

TITLE: SIDEWALL FARMING SYSTEM

BRIEF DESCRIPTION OF INVENTION

The present invention is in the field of urban farming specifically in the technical areas of vertical farming done on external facade of multistory buildings. The Sidewall Farming System enables farm produce to be grown on the side walls and roofs of multistory buildings. It is a fully automated system that delivers the harvest right to the consumer's apartment window or door step. This invention brings the farm to the consumer with a press of a button eliminating expensive transportation cost. This invention deploys a system to eliminate the need for pesticide.



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BRIEF DESCRIPTION OF THE DRAWINGS

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DETAILED DESCRIPTION OF THE INVENTION

This Sidewall Farming System radicalizes urban farming in five ways. First, it transforms external building walls and roofs into fertile farm lands. Second, it brings farming automation to new level by delivering the harvest to the farmer's apartment window or door saving on expensive transportation cost. Thirdly, mass farming is individualized through the use of protected pods that provide each plant with a controlled micro-environment. These pods are micro-greenhouses that open up the possibility to grow very diverse plants on the same building. Fourthly, the invention utilizes only sunlight and rain to create the controlled micro-environment for the plant. Fifth, the invention employs electronically based defensive system to keep pest at bay hence eliminating the need for chemical pesticides.

Figure 1 illustrates the Sidewall in its entirety. There four key sub-systems that can be viewed in the diagram: the Track System (200), two Stock Cars (300), the Drive System (400) and Central Control (510); refer to Figure 2.

The Track System (200) is routes the Pod (360) to anywhere on the outside of the building. The Track System comprises of the Vertical Sets (200), Horizontal Sets (230) and Track Switchers (240); see Figures 3 and 4a. The Horizontal Set (230) is a set of rails that would sit on any horizontal surface of a building such as the roof. The Vertical Set (220) is a set of rails that is affixed to external side walls of any building. The Vertical Set (220) and Horizontal Set (230) have rectangular configurations to simplify explanations. These are no limitations to how the tracks can be configured. This flexibility is derived from the use different combinations of Rails (201) and the varying Rails' (201) lengths. The Rails (201) come in four shapes I-rail (203), S-rail (205), L-rail (207) and Cobra-rail (209) as shown in Figure 5.

The Track Switcher (240) allows the Stock Car (300) to stay within the Vertical (220) or Horizontal (230) sets or switch between the tracks. The Track Switcher (240) comprise of the Switch Rails (241), Switch Plate (250) and Base Plate (260) as shown in Figure 6. The Switch Rails (241) has a pair of I-rails (203) and an S-rail (205) as in Figure 7. The I-rails (203) allow the Stock Car (300) to stay within the Vertical (220) or Horizontal (230) sets. The S-rail (205) connects the two track sets enabling the Stock Car (300) to traverse between the track sets as show in Figure 4b. The Switch Rails (241) are slightly different than the rails on the track sets. They have a Tractor Groove (243) in the center of them as illustrated on Figure 7b. The use of these grooves will be explained together with the Tractor System (450). The Switch Plate (250) rolls on the Base Plate (260). This rolling action enables the S-rail (205) to connect the track sets. The Switch Plate (250) comprises of Support Rails (251), Support Block (253), Support Plate (255), Blade Wheels (257) and Tractor Openings (259). These parts can be seen on Figure 8. The Support Rails (251) hold up the Switch Rails (241). The Support Block (253) holds up the Support Rails (251). The Support Block (253) and Blade Wheels (257) are installed on the Support Plate (255). The Tractor Openings (259) can be seen on the Switch Plate (250) and it's use will be explained with the Tractor System (450).

The Stock Car (300) moves dynamically on the Track System (200) carrying the Pods (360) which contains seedlings and plants. The Stock Car (300) consists of a Bogie (301), Mount Plate (320), Frame (330), Flange (340), multiple Pods (360), Water System (380) and the Robot Hands (390). The Bogie's (301) main function is

to integrate the key parts of the Stock Car (300). The Bogie (301) is a light weight metal block with a profile that resembles number three. The design allows it to hug the Track system (200) while allowing it to be fitted with the different parts of the Stock Car (300). A small but vital part of the Bogie (300) is the pair of Flaps (300) which acts as push levers for the Tractor System (450).

