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Rabb et al.

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[54] BEET TOPPING AND WINDROWING APPARATUS AND KNIFE ORIENTATION MEANS THEREFOR

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[52] **U.S. Cl.** **56/121.45**

[51] **Int. Cl.** **A01d 23/02**

[58] **Field of Search** 56/121.4, 121.44, 56/121.45, 121.46; 171/58

[56] **References Cited**

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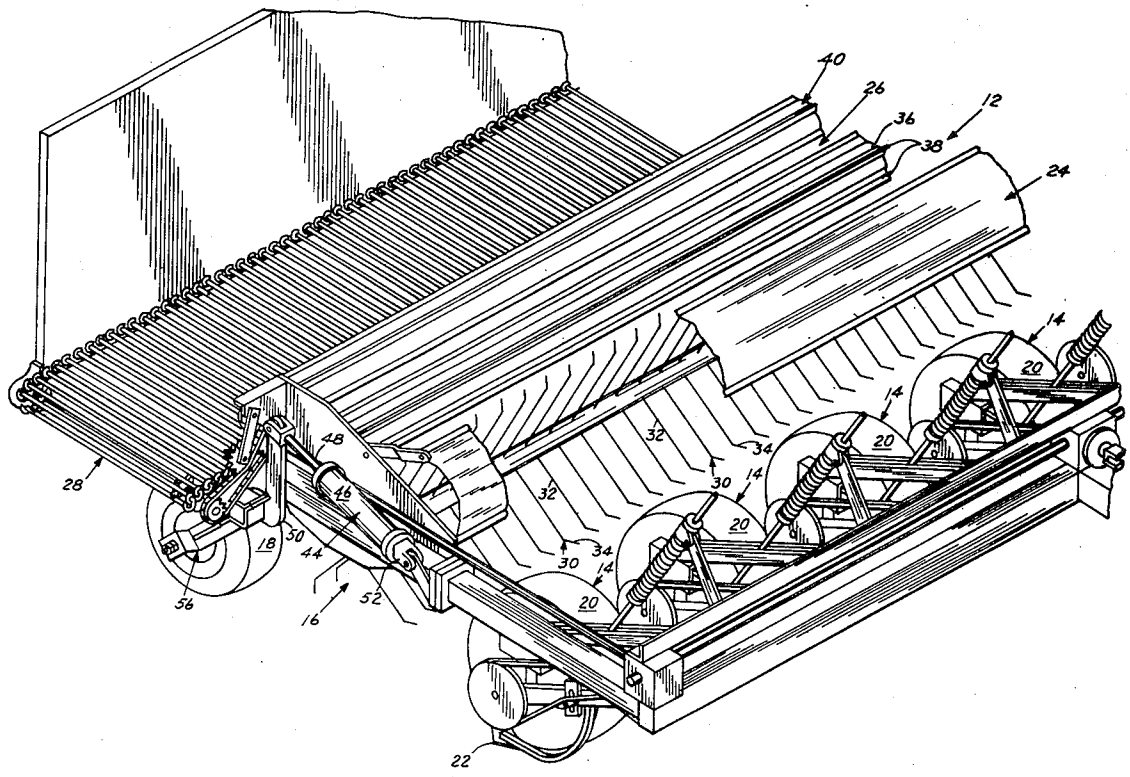
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[57] **ABSTRACT**

An improved beet topping and windrowing apparatus of the trail-mounted type having a substantially reduced turning radius. The reduced turning radius is achieved through the use of a plurality of follower wheels for supporting said apparatus, and resisting movement in a lateral direction when operated along an inclined surface, said wheels being disposed beneath the conveyor and inwardly of the ends thereof. The apparatus includes a pickup means having a plurality of rows of fingers, each finger being generally L-shaped in configuration and having a base portion extending in the direction of rotation of the pickup means, said base portion providing resistance against radially outwardly movement of items being picked up by the pickup means, a stripper means disposed vertically above and rearwardly of the pickup means for transferring items picked up by the pickup means to a conveyor, said stripper means including a rotatably mounted member having a plurality of longitudinally extending flaps disposed about the periphery thereof, said rotatably mounted member being disposed such that a plane passing through the longitudinal axes of said member and said pickup means forms an included angle of approximately 27 degrees or more with a horizontally disposed plane, and means for adjusting the vertical distance separating the pickup assembly relative to the follower wheels. The apparatus also includes means for maintaining the topping knife of each topping unit in a predetermined attitude relative to a predetermined plane upon pivotal movement of the means supporting said topping knife.

