United States Patent

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[45] Apr. 4, 1972

[54] ROTARY CUTTER MECHANISM

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[52] **U.S. Cl.** **56/10.7**

[51] **Int. Cl.** **A01d 35/26**

[58] **Field of Search** 56/25, 25.4, 10.6, 10.7, 15.3, 56/15.4, 15.5, 15.6, 15.7

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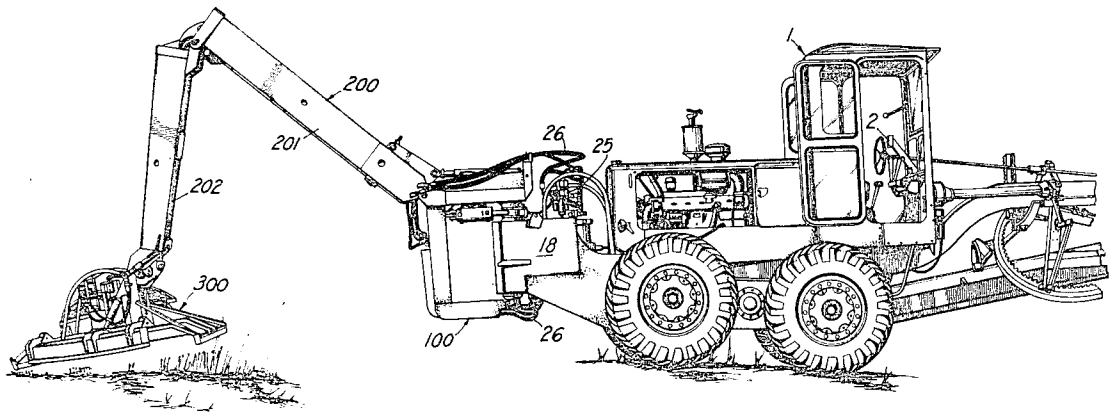
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[57] **ABSTRACT**

Apparatus for use in cutting vegetation located remotely from the path of travel of a support vehicle, such as vegetation located along the banks and shoulders adjacent a highway. The apparatus includes a base support housing having attachment means for permitting easy attachment of the apparatus to a support vehicle. A yoke is supported on the housing for pivotal movement about a substantially vertical axis and provides a support for a boom which is mounted for pivotal movement about a substantially horizontal axis. Hydraulic control means is operatively associated with the yoke and boom means for effecting movement of the yoke and boom means about their respective support axis. A cutter head having a rotary cutting blade is pivotally mounted for universal movement on the extended end of the boom and includes hydraulic control means for effecting pivotal movement of the cutter head about the universal mounting and for effecting operation of the cutting blade. The boom and cutter heads are supported for pivotal movement relative to the housing whereby the cutter head can be selectively positioned adjacent opposite lateral sides of the housing substantially 180° displaced relative to each other.

10 Claims, 18 Drawing Figures



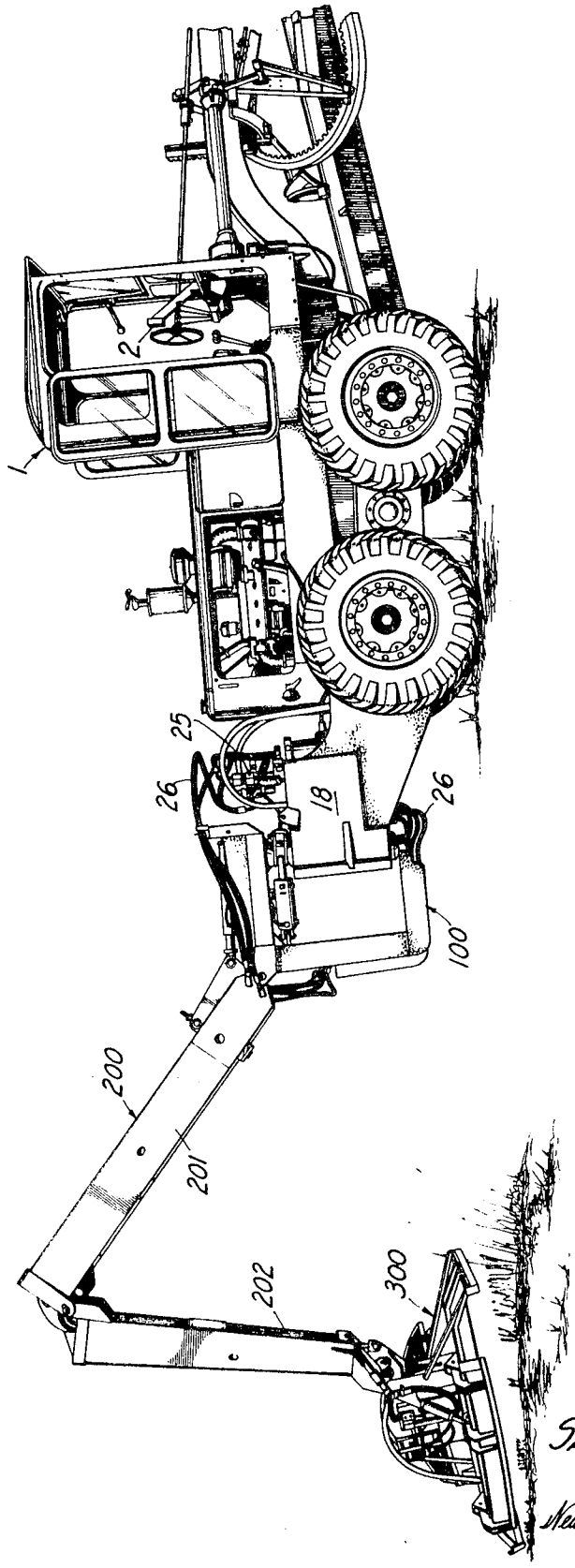


FIG 1

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Newton, Hopkins & Ormsby
ATTORNEYS

