Title: ONION HARVESTING MACHINE WITH ABILITY TO CUT STEMS

Abstract: This invention is called an onion harvesting machine with the capability of cutting stems and separating cobs and stones. This machine is attached to a tractor and carried. The power of this machine is supplied by PTO tractor. The main part or the main core of machine is made of three separate chains that rotate in one cycle and simultaneously. After filtering large objects of onions and cobs are poured to the bottom of machine main part or on the lower chain, the onion stem is placed between the middle and upper chains; whenever the onion stem reached to the rollers, which involve between horizontal wire of second chain and rollers and onions are suspended in the air and then cut by the razor, ultimately the device picks up a product that is without soil, cobs and healthy.
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— in black and white: the international application as filed contained color or greyscale and is available for download from PATENTSCOPE
Description
Title of Invention: Onion Harvesting Machine with Ability to Cut Stems.

[0001] This invention is called an onion harvesting machine with the capability of cutting stems and separating clods and stones. This machine is attached to tractor and is carried. The power of this machine is supplied by PTO tractor. The main part or the main core of machine is made of three separate chains that rotate in one cycle and simultaneously. The main part or the main core of machine consists of three separate chains that rotate in one cycle and simultaneously, the duty of high chains is to separate objects larger than 14 cm. After filtering large objects of onions and clod are poured to the bottom of machine main part or on the lower chain, the onion stem is placed between the middle and upper chains; when the onion stem reached to the rollers, which involve between horizontal wire of second chain and rollers and onions are suspended in the air and then cut by the razor. This machine cuts types of onion stem in any size from distance of 2 to 3 cm and at one height and harvests a crop without soil – clod and healthy. The design of this machine is such a way that has technical upgrade capability for changing to agricultural machine with independent control and it is usable on rough grounds.

Technical Field

[0002] The technical field of the invention is related to the mechanical engineering - Agricultural machinery industry - Harvesting; Mowing (A01D) - Methods for harvesting agricultural products (A01D 91/00)

Background Art

[0003] According to the search Conducted at the Central Bank for Intellectual Property and International Registration of Patent, the description of the past Inventions is as follows:


[0005] An orientation system for vegetables includes a plurality of rotating rollers that both pull the vegetable into an inverted position, with leafy top down, and advance the vegetable along the length of the rollers to deliver the vegetables to a cutting system. The orientation system may be included in a vegetable harvester and topper or may be used separate from the harvester vehicle. The orientation system preferably has a plurality of orientation roller pairs, made up of first and second counter-rotating orientation rollers. These rollers may include strips of elastomeric fingers or other protrusions that engage the leafy top and pull it downward. Preferably, one of the rollers may also have a vegetable advancing spiral that moves the vegetables in “auger-style” by pushing the vegetables along in front of the rotating spiral. These rollers deliver the
vegetables to the cutting system in the inverted position, so that the leafy top, when cut off, falls down to a trash removal system and the vegetable roots/bulbs' momentum carries them past the cutting system into another portion of the harvester for further processing or collection.

[0006] Similarity between this machine and my invention is in cutting and removing onion stems; however, the mechanism of this action in my invention is different in that when the onion stem reaches the rollers, involved between horizontal wire of second chain and rollers and onions are suspended in the air and then cut by the razor.

[0007] Mechanical harvester for harvesting bulb crops US6484810B1

[0008] A mechanical harvester for harvesting, topping and sacking bulb crops, such as onions. The harvester extracts the onions from the ground and transports them rearward to a cutting assembly by conveyor systems that drop out small onions, dirt, rocks and debris. The cutting assembly comprises a set of elongated cutting blades positioned to cooperatively accept and sever the leaves and roots from the bulb. The offal drops away from the harvester to the ground by manner of gravity. After cutting, the onions are transported through an inspection assembly for inspection, sorting, grading and further distribution. The onions are then transported rearward to a sacking assembly for placing the onions into sacks, to a chute device returning the onions to the ground or to a conveyor system transferring the onions to an adjacent vehicle. Platforms on the sides and ends of the harvester facilitate the above operations.

