

[54] **SUGAR CANE LOADER-CLEANER MACHINE**

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[52] U.S. Cl. **56/502, 56/504, 56/13.3, 56/13.7, 209/153, 83/98**
 [51] Int. Cl. **A01d 45/10**
 [58] Field of Search **56/12.8, 13.3, 14.3, 60, 56/504, 505, 13.9, 13.7, 364, 502; 83/356.3, 436, 449, 113, 98; 241/277, 79; 209/3, 20, 134, 135, 153, 148, 150**

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[57] **ABSTRACT**

A field operated cane loading and cleaning vehicle is provided with a rotary pickup drum adjacent the ground for picking up windrowed cane, a conveyor conveys the cane to a continuously rotating segmentizer drum which slices the cane into small segments from which it is conveyed to a kicker drum which hurls the segments into a cleaning chamber where they are subjected to an air blast for separating trash from the cane segments which then fall onto a removal conveyor to be discharged onto a truck or the like; the pickup drum has radially extending fingers which engage and lift the cane from the field and the segmentizer drum employs triangular blades which slice through the cane to minimize wastage and cane damage.

22 Claims, 6 Drawing Figures

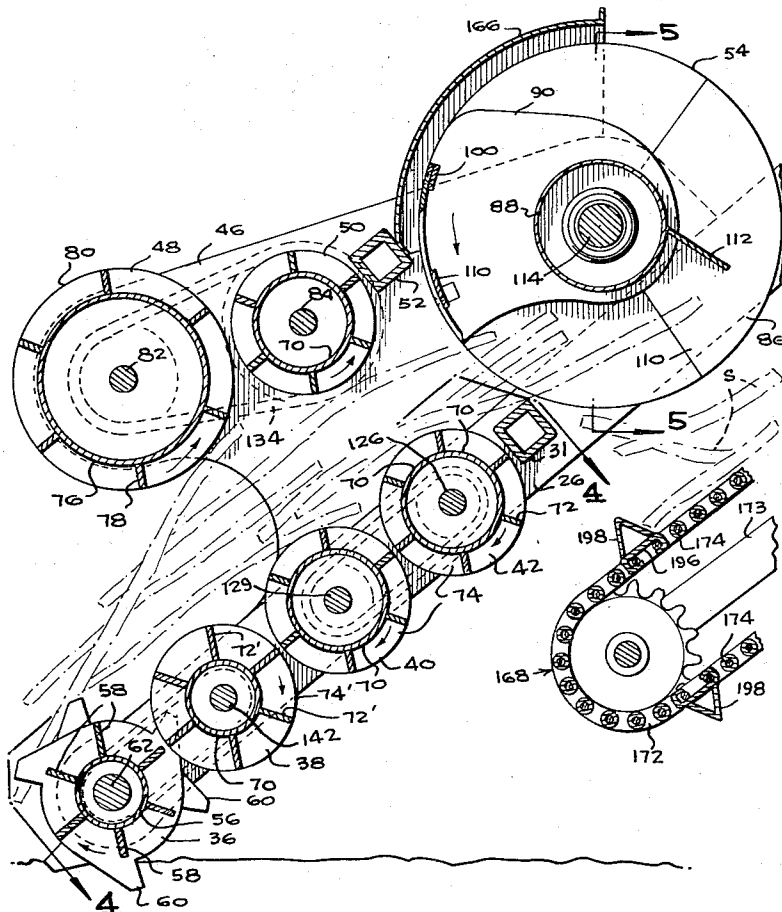
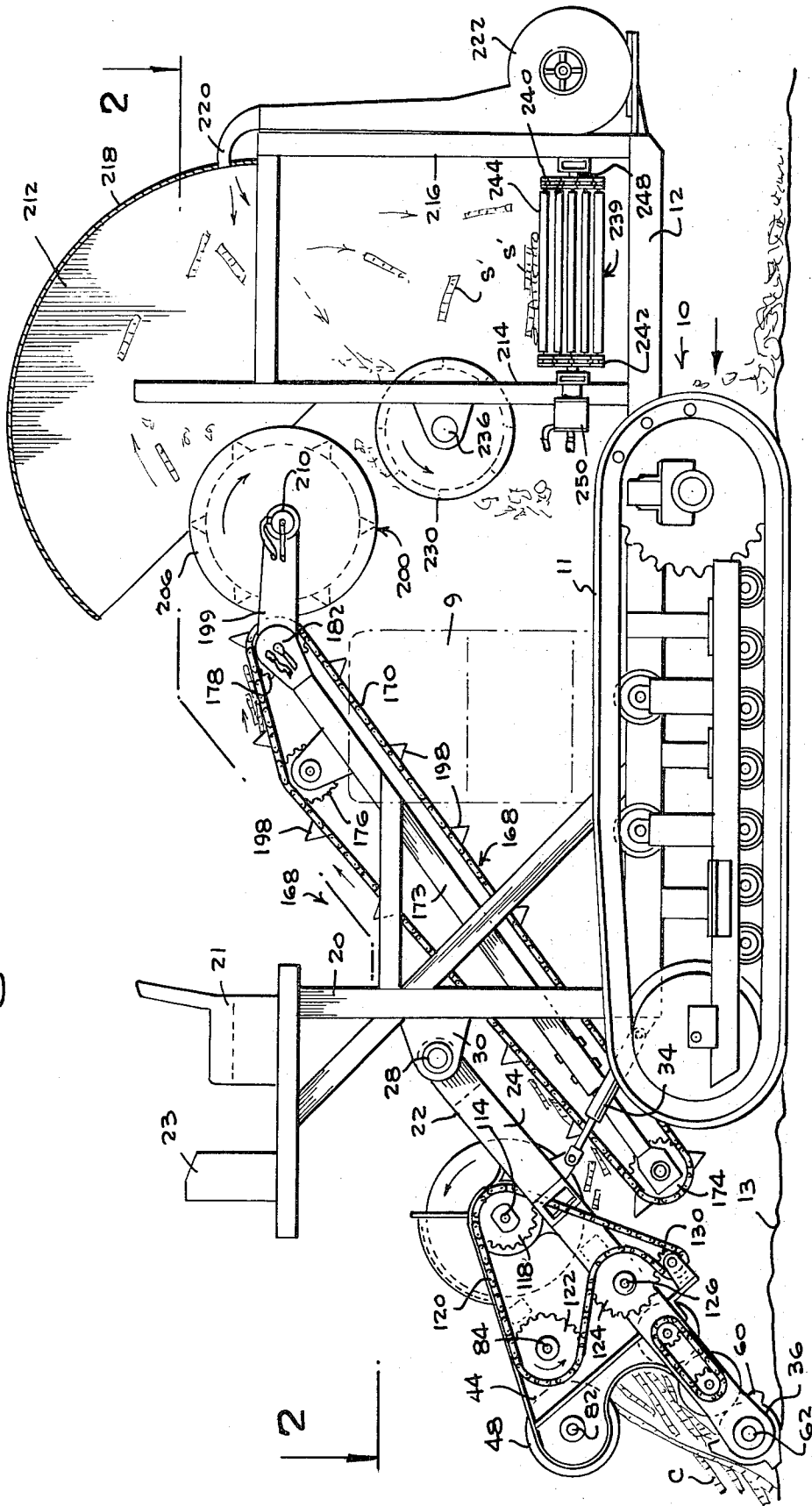