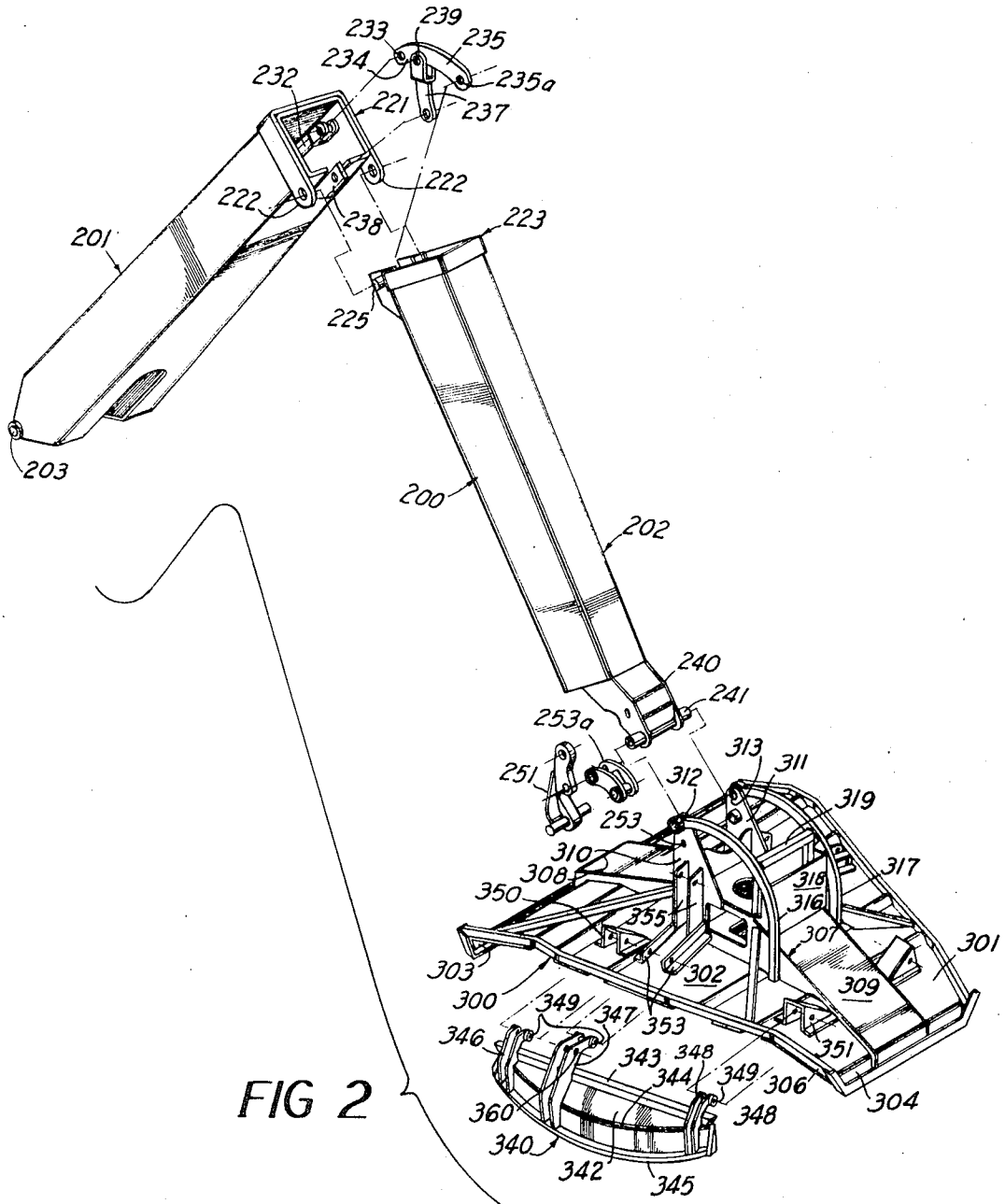

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FIG 2

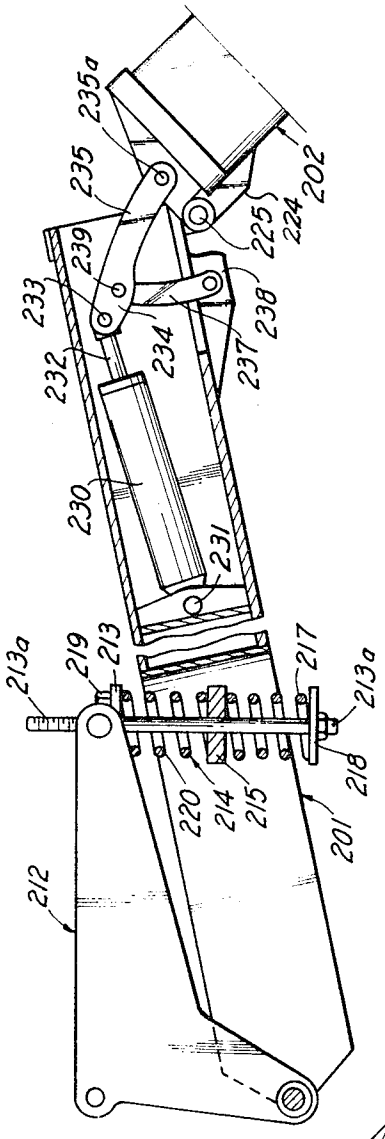


FIG 3

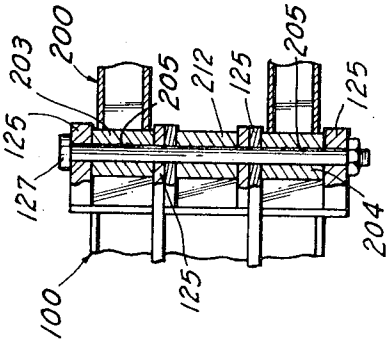


FIG 3B

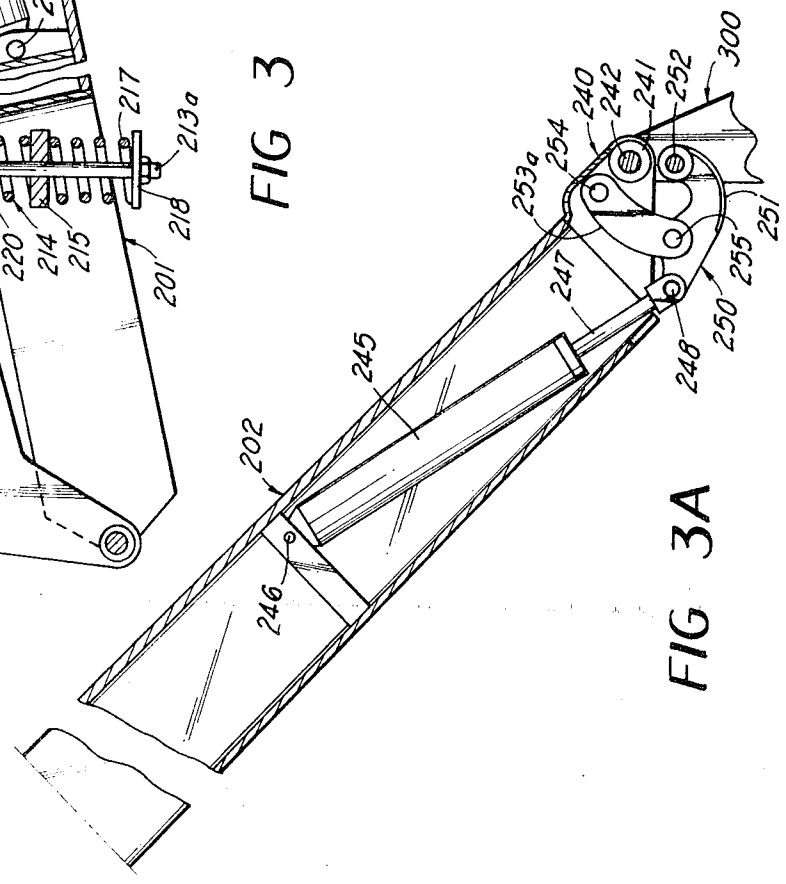


FIG 3A

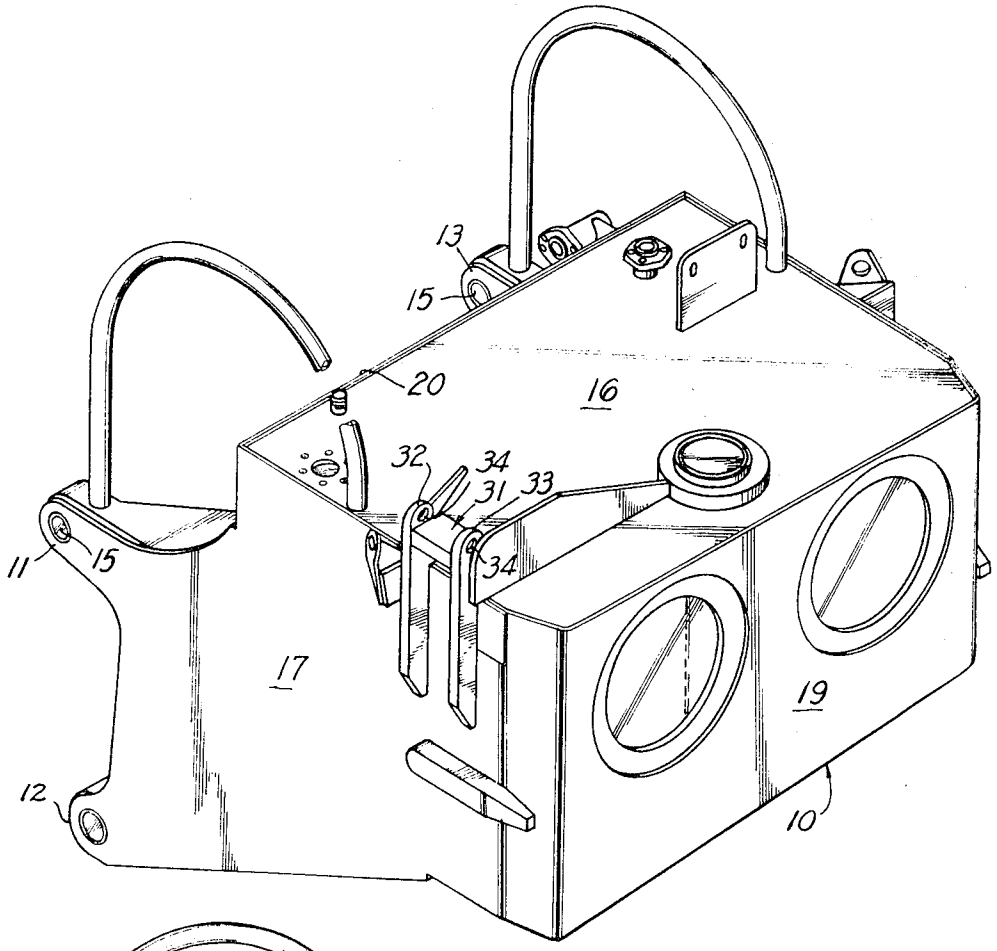

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FIG 4

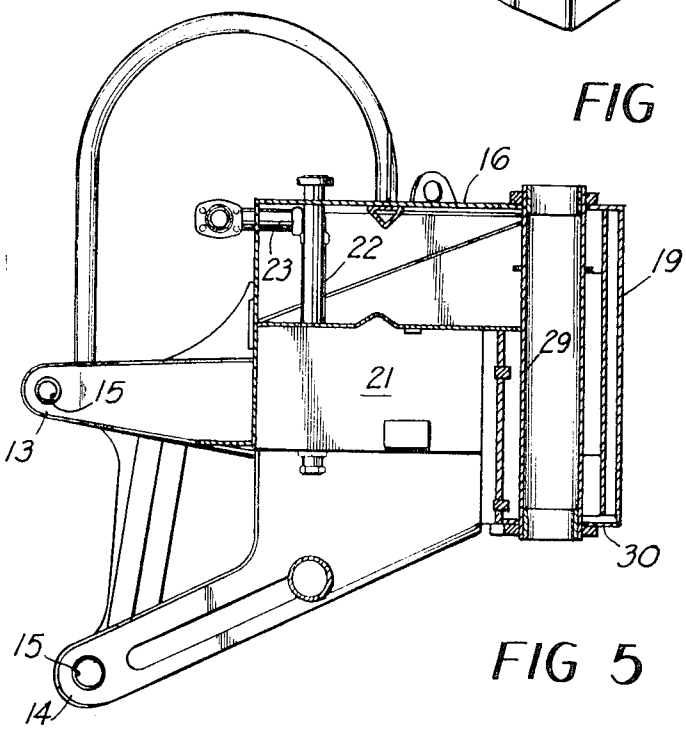

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FIG 5

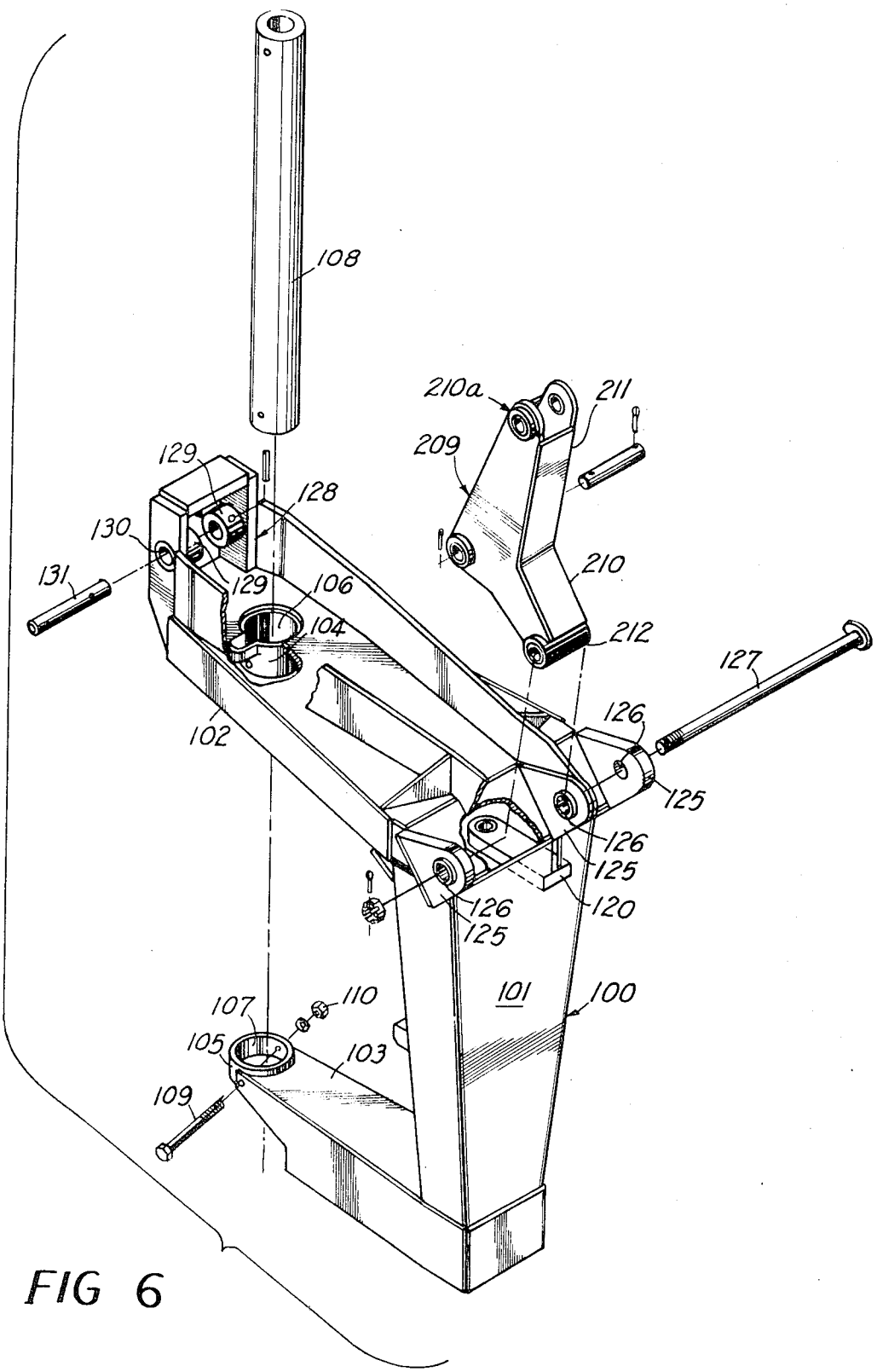

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FIG 6

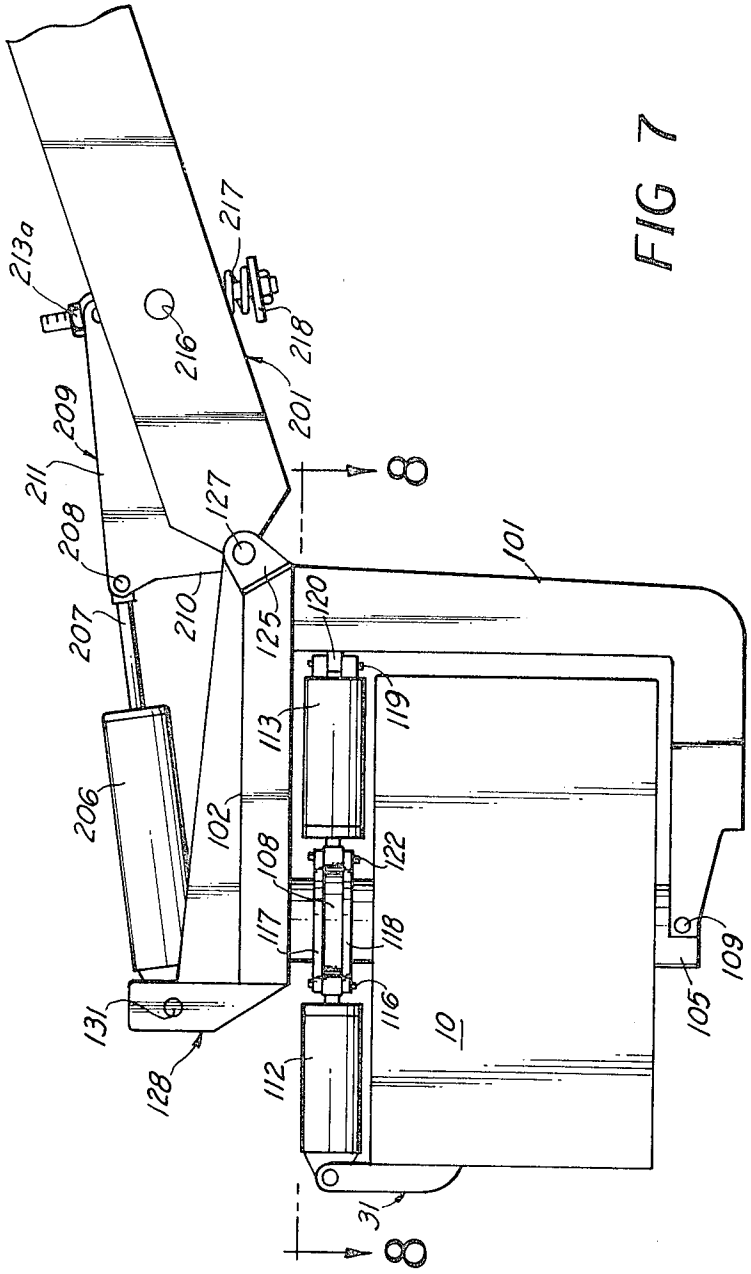

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FIG 7

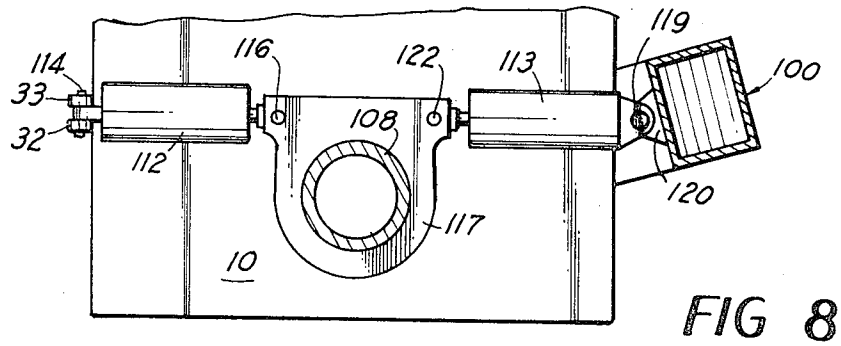


FIG 8

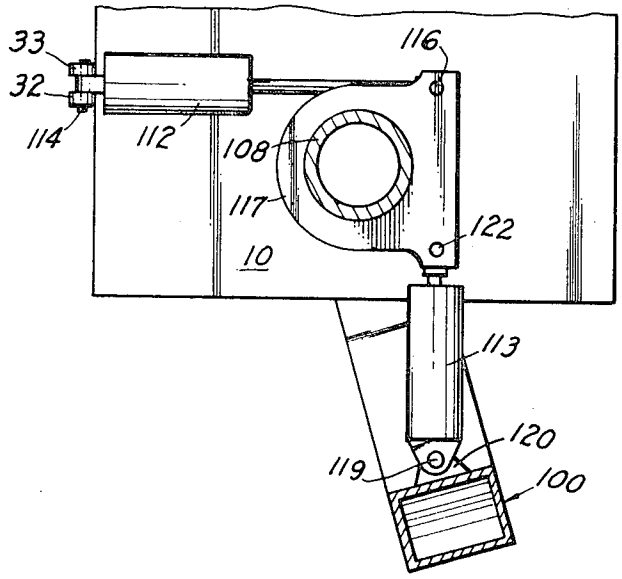


FIG 8A

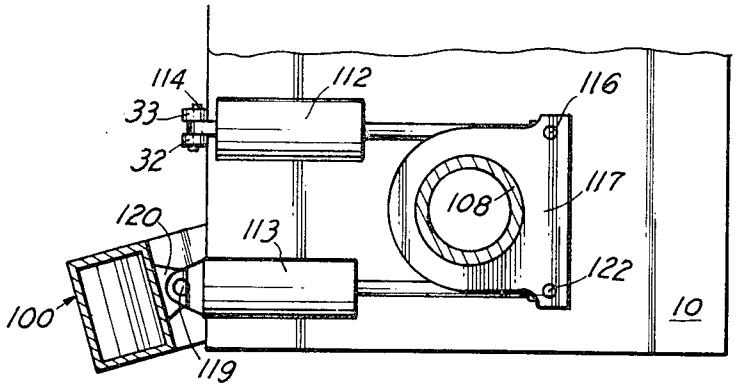


FIG 8B

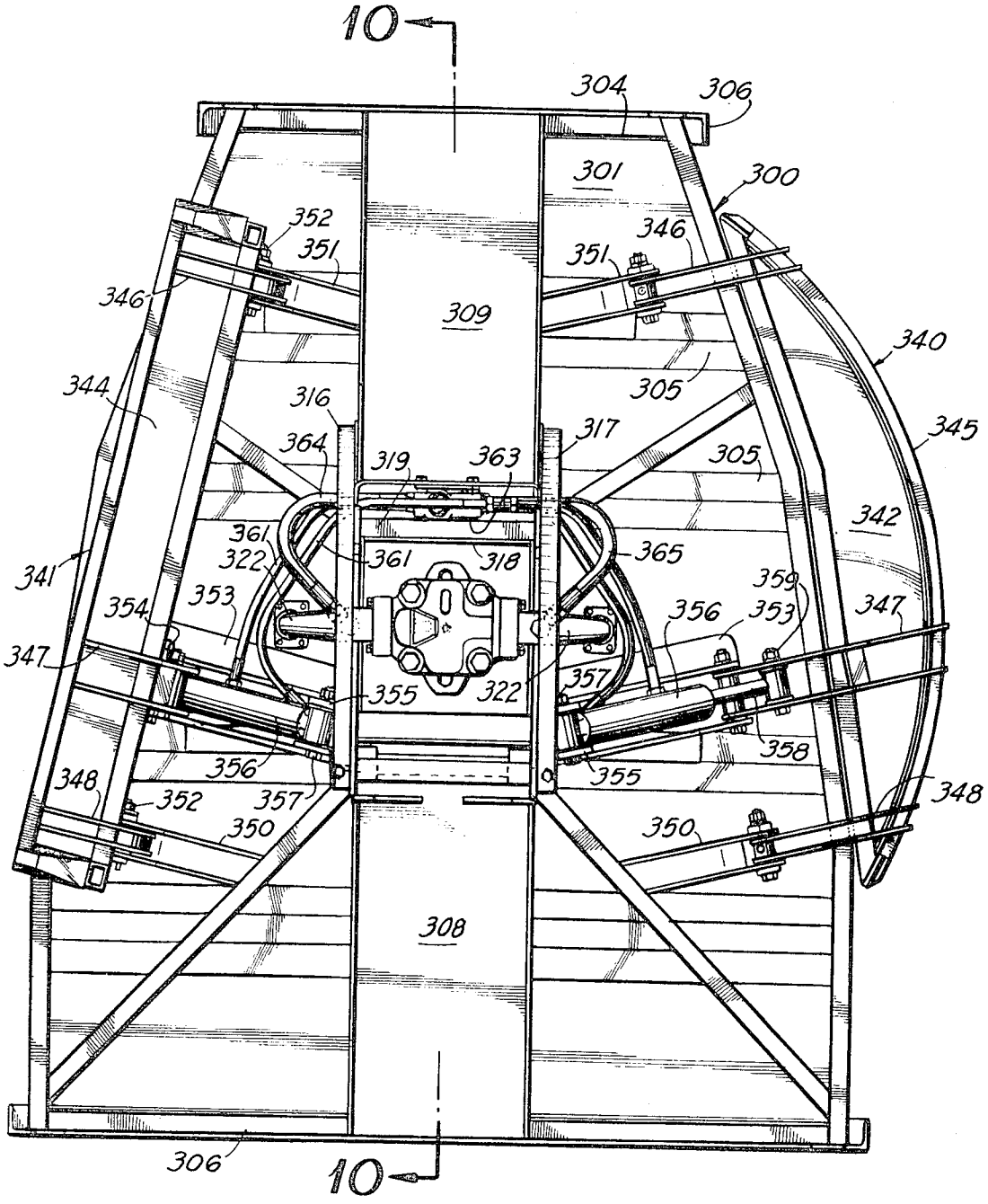

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FIG 9

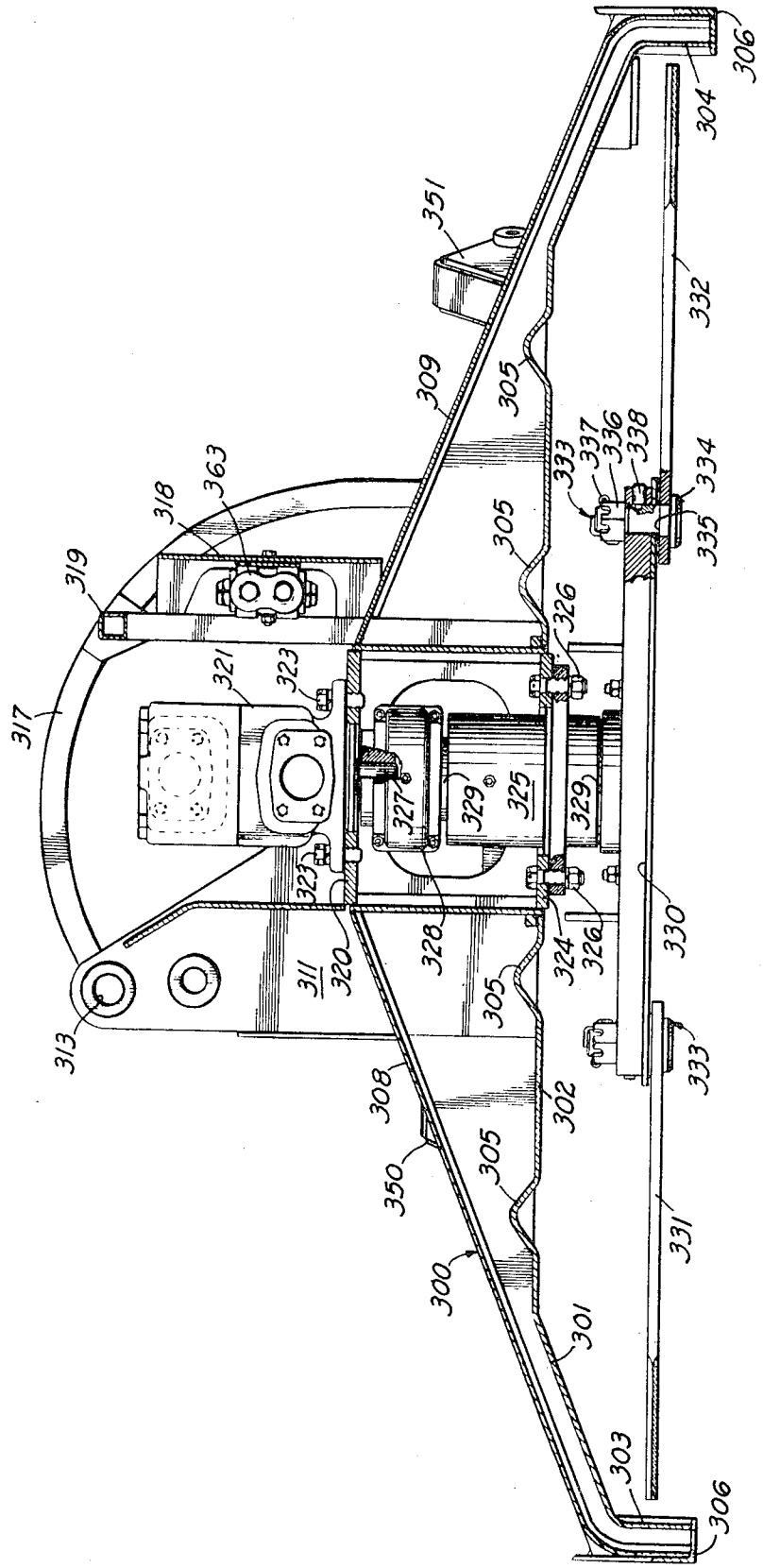

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FIG 10

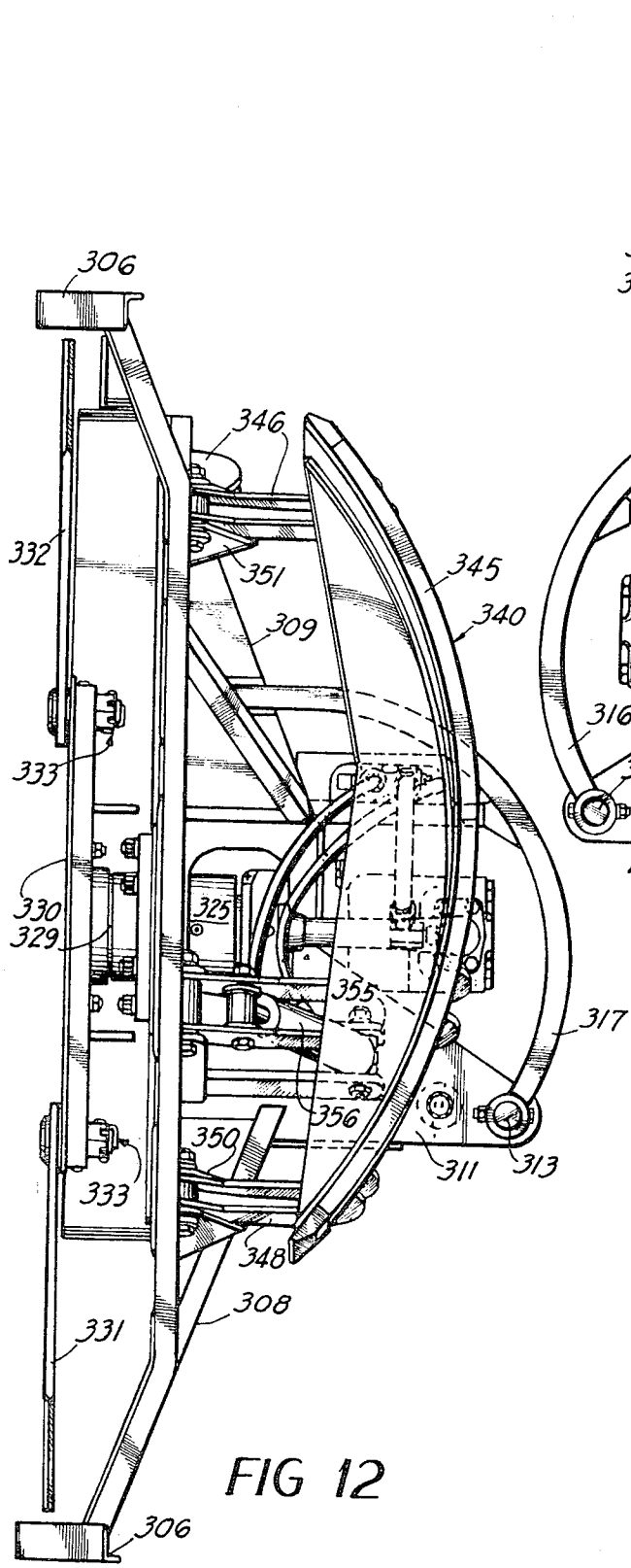

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FIG 12

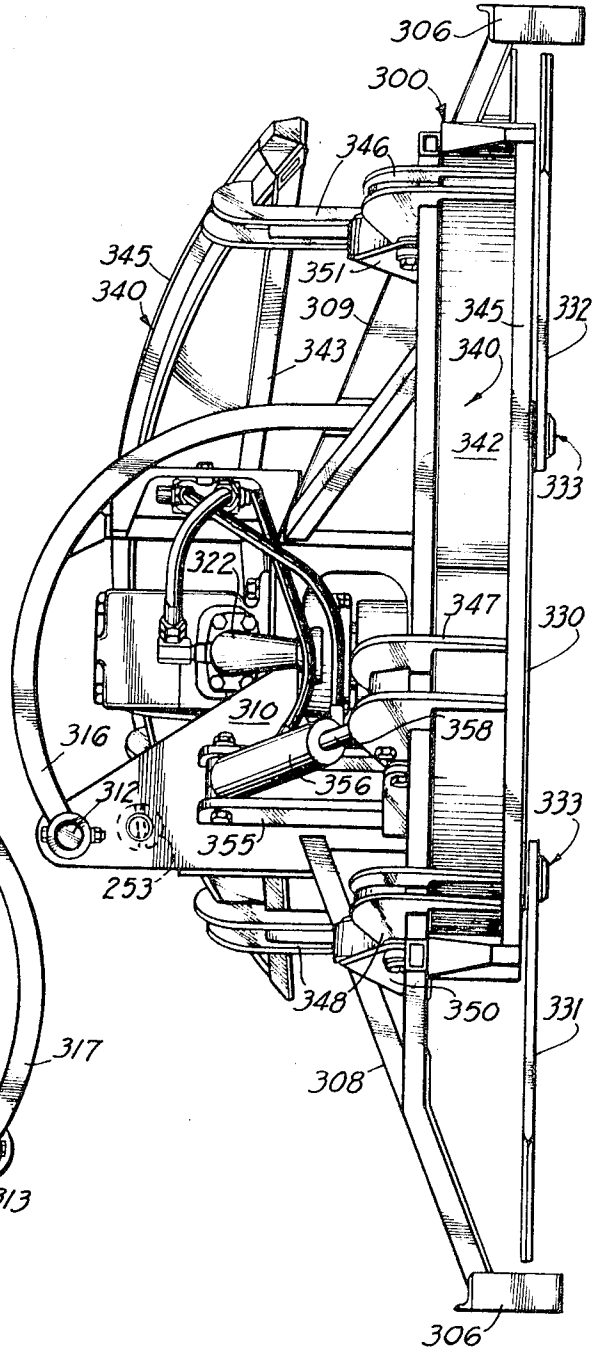

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FIG 11

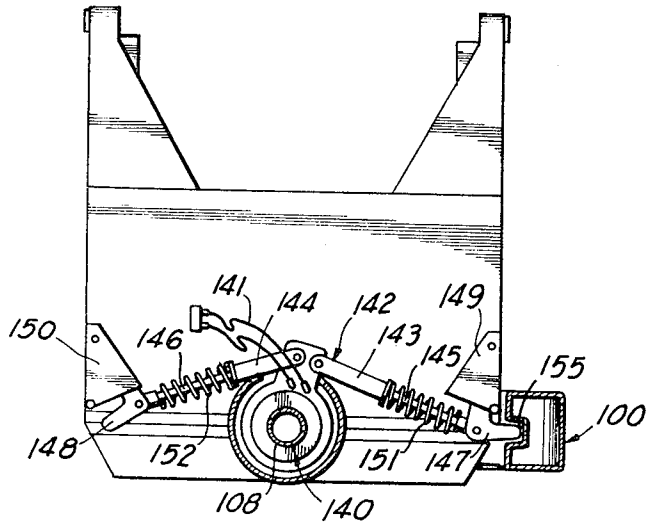

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FIG 13

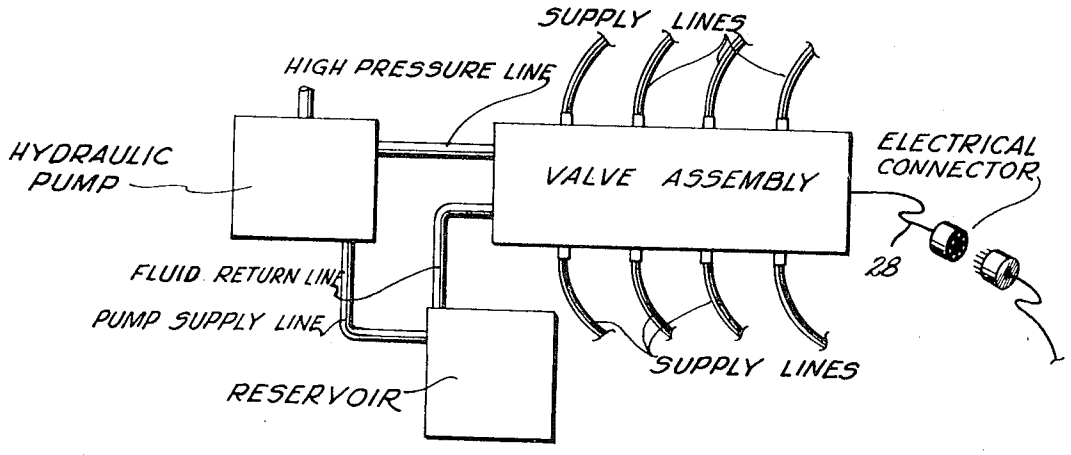

SUPPLY LINES
HIGH PRESSURE LINE
HYDRAULIC PUMP
VALVE ASSEMBLY
ELECTRICAL CONNECTOR
28
FLUID RETURN LINE
PUMP SUPPLY LINE
SUPPLY LINES
RESERVOIR

FIG 14

ROTARY CUTTER MECHANISM

BACKGROUND OF THE INVENTION

With the tremendous amount of highway networks now in existence for the American public to enjoy, the problem of grooming or cutting the vegetation along the shoulders and banks adjacent the highways have become a very time consuming job. In the construction of the highways, the terrain associated therewith often presents large areas of fill construction which will in effect present a great amount of sloping shoulder portions. Further, the highway construction often presents long areas of cuts through the hillsides which will in turn present large areas of elevated banks along the highway. To prevent these shoulder portions and banks from becoming eroded, it is necessary to establish a good growth of vegetation thereon. After the vegetation has been established, then comes the problem of cutting or grooming the shoulder portions and the sloping banks to maintain them in an attractive condition for the public to enjoy as they are utilizing the highway system.