[0009] This invention is a complete harvesting system, soil separator, stem cutter, grading and transferring to storage location; however, in my machine there is only the operation of soil separation and stem cutting on a smaller scale, which design and operation of the other mentioned steps in this invention are also different from mines.


[0011] A root-crop harvester is configured to temporarily store tubers by recirculating tubers on the conveyor system of the harvester. The conveyor system has selectable first and second operating configurations. In the first operating configuration the conveyor system transports tubers from the digger bed to an outlet where tubers are unloaded from the harvester (e.g., onto a truck). In the second operating configuration the conveyor system transports tubers along the conveyor system for a period of time and then diverts tubers to an earlier position within the conveyor system, thereby recirculating tubers on the harvester. After a period of time, the harvester operator selects the first operating configuration and the recirculating tubers along with newly dug tubers are unloaded from the harvester.

[0012] In this invention harvesting crops is done rotatory from inside the soil; however, in my invention the onion comes straight out of the soil and the next step the process of separating soil, clods and cutting stem, which is different with this mentioned
invention.


[0014] A harvesting machine particularly suitable for picking or harvesting vegetables, such as peppers or tomatoes, employs a harvesting frame on which is mounted a rotating shaft aligned transversely to the direction of movement of the machine. A pair of spaced apart picking members are mounted on the shaft on opposite sides of a row of plants having a crop to be harvested. The picking members are simultaneously rotated; and each of them has a plurality of arcuate picking elements pivotally mounted on them. The picking elements rotate with the picking members in the same direction of movement of the machine; and as the picking elements rotate downwardly above the row of plants, a cam pivots them into a position adjacent the picking members, spaced away from a plant located between the picking members. As the machine passes over the plant, the picking elements are moved by a second cam into a position to extend into the space between the picking members to engage the plant to be picked and remove crop therefrom for deposition onto a conveyor for removal from the machine.

[0015] This invention is for harvesting different types of vegetables, which arrange herbal products via special embedded parts and are ejected from machine by the conveyor. This invention is related to my design for the purpose of construction and service; however, about mechanism and structural properties are quite different.


[0017] The utility model relates to a vertical conveyor of full-automatic crawler-type shallot harvester, it includes two transport unit, skeleton that this transport unit set up on be used for with the connecting portion of positioning of engine frame installation, be located connecting portion and along shallot transmission direction, sets up and is in the action wheel of framework two ends portion and axis and the perpendicular setting of skeleton facies and establish in action wheel and the driven gridle that takes turns to, set up from driving wheel,

[0018] cover and be used for the straining device of gridle by interior outwardly strutting and tensioning at the skeleton, wherein the gridle be sponge belt, and two sponge belt are laminated and form shallot clamping area by straining device outwardly strutting's side, and the upright setting of shallot is in shallot clamping area. The utility model discloses can making the shallot, vertical and the bottom is unsettled is carrying to be convenient for the going on of the work of getting rid of shallot root earth simultaneously by sponge belt and straining device's setting, makes shallot not damaged in data send process, improves the quality that the shallot was gathered in the crops.

[0019] The mentioned invention is about a complete large-scale harvesting system, for
example beetroot, which removes the plant from earth cleanly and without damage on the band and conveyor and transfer to the storage compartment. This invention has a different mechanism and is aimed to harvesting of mass product, my invention is in smaller dimension to harvest onions and this plan applied to farmers.

**Summary of Invention**

[0020] This invention is called an onion harvesting machine with the capability of cutting stems and separating clods and stones, by attaching and carrying via tractor, no need for transplanting machine, which is applicable to all agricultural lands. The components of this machine include parts related to the onion harvesting part, the mechanism of onion-stone clod separator and the mechanism of onion separation from the stem is as follows: Gears, shafts, hands connected to the tractor, front blade, downpipe, chains, plastic horizontal strips, rollers and cutting blades. As mentioned, this machine is attached to the back of the tractor and connected to the tractor power transmission arm that the power of this machine is provided via tractor PTO.