FIG-1



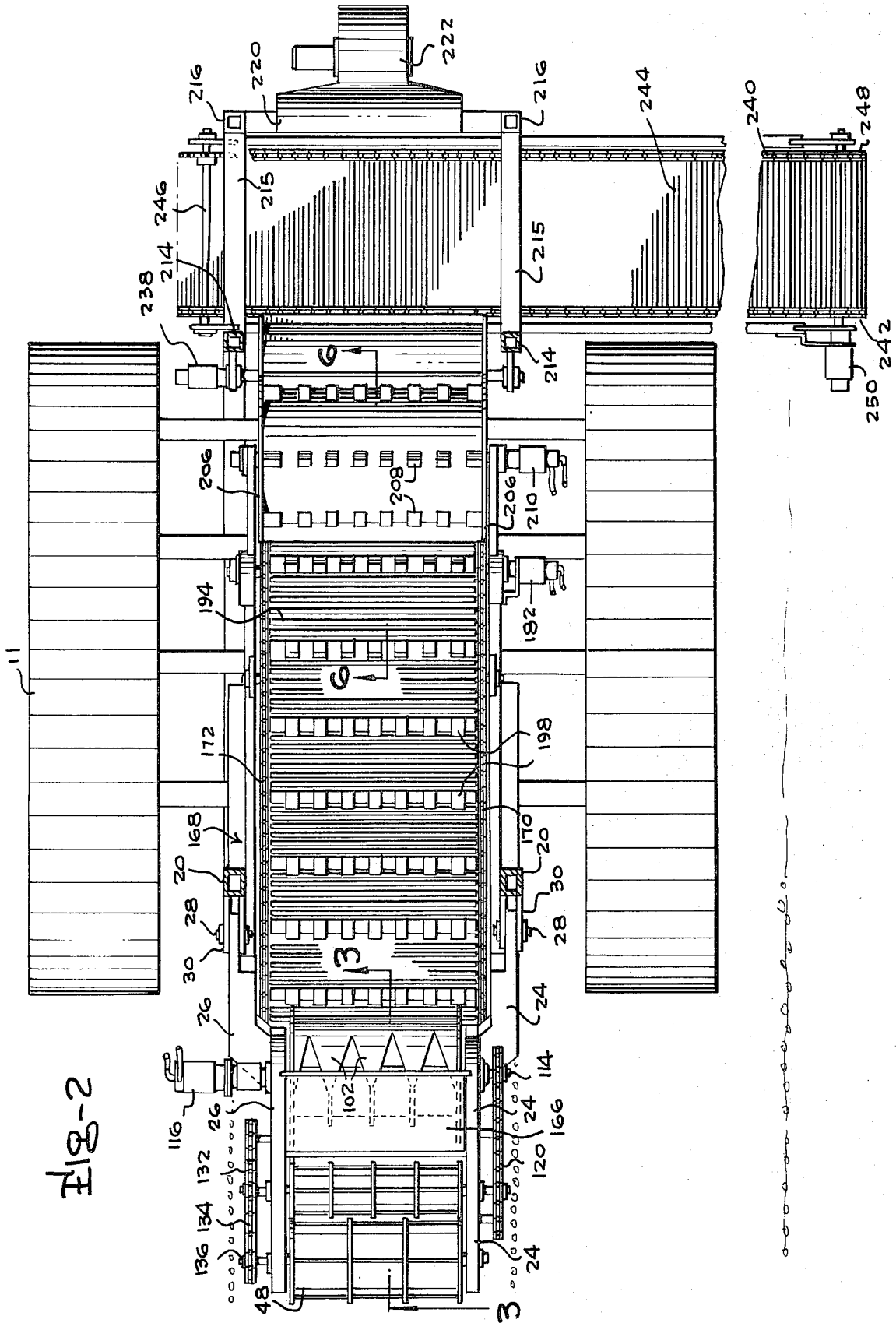
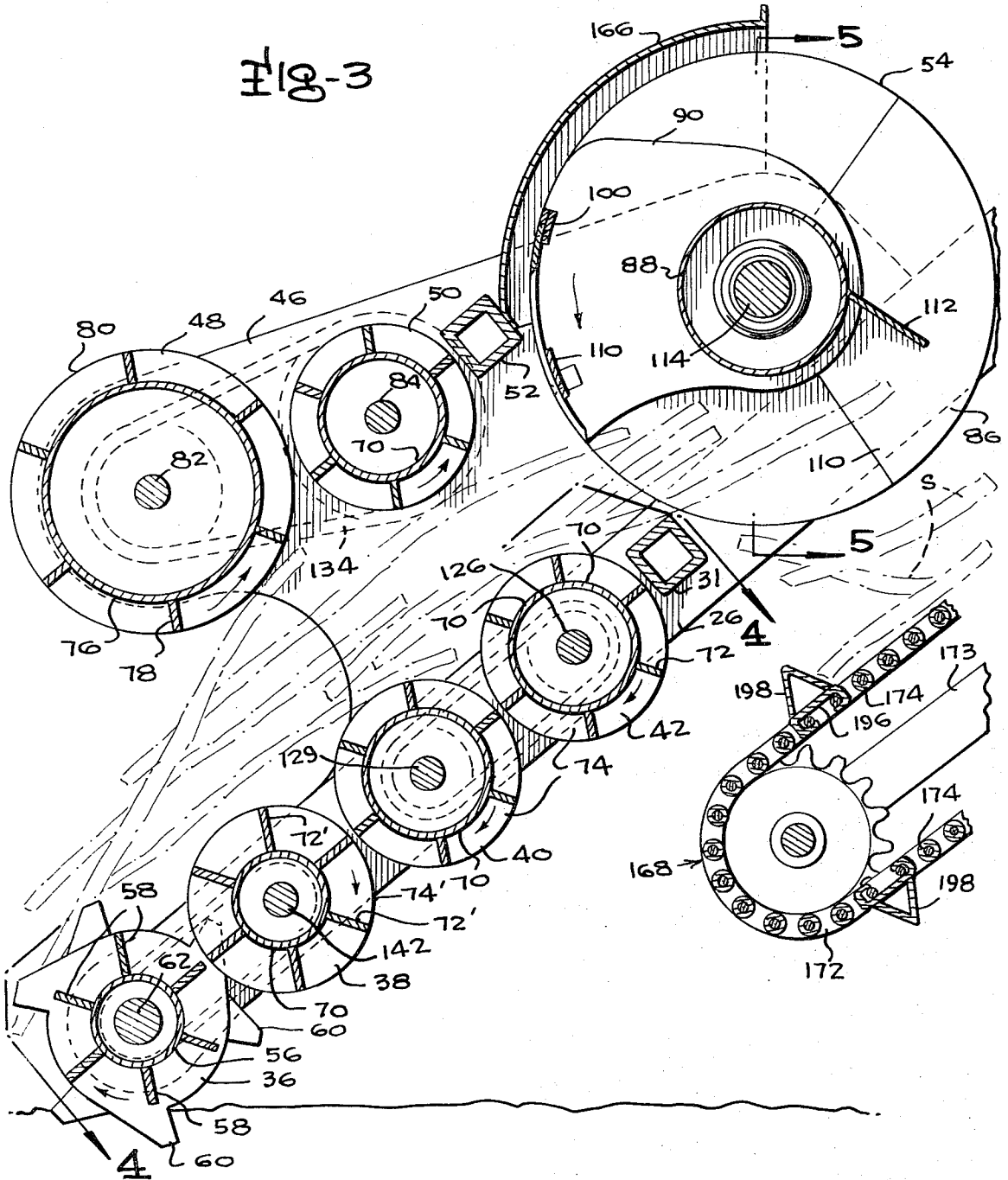