12 Claims, 5 Drawing Figures



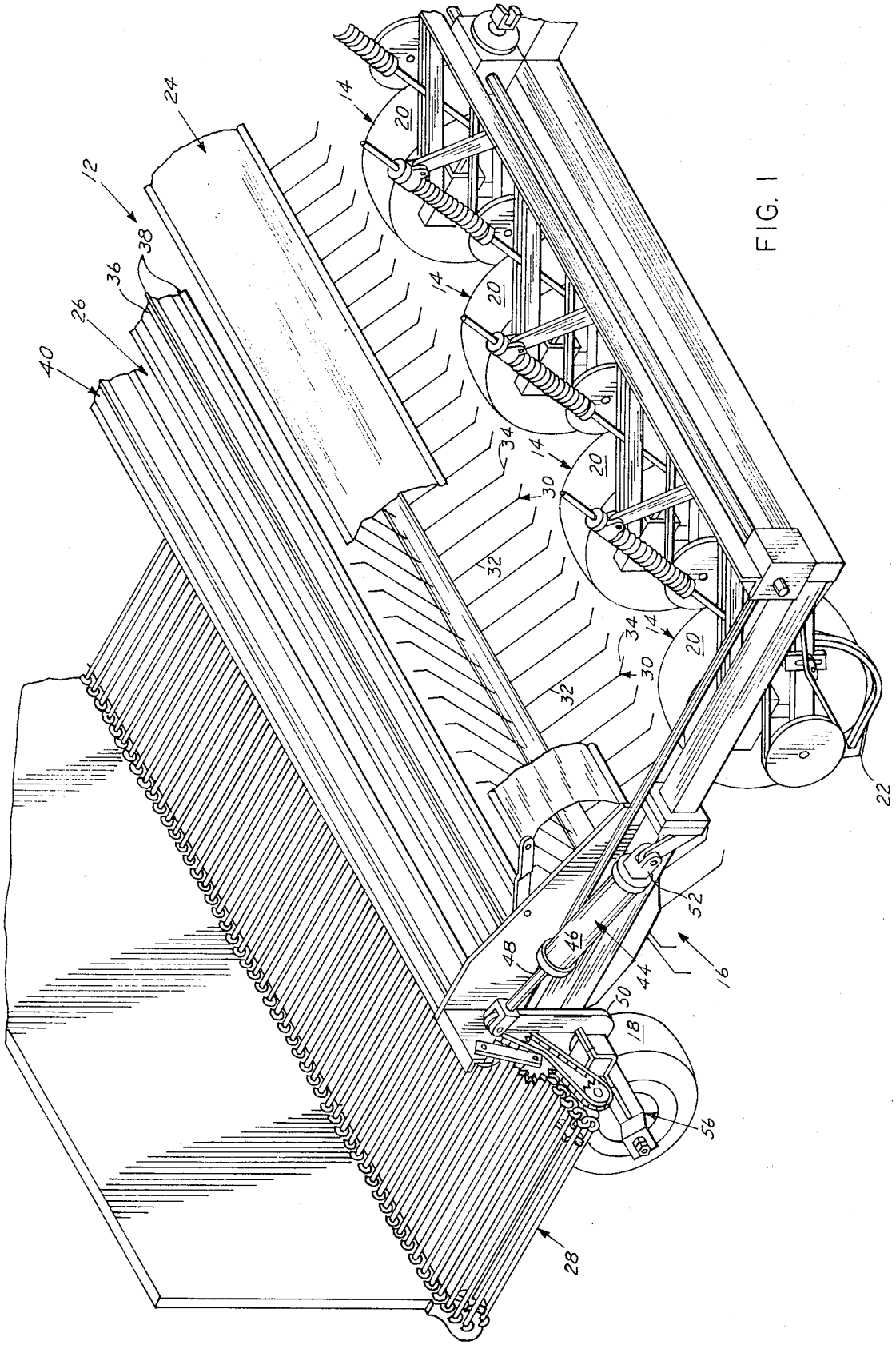


FIG. 1

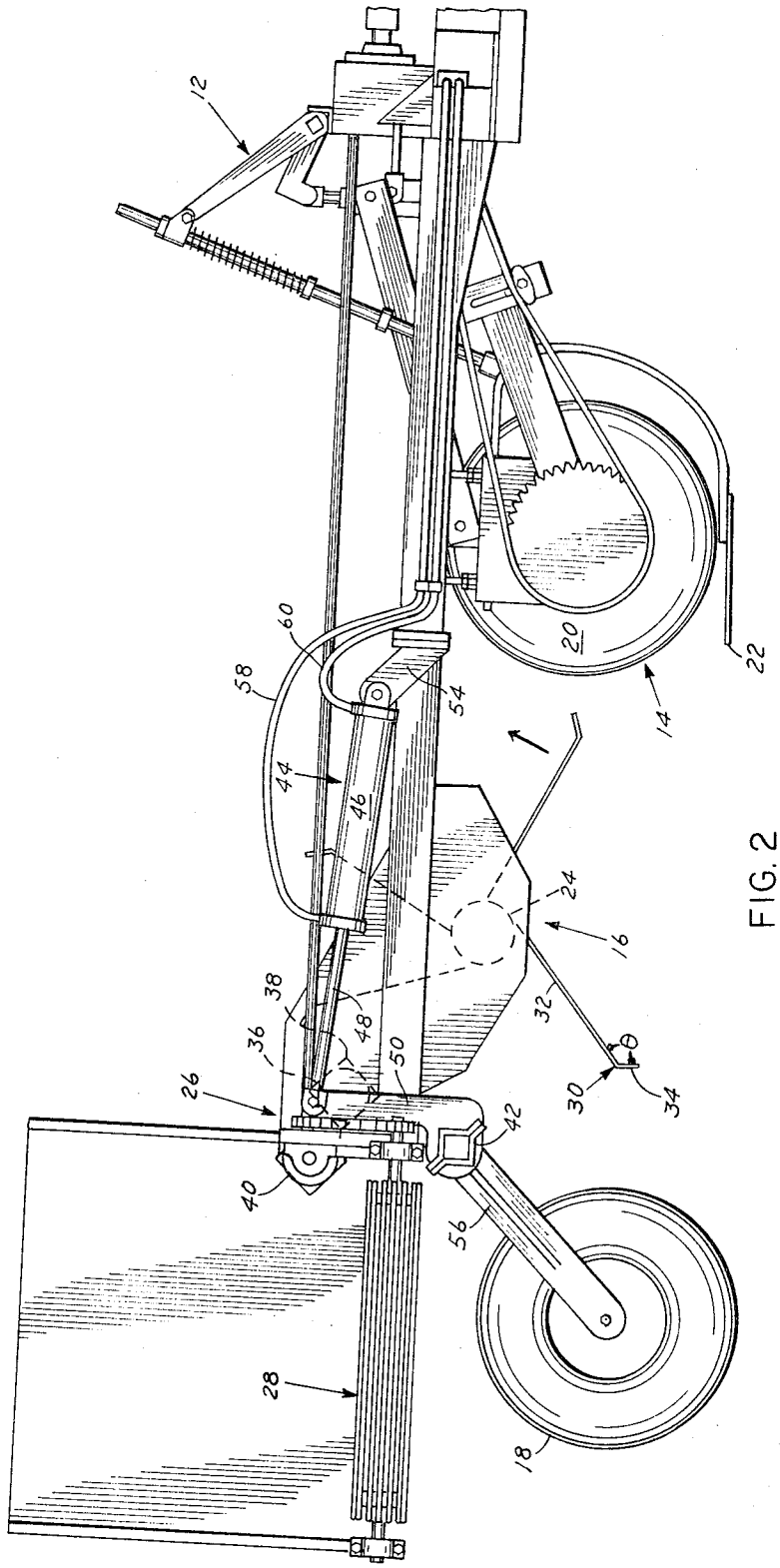


FIG. 2

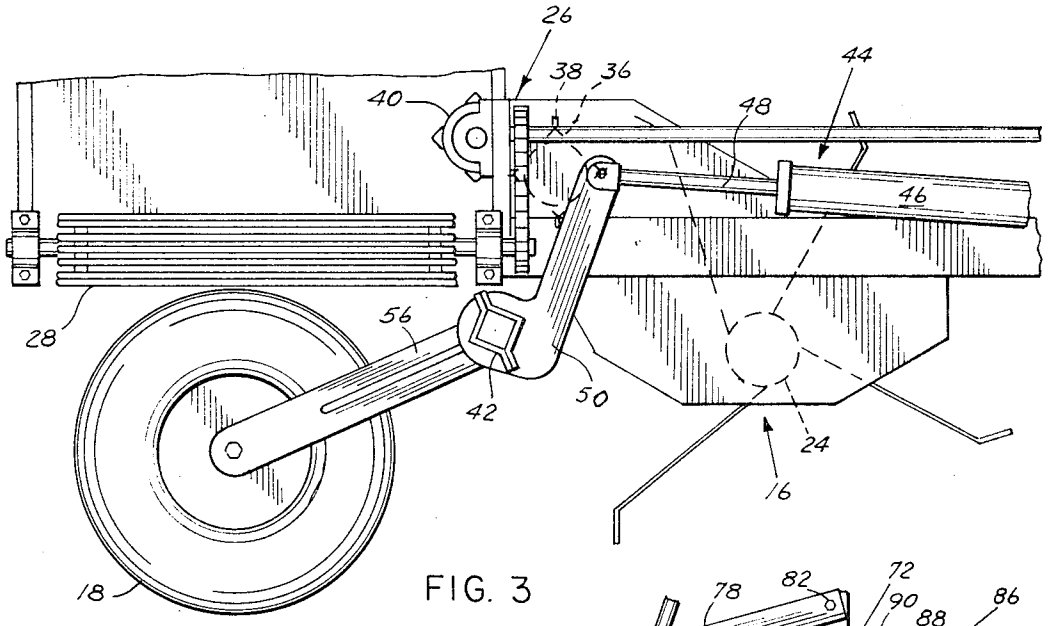


FIG. 3

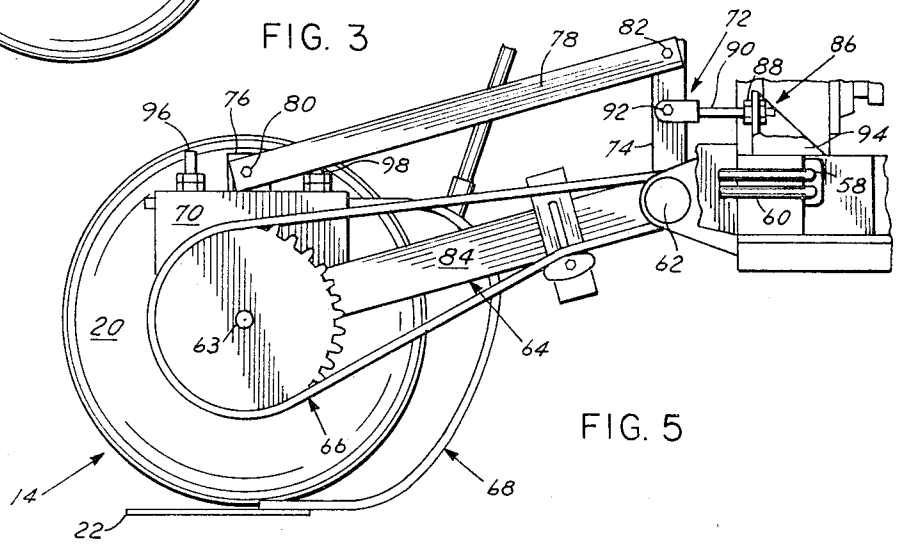


FIG. 5

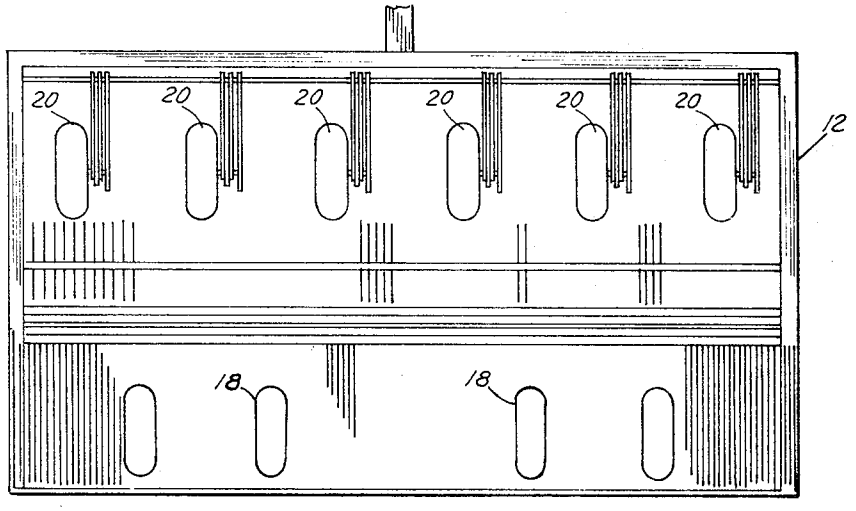


FIG. 4

BEET TOPPING AND WINDROWING APPARATUS AND KNIFE ORIENTATION MEANS THEREFOR

BACKGROUND OF THE INVENTION

Beet topping and windrowing apparatuses in use today are usually one of two types. One type is known as the trail-mounted type, i.e., the entire apparatus is drawn behind a tractor. The other type has a portion of the apparatus (the beet topping units) mounted directly to the tractor either beneath the tractor or in front thereof and a portion (the pickup assembly) drawn behind the tractor. A third type of apparatus, which is generally no longer being manufactured, involved constructing a completely self-powered apparatus, i.e., it was not constructed to be used in conjunction with a tractor.

One disadvantage associated with the second type of beet topping and windrowing apparatus referred to above was the amount of time and labor involved in mounting and removing the beet topping units from the tractor. Removal of the beet topping units from the tractor was found to be necessary in order to facilitate the tractor being used in other applications. In order to eliminate this problem, efforts were directed toward manufacturing and using a trail-mounted type of beet topping and windrowing apparatus. However, one disadvantage associated with the use of prior art trail-mounted beet topping and windrowing apparatuses has been the unusually large turning radius associated with such apparatuses. As a result thereof, a considerable amount of ground area adjacent the ends of each row could not be cultivated because same had to be used for turning of the beet topping and windrowing apparatus. In order to minimize this problem, some prior art beet topping and windrowing apparatuses were constructed to accomodate a smaller number of rows in the field and thereby reduce somewhat the turning radius required for said apparatus. However, this increased the amount of time required to work a field and, thus, was less than satisfactory as a solution to this problem. Another proposed solution to this problem was to use wheels having a very small diameter. However, this was unsatisfactory because of the extreme difficulty associated with pulling such an apparatus over ridges and the like which exist in large numbers in a field. Another disadvantage was the difficulty of preventing movement laterally of said apparatus when same was operated along an inclined surface such as a hillside. The wider the apparatus used, the more serious was this problem.

