination.

Respectfully submitted,

Date: January 22, 2016

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