Due to the tremendous angle and distance of the sloping shoulders and elevated banks of the highway system, the conventional cutter mechanism which is located for cutting directly adjacent the support vehicle is not capable of performing the cutting jobs necessary. Numerous attempts have been made to design a special cutter mechanism for use in cutting the vegetation along the sloping shoulders and elevated banks of a highway. However, most of these devices were complicated in construction, expensive to manufacture and unreliable in operation.

In the construction of a rotary cutting mechanism for cutting vegetations at a remote distance from a support vehicle, it is important to provide a control mechanism whereby the cutter head can be controlled effectively during all the angles and lateral positions of operation. Often in the operation of a rotary cutter mechanism at a laterally extending remote position, the cutter mechanism may strike or contact stationary objects which will damage the support structure of the mechanism. Further, in the operation of a rotary cutter mechanism at various angular disposed remote positions, the problem of maintaining safety in operating the cutter mechanism is a problem, since the characteristics of a rotary cutter is to impale by centrifugal force any objects contacted by the rotary cutter blade.

One problem with the prior art cutter mechanism designed for cutting vegetation along the sloping shoulders and elevated banks of a highway was that the cutter was only operable on one lateral side of the support vehicle and it was necessary to reverse the direction of the vehicle to cut vegetation along the opposite side of the highway. Some attempts have been made to provide cutter mechanisms which could be moved from one lateral position to a second lateral position. However, most of these mechanisms utilized complicated control mechanisms which were unreliable in operation.

SUMMARY OF THE INVENTION

It is therefore a primary object of this invention to provide a rotary cutter mechanism which is capable of cutting vegetation along the sloping shoulders and elevated banks adjacent a highway and at a remote distance from a support vehicle.