Figure 11 shows the Bogie (301) with the Contact Wheels (310) installed on it. The spring loaded Contact Wheels (310) act as a shock absorber for the Stock Car (300) while providing stability during the Stock Car's (300) travels. Figure 12 illustrates the salient parts of the Contact Wheels (310): Mount Rod (311), Spring Casing (312), Spring (313), Spring Board (314) and Wheels (315). The Wheels (315) are connected to the Spring Board (314). The Spring Board (314) is screwed onto the Spring Casing (312) creating the necessary support for the Mount Rod (311). The Mount Rod (311) acts as a plunger in the Spring casing (312). The Spring (313) provides the tension and takes on most of the vibration between the Spring Board (314) and the Mount (311).

The Mount Plate (320) is the interface between the Bogie (301) and the Frame (330). The Mount Plate (320) is bolted onto the Bogie (301) through the 2 pairs of Bogie Bolt Holes (325) while the Frame (330) is bolted onto the Mount Plates (320) via the Frame Bolt Holes (327). The Mount Plate (320) has three sections, a Water Tank Mount Plate (323) which is sandwiched horizontally between a pair of Frame Mount Plates (321). The Water Tank (381) will be ensconced in the indentation formed by the Water Tank Mount Plate (323) and the Frame Mount Plates (321). The Frame (330) is mounted on the Frame Mount Plates (323).

The Frame (330) has two key functions. It is where the Pods (360) are hung and it collects rain water. The Frame (330) can be divided into two parts: the Appendages (331) and a Hub (335). In Figure 14, the four Appendages (331) collectively resemble a digit eight. However, the Appendages (331) take on any shape so long as it's center of gravity ends up at the Hub (335). The Hub (335) is the center where all the Appendages (331) will be attached either through welding or other means. The Frame's (330) water collection system mimics a plant's leafs for absorbing water. Figure 18 depicts the path of rain droplet. Pores (332) are found throughout the outer surface of the Frame's (330) Appendages (331). A rain water droplet starts its journey here and ends up the Stock Car's (300) Water Tank (381). The Pore (332) is oddly shape so that it is able to break the surface tension of a water droplet. When that happens, the water droplet falls into a Capillary (333) underneath the Pore (332) as seen in Figure 15d. The Capillary (333) has diminishing circumference creating the necessary suction force to keep the water from flowing out of the Pore (332). Once water droplet flows through the Capillary (333), the single droplet may merge with other water droplets forming small rivulets traversing on Channels (334) found on the inside surface of the Appendages (331). The Channel's (334) width and depth is inversely proportionate through the length of the Channel (334). The Channel's (334) depth decreases as it's width increase as seen in Figure 16. Where the Channel (334) is shallowest and widest is when it is closest to the Hub (335). Conversely, the farther a Channel (334) is from the Hub (335), the deeper is the Channel's (334) depth and smaller is the width. This design helps aggregate the water droplets into micro-rivulets which would eventually flow into the Hub (335). In the Hub are several features that would further aggregate the water. The hollowed chamber within the Hub (335) is called the Collection Chamber (336) is lined with

Collection Fins (337) condenses and aggregates water. The water would collect at the base of the Collection Chamber (336), the contoured surface of the Central Mount (339) found in the middle of the Collection Chamber's (336) base prevents any pool of water from forming hence, forcing the water to flow out of the Collection Nipple (338). For simplicity, Figure 17 has various perspectives of a single Pore (332), Capillary (333), Drainage Channel (334) leading to the Hub (335) to further illustrate the path of a water droplet. Figures 16c and 18 offer various views of the Hub (335). These diagrams provide visual details of the water collection system specifically the water Collection Chamber (336), Collection Fins (337), Collection Nipples (338) and Central Mount (339). In the middle of the Collection Nipples (338) is a hole that forms a perfect seal with the Flow Regulator (385). Flow Regulator (385) is connected from the back of the Hub (335) as seen in Figure 20. The Flow Regulator (385) ensures that the water flows only in a single direction from the Hub (335) to the Water Tank (381); see Figure 21. The Flow Regulator (385) comprises of four parts: the Hub Insert (386) which forms the seal with the Hub (335), the Ball Stopper (387) which moves freely within the Tapered Tube (388) and the Tank Insert (389) which connects to the Water Tank's (381) Intake valves (382). The Tapered Tube's (388) circumference diminishes near the Hub Insert (386) and increases towards the Tank Insert (389). The Ball Stopper (387) closes against the smallest point of the Tapered Tube (388) should there be any back flow of water.