Another problem associated with prior art beet topping and windrowing apparatuses related to the cutting off of the top of the beets when the beet topping unit was disposed in any but its lowest position. In this connection, it has long been customary to incorporate within a beet topping and windrowing apparatus a plurality of beet topping units each of which is mounted for pivotal movement independent of the other beet topping units. The purpose for this mounting arrangement was to permit each beet topping unit to adjust to the vertical height of each beet within the row associated with the beet topping unit. Since the beet topping knife of each beet topping unit is normally disposed in its lowermost position, it was found that upon upward pivotal movement of the beet topping unit (a condition that occurs for beets that extend above the ground by a greater amount that other beets) the topping knife would no longer be disposed in a horizontal plane but,

rather, would be disposed in a plane inclined slightly (in the direction of travel) toward the ground. Orientation of the beet topping knife in this manner has proven to be unsatisfactory since the top of the beet often times was torn away from the body of the beet thereby reducing the amount of beet to be processed for the recovery of sugar, or the beet was partially or completely pulled out of the ground and, thus, not topped as desired. In either event, the result was quite unsatisfactory.

It has been found that the aforementioned disadvantage of trail-mounted type of beet topping and windrowing apparatuses having large turning radiuses may be overcome by constructing said apparatuses with a plurality of laterally spaced apart follower wheels (of conventional size) each of which is disposed beneath the conveyor and inwardly of the ends thereof. Said apparatuses also have a pickup means including a plurality of rows of fingers, each finger being generally L-shaped and having a base portion extending in the direction of the rotation of the pickup means, said base portion providing resistance against radially outwardly movement of items being picked up by the pickup means (particularly as said fingers approach a horizontal position when moving in an upward direction), a stripper means disposed vertically above and rearwardly of the pickup means for transferring items picked up by the pickup means, said stripper means including a rotatably mounted member having a plurality of longitudinally extending flaps disposed about the periphery thereof, said rotatably mounted member being disposed such that a plane passing through the longitudinal axes thereof and said pickup means form an included angle with a horizontal plane of at least approximately 27° or more and means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels.

The problem associated with beet topping units to prevent the topping knife from tearing off the top of the beet (rather than cutting same cleanly) or pulling the beet partially or wholly out of the ground, has been overcome by incorporating within said beet topping unit means for maintaining the topping knife in a predetermined attitude relative to a predetermined plane upon any pivotal movement of the topping knife and the means supporting same relative to a pivot axis upon which said knife and its supporting means are mounted for pivotal movement with respect thereto.

SUMMARY OF THE INVENTION

This invention relates to a beet topping and windrowing apparatus of the trail-mounted type comprising a pivot axis disposed generally normal to the longitudinal axis of said apparatus, a plurality of laterally spaced beet topping units, each unit including a support member mounted for pivotal movement about said pivot axis, each unit including a finder wheel, a pickup assembly mounted in tandem relation to said beet topping units, said assembly including pickup means disposed generally normal to the longitudinal axis of said apparatus and having a plurality of rows of fingers, stripper means for receiving and removing items from said rows of fingers of said pickup means and simultaneously moving the items rearwardly of the apparatus, said stripper means being disposed normal to the longitudinal axis of the apparatus and vertically above and rearwardly of said pickup means, said stripper means

including a rotatably mounted member having a plurality of longitudinally extending flaps disposed about the periphery of said member, a conveyor disposed rearwardly of said stripper means for receiving items from said stripper means and conveying the items laterally of said apparatus, said conveyor having a longitudinal axis disposed generally normal to the longitudinal axis of said apparatus, and a plurality of laterally spaced follower wheels for supporting said apparatus, said wheels being disposed beneath said conveyor and inwardly of the ends thereof. Said apparatus includes means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels. The rotatably mounted member of said stripper means is disposed such that a plane passing through the longitudinal axes of said rotatably mounted member and said pickup means forms an included angle of at least approximately 27° or more (preferably 30° or more) with a horizontally disposed plane. Where the apparatus is to be used along an inclined surface (such as along a hillside), the apparatus preferably includes three or more follower wheels, thereby providing resistance against movement in a lateral direction. Each finger included within the plurality of rows of fingers has a generally L-shaped configuration including a stem portion and a base portion. The base portion extends in the direction of rotation of said pickup means. The base portion preferably forms an included angle with the stem portion between approximately 120° and 150°.

This invention also relates to a beet topping apparatus having an improved beet topping unit comprising a pivot axis, a support member mounted for pivotal movement about said pivot axis, said support member including an axle, a finder wheel mounted on said axle for rotation thereabout, means for rotating said finder wheel, a topping knife assembly having a topping knife disposed beneath said finder wheel, a topping knife assembly support mounted on said axle, said topping knife assembly being mounted in said topping knife assembly support, said topping knife assembly support and topping knife assembly being mounted for pivotal movement about said pivot axis, and means for maintaining said topping knife in a predetermined attitude, relative to a predetermined plane, upon pivotal movement of said topping knife assembly support and topping knife assembly about said pivot axis. Said attitude maintaining means includes a parallelogram linkage having a first part that is mounted to permit pivotal movement of said pivot axis relative to said first part, a second part that is mounted to permit pivotal movement of said axle relative to said second part, said topping knife assembly support being mounted on said second part, a third part that interconnects said first and second parts, said third part being pivotally connected to said first and second parts, and a fourth part that pivotally interconnects said first and second parts.

One of the principal objects of this invention is to provide an improved beet topping and windrowing apparatus of the trail-mounted type having a substantially reduced turning radius while, at the same time, permitting the working of a large number of rows of beets.

Another object of this invention is to provide an improved beet and windrowing apparatus of the trail-mounted type having a stripper means including a pair of rotatably mounted members one of which is disposed rearwardly of and vertically above the other one wherein the uppermost rotatably mounted member is disposed such that a plane passing through the longitudinal axes thereof and the pickup means of said pickup assembly forms an included angle of at least approximately 27° or more with a horizontally disposed plane (and preferably approximately 30° or more).

Another object of this invention is to provide an improved beet topping and windrowing apparatus of the trail-mounted type including pickup means having a plurality of rows of fingers, each finger comprising a stem portion and a base portion, the base portion extending in the direction of rotation of said pickup means, the base portion providing resistance against radially outwardly directed movement of the items being picked up by said pickup means, the base portion of each finger forming an included angle with the stem portion varying between approximately 120° to 150°, and preferably forming an included angle of approximately 135°.

Another object of this invention is to provide an improved beet topping and windrowing apparatus of the trail-mounted type having follower wheels which provide resistance against movement in a lateral direction when operated along an inclined surface, such as along a hillside.

Another object of this invention is to provide a beet topping apparatus having one or more beet topping units each including means for maintaining the topping knife of each topping unit in a predetermined attitude relative to a predetermined plane upon pivotal movement of the means supporting the topping knife.

