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Asparagus lifting apparatus with interfering members, asparagus collection and storage apparatus, and asparagus harvesters formed therewith

Abstract

An asparagus harvester includes a chassis movable over a bed of growing asparagus. Spears above a selected height are severed at the ground by a severing assembly. A conveyor receives from a pick-up apparatus and conveys away the severed asparagus spears to bin. In one embodiment, counter-rotating rollers of the pick-up apparatus have interfering members configured to disable the severed asparagus spears when being engaged and lifted by and between them from passing outwardly from between their trailing ends. In another embodiment, a partition in the bin cooperates with it to define a confined volume open to receive severed asparagus spears from the conveyor. A drive assembly actuates to displace the bin relative to the partition to increase the confined volume to enable it to accept more severed asparagus spears each time a sensor senses severed asparagus spears at a fill level of the confined volume.

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Background/Summary

FIELD OF THE INVENTION

(1) This invention relates to asparagus harvesting and, more particularly, to asparagus lifting apparatus and asparagus collection and storage apparatus specially adapted for use with an asparagus harvester.

BACKGROUND OF THE INVENTION

(2) Asparagus is customarily cultivated in friable or loamy soil and is planted in beds to emerge as spears disposed in longitudinal rows or paths. The bed of growing asparagus spears surface from below the ground and extend to varying heights. It is known to harvest the spears of more than a predetermined height while leaving the remaining comparatively shorter spears to continue

growing in the ground for later harvesting. Asparagus is harvested by hand or with an asparagus harvester.

(3) A known asparagus harvester includes a chassis or frame configured to be advanced over the ground, whether by being self-propelled or towed behind a tractor, along the rows of the bed of growing asparagus. The chassis supports a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus, composed of a series of severing assemblies, for severing the asparagus spears proximate to the ground, and a conveyor for receiving asparagus spears severed by the severing apparatus from the pick-up apparatus and conveying them to a lug box or other suitable storage area.

(4) Each severing assembly relates to an appropriate alley defined by the asparagus harvester, is operatively connected to an actuator and to a sensor/detector, and includes a severing blade carried by a plunger mounted in a pneumatic cylinder and conduits that couple the pneumatic cylinder to a source of air under pressure through a dedicated valve unit. The valve unit is configured to switch between a firing position to supply air under pressure from the source through one of the conduits to cause the plunger to eject outwardly from the pneumatic cylinder to move the severing blade downwardly along a stroke path from a normally raised set position to a lowered severing position proximate to the ground for severing one of the asparagus spears in the path and a normal holding position to supply air under pressure from the source through another one of the conduit to cause the plunger to withdraw into the pneumatic cylinder to move the severing blade upwardly along the stroke path from its lowered severing position to its normally raised set position. As the frame advances along the rows of growing asparagus in the field, the asparagus spears of at least a pre-selected height of a corresponding row sequentially enter the alley and trigger the sensor energizing the actuator. The valve unit is controlled by the actuator under the influence of the sensor. When an impulse from the sensor is effective upon the actuator in response to the sensor detecting an asparagus spear at the alley while the chassis advances over the ground, the valve unit automatically switches to the firing position to cause the plunger in the cylinder to eject and to cause the connected severing blade to move downwardly along the stroke path from its normally raised set position to its lowered severing position proximate to the ground for severing the sensed/detected asparagus spear. The valve unit is configured to automatically switch from the firing position to the holding position when the blade completes its severing excursion, which immediately restores the blade to its normally raised set position. In the meantime, the spear has been engaged by the pick-up apparatus, which exerts an upward force on the spear but not to an extent to uproot or break the spear but only to hold and support the spear while the severing assembly does its work to sever the spear. The now severed spear is then lifted upwardly and carried somewhat rearwardly by the pick-up apparatus and is cast upon the conveyor, which conveys it to a suitable storage area supported by the chassis. This process is repeated for each asparagus spear that triggers the sensor.

(5) The pick-up apparatus includes pick-up beds arranged one above the other from a lowermost or upstream one of the pick-up beds proximate to the ground to an uppermost or downstream one of the pick-up beds proximate to the conveyor. The pick-up apparatus normally includes two or more intermediate pick-up beds between the upstream pick-up bed and the downstream pick-up bed, although there can be just one intermediate pick-up bed between the upstream pick-up bed and the downstream pick-up bed in certain examples.

(6) Each pick-up bed is characterized by pairs of adjacent pick-up rollers. The pick-up rollers of each pair of adjacent pick-up rollers counter-rotate with their closest portions having an inherent upward component. A pair of adjacent pick-up rollers of each of the pick-up beds relate to one of the alleys and to a corresponding one of the severing assemblies. For each alley and its corresponding severing assembly and pairs of adjacent pick-up rollers between the severing assembly and the conveyor from the upstream pick-up bed to the downstream pick-up bed, either side of an asparagus spear that enters the alley and that is of a sufficient height to trigger the

corresponding sensor is engaged by the pair of adjacent pick-up rollers of the upstream pick-up bed and upon being severed is lifted upwardly thereby and handed off to and lifted in turn by each successive pair of adjacent pick-up rollers and ultimately cast onto the conveyor from the pair of adjacent pick-up rollers of the downstream pick-up bed and which transports it to the storage area.
(7) Asparagus is often harvested when the ambient temperature is sufficiently low to cause the temperature of the valve units to drop below their suitable operating temperature which impairs or otherwise disables the valve units from sufficiently switching between the firing position and the holding position and thereby inherently impairs or otherwise disables the pneumatic cylinders from sufficiently actuating the plungers along the stroke path between the normally raised set positions of the severing blades to the lowered positions of the severing blades. This leaves uncut asparagus spears and thus unfavorably influences asparagus harvesting. Furthermore, asparagus spears severed by the severing apparatus routinely eject outwardly from between adjacent pick-up beds from either side of the pick-up apparatus only to fall to the ground during harvesting operations, which also unfavorably influences asparagus harvesting. It has also been found that severed spears inadvertently fall out the back of the pick-up beds downstream of the upstream pick-up bed and onto the ground only to become lost, which also unfavorably influences asparagus harvesting. It has additionally been found that that the collection and storage of the asparagus spears in the storage area from the conveyor is clumsy and often results in a disordered jumble of entangled spears that occupy an unnecessarily large amount of space compared to when stacked in an orderly, parallel arrangement. This requires the operator of the asparagus harvester to repeatedly cease harvesting operations, manually order the asparagus spears into an ordered, stacked arrangement in the storage area, and then resume harvesting operations. In view of at least these and other deficiencies inherent in the art, the need for continued improvement in the art is evident.

SUMMARY OF THE INVENTION

(8) A.
(9) According to the principle of the invention, improvements to an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path are disclosed. The asparagus harvester includes a chassis configured to be advanced over the ground along the path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing assembly for severing the asparagus spears proximate to the ground and a conveyor for receiving from the pick-up apparatus and conveying away asparagus spears severed by the severing assembly, the severing assembly including a severing blade carried by a plunger mounted in a pneumatic cylinder, and conduits coupled to the pneumatic cylinder and through a valve unit to a source of air under pressure, the valve unit configured to switch between a firing position to supply air under pressure from the source through the one of the conduits to cause the plunger to eject outwardly from the pneumatic cylinder to move the severing blade downwardly along a stroke path from a raised set position to a lowered severing position proximate to the ground for severing one of the asparagus spears in the path and a holding position to supply air under pressure from the source through another one of the conduits to cause the plunger to withdraw into the pneumatic cylinder to move the severing blade upwardly along the stroke path from the lowered severing position to the raised set position.
(10) 1.
(11) The improvements in one embodiment include a heater mounted proximate to the valve unit and configured to sufficiently heat the valve unit to enable the valve unit to switch between the firing position and the holding position in the presence of an ambient temperature sufficiently low to impair the valve unit from sufficiently switching between the firing position and the holding position. The heater is configured to activate in response to actuation of a switch operatively coupled to the heater. The heater is connected to the valve unit. The heater is connected to the valve unit with a thermally-conductive adhesive in an illustrative embodiment. The heater is a positive temperature coefficient heater in a preferred embodiment.

(12) In another embodiment, the improvements include a method including mounting a heater proximate to the valve unit, and activating the heater, the heater sufficiently heating the heater over a period of time to enable the valve unit to switch between the firing position and the holding position in the presence of an ambient temperature sufficiently low to impair the valve unit from sufficiently switching between the firing position and the holding position. The heater is configured to activate in response to actuation of a switch operatively coupled to the heater, and the step of activating the heater includes actuating the switch. The step of mounting the heater proximate to the valve unit further includes connecting the heater to the valve unit, such as by adhering the heater to the valve unit with a thermally-conductive adhesive in an illustrative embodiment. In this embodiment, the heater is preferably a positive temperature coefficient heater.
(13) B.
(14) According to the principle of the invention, improvements to an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path are disclosed. The asparagus harvester includes a chassis configured to be advanced over the ground along the path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground and a conveyor for receiving from the pick-up apparatus and conveying away asparagus spears severed by the severing assembly.
(15) 1.
(16) In one embodiment, the improvements include a spear guide disposed on either side of the pick-up apparatus for guiding the asparagus spears severed by the severing apparatus through the pick-up apparatus and currently disabling the asparagus spears severed by the severing apparatus from ejecting laterally outward from either side of the pick-up apparatus. The pick-up apparatus includes pick-up beds arranged one above the other and the spear guides are disposed between adjacent pick-up beds and define a laterally-enclosed spear-conveying area between the adjacent pick-up beds. Each of the adjacent pick-up beds has a leading end, a trailing end and a length extending longitudinally to the path from the leading end to the trailing end and the spear guides extend forwardly along the lengths from proximate to the trailing ends and to and beyond the leading ends. The spear guides project angularly outward from either side of one of the adjacent pick-up beds. In another embodiment, the spear guides are supported by support members mounted proximate to either side of one of the adjacent pick-up beds. One of the adjacent pick-up beds is a lowermost one of the pick-up beds proximate to the ground. The spear guides are shields, which are each flat in an illustrative embodiment.
(17) 2.
(18) In another embodiment, the improvements include a method including disposing a spear guide on either side of the pick-up apparatus for guiding the asparagus spears severed by the severing apparatus through the pick-up apparatus and currently disabling the asparagus spears severed by the severing apparatus from ejecting laterally outward from either side of the pick-up apparatus. The pick-up apparatus includes pick-up beds arranged one above the other, and the step of disposing the spear guide on either side of the pick-up apparatus includes disposing the spear guide on either side of the pick-up apparatus between adjacent pick-up beds to form a laterally-enclosed spear-conveying area between the adjacent pick-up beds. Each of the adjacent pick-up beds has a leading end, a trailing end and a length extending longitudinally to the path from the leading end to the trailing end and the spear guides extend forwardly along the lengths from proximate to the trailing ends and to and beyond the leading ends. The spear guides project angularly outward from either side of one of the adjacent pick-up beds in an illustrative embodiment. The step of disposing the spear guide on either side of the pick-up apparatus between adjacent pick-up beds includes mounting the spear guide to a support member mounted proximate to either side of one of the adjacent pick-up beds. One of the adjacent pick-up beds is a lowermost one of the pick-up beds proximate to the ground. The spear guides are shields, which are each flat in an illustrative

embodiment.
(19) C.
(20) According to the principle of the invention, improvements to an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path are disclosed. The asparagus harvester includes a chassis configured to be advanced over the ground along the path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground and a conveyor for receiving from the pick-up apparatus and conveying away asparagus spears severed by the severing assembly, the pick-up apparatus includes pick-up beds each including a leading end, a trailing end, a first side and a second side, and the pick-up beds are arranged one above the other and include an upper pick-up bed over a lowermost pick-up bed. The improvements include an interfering member extending across the trailing end of the upper pick-up bed from the first side to the second side and configured to disable spears severed by the severing apparatus and being lifted through the upper pick-up bed between the leading end and the trailing end from passing outwardly through the trailing end of the upper pick-up bed. The interfering member, which is an elongate bar, is carried by a support member mounted on either side of the upper pick-up bed.
(21) D.
(22) According to the principle of the invention, improvements to an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path are disclosed. The asparagus harvester includes a chassis configured to be advanced over the ground along the path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground and a conveyor for receiving from the pick-up apparatus and conveying away severed asparagus spears severed by the severing apparatus, the pick-up apparatus includes pick-up beds arranged one above the other and including an upper pick-up bed over a lowermost pick-up bed, and the upper pick-up bed includes adjacent pick-up rollers configured to be actuated for counter-rotation and each including a leading end and a trailing end.
(23) In one embodiment, the improvements include an interfering member mounted to each pick-up roller proximate to the trailing end thereof. The interfering members are sufficiently juxtaposed to disable the severed asparagus spears, when being engaged and lifted by and between the pick-up rollers between the leading end and the trailing end of each pick-up roller when the pick-up rollers are actuated for counter-rotation, from passing outwardly from between the trailing ends. The interfering members are configured to counter-rotate with the pick-up rollers when the pick-up rollers are actuated for counter-rotation while remaining sufficiently juxtaposed. The interfering members are identical. Each interfering member is a flat ring in an exemplary embodiment.
(24) 2.
(25) In another embodiment, the improvements include a method including mounting an interfering member to each pick-up roller proximate to the trailing end thereof, the interfering members arranged in juxtaposition, counter-rotating the pick-up rollers, the counter-rotating pick-up rollers engaging and lifting the severed asparagus spears therebetween between the leading end and the trailing end of each pick-up roller, and disabling, by the juxtaposition of the interfering members, the severed asparagus spears from passing outwardly from between the trailing ends. The method further includes the interfering members counter-rotating with the counter-rotating pick-up rollers while remaining in the juxtaposition. The interfering members are identical. Each interfering member is a flat ring in an exemplary embodiment.
(26) E.
(27) According to the principle of the invention, an asparagus pick-up bed for an asparagus harvester includes adjacent pick-up rollers configured to be actuated for counter-rotation and each including a leading end and a trailing end, and an interfering member mounted to each pick-up roller proximate to the trailing end thereof, the interfering members sufficiently juxtaposed to

disable severed asparagus spears, when being engaged and lifted by and between the pick-up rollers between the leading end and the trailing end of each pick-up roller when the pick-up rollers are actuated for counter-rotation, from passing outwardly from between the trailing ends. The interfering members are configured to counter-rotate with the pick-up rollers when the pick-up rollers are actuated for counter-rotation while remaining sufficiently juxtaposed. The interfering members are identical. Each interfering member is a flat ring in an exemplary embodiment.