It is a further object of this invention to provide a support assembly for a remote cutter head whereby the cutter head can be moved for operation in two opposite laterally extending positions substantially 180° displaced relative to each other.

Another object of this invention is to provide a cutter mechanism capable of cutting vegetations at a remote distance from support vehicle which includes safety means for releasing the cutter assembly from a lateral support position in response to a predetermined amount of pressure against the cutter head.

A still further object of this invention is to provide control means for moving a laterally supported cutter head from one

laterally extending position to an opposite laterally extending position.

Another object of this invention is to provide a cutter mechanism which includes means to facilitate easily attachment of the cutter and support assembly to a support vehicle.

A further object of this invention is to provide a cutter mechanism including a support housing which is provided with operable power means for delivering power to the control mechanisms of the cutter assembly.

Still another object of this invention is to provide a support mechanism for a laterally displaced cutter head which is yieldably in a vertical plane to prevent damage of the support mechanism.

A still further object of this invention is to provide a support mechanism for a laterally displaced cutter head which includes control means for effecting movement of the cutter head in a vertical plane.

A further object of this invention is to provide a cutter head having a shielding flange means which is detail for operation in two opposite directions.

A still further object of this invention is to provide a housing for a cutter mechanism which includes two movable shielding flange sections.

Another object of this invention is to provide a cutter mechanism for cutting vegetation along the sloping shoulders and elevated banks of a highway which is safe in operation.

An additional object of this invention is to provide a rotary cutter mechanism which is simple in construction, economical to manufacture and reliable in operation.

Still other objects and advantages of the invention will become apparent after reading the description of one illustrative embodiment of the invention, with reference to the attached drawings, wherein like reference characters have been used to refer to like parts throughout the several figures of drawings.