Another object of this invention is to provide a beet topping apparatus as aforedescribed in which the means for maintaining the beet topping knife in a predetermined attitude includes adjustable means for maintaining one of the first or second parts of the parallelogram linkage in a predetermined orientation with respect to the pivot axis of the said beet topping unit.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the invention will become apparent from the following description and claims, when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view, partially cut away, of a portion of a beet topping and windrowing apparatus of the trail-mounted type constructed in accordance with this invention;

FIG. 2 is a side elevational view taken from the left side of the apparatus shown in FIG. 1;

FIG. 3 is a side elevational view of the portion of the apparatus shown in FIG. 1, taken from the left side thereof, illustrating said apparatus being supported by the follower wheels thereof in a lowered position;

FIG. 4 is a schematic plan view of the apparatus shown in FIG. 1 illustrating the number and position of the follower wheels and finder wheels of said apparatus; and

FIG. 5 is a side elevational view of an improved beet topping unit including therein means for maintaining the topping knife in a predetermined attitude.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, FIGS. 1–4 show a beet topping and windrowing apparatus 12 of the trail-mounted type constructed in accordance with this invention. The apparatus 12 comprises a pivot axis (not

shown, but see the part identified with numeral **62** in FIG. **5**) disposed generally normal to the longitudinal axis of said apparatus, a plurality of laterally spaced beet topping units **14**, a pickup assembly **16**, a plurality of follower wheels **18** for supporting said apparatus **12** and resisting movement laterally when operated along an inclined surface such as a hillside, and means for adjusting the vertical distance separating said pickup assembly **16** relative to said follower wheels **18.**

Each beet topping unit is mounted for pivotal movement about said pivot axis and comprises a finder wheel **20** and a topping knife **22** disposed beneath its associated finder wheel. It will be understood that each finder wheel **20** will travel on the ridge or row between the furrows while each follower wheel **18** will travel in the furrows between each ridge. The pickup assembly **16** comprises a pickup means **24** disposed normal to the longitudinal axis of the apparatus **12**, a stripper means **26** for receiving and removing items from said pickup means **24**, and a conveyor **28** disposed rearwardly of said stripper means **26** for receiving items from said stripper means and conveying the items. The pickup means **24** includes a plurality of rows of fingers **30.** The rows of fingers are preferably mounted on the pickup means **24** in the manner shown in U.S. Pat. No. 3,426,514. Each finger **30** comprises a generally L-shaped configuration including a stem portion **32** and a base portion **34.** As shown, the base portion of each finger forms an included angle θ with the stem portion varying between approximately 120° and 150°, and preferably at an included angle of approximately 135°, see FIG. **2.** As shown in FIGS. **1** and **2**, the base portion **34** of the fingers **30** extends in the direction of rotation of the pickup means **24** for the purpose of providing resistance against radially outwardly directed movement of the items, such as beet tops, being picked up by said pickup means **24** particularly when the stem portion **32** of a finger **30** is disposed generally horizontally, i.e., in the direction of movement of the apparatus **12**, and is moving in an upward direction. The stripper means **26** includes a rotatably mounted member **36** having a plurality of longitudinally extending flaps **38** disposed about the periphery of the member **36.** Preferably, member **36** includes four flaps **38** equiangularly disposed about the periphery thereof. The flaps **38** may be made from any suitable material such as rubber or metal. The member **36** is preferably cylindrical in shape. The flaps **38** extend radially outwardly from the outer surface of the member **36** by approximately 2 inches. Where the diameter of the member **36** is approximately 4½ inches, an overall diameter, from tip to tip of two opposed flaps, of approximately 8½ inches is achieved. The stripper means **26** also includes a second rotatably mounted member **40.** Said member **40** is disposed in parallel relationship with the member **36.** The longitudinal axis of said member **40** is located above the longitudinal axis of the member **36.** Member **40** is, in cross-section, generally square-shaped. The cross-sectional length of one of the sides of member **40** is approximately 4½ inches. Member **40** is preferably constructed in the manner shown in U.S. Pat. No. 3,426,514. The conveyor **28** is disposed rearwardly of and below the longitudinal axis of member **40.** This facilitates the items being transferred by the member **40** to fall, through the effect of gravity, upon the upper surface of the conveyor **28.** The apparatus **12** also includes a follower wheel control bar **42** mounted for limited rotary movement about its longitudinal axis. The control bar **42** is shown disposed beneath the conveyor **28** adjacent the forward or leading edge thereof; however, it may be disposed beneath the conveyor adjacent the rearward or trailing edge thereof. The apparatus **12** also includes a follower wheel control bar **42** mounted for limited rotary movement about its longitudinal axis. The control bar **42** is shown disposed beneath the conveyor **28** adjacent the forward or leading edge thereof; however, it may be disposed beneath the conveyor adjacent the rearward or trailing edge thereof. The apparatus **12** also includes means **44** for effecting rotary movement of said control bar **42.** Said means **44** comprises a hydraulic cylinder **46** with a piston (not shown) disposed therein, said piston being connected to a piston rod **48** that extends out of a first end of said cylinder **46.** The free end of the piston end **48** is pivotally mounted to a link **50.** Link **50** is mounted at one end thereof to the control bar **42** for rotation therewith. The cylinder **46** has a clevis **52** attached to the second or other end thereof. The clevis **52** is pivotally mounted to a portion **54** of the frame of the apparatus **12.** The apparatus **12** also includes a plurality of support frames **56.** Each support frame is relatively short in length and has an axle mounted therein and a follower wheel **18** mounted for rotation about said axle. Each support frame **56** is mounted upon the control bar **42** for rotation therewith. Thus, it will be readily understood that upon supplying pressurized fluid from a source of pressurized fluid (not shown) through one of the fluid lines **58** or **60** (shown only in FIGS. **2** and **5**), the piston within the cylinder **46** will be moved toward one end or the other of said cylinder thereby causing pivotal movement of the link **50** about the longitudinal axis of the control bar **42.** Pivotal movement of the link **50** causes the control bar **42** to rotate about its longitudinal axis. Clockwise movement of the link **50** as viewed in FIGS. **2** and **3**, will result in the conveyor **28** of the apparatus **12** moving downwardly toward the top of the follower wheels **18.** Counterclockwise movement of the link **50** as viewed in FIGS. **2** and **3**, will result in the conveyor **28** being elevated relative to the top of the follower wheels **18.** In view of the foregoing, it will be readily appreciated that the frame of the apparatus **12** and the pickup means **24** which is mounted upon said frame may be quickly and easily raised or lowered merely by controlling the amount of pressurized fluid being transmitted through lines **58** or **60** to the cylinder **46.** Thus, under normal circumstances the position of the follower wheels **18** relative to the remaining portion of the apparatus **12** will be that as shown in FIG. **2** when the apparatus is being pulled from one place to another; however, the position of the follower wheels **18** relative to the remaining portion of the apparatus **12** will be that as shown in FIG. **3** when the apparatus **12** is being used to top and windrow beet tops in the field.