[0021] Core and the main part of the machine are made of three separate chains that rotate in one cycle and simultaneously. The role of the upper chains is separating objects larger than 14 cm. After filtering large objects and clod, the onion is dropped to the onion is dropped to the bottom of the machine or on the lower chain. The onion stem lies between the middle and upper chains, when the onion stem reaches to rollers, involved between horizontal wires of second chain and rollers and onions are suspended in the air and then cut by the razor. This machine cut variety of onion stem in any size with a distance of 2 to 3 cm and at one height and harvests a crop without soil - clod and healthy.

**Technical Problem**

[0022] Harvesting crops traditionally and man-power is incompatible with today's conditions of agriculture and food production in the world. In fact, it is not possible to use heavy agricultural machinery to harvest crops for all farmers because of the high cost of buying and renting this machine. Accordingly, design and construction of a high-capacity onion harvesting machine and low construction cost has been applied to different agricultural lands has been carried out.

[0023] In other similar devices, it is not possible to cutting stem and complete separation of soil-clod and stone, but this device does not require transplanting device in addition to the above facilities having the above facilities as well as the design of the device is in such a way that It also has the potential of technically upgraded in order to become an independent controlled farming machine. The purpose of this invention is to provide an onion harvesting machine to speed up the harvesting process that reduces human intervention and increased production efficiency, resulting in a high quality product and
low discarding.

**Solution to Problem**

[0024] The present invention is an onion harvesting machine with the capability of cutting stems and separating clod and stone. This machine attaches to the bottom of the tractor and when the onion harvesting process begins, first, the tractor pushes the front part of machine into the ground then move forward, the front razor sinks into the soil about 20 to 30 centimeters and because the device is moving forward, onion with soil, stone and clod moves to the end of the machine, which is the main part through chain strap, which draws its propulsion from the hydraulic and embedded engines behind the device. while the onion is rising from the front of the machine, all small stone and clod, which their diameter is less than 3 cm, during this step, as it rises from the band, it falls to the ground and is separated from the onion.

[0025] After the onion are raised up, clod and stone at the bottom of the device front band are poured into the central and main part of the machine, the main part or the main core of machine consists of three separate chains that rotate in one cycle and simultaneously. The task of separating chains of objects greater than 14 cm by means of wires that are connected at a distance of 14 cm horizontally to the chain wings, below the mentioned chains, the wires are mounted vertically and fixed at 14 cm intervals, which cause the upper chains to act as a filter and prevent objects larger than 14 cm from being thrown into the machine and because the chains are moving backwards, all the big objects fall on the ground from the end of the device.

[0026] After filtering the large objects, onion and objects under 14 cm are poured into the machine, the second chain or the middle chain has a structure similar to the upper one with the same horizontal and vertical wires, both chains move at exactly the same speed and they are moving exactly the in same direction about 30 to 40 centimeters is far from high chain, the middle chain has several pieces (rollers), which are at the bottom of this chain and on top of the machine razor, this rollers exactly the same speed of chain are spinning through gears that fitted on the middle chain.

[0027] When onion and clod are poured to the bottom of the main part of device or on the lower chain, the onion stem is placed between the middle and upper chains; because all three chains are moving at the same time, onion and clod are also moving inside the apparatus, when the onion stem reaches the rollers between the horizontal chains of the second chain and the rollers are involved and the onion is suspended in the air.

[0028] In this way, the onion continues to move until it reaches the blade of the machine. The blade is mounted just below the second chain with adjustable spacing, which is driven by a hydraulic-motor; when the suspended onion in the air reaches to blade, the blade cuts stem and separates it from the onion; after the onion is cut from the stem it
falls on the horizontal strip that there is behind the chain and comes out of the
machine. The mentioned horizontal strap is made of soft plastic, which its mover force
is a high-speed hydraulic motor and 2 cycles. Horizontal band via a metal sheet
divided into two parts, which transfer onions and clods apart from each other to outside
of the device separately.