(28) F.

(29) According to the principle of the invention, improvements to an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path are disclosed. The asparagus harvester includes a chassis configured to be advanced over the ground along the path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground, and a conveyor for receiving from the pick-up apparatus and conveying away severed asparagus spears severed by the severing apparatus.

(30) 1.

(31) In one embodiment, the improvements include a bin mounted displaceably adjacent to the conveyor, a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor, a drive assembly configured to displace the bin relative to the partition from a first station to a second station when the drive assembly actuates, the confined volume having a first size when the bin is at the first station and a second size when the bin is at the second station, the second size greater than the first size, and a sensor operatively coupled to the drive assembly, wherein the drive assembly actuates when the sensor senses a presence of severed asparagus spears at a fill level of the confined volume. The partition includes an upper end and extends downwardly into the bin from the upper end mounted at a fixed position over the bin. The sensor is mounted to the partition. A hole extends through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume, the sensor opposes the second surface adjacent to the hole, and the sensor is open to the confined volume via the hole, enabling the sensor to sense the presence of severed asparagus spears at the fill level of the confined volume. The sensor is mounted to the second surface of the partition. The drive assembly is a cylinder assembly. The cylinder assembly includes a cylinder mounted at a fixed position, and an operating rod coupled to the bin and mounted partially within the cylinder for movement between an extended position corresponding to one of the first station of the bin and the second station of the bin and a retracted position corresponding to another one of the first station of the bin and the second station of the bin. The confined volume is flanked by a first side of the bin proximally to the conveyor a second side of the bin distally from the first side of the bin and the conveyor. A backstop is adjacent to the second side of the bin opposite to the conveyor, the backstop configured to deflect the severed asparagus spears into the confined volume from the conveyor. The backstop extends from the partition.

(32) 2.

(33) In another embodiment, the improvements include a bin mounted displaceably adjacent to the conveyor, a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor, a drive assembly configured to displace the bin relative to the partition to enlarge the confined volume each time the drive assembly actuates, and a sensor operatively coupled to the drive assembly, wherein the drive assembly actuates each time the sensor senses a presence of severed asparagus spears at a fill level of the confined volume. The partition includes an upper end and extends downwardly into the bin from the upper end mounted at a fixed position over the bin. The sensor is mounted to the partition. A hole extends through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume, the sensor opposes the second surface adjacent to the hole, and the sensor is open to the confined volume via the hole, enabling

the sensor to sense the presence of asparagus spears at the fill level of the confined volume. The sensor is mounted to the second surface of the partition. The drive assembly is a cylinder assembly. The cylinder assembly includes a cylinder mounted at a fixed position, and an operating rod coupled to the bin and mounted partially within the cylinder for movement between an extended position and a retracted position to displace the bin. The confined volume is flanked by a first side of the bin proximally to the conveyor a second side of the bin distally from the first side of the bin and the conveyor. A backstop is adjacent to the second side of the bin opposite to the conveyor, the backstop configured to deflect the severed asparagus spears into the confined volume from the conveyor. The backstop extends from the partition.

(34) In yet another embodiment, the improvements include a method including mounting a bin displaceably adjacent to the conveyor, locating a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor, configuring a drive assembly to displace the bin relative to the partition between a first station and a second station when the drive assembly actuates, the confined volume having a first size when the bin is at the first station and a second size when the bin is at the second station, the second size greater than the first size, operatively coupling the drive assembly to a sensor configured to sense a presence of severed asparagus spears at a fill level of the confined volume, the drive assembly configured to actuate when the sensor senses the presence of severed asparagus spears at the fill level, the sensor sensing the presence of severed asparagus spears at the fill level, and in response the drive assembly actuating displacing the bin from the first station to the second station. Locating the partition in the bin includes mounting an upper end of the partition at a fixed position over the bin and extending the partition downwardly into the bin from the upper end. Additional steps include forming a hole through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume, locating the sensor adjacent to the second surface proximate to the hole, and the hole opening the sensor to the confined volume, enabling the sensor to sense the presence of severed asparagus spears at the fill level of the confined volume. Locating the sensor adjacent to the second surface proximate to the hole includes mounting the sensor to the second surface proximate to the hole. Configuring the drive assembly includes providing a cylinder assembly including a cylinder and an operating rod mounted partially within the cylinder for movement between an extended position and a retracted position, mounting the cylinder at a fixed position, and coupling the operating rod to the bin, the extended position of the operating rod corresponding to one of the first station of the bin and the second station of the bin and the retracted position of the operating rod corresponding to another one of the first station of the bin and the second station of the bin. The method further includes configuring a backstop at a fixed position adjacent to the confined volume and opposing the conveyor, the backstop deflecting the severed asparagus spears into the confined volume from the conveyor. Configuring the backstop at the fixed position adjacent to the confined volume and opposing the conveyor preferably includes extending the backstop from the partition.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Specific objects and advantages of the invention will become apparent to those skilled in the art from the following detailed description of illustrative embodiments thereof, taken in conjunction with the drawings in which:

(2) FIG. **1** is a top perspective view of an asparagus harvester embodying features of the invention;

(3) FIG. **2** is a bottom perspective view of the embodiment of FIG. **1**;

(4) FIG. **3** is a top plan view of the embodiment of FIG. **1**;

(5) FIG. **4** is a side elevation view of the embodiment of FIG. **1**;

(6) FIG. **5** is an enlarged perspective view of the asparagus harvester corresponding to FIG. **1**;
(7) FIG. **6** is a side elevation view of a pick-up apparatus and an asparagus severing assembly removed from the asparagus harvester of FIG. **1** for illustrative purposes;
(8) FIG. **7** is an enlarged fragmentary partially diagrammatic view corresponding to FIG. **6** illustrating a valve unit configured with a heater;
(9) FIG. **8** is a perspective view of another embodiment of an asparagus harvester embodying features of the invention;
(10) FIG. **9** is an enlarged fragmentary view corresponding to FIG. **8** illustrating pick-up beds of a pick-up apparatus;
(11) FIG. **10** is a perspective view of one of the pick-up beds illustrated in FIG. **9** incorporating spear guides and an interfering member;
(12) FIG. **11** is a side elevation view of the embodiment of FIG. **10**, the opposite side elevation being the same thereof;
(13) FIG. **12** is a rear elevation view of the embodiment of FIG. **10**;
(14) FIG. **13** is a perspective view of an alternate embodiment of a pick-up bed embodying features of the invention;
(15) FIG. **14** is a top plan view of the embodiment of FIG. **13**;
(16) FIG. **15** is a side elevation view of the embodiment of FIG. **13**, the opposite side elevation view being the same thereof;
(17) FIG. **16** is a rear elevation view of the embodiment of FIG. **13**;
(18) FIG. **17** is a section view along line **17**-**17** of FIG. **14**;
(19) FIG. **18** is an enlarged, fragmentary perspective view corresponding to FIG. **13**;
(20) FIG. **19** is a front perspective view of an asparagus collection and storage apparatus embodying features of the invention and for use with an asparagus harvester;
(21) FIG. **20** is a bottom perspective view of the embodiment of FIG. **19**;
(22) FIG. **21** is a top plan view of the embodiment of FIG. **19**;
(23) FIG. **22** is an outer side elevation view of the embodiment of FIG. **19**;
(24) FIG. **23** is a rear perspective view of the embodiment of FIG. **19**;
(25) FIG. **24** is an enlarged view of the circled portion of the embodiment of FIG. **19**;
(26) FIG. **25** is an enlarged view of a circled portion of the embodiment of FIG. **23**;
(27) FIG. **26** is an enlarged fragmentary partially diagrammatic view illustrating two sensors wired to a valve unit, and an alarm wired to one of the sensors; and
(28) FIGS. **27**-**31** illustrate a sequence of operation of the embodiment first illustrated in FIG. **19**.

DETAILED DESCRIPTION

(29) Turning to the drawings, in which like reference characters indicate corresponding elements throughout the various views, FIG. **1** illustrates an asparagus harvester **20** embodying features of the invention. Harvester **20** is configured to harvest asparagus spears growing in ground/field **22** and projecting upwardly therefrom in longitudinal rows or paths. Asparagus harvester **20** is a wheeled machine, which enables it when advanced to roll across ground **22**. In this embodiment, harvester **20** is an implement configured to be towed behind a tractor, and it can be configured to be self-propelled in alternate embodiments. In a self-propelled embodiment, for example, an asparagus harvester constructed and arranged in accordance with the principle of the invention can be configured with a propelling unit, one or more fuel tanks, and the other customary attributes of a self-propelled harvester ordinarily controlled by an operator operating suitable controls from a seat, cab or other suitable operator area.
(30) Referring to FIGS. **1**-**4**, harvester **20** includes wheeled frame or chassis **30** incorporating hitch **31** designed to be suitably hitched to a tractor and which is configured to be advanced by being towed over ground **22** along the paths of growing asparagus. Chassis **30**, a rugged, stout, reinforced frame of metal bar and tube stock secured by welding, rivets, fasteners, or combination thereof, supports pick-up apparatus **32** for engaging and lifting the asparagus spears, severing apparatus **34**

for severing the asparagus spears proximate to ground **22** and conveyor **36**. Conveyor **36** is mounted at a fixed position and is configured to receive from pick-up apparatus **32** and convey away asparagus spears severed by severing apparatus **34** to a suitable asparagus collection and storage apparatus **70** disposed along one side of harvester **20**. The apparatus **60** includes a bin or lug box **38** supported by an auxiliary framework **72** of chassis **30**. Framework **72** includes a frame **74** extending outwardly from opposed, upright supports **76** and **77** affixed to chassis **30**. Frame **72** supports lug box **38**, which is open to receive severed asparagus spears from conveyor **36**.

(31) As harvester **20** advances along the rows of growing asparagus spears, some of the asparagus spears are tall enough to project upwardly and to enter generally into alleys or spaces between individual pairs of a transverse series of upright plates **40** in FIG. **1** supported by chassis **30** immediately behind hitch **31**. Plates **40** are planar and are disposed longitudinally or parallel to the direction of advance of harvester **20** and are disposed at an appropriate distance above the ground. Plates **40** arranged on chassis **30** immediately to the rear of hitch **31** support standard sensors/detectors connected by appropriate circuitry to a source of power on chassis **30** and through a representative sensor and to an appropriate one of a corresponding number of individual actuators. As harvester **20** advances, the sensors are arranged to not sense/detect the relatively short asparagus spears. Rather, the sensors are arranged to sense/detect the sufficiently tall spears suitable for harvesting, which causes the corresponding sensors to be alerted and the corresponding actuators to be energized in response as is known in the art.

(32) The sensing of an asparagus spear is not necessarily immediate in effect since the sensor and actuator circuit may include a time delay structure. Particularly, this may be a delay dependent upon the amount of rotation of the vehicle wheels (corresponding to an amount of vehicular advance) so that from the time a sensor senses an asparagus spear until the corresponding actuator becomes effective upon that particular spear can be a time lapse of a predetermined or selected amount related to the amount or speed of advance of harvester **20**.