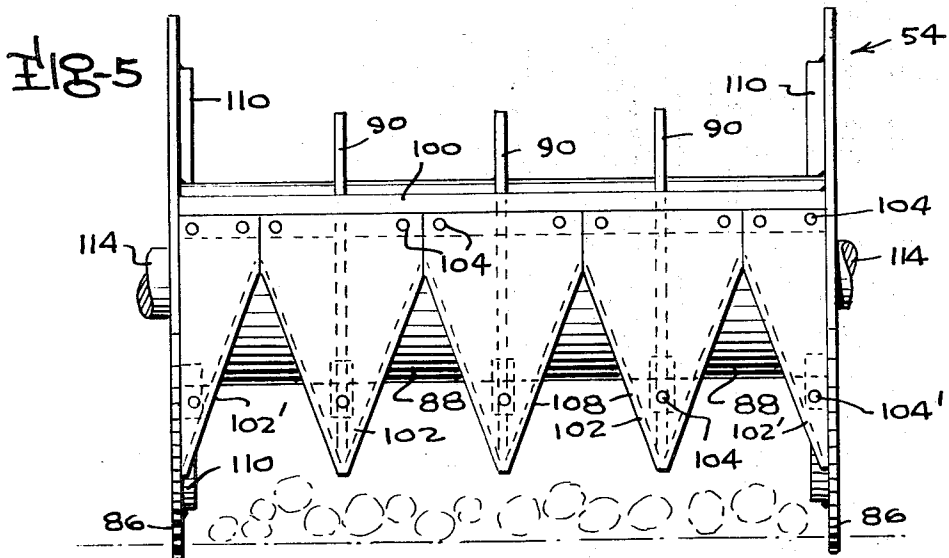
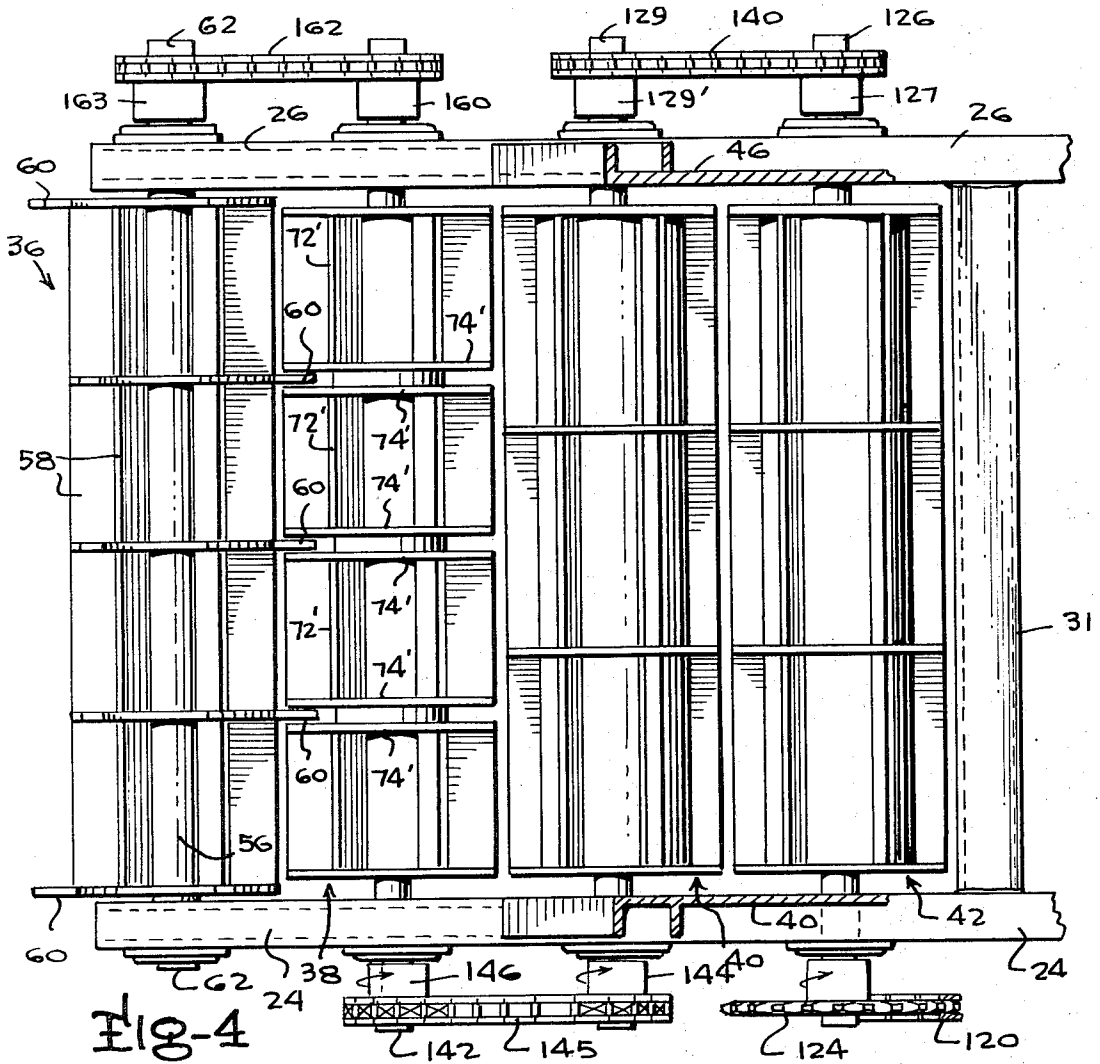