[0029] Because of the fact that clods and stones are without stem and do not involve with
rollers, therefore, they are poured to the first section of the horizontal strip and
transported outside the machine, the beneath chain is at the same speed of the superior
chains and the distance to the middle chain is adjustable depending on the onion and
the ground, however as a result of onion stem involve with rollers and are suspended in
the air with the help of rollers, transfer to the end of the device and after cutting the
onion stem, to the second part of the horizontal band(plastic) has poured, which is
without stone and clod and are individually driven out of the machine. Stems cut by the
machine razor move to the end of the middle chain as they involved rollers and
horizontal wire chain and between the middle chain and the upper chain are leaving
that distance between the two chains is about 40 cm, then among the horizontal wires
of upper chain are poured out of the machine easily and without any hassle.

**Advantageous Effects of Invention**

[0030] Indirect stresses on the onion and reducing the damages to the crop
[0031] Ability to cut stem
[0032] Crop separation from stone and clod in rough grounds
[0033] Reduce damages to soil structure compared to other harvesting methods
[0034] There is no need for a transplant machine
[0035] Usable on rough grounds

**Brief Description of Drawing**

[0036] [Fig.1] Is overview of the device Chassis and embodiments.
[0037] [Fig.2] Illustrates a channel beam according to an embodiment.
[0038] [Fig.3] Demonstration of a blade according to an embodiment.
[0039] [Fig.4] Illustrates a Arm fixator according to an embodiment.
[0040] [Fig.5] Representation of a Tractor attachment arm according to an embodiment.
[0041] [Fig.6] Illustrates a chain according to an embodiment.
[0048] [Fig.7]
[0049] Is a chain roller according to an embodiment
[0050] [Fig.8]
[0051] Illustrates a hydraulic motor according to an embodiment.
[0052] [Fig.9]
[0053] Demonstration of a Roller according to an embodiment.
[0054] [Fig.10]
[0055] Shows a hydraulic motor according to an embodiment.
[0056] [Fig.11]
[0057] Reveals a shaft coupling according to an embodiment.
[0058] [Fig.12]
[0059] schematic view of wires in device.
[0060] [Fig.13]
[0061] Roller
[0062] [Fig.14]
[0063] Illustrates a chain roller conveyor bar, according to an embodiment.
[0064] [Fig.15]
[0065] Discloses a shaft according to an embodiment.
[0066] [Fig.16]
[0067] Illustrates a shaft coupling according to an embodiment.
[0068] [Fig.17]
[0069] Reveals a chain roller conveyor bar, according to an embodiment.
[0070] [Fig.18]
[0071] displays the gear.
[0072] [Fig.19]
[0073] High angle schematic view of the device.
[0074] [Fig.20]
[0075] Interior view of chains, wires and shafts.
[0076] [Fig.21]
[0077] Side view of device with chassis.
[0078] [Fig.22]
[0079] Side view of device without chassis.

**Description of Embodiments**

[0080] In the following sufficient description of drawings and its embodiments clarify the main part and other parts, which embed in invention of machine design. This section prepares the way for demonstration of all embodiments that exist in this mentioned invention. The embodiments are described complete and comprehensive in order to
disclose details sections of the invented machine; therefore, everyone can distinguish the design of this plan and obtain the main idea of this invention via its sufficient description.

[0081] [Fig.1] device chassis and embodiments [Fig. 2] shows channel beam [Fig. 3] blade [Fig. 4] Arm fixator [Fig. 5] Tractor attachment arm [Fig. 6] Chain [Fig. 7] chain roller [Fig. 8] hydraulic motor [Fig. 9] Roller [Fig. 10] hydraulic motor [Fig. 11] Shaft coupling [Fig. 12] wires [Fig. 13] Roller [Fig. 14] chain roller Conveyor Bar [Fig. 15] Shaft [Fig. 16] Shaft coupling [Fig. 17] chain roller conveyor bar [Fig. 18] Gear. [Fig. 19] High angle schematic view of the device. [Fig. 20] Interior view of chains, wires and shafts. [Fig. 21] Side view of device with chassis. [Fig. 22] Side view of device without chassis.