(33) Arranged on chassis **30** immediately to the rear of plates is the pick-up apparatus denoted generally at **32**. Pick-up apparatus **32** is made up of pick-up beds **32**A, **32**B, **32**C, and **32**D arranged one above the other from the lowermost pick-up bed **32**A proximate to the ground to the uppermost pick-up bed **32**D proximate to conveyor **36** as shown. Pick-up beds **32**A, **32**B, **32**C, and **32**D are each part of a pick-up unit of harvester **20**. In this embodiment, there are four pick-up beds **32**A, **32**B, **32**C, and **32**D of four corresponding pick-up units. Pick-up bed **32**B is immediately above pick-up bed **32**A proximate to the ground, pick-up bed **32**C is immediately above pick-up bed **32**B, and pick-up bed **32**D proximate to conveyor **36** is immediately above pick-up bed **32**C. Pick-up beds **32**B and **32**C between the lowermost pick-up bed denoted at **32**A and the uppermost pick-up bed denoted at **32**B are intermediate pick-up beds. Although this harvester **20** embodiment includes two intermediate pick-up beds **32**B and **32**C, pick-up apparatus **32** can include less or more intermediate pick-up beds in alternate embodiments.

(34) Pick-up beds **32**A-**32**D are known in the art and similar in that they are each characterized by a transverse array of pick-up rollers **44** and **45**. These are comparable in number to plates **40** and likewise are arranged in counter-rotating designated pairs. The spaces between the designated pairs of the pick-up rollers **44** and **45** are disposed in longitudinal alignment with or centrally of the spaces or alleys between the plates **40**. The pick-up rollers **44** and are mounted for rotation about parallel axes lying in longitudinal planes and parallel to each other and arranged, in this example, at an inclination with the aft or trailing portion of the rollers closer to the ground compared to the forward or leading portion of the rollers at a comparatively greater distance from the ground.

(35) Pick-up rollers **44** and **45** that constitute each of pick-up beds **32**A, **32**B, **32**C, and **32**D are customarily provided with relatively rigid cores and with surrounding coverings of yieldable, relatively soft material such as foam rubber or the like in the form of pads or fingers for example. The cores of pick-up rollers **44** and **45** are mounted on corresponding shafts each mounted in suitable journals and carry drive gears all in engagement with a common chain or belt appropriately

connected to a drive shaft ultimately driven by a motor **47**, which in this embodiment is a hydraulic motor operatively coupled to an appropriate hydraulic system as is known in the art. Pick-up rollers **44** and **45** are simultaneously rotated at substantially the same speed, and the adjacent pick-up rollers **44** and **45** of each pair counter-rotate and thereby move with their closest portions having an upward component as is known in the art.

(36) As harvester **20** advances, brought into action is severing apparatus **34** arranged on chassis **30** immediately to the rear of pick-up apparatus **32**. Severing apparatus **34** includes identical severing assemblies **50** arranged in a transverse array with one severing assembly **50** for each of the spaces or alleys between the initial plate **40** pairs. Severing assemblies **50** are identical. Accordingly, severing assembly **50′** in FIG. **6** will now be discussed, with the understanding that the ensuing discussion of severing assembly **50′** applies in every respect to each severing assembly **50**.

(37) Like each severing assembly **50**, severing assembly **50′** relates to an appropriate alley defined by the appropriate pair of plates **40** of harvester **20** and to a corresponding sensor and actuator and includes a suitable severing blade **52** carried by plunger **54** mounted in pneumatic cylinder **60**. Plunger **54** and pneumatic cylinder **60** form a standard and well-known pneumatic cylinder assembly. Conduits **62** and **63** couple pneumatic cylinder **60** through valve unit **65** to a source **66** (FIGS. **1**-**5**) of air under pressure via supply conduit **68**. Valve unit **65**, which in this example is a model VSS 1/2 AAS 24 VDC 4-way solenoid valve that is readily available under the brand name ALLENAIR or other like/commensurate valve unit, is operatively coupled by standard circuitry to a corresponding actuator in turn operatively by standard circuitry to the sensor corresponding to the assigned alley for severing assembly **50′**. Source **66** is a standard air compressor configured in this example to cycle between 135 pounds per square inch (psi) and 175 psi. Valve unit **65** is standard and well-known and configured to switch between a firing position to supply air under pressure from source **66** through conduit **62** to cause plunger **54** to eject outwardly from pneumatic cylinder **60** to move severing blade **52** downwardly in the direction of arrow A along a stroke path from its normally raised set position denoted at **52′** to its lowered severing position denoted at **52″** proximate to ground **22** for severing one of the asparagus spears in the path and a normal holding position to supply air under pressure from source through conduit **64** to cause plunger **54** to withdraw into pneumatic cylinder **60** to move severing blade **52** upwardly in the direction of arrow B along the stroke path from its lowered severing position denoted at **52″** to its normally raised set position denoted at **52′**.

(38) As harvester **20** advances along the rows of growing asparagus in the ground **22**, the asparagus spears of a pre-selected height of a corresponding row sequentially enter the alley corresponding to severing assembly **50′** and trigger the corresponding sensor energizing the corresponding actuator. Valve unit **65** connected by appropriate circuitry to the actuator is controlled by the actuator under the influence of the sensor. When an impulse from the sensor is effective upon the actuator in response to the sensor sensing/detecting an asparagus spear at the alley while harvester **20** advances over the ground, valve unit **65** automatically switches from the normal holding position to the firing position to cause plunger **54** in pneumatic cylinder **60** to eject to cause the connected severing blade **52** to move downwardly in the direction of arrow A along the stroke path from its normally raised set position denoted at **52′** in FIG. **6** to its lowered severing position denoted at **52″** in FIG. **6** proximate to ground **22** for severing the sensed/detected asparagus spear. Valve unit **54** is configured to automatically switch from its firing position to its normal holding position when the severing blade **52** completes its severing excursion, which immediately restores the severing blade **52** to its normally raised set position denoted at **52′** in FIG. **6** from its lowered severing denoted at **52″** in FIG. **6**.

(39) In the meantime, the spear has been engaged by pick-up apparatus **32**, which exerts an upward force on the spear but not to an extent to uproot or break the spear but only to hold and support the spear while severing assembly **50′** does its work. The now severed spear is lifted upwardly and carried somewhat rearwardly by pick-up apparatus **32** and cast therefrom onto conveyor **36**, which

conveys away the spear to lug box **38**. This standard and well-known process is repeated for each asparagus spear that triggers the sensor associated with severing assembly **50**′, further details of which will readily occur to the skilled artisan.

(40) In the general operation of harvester **20**, as chassis **30** advances along the rows of growing asparagus in the ground **22**, asparagus spears become disposed in appropriate alleys between the appropriate plate **40** pairs. A pair of adjacent pick-up rollers **44** and **45** of each of pick-up beds **32**A-**32**D concurrently relate to an alley and a corresponding severing assembly **50**. For each alley and its corresponding severing assembly **50** and pairs of adjacent pick-up rollers **44** and **45** of pick-up beds **32**A-**32**D between the severing assembly **50** and conveyor **36**, either side of an asparagus spear that enters the alley and that is of a sufficient height to trigger the corresponding sensor is engaged by the pair of adjacent pick-up rollers **44** and **45** of the lowermost pick-up bed **32**A, which exert an upward force on the asparagus spear sufficient to hold it without uprooting it, and upon being severed the severing assembly **50** is lifted upwardly thereby and handed off to and lifted in turn by the corresponding pair of adjacent pick-up rollers **44** and **45** of the succeeding pick-up beds **32**B, **32**C, and **32**D, respectively, and ultimately cast onto conveyor **36** from the pair of adjacent pick-up rollers of the uppermost pick-up bed **32**D and which transports it to the storage area, which in this example is lug box **38**, thereby completing an asparagus spear harvesting operation. In this example, the asparagus spear is cast onto up-angled backstop **69** immediately to the rear of conveyor **36** and which slides down backstop **69** by gravity onto conveyor **36**.

(41) Harvester **20** is effective to be advanced, whether by being driven or towed, over ground/field **22** along rows of growing asparagus spears. Harvester **20** is effective to sever the spears at an appropriate position beneath the surface of the soil and to extract or withdraw such severed spears from their growing location and deposit them gently upon conveyor **36** for carriage to eventual storage.

(42) Valve unit **65** is configured to operate at and above an operating temperature, namely, a temperature at and above which valve unit **65** is configured to operate for its intended purpose. In this example, the operating temperature of valve unit **65** is 90 degrees Fahrenheit (° F.). When valve unit **65** is at or above this operating temperature, 90° F. in this example, valve unit **65** is enabled to work for its intended purpose, namely, to completely or otherwise sufficiently switch repeatedly between its firing position and its holding position to enable pneumatic cylinder **60** to completely or otherwise sufficiently actuate plunger **54** repeatedly along the stroke path between the normally raised position of severing blade denoted at **52**′ and the lowered severing position of severing blade denoted at **52**″.

(43) It is customary to harvest asparagus spears when the ambient temperature is below the operating temperature of valve unit **65**. When the ambient temperature is below the operating temperature of valve unit **65** and inherently chills valve unit **65** to below its operating temperature, valve unit **65** is inherently disabled from reaching and operating at its operating temperature. In other words, when the ambient temperature is below the operating temperature of valve unit **65**, the ambient temperature is inherently sufficiently low to disable valve unit **65** from reaching and operating at its operating temperature. Unfortunately, when valve unit **65** is below its operating temperature, the ability of its various moving parts to suitably move is inherently impaired or otherwise disabled which inherently restricts the amount of air that can move through valve unit **65**. Accordingly, when valve unit **65** is below its operating temperature, valve unit **65** is inherently impaired or otherwise disabled from completely or otherwise sufficiently switching between its firing position and its holding position which, in turn, inherently disables pneumatic cylinder **60** from completely or otherwise sufficiently actuating plunger **54** along the stroke path of severing blade **52** between the normally raised set position of the severing blade denoted at **52**′ in FIG. **6** and the lowered severing position of the severing blade denoted at **52**″ in FIG. **6** and thereby disables severing blade **52** from reaching its lowered severing position to suitably sever growing asparagus spears. This leaves uncut asparagus spears suitable for harvesting and thus unfavorably influences

asparagus harvesting.
(44) To suitably solve this “temperature-sensitive” problem related to the effective operation of valve unit **65** associated with severing assembly **50′**, namely, to avoid unfavorable influences on asparagus harvester by enabling valve unit **65** to completely or otherwise sufficiently switch repeatedly between its firing position and its holding position for enabling pneumatic cylinder **60** to completely or otherwise sufficiently actuate plunger **54** repeatedly along the stroke path between the normally raised position of severing blade denoted at **52′** and the lowered severing position of severing blade denoted at **52″** in the presence of an ambient temperature that is sufficiently low to disable valve unit **65** from operating at or above its given operating temperature, heater **80** is mounted proximate to valve unit **65**. Heater **80** is configured when activated to sufficiently heat valve unit **65** to enable valve unit **65** to operate according to its intended purpose, namely, to switch according to its intended operation between its firing position and its holding position in the presence of an ambient temperature sufficiently low to impair or otherwise disable valve unit **65** from so operating. Valve unit **65** is operatively associated with heater **80** configured to heat valve unit **65** in accordance with the principle of the invention.
(45) In this example, heater **80** is mounted proximate to valve unit **65**. Heater **80** is configured when activated to sufficiently heat valve unit **65** to at least its operating temperature over a period of time, such as from approximately 1-30 minutes for example depending how cold valve unit **65** is as dictated by the ambient temperature, before commencing asparagus-harvesting operations to enable valve unit **65** to suitably operate at or above is operating temperature to enable valve unit **65** to suitably switch between its firing position and its holding position to effectuate the desired operation of pneumatic cylinder **60** to actuate plunger **54** to move severing blade **52** along the stroke path between its normally raised set position denoted at **52′** in FIG. **6** and its lowered severing position denoted at **52″** in FIG. **6** for suitably severing sensed/detected asparagus spears in the presence of an ambient temperature sufficiently low to otherwise impair or disable valve unit **52** from reaching, and operating at, at least its operating temperature and from so operating according to its intended purpose, in accordance with the principle of the invention. Being configured with heater **80**, valve unit **65** of severing assembly **50′** is a heated valve unit, according to the principle of the invention.
(46) Referring to FIG. **7**, heater **80** is connected by appropriate circuitry to a source of power on chassis **30** through a suitable switch **82**. Heater **80** is configured to activate in response to actuation of switch **82** operatively coupled to heater **80**. Switch **82** is configured to be selectively switched between an ON state denoted at **84** to activate heater **80** to sufficiently heat valve unit **65** over a given period of time to at least its operating temperature to enable valve unit **65** to suitably perform its intended functions in the presence of an ambient temperature sufficiently low to sufficiently disable valve unit **65** from operating at or above its operating temperature and thereby sufficiently performing its intended functions described with particularity herein and an OFF state denoted at **85** to deactivate switch **80** when the services of heater **80** are not required, such as when valve unit **65** is sufficiently heated to or above its operating temperature or is otherwise at or above its operating temperature to enable it to suitably perform its intended functions. In this example, switch **82** is a standard toggle switch which can be selectively operated by the operator of harvester **20** as needed.
(47) In this example, heater **80** is a standard, rugged and readily-available positive temperature coefficient (PTC) heater, an efficient and well-known self-regulating heater that runs open-loop without any external diagnostic controls. Heater **80** is connected directly to valve unit **65** in this example by adhering heater **80** directly to valve unit **65** with a suitable thermally-conductive adhesive denoted at **87**. Heat generated by heater **80** when activated in response to actuation of switch **82** transmits to valve unit **65** to suitably heat it when needed to at least its suitable operating temperature sufficient to enable valve unit **65** completely or otherwise sufficiently switch repeatedly between its firing position and its holding position for enabling pneumatic cylinder **60** to

completely or otherwise sufficiently actuate plunger **54** repeatedly along the stroke path between the normally raised position of severing blade denoted at **52**′ and the lowered severing position of severing blade denoted at **52**″.