The Water Tank's (381) side's profile looks like the letter "W" as seen in Figure 23a. This design allows it to sit snugly in the Bogie (301). There are two types of one directional flow valves on the Water Tank (381): Intake Valves (382) and Outtake Valves (383). Water is dispensed from the Outtake Valves through the Tubings (384) and the water ultimately reaches the Pod (360); see Figure 24. The forces that dispense water from the Water Tank (381) are the heat from the Sun and kinetic movement from the Stock Car (300). The Water Tank (381) has a positive pressure from the sun's heat. The movement from the Stock Car (300) sloshes the water around further increasing the possibility of water flowing out of the Outlet Valves (382).

The Pod (360) is the container that holds the plant or seeds and soil. The Pod (360) consists of two parts: the Top (361) which screws onto the Flask (365); see Figure 25. There is a one way intake valve atop the Top (361) called the Pod Nipple (362). The Pod Nipple (362) takes in water from the Tubing (384). The seal created by the Top (361) and Flask (365) creates the micro-atmosphere conducive for whatever that the owner of the Pod (360) wants to plant. The Flask (365) should be made of a denser material than the Top (361). It works together with the Flange (340) to ensure that the Pod (360) remains up right regardless of the orientation of the Frame (330). This will be further explained below.

The Top (361) and Flask (365) contains different sizes of pores not different than what had been previously described. These pores can be the size of microns to mils depending on the type of micro-atmosphere needed within the Pod (360). These pores are also of diminishing circumference; however the direction of the decrease depends on the objective. Consider the example of soil to be contained in the Flask (365) and the size of the soil are 200 microns. The Flask (365) can have no pores if there is no need for porosity. If the roots of the plant need to breathe, then the pores need to have circumference less than 200 microns so that no soil is lost. In this particular example, it would be better to have the smallest circumference on the

inside and the larger circumference on the outside surface. To illustrate, the pore has circumference 100 microns on the inside of the Flask (365) and it increases to about 180 microns on the outer surface of the Flask (365). The Top (361) of the Flask (365) not only creates the micro-atmosphere within the Pod (360), it also protects the plant for insects. As such the pores are limited by the size of smallest pest. In tropical countries, the larvae of the Aedes mosquito is of big concern, hence of the circumference of the outer pore should be less than the larvae of the Aedes mosquito. The pores on the inside of the Top (361) can be bigger.

A large part of the micro-atmosphere within the Pod (360) is created by the placement of the Pod (360) on the right spots on the Track System (200). The optimum placement of the Pod (360) on the Track System (200) is based on the data received by the Central Control (510). Hence it is important to have wireless sensors are placed in the Pod (360). Sensors can be put in the Pod's (360) Top (361) and in the Flask (365). These sensors that collect the Pod's (360) internal weather condition such as temperature, humidity, light and noise levels. These data are sent to the Central Control (510) of the Control System (500) for processing. For instance, the noise data are for defensive purposes. If the sensor picks up the sound of a bird pecking on the Pod (360), the Control System (500) will be able to take defensive measures which will be explained later. The other factors that determine the type of micro-atmosphere found in the Pod (360) are the seal of formed by the Top (361) with the Flask (365), the size of pores found on the Pod (360) and the water intake from the Pod Nipple (362).