Where the apparatus **12** is to be used on an inclined surface, such as along a hillside, three and preferably four follower wheels **18** have been found to be effective in resisting movement of the apparatus in a lateral direction. It has been found that an apparatus **12** constructed with four follower wheels may be used on both flat as well as relatively steeply inclined surfaces with good advantage.

Heretofore, it was not believed to be possible to use follower wheels of conventional size and construct a

beet topping and windrowing apparatus of the trail-mounted type which would have a short turning radius because, during operation of the apparatus within the field, the conveyor **28** had to be maintained relatively close to the ground. On the other hand, the conveyor **28** could not be positioned as far above the ground as was needed because of the inability of the apparatus to pick up the beet tops and transfer same upwardly by more than a predetermined distance. For example, the fingers **30** of the pickup means **24** cannot be operated in excess of a predetermined angular velocity (approximately 113 rpm) without either shredding the beet tops being picked up or having same fall off the ends of the fingers **30** as a result of the centrifugal force to which same would be subjected. It has been discovered, however, that the beet tops may be picked up through the use of fingers of increased length (approximately 10 inches vs. 8 inches) by forming same in a generally L-shaped configuration. Although an increased peripheral speed is involved through the use of fingers of increased length, such increased speed has not resulted in a shredding of the beet tops when said beet tops initially come into contact with the fingers. This is attributable to the fact that the fingers are formed of a flexible material which permits the fingers to bend slightly in a direction opposite to the direction of rotation thereof upon coming into initial contact with the beet tops. However, in order to prevent the beet tops from being centrifuged radially outwardly and thereby falling off of the ends of the fingers (a problem which was aggravated due to the ends of the fingers flexing forwardly in the direction of rotation following initial flexing in the opposite direction), it has been discovered that the beet tops may be retained upon the fingers by bending the ends thereof in the direction of the rotation of said fingers thereby forming an L-shaped configuration as hereinbefore described. Thus, the problem associated with having the beet tops fall off the ends of the fingers as a result of the centrifugal force to which same are being subjected, said problem being especially critical at the time said fingers become disposed in a horizontal direction (pointing generally in the direction of travel of the apparatus) as same move in an upward direction, has been substantially eliminated through the use of fingers of increased length, approximately two inches longer than the length of prior art fingers, and having an L-shaped configuration as heretobefore described. Parenthetically, the stem portion of each finger extending outwardly of the outer surface of tube is about 9½ inches and the base portion is about **1** inch. Additionally, the ability to elevate the beet tops has been further enhances through the use of the member **36** and its radially extending flaps **38.** As a matter of fact, the use of member **36** in lieu of prior art members (said prior art members being, in cross-section, substantially square in configuration with the length of one side thereof being approximately **5** inches) has enabled the beet tops to be elevated approximately two inches greater than heretofore had been the case.

A typical prior art pickup assembly is shown in U.S. Pat. No. 3,426,514. The longitudinal axis of the pickup means thereof is located approximately 12½ inches above the ground level. The longitudinal axis of the first stripper roll is located approximately 16 inches above the ground level and approximately 10 inches rearwardly of the longitudinal axis of the pickup means. The longitudinal axis of the second stripper roll is located approximately 19 inches above the ground level and approximately 16 inches rearwardly of the longitudinal axis of the pickup means. Compared with this, the longitudinal axis of pickup means **24** of one preferred embodiment of an apparatus **12** is located approximately 15 inches above the ground level. The longitudinal axis of rotatably mounted member **36** is located approximately 19 inches above the ground level and approximately 13 inches rearwardly of the longitudinal axis of pickup means **24.** The longitudinal axis of rotatably mounted member **40** is located approximately 26½ inches above the ground level and approximately 19 inches rearwardly of the longitudinal axis of the pickup means **24.** Thus, it will now be readily appreciated that the pickup assembly **16** of this apparatus enables items to be elevated by an amount approximately 7½ inches more than the prior art pickup assemblies were capable of elevating same while operating the pickup means and the rotatably mounted members at the same speeds as used in prior art devices (e.g., 113 rpm for the pickup means and 260 rpm for the stripper rolls). Additionally, the items being picked up and conveyed rearwardly by the pickup assembly **16** are conveyed in a plane inclined at an angle of approximately 30° or more compared with a horizontally disposed plane. In other words, the longitudinal axes of the second rotatably mounted member **40** and the pickup means **24** are disposed in a plane that forms an included angle of approximately 30° or more with a horizontally disposed plane. Acceptable results are obtained where the items are conveyed in a plane inclined at an angle of approximately 27° or more with a horizontal plane.

Referring no to FIG. **5,** the improved beet topping unit of this invention is now described. Said improved beet topping unit comprises a horizontally disposed pivot axis **62** extending normal to the longitudinal axis of said apparatus, a support member **64** mounted for pivotal movement about said pivot axis **62,** an axle **63** mounted on said support member for rotation thereabout, a finder wheel **20** mounted on said axle **63,** means **66** for rotating said finder wheel **20,** a topping knife assembly **68** having a topping knife **22** disposed beneath the finder wheel **20,** a topping knife assembly support **70** mounted to permit pivotal movement of said support relative to said axle **63,** and means **72** for maintaining said topping knife **22** in a predetermined attitude (relative to a predetermined plane) upon pivotal movement of said support member **64** about said pivot axis **62.** Said means **72** includes a parallelogram linkage having a first part **74** that is mounted to permit pivotal movement of said pivot axis **62** relative to said first part, a second part **76** that is mounted to permit pivotal movement of said axle **63** relative to said second part, said topping knife assembly **70** being supported on said second part **76,** a third part **78** that interconnects said first part and second part, said third part **78** being pivotally connected to said first and second parts by pins **80** and **82,** and a fourth part that pivotally interconnects (via pivot axis **62** and axle **63**) said first and second parts, said fourth part including a portion **84** of the support member **64.** The means **72** for maintaining said topping knife in a predetermined attitude also includes adjustable means **86** for maintaining one of said first or second parts (and, thus, said topping knife **22** in a predetermined orientation with respect to the pivot axis **62.** As shown in FIG. **5,** said adjustable

means **86** maintains the first part **74** in a generally vertically disposed orientation with respect to the pivot axis **62.** However, it will be readily appreciated that the orientation of the first part **74** may be quickly and easily changed by adjusting nuts **88** mounted on the end of the member **90.** As shown in FIG. **5,** member **90** is pivotally connected to the first part **74** by a pin **92.** Member **90** extends through an opening formed in the wall of member **94.** Member **94** is rigidly mounted with respect to the pivot axis **62.**

In view of the foregoing, it will be readily appreciated that the first and second parts **74** and **76** will be maintained in a generally parallel relationship. Additionally, since the topping knife assembly support **70** is securely mounted to the second part **76** and since the topping knife assembly **68** is mounted within said support **70,** it will likewise be appreciated that the topping knife **22** will always be maintained in a predetermined attitude relative to the second part **76.** As shown in FIG. **5,** the portion of the topping knife assembly **68** disposed within the support **70** may be raised or lowered or disposed at a predetermined angle of inclination by adjusting the bolts **96** and **98.** However, following any adjustment of the bolts **96** and **98,** the topping knife **22** will then be disposed in a predetermined attitude relative to the second part **76** and the attitude will not be changed until said bolts **96** and **98** are once again adjusted or until the nuts **88** are appropriately adjusted.