(48) In the present embodiment disclosed herein by way of illustration and reference, the suitable operating temperature of valve unit **65** disclosed herein is 90 degrees Fahrenheit. The person having ordinary skill in the art will readily appreciate that the suitable operating temperature of the valve unit **65** may vary depending on the commensurate valve unit chosen for valve unit **65** in accordance with the principle of the invention and that heater **80** can be configured when activated to heat the chosen valve unit to its suitable operating temperature according to this disclosure.

(49) The use of thermally-conductive adhesive **87** to connect heater **80** directly to valve unit **65** is easy and efficient, does not impair or interfere with the operation of heater **80** or the transfer of heat from heater **80** to valve unit **65**, and does not require the use of mechanical fasteners, brackets or welding that could otherwise impair the operation of either valve unit **65** or heater **80**. It is to be understood that each severing assembly **50** of severing apparatus **34** is identically configured with a suitable heater **80** as discussed in conjunction with severing assembly **50**′. Each severing assembly **50** can be configured with a dedicated switch **82**. In an alternate embodiment, the heaters **80** of the various severing assemblies **50** can be operatively coupled to a single switch **82** configured when actuated to concurrently activate the various heaters **80**. If desired, each valve unit and its attached heater of each of the severing assemblies **50** can be configured with be insulated to retain heat, such as by the application of insulation or an insulative jacket for example.

(50) Reference is now directed to FIG. **8** illustrating an alternate embodiment of an asparagus harvester denoted generally at **100**. In common with harvester **20**, harvester **100** shares chassis **30**, hitch **31**, pick-up apparatus **32**, including pick-up beds **32**A, **32**B, **32**C, and **32**D, severing apparatus **34**, conveyor **36**, lug box **38**, and the various appurtenances thereof as previously described. As seen in FIG. **8** and also in FIG. **9**, which is an enlarged fragmentary view corresponding to FIG. **8** illustrating portions of pick-up apparatus **32** in greater detail, pick-up apparatus **32** is configured with spear guides **110** and **112** and interference or interfering member **114**. In this example, pick-up bed **32**B immediately above lowermost pick-up bed **32**A of pick-up apparatus **32** is configured with spear guides **110** and **112** and interference/interfering member **114**.

(51) Referring in relevant part to FIGS. **9-12**, pick-up bed **32**B, like each pick-up bed of pick-up apparatus **32**, is characterized by the previously-described pick-up rollers **44** and **45**. Pick-up rollers **44** and **45** are arranged in a transverse array from one side of pick-up bed **32**B, denoted generally at **120**, to the other side of pick-up bed **32**B, denoted generally at **122**, and are mounted for rotation about parallel axes X and Y, respectively, lying in longitudinal planes and parallel to each other. The opposite sides **120** and **122** of pick-up bed **32**B also inherently define parts of the opposite sides of pick-up apparatus **32** defined collectively by the opposite sides of the various pick-up beds **32**A, **32**B, **32**C, and **32**D. Pick-up rollers **44** and **45** together define a leading or forward end of pick-up bed **32**B denoted generally at **130**, a trailing or aft end of pick-up bed **32**B denoted generally at **132**, and a length L of pick-up bed **32**B in FIG. **11** extending rearwardly and longitudinally, as well as along the path of growing asparagus when harvester **100** brought to service to harvest growing asparagus spears, from leading end **130** to trailing end **132**. The opposite leading and trailing ends **130** and **132** of pick-up bed **32**B inherently constitute parts of the opposite leading and trailing ends of pick-up apparatus **32** collectively defined by the leading and trailing ends of the various pick-up beds **32**A, **32**B, **32**C, and **32**D.

(52) As described previously, pick-up rollers **44** and **45** that constitute pick-up bed **32**B, and also pick-up beds **32**A, **32**C, and **32**D for that matter, form part of a pick-up unit and are each mounted for rotation in suitable journals **140** of a housing assembly **142** immediately to the front of pick-up rollers **44** and **45** and carry drive gears, housed in housing assembly **142**, all in engagement with a common chain or belt, housed in housing assembly **142**, appropriately connected to a drive shaft ultimately driven by motor **47** mounted to housing assembly **142**. Pick-up rollers **44** and **45** are

simultaneously rotated about axes X and Y, respectively, at substantially the same speed by motor **47**, and the adjacent pick-up rollers **44** and **45** of each pair counter-rotate about the respective axes X and Y and thereby move with their closest portions having an upward component as is known in the art and described previously in conjunction with harvester **20**. All of this is the same for each of pick-up beds **32**A, **32**B, **32**C, and **32**D. Spear guides **110** and **112** are disposed on either side of pick-up apparatus **32** for guiding the asparagus spears severed by severing apparatus **34** through pick-up apparatus **32** and currently disable the asparagus spears severed by severing apparatus **34** from ejecting laterally outward from either side of pick-up apparatus in the directions of arrows C and D in FIG. **9**. Spear guides **110** and **112** are disposed on either side of pick-up apparatus **32** between pick-up beds **32**A and **32**B in this example.

(53) With continuing reference in relevant part to FIGS. **9**-**12**, spear guides **110** and **112** are identical and are coextensive panels or shields of metal, which are each preferably flat and generally rectangular in shape in this example. Spear guides **110** and **112** are disposed proximate to the respective sides **120** and **121** of pick-up bed **32**B, are axially-aligned, and depend downwardly from proximate to the respective sides **120** and **122** from under the respective outermost rollers **44** and **45** just inboard or otherwise inside of their respective longitudinal centerlines C**1** and C**2** and their respective axes of rotation X and Y in FIG. **12** present along the respective centerlines C**1** and C**2**. Spear guides **110** and **112** project not only downwardly from just inboard or otherwise inside of their respective longitudinal centerlines C**1** and C**2** and their respective axes of rotation X and Y in FIG. **12** but also angularly outward therefrom and from the respective sides **120** and **122** of pick-up bed **32**B. Spear guides **110** and **112** additionally extend forwardly along length L of pick-up bed **32**B from proximate to trailing end **132** and to and beyond leading end **130** to between leading end **130** and housing assembly **142**.

(54) In this embodiment, spear guides **110** and **112** are mounted to and supported by support members **160** and **164** mounted proximate to the respective sides **120** and **122** of pick-up bed **32**B. Support members **160** and **164** are parallel relative to one another, are rigid, rugged and elongate, are rigidly affixed to either end of housing assembly **142**, such as by welding, fasteners, or the like, and project rearwardly from either end of housing assembly **142** along the respective sides **120** and **122** of pick-up bed **32**B and terminate at outer ends **161** and **165**, respectively, proximate to trailing end **132** of pick-up bed **32**B. Spear guides **110** and **112** concurrently depend downwardly, and angularly outward as previously described, from respective upper ends **111** and **113** affixed to the respective support members **160** and **164** between housing assembly **142** and outer ends **161** and **165**, respectively.

(55) In pick-up apparatus **32** in FIG. **9**, spear guides **110** and **112** are present between pick-up beds **32**A and **32**B proximate to their respective sides **120** and **122**. Spear guides **110** and **112** depend downwardly and angularly outward from the respective upper ends **111** and **112** affixed to the respective support members **160** and **164** from proximate to the respective sides **120** and **122** of pick-up bed **32**B from under the respective outermost rollers **44** and **45** to along the respective sides **120** and **122** of the immediately subjacent lowermost pick-up bed **32**A proximate to the outer side of its respective outermost rollers **44** and **45** at the respective sides **120** and **122**. Spear guides **110** and **112** concurrently extend forwardly along lengths L of the respective pick-up beds **32**B and **32**A along the respective sides **120** and **122** of pick-up beds **32**B and **32**A from proximate to trailing ends **132** of the respective pick-up beds **32**B and **32**A and to and beyond the leading ends **130** of the respective pick-up beds **32**B and **32**A to define a spear-conveying area **170** in FIG. **10** that is laterally-enclosed on either side of pick-up apparatus **32** by spear guides **110** and **112** extending between pick-up beds **32**B and **32**A proximate to sides **120** and **122** of the respective pick-up beds **32**B and **32**A, according to the principle of the invention.

(56) In the general operation of harvester **100** as first described above in conjunction with harvester **20**, as chassis **30** advances along the rows of growing asparagus in the ground, asparagus spears become disposed in the appropriate alleys. A pair of adjacent pick-up rollers **44** and **45** of each of

pick-up beds **32**A-**32**D concurrently relate to an alley and a corresponding severing assembly **50**. For each alley and its corresponding severing assembly **50** and pairs of adjacent pick-up rollers **44** and **45** of pick-up beds **32**A-**32**D between the severing assembly **50** and conveyor **36**, either side of an asparagus spear that enters the alley and that is of a sufficient height to trigger the corresponding sensor is engaged by the pair of adjacent pick-up rollers **44** and **45** of the lowermost pick-up bed **32**A, which exert an upward force on the asparagus spear sufficient to hold it without uprooting it, and upon being severed by the severing assembly **50** is lifted upwardly thereby and handed off to and lifted in turn by the corresponding pair of adjacent pick-up rollers **44** and **45** of the succeeding pick-up beds **32**B, **32**C, and **32**D, respectively, and ultimately cast onto conveyor **36** from the pair of adjacent pick-up rollers of the uppermost pick-up bed **32**D and which transports it to the storage area. Pick-up rollers **44** and **45** of lowermost pick-up bed **32**A lift severed asparagus spears from the ground and into and through spear-conveying area **170** enclosed laterally on sides **120** and **121** by spear guides **110** and **112** to the immediately superjacent pick-up bed **32**B which, in turn, picks up the spears and lifts and transfers them to the next immediately superjacent pick-up bed **32**C. Spear guides **110** and **112** between pick-up beds **32**A and **32**B on the respective sides **120** and **122** of each of pick-up beds **32**A and **32**B and thereby inherently on either side of pick-up apparatus **32** in FIG. **9** suitably guide severed asparagus spears lifting upwardly by pick-up rollers **44** and **45** proximate to the respective sides **120** and **122** from lowermost pick-up bed **32**A and to the corresponding pick-up rollers **44** and **45** of pick-up bed **32**B of pick-up apparatus **32**. At the same time, pick-up guides **110** and **112** disable the severed asparagus spears so advancing upwardly through spear-conveying area **170** from the pick-up rollers **44** and **45** of lowermost pick-up bed **32**A to the corresponding pick-up rollers **44** and **45** of the immediately superjacent pick-up bed **32**B from ejecting laterally outward from between pick-up beds **32**A and **32**B from the spear-conveying area **170** from either of sides **120** and **121** of the respective pick-up bed **32**A and **32**B, and thus from either side of pick-up apparatus **32**, in the opposite directions of arrows C and D, respectively, in FIGS. **9** and **10**, thereby favorably influencing asparagus spear loss in accordance with the principle of the invention. Although spear guides **110** and **112** are disclosed between adjacent pick-up beds **32**A and **32**B to define laterally-enclosed spear-conveying area **170** therebetween in FIG. **9**, suitable spear guides can be similarly disposed between any of the adjacent pick-up beds of pick-up apparatus **32** to define the appropriate laterally-enclosed spear-conveying area therebetween as may be desired.

(57) Referring in relevant part to FIGS. **9**, **10**, and **12**, interfering member **114** extends across trailing end **132** of pick-up bed **32**B from side **120** to side **12** and is configured to disable spears severed by severing apparatus **34** and being lifted through pick-up rollers **44** and **45** of pick-up bed **32**B between leading end **130** and trailing end **132** from inadvertently passing outwardly and rearwardly in the direction of arrow E in FIGS. **9** and **10** through trailing end **132** of pick-up bed **32**B and onto the ground only to become lost, thereby favorably influencing asparagus spear loss in accordance with the principle of the invention. In other words, interfering member **114** extends across trailing end **132** of pick-up bed **32**B across the trailing ends of the various pick-up rollers **44** and **45** from side **120** to side **121** to keep severed asparagus spears entrained between the spaces of various pick-up rollers **44** and **45** and prevent them from discharging rearwardly from between the various pick-up rollers **44** and **45** and relieved from their entrainment while they are being lifted. Interfering member **114** is a longitudinally straight elongate bar carried or otherwise supported by support members **160** and **164**. In this example, interfering member **114** has opposed ends **114**A and **114**B. End **114**A is connected to outer end **161** of support member **160** disposed proximate to side **120** of pick-up bed **32**B and end **114**B, end **114**B is connected to outer end **161** of support member **164** disposed proximate to side **122** of pick-up bed **32**B. Interfering member **114** extends transversely across trailing end **132** of pick-up bed **32** from end **114**A connected to outer end **161** of support member **160** proximate to side **120** of pick-up bed **32**B to end **114**B connected to outer end **165** of support member **164** proximate to side **122**. In this embodiment, ends **114**A and **114**B

extend through appropriate holes in the respective outer ends **161** and **165** and are secured with removable pins **174** and **176**, respective, shown in FIG. **12**. Ends **114**A and **114**B can be secured by other methods in alternate embodiments, such as by welding if so desired.