The Pod (360) is held by the Pod Holder (341) which connects to the Flange (340); see Figure 26. The Flange (340) is a system of joints and sliding parts that allow the Pods' (360) base to point to the ground regardless of the orientation of the Frame (330). The Flange (340) can be divided into four parts: the Pod Holder (341), Elbow Joint (342), Rotating Gear Box (343) and the Slider (345). These parts can be seen in Figures 26 and 27. The Pod Holder (341) connects to the Elbow Joint (342). The Elbow Joint (342) is a spring loaded swing joint that enables the Pod Holder (341) to move up and down. The spring in the Elbow Joint (342) softens any uncontrolled motion. The Elbow Joint (342) inserts into the Rotating Gear Box (343). The Rotating Gear Box (343) provides the Pod Holder (341) a rotational movement plane that is perpendicular to the Elbow Joint (342). There are two types of gears in the Gear Rotating Gear Box (343), an Inertia Gear (345) and a Main Gear (344). The Elbow Joint (342) inserts into the hub of the Main Gear (344). Figure 27 shows only one Inertia gear (345) but there could be more. The function of the Inertia gear (345) is to prevent any sudden unpredictable movement of the Main gear (344). There are many mechanisms to slow down the movements of the Inertia Gear (345) such as using spring or winding mechanisms like those found in watches. The Rotating Gear Box (343) is connected to the Slider's (345) Stem (346). The Slider (345) allows the Pod's (360) gives the Pod (360) the vertical plan movement. It's use is when the Stock Car (300) switches tracks and the Pod (360) needs to adjust its orientation relative to the ground. The Slider (345) consists of a Stem (346), Slide Block (347), Slide Groove (348) and Frame Ring (349). The Slide Block (347) slides inside the Slide Groove (348). There are a multitude of methods allowing the kinematics between the Slide block (347) and Slide Groove (348). Two common methods are the use of ball bearings or wheels on one of the sliding surface.

The Stock Car (300) is propelled by the Cable Drive System (400). The Cable Drive System (400) comprises of the Cable Sets (401), Bobbin Guides (410), Drive Motor (430), Tractor System (450) and Robot Hands (480). There are two types of cable sets: an Inner Cable Set (403) and Outer Cable Set (405); see Figure 1. These two sets run in opposite directions, e.g. the Inner Cable set moves clockwise whilst the Outer Cable Set (405) moves counter clockwise. The different directions allow the Stock Car (300) to travel forward or reverse.

The Bobbin Guides (410) path the cable around the Track System (200) and ensures that the cables don't get entangled; see Figure 29. The Bobbin Guide (410) comprise of a pair of Bobbins (411). Rubber rings (413) cover the outer rims of the Bobbins (411) allowing smooth the rotations of the Bobbins (411). On one of the Bobbin sits a wireless Sensor (415). This Sensor (415) collects and sends data to the Central Control (510) three types of data. They are the radiofrequency identification (RFID) tag of the Stock Car (300) and Pod (360) that passes through the Bobbin guides (410); the speed of the Stock Car (300) and environmental data such as temperature, humidity and water.

The Drive Motor (430) is the work horse that runs the cables. The Drive Motor (430) consists of a Drum (431), an electric Motor (435), Drive Motor Electronics (437) and Power Source (439); see Figure 30. The cable loops around the Drum (431). The Cable Groove (432) on the Drum (431) ensures that the cable don't slip out; see Figure 30c. There are Fins (433) on the periphery of the Drum (431). These Fins (433) are designed to reach out to and push the Robot Hands (480) which sits on the Stock Car (300). The needs of the Fins (433) will become obvious when explained with the Robot Hands (480). The electric Motor (435) turns the Drum's (431) Spindle (434). Interacting with the Motor (435) and the Central Control (510) is the Drive Motor Electronics (437). The Drive Motor Electronics (437) has four functions. It controls the Motor's (435) speed, collects information of the Motor (435), collects information of its environment through inbuilt sensors and communicates wirelessly with the Central Control (510) through its Antenna (438). It receives it's instructions to speed up, slow down or stop from the Central Control (510). It sends four types of information to the Central Control (510): rotational direction of the Motor (435), rotational speed of the Motor (435), environmental factors (temperature, humidity, water), RFID generated by the Stock Car (300) and Pod (360).