BRIEF DESCRIPTION OF THE FIGURES OF DRAWING

FIG. 1 is a fragmentary perspective view looking at the support vehicle and rotary cutter attachment from the right rear corner thereof.

FIG. 2 is an exploded perspective view of the boom and cutter head mechanism with certain parts being broken away and shown in section for purposes of clarity and with certain parts omitted.

FIG. 3 is a fragmentary elevational view of the boom support structure drawn on a larger scale with certain parts omitted and with certain parts being broken away and shown in sections for purposes of clarity.

FIG. 3A is a fragmentary elevational view similar to FIG. 3 showing an extended end of the boom support structure.

FIG. 3B is a fragmentary plan view of a inner-end connecting portion the boom structure with certain parts being omitted and certain parts broken away and shown in sections for purposes of clarity.

FIG. 4 is a left rear perspective view of the main support housing with certain parts being omitted for purposes of clarity.

FIG. 5 is a vertical sectional view taken substantially longitudinally through the center of the main support housing shown in FIG. 4.

FIG. 6 is an enlarged fragmentary elevational view of the main support housing, yoke support assembly and boom structure with control means.

FIG. 8 is a sectional view taken substantially along lines 8—8 of FIG. 7.

FIG. 8A is a sectional view similar to FIG. 8 showing the yoke assembly adjusted to a trailing position.

FIG. 8B is a sectional view similar to FIG. 8A showing the yokes support assembly adjusted to a opposite laterally extending position.

FIG. 9 is an enlarged top plan view of the cutter head assembly with certain parts omitted for purposes of clarity.

FIG. 10 is a vertical sectional view taken substantially along lines 10—10 of FIG. 9.

FIG. 11 is a side elevational view of the cutter head assembly as seen from the right of the FIG. 9 and drawn on a reduced schedule.

FIG. 12 is a side elevational view of the cutter head assembly as seen from the left of FIG. 9, and drawn on a reduced scale.

FIG. 13 is a sectional plan view similar to FIG. 8 showing a modification of the yoke control mechanism.

FIG. 14 is a schematic diagram showing the hydraulic pump, valve assembly, reservoir and electrical connector therefor.