FIG-3





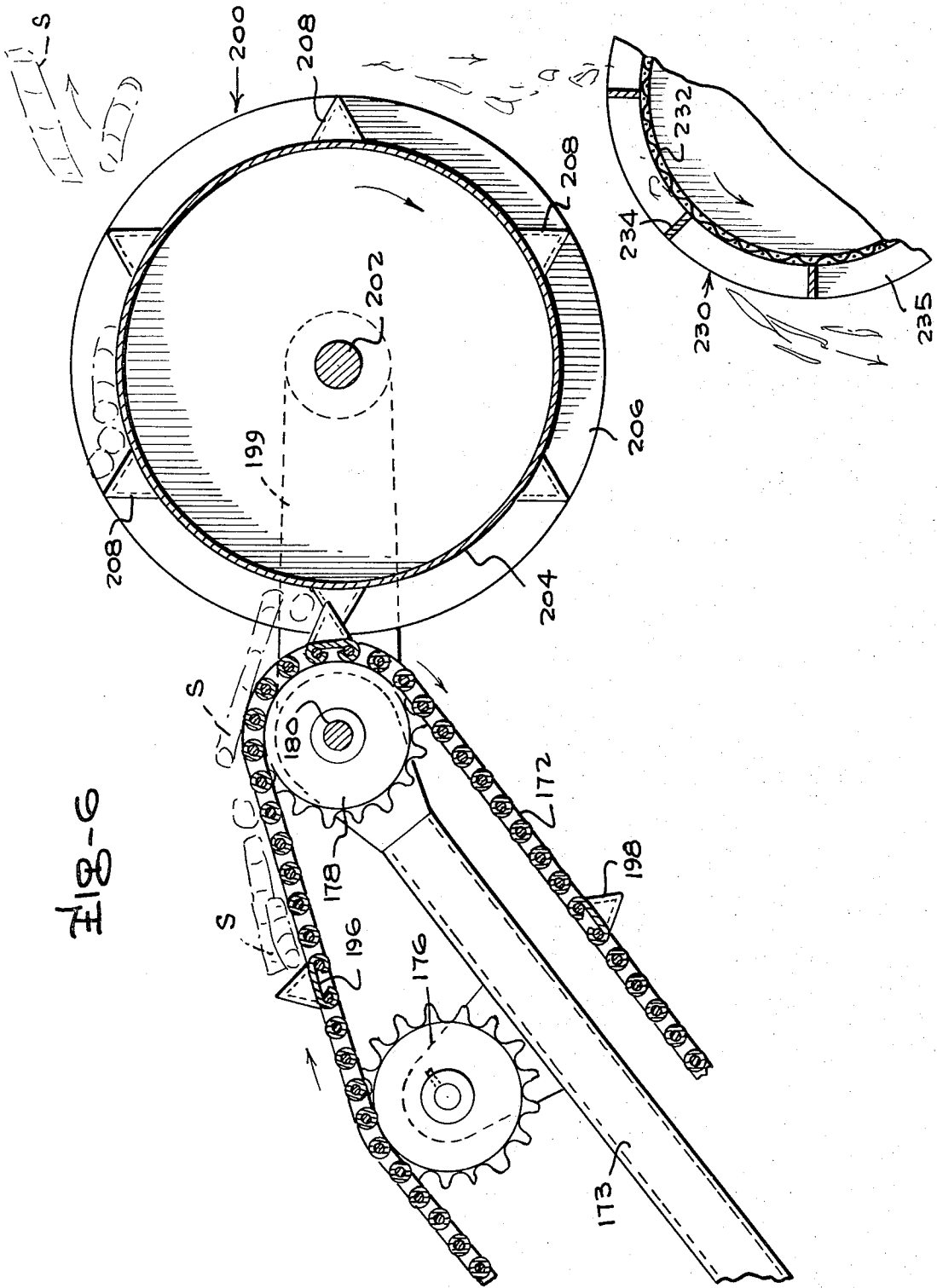


FIG-6

SUGAR CANE LOADER-CLEANER MACHINE

This invention is in the field of agricultural equipment and is specifically directed to a sugar cane harvesting and cleaning device of the type operated in the field for picking up the cane, cutting the cane, cleaning the cane and depositing the cane onto a truck or other vehicle for removal to the refinery.

A number of prior known devices have been proposed for the purpose of picking up, cutting and cleaning cane for subsequent delivery to the refinery; however, prior known devices for these purposes have suffered from a number of deficiencies which are obviated by the subject invention.

For example, the prior known devices have employed finger-type chains moving parallel to the line of travel of the machine for engaging the cane to lift the cane onto the machine. Devices of this type require that the cane be oriented perpendicular to the line of travel of the machine and the chain and it is consequently necessary that the workers cutting the cane orient the cut cane in this manner. Harvesters of the type employing pickup chains are subjected to substantial wear and tear in that the chains engage the abrasive soil which is picked up on the chains and carried to various parts of the mechanism so that the mechanism is subjected to substantial wear and consequent high maintenance costs.

In addition, the continuous cane loaders of the type presently employed also employ a series of rotating saw members for cutting the stalks into shortened segments. The employment of such saw members causes a loss of cane in the form of sawdust resultant from each cut of the saw and also frequently results in mutilation of the cane ends.

Therefore, it is the primary object of this invention to provide an improved cane loader-cleaner device eliminating the problems of prior cane harvesters.

It is another object of this invention to provide a new and improved cane loader which eliminates excessive maintenance costs and which lessens cane wastage in the cutting process.

Obtainment of the foregoing objects is enabled by the subject invention through the provision of a motor driven, tracked vehicle having a chassis frame with a pivotable adjustable cantilever frame extending forwardly from the chassis frame and supporting a rotating pickup drum on its forwardmost end. The rotating pickup drum includes a plurality of radially extending finger members which engage a windrow of cane and lift the cane upwardly onto a plurality of conveyor rollers extending upwardly and rearwardly of the pickup drum. The conveyor rollers convey the cane into a constantly rotating segmentizer drum having a plurality of blade members mounted on its periphery which slice through the cane without creating any sawdust or similar wastage so that the cane is sliced into a large number of segments. Moreover, the blade members are oriented at an angle to the cane and do not mutilate the cane ends in the manner of a saw member of the type employed in previous known devices.