(58) The trailing end **132** of the lowermost pick-up bed **32**A has no interfering member for enabling short asparagus spears not severed by severing apparatus **34** to pass outwardly through its trailing end **12** from between rollers **44** and **45**. Although only pickup bed **32**B immediately above lowermost pickup bed **32**A incorporates interfering member **114**, pick-up beds **32**C and **32**D can be selectively configured with an interfering member if desired.

(59) FIG. **13** illustrates an alternate embodiment of pick-up bed **32**B embodying features of the invention and denoted with a prime (“′”) symbol to differentiate it from the previously-described pick-up bed **32**B. Pick-up bed **32**B of pick-up apparatus **32** of harvester **20** is replaced with pick-up bed **32**B′. The operation of pick-up apparatus **32** with pick-up bed **32**B replaced with pick-up bed **32**B′ is the same as discussed above with the exception that the operation of pick-up apparatus **32** and harvester **20** is improved with the improvement of the interfering members **230** embodied in pick-up bed **32**B′.

(60) Referring in relevant part to FIGS. **13-18**, pick-up bed **32**B′, like each pick-up bed of pick-up apparatus **32**, has the previously-described pick-up rollers **44** and **45** arranged in a transverse array from one side **120** of pick-up bed **32**B′ to the other side **122** of pick-up bed **32**B′. Pick-up rollers **44** and **45** are mounted for rotation about the previously-described parallel axes X and Y, respectively. The opposite sides **120** and **122** of pick-up bed **32**B′ define parts of the opposite sides of pick-up apparatus **32** defined collectively by the opposite sides of the various pick-up beds **32**A, **32**B, **32**C, and **32**D described previously. For illustration and reference, pick-up rollers **44** each have a leading end **44**A and a trailing end **44**B, and pick-up rollers **45** each have a leading end **45**A and a trailing end **45**B. Leading ends **44**A and **45**A of the various pick-up rollers **44** and **45** define the leading or forward end **130** of pick-up bed **32**B′. Trailing ends **44**B and **45**B of the various pick-up rollers **44** and **45** together define the trailing or aft end **132** of pick-up bed **32**B′. The various pick-up rollers **44** and **45** define the length L of pick-up bed **32**B′ in FIGS. **14** and **15** from leading end **130** to trailing end **132**. The opposite leading and trailing ends **130** and **132** of pick-up bed **32**B′ constitute parts of the opposite leading and trailing ends of the pick-up apparatus incorporating pick-up bed **32**B′.

(61) As described previously, pick-up rollers **44** and **45** of pick-up bed **32**B′ are identical and customarily provided with relatively rigid cores and with surrounding coverings of yieldable, relatively soft material such as foam rubber or the like in the form of pads or fingers shown in this example. According to standard practice, the cores of pick-up rollers **44** and **45** are mounted to and arranged about corresponding shafts **200**. The various shafts **200** are identical and mounted in standard, suitable journals **140** of housing assembly **142**. Shafts **200** carry the customary drive gears engaged directly or with a common chain or belt appropriately connected to a drive shaft ultimately driven by motor **47**. Pick-up rollers **44** and **45** are simultaneously rotated about axes X and Y, respectively, at substantially the same speed when shafts **200** are rotated by motor **47**. Each designated pair of adjacent pick-up rollers **44** and **45** counter-rotate about the respective axes X and Y and thereby move with their closest portions having an upward component as is known in the art.

(62) According to the invention, rollers **44** and **45** each incorporate an interfering member **230**. Interfering members **230** are independent of each other and do not directly engage or contact one another. Each interfering member **230** relates to one of the various pick-up rollers **44** and **45**. An interfering member **230** is mounted to each pick-up roller **44** proximate to its trailing end **44**B and each pick-up roller **45** proximate to its trailing end **45**B.

(63) Each designated pair of adjacent interfering members **230** of each designated pair of adjacent pick-up rollers **44** and **45** are “sufficiently juxtaposed.” This means that each designated pair of interfering members **230** are sufficiently close together to enable them to block and thereby disable severed asparagus spears from passing outwardly therebetween from between the trailing ends **44**B

and **45**B. This occurs when the severed asparagus spears are being engaged and lifted by and between the pick-up rollers **44** and **45** between the leading end and the trailing end of each pick-up roller when the pick-up rollers **44** and **45** are actuated for counter-rotation.

(64) Interfering members **230** are identical in every respect and identically mounted to the various pick-up rollers **44** and **45**. For example, FIG. **17** is a section taken along line **17**-**17** of FIG. **14** illustrating the corresponding roller **44** arranged about shaft **200**, which includes a free end **202** that extends beyond trailing end **44**B. A collar **210** fit over free end **202** and secured to it with a standard set screw **212** in FIGS. **13**-**15** entraps an interfering member **230** applied over shaft **200** between collar **210** and roller's **44** trailing end **44**B. In FIGS. **17** and **18**, interfering member **230** is a standard, circular washer, a flat ring of metal including inner and outer parallel radial surfaces **232** and **234** extending radially outward from a circular inner edge **236** encircling an opening **238** in FIG. **17** through which shaft **200** extends to a circular outer edge **240** in FIGS. **17** and **18** that is proximate to the outer diameter of roller **44** and that defines a constant, circular outer diameter of interfering member **230**. Collar **210** and interfering member **230** are arranged coaxially about axis X of rotation X of roller's **44** shaft **200**. Trailing end **44**B of roller **44** is in direct contact against inner radial surface **232**, collar **210** is in direct contact against outer radial surface **234**, and interfering member **230** is effectively clamped and entrapped by and between collar **210** and roller's **44** trailing end **44**B, which causes the interfering member **230** to rotate with the rotation of roller **44**. Rollers **44** and **45** of pick-up bed **32**B′ are each identically configured with an interfering member **230**.

(65) In FIG. **18**, the closest portions of each designated pair of adjacent interfering members **230** are the circular outer edges **240**, being separated only by a small gap **242** that is sufficiently small to disable an asparagus spear suitable for harvesting from passing through it. The circular outer edges **240**, the closest portions of the adjacent interfering members that correspond to the closest portions of the designated pair of adjacent pick-up rollers **44** and **45** having the inherent upward component, are thus “sufficiently juxtaposed” or otherwise sufficiently close together to enable the interfering members **230** to work in concert by their inner radial surfaces **232** and outer edges **240** interacting with and blocking or otherwise obstructing severed asparagus spears from passing outwardly from between the interfering members **230** through gap **242** from between the trailing ends **44**B and **45**B and onto the ground only to become lost when the severed asparagus spears are being engaged and lifted by and between the pick-up rollers **44** and **45** between the leading end and the trailing end of each pick-up roller when the pick-up rollers **44** and **45** are actuated for counter-rotation, thereby favorably influencing asparagus spear loss in accordance with the principle of the invention. The interfering members **230** counter-rotate with the various pick-up rollers **44** and **45** when they are actuated for counter-rotation while remaining sufficiently juxtaposed as herein described because of their described circular configuration.

(66) In the general operation of harvester **20** with pick-up bed **32**B replaced with pick-up bed **32**B′, as chassis **30** advances along the rows of growing asparagus in the ground, asparagus spears become disposed in the appropriate alleys. A designated pair of adjacent pick-up rollers **44** and **45** of each of pick-up beds **32**A-**32**D concurrently relate to an alley and a corresponding severing assembly **50**. For each alley and its corresponding severing assembly **50** and pairs of adjacent pick-up rollers **44** and **45** of pick-up beds **32**A-**32**D between the severing assembly **50** and conveyor **36**, either side of an asparagus spear that enters the alley and that is suitable for harvesting, being of a sufficient height to trigger the corresponding sensor, is engaged by the pair of adjacent pick-up rollers **44** and **45** of the lowermost pick-up bed **32**A, which exert an upward force on the asparagus spear sufficient to hold it without uprooting it, and upon being severed by the severing assembly **50** is lifted upwardly thereby and handed off to and lifted in turn by the corresponding pair of adjacent pick-up rollers **44** and **45** of the succeeding pick-up beds **32**B′, **32**C, and **32**D, respectively, and ultimately cast onto conveyor **36** from the pair of adjacent pick-up rollers of the uppermost pick-up bed **32**D and which transports it to the storage area. Pick-up rollers **44** and **45** of lowermost pick-up

bed **32**A lift severed asparagus spears from the ground to the immediately superjacent pick-up bed **32**B′ which, in turn, picks up the spears and lifts and transfers them to the next immediately superjacent pick-up bed **32**C.

(67) Interfering members **230** of pick-up bed **32**B′ serve to block the spears severed by severing apparatus **34** and being lifted through pick-up rollers **44** and **45** of pick-up bed **32**B′ between leading end **130** and trailing end **132** from passing outwardly and rearwardly in the direction of arrow E in FIGS. **13-15** and **18** through trailing end **132** of pick-up bed **32**B′ and onto the ground only to become lost, thereby favorably influencing asparagus spear loss according to the invention. The designated pairs of adjacent interfering members **230** mounted directly to the designated pairs of the various pick-up rollers **44** and **45** extend across trailing end **132** of pick-up bed **32**B across the trailing ends of the various pick-up rollers **44** and **45** from side **120** to side **121** and keep severed asparagus spears entrained between the spaces of the designated pairs of pick-up rollers **44** and **45** and prevent them from discharging rearwardly from between the various designated pairs of pick-up rollers **44** and **45** and being relieved from their entrainment while they are being lifted.

(68) Shown in FIG. **19** is an alternate embodiment of an asparagus collection and storage apparatus **70** embodying features of the invention and denoted with a prime (“′”) symbol to differentiate it from apparatus **70** of previously-described harvester **20**. Apparatus **70** of the previously-described harvester is replaced apparatus **70**′ in an exemplary embodiment. The operation of harvester **20** with apparatus **70** replaced with apparatus **70**′ is described briefly below. As described above with harvester **20**, conveyor **36** mounted at a fixed position and is configured to receive from pick-up apparatus **32** and convey away asparagus spears severed by severing apparatus **34** to apparatus **70**′ when it replaces apparatus **70**.

(69) Referring in relevant part to FIGS. **19-23**, apparatus **70**′ includes framework **72**, including horizontal frame **74** affixed to and extending outwardly from the lower ends of opposed supports **76** and **77** extending upright from frame **74** under conveyor **36** to their upper ends affixed to chassis **30**. Frame **74** is a rectangular perimeter frame including opposed parallel sides **250** and **252** that extend longitudinally along chassis **30** between opposed parallel ends **254** and **256**. Side **250** is the inner side of frame **74** near chassis **30**, side **252** is the outer side of frame **74**, end **254** is the leading end of frame **74**, and end **256** is the trailing end of frame **74**. Sides **250** and **252** are equal in length and are longer than ends **254** and **256** that are equal in length. This configuration forms the rectangular shape of frame **74**. Frame **74** surrounds, supports, and is affixed to perimeter extremity **266** of a robust, rugged, horizontal platform **260** of metal or plastic that includes an upper surface **262** under and facing conveyor **36** and an opposed lower surface **264** that supports part of a drive assembly **350**. Platform **260** is an extension of frame **74** and is considered part of it.

(70) Sides **250** and **252** and ends **254** and **256** are angle bars. The angle bars have identical vertical cross-sections of horizontal and vertical components along their respective lengths. For reference purposes, side **250** has horizontal and vertical components **250**A and **250**B, side **252** has horizontal and vertical components **252**A and **252**B, end **254** has horizontal and vertical components **254**A and **254**B, and end **256** has horizontal and vertical components **256**A and **256**B. Lower surface **264** of perimeter extremity **268** of platform **260** rests atop horizontal components **250**A, **252**A, **254**A, and **256**A. Welding, rivets, or other joinery secures perimeter extremity **266** to horizontal components **250**A, **252**A, **254**A, and **256**A. Vertical components **250**B, **252**B, **254**B, and **256**B extend upright from platform's **260** perimeter extremity **266** to define frame's **74** perimetric rim that confines the longitudinal translation of a lug box or bin **270** across upper surface **262** of platform **260**.