GENERAL DESCRIPTION

The cutter mechanism of the present invention is shown attached to the trailing or rear edge of a prime mover support vehicle **1** and is generally illustrated in FIG. **1**. The cutter mechanism includes a base support housing **10** having an operable self-contained power supply means for delivering power to the cutter control mechanisms. A yoke assembly **100** is pivotally supported on the base support housing for pivotal movement about a vertical axis from one laterally extended position to a second opposite laterally extended position substantially 180° displaced relative to the first position. A boom means **200** is connected to the yoke assembly **100** for adjustment about a first horizontal axis and includes control means for effecting adjustment of the boom about the horizontal axis. A cutter head assembly **300** is pivotally connected to the extended end of the boom support means **200** for adjustment about a horizontal axis and includes control means for effecting the adjustment of the cutter head assembly. The cutter head assembly includes conventional hydraulic motor means operatively associated with a cutting blade. The control means for effecting adjustment of the yoke mechanism **100**, the boom mechanism **200**, and the cutter head assembly **300** includes conventional hydraulic control means which are detailed to receive a supply of hydraulic power from the operable power supply means located on the main support housing **10**. A detailed description of the main support housing **10**, the yoke assembly **100**, the boom means **200**, and the cutter head assembly **300** will be described hereinbelow.

BASE SUPPORT HOUSING

Referring now particularly to FIGS. **1**, **4** and **5**, the cutter support mechanism includes a base support housing **10**. The base support housing **10** is detailed for attachment to the prime mover supporting vehicle **1** by means of a series of forwardly projecting arms **11**, **12**, **13**, and **14**. The forward projecting ends of each of the support arms **11–14** includes an opening **15** which is detailed to receive a conventional connecting pin (not shown) for attachment of the base support housing to the main support vehicle **1**. As shown in FIGS. **4** and **5**, the base support housing includes a box like construction which is constructed of sheet metal material and includes a top supporting surface **16**, two side plates **17**, **18**, a rear plate **19** and a forward plate **20**. Contained within the base support housing **10** is a conventional hydraulic pump means **21** which is adapted to be connected to a power take off drive of the main support vehicle **1**, by conventional means, not shown. The hydraulic pump means **21** includes power supply lines **22**, **23**, which are detailed for delivering a supply of hydraulic power under pressure to a valve control assembly **25**. A plurality of fluid pressure supply lines **26** are detailed for providing a supply of fluid pressure to the relative control mechanisms as will be described hereinbelow.

As shown in FIG. **14**, the valve control assembly **25** includes an electrical connector element **28** which is adapted to receiver electrical signals from a control panel **2** located on the prime mover vehicle.

The valve mechanism **25** of the operable power supply means **21** is controlled by conventional solenoid means operated from the control panel **2** located on the vehicle. The details of the solenoid operated valve and the remote control panel are not shown herein since the details form no part of the present invention.

Referring now particularly to FIG. **5**, the base support housing **10**, includes a vertically oriented sleeve **29** which is connected to the top support plate **16** of the housing **10** and to a base support plate **30** of the support housing. The sleeve **29** is detailed to provide a vertically oriented bearing support for receiving a pivot shaft **108** of the yoke assembly which will be described hereinbelow. As shown in FIG. **4**, the base support housing **10** includes a bracket **31** detailed to provide a pair of spaced journal members **32**, **33**, which includes aligned openings **34** for receiving a connecting pin **114** to connect a control cylinder thereto for operation of the yoke assembly.

YOKE MEANS

The function of the yoke means **100** is to provide a support assembly whereby the boom **200** and cutter head assembly **300** can be connected to the base support housing **10** for adjustment about a vertical axis so that the cutter head assembly **300** can be moved from one laterally extended position through an arc of substantially 180° to an opposite laterally extended position.

Referring now particularly to FIG. **6**, the yoke mechanism **100** includes a main vertically extending leg portion **101** having a projecting first arm **102** located adjacent the top edge thereof and having a second arm **103** located adjacent the bottom end thereof. The two arms **102**, **103**, are detailed to be substantially coplanar and disposed parallel relative to each other. The arms **102**, **103**, are provided with spaced and aligned support members **104**, **105**, which are provided with coaxial openings **106**, **107**. The openings **106**, **107**, are detailed for receiving a support shaft **108**. The shaft **108** is detailed to be inserted through the sleeve **29** of the base support housing. The shaft **108** is held in position within the members **104**, **105**, by means of a threaded connecting bolt **109** extending through openings in members **104**, **105**, and shaft **108** and having a locking nut **110** threaded thereon (only one of the bolts **109** is shown in FIG. **6**.)

Adjustment of the yoke means **100** about the support shaft **108** is effected by means of a pair of hydraulic control cylinders **112**, **113**. The hydraulic control cylinder **112** includes a first end which is pivotally connected by a connecting pin **114** to the bracket mechanism **31** of the base support housing **10**. The hydraulic control cylinder **112** includes a conventional piston rod which has an extended end connected by a pin **116** to a pair of plate members **117**, **118**. The plate member **117**, **118**, are rotatably supported on the support shaft **108** between the top of sleeve **29** and yoke arm member **102** as shown in FIG. **7**. The hydraulic control cylinder **113** includes a first end which is pivotally connected by a pin **119** to a support bracket **120** which is provided beneath the arm **102** of the yoke assembly **100**. The bracket **120** is fixed to the base vertical support leg **101** of the yoke assembly and projects rearwardly therefrom in substantial alignment with the top leg members **102** and bottom leg member **103**. The hydraulic cylinders **113** include a conventional piston rod having an extended end which is connected by a pin **122** to the pair of rotatable plate members **117**, **118**.

The above described adjustment control means of the yoke assembly is detailed for adjusting the yoke from one laterally extending position adjacent one side of the base support housing through an arc of substantially 180° to a second laterally extending position adjacent an opposite side of the base support housing. To accomplish the 180° adjustment of the yoke, the first hydraulic control cylinder **112** which is connected to the base support housing **10** is detailed for effecting movement of the yoke assembly through a first 90° portion and operation of the second hydraulic cylinder **113** which is connected between the rotatable plates **117**, **118** and de-energized yoke bracket member **120** is detailed for effecting adjustment of the yoke assembly through a second substantially

90° portion. Thus, it can be seen by maintaining both of the hydraulic control cylinders **112**, **113**, in a de-energized position, the yoke means will be moved and maintained in a position whereby the yoke assembly is disposed adjacent the right side of the base support housing **10** or adjacent the side plate **18**. Operation of one of the hydraulic control cylinders **112**, **113**, will effect movement of the yoke assembly from the position adjacent side plate **18** to a trailing position substantially as shown in FIG. **1**. Further, operation of a second one of the hydraulic control cylinders **112**, **113**, will effect movement of the yoke means **100** to a second laterally extending position whereby the yoke assembly will be positioned adjacent the left side plate **17** of the base support housing.

Referring again to FIG. **6**, the yoke mechanism **100** includes a series of bracket members **125**. The bracket members **125** are fixed to the yoke assembly adjacent the upper edge of the main leg portion **101**. The bracket members **125** are detailed substantially parallel relative to each other and include a series of openings **126**, which are coaxially arranged relative to each other. The brackets **125** with openings **126** are detailed for receiving a pivot pin **127** which will attach the boom mechanism **200** to the yoke assembly as will be described hereinbelow.

As shown in FIG. **6**, the top leg member **102** of the yoke assembly includes a support bracket **128** adjacent the extended end thereof. The bracket **128** includes a pair of spaced and aligned sleeve elements **129** which include coaxial arranged openings **130** which are detailed to receive a connecting pin **131** for attachment of a hydraulic control cylinder **206** thereto for effecting operation of the boom about a horizontal axis as will be described hereinbelow.

MODIFICATION OF YOKE CONTROL MECHANISM

Referring now particularly to FIG. **13**, a modification for controlling the yoke assembly **100** is shown herein which includes a conventional hydraulic rotary actuator mechanism **140** which is operatively associated with the support shaft **108**. The rotary actuator mechanism **140** includes conventional input lines **141** for supplying fluid under pressure to the rotary actuator for effecting movement of the yoke assembly **100** from a position shown adjacent the right support plate **18** of the support housing **10** to a position 180° displaced therefrom adjacent the support plate **17**. The modification of the yoke control mechanism illustrated in FIG. **13** includes a releasable latch mechanism **142** which is operatively associated with the hydraulic rotary actuator **140** and the yoke assembly **100** to hole the yoke assembly **100** in either of the two laterally displaced positions.

The releasable latch mechanism **142** includes a pair of links **143**, **144**, which are pivotally connected adjacent one end to the rotary actuating mechanism **140**. Each of the links **143**, **144**, includes a telescoping rod element **145**, **146**, respectively, which is slidably received by the link elements **143**, **144**. The extending end of the rods **145**, **146** are pivotally connected to a movable latch element **147**, **148**, respectively. Latch elements **147**, **148**, are pivotally supported by a support bracket **149**, **150**, respectively, as shown in FIG. **13**. Supported on each of the rods **145**, **146**, between the link **143**, **144**, and the pivotal latch element **147**, **148**, is a compression spring element **151**, **152**, respectively which provides a yieldable connection between the links **143**, **144**, and the releasable latch means **147**, **148**. As shown in FIG. **13**, the latch elements **147**, **148**, include an end portion which is detailed to be inserted in a recessed notch portion **155** formed on the vertically extending leg **101** of the yoke assembly **100**. The above described releasable latch mechanism is detailed such that the latch elements **147**, **148**, will release from the yoke latch portion **155** in response to a predetermined amount of pressure being applied against the cutter head assembly **300** which is supported on the extended end of the boom structure **200**. The latch mechanism **142** is operatively associated with the rotary actuator **140** and the yoke assembly **100** such that as the yoke assembly is moved to a first laterally extending position, one of the latch elements **147** as shown in FIG. **13**, will be inserted in the recessed notch portion **155** and the second latch element **148** will be retracted to a non-effective position. However, operation of the rotary actuating mechanism to move the yoke support assembly **100** from the position shown in FIG. **13** to an opposite laterally supported position will effect movement of the latch **147** from a latching position to a releasable position and will effect movement of the latch element **148** into a latching position with the recess notch portion **155**.

The yoke control mechanism illustrated in FIG. **8** which includes the pair of hydraulic control cylinders **212**, **213**, includes conventional pressure responsive valve mechanism (not shown) within the control lines which would allow the yoke assembly to be moved from a laterally extended position to a trailing position in response to a predetermined amount of pressure applied to the cutter head assembly. The modification shown in FIG. **13** is detailed for effecting operation of the yoke assembly in a similar matter as illustrated in FIGS. **8**–**8A**, **8**, and **8B**. The releasable latch means illustrated in FIG. **13** could be either operatively associated with the rotary actuator mechanism **140** of FIG. **13** of could be associated with the yoke control means including the pair of hydraulic control cylinders **212**, **213** as shown in FIG. **8**.