Examples

[0082] Due to the economical production cost of this machine, the main use of this tool in all agricultural lands, regardless of size, in large and small scales, to accelerate harvesting and maintain product quality, without stem and no soil and clod along with onions, it is ready for delivery.

Industrial Applicability

[0083] This device can be used in industrial agriculture in order to speed up the harvesting process, which reduces the interference of man-power and increases production efficiency and maintains the quality of products in the harvesting process.
Claims

[Claim 1] Onion harvesting machine with the ability to cut stem and separates clod and stone from the crop, with connection and carrying by tractor, which is applicable to all agricultural lands.

[Claim 2] According to claim 1, components of this machine include parts related to the onion harvesting section, onion separator mechanism from stone and clod, and the mechanism of onion separation from the stem are: gear, shaft, arm connection to tractor, front blade, downpipe, chains, horizontal plastic strips, rollers and cutting blade.

[Claim 3] According to claim 1, the machine is attached to the back section and tractor power transmission arm, which the power of this machine is supplied by PTO tractor.

[Claim 4] According to claim 2, the core or the main part of the device consists of three separate chains which consist of rotating in one circle at the same time.

[Claim 5] According to claim 4, above chain causes separation of objects larger than 14cm, this is accomplished via wires that are at distances of 14 cm from each other, which are horizontally attached to the chain wings.

[Claim 6] According to claim 4, the second chain or the middle chain has a structure similar to the first one, with horizontal and vertical wires then the middle chain has some pieces of rollers, which are located at the bottom of this chain and above of blade device.

[Claim 7] According to claim 6, the rollers are rotating at the same speed by means of gears mounted on the middle chain. When the onion stem reaches the rollers, involve between horizontal wires of second chain and rollers and the onion is suspended in the air and so the onion continues to move until it reaches the cutting edge of the machine.

[Claim 8] According to claim 7, the blade is mounted underneath the second chain with adjustable spacing, which is driven by a hydro-motor.

[Claim 9] According to claim 8, the onion fall down after cutting from stem to the horizontal band, which is behind the lower chain and come out of the machine.

[Claim 10] According to claim 8 and 9, the mentioned horizontal band is made of soft plastic, which its mover force is a high speed hydraulic motor of 2 cycles.

[Claim 11] According to claim 1, 2, 9, the horizontal band is divided into two parts via a sheet of metal.
[Claim 12] According to claim 2, 7 and 11, onion stem involves to rollers and those are suspended in the air with the help of rollers and transfers to the bottom of the device; then after cutting the onions stem, pour into the second part of the horizontal strip (plastic), which lacks stone and clod, moreover, are individually transported outside the machine. The duty of high chains is to separate objects larger than 14 cm. After filtering large objects of onions and clod are poured to the bottom of machine main part or on the lower chain.
Fig 7

[Fig. 8]

Fig 8
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
A01D23/04, A01D17/00 Version=2019.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)
Total Patent One, IPO Internal Database, Google patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<tbody>
<tr>
<td>X</td>
<td>US6484810B1 (BENDIX Richard D.; 26 Nov. 2002) Abstract; col.5, lin.49-51; col.7, lin.27-36; col.9, lin.12-16; col.10, lin.22-26; Figures 1, 4</td>
<td>1-5, 10</td>
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<td>Y</td>
<td>Abstract; Figures 1-10</td>
<td>6-9, 11-12</td>
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<td>JP2012139214A (KUNNEPPU KIKAI KOGYO KK; 26 Jul. 2012) Abstract; Figures 1, 4</td>
<td>6-9, 11-12</td>
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<td>A</td>
<td>US2625781A (TATEYAMA Hiroshi; 20 Jan 1953) Figures 1-10; entire document</td>
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