(71) Upper surface **262** of platform **260** supports bin **270** under and open to receive and temporarily store severed asparagus spears from conveyor **36** during harvesting operations. Drive assembly **350** is operatively coupled or otherwise operatively engaged to bin **270** and displace it slidably across upper surface **262** along a longitudinal displacement path denoted by arrow F between bin's **270** stations when drive assembly **350** actuates. Bin's **270** stations include a first or

rearward station in FIGS. **19**, **21**, and **22** toward frame's **74** end **256** and a second or forward station toward frame's **74** end **254** away from end **256** in FIGS. **29** and **30**. Bin **270** is open to receive and temporarily store severed asparagus spears from conveyor **36** at each of its first and second stations and all stations therebetween, all of which are considered bin's "filling" stations, i.e., stations where bin **270** is positioned to accept severed asparagus spears from conveyor **36** during harvesting operations.

(72) Bin **270**, a rugged metal or plastic container, includes continuous sidewall **272** having outer surface **274**, inner surface **276**, upper edge **278**, lower edge **280**, and horizontal bottom **282** affixed to lower edge **280**. Continuous sidewall **272** extends upright from bottom **280** supported slidably directly against upper surface **262** to upper edge **278** encircling opening **286** to bin's **270** volume **284** defined by bottom **280** and inner surface **276**. Bin's **270** volume **284** is open to receive severed asparagus spears through opening **286** from conveyor **36** while bin **270** is disposed along path F at its rearward station, its forward station, and all stations therebetween, such as the station of bin **270** in FIG. **27** disposed between bin's **270** rearward and forward stations. Therefore, opening **286** to volume **284** is open to conveyor **36** to receive asparagus spears from conveyor **36** while bin **270** is disposed along path F at its filling stations, namely, its rearward station, its forward station, and any station therebetween.

(73) Continuous sidewall **272** includes opposite side walls **290** and **292** that extend between opposite end walls **294** and **296**. Side walls **290** and **292** define either side of bin **270** and are equal in length and longer than end walls **294** and **296**, which are equal in length and define either end of bin **270**. Side walls **290** and **292** flank either side of volume **284**. End walls **294** and **296** flank either end of volume **284**. Bin **270** is rectangular in this example, in which side walls **290** and **292** are perpendicular relative to end walls **294** and **296**, and the length of bin **270** from end wall **294** to end wall **296** is greater than the width of bin **270** from side wall **290** to side wall **292**.

(74) Bottom **282** of bin **270** rests directly against upper surface **262** of bin **270**. Bottom **282** extends across upper surface **262** of platform **260** laterally from side wall **290**, the inner side of bin **270** adjacent to the vertical component **250**B of the inner side **250** frame **74**, to side wall **292**, the outer side of bin **270** adjacent to the vertical component **252**B of the outer side **252** of frame **74**. Bin **270** extends across upper surface **262** of platform longitudinally from end wall **294**, the leading end of bin **270** directed toward the vertical component **254**B of the leading end **254** of frame **74**, to end wall **296**, the trailing end of bin **270** directed toward the vertical component **256**B of the trailing end **256** of frame **74**. Bin **270** is between leading and trailing ends **254** and **256** of frame **74** and inner and outer sides **250** and **252** of frame **74**. Bottom **282** can simply slide longitudinally over and across upper surface **262** of platform **260** along path F, in which case bin **270** can displace slidably across upper surface **262** of platform **260** relative to the overlying conveyor **36** longitudinally along path F between its rearward station in FIGS. **19**, **21**, and **22** and its forward station in FIGS. **29** and **30**. Frame's **74** vertical components **250**B and **252**B flank the respective side walls **290** and **292** and serve as confining rails constraining bin's **270** longitudinal displacement along displacement path F. Frame's **74** vertical components **254**B and **256**B flank the respective end walls **295** and **296** and serve as confining stops disabling bin **270** from moving forwardly in the direction of arrow F beyond vertical component **254**B and rearwardly in the opposite direction beyond vertical component **256**B.

(75) Apparatus **70′** incorporates a partition **300** in FIGS. **19-25**, a dividing wall of metal or plastic mounted at a fixed position. In FIGS. **19**, **21**, **23**, **24**, and **25**, partition **300** in volume **284** of bin **270** between side walls **290** and **292** and end walls **294** and **296** in FIGS. **19**, **21**, and **23** and transversely compartments or otherwise divides bin's **270** volume **284** into a first confined volume **284**A and a second confined volume **284**B. Confined volume **284**A extends between partition **300** and bin's **270** end wall **294**. Confined volume **284**B extends between partition **300** and bin's **270** end wall **296**. Confined volume **284**A is the forward confined volume of bin **270** ahead of confined volume **284**B, the aft or rear confined volume of bin **270**.

(76) Partition **300** separates confined volume **284**A from confined volume **284**B. Bin **270** displaces along path F between its rearward and forward stations relative to partition **300**. Partition **300** remains in bin **270** dividing bin's volume **284** into the described confined volumes **284**A and **284**B at each of bin's **270** filling stations and when bin **270** displaces longitudinally along path F relative to partition **300** between bin's **270** rearward and forward stations. Confined volume **284**A is open to receive severed asparagus spears deposited into it through opening **286** open to conveyor **36** when bin **270** is in its rearward station in FIGS. **19** and **21**, its forward station in FIG. **29**, and all stations therebetween. Confined volume **284**A has a first size when bin **270** is in its rearward station in FIGS. **19** and **21** and a second greater size when bin **270** is in its forward station in FIG. **29**. The size of confined volume **284**A increases with bin's **270** movements from its rearward station to its forward station. At the same time, confined volume **284**B has a first size when bin **270** is in its rearward station in FIGS. **19** and **21** and a second lesser size when bin **270** is in its forward station in FIG. **29**. The size of confined volume **284**B decreases with bin's **270** movements from its rearward station to its forward station.

(77) Referring in relevant part to FIGS. **19**, **21**, **23**, **24**, and **25**, partition **300** is a flat panel including opposed, parallel surfaces **302** and **304**, opposed parallel side edges **306** and **308**, and opposed parallel upper and lower edges **310** and **312**. Surface **302** is the front surface of partition **300**. Surface **304** is the rear surface of partition **300**. Partition **300** is configured with a backstop **314** and a mounting plate **316**. Backstop **314**, a flat panel, is perpendicular to front surface **302** and extends forwardly relative to front surface **302**. Mounting plate **316** defines partition's **300** upper end or extremity. Mounting plate **316** extends upwardly from upper edge **310** along the width of partition **300** from side edge **306** to side edge **308**. Partition **300** and its backstop **314** are normally in a lowered position lowered into volume **284** through bin's **270** opening **286**, in which they concurrently extend downward, and angularly forward in the direction of end wall **294**, into bin's **270** volume **284** through opening **286** to lower edge **312** at bin's **270** bottom **282** from mounting plate **316** mounted at a fixed position over bin's **270** opening **286** aft of conveyor **36**. Partition **300**, including its front and rear surfaces **302** and **304**, extends laterally across volume **284** from side edge **306** adjacent to the flanking inner surface **276** of side wall **290** to side edge **308** and backstop **314** adjacent to the flanking inner surface **276** of side wall **296** opposite to conveyor **36** dividing volume **284** transversely into forward and aft confined volume **284**A and **284**B. Front surface **302** of partition **300** and inner surface **276** of end wall **294** and side walls **290** and **292** extending forwardly from front surface **302** to end wall **294** define confined volume **284**A. Rear surface **304** of partition **300** and inner surface **276** of end wall **296** and side walls **290** and **292** extending rearwardly from rear surface **302** to end wall **296** define confined volume **284**B. Backstop **314** perpendicular to front surface **302** extends forwardly relative to front surface **302** along inner surface **276** of sidewall **292** toward end wall **294** in FIGS. **19** and **21** from side edge **308** along the height of partition **300** from upper edge **310** to lower edge **312**.

(78) Confined volume **284**A extending forwardly from front surface **302** to end wall **294** has its first size when bin **270** is in its rearward station in FIGS. **19** and **21** and its second greater size when bin **270** is in its forward station in FIG. **29**. The size of confined volume **284**A extending forwardly from front surface **302** to end wall **294** increases with bin's **270** movements relative to partition **300** from its rearward station to its forward station. At the same time, confined volume **284**B extending rearwardly from rear surface **304** to end wall **296** has its first size when bin **270** is in its rearward station in FIGS. **19** and **21** and its second lesser size when bin **270** is in its forward station in FIG. **29**. The size of confined volume **284**B extending rearwardly from rear surface **304** to end wall **296** decreases with bin's **270** movements relative to partition **300** from its rearward station to its forward station. Partition's **300** lower edge **312** slides across bottom **282** when bin **270** displaces relative to partition **300**.

(79) In FIGS. **19** and **24**, plate **316** is mounted at its fixed position over bin's **270** opening **286** to a support member **320** by a hinge **330**. Support member **320** is elongate, is aft of conveyor **36** above

opening **286** to bin's **270** volume **284**, and extends laterally outward from an inner end **322** affixed to chassis **30** to an outer end **324**. Support member **320** is an angle bar having a horizontal component **326** and a vertical component **328**.

(80) In FIG. **24**, hinge **330**, which is of standard construction, includes a first plate **332** atop and affixed to horizontal component **326** by welding or suitable fasteners and a second plate **334** affixed by welding or suitable fasteners to partition's **300** mounting plate **316** extending across vertical component **328**. First plate **332** has spaced apart generally cylindrical members **340** and second plate **334** has spaced apart generally cylindrical members **342**. Cylindrical members **340** of first plate **332** are received between cylindrical members **342** of second plate **334**. A pin **344** extends through the several cylindrical members **340** and **342** pivotally connecting first plate **332** to second plate **334**. Partition **300** extends downwardly and forwardly into volume **284** through opening **286** to lower edge **312** at bottom **282** of bin **270** from mounting plate **316** affixed to hinge's **330** second plate **334** and extending upright along horizontal component **326** of support member **320**. Hinge **330** enables partition **300** to pivot into and out of its normally lowered position lowered in bin's volume **284** through opening **286** in the directions of arcuate arrow G in FIG. **24**.

(81) Drive assembly **350** is operatively coupled to sensors **400** and **402** shown in FIG. **22**. Drive assembly **350** is configured to selectively displace bin **270** longitudinally along path F when drive assembly **350** selectively actuates automatically each time sensor **400** in FIGS. **22**, **23**, **25**, **26**, **28**, and **30** actuates, i.e., senses the presence of severed asparagus spears at a fill level of the confined volume **284**A and issues an impulse effective upon drive assembly **350** in response. Drive assembly **350** is configured to automatically longitudinally displace bin **270** relative to partition **300** along path F between bin's **270** rearward and forward positions to enlarge confined volume **284**A each time drive assembly **350** actuates under the influence of sensor **400**. Sensor **400**, a standard and readily-available position sensor or photosensor, is configured to sense the presence of severed asparagus spears at the fill level of confined volume **284**A proximate to opening **286** to confined volume **284**A and issue its impulse effective upon the drive assembly **350** in response. When an impulse from sensor **400** is effective upon drive assembly **350** in response to sensor **400** detecting the presence of severed asparagus spears at the fill level, drive assembly **350** automatically actuates. Sensor **402**, also a standard and readily-available position sensor or photosensor, is configured to sense the presence of bin **270** at its “filled” station described below and issue an impulse concurrently effective upon the drive assembly **350** and an alarm **406** in FIG. **26** operatively coupled to sensor **402** in response. When an impulse from sensor **402** is effective upon drive assembly **350** and alarm **406** in response to sensor **402** detecting the presence of bin **270** at its filled station, drive assembly **350** and alarm **406** automatically actuate.

(82) Drive assembly **350** includes a cylinder assembly **352** in FIGS. **20** and **22** and a valve unit **394** in FIG. **26** that operates cylinder assembly **352** under the influence of sensor **400** and under the influence of sensor **402** referenced in FIGS. **22** and **26**. Cylinder assembly **352** is chosen because it is inexpensive, readily available, and reliable.

(83) Referring in relevant part to FIGS. **20** and **22**, cylinder assembly **352** is parallel to path F and includes cylinder **360** and operating rod **370** configured to operatively engage or otherwise couple to bin **270**. Cylinder **260** has opposed first and second ends **362** and **364** and operating rod **370** has an outer end **372**. Cylinder **360** is mounted rigidly at a fixed position to lower surface **264** of platform **260** by suitable brackets **366** secured between cylinder **360** and lower surface **274**. In this example, a first bracket **366** adjacent to the first end **362** of cylinder **360** and a second bracket **366** adjacent to the second end **364** of cylinder **360** secure cylinder **360** to platform's **260** lower surface **264**. Cylinder **360** is between and parallel to sides **250** and **252** of frame **74** and extends longitudinally from first end **362** near end **254** of frame **74** to second end **364** at an intermediate location between ends **254** and **256** of frame **74**. Operating rod **370** mounted partially within cylinder **360** through second end **364** for reciprocal movement therein extends outwardly from second end **364** to outer end **372**. Operating rod **370** is configured to retract inwardly into cylinder

360 in the direction of arrow H in FIGS. **20** and **22** and extend outwardly from cylinder **360** in the direction of arrow I in FIGS. **20** and **22**. Outer end **372** is configured to operatively engage or otherwise couple to bin **270**, wherein retracting movement of operating rod **370** into cylinder **360** in response to actuation of cylinder assembly **252** imparts corresponding movement of bin **270** along path F between its rearward station in FIGS. **19**, **21**, and **22** and its forward station in FIGS. **29** and **30**.