The Tractor System (450) is situated directly underneath the Track Switcher (240), see Figure 1. The Tractor System (450) is engaged when the Track Switcher (240) connects the Vertical Track Set (220) to the Horizontal Track Set (230). The Tractor System (450) pushes the Stock Car (300) along the S-rail of the Track Switcher (240) with its Push Post (452). The Tractor System (450) is made out of four parts: a Track (451), Rollers (453), Tractor Motor (455) and the Tractor Electronics (457); see Figure 31. The Track (451) is made out of tough lightweight metal and rotates around the Rollers (453). Push Posts (452) are unbendable metal bars attached evenly to segments of the Track. The Push Posts (452) travel through special openings found called the Tractor Openings (259) on the Base (260) and Switch Plates (250); Tractor Groove (243) on the Switch Rail (241). The Push Posts (452) pushes the Flap (303) found on the Bogie (301) which will propel the Stock Car (300) forward. One of the Rollers (453) has an Axel (454) that is connected to the Tractor Motor (455). The Tractor Motor (455) is an electric motor that turns that Axel (454)

which in turn rotates the Roller (453). The Tractor Electronics (457) has the four similar functions as the Drive Motor Electronics (437) previously described.

The Robot Hands (480) are found on the Bogie (301) of the Stock Car (300). The Robot Hands (480) works together with the Cable Sets (401) to propel the Stock Car (300). To understand the rationale for these parts, we should consider the alternative means of propulsion which is none other than to equip each Stock Car (300) with its own electric motor. There are several problems that need to be overcome. First the Stock Car (300) will be saddled with the additional weight of the motor and battery. The second and largest obstacle is the ability of the motor to propel the Stock Car (300) up a vertical track. This invention does not use such means of propelling the Stock Car (300) hence the need for small Robot Hands (480) to grab hold of the cable. There is a pair of Robot Hands (480) on each Stock Car (300) positioned to grab either the Outer Cable set (405) or Inner Cable set (403). Since cable sets are moving in opposite direction, only one the Robot Hand (480) can grab the cable. To error proof such a delicate coordination, one of the Robot hands (480) needs to be retracted or moved out of the way when the other is in operation. This can be done either by opening the Robot Hands (480) fully or turning the Robot hands (480) towards the Bogie (301). The dance becomes a bit more complicated when the Robot Hand (480) approaches the Drive Motor (430). Since the cables are coiled around the Drive Motor's Drum (431), the Robot Hand (480) needs to release the cable to avoid being damaged. The Drive Motor Fins (433) will push the extended Robot Hand (480) until it passes the Drive Motor (430) which leaves the Robot Hand (480) undamaged to can re-grab the cable. The coordination of these Robot Hands (480) is done via the Central Control (510). The Robot Hand (480) can be seen in Figure 32. A Robot Hand (480) consists of a pair of Grips (481), a pair of Hands (483), a rotary Joint (485), a Hand Motor (487) and Hand Electronics (489). The Grips (481) are patterned metal plates that allow the Robot Hand (481) to effectively grab hold of the cable. Furthermore the Grips (481) have tapered ends to pass smoothly between the Bobbins (411); see Figure 33 for how a Robot hand (480) passes through a Bobbin Guide (410). The Hand (483) transmits the movements of the rotary Joints (485). The movements of the rotary Joints (485) are actuated by an electric motor simply called the Hand Motor (487). The Hand Motor (487) not only actuates the opening and closing of the Robot Hand, it can also be used to move the Robot Hand out of the way. The electronics coined as the Hand Electronics (489) are encased within the Hand Motor (487) casing. It receives its instructions from the Central Control (510) on how it should conduct the Hand Motor (487). The Hand Electronics (489) contained on each of the Robot Hands (480) talks to each other wirelessly so that both Robot Hands on a Stock Car (300) will not grab the opposing moving cables at one time. The Hand Electronics also collect data on the Stock Car (300) and environment. It sends these data wirelessly to the Central Control (510). Data collected on the Stock Car (300) are telemetry data and Bobbin Guides (410) RFID that it had passed.

The Control System (500) is the brains, ears and eyes of the Sidewall Farming System. The Wireless Communication (501) fabric must envelope all elements of the Sidewall Farming System (100) like the Track System (200), the Stock Car (300), the Drive System (400) and the Control System (500). The Control System (500) comprises of the Wireless Connections (501), Central Control (510), Remote Control (530) and Environment Operations (550). All Wireless Connections (501) in the Sidewall Farming System (100) needs to listen and talk to each other, hence there's