Operation of the means **72** for maintaining the topping knife **22** in a predetermined attitude is now described. First, let it be assumed, that the topping knife **22** is disposed in a generally horizontal plane and that the first and second parts **74** and **76** are disposed in a generally vertical plane. Since the support member **64** is mounted for pivotal movement about pivot axis **62,** it will be readily appreciated that upon pivotal movement of the support member **64** in a clockwise direction, as viewed in FIG. **5,** the topping knife **22** would, except for the means **72,** be disposed in a plane inclined downwardly toward the right. Further, the angle of inclination of said plane would be proportional to the amount of pivotal movement of the support member **64.** However, due to the use of the means **72,** upon clockwise pivotal movement of the support member **64** about the pivot axis **62,** the first and second parts **76** and **78** will remain unchanged in their vertically disposed positions since the first part **74** is mounted to permit pivotal movement of the pivot axis **62** relative thereto and since the second part **76** is mounted to permit pivotal movement of the axle **63** relative to said second part. Since the topping knife assembly **68** is securely mounted within the support **70** and since the support **70** is mounted upon the second part **76,** the topping knife assembly **68** and the topping knife **72** will maintain a predetermined attitude, relative to a predetermined plane, upon any pivoted position of a support member **64.** Thus, through the use of the means **72,** it will now be appreciated that the topping knife **22** may be positioned in any predetermined attitude and this attitude will be maintained continuously during the topping operation. Additionally, the attitude of said topping knife may be changed either through the adjustment of the bolts **96** and **98** and/or adjustment of the nuts **88** on the end of the member **90.**

In view of the foregoing, it will now be readily appreciated that an improved beet topping and windrowing apparatus and knife orientation means therefor has been described. The improved beet topping and windrowing apparatus is of the trail-mounted type and has a substantially reduced turning radius. Construction of such an apparatus has been achieved through the use of a novel pickup assembly and location of the follower wheels beneath the conveyor and inwardly of the ends thereof. Further such construction has been achieved without increasing the speed of rotation of the pickup means or the stripper rolls incorporated within the pickup assembly and without experiencing any increase in loss of items to be picked up by said apparatus. Further, the items to be picked up, i.e., beet tops, are not shredded when picked up by the apparatus of this invention. The follower wheels used in the apparatus of this invention are substantially the same size as the finder wheels, i.e., approximately 13 to 14 inches in diameter. The pickup means utilizes a plurality of rows of fingers wherein each finger is formed with a novel configuration to resist radially outwardly directed movement of items being picked up by said fingers. The stripper rolls, i.e., rotatably mounted members **36** and **40,** are located relative to the pickup means such that the items being conveyed rearwardly by same are elevated along an inclined plane forming an included angle of approximately 27° (which exceeds prior art devices by approximately 5°) or more with respect to a horizontally disposed plane. The ability to convey items upwardly by a substantial increase in distance has enabled the construction of an improved apparatus of the trail-mounted type which enables suitable positioning of the pickup means, through rotation of the control bar, for use in the field with the ends of the fingers coming into contact with the ground surface as well as being transported from one place to another but without risk of bending or breaking off of said fingers.

It will also be appreciated that a beet topping apparatus having an improved beet topping unit has been described. The beet topping unit permits the beet tops to be cleanly severed from the top of the beet without same being partially or completely torn away from the top of the beet or without pulling the beet itself partially or completely out of the ground. This objective has been accomplished through the use of a means for maintaining the topping knife in a predetermined attitude for any pivotal position of the topping knife relative to a pivot axis about which topping knife is mounted for pivotal movement.

The above objectives and advantages are achieved through the construction of a beet topping apparatus at the same or less cost than prior art beet topping apparatuses. Further, said objectives are accomplished without increasing the cost of operating such beet topping apparatuses in the field.

It is to be understood that this invention is not limited to the exact embodiments of apparatuses described and shown, which are merely by way of illustration and not limitation, as various other forms and modifications will be apparent to those skilled in the art. For example, although the support members **64** for the beet topping units are shown extending rearwardly for pivotal movement about said pivot axis, and this construction is preferred, it will be understood that same may extend forwardly for pivotal movement about the pivot axis. Additionally, although it is preferred that the control bar **42** be disposed beneath the conveyor and adjacent the forward or leading edge thereof (such disposition thereby further decreasing the turning radius of such an

apparatus when the pickup assembly is elevated upwardly with respect to the follower wheels), it will be understood that said control bar may be disposed beneath the trailing or rearward edge of the conveyor. Also, it will be appreciated that the fingers may be further modified by forming on the free end of the base portion an extension which is disposed either in parallel relation with the stem portion or generally normal thereto. Forming the extension parallel to the stem portion facilitates picking up of items from the ground surface while forming same normal to the stem portion facilitates resisting outwardly directed movement (along the longitudinal axis of the finger) of the items picked up.

We claim:

1. A beet topping and windrowing apparatus of the trail-mounted type comprising:

a. a pivot axis disposed generally normal to the longitudinal axis of said apparatus;

b. a plurality of laterally spaced, beet topping units, each unit including a support member extending rearwardly for pivotal movement about said pivot axis, each unit including a finder wheel;

c. a pickup assembly mounted in tandem relation to said beet topping units, said assembly including

1. pickup means disposed generally normal to the longitudinal axis of said apparatus and having a plurality of rows of fingers, each finger comprising a generally L-shaped configuration including a stem portion and a base portion, the base portion extending in the direction of rotation of said pickup means, the base portion of each finger forming an included angle with the stem portion varying between approximately 120° and 150 , the base portion providing resistance against radially outwardly directed movement of the items being picked up by said pickup means,

2. stripper means for receiving and removing items from said rows of fingers of said pickup means and simultaneously moving the items rearwardly of the apparatus, said stripper means being disposed normal to the longitudinal axis of the apparatus and vertically above and rearwardly of said pickup means, said stripper means including (i) a first rotatably mounted member having a plurality of longitudinally extending flaps disposed about the periphery of said member and (ii) a second rotatably mounted member disposed rearwardly of and vertically above said first rotatably mounted member, said second rotatably mounted member being disposed such that a plane passing through the longitudinal axes of said second rotatably mounted member and said pickup means forms an included angle of approximately 27° or more with a horizontally disposed plane, and