An upwardly extending and moving chain conveyor conveys the small cane segments from the segmentizer drum upwardly into a constantly driven rotating kicker roll which receives the cane segments and hurls them into a cleaning chamber. An air blast from a blower is provided in the cleaning chamber for separating the

small cane segments from leaf particles and other trash material accompanying the small segments. The trash is blown onto a trash removal drum which deposits it to the rear of the machine and the cane segments fall on a transverse conveyor which conveys them outwardly of the machine for discharge into a truck or the like moving alongside the harvester machine.

A substantial advantage of the subject invention resides in the fact that the stalks do not have to be oriented perpendicular to the line of travel since the pickup drum is capable of lifting stalks lying parallel to the line of travel for upward movement into the segmentizer drum.

Additionally, the subject invention employs a plurality of feed rolls which feed the cane from the pickup drum and which perform the double function of moving the cane to the segmentizer and also removing ground trash and soil from the cane by means of ribs extending from the feed rolls which engage and shake the cane as it is being moved upwardly by the rolls.

A better understanding of the manner in which the subject invention enables obtainment of the objects of the invention will be achieved when the following written description is read in conjunction with the attached drawings in which:

FIG. 1 is a side elevational view of the preferred embodiment of the invention;

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 2;

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 3;

FIG. 5 is a sectional view taken along lines 5—5 of FIG. 3; and

FIG. 6 is a sectional view taken along lines 6—6 of FIG. 2.

Attention is initially invited to FIG. 1 of the drawings which illustrates the preferred embodiment of the invention in the form of a vehicle 10 having crawler tracks 11 and a chassis frame 12 with the tracks 11 being driven by a motor 9 in a conventional manner for moving the vehicle across the surface 13 of a field in which cane C is windrowed for harvesting.

Chassis frame 12 includes a pair of forwardly located vertical frame members 20, FIGS. 1 and 2, which support an operator's seat 21 and control panel 23. In addition, a cantilever support frame 22 is pivotally connected about pivot pins 28 on supporting bracket members 30 fixedly attached to the forward edge of the frame members 20. Cantilever support frame 22 is formed of dog-legged shaped side frame members 24 and 26 connected by a transversely extending box frame member 31 for unitary pivotal movement about the pivot pins 28. Pivotal movement of the frame members 24, 26, etc., is effected by means of hydraulic cylinder means 34 extending between the chassis frame 12 and the cantilever support frame 22 so that actuation of the hydraulic cylinder 34 serves to adjust the angle of inclination of the support frame and the height of the forward end of the frame with respect to the surface 13 of the field.