a need for a Receiver (501) and Transmitter (505) for any element within the Sidewall Farming System (100) that receive instructions or talk to the Central Control (510). The Central Control (510) is made out of a Computer (511) which houses a Software (515) system. The Software has four functions: a Tracker (517) module, Inventory Manager (520), a Micro-atmosphere Controller (525) and a Defense Calculator (528). The Tracker (517) has two functions: a Pod Tracker (518) and Stock Car Tracker (519) software. The Pod Tracker (518) tracks the location of all the Pods (360) and also instructs the Stock Cars (300) on where to deliver to Pods (360). The Stock Car Tracker (519) tracks the location of all the Stock Cars (300) and instructs the Stock Car on where they should be. The Inventory Manager (520) tracks the different plants that are in the Pods (360) and the different Pods (360) that are in the Stock Car (300). It has five modules. They are the Plant Maturity Estimator (521), a Scheduler (522), an Alerter module (523), an Inventory Database (524) and a Placement Optimizer (529). The Plant Maturity Estimator (521) takes input from the Farmer figures out the maturity dates of the plants. It provides the Farmer with three estimates of harvest dates: the earliest, average and latest harvest dates. These dates are sent to the Remote Control (530). The Farmer has to pick a date or provide another date. The date is then locked into the Scheduler (522). The Scheduler (522) tracks the plant date and harvest date. It works with the Alerter (523) module when the harvest dates arrives. The Scheduler (522) is able to send reminders to the Farmer through the Remote Controller (530) or through other wireless means such as short mobile messages. The Scheduler (522) also tracks the lifecycle of the Stock Car (300). A duration or utilization rate can be set on the Stock Car (300) so that when the limit is reached, the Alerter will summon the person responsible for the maintenance.

The Micro-atmosphere Controller (525) figures out the type of atmosphere that is optimum for the plant. It suggests the types of Pod (360) that the farmer should use. Remember that the Pod (360) will come in different varieties depending on configuration of its Pores. The Micro-atmosphere Controller (525) takes in environmental data from the sensors within the Pod (360) and determines if there are gaps. Gaps in here refer to temperature and wetness differences between the optimum and sensor data. If there's a gap, the Micro-atmosphere Controller (525) will use the data from the external environment taken from other sensors throughout the Sidewall Farming System (100) network to figure out the best position to place the Pod (360). If such a position could not be found, it will work inform the Alerter (523) module to get the Farmer's attention. The Inventory Database (524) contains all the information pertaining to the plants, pods in use, pods out of use and status of the Stock Car (300), logs, sensor data, harvest schedules, maintenance schedule and Pod ownership. The Defense Calculator's (528) main function is to prevent theft and control pest using sound and light. The Defense Calculator (528) takes in sound and light sensor data from the Pod (360). If detect an abnormal sound like bird pecking on the Pod (360) it will instruct the Stock Car (300) to move to scare off the bird or it will instruct speakers that can be placed in strategic location to sound off thus scaring away the pest. The Placement Optimizer (529) will try to place plants of the species on the same Stock Car (300). This implies that a single farmer plating three different plants may have Pods (360) distributed to different Stock Cars (300) where not all the Pods (360) on the Stock Car (300) belongs to this particular farmer.

The Remote Control (530) has three functions: Retrieve (531), Reset (535) and Information Interface (540). The Remote Control (530) can be a standalone device or

a piece of software in a smartphone. The Retrieve (531) function is made out of two sub-functions: Retrieve Pod (532) and Retrieve Stock Car (533). When the farmer invokes the Retrieve Pod (532) function, the Remote control (530) will require the farmer to choose the right Pod (532) and location to deliver the Pod (360). It then send the command to the Central Control (510) which then will instruct the Stock Car (300) to go to the location chosen by the farmer. The Retrieve Stock Car (533) function is typically available only to the person performing maintenance such as a maintenance engineer. The Retrieve Stock Car (533) function works similarly as the Retrieve Pod (532) function except that it gets the entire Stock Car (533) to a location on the Track System (200) requested by the maintenance engineer. The Reset (535) function has two sub-functions: Reset Pod (536) and Reset Stock Car (537). The Reset Pod (536) clears whatever schedule associated to that Pod (360) and reset its status to un-use. Reset Stock Car (537) again is function made available to the maintenance engineer. Once the Stock Car (300) has gone through the maintenance process, the maintenance engineer will need to invoke the Reset Stock Car (537) function which will inform the get the Scheduler (522) to reset to clock on that particular Stock Car (300). The Information Interface (540) holds three key functions: the Pod Content Input (541), the Harvest Date Input (542) and the Alert Response Input (543). Before a farmer can put a Pod (360) onto a Stock Car (300), the farmer has to input the type of plant that is in the Pod (360). This information is sent by the Remote Control (530) to the Central Control (510) which then decides which Stock Car (300) to make available to the farmer. The farmer has then got to decide on a harvest date. Three dates are suggested by the Central Controls (510) Plant Maturity Estimator (521). The farmer chooses one of those three dates or input a different date. The Alert response Input (543) lets the farmer know if his attention is needed for a specific pod. The farmer can choose to ignore or to Retrieve the Pod (532).