3. a conveyor disposed rearwardly of said second rotatably mounted member of said stripper means for receiving items from said second rotatably mounted member and conveying the items to one side of said apparatus, said conveyor having a longitudinal axis disposed generally normal to the longitudinal axis of said apparatus, said conveyor having a forward edge and a rearward edge;

d. a plurality of laterally spaced follower wheels for supporting said apparatus, said wheels being disposed beneath said conveyor and inwardly of the ends thereof; and

e. means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels, said means including

1. a control bar mounted for rotary movement about its longitudinal axis, said control bar being disposed beneath said conveyor adjacent one of the edges thereof,

2. means for effecting rotary movement of said control bar, and

3. a plurality of support frames, each support frame having a follower wheel mounted for rotation about its axle, said support frames being mounted upon said control bar for rotation therewith upon rotary movement of said control bar about its longitudinal axis.

2. A beet topping and windrowing apparatus as described in claim **1** in which said second rotatably mounted member of said stripper means is disposed such that a plane passing through the longitudinal axes of said second rotatably mounted member and said pickup means forms an included angle of approximately 30° or more with a horizontally disposed plane.

3. A beet topping and windrowing apparatus as described in claim **1** in which the base portion of each finger forms an included angle with the stem portion of approximately 135°.

4. A beet topping and windrowing apparatus of the trail-mounted type comprising:

a. a pivot axis disposed generally normal to the longitudinal axis of said apparatus;

b. a plurality of laterally spaced, beet topping units, each unit including a support member mounted for pivotal movement about said pivot axis, each unit including a finder wheel;

c. a pickup assembly mounted in tandem relation to said beet topping units, said assembly including

1. pickup means disposed generally normal to the longitudinal axis of said apparatus and having a plurality of rows of fingers, each finger comprising a generally L-shaped configuration including a stem portion and a base portion, the base portion extending in the direction of rotation of said pickup means, the base portion providing resistance against radially outwardly directed movement of the items being picked up by said pickup means,

2. stripper means for receiving and removing items from said rows of fingers of said pickup means and simultaneously moving the items rearwardly of the apparatus, said stripper means being disposed normal to the longitudinal axis of the apparatus and vertically above and rearwardly of said pickup means, said stripper means including a rotatably mounted member having a plurality of longitudinally extending flaps disposed about the periphery of said member, and

3. a conveyor disposed rearwardly of said stripper means for receiving items from said stripper means and conveying the items to one side of said apparatus, said conveyor having a longitudinal axis disposed generally normal to the longitudinal axis of said apparatus, said conveyor having a forward edge and a rearward edge;

d. a plurality of laterally spaced follower wheels for supporting said apparatus, said wheels being dis-

posed beneath said conveyor and inwardly of the ends thereof; and

e. means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels.

5. A beet topping and windrowing apparatus as described in claim **4** in which said means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels includes (1) a control bar mounted for rotary movement about its longitudinal axis, said control bar being disposed beneath said conveyor adjacent one of the edges thereof, (2) means for effecting rotary movement of said control bar, and (3) a plurality of support frames, each support frame including an axle therein, each support frame having a corresponding follower wheel mounted on its axle for rotation thereabout, said support frames being mounted upon said control bar rotation therewith upon rotary movement of said control bar about its longitudinal axis.

6. A beet topping and windrowing apparatus as described in claim **4** in which said stripper means includes a second rotatably mounted member disposed rearwardly of and vertically above said rotatably mounted member having longitudinally extending flaps disposed about the periphery thereof, said second rotatably mounted member being disposed such that a plane passing through the longitudinal axes of said second rotatably mounted member and said pickup means forms an included angle of approximately 27° or more with a horizontally disposed plane.

7. A beet topping and windrowing apparatus as described in claim **6** in which said second rotatably mounted member of said stripper means is disposed such that a plane passing through the longitudinal axes of said second rotatably mounted member and said pickup means forms an included angle of approximately 30° or more with a horizontally disposed plane.

8. A beet topping and windrowing apparatus as described in claim **4** in which the base portion of each finger forms an included angle with the stem portion varying between approximately 120° and 150°.

9. A beet topping and windrowing apparatus as described in claim **8** in which the base portion of each finger forms an included angle with the stem portion varying between approximately 120° and 150°.

10. A beet topping and windrowing apparatus as described in claim **8** in which said stripper means includes a second rotatably mounted member disposed rearwardly of and vertically above said rotatably mounted member having longitudinally extending flaps disposed about the periphery thereof, said second rotatably mounted member being disposed such that a plane passing through the longitudinal axes of said second rotatably mounted member and said pickup means forms an included angle of approximately 27° or more with a horizontally disposed plane.

11. A beet topping and windrowing apparatus of the trail-mounted type comprising:

a. a pivot axis disposed generally normal to the longitudinal axis of said apparatus;

b. a plurality of laterally spaced, beet topping units, each unit including a support member mounted for pivotal movement about said pivot axis,

c. a pickup assembly mounted in tandem relation to said beet topping units, said assembly including

1. a pickup means disposed generally normal to the longitudinal axis of said apparatus and having a plurality of rows of fingers,

2. stripper means for receiving and removing items from said rows of fingers of said pickup means and simultaneously moving the items rearwardly of the apparatus, said stripper means being disposed normal to the longitudinal axis of the apparatus and vertically above and rearwardly of said pickup means, and

3. a conveyor disposed rearwardly of said stripper means for receiving items from stripper means and conveying the items laterally of said apparatus, said conveyor extending normal to the longitudinal axis of said apparatus;

d. a plurality of laterally spaced follower wheels for supporting said apparatus, said wheels being disposed beneath said conveyor and inwardly of the ends thereof, and

e. means for adjusting the vertical distance separating said pickup assembly relative to said follower wheels.

12. In a beet topping and windrowing apparatus of the trail-mounted type having a frame, and beet topping means, pickup means, stripper means, and transversely extending conveying means mounted on said frame in successive tandem relationship to each other; the improvement comprising:

means defining a horizontal pivot axis extending transversely of said frame at a location forwardly of said conveying means and rearwardly of said pickup means,

a plurality of support wheel mounting members mounted on said frame for pivotal movement about said pivot axis, said mounting members being inclined downwardly and rearwardly from said pivot axis into underlying relationship with said conveying means,

support wheels rotatably mounted upon the lower end portions of said mounting means inwardly of the opposite ends of said conveying means for supporting the rearward end of said frame,

and power means for pivoting said mounting members about said axis to selected positions of pivotal adjustment to thereby adjust the elevation of said pickup means above ground level.

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