BOOM ASSEMBLY

The function of the boom **200** is to provide a connection between the yoke assembly **100** and the cutter head assembly **300** whereby the cutter head assembly can be moved to various laterally extending positions and the cutter head assembly can be held in various angular disposed positions for cutting the vegetation on varying degrees of sloping shoulders and elevated banks.

Referring now particularly to FIGS. **2** and **3**, the boom **200** includes an inner boom section **201** and an outer boom section **202**.

The inner end of the inner boom section **201** is pivotally connected to the yoke assembly **100** for adjustment about a first horizontal axis. The inner and outer boom sections **201**, **202** are pivotally connected to each other for adjustment about a second horizontal axis. The extended end of the outer boom section **202** is pivotally connected to the cutter head assembly **300** for adjustment of the cutter head assembly **300** about a third horizontal axis. The inner and outer boom sections **201**, **202** are constructed of plates of heavy gauge sheet metal to form a tubular or box-like structures and are detailed for containing the hydraulic supply control lines and the hydraulic control cylinders for adjusting the cutter head assembly **300** relative to the outer boom section **202** and for adjusting the outer boom section **202** relative to the inner boom section **201**.

Referring now particularly to FIG. **3B**, the inner boom section **201** includes a pair of spaced sleeve elements **203**, **204** which includes aligned openings **205** for receiving a pivot pin **127** for attaching the boom assembly **200** to the yoke mechanism **100**.

Adjustment of the boom assembly **200** about the first horizontal axis is effected by means of a hydraulic power control cylinder **206**. The hydraulic power control cylinder **206** is connected adjacent one end by a support pin **131** which is inserted through the pair of spaced sleeve members **129** mounted on the yoke support bracket **128**. The hydraulic cylinder **206** includes a conventional piston rod **207** which is pivotally connected by a pin **208** to a bell crank assembly **209**. The bellcrank assembly **209** includes two laterally projecting arms **210**, **211**. Connected to bell crank arm **210** is a sleeve member **212** which includes an opening detailed for receiving the pivot connecting pin **127**. The above described pivotal connection between the bell crank assembly **209** and the pivot pin **127** permits the bell crank assembly and the boom assembly to be coaxially mounted. The second arm **211** of the

bell crank assembly **209** includes a pair of spaced sleeves **210***a* which is adapted to receive a collar attachment means **213**. The collar attachment means **213** is received on a support bolt **213A** which is a part of a spring biasing assembly **214**. The spring biasing assembly **214** includes a collar mechanism **215** which is provided with a connecting means **216** for attaching the collar assembly **215** to the boom housing at a position displaced from the first horizontal axis. A compression spring **217** is supported on the bolt **213A** below the collar assembly **215** and is held thereon by a retaining member **218**. The bell crank collar member **213** is received on the upper end of the bolt **213A** and is maintained thereon by means of a threaded connecting bolt **219**. A second spring **220** is held on the bolt **213** between the collar **212** and collar **215**.

The above described bell crank assembly **209** and spring biasing mechanism **214** provide a yieldable connection between the boom **200** and control cylinder **206**.

As shown in FIGS. **2** and **3**, the outer end of the inner boom section **201** includes a support bracket **221** which includes a plurality of spaced sleeve bearing members **222**. The inner end of the outer boom section **202** also includes a support bracket **223** having a plurality of spaced and aligned sleeve bearing members **224**. The sleeve members **224** of the outer boom section **202** are detailed to be inserted in the space between the sleeve members **222** of the inner boom sections **201**. A pivot pin **225** is inserted through a plurality of aligned openings of the sleeve members **222**, **224**, for pivotally connecting the outer boom section **202**, to the inner boom section **201** for pivotally adjusting about a second horizontal axis.

Adjustment of the outer boom section **202** about the second horizontal axis is effected by a hydraulic control cylinder **230**. The hydraulic control cylinder **230** is connected by a connecting pin **231** to the housing of the inner boom section **201**. The hydraulic control cylinder **230** includes a piston rod **232** which is connected by a pin **233** to a linkage mechanism **234**. The linkage mechanism **234** includes a first link **235** connected by pin **233** to the piston rod **232** and connected adjacent its opposite end to the outer boom section **202** by a pin **235A**. The linkage mechanism **234** also includes a stabilizing link **237** which is pivotally connected to the inner boom section by a connecting pin **238**. The other end of the stabilizing link **237** is pivotally connected to the first link **235** by a connecting pin **239**.

As shown in FIGS. **2** and **3**, the extended outer end of the outer boom section **202** includes a support bracket **240** which is provided with a sleeve bearing element **241** detailed to be inserted between the aligned openings **312**, **313**, of the vertically extending plates **310**, **311**, for receiving a connecting pin **242** which will connect the cutter head assembly **300** to the outer boom section **202** for pivotal adjustment about a third horizontal axis.

Adjustment of the cutter head assembly **300** about the third horizontal axis is effected by a hydraulic control cylinder **245** which is pivotally connected adjacent one end by a pin **246** to the outer boom section **202**. The hydraulic control cylinder **245** includes a conventional piston rod **247** which has an extended end connected by a pin **248** to a linkage assembly **250**. The linkage assembly **250** includes a first link **251** which is pivotally connected to piston rod **247** by pin **248** and is pivotally connected to the cutter head assembly **300** by means of a pin **252** inserted through an opening **253** in the two vertically extended plates **310**, **311**. The linkage assembly **250** also includes a stabilizing link **253A** which has a first end pivotally connected to bracket **240** by a pin **254** and has a second end pivotally connected to the first link **251** by a second connecting pin **255**.

From the above description of the boom mechanism, it is apparent that the inner boom section **201** can be adjusted about the first horizontal axis by operation of the hydraulic control cylinder **206** which will effect movement of the bell crank assembly **209**. Further, the inner boom section **201** and outer boom section **202** can be adjusted relative to each other about the second horizontal axis by operation of the hydraulic control cylinder **230** to effect movement of the linkage assembly **234**. Further, the cutter head assembly **300** can be adjusted about the third horizontal axis by operating the hydraulic control cylinder **245** to effect operation of the linkage assembly **250**.

The pivotal connection of the inner boom section **201** to the yoke mechanism **100** and the hydraulic control mechanism **206**, **209** are detailed to permit the inner boom section **201** to be adjusted through an arc of substantially greater than 90°. The pivotal connection of the inner boom section **201** to the outer boom section **202** and the controls therefore are detailed to permit the inner and outer boom section to be adjusted through an arc of substantially greater than 90°. Also, the pivotal connection between the outer boom section **202**, the cutter head assembly **300**, and the control means therefore are detailed to permit the adjustment of the cutter head assembly **300** relative to the outer boom section **202**, through an arc substantially greater than 90°.

CUTTER HEAD ASSEMBLY

The function of the cutter head assembly **300** is to contain a rotary cutting blade which will effect cutting of vegetation. The cutter assembly **300** also includes control means for effecting operation of the cutting blade and for effecting pivotal movement of the cutter assembly **300** to various angular disposed positions.

Referring now particularly to FIGS. **1**, **2**, and **9–12**, the cutter head assembly **300** includes a main housing **301** as shown in FIG. **2**. The housing **301** includes a top surface **302** with two oppositely disposed depending flange members **303**, **304**. A series of ribbed reinforcing portions **305** are provided on the top surface **302** as shown in FIGS. **2** and **10** for increasing the rigidity of the top surface **302**. An angular reinforcing member **306** is provided along the edge of the top surface **302** and along the edge of the flanges **303**, **304**, to provide still further rigidity to the support housing **301**. As shown in FIG. **2**, the main support housing **301** includes a transverse attachment housing **307** which is fixed to the main support housing **301** adjacent and intermediate portion thereof and is arranged to extend laterally of the main support housing. The transverse attachment housing **307** includes two oppositely extending reinforcing portions **308**, **309**, which extend from a central area to a position adjacent the depending flange members **303**, **304**. Connected to the transverse attachment housing **307** adjacent the center of the main support housing are a pair of vertically extending support plates **310**, **311**. The support plates **310**, **311** are fixed to the transverse attachment housing in substantially a parallel relationship. The upper extended end of each of the support plates **310**, **311**, includes a pair of openings **312**, **313**, which are coaxially aligned and adapted to receive a pivot pin **242** for pivotally attaching the cutter head assembly **300** to the extended end of the outer boom section **202**. Extending from adjacent the top of the support plates **310**, **311**, are a pair of arcuate reinforcing and guide members **316**, **317** which terminate adjacent the transverse attachment housing and the top surface **302** of the main support housing **301**. A vertically oriented mounting plate **318** is connected between the arcuate reinforcing guide members **316**, **317**, as shown in FIG. **2**. A cross connecting frame element **319** is also connected between arcuate reinforcing members **316**, **317** at a position inwardly spaced from the mounting plate **318**.

Referring now particularly to FIG. **10**, the transverse attachment housing **307** includes a horizontally disposed plate member **320** which is designed for supporting a conventional hydraulic motor **321**. The hydraulic motor **321** is connected to the mounting plate **320** by a series of threading connecting bolts **323**, only two of which are shown in FIG. **10**. Control of the hydraulic motor **321** is effected through a conventional hydraulic supply line **322** as shown in FIG. **9**. A second support plate **324** is connected to the transverse attachment housing **307** in downwardly displaced relationship relative to the

mounting plate 318. As shown in FIG. 10, the mounting plate 324 is substantially coplanar with the top surface 302 of the main support housing. The mounting plate 324 is detailed for supporting a bearing element 325. The bearing element 325 is connected to the support plate 324 by a series of connecting bolts 326, only two of which are shown in FIG. 10. The hydraulic motor 321 includes a drive shaft 327 as shown in FIG. 10 and is connected by means of an adapter 328 to a cutter mechanism drive shaft 329.

Referring to FIG. 10, the cutter mechanism includes a circular support plate 330 which is fixed to the cutter drive shaft 329 by conventional means not shown. The cutter mechanism includes a pair of cutter knives 331, 332, pivotally connected adjacent the edge of the circular support plate 330. The cutter knives 331, 332, are connected to the support plate 330 in such a manner that each of the knives are angularly displaced substantially 180° relative to each other. The cutter knives 331, 332, are pivotally connected to the circular plate 330 by means of a support lug 333. The support lug 333 includes an enlarged head 334 and a shoulder portion 335 for rotatably receiving the cutter knife 331, 332. The support lug 333 includes a body portion which extends through the support plate 330 and is held in position thereon by means of a threaded nut 336 and a cotter pin 337. An additional locking means in the form of a set screw 338 is provided for securely locking the support lug 333 to the support plate 330, as shown in FIG. 10.

