[0008a] According to embodiments of the disclosures, a method for operating one or more drive units in a controlled agricultural environment includes for each of the one or more drive units, increasing a distance between an alignment element and a drive element; receiving a plant support structure that is oriented non-vertically so that the plant support structure rests on the drive element or the alignment element of each of the one or more drive units; and for each of the one or more drive units, decreasing the distance between the alignment element and the drive element so that the alignment element or the drive element rests on the plant support structure.

CLAIMS

What is claimed is:

1. A method for operating one or more drive units in a controlled agricultural environment, the method comprising:

(a) for each of the one or more drive units, increasing a distance between an alignment element and a drive element;

(b) receiving a plant support structure that is oriented non-vertically so that the plant support structure rests on the drive element or the alignment element of each of the one or more drive units; and

(c) for each of the one or more drive units, decreasing the distance between the alignment element and the drive element so that the alignment element or the drive element rests on the plant support structure.

2. The method of claim 1 further comprising, for each of the one or more drive units, driving the drive element to convey the plant support structure.

3. The method of claim 1, wherein the plant support structure comprises a grow tower.

4. The method of any one of the preceding claims, wherein the plant support structure includes a groove that rests on the drive element or the alignment element.

5. The method of any one of the preceding claims, wherein decreasing the distance is performed in response to sensing the presence of the plant support structure in the drive unit.

6. The method of any one of the preceding claims, further comprising applying a force via the alignment element or the drive element to force the plant support structure against the drive element or the alignment element, respectively.

7. The method of any one of the preceding claims, wherein:

a. the alignment element comprises one or more rollers, one or more wheels, a linear bearing element, a belt, a tread, one or more gears, or a fixed material that has a coefficient of friction against the plant support structure less than a coefficient of friction of the drive element against the plant support structure; and

b. the drive element comprises one or more rollers, one or more wheels, a belt, a tread, a linear actuator, or one or more gears.

8. The method of any one of the preceding claims, further comprising generating a slippage detection signal based at least in part upon a comparison of a measured position or motion of the plant support structure with a desired position or motion of the plant support structure.

9. The method of claim 8, further comprising triggering an action based at least in part upon the slippage detection signal.

10. A drive unit in a controlled agricultural environment, the drive unit comprising:

(a) an alignment element;

(b) a drive element; and

(c) an actuator for adjusting a distance between the alignment element and the drive element,

wherein the actuator is operable to increase the distance to enable reception of a plant support structure, and to decrease the distance to cause the alignment element and the drive element to contact opposing sides of the plant support structure.

11. The drive unit of claim 10, further comprising a second actuator for driving the drive element to convey the plant support structure.

12. The drive unit of ~~any one of the preceding claims starting with~~ claim 10 or 11, wherein the plant support structure comprises a grow tower.

13. The drive unit of any one of ~~the preceding claims starting with claim 10~~claims 10 to 12, wherein the plant support structure includes a groove that rests upon the drive element or the alignment element.

14. The drive unit of any one of ~~the preceding claims starting with claim 10~~claims 10 to 13, wherein the actuator is operable to decrease the distance in response to one or more sensors sensing the presence of the plant support structure in the drive unit.

15. The drive unit of any one of ~~the preceding claims starting with claim 10~~claims 10 to 14, wherein the actuator is operable to apply a force via the alignment element or the drive element to force the plant support structure against the drive element or the alignment element, respectively.

16. The drive unit of any one of ~~the preceding claims starting with claim 10~~claims 10 to 15, wherein:

a. the alignment element comprises one or more rollers, one or more wheels, a linear bearing element, a belt, a tread, one or more gears, or a fixed material that has a coefficient of friction against the plant support structure less than a coefficient of friction of the drive element against the plant support structure; and

b. the drive element comprises one or more rollers, one or more wheels, a belt, a tread, a linear actuator, or one or more gears.

17. The drive unit of any one of ~~the preceding claims starting with claim 10~~claims 10 to 16, further comprising:

a. one or more sensors;

b. one or more memories storing instructions; and

c. one or more processors, coupled to the one or more memories, that execute the instructions to cause performance of:

i. commanding the drive element to achieve a desired position or motion of the plant support structure;

ii. determining a measured position or motion of the plant support structure, wherein the measured position or motion is based at least in part upon a signal from the one or more sensors; and

iii. generating a slippage detection signal based at least in part upon comparing the measured position or motion with the desired position or motion.

~~18. A system for controlling the conveyance of a plant support structure, the system comprising:~~

~~a drive mechanism, comprising an actuator configured to move the plant support structure along a direction of conveyance;~~

~~one or more sensors configured to detect position or motion of the plant support structure;~~

one or more memories storing instructions; and

one or more processors, coupled to the one or more memories, that execute the instructions to cause performance of:

commanding the actuator to achieve a desired position or motion of the plant support structure along the direction of conveyance;

determining a measured position or motion of the plant support structure, wherein the measured position or motion is based at least in part upon a signal from the one or more sensors; and

generating a slippage detection signal based at least in part upon comparing the measured position or motion with the desired position or motion.

19. The system of claim 18, wherein the slippage detection signal triggers an action.

20. The system of claim 19, wherein the action comprises alerting a user of the system.

21. The system of any one of claims 19 or 20, wherein the action comprises stopping the movement of the plant support structure by the actuator.

22. The system of any one of claims 19-21, wherein the action comprises storing information related to the plant support structure.

23. . The system of of any one of the preceding claims starting with claim 18, wherein the actuator comprises a friction drive roller roller coupled to a motor.

24. The system of of any one of the preceding claims starting with claim 18, wherein the actuator is a linear actuator.

25. . A method for controlling the conveyance of a plant support structure, the method comprising:

moving the plant support structure along a direction of conveyance using an actuator;

commanding the actuator to achieve a desired position or motion of the grow tower along the direction of conveyance;

determining a measured position or motion of the grow tower along the direction of conveyance; and

~~generating a slippage detection signal based at least in part upon comparing the measured position or motion with the desired position or motion.~~

~~26. The method of claim 25, wherein the slippage detection signal triggers an action.~~