(84) In this example, and in reference in relevant part to FIGS. **20**, **22**, and **23**, outer end **372** is configured with a rigidly attached lug **374** configured to engage or otherwise couple to bin **270**. Lug **374** interfaces between bin **270** outer end **372** of operating rod **370**. A slot **380** extends through platform **260** from lower surface **264** to upper surface **262**. Lug **374** translates longitudinally through slot **380** when operating rod **270** reciprocates into and from cylinder **360**. Slot **380** is straight, elongate, narrow, parallel to sides **250** and **252** and to operating rod **370**, and extends longitudinally over operating rod **370** from end **256** to adjacent to second end **364** of cylinder **260**. Lug **374** is elongate and projects upright through slot **380** from lower surface **264** to upper surface **262** and beyond upper surface **262** to an upper end **376** opposing outer surface **274** of bin's **270** end wall **296** between upper and lower edges **278** and **280** and between end walls **290** and **292**. The retracting operating rod **370** urges lug **274** in the same direction directly against outer surface **274** of bin's **270** end wall **296** in response to actuation of cylinder assembly **252** by valve unit **394** under the influence of sensor **400** urging or otherwise imparting the corresponding movement of bin **270** in the direction of path F between its rearward and forward positions.

(85) Cylinder assembly **352** is a standard pneumatic cylinder assembly. Referring to FIGS. **20** and **26** in relevant part, conduits **390** and **392** couple cylinder **360** through valve unit **394** to the previously-described source **66** (FIGS. **1-5**) of air under pressure via supply conduit **396**. Valve unit **394** is operatively coupled by appropriate circuitry to sensor **400** referenced in FIGS. **22**, **23**, **25**, **26**, **28**, and **30**, and also sensor **402** in FIGS. **19**, **23**, **26**, **27**, **29**, and **31**, which is operatively coupled to alarm **406** in FIG. **26** by appropriate circuitry. Sensors **400** and **402** and alarm **406**, a standard electronic audible alarm configured to sound an appropriately loud audible stimulus, are connected by appropriate circuitry to a source of power on chassis **30**. Valve unit **394** operates actuating cylinder assembly **352** in response each time it receives an impulse from sensor **400** and each time it receives an impulse from sensor **402**, characterizing the operative coupling of sensors **400** and **402** to cylinder assembly **352** of drive assembly **350**.

(86) Valve unit **394** is standard and well-known and configured to alternately switch into and out of an index position and a reset position from a normally closed position. Valve unit **394** switches into and out of its index position from its closed position under the influence of sensor **400**, the fill sensor of apparatus **70′**. Valve unit **394** switches into and out of its reset position from its closed position under the influence sensor **402**, the reset sensor of apparatus **70′**. Valve unit **394** isolates cylinder **360** from source **66** when valve unit **394** is in its closed position securing operating rod **370** relative to cylinder **360**.

(87) Valve unit **394** momentarily actuates, such as for approximately 1-3 seconds, into and out of its index position from its closed position in response to receiving an impulse from sensor **400**. This momentarily supplies air under pressure from source **66** through conduit **390** actuating cylinder assembly **352** sufficiently to retract operating rod **370** inwardly into cylinder **360** in the direction of arrow H in FIGS. **20** and **22** as described herein. In other words, when an impulse from sensor **400** is effective upon valve unit **394** in response to sensor **400** detecting the presence of severed asparagus spears at the fill level, valve unit **394** automatically actuates as described herein.

(88) Valve unit **394** momentarily actuates, such as for approximately 1-3 seconds, into and out of its reset position from its closed position in response to receiving an impulse from sensor **402**. This momentarily supplies air under pressure from source **66** through conduit **392** actuating cylinder assembly **352** sufficiently to extend operating rod **370** outwardly from cylinder **360** in the direction of arrow I in FIGS. **20** and **22** as described herein. In other words, when an impulse from sensor

402 is effective upon valve unit **394** in response to sensor **402** detecting the presence of bin **270** at its filled station, valve unit **394** automatically actuates as described herein.
(89) Alarm **406** also momentarily actuates, such as for approximately 1-10 seconds, in response to receiving an impulse from sensor **402**. Each time alarm **406** actuates, it momentarily sounds an audible alarm that is sufficiently loud to enable it to be easily heard by an ordinary workman during harvesting operations. In other words, when an impulse from sensor **402** is effective upon alarm **406** in response to sensor **402** detecting the presence of bin **270** at its filled station, alarm **406** automatically actuates as described herein.
(90) Bin **270** is set to its rearward position or station in FIGS. **19**, **21**, and **22** when operating rod **360** is in its extended position in FIGS. **20** and **22**. Lug **374** is in its extended position when operating rod **370** is in its extended position. Bin **270** is set to its forward position or station in FIGS. **29** and **30** under the influence of lug **374** when operating rod **370** is retracted to a retracted position in FIG. **30** from its extended position. Lug **374** is in a retracted position when operating rod **370** is in its retracted position corresponding to bin's **270** forward position. The retracting movement of operating rod **370** into cylinder **360** from its extended position in the direction of arrow H urges corresponding movement of lug **374** and bin **270** under the influence of lug **374** in the same direction. The extending movement of operating rod **370** from cylinder **360** from its retracted position in the direction of arrow I imparts corresponding movement of lug **374** in the same direction, but not bin **270**.
(91) Sensor **400** is configured to sense the presence of severed asparagus spears at the fill level of confined volume **284**A and issue an impulse in response effective upon valve unit **394** for momentarily actuating cylinder assembly **352**. Sensor **400** issues an impulse effective upon valve unit **394** each time sensor **400** senses the presence of asparagus spears at the fill level of confined volume **284**A for a predetermined duration of time, from 2-3 seconds in a preferred embodiment, which prevents sensor **40** from issuing its impulse in response to sensing severed asparagus spears falling past sensor **400** into confined volume **284**A through bin's opening **286** for less than the predetermined period of time. Drive assembly **350** actuates to displace bin **270** along path F to enlarge confined volume **284**A each time an impulse from sensor **400** is effective upon it, namely, each time sensor **400** senses the presence of severed asparagus spears at the fill level of confined volume **284**A for the predetermined duration of time and issues its impulse effective upon valve unit **394** in response. When sensor **400** senses the presence of severed asparagus spears at the fill level of confined volume **284**A proximate to opening **286** to confined volume **284**A in any station of bin **270**, confined volume **284**A is considered full of severed asparagus spears up to or near opening **286** and unsuitable to take in more severed asparagus spears without the chance of them falling outwardly from confined volume **284**A through its opening **286**.
(92) Sensor **400** senses the presence of severed asparagus spears at the fill level of confined volume **284**A via a hole **410** present through partition **300** from front surface **302** in FIGS. **19**, **21**, **24**, **27** and **29** to rear surface **304** in FIGS. **23** and **25**. Hole **410** is between side edges **306** and **308** of partition **300** at an intermediate location between side walls **290** and **292** of bin **270** and between upper and lower edges **310** and **312** proximate to opening **286** to volume **284**. Hole **410** opens confined volume **284**A proximate to opening **286** to sensor **400** located at a fixed position in confined volume **284**B adjacent to partition's **300** rear surface **304** proximate to opening **286** to confined volume **284**B, enabling sensor **400** to perform is described functions. In this example, a bracket **412** secured to rear surface **304** of partition **300** by welding, rivets, screws, or other suitable fasteners secures sensor **400** adjacent to rear surface **304** in opposition to hole **410**. Hole **410** opens sensor **400** to confined volume **284**A proximate to opening **286**, enabling sensor **400** to sense the presence of severed asparagus spears at the fill level of confined volume **284**A. The positioning of sensor **400** enables partition **300** to isolate sensor **400** from severed asparagus spears falling into confined volume **284**A from conveyor **36**, shielding sensor **400** from becoming damaged by severed asparagus spears falling past it into confined volume **284**A through opening **286** from

conveyor **36**.

(93) The general operation of harvester **20** configured with the described apparatus **70**′ begins with operating rod **370** extended to its extended position in FIGS. **20** and **22** and bin **470** appropriately located at its corresponding rearward station in FIG. **19** against lug **374**. As chassis **30** advances along the rows of growing asparagus in the ground **22**, asparagus spears become disposed in appropriate alleys between the appropriate plate **40** pairs. A pair of adjacent pick-up rollers **44** and **45** of each of pick-up beds **32**A-**32**D concurrently relate to an alley and a corresponding severing assembly **50**. For each alley and its corresponding severing assembly **50** and pairs of adjacent pick-up rollers **44** and **45** of pick-up beds **32**A-**32**D between the severing assembly **50** and conveyor **36**, either side of an asparagus spear that enters the alley and that is of a sufficient height to trigger the corresponding sensor is engaged by the pair of adjacent pick-up rollers **44** and **45** of the lowermost pick-up bed **32**A, which exert an upward force on the asparagus spear sufficient to hold it without uprooting it, and upon being severed the severing assembly **50** is lifted upwardly thereby and handed off to and lifted in turn by the corresponding pair of adjacent pick-up rollers **44** and **45** of the succeeding pick-up beds **32**B, **32**C, and **32**D, respectively, and ultimately cast onto conveyor **36** from the pair of adjacent pick-up rollers of the uppermost pick-up bed **32**D and which transports it in the direction of arrow J in FIGS. **19** and **21** to confined volume **284**A of bin **270**. In this example, the asparagus spear is cast onto up-angled backstop **69** immediately to the rear of conveyor **36** and which slides down backstop **69** by gravity onto conveyor **36** that suitably operates to deposit the severed asparagus spears one after the other into confined volume **284**A. When operating rod **370** is extended to its extended position in FIGS. **20** and **22** and bin **270** is set to its corresponding rearward position defining the smallest size of confined volume **284**A open to receive asparagus spears from conveyor **36** through opening **286**, brought into action are the following operations.

(94) Conveyor **36** deposits severed asparagus spears into bin's **270** confined volume **284**A through opening **286** while bin **270** is set to its rearward position. Backstop **314** adjacent to side wall **292** opposite to conveyor **36** deflects the severed asparagus spears into confined volume **284**A from the conveyor **36**, suitably consolidating the severed asparagus spears in volume **284**A in an orderly stack of parallel severed asparagus spears. Valve unit **394** automatically moves into and out of its index position from its closed position when sensor **400** senses the presence of severed asparagus spears at the fill level denoted generally at FL in FIG. **19** and issues its impulse effective upon valve unit **394** in response as described above. This momentarily actuates cylinder assembly **352** sufficient to partially retract operating rod **370** in the direction of arrow H out of its extended position corresponding to the rearward station of bin **270** to an initially retracted position in FIG. **28**. At the same time, lug **374** of the retracting operating rod **370** acting directly against bin **270** indexes or otherwise moves bin **270** longitudinally in the same direction along path F indexing it out of its rearward station to an advanced position or station in FIGS. **27** and **28** between bin's **270** rearward and forward stations. This increases the distance between front surface **302** of partition **300** and end wall **294**, enlarging the size of confined volume **284**A in response, enabling the deposited severed asparagus spears to settle under the influence of gravity in the now enlarged confined volume **284**A to create more space for accepting additional severed asparagus spears from conveyor **36** during the harvesting operations. The distance between rear surface **304** of partition **300** and end wall **296** also concurrently decreases, decreasing the size of confined volume **284**B in response. Conveyor **36** deposits severed asparagus spears into bin's **270** confined volume **284**A through opening **286** while bin **270** is set to its advanced station ahead of its starting or rearward station. Backstop **314** adjacent to side wall **292** opposite to conveyor **36** deflects the severed asparagus spears into confined volume **284**A from the conveyor **36**, suitably consolidating the severed asparagus spears in the now enlarged volume **284**A as before.

(95) Next, valve unit **394** automatically moves into and out of its index position from its closed position when sensor **400** again senses the presence of severed asparagus spears at the fill level FL

of confined volume **284**A at bin's **270** advanced station in FIG. and issues its impulse effective upon valve unit **394** in response. This again momentarily actuates cylinder assembly **352** sufficient to partially retract operating rod **370** in the direction of arrow H out of its initially retracted position in FIG. **27** corresponding to the advanced station of bin **270** in FIGS. **27** and **28** to a further retracted position in FIG. **30**. At the same time, lug **374** of the retracting operating rod **370** acting directly against bin **270** again indexes or otherwise moves bin **270** longitudinally in the same direction along path F indexing bin **270** out of its advanced station to its forward station in FIGS. **29** and **30**. This again increases the distance between front surface **302** of partition **300** and end wall **294** again enlarging the size of confined volume **284**A in response, enabling the deposited severed asparagus spears to settle under the influence of gravity in the now further enlarged confined volume **284**A to yet again create more space for accepting additional severed asparagus spears from conveyor **36**. The distance between rear surface **304** of partition **300** and end wall **296** concurrently decreases yet again, further decreasing the size of confined volume **284**B in response. Backstop **314** adjacent to side wall **292** opposite to conveyor **36** deflects the severed asparagus spears into confined volume **284**A from the conveyor **36** when bin **270** is in its rearward station, its forward station, and any station therebetween, consolidating the severed asparagus spears in volume **284**A in an orderly stack of parallel severed asparagus spears. The described indexing of bin **270** from its rearward station to its advanced station and from there to its forward station serves to orderly arrange and consolidate the severed asparagus spears deposited in confined volume **284**A by conveyor **36** in a stack of parallel severed asparagus spears.