Referring now particularly to FIGS. 2, 9, 11, cutter head assembly includes a pair of movable flange members 340, 341. Each of the movable flange members 340, 341, includes an arcuate shaped top surface portion 342 and a depending curved flange portion 344. A reinforcing border member 343 is provided along one edge of the arcuate shaped top surface 342 and a reinforcing border member 345 is provided along depending edges of a curved flange 344, as shown in FIG. 2. Each of the movable flange members 340, 341, is provided with three vertically projecting support brackets 346, 347, 348. Each of the support brackets 346 – 348 includes a pivot receiving opening 349. The pivot receiving openings 349 in each of the support brackets are detailed to be in coaxial alignment relative to each other. The two outer vertically projecting brackets 346, 348, are detailed to be connected to support brackets 350 and 351 which are provided on the top surface 302 of the main support housing 301. The support brackets 346, 348, and brackets 350, 351, are detailed to receive pivot support pins 352. The center vertically projecting bracket 347 is pivotally connected to a third center support bracket 353 by means of a pivot connecting pin 354. The center support brackets 353 are also provided on the top surface 302 of the main cutter housing 301. The center support bracket 353 includes a pair of vertically extending members 355. Connected between an upper end of a vertically extended members 355 is a hydraulic control member 356 which is connected thereto by means of a pivot pin 357. The control cylinder 356 includes a conventional piston rod 358 which has its extended end connected by means of a pivot pin 359 to an opening 360 provided in the center vertically projected bracket 347. Operation of the control cylinder 356 is provided by means of a pair of hydraulic control lines 361, 362, from control valve 363. The control valve 363 further includes control lines 364, 365, which are hydraulically connected to the fluid supply line 322 detailed for providing power to the hydraulic motor 321.

The operation of the cutter head assembly, in so far as the positioning of the two movable flange members and the other control members of the control head assembly will be described hereinbelow in the operation of the mechanism.

OPERATIONS

To begin an operation of the rotary cutter mechanism of the present invention, the rotary cutter mechanism is mounted on a prime mover vehicle 1, by inserting conventional connecting pins through the openings 15 in each of the forward projection arms 11 – 14. A conventional rotary drive connection is made between the power take off of the prime mover vehicle and the drive shaft of the hydraulic pump mechanism 21. The control panel 2 on the prime mover vehicle is then operatively connected to the valve assembly 25 by making an electrical connection to the electrical connector 28. As shown in the schematic diagram of FIG. 14, the operable power supply means contained on the basic support housing 10 includes a conventional hydraulic pump 21 which is driven by conventional power take off means from the prime mover vehicle. The hydraulic pump 21 includes a high pressure power supply line 22 for delivering fluid under pressure to a valve assembly mechanism 25. The valve assembly 25 is a conventional solenoid control valve mechanism which receives electrical signals from the control panel 2 of the prime mover vehicle through the electrical connector element 28. The valve assembly 25 includes a plurality of supply lines 26 for delivering fluid power under pressure to each of the control mechanisms of the cutter mechanism. The return supply of fluid under pressure is delivered to a reservoir mechanism 35 which has connection 23 to the hydraulic pump 21. The hydraulic pump 21 and reservoir 35 are contained within the base support housing 10 and the valve assembly 25 is supported on housing 10 and the valve assembly 25 is supported adjacent the top plate 16 of the support housing, as illustrated in FIG. 1.

After the cutter mechanism has been mounted on the prime mover vehicle as outlined above, the controls are operated to effect operation of either of the hydraulic cylinders 112, 113 to position the yoke support assembly 100 and boom 200 in the desired laterally extending position for effecting a cutting operation at a remote position laterally along one side of the prime moving vehicle 1. It is pointed out that the hydraulic control cylinders 112, 113, includes conditional pressure release means which will allow the yoke support assembly 100 and boom support structure 200 to be released from a laterally extending position to a trailing position in response to a predetermined amount of pressure being applied to the rotary cutter head. As stated hereinabove the operation of one of the hydraulic cylinders 112, 113 will effect movement from a first laterally extending position illustrated in FIG. 8 to a trailing position illustrated in FIG. 8A and operation of a second one of the hydraulic cylinders 112, 113 will effect movement of the yoke support assembly 100 from a trailing position shown in FIG. 8A to a second laterally extending position shown in FIG. 8B which is angularly displaced relative to the first position by substantially 180°. The above described operation of the yoke control mechanism will allow the cutter head to be positioned on either of the two laterally extending sides of the support housing whereby the vegetation can be cut on either side of the prime mover vehicle as it is moved along in a first direction.

Operation of the hydraulic control cylinders 206, 230, and 245 is effected to position the rotary cutter head 300 at a desired laterally spaced position and at a desired angularly oriented position whereby vegetations can be cut on varying degrees of sloping shoulders and elevated banks.

It is pointed out that the above described linkage mechanism 235, 250 associated with the hydraulic control cylinders 230, 245, respectively are detailed to allow the control cylinders 230, 245, to effect movement of the outer boom section 202 and rotary cutter head 300 through various angular positions substantially greater than 90°. Further, the linkage mechanism 235, 250 provide a mechanical advantage for the hydraulic control cylinders 230, 245, and allows the hydraulic control cylinders to be operated through their extended length without interference with the housing structure of the two boom sections 201, 202.

It now becomes apparent that the above described illustrated embodiment of the rotary cutter mechanism is capable of obtaining the above stated objects and advantages. Further it is obvious that those skilled in the art may make modifications in the details of construction without departing from the spirit of the invention which is to be limited only by the scope of the depending claims.

What is claimed is:

1. A cutter mechanism for use in cutting vegetation and designed for attachment to a vehicle, comprising in combination; a base support housing including means for easy attachment of the housing to a vehicle and also including operable power means for delivering power to cutter control mechanisms, yoke means mounted on said base support housing for pivotal movement about a substantially vertical axis, control means operatively associated with said yoke means, said base support housing and said operable power means for effecting pivotal movement of said yoke means about said vertical axis, boom means pivotally mounted adjacent one end on said yoke means for pivotal movement about a substantially horizontal axis, control means operatively associated with said boom means, yoke means and operable power means for effecting pivotal movement of said boom means about said horizontal axis, said boom means including an inner portion and an extended end portion pivotally mounted at its inner end on the outer end of said inner portion, a cutter head mounted at the outer end of said extended portion for pivotal movement about a substantially horizontal axis, said cutter head including a cutting blade having control means operatively associated with said operable power means for effecting operation of said cutter blade, and control means operatively associated with said cutter head, said boom means and said operable power means for effecting pivotal movement of said cutter head about said last mentioned horizontal axis.

2. A cutter mechanism as described in claim 1 further characterized in that said yoke means is pivotally mounted on said base support housing for pivotal movement through an arc of substantially 180° whereby said yoke means can be positioned laterally on either of two opposite sides of said housing, and in that said yoke means includes releasable holding means for holding it selectively in either of such lateral positions.

3. A cutter mechanism as in claim 2 further characterized in that said releasable holding means includes a latch receiving notch portion defined on said yoke means and wherein a pair of spring biased and movable latch elements are provided, one such element being located on each of two opposite sides of the base support housing, said movable latch elements being adapted to engage said latch receiving notch portion selectively as the yoke means is positioned laterally at one side of said base support housing or the other, said spring biased and movable latch elements being detailed to be released from said latch receiving notch element in response to a predetermined pressure being applied to said boom means.

4. A cutter mechanism as described in claim 3 further characterized in that said pair of latch elements are operatively associated with said yoke control means and wherein alternate ones of said latch elements are rendered effective in response to said yoke control means moving said yoke to a laterally extending position adjacent a lateral side of said housing and adjacent said one of said latch elements.

5. A cutter mechanism as defined in claim 1 further characterized in that said yoke control means includes hydraulic power means for moving said yoke means about said vertical axis whereby said yoke with said boom and cutter head can be positioned adjacent one lateral side edge of said support housing and can be moved to an opposite lateral side edge of said support housing and wherein said hydraulic power means includes releasable means operatively associated with said control means for releasing said yoke means from said laterally extending position in response to a predetermined amount of pressure being applied to said boom and cutter head.

6. A cutter mechanism as described in claim 1 further characterized in that said yoke control means includes a pair of hydraulic control cylinders and a pivotally mounted control plate and wherein one of said control cylinders is supported between said housing and said control plate and said other hydraulic cylinder is supported between said yoke and said control plate, whereby operation of one of said hydraulic cylinders will effect movement of said yoke and said boom through an arc of substantially 90° and operation of said second hydraulic cylinder will effect movement of said yoke and boom through a second arc of 90°.

7. A cutter mechanism as described in claim 1 further characterized in that said boom control means includes a bell crank assembly having one end coaxially mounted relative to said horizontal pivot axis of said boom, said bell crank including spring biasing connecting means connected to an opposite end of said bell crank and to said boom at a position spaced from said horizontal axis and wherein said control means includes a hydraulic cylinder operatively connected to said bell crank and said yoke support means.

8. A cutter mechanism as described in claim 1 further characterized in that said cutter head includes a pair of pivotally mounted flange means supported for pivotal movement between a retracted inoperative position and an extended position wherein said flanges are angularly disposed in the plane of said cutter blade for providing a shield for debris being cut by said cutter blade and wherein control means is operatively associated with each of said flange means and said operable power means for effecting movement of said flange means from said extended operable position to said retracted inoperable position.

9. A cutter mechanism for use in cutting vegetation, detailed for attachment to a prime mover vehicle and comprising a base support housing including means for attachment of said housing to said vehicle, and wherein said housing includes a self-contained hydraulic control system, said attachment means including a power take off connection and a plug-in electrical control means, a cutter head including a cutting blade having control means operatively associated with said hydraulic control system for effecting operation of said cutting blade, and means for supporting said cutter head on said base support housing, said cutter head including a depending flange for providing a lateral shield against objects thrown outwardly by said cutting blade, said flange including two movable sections, each section being mounted for movement to and from an extended shielding position and means operatively associated with each of said sections for effecting such movement of said sections.

10. A cutter mechanism as described in claim 9 further characterized in that said means for supporting the cutter head may be moved about a vertical axis through an arc of substantially 180° with respect to said vehicle.

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