The Environment Operations (550) unit of the Control System (500) comprise of external sensors placed in strategic locations of the Track System (200) and a Defense system (555) based on sound and light. There are three types of external Sensors (551): Light Sensors (552), Water Sensors (553) and Sound Sensors (554). Best if these sensors are integrated. The Light (552) and Water (553) sensors are used to determine the optimum position of the Pods (360). The Sound Sensors (554) are used to detect unusual noises. For instance if there's a flock of birds resting in a corner of the building, the Central Control (510) will use the data to determine whether it will sound off a nearby Speaker (556), light up the Flood Lights (557) to scare off the pest or just steer Stock Cars (300) clear from that particular area. The Defense System (555) comprise of Speakers (556), Flood Lights (557) and Flash Lights (558) used to deter pests and theft. The Defense system (555) allows the plants to be grown without pesticides.

CLAIMS

- Claim 1: A system to farm on building exteriors such as the building's side walls and rooftop.
- Claim 2: A system of farming vertically and horizontally on the exteriors of buildings.
- Claim 3: A track system that all can be placed on any exterior surface of buildings.
- Claim 4: A set of Rails that provide flexibility for the track system to be configured into any shape.
- Claim 5: A track switcher that allows the Stock Car to move from any sets of tracks.
- Claim 6: A tractor system that moves the Stock Car on the track switcher.
- Claim 7: A Stock Car that be farmed on.
- Claim 8: A "W" shaped bogie that integrates the different parts of the Stock Car.
- Claim 9: Spring loaded contact wheels that ensure a smooth rider for the Stock Car.
- Claim 10: A Mount Plate that holds a water tank and frame.
- Claim 11: A frame comprise of a hub and appendages.
- Claim 12: A frame that can have appendages of any shape and configuration so long as the center of gravity is at the hub.
- Claim 13: A water collection and dispensing system that mimics the leaf of plant to collect and transport water.
- Claim 14: A water collection system that spans from the frame to the water tank consisting of pores, capillaries, channels, condensation fins, collection centers and water flow regulators.
- Claim 15: A water tank that utilizes heat and kinetic energy to dispense water.
- Claim 16: A system of one way valves to feed water to the plant.
- Claim 17: A system of joints and slides that allow the plant to stay upright regardless of the orientation of the Stock Car.
- Claim 18: A Pod that creates a micro-atmosphere for plants.
- Claim 19: A system of micro-pores on the Pod that can keep pests out and maintain an optimum micro-atmosphere for the plant.

- Claim 20: A cable system that allows the Stock Car to move forward or backward on the track.
- Claim 21: A system that uses robot hands and dual cable system for Stock Car propulsion.
- Claim 22: The use of fins on the drive system to move the stock car.
- Claim 23: A system of bobbin guides, drive motors and robot hands for optimum placement of the Stock Car.
- Claim 24: A tapered Robot Hand that can slide through the bobbins without displacing the wires from the bobbin.
- Claim 25: A wireless system and a pair of autonomous Robot hands placed on the Stock Car to enable the Stock Car's propulsion.
- Claim 26: A wireless control system that controls and defends the plants being farmed.
- Claim 27: A central control system of computer and software that manages the inventory of plants being grown.
- Claim 28: A remote control system that allows the farmer to interface with the Sidewall Farming System.
- Claims 29: A system of sensors and passive defense mechanism that protects the plants being farmed.
- Claims 30: The use of light and sound to protect plants.