A cane pickup drum 36 is journaled in bearing members in the side frame members 24 and 26 at the forwardmost end of these frame members for rotation to initially lift windrowed cane lying on the surface 13 of the field and oriented parallel to the path of travel of

vehicle 10. Additionally, lower conveyor rolls 38, 40 and 42 are also journaled between the side frame members 24 and 26 for conveying the cane upwardly from the pickup drum 36. Side frame members 24 and 26 respectively include upwardly extending generally triangular bearing support plates 44 and 46 respectively which provide support for upper cane conveyor rolls 48 and 50 journaled for rotation in bearings in the support plates. An additional box frame member 52 extends between the bearing support plates 44 and 46 for enhancing the rigidity of the entire cantilever frame members 24, 26, 46, 48, etc.

A segmentizer drum 54 is mounted on the rear portions of the bearing support plates 44 and 46 for severing cane fed to it by the feed rollers 38, 40, etc., into short segments S. Pickup drum 36 includes a base cylinder 56 from which a plurality of longitudinal radially extending ribs 58 extend. In addition, the pickup drum also includes a plurality of transverse radially extending cane lifting fingers 60 formed as an integral part of radial transverse flange members extending outwardly from the surface of the base cylinder 56. The entire cane pickup drum assembly is keyed to a shaft 62 supported in bearings in the frame members 24 and 26 with a sprocket 63 being keyed on one end of shaft 62 for driving the pickup drum in the direction of the arrow in FIG. 3.

Similarly, the lower feed rolls 40 and 42 are each formed with a base cylinder 70 from which a plurality of longitudinally extending flat rib plate members 72 extend with roll 38 having shorter longitudinal rib plate segments 72' as shown in FIG. 4. Also, intermediate transverse radial flanges 74 are provided at the ends and interior of the rolls 40 and 42 and similar flanges 74' are provided on roll 38. The interior radial flanges 74' are associated in pair defining slots between the members 72' on roll 38 into which slots fingers 60 extend as shown in FIG. 4. The upper feed roll 50 is identical in construction to feed rolls 40 and 42, while the other upper feed roll 48 is provided with a larger base cylinder 76 and longitudinal rib plates 78 along with radial transverse flanges 80. Upper rolls 48 and 50 are keyed to shafts 82 and 84 respectively mounted in bearings in the bearing support plates 44 and 46.

Segmentizer drum 54 is best illustrated in FIGS. 3 and 5 and includes radial end flanges 86, a base cylinder 88 and three smaller intermediate blade supporting radial flanges 90 which extend outwardly from one side of base cylinder 88 as shown in FIG. 3. Additionally, a longitudinally extending support plate member 100 extends along the length of the segmentizer drum with a plurality of interior triangular blade members 102 and triangular side blade members 102' being attached by rivets 104 or the like to the plate 100. Adjacent triangular blade members 102 define an apex for cutting surfaces 108 and the forward ends of the blades are connected by rivets 104' to tab plates 110 extending outwardly from the blade support flanges 90.

It is to be noted that the end blade members 102' are only one-half the width of the intermediate blade members 102. Rotation of drum 54 moves the blades in a path past the edge of frame member 31 as shown in FIG. 3. Counterweight plates 110 extend radially from the side of the drum opposite the blades 102, etc., at points adjacent end flanges 86 to balance the drum in an obvious manner.

The entire drum assembly 54 is keyed to a shaft 114 to the outer ends of which is connected a hydraulic motor 116 (FIG. 2). The other end of shaft 114 is provided with a sprocket 118 over which a chain 120 extends. Chain 120 is drivingly connected to a sprocket 122 on the end of shaft 84 supporting the upper feed roll 50 for driving feed roll 50 and with a sprocket 124 on the end of a shaft 126 to which the uppermost lower feed roll 42 is keyed. Chain 120 also extends over an idler 130. The end of shaft 84 opposite sprocket 122 is provided with a sprocket 132 over which a chain 134 extends with chain 134 also extending over a sprocket 136 on the end of shaft 82 so that driving force applied from the hydraulic motor 116 serves to rotate the upper rolls 48 and 50 in the direction of the arrows in FIG. 3 and also serves to rotate the lower roll 42 in a clockwise direction as shown in FIG. 3. The end of shaft 126 opposite sprocket 124 is provided with a sprocket 127 (FIG. 4) over which a drive chain 140 extends. Chain 140 also extends over a sprocket 129' on the end of a shaft 129 to which the intermediate lower roll 40 is keyed. Consequently, drive from shaft 126 is conveyed to shaft 129 which in turn is conveyed to shaft 142, supporting roll 38, by means of a sprocket 144 and chain 145 with the chain 145 extending over a sprocket 146 on the end of shaft 142.

Drive to the cane pickup drum 36 is provided by a sprocket 160 on the end of shaft 142 opposite sprocket 146, a chain 162 and sprocket 63 keyed to the end of shaft 62 with chain 162 going drivingly engaged with the sprocket 63 as shown in FIG. 4.

Therefore, it will be seen that the output from the hydraulic motor 116 serves to drive the segmentizer drum 54, the upper feed rolls 48 and 50, the lower feed rolls 38, 40 and 42 and the pickup drum 36. A cover shield 166 is provided adjacent the segmentizer drum for safety purposes.