(96) Next, valve unit **394** automatically moves into and out of its index position from its closed position when sensor **400** yet again senses the presence of severed asparagus spears at the fill level FL of confined volume **284**A at bin's **270** forward station in FIG. **29** and issues the impulse effective upon valve unit **394** in response. When sensor **400** senses the presence of asparagus spears at the fill level FL when bin **270** is set to its forward position, bin **270** is considered full and unsuitable for confined volume **284**A taking on additional severed asparagus spears. The impulse from sensor **400** effective upon valve unit **394** again momentarily actuates cylinder assembly **352** sufficient to yet again partially retract operating rod **370** in the direction of arrow H out of its retracted position in FIG. **30** corresponding to the forward station of bin **270** in FIGS. **29** and **30** to yet a slightly further retracted position in FIG. **31**. At the same time, lug **374** of the retracting operating rod **370** acting directly against bin **270** yet again indexes or otherwise moves bin **270** longitudinally in the same direction along path F slightly indexing bin **270** out of its forward station to its filled station in FIG. **31** triggering sensor **402** by it sensing the presence of bin **270** at its filled position.

(97) Upon bin **270** reaching its filled station in FIG. **31**, sensor **402** is configured to sense the presence of bin **270** and issue an impulse concurrently effective upon valve unit **394** and alarm **406** in FIG. **26** in response. This momentarily and concurrently actuates cylinder assembly **352** and alarm **406**. Cylinder assembly **352** momentarily actuates under the influence of sensor **402** sufficient to extend operating rod **370** in the direction of arrow I out of its retracted position in FIG. **31** corresponding to the filled station of bin **270** to its original or starting extended position in FIGS. **20** and **22**, effectively returning or otherwise resetting operating rod **370** and its lug **374** to their extended positions. At the same time, alarm **406** momentarily actuates under the influence of sensor **402** sufficient to sounds its audible alarm that is sufficiently loud to enable it to be easily heard by an ordinary workman during harvesting operations, alerting the workman that bin **370** is full and ready to be taken away for further processing of its contents and that the installation of a fresh bin is required. Now that bin **270** is full of severed asparagus spears, a workman may carefully pivot partition **300** at hinge **330** upwardly from its normal lowered position while he removes the filled bin **270** from platform **260** and replaces it with a fresh bin by placing it on upper surface **262** of platform **260** and setting it to its rearward position against lug **374** as previously described. The workman lowers partition **300** into its normally lowered position into the fresh bin

simply by pivoting it downwardly into the fresh bin at hinge **330** for resuming harvesting operations.

(98) Sensor **402** is mounted at a fixed position between bin's **270** forward position and frame's **74** end **254** for enabling it to sense the presence of bin **270** at its filled position ahead of its forward position and issue its impulse concurrently effective upon valve unit **394** and alarm **406** in response. Sensor **402** issues its impulse concurrently effective upon valve unit **394** and alarm **406** each time sensor **402** actuates, namely, each time sensor **402** senses the presence of bin **270** at its filled position and issues its resulting impulse.

(99) The operations of harvester **20** and its apparatus **70′** repeat commensurate with continued harvesting operations. While apparatus **70′** is configured to cycle or otherwise index bin **270** incrementally between a rearward station, one advanced station, and a forward station, effectively increasing the size of confined volume **284**A twice, once at bin's **270** advanced station and a second time at bin's **270** forward station before bin **270** is subsequently indexed to its filled position, apparatus **70′** can be configured to index bin **70** to a plurality of successively advanced stations between its rearward and forward stations, such as two or more successively advanced stations, for enlarging confined volume **284**A incrementally two or more times between bin's **270** rearward and forward stations.

(100) In FIGS. **19** and **20**, backstop **69** associated with apparatus **70′** is configured with a transverse series of dividing walls **420** defining alleys corresponding to the designated pairs of adjacent pick-up rollers **44** and **45** of the various pick-up beds **32**A-**32**D. Dividing walls **420** have openings **422** that are open to conveyor **36** and up-angled forwardly 5-10 degrees from the 70-75 degree angle of backstop **69**. Severed asparagus spears cast onto up-angled backstop into the various alleys slide down backstop **69** by gravity and pitch angularly downward through the various openings **422** and onto conveyor **36**, which conveys the severed asparagus spears to bin **27**. The angular displacement of backstop **69** and each opening **422** of the various dividing walls **420** serves to effectuate an orderly deposition of the asparagus spears onto conveyor **36**.

(101) As described above, cylinder assembly **352** operated by valve unit **394** is a preferred drive assembly **350** because it is inexpensive, readily available, and reliable. The positioning of cylinder assembly **352** causes operating rod's **370** extended position to correspond with bin's **270** rearward station and operating rod's retracted position to correspond to bin's **270** forward station. The orientation of cylinder assembly **352** is reversible for reversing its operation. In this latter embodiment, switching the direction of cylinder assembly **352** would cause the retracted position of operating rod **370** to correspond to bin's **270** rearward station and the extended position of operating rod **370** to correspond to bin's **270** forward station. While cylinder assembly **352** driven by valve unit **394** is a preferred drive assembly **350**, hydraulic or gear-driven cylinder assemblies, geared drive assemblies, gear or cylinder-driven linkage assemblies, or other chosen drive assembly forms are useful in alternate embodiments.

(102) As disclosed, bin **270** displaces slidably across upper surface **262** longitudinally along path F from its rearward station where confined volume **284**A is smallest to its forward station where confined volume **284**A is at its largest. Reversing the orientation of partition **300**, bin **270**, and frame **74**, including its platform **260** and its attached cylinder assembly **352**, would flip the stations. In such an alternate embodiment, bin **270** would be configured to displace slidably across upper surface **262** longitudinally along a displacement path between a forward station of bin **270**, where the confined volume **284**A would be at its smallest, and a rearward station of bin **270**, where the confined volume **284**A would be at its largest.

(103) The present invention is described above with reference to illustrative embodiments. Those skilled in the art will recognize that changes and modifications may be made in the described embodiments without departing from the nature and scope of the present invention. To the extent that such modifications and variations do not depart from the spirit of the invention, they are intended to be included within the scope thereof.

Claims

1. In an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path, the asparagus harvester comprising a chassis configured to be advanced over the ground along said path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground, and a conveyor for receiving from the pick-up apparatus and conveying away severed asparagus spears severed by the severing apparatus, improvements therein comprising: a bin mounted displaceably adjacent to the conveyor; a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor; a drive assembly configured to displace the bin relative to the partition from a first station to a second station when the drive assembly actuates, the confined volume having a first size when the bin is at the first station and a second size when the bin is at the second station, the second size greater than the first size; and a sensor operatively coupled to the drive assembly, wherein the drive assembly actuates when the sensor senses a presence of severed asparagus spears at a fill level of the confined volume.
2. The improvements according to claim 1, wherein the partition includes an upper end and extends downwardly into the bin from said upper end mounted at a fixed position over the bin.
3. The improvements according to claim 1, wherein the sensor is mounted to the partition.
4. The improvements according to claim 3, further comprising: a hole through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume; the sensor opposing the second surface adjacent to the hole; and the sensor open to the confined volume via the hole enabling the sensor to sense the presence of severed asparagus spears at the fill level of the confined volume.
5. The improvements according to claim 4, wherein the sensor is mounted to the second surface of the partition.
6. The improvements according to claim 1, wherein the drive assembly comprises a cylinder assembly comprising: a cylinder mounted at a fixed position; and an operating rod coupled to the bin and mounted partially within the cylinder for movement between an extended position corresponding to one of the first station of the bin and the second station of the bin and a retracted position corresponding to another one of the first station of the bin and the second station of the bin.
7. The improvements according to claim 1, further comprising: the confined volume flanked by a first side of the bin proximally to the conveyor a second side of the bin distally from the first side of the bin and the conveyor; and a backstop adjacent to the second side of the bin opposite to the conveyor, the backstop configured to deflect the severed asparagus spears into the confined volume from the conveyor.
8. The improvements according to claim 7, wherein the backstop extends from the partition.
9. In an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path, the asparagus harvester comprising a chassis configured to be advanced over the ground along said path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground, and a conveyor for receiving from the pick-up apparatus and conveying away severed asparagus spears severed by the severing apparatus, improvements therein comprising: a bin mounted displaceably adjacent to the conveyor; a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor; a drive assembly configured to displace the bin relative to the partition to enlarge the confined volume each time the drive assembly actuates; and a sensor operatively coupled to the drive assembly, wherein the drive assembly actuates each time the sensor senses a presence of severed

asparagus spears at a fill level of the confined volume.
10. The improvements according to claim 9, wherein the partition includes an upper end and extends downwardly into the bin from said upper end mounted at a fixed position over the bin.
11. The improvements according to claim 9, wherein the sensor is mounted to the partition.
12. The improvements according to claim 11, further comprising: a hole through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume; the sensor opposing the second surface adjacent to the hole; and the sensor open to the confined volume via the hole enabling the sensor to sense the presence of severed asparagus spears at the fill level of the confined volume.
13. The improvements according to claim 12, wherein the sensor is mounted to the second surface of the partition.
14. The improvements according to claim 9, wherein the drive assembly comprises a cylinder assembly, the cylinder assembly comprising: a cylinder mounted at a fixed position; and an operating rod coupled to the bin and mounted partially within the cylinder for movement between an extended position and a retracted position to displace the bin.
15. The improvements according to claim 9, further comprising: the confined volume flanked by a first side of the bin proximally to the conveyor a second side of the bin distally from the first side of the bin and the conveyor; and a backstop adjacent to the second side of the bin opposite to the conveyor, the backstop configured to deflect the severed asparagus spears into the confined volume from the conveyor.
16. The improvements according to claim 15, wherein the backstop extends from the partition.
17. In an asparagus harvester for harvesting asparagus spears growing in the ground and projecting upwardly therefrom in a path, the asparagus harvester comprising a chassis configured to be advanced over the ground along said path and supporting a pick-up apparatus for engaging and lifting the asparagus spears, a severing apparatus for severing the asparagus spears proximate to the ground, and a conveyor for receiving from the pick-up apparatus and conveying away severed asparagus spears severed by the severing apparatus, a method, comprising: mounting a bin displaceably adjacent to the conveyor; locating a partition in the bin, the partition and the bin defining a confined volume open to receive the severed asparagus spears from the conveyor; configuring a drive assembly to displace the bin relative to the partition between a first station and a second station when the drive assembly actuates, the confined volume having a first size when the bin is at the first station and a second size when the bin is at the second station, the second size greater than the first size; operatively coupling the drive assembly to a sensor configured to sense a presence of severed asparagus spears at a fill level of the confined volume, the drive assembly configured to actuate when the sensor senses the presence of severed asparagus spears at the fill level; the sensor sensing the presence of severed asparagus spears at the fill level; and in response the drive assembly actuating displacing the bin from the first station to the second station.
18. The method according to claim 17, wherein the step of locating the partition in the bin comprises mounting an upper end of the partition at a fixed position over the bin and extending the partition downwardly into the bin from said upper end.
19. The method according to claim 17, further comprising: forming a hole through the partition from a first surface thereof facing the confined volume to a second surface thereof facing away from the confined volume; locating the sensor adjacent to the second surface proximate to the hole; and the hole opening the sensor to the confined volume enabling the sensor to sense the presence of severed asparagus spears at the fill level of the confined volume.
20. The method according to claim 19, wherein the step of locating the sensor adjacent to the second surface proximate to the hole comprises mounting the sensor to the second surface proximate to the hole.
21. The method according to claim 17, wherein the step of configuring the drive assembly comprises: providing a cylinder assembly comprising a cylinder and an operating rod mounted

partially within the cylinder for movement between an extended position and a retracted position; mounting the cylinder at a fixed position; and coupling the operating rod to the bin, the extended position of the operating rod corresponding to one of the first station of the bin and the second station of the bin and the retracted position of the operating rod corresponding to another one of the first station of the bin and the second station of the bin.

22. The method according to claim 17, further comprising configuring a backstop at a fixed position adjacent to the confined volume and opposing the conveyor, the backstop deflecting the severed asparagus spears into the confined volume from the conveyor.

23. The method according to claim 22, wherein the step of configuring the backstop at the fixed position adjacent to the confined volume and opposing the conveyor comprises extending the backstop from the partition.