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(54) **Title:** TECHNIQUES FOR AUTOMATED PLANTING

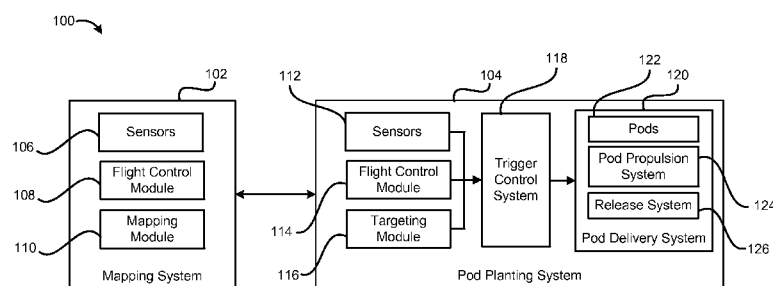


FIG. 1

(57) **Abstract:** Embodiments of the present invention provide techniques, including systems and methods, for planting using plant-ing pods. A planting system can be configured to deliver pods including a payload (e.g., seeds, cuttings, or other planting materials) into or onto the ground at a predetermined location. In some embodiments, the automated planting system can include a mapping system that receives various sensor inputs and generates a map of a planting area. A pod planting system may use the map of the planting area to deliver pods to the planting area. The pod planting system may be executed automatically using the maps generated by the mapping system and/or manually by a remote operator. Each pod can include a payload to be planted on or in the ground by the pod planting system. Pods may be customized depending on the types of plants being planted, the terrain, prior planting results, etc.

AMENDED CLAIMS
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1. A computer-implemented method, comprising:
receiving input data from a plurality of sensors;
processing the input data to generate one or more output maps;
generating a planting pattern for a planting operation using the one or more output maps, the planting pattern defining a plurality of locations wherein each location of the plurality of locations is associated with at least one species of plant to be planted at the location by a planting platform and one or more planting conditions;
determining a quantity of planting platforms available;
dividing the planting pattern into a plurality of portions based on the quantity of planting platforms available;
uploading to each available planting platform a corresponding portion of the plurality of portions; and
executing the planting operation using the available planting platforms.
2. The computer-implemented method of claim 1, wherein the planting platforms include one or more unmanned aerial vehicles (UAVs).
3. The computer-implemented method of claim 1, wherein the one or more output maps include terrain data identifying one or more of structures, terrain types, and debris, and wherein generating a planting pattern for a planting operation using the one or more output maps includes identifying areas for planting based on the terrain data.
4. The computer-implemented method of claim 3, wherein generating a planting pattern for a planting operation using the one or more output maps further comprises:
applying one or more terrain thresholds to the tags in the one or more output maps; and
tagging one or more regions of the one or more output maps with threshold data to generate one or more enriched output maps.
5. The computer-implemented method of claim 4, further comprising:
comparing the enriched output maps to planting requirements for a payload;
identifying, based on the comparison, one or more planting regions for the payload; and

defining the planting pattern for the payload based on a density level associated with the payload.

6. A planting apparatus comprising:

a casing comprising an inner surface and an outer surface, wherein a first end portion of the casing is closed to form a chamber and a second end portion of the casing is open;

a payload in the chamber, the payload including planting material and matrix material; and

a lid having a lower surface and an upper surface, the lower surface adapted to seal the second end portion of the casing.

7. The planting apparatus of claim 6, wherein the casing is made of biodegradable materials and includes a nutrient mixture specific to the payload.

8. The planting apparatus of claim 7, wherein the casing is substantially conical and wherein one or more of the casing and the lid are adapted to break upon impact with a planting environment, exposing the payload to the planting environment.

9. The planting apparatus of claim 6, further comprising:

a pushrod connected to the lower surface of the lid and extending through the first end portion of the casing, wherein at impact with a substrate the pushrod causes the lid to open.

10. The planting apparatus of claim 6, further comprising:

one or more wings connected to the upper surface of the lid, the one or more wings adapted to cause the planting apparatus to spin when released from a first height.

11. The planting apparatus of claim 6, wherein the outer surface of the casing comprises one or more stabilization surfaces, the one or more stabilization surfaces adapted to cause the planting apparatus to spin about its axis.

12. The planting apparatus of claim 6, wherein the upper surface of the lid comprises one or more stabilization surfaces extending from the upper surface of the lid.

13. The planting apparatus of claim 6, further comprising:

one or more sensors integrated with the casing;

an energy generation system connected to an energy storage system, wherein the energy storage system provides energy to the one or more sensors;

wherein the one or more sensors include at least one communication module and at least one environmental sensor, the at least one communication module configured to transmit data from the at least one environmental sensor to a second planting apparatus.

14. The planting apparatus of claim 13, wherein the second planting apparatus includes a second communication module configured to transmit data received from a plurality of planting apparatuses to a base station.

15. An automated planting system, comprising:

a planting system including a chamber connected to a trigger-controlled firing mechanism, a barrel, and a feeder, wherein the trigger-controlled firing mechanism is configured to direct a pod fed into the chamber by the feeder, through the barrel;

a trigger control system connected to the trigger-controlled firing mechanism and configured to receive data from one or more sensors, wherein the trigger control system is configured to

determine a position of the mobile transport platform using the one or more sensors;

compare the position of the mobile transport platform to a first location in a planting pattern; and

determine that the position is within a threshold distance of the first location; and

cause the trigger-controlled firing mechanism to fire a pod at the first location.

16. The automated planting system of claim 15, further comprising:

a mobile transport platform coupled to the planting system, the mobile transport platform including the one or more sensors, wherein the mobile transport platform is a unmanned aerial vehicle.

17. The automated planting system of claim 15, wherein the firing mechanism further comprises:

a high pressure chamber connected to the chamber via an electronically controlled valve, wherein when the trigger control system causes the trigger controlled firing mechanism to fire the pod by opening the electronically controlled valve.

18. The automated planting system of claim 17, wherein the high pressure chamber includes a compressed gas cylinder that pressurizes the high pressure chamber.

19. The automated planting system of claim 17, further comprising:
a gimbal rotatably coupling the planting system to the mobile transport platform.

20. The automated planting system of claim 15, further comprising:
a mapping system configured to receive data from the one or more sensors, wherein the mapping system generates the planting pattern based on the data from the one or more sensors.

21. The computer-implemented method of claim 5, wherein the payload includes one or more of one or more of:
planting material for the at least one species of plant;
at least one organism;
support matrix material; or
sensor.

22. The computer-implemented method of claim 21 further comprising:
defining the planting pattern for the payload based on a distribution of plant species in an area represented by the output maps.

23. The computer-implemented method of claim 21 further comprising:
defining the planting pattern for the payload based on soil restoration requirements.

24. The computer-implemented method of claim 21 further comprising:
defining the planting pattern for the payload based on one or more decorative patterns.

25. The computer-implemented method of claim 1, wherein each location of the plurality of locations is further associated with one or more of one or more of:

at least one organism;
support matrix material; or
sensor.

26. The automated planting system of claim 15 wherein the trigger control system is further configured to cause the trigger-controlled firing mechanism to fire a pod based on a signal received from a user device.