A segment conveyor generally designated 168 and including first and second side chains 170 and 172 extends upwardly from a point adjacent and beneath the segmentizer drum 54 as shown in FIGS. 1 and 3. Chains 170 and 172 are supported by a frame 173 supporting idler sprockets 174 at its lowermost end and upper idler sprockets 176 near its uppermost extent and by drive sprockets 178 keyed to a conveyor drive shaft 180. Conveyor drive shaft 180 is driven by a hydraulic conveyor drive motor 182 illustrated in FIG. 2 which serves to drive the upper flight of the chains 170 and 172 upwardly in the direction of the arrows in FIG. 1. Additionally, the segment conveyor 168 includes a plurality of transversely extending cylindrical rods 194 extending between the chains 170 and 172 with intermediate channel members 196 (FIGS. 3 and 6) being interposed along the length of the chains and extending between the chains. The channel members 196 are provided with spaced triangular teeth members 198 extending outwardly therefrom for engaging the cane segments and aiding in the upward conveyance of the cane segments in a manner that will be discussed in detail hereinafter.

The upper ends of the elongated frame members 173 are provided with a dog-legged extension 199 which supports a kicker drum 200 by means of a driven shaft 202. Kicker drum 200 includes a main base cylinder 204 and end flanges 206. Additionally, triangular teeth 208 extend outwardly from the drum 204 as shown in FIG. 6.

A cleaning chamber 212 supported by upright standards 214 and 216 connected by horizontal braces 215 is provided to the rear of the kicker drum 200 and includes a hood 218 into which cane segments are discharged from the kicker drum 200, an air nozzle 220 and a blower 222 for providing an air blast into the cleaning chamber. Additionally, kicker drum 200 is driven by a hydraulic motor 210 connected to the shaft 202 to which the kicker drum 200 is keyed.

A trash removal drum 230 is mounted for rotation on the standards 214 and includes a base cylinder 232 fabricated of a screen-like material to allow passage of air from the blower with longitudinally extending radial flanges 234 and end flanges 235 with the drum being keyed to a shaft 236 to the end of which a hydraulic motor 238 is connected.

A discharge conveyor generally designated 239 is provided at the bottom of the cleaning chamber 212 for conveying the cleaned cane segments to the side of the vehicle for discharge onto a truck or the like. Discharge conveyor 239 is formed of side chains 240 and 242 between which a plurality of cylindrical rods 244 extend. Chains 240 and 242 are supported upon sprockets on shafts 246 and 248 adjacent each end of the conveyor. Shaft 248 is driven by a hydraulic motor 250 for moving the conveyor into the direction of the arrow as shown in FIG. 2.

The harvester-cleaner machine is moved to the left as shown in FIG. 2 with the pickup drum rotating in the direction of the arrow in FIG. 1 so as to rotate the fingers 60 downwardly beneath the surface of the soil to effectively pick up the windrowed cane C. The cane is lifted upwardly by the pickup drum with the upper rolls 48 and 50 aiding in the guiding of the cane inwardly and upwardly so that the forward ends of the cane move to extend across the box frame member 31 which comprises a support for the cane. The segmentizer drum 54 is continuously rotated in the direction of the arrow as shown in FIG. 30 so that the blades 102 engage the ends of the cane and slice through the cane as shown so as to provide short cane segments S which fall downwardly onto the segment conveyor 168. The short cane segments are carried upwardly by the segment conveyor to the discharge end of the conveyor where they are discharged onto the kicker drum 200 as best shown in FIG. 6. The drum 200 engages the short segments and hurls them into the cleaning chamber 212 so that they fall into the air blast created by the wide nozzle 220 extending across the width of the chamber.

Leafy trash and the like has such substantial air resistance as to be incapable of being hurled through the air like the short cane segments S and much of this trash material consequently falls from the kicker drum onto the trash removal drum 230 immediately below the kicker drum. Cleaning is further enhanced due to the fact that the air blast extends across the path of travel of the short segments S as shown in FIG. 1. Consequently, the air blast serves to dislodge and blow trash associated with the cane segments to the left as shown in FIG. 1 into engagement with the trash removal drum 230 from which the trash falls downwardly for deposit on the ground beneath the vehicle as it moves across the field. The cleaned cane segments S' fall onto the removal conveyor 239 from which they are conveyed outwardly of the machine for deposit onto a truck or the like.

It is to be understood that the subject invention is susceptible to numerous modifications; however, the spirit and scope of the invention is to be limited solely in light of the appended claims.

I claim:

1. A field operated sugar cane loader-cleaner machine for movement along windrows formed of generally parallel severed cane members oriented parallel to the direction of movement of said machine for picking up the cane, cutting the cane into small segments and removing trash from the cane to enable the deposit of cleaned cane segments on a truck or other removal vehicle, said machine comprising a motor driven vehicle having a chassis frame, means for picking up the generally parallel cane of a windrow as the motor driven vehicle moves along the windrow including a cane pickup drum means mounted for rotation adjacent the ground on the forward end of a supporting frame about a horizontal axis perpendicular to the path of travel of said vehicle and including radially extending portions movable below the lowermost cane of a windrow for engaging and lifting the windrowed cane upwardly, a cane slicing means mounted to the rear of said pickup drum for slicing cane into short segments, conveyor means for feeding cane from said pickup drum to said cane slicing means, a segment conveyor for receiving cane segments from said slicing means and conveying said cane segments into a rotating kicker drum which receives the segments and hurls the segments into a cleaning chamber, means creating an air blast in said cleaning chamber across the path of travel of said segments for blowing trash such as leaf material and other debris from said cleaning chamber to separate such trash from the cane segments and discharge conveyor means in said cleaning chamber for receiving the cleaned cane segments for discharging said cleaned cane segments from said chamber.

2. The invention of claim 1 wherein said cane slicing means comprise a segmentizer drum having a plurality of blade members positioned about the periphery of the segmentizer drum and rotating in a path extending closely adjacent a fixed cane support member across which the forward ends of the cane are fed into said segmentizer drum so that said rotating blade members cooperate with the fixed cane support member to engage the forward ends of the cane and slice the cane into small segments.

3. The invention of claim 1 wherein said pickup drum is formed of a base cylinder mounted for rotation on a supporting frame about the axis of said base cylinder and said radially extending portions including but not limited to a plurality of radially extending cane lifting fingers engageable with the cane on the ground for lifting the cane upwardly as said vehicle moves along a windrow of cane.

4. The invention of claim 3 wherein said cane feed means for feeding cane from said pickup drum to said segmentizer includes a plurality of parallel rotating lower feed rolls positioned rearwardly of the pickup drum and having radially extending longitudinal feed flanges for engaging and conveying cane lifted from the ground by the pickup drum.

5. The invention of claim 4 wherein said cane feed means additionally include upper feed rolls mounted above said lower feed rolls for engaging any upwardly extending cane lifted from the ground by the pickup

drum to guide such cane between the upper feed rolls and the lower feed rolls into said segmentizer drum.

6. The invention of claim 5 wherein said segment conveyor comprises a chain conveyor means having an infeed end positioned adjacent said segmentizer roll for receiving cane segments and having a discharge end positioned adjacent said kicker roll for discharging cane segments onto said rotating kicker drum.

7. The invention of claim 6 wherein said supporting frame comprises a cantilever frame member pivotally connected at its rearmost end to said chassis frame with said lower feed rolls, said upper feed rolls, and said segmentizer drum being mounted on bearings on said cantilever frame member and hydraulic cylinder means connected between said chassis frame and said cantilever frame for adjusting the angle of said cantilever frame and height of said pickup drum.

8. The invention of claim 7 additionally including a hydraulic motor connected to a drive shaft drivingly connected to said segmentizer drum and power transmission means extending from said segmentizer drum to said lower feed rollers, said upper feed rollers and said pickup drum for rotatingly driving said rollers and drum.

9. The invention of claim 8 wherein said discharge conveyor extends transversely of said vehicle along the rear portion thereof at the bottom of said cleaning chamber for discharging the cleaned cane segments onto a removal vehicle.

10. The invention of claim 9 wherein said cleaning chamber includes a hood member extending over the top of the chamber, said rotating kicker drum is mounted adjacent said hood member for kicking the cane segments and trash into the cleaning chamber and the means providing the air blast comprises a power driven blower having a discharge nozzle in said hood member blowing forwardly across said cleaning chamber toward a rotating trash removal drum upon which the trash is impinged to be dumped adjacent the rearmost end of the vehicle.

11. The invention of claim 10 wherein said blade members comprise a plurality of pointed generally triangularly shaped curved blade plates mounted adjacent each other to provide a V-shaped narrowing opening defined by the converging cutting edge of two adjacent triangular shaped plates so that the cane ends fed into the segmentizer drum are moved into the apex of the cutting edges for slicing said cane into small segments and circular end flanges on each end of said segmentizer drum.

12. The invention of claim 11 wherein said segmentizer drum additionally includes a transverse blade supporting flange beneath each of said blade members upon which said blade members are mounted for rotation about the axis of said segmentizer.

13. The invention of claim 12 wherein said pickup drum includes a plurality of transverse radially extending circular flanges and a plurality of longitudinal radially extending ribs with said radial fingers extending outwardly from said transverse flanges.

14. The invention of claim 13 wherein said lower feed rolls and said upper feed rolls each comprises a cylindrical drum member having longitudinal radially extending flanges extending outwardly along its length and terminating on each end in an end flange extending radially and transversely with respect to said feed rolls.

15. The invention of claim 14 wherein said kicker drum comprises a cylindrical drum member having triangular teeth extending longitudinally along its length for engaging cane segments on the discharge end of said segment conveyor.

16. The invention of claim 1 wherein said cane slicing means comprises a segmentizer drum having a plurality of triangular blade members positioned about its periphery for downward movement adjacent a fixed cane support member across which the forward ends of cane are fed into said segmentizer drum so that said blade members cut the cane into small segments.

17. The invention of claim 16 wherein said cane feed means for feeding cane from said pickup drum to said segmentizer includes a plurality of parallel rotating lower feed rolls positioned rearwardly of the pickup drum and having radially extending longitudinal feed flanges for engaging and conveying cane lifted from the ground by the pickup drum.

18. The invention of claim 17 wherein said cane feed means additionally include upper feed rolls mounted above said lower feed rolls for engaging any upwardly extending cane lifted from the ground by the pickup drum to guide such cane between the upper feed rolls and the lower feed rolls into said segmentizer drum.

19. The invention of claim 18 wherein said segment conveyor comprises a chain conveyor means having an infeed end positioned adjacent said segmentizer roll for receiving cane segments and having a discharge end positioned adjacent said kicker roll for discharging cane segments onto said kicker roll.

20. The invention of claim 19 wherein said supporting frame comprises a cantilever frame member pivotally connected at its rearmost end to said chassis frame with said lower feed rolls, said upper feed rolls, and said segmentizer drum being mounted on bearings on said cantilever frame member and hydraulic cylinder means connected between said chassis frame and said cantilever frame for adjusting the angle of said cantilever frame and height of said pickup drum.

21. The invention of claim 20 additionally including a hydraulic motor connected to a drive shaft drivingly connected to said segmentizer drum and power transmission means extending from said segmentizer drum to said lower feed rollers, said upper feed rollers and said pickup drum for rotatingly driving said rollers and drum.

22. The invention of claim 21 wherein said discharge conveyor extends transversely of said vehicle along the rear portion thereof at the bottom of said cleaning chamber for discharging the cleaned cane segments onto a removal vehicle.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,828,536

Dated August 13, 1974

Inventor(s) Larry G. Fowler

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract:

Line 4, change "can" to -- cane --;

Line 14, change "can" (first occurrence) to -- cane --.

Signed and sealed this 29th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents