April 12, 1966 R. D. MacDONALD 3,245,159

ROAD TRENCHER

Filed May 10, 1963 4 Sheets-Sheet 1

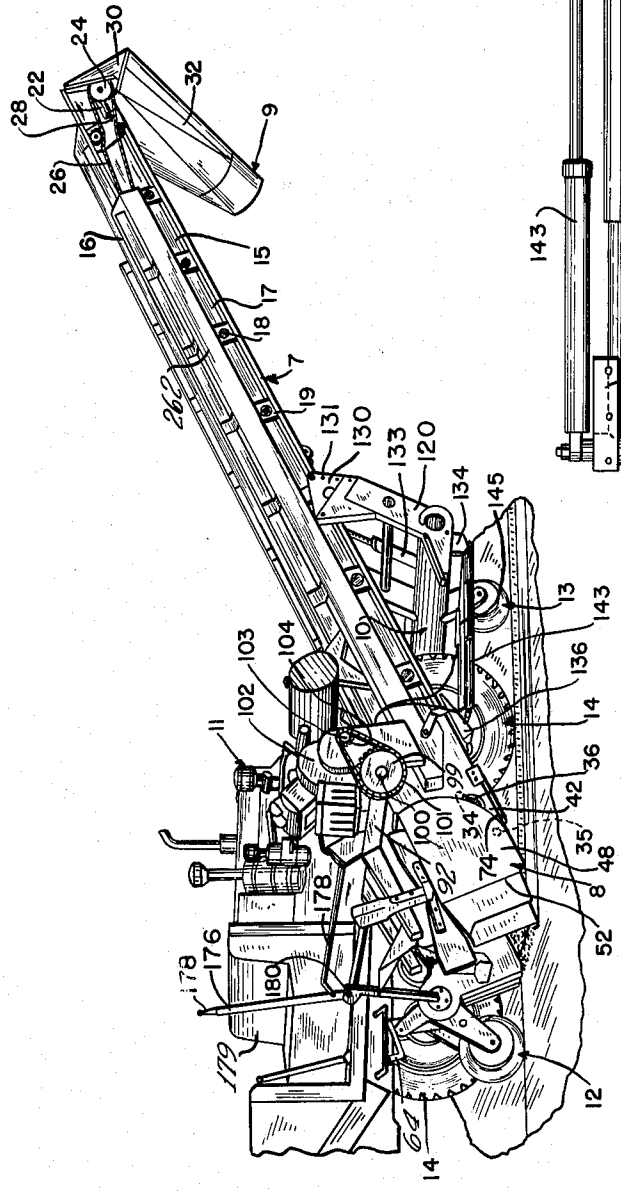


FIG. 1

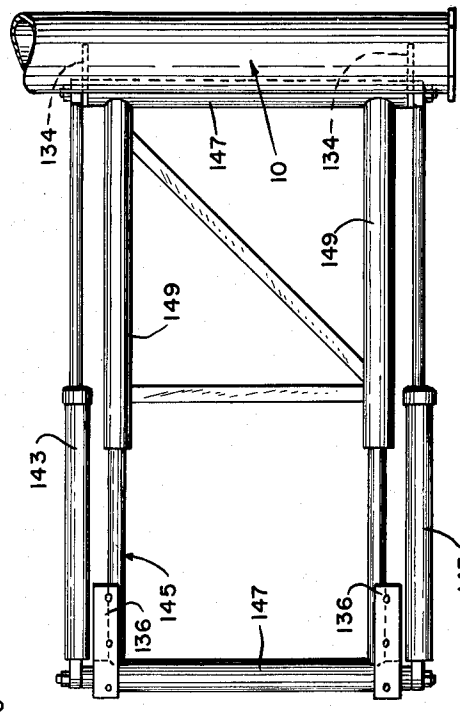


FIG. 6

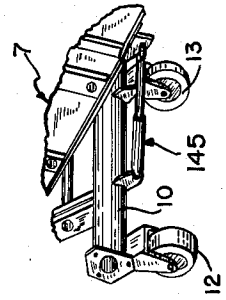


FIG. 5

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ROAD TRENCHER

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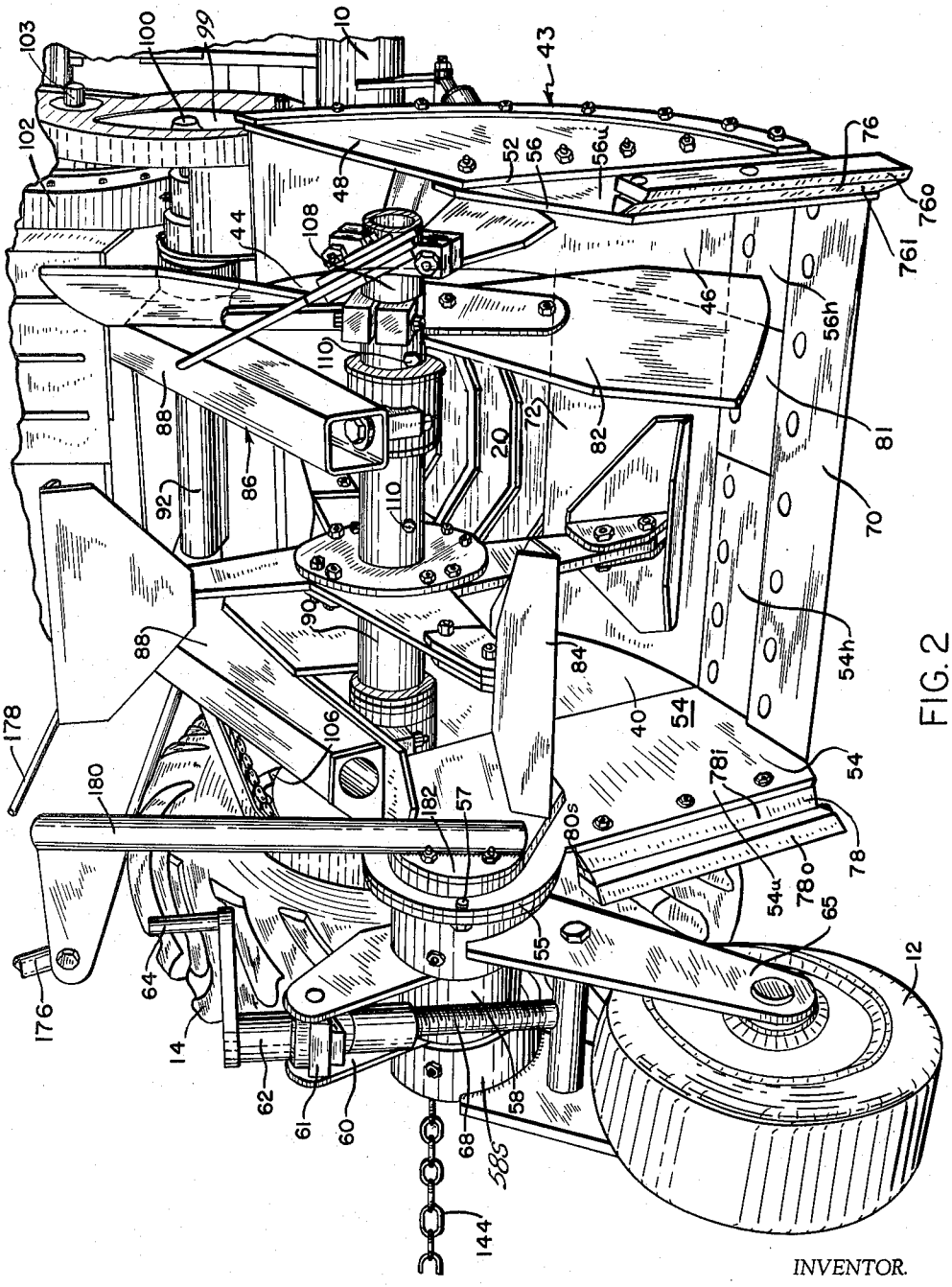


FIG. 2

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April 12, 1966 R. D. MacDONALD 3,245,159

ROAD TRENCHER

Filed May 10, 1963 4 Sheets-Sheet 3

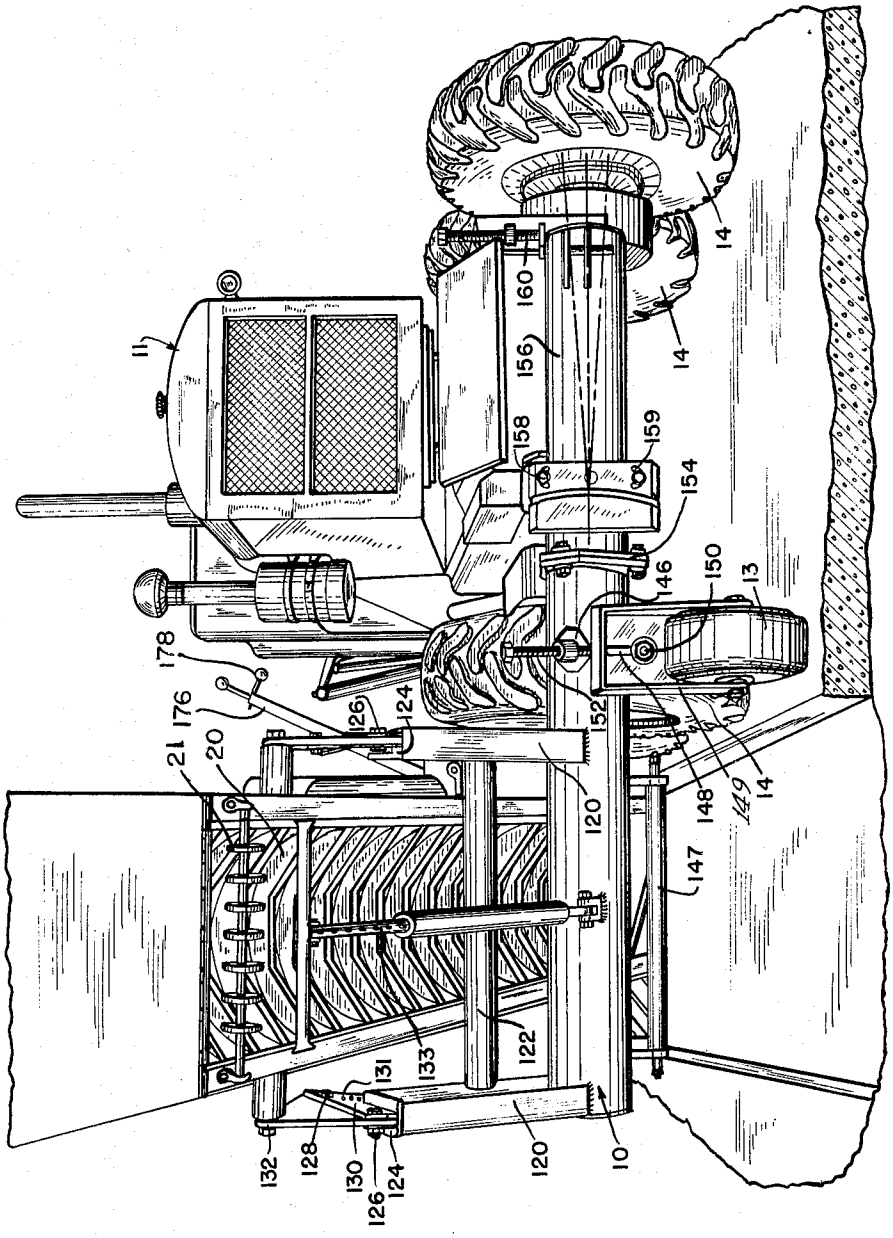


FIG. 3

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ROAD TRENCHER

Filed May 10, 1963 4 Sheets-Sheet 4

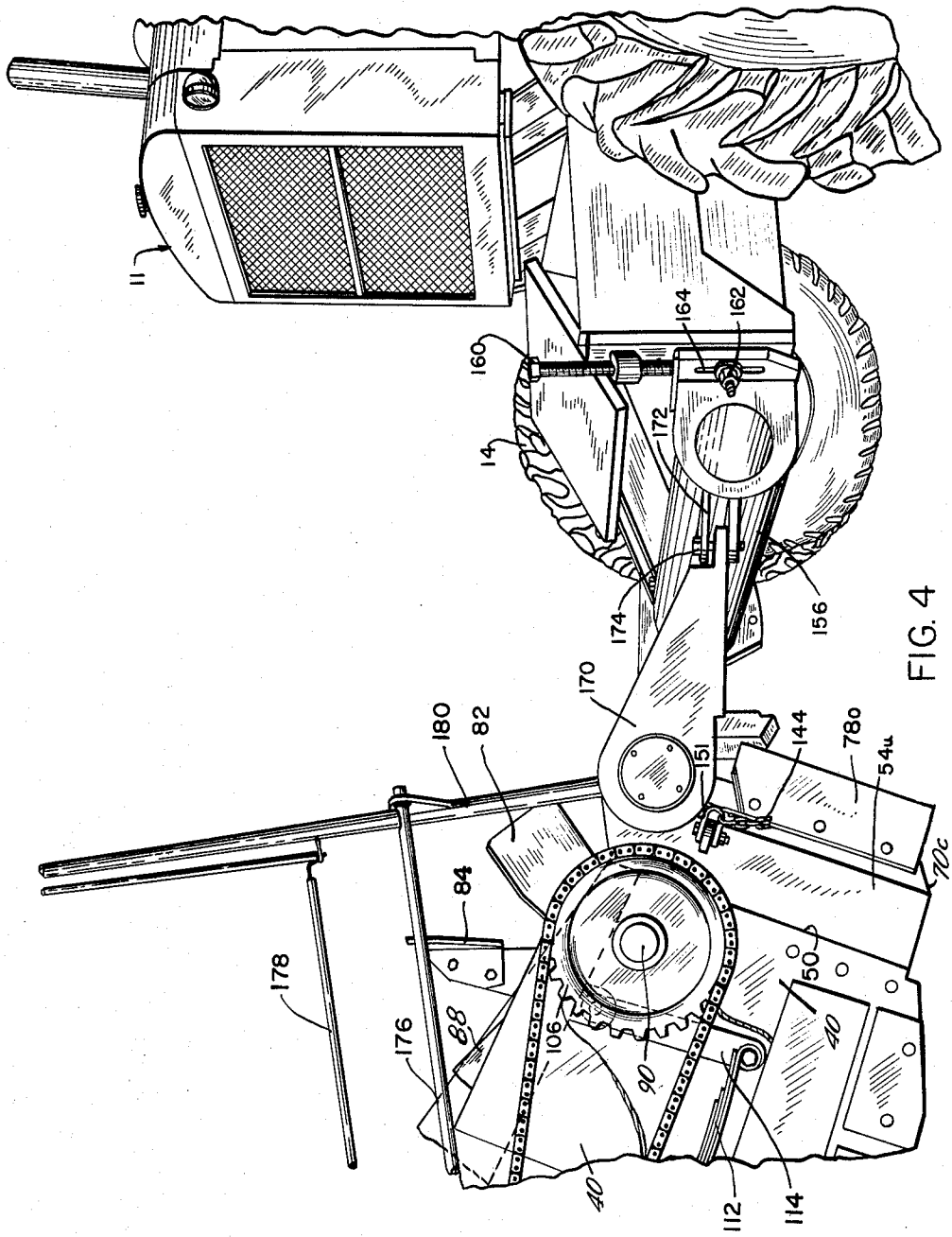


FIG. 4

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United States Patent Office 3,245,159 Patented Apr. 12, 1966



3,245,159

# ROAD TRENCHER

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Filed May 10, 1963, Ser. No. 279,438
16 Claims. (Cl. 37—101)

The present invention relates generally to road building equipment for operation by a motor driven vehicle and more particularly to a road trencher attachment trenching, berm cutting and windrow loading.

By way of example, the present invention is illustrated in connection with a motor grader driven at the rear by four pneumatic road wheels located just behind the operator's seat; steered by front wheels; and provided with a scraper blade operated by a circle that is movable laterally.

The invention is characterized by a trencher attachment that is side mounted on the motor grader at the rear end thereof and extends forwardly along the side of the grader to a point below the operator's seat but in rear of the motor grader scraper blade where it has a trench cutting mechanism that cuts and loosens its own material; bottoms and carves the sides of a trench up to and along the edge of the paved portion of the roadway; and, moves the loosened material away from the cutting edges and onto a belt conveyor to elevate and load it on a truck following the grader, all in one operation when propelled forwardly by the motor grader. The controls for the attachment are located right next to the operator's seat on the motor grader.

One of the objects of the invention is to gauge the depth of the trench cut along the edge of the roadway independently of any vertical movement of the grader frame on its pneumatic road wheels and to control the grade or slope of the cut in conjunction with the laterally spaced grader road wheels running on the roadway.

Another object of the invention is to locate the trench cutting mechanism in close proximity to the motor vehicle and rapidly relieve the cutters of the burden of the material loosened by them whereby side draft effects on the motor vehicle are negligible.

Another object of the invention is to provide an adjustable frame support relationship in which maximum truck loading height is maintained behind the grader regardless of the depth and grade of the trench during trenching operations and below the minimal road clearances during transportation.

The invention also contemplates positive and uniform depth control by longitudinally spaced road wheels tired with solid rubber and running in tandem along the edge of the roadway in close proximity to the inner side of the trench.

A further object of the invention is to balance to a major degree while trenching the tendency of the bottom cutting edge to cut deeper with a downward side cutting component that not only tends to plane and lift the bottom cutting edge, but also cleanly shears the sides of the trench without uprooting or disturbing ground material adjacent to the cut.

It is also an object of the invention to vary the width of the cut with a rugged feeder housing construction that is easily handled including replaceable side and bottom cutters.

Furthermore, by moving the trencher depth gauge wheel from its forward tandem position to a position lateral to the slope control trailing wheel, the attachment can be disconnected from its side mount position and towed in line with the motor grader for transport without occupying more than one traffic lane of the highway.



A further object of the invention is to provide a trencher which leaves a clean cut with undisturbed side walls and with the surfaces adjacent to the trench clean of any loose material so that the trench may be cleanly filled with road building material and the road when thus widened is ready for use without need for removing any loose dirt either on the roadway or on the berm. Intersecting side roads are also open for immediate use.

These being among the objects other and further objects of the invention will appear from the description herein and the drawings relating thereto in which:

FIG. 1 is a side elevation showing the trencher attachment in place on a motor grader ready for work,

FIG. 2 is a front perspective view looking into the mouth of the trench cutting mechanism,

FIG. 3 is a rear perspective view showing the torque tube main frame mounting arrangement,

FIG. 4 is a side view of the in-line trailing transport tow hitch,

FIG. 5 is a side elevation showing the location of the gauge wheels upon the main frame torque tube when arranged for transport towing, and

FIG. 6 is a top plan view of the anti-torsion device by which the front end of the conveyor can be raised and lowered.

Referring now to the drawings in further detail, the trencher attachment comprises a conveyor belt section **7** supporting a trenching mechanism **8** on the lower front end and a truck loading spout **9** at the upper back end. The conveyor belt section is supported on a main frame torque member in the form of a tube **10** attached to a slope control tube **156** on the motor grader **11** and its weight carried front and back by a front gauge wheel **12** and slope control rear trailing wheel **13** both having solid rubber tires. The gauge and trailing wheels are arranged to run upon the roadway in tandem alignment with the left side motor grader road wheels **14**.

The conveyor belt frame **15** comprises two side frame members **16** and **17** that are cross braced by torque tube cross struts **18** welded thereto at spaced points where they extend through the side frames and also reinforcing box rib members **19** welded to the side frames. An endless conveyor belt **20**, cleated to carry loose material upwardly and rearwardly, is received between the side frames and is carried on support rollers (not shown) spaced throughout the length of the frame in a conventional manner for supporting the upgoing portion of the belt and self cleaning return rollers **21** supporting the return portion of the belt. The upper end of the conveyor belt is driven by a head pulley (not shown) journalled in slidable bearing blocks **22** and driven by a sprocket wheel **24** and chain **26**. Jack screws **28** adjust the bearings to center the belt and take up any belt slack and the chain extends through a channel **262** on the side of the frame **15** to a driving sprocket (not shown) connected to the engine transmission **102**.

The truck loading spout **9** comprises a hood **30** at the top of the upper end of the belt and a spout **32** therebelow. The spout is detachably mounted to the hood for delivery on either side of the trench in that it can be readily unhooked and reversed to discharge the loose material either inwardly behind the motor grader where a truck (not shown) may run in line with the motor grader to receive it or outwardly back on the shoulder of the road next to the trench if desired. Preferably, the use of a truck keeps the roadway and berm of the road clear of loose material or windrows so that road building machinery can go to work at once to fill the trench with road building material.

The trench cutting mechanism **8** is secured to the front end of the side frames **16** and **17** and it in turn journals

at approximately 35 a self cleaning foot or tail pulley (not shown) for the lower end of the conveyor belt as carried by bearing blocks slidably adjusted for belt centering by jack screws 34 accessible through holes 36 in the side frames.

The trench cutting mechanism is concerned with the support of two heavy right angle cutter supports; means for changing the space between them to vary the width of the trench; a spade paddle wheel feeder unit to move the loosened material to the conveyor belt; and, also an auger paddle wheel to feed the loosened material laterally into the path of the spade paddle wheel when the trench cutter is widened beyond a minimum 28" cut as determined by the cutter supports without a spacer between them.

A heavy feeder housing side plate 42 is bolted as an elongation of side frame 17, as shown in FIG. 1. A corresponding feeder housing plate is bolted to side frame 16, the extension of which is shown as side plate 40 in FIG. 2. Plate 42 at its front end is arcuately cut away as at 44 to accommodate the arc of the auger paddle wheel 84 when the feeder housing 43 is widened and follows down and in under the auger paddle. The auger paddle wheel 82 can be removed and plate 48 bolted to plate 42 for digging a trench of minimum width, as hereafter explained. Alternatively, a wider trench may be dug by bolting a complementary curved insert or auger back plate 46 of a selected width to the arcuate edge 44 of the plate 42. If the back plate 46 is used, the plate 48 is in turn bolted to the back plate 46 as shown in the drawings to provide an auger feeder extension of the feeder housing. The plate 40 on the other side extends forwardly the same distance as plate 48 and both terminate in straight edges that are disposed approximately normal to the conveyor frames so that with the conveyor frame at an incline, their leading edges 50 (FIG. 4) and 52 are inclined forwardly.

Bolted to the leading edges 50 and 52 are the right angle cutter support members 54 and 56, right and left respectively. These support members comprising an upstanding portion, 54*u* and 56*u* respectively, and a horizontal portion, 54*h* and 56*h* respectively are of heavy stock because they carry all of the work effort of the cutters they support. Member 54 additionally carries the downward cutting strain imposed upon the front gauge wheel 12.

In accomplishing this, the upright portion 54*u* of the cutter support 54 extends upwardly and forwardly where it is rounded as at 55 to receive a stub tube torque member 58 in flange bolted relation with three bolts 57 threaded thereto. The torque member has ears 60 welded thereto to support a trunnion 61 having the flanged shank of a jack sleeve nut 62 supported thereby rotated manually by handle 64. The gauge wheel support frame or fork 65 is pivoted on the torque member 58 by split-ring sleeve 58*s* slotted to accommodate the trunnion support ears 60 with the gauge wheel 12 disposed ahead of the cutter support members 54 and 56. The male member 68 of the screw jack is threaded into the sleeve nut 62 for positive adjustment of the height of the gauge wheel 12 with respect to the horizontal portion 54*h* of the cutter support 54 by use of the handle 64. This pivotal support of the front gauge wheel provides a high range of cutter depth control located directly in front of and in tandem with the left rear road wheels 14 of the motor grader.

With the other vertical portion 56*u* of the cutter support 56 bolted to the leading edge of plate 48 as shown, the two horizontal portions 54*h* and 56*h* are tied together by a heavy bottom cutter bar 70 bolted thereto on top of and along their leading edges. A bottom section or pan 72 is bolted along the trailing edges of the horizontal portions 54*h* and 56*h* along the side of the auger back plate 44 to catch the material loosened by the cutting edge and guide it back towards the lower end of the conveyor belt. Also bolted to the rear edges of portions 54*h* and 56*h* are the front edges of sectional dirt guards 74 for the protection of the lower bottom side of the conveyor belt. These elements rigidify the cutter supports. The bottom cutting edge 70 is beveled on the bottom side as at 70*c* (FIG. 4) to provide uniform planing action with minimum power.

The vertical edges have double thicknesses of plate members externally bolted to their front edges and beveled outwardly on their front inside face edges. Both left side plate members 76*i* and 76*o* on the portion 56*u* are disposed in face to face contact with their bevels disposed coplanar, while the right side plate members 78*i* and 78*o* on portion 54*u* have provision for clamping shims 80*s* therebetween. The inner members 76*i* and 78*i* serves as stiffeners and are also beveled at their lower corners to match the bevel on the bottom cutter bar 70 while the lower front corners of the outside member 76*o* and 78*o* are left with square corners to extend below the level of the bottom cutter bar 70.

The use of shims varies the overall cutting width of the side cutting blades 76*o* and 78*o* to provide a fine variable trench width adjustment.

It will be observed that the bottom cutting edge of bar 70 appreciably trails the bottom corners of the vertical side cutting edges 76*o* and 78*o*, but is slightly above the bottom corners of the side cutter edges so that the lower corners overscore the bottom cut to assure a clean and uniform trench. The forward incline of the side plate edges and their bevel shear the dirt cleanly in a downward and forward direction and the reaction force developed thereby urges the cutters upwardly to balance to a major extent the suctional downpull of the ground material on the bottom cutter. Thus, a clean square walled trench is formed as solidly gauged in depth by the solid rubber gauge wheel 12 running along the paved edge of the roadway, and this depth can be readily adjusted by the handle 64.

When a wider trench is desired, as where a 38" width is required instead of the 28" width just described, a 38" long cutting blade is provided and bolted in place with a 10" spacer bottom section 81 disposed between the ends of the horizontal portions 54*h* and 56*h*. The arcuate auger backplate 80*s* which matches the width of the bottom section is also bolted in place between the plates 42 and 48 along their arcuate edges and to the bottom pan 72 to provide a larger sized feeder housing. Other widths can be selected up to 48" so that the trench can be cut up to 24" deep and 48" wide at motor grader speeds.

Assuming that loose material is sliding onto the horizontal portions 54*h*, and 56*h* and spacer 81, this material is propelled laterally onto bottom pan 72 into alignment with the conveyor belt by the auger paddle feeder wheel 82 and longitudinally onto the conveyor belt by the spade paddle feeder wheel 84. The axis of the wheel 82 and 84 is located to the rear of the bottom cutting edge 70.

These wheels are mounted on a floating frame 86 comprising a torque tube 92 and spaced offset feeder arms 88 arched to accommodate lateral feed of the auger blades to the spade paddle wheel. The arms 88 are secured at their upper ends to the torque tube 92 and the torque tube in turn is pivoted to the upper edges of plates 40 and 42 and journals a shaft 100 which carries at one end (FIG. 1) a large sprocket wheel 99 driven by sprocket chain 101 from the output shaft 103 of the engine transmission 102. At its other end the journalled shaft 100 carries a small sprocket wheel (not shown) which drives a large sprocket wheel 106 (FIG. 4) mounted on a tubular shaft 90 to rotate the paddle wheels 82 and 84 at approximately 40 r.p.m. The tubular shaft is journalled on and flanged to brace the front ends of the feeder arms 88.

The spade paddle wheel 84 is mounted on the tubular shaft 90 between the arms 88 and has pusher type blades which strip on their leading edges upon delivery of material to the conveyor belt. The shaft 103 telescopes into the tubular shaft 90 and extends beyond one of the arms 88 to receive the auger paddle wheel 82 clamped thereon.

at various desired spaced relationships depending upon the width of the cut. The spade paddle wheel handles a 28" cut and the auger paddle wheels are added and expanded only if the width of the cut is made substantially greater. The shaft **108** is extendable as locked in position by through bolts **110** extending through the wall of the sleeve shaft **90**.

Leaf springs **112** anchored at their rear ends to plates **42** and **40** have their working ends fastened under tension to the arms **88** by shackles **114** to urge the paddle wheels downwardly, yet permit them to relieve themselves to any excessive overload that might occur during trenching operations. This provides a spring loaded feeder arrangement which prevents damage to the rotating mechanism.

The rear part of the trencher is supported on the main frame torque tube **10** which is detachably mounted to a slope control tube **156** secured to the motor grader. This main frame torque tube **10** has two upwardly and rearwardly extending box section arms **120** cross braced at **122**, and each are capped with spaced ears **124** at their upper ends which extend forwardly to receive a pivot pin **126** and rearwardly to receive a key bolt **128**. A segmented conveyor pivot plate **130** is pivoted on the pin **126** and has a series of holes **131** engageable by said key bolt to provide a height adjusting bracket for the conveyor belt in which the conveyor belt side frames are disposed between and pivotally secured to the upper edge of the plate **130** at **132**. A hydraulic hand jack **133** interconnects the conveyor belt frame and the main frame torque tube to assist in adjusting the tilt of the conveyor belt and the main frame torque tube whereupon location of the key bolt **128** in one of the series of holes **131** raises or lowers the conveyor frame. Removal of the bolt permits the torque tube and conveyor frame to fold towards each other to greatly lower the upper end of the conveyor for transport clearances.

Secured to the lower side of the main frame tube **10** are spaced brackets **134** and horizontally therefrom are correlated brackets **136** at the juncture of the conveyor side frames **16** and **17** and the side plates **42** and **40**.

The four brackets **134** and **136** support hydraulic jacks **143** interconnecting the brackets **134** and **136** to raise and lower the trenching mechanism. The four brackets **134** and **136** also support a stabilizer frame **145**. The jacks are conventional elements but the stabilizer frame includes two torque tubes **147**, one between brackets **134** and the other between brackets **136**. The tubes have telescoping elements **149** terminally welded to them with the external members of elements **149** cross braced at the free ends and diagonally braced remote from the free ends. Thus constructed, the frame **145** provides a torque resisting extendable stabilizer for torsional and lateral stability of the trenching mechanism under work conditions regardless of the incline of the conveyor.

Additional stability of the trencher mechanism is had against runout when necessary by a tether chain **144** interconnecting a clevis **151** on the side cutter support portion **54***u* and an ear on the laterally movable motor grader blade circle.

In alignment with the motor grader wheels the main frame torque tube **10** is provided with a rearwardly and upwardly inclined track and jack screw arrangement **146** which guides a box frame support **149** for the vertical adjustment of the trailing gauge wheel **13**. The support is slotted vertically at **148** to receive a clamp bolt **150** therethrough and permit the box and wheel **13** to be raised and lowered by a screw jack bolt **152**. This vertical adjustment of the trailing gauge wheel **13** more squarely supports the main frame torque tube and brings the gauge wheel closer to the motor grader wheels as the wheel is lowered to minimize scuffing and to provide a greater load carrying strength more directly under the main frame torque tube.

The solid rubber tired wheel **13** is preferably adjusted to carry the main frame tube load at medium deflection of the pneumatic grader wheels **14**. This is designed to remove the conveyor belt weight load from the motor grader and maintain a constant depth gauge for the trencher.

The grader end of the torque tube **10** is quickly and easily mounted and dismounted by a 3-bolt flanged mounting **154** to a like diameter tube serving as a slope control member or tube **156** that is secured to the rear bumper ends of the motor grader frame. The slope control tube **156** is pivotally mounted about a horizontal axis extending longitudinally of the motor grader adjacent to the trencher as secured in place by lock bolts **158** in arcuate slots **159**. The correct lateral position and tilt is controlled by a jack screw **160** at the end of the slope control tube **156** remote from the trencher clamped by a lock bolt **162** in an arcuate slot **164** with appropriate thickness shims between the tube mounting face and motor grader.

Thus, by the adjustment of the jack screw **160** and the locking of the bolts **158** and **162**, a slope or grade control is provided for the trench that is being cut. Raising the remote end of the tube **156** increases the lateral incline of the trench bottom over that of the roadway as measured by the rear gauge wheel **13** and the right hand rear grader wheels **14**. Lowering the remote end of the tube **156** past its midpoint, levels or even reverses the incline or grade of the trench bottom. Furthermore, if the main frame tube **10** is not square to the motor grader, the shims are provided to make the desired correction or even a slight over correction to locate the trench cutting mechanism parallel to the line of movement of the motor grader wider working conditions.

It will be noted that the front gauge wheel **12** is bolted to the rounded portion **55** of the side cutter support portion **54***u* with bolts threaded through the heavy plate **54***u*. The left end of the main frame tube **10** is internally provided with a flange with like threaded holes matching the holes for the front gauge wheel tube **53**. Thereby the gauge wheel **12** and its height adjustment device is demountable as a unitary assembly for remounting on the open or free end of the main frame torque tube **10** when the hydraulic jacks **143** lift the front end of the trencher. Thereupon the two wheels **12** and **13** can be leveled to support the weight of the torque tube and its burden; the front end again lowered; and, the main frame tube **10** dismounted from the grader at the three bolt flange connection **154**. Thus, the two wheels serve as trailer tow wheels.

The front gauge wheel assembly is replaced by a tow bracket **170**, whereupon the grader is then backed into the front of the trencher, with the bracket **170** received between two towing brackets **172** welded on the slope tube **156** and the hitch pin **174** is dropped into place. The trencher can then be towed in line with the grader from one job to another with the upper end lowered sufficiently for transport clearances.

Furthermore, it will be observed that the clutch **176** and engine speed **178** controls are located right next to the operator's seat **179** on the motor grader as pivotally supported on a bracket arm **180** secured to the cutter blade support **55** at **182**. Preferably the upright lever arm is of two telescoping members to vary the height of the clutch control handle in relation to the different levels of the operators' seats on different motor driven vehicles.

It will be appreciated from the description that a stinger blade and a side cutting extension can be fastened to the front edges of the cutter support **54** if cuts narrower than 28" are desired and a cutter blade filling the remaining width will clean and pick up the lateral overspill material loosened by the stinger. Also it will be observed that with the outer square cornered side cutters removed the trencher can be used for windrow loading purposes and in those instances where the travelled portion of the roadway has loose material on it, the motor grader scraper blade can gather and windrow it along the edge of the

roadway just ahead of the trencher where it can be picked up along with the material loosened by the trencher, all in one operation at motor grader speed.

Although one embodiment of the invention has been illustrated in the drawings, it will be apparent to those skilled in the art to make various and further changes without departing from the spirit of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. A road trencher comprising a power propelled vehicle having laterally spaced rear road wheels, a downwardly and forwardly inclined conveyor belt means mounted on said vehicle along one side thereof, a trench cutting means on the forward end of the conveyor belt means comprising right angle cutter support members having their lower portions disposed in alignment and their other portions disposed parallel and upright, a horizontal cutter bar on top of and rigidly joining said lower portions in a relationship overlapping with the front ends thereof and having a bevel below the cutting edge thereof, side cutters secured to the upright portions on their remote faces and overlapping the front edges thereof with diverging beveled edges inclined upwardly and forwardly to cut the ground material with a downwardly directed moment of force tending to lift the horizontal cutting edge, a solid rubber tired gauge wheel means carried by one of said cutter support members in front and in alignment with one of said rear road wheels, and means for adjusting the height of said gauge wheel means above said horizontal cutter bar.

2. A road trencher comprising a power propelled vehicle having laterally spaced road wheels, a downwardly and forwardly inclined conveyor belt means mounted on said vehicle at one side thereof, a trench cutting means on the forward end of the conveyor belt means comprising two right angle cutter support members having their lower portions disposed in alignment with each other and their other portions disposed parallel and upright, a removable horizontal cutter bar joining the lower portions and overlapping the front ends thereof in rigidifying relationship, side cutters secured to the upright portions on their remote faces and overlapping the front edges thereof with divergingly beveled edges, a solid rubber tired gauge wheel means carried by one of said cutter support members in front of and in alignment with one of said road wheels, and means for adjusting the height of said gauge wheel means above said horizontal cutter bar.

3. The combination called for in claim 2 in which said trench cutting means includes side and bottom plates secured to the rear edges of said cutter support members directing loosened material towards said conveyor belt means and paddle wheel means for moving onto the conveyor belt means the loosened material so directed.

4. A road trencher comprising a power propelled vehicle having laterally spaced road wheels, conveyor belt means having a conveyor belt, a detachable torque member carried by said vehicle at one side thereof mounting pivotally the conveyor belt means with a downward and forward inclination alongside of said vehicle to propel said conveyor belt means forwardly, a trench cutting means on the forward end of the conveyor belt means including a horizontal cutter bar and upright side cutters inclined forwardly with divergingly beveled edges, a solid rubber tired gauge wheel means carried by said forward end of the conveyor belt means disposed in front of and in alignment with one of said road wheels, means for adjusting the height of said gauge wheel means above said horizontal cutter bar, and means for carrying onto said conveyor belt material loosened by the forward movement of the cutter bar and cutters.

5. A road trencher comprising a power propelled vehicle having laterally spaced road wheels, a downwardly and forwardly inclined assembly including a conveyor belt means mounted on said vehicle along one side thereof having a predetermined width and a trench cutting means on the forward end of the conveyor belt means, said trench cutting means comprising two right angle cutter support members having their lower portions disposed in alignment and their other portions disposed parallel and upright and inclined forwardly, a spacer means between said lower portions, a horizontal cutter bar longer than said predetermined width joining said lower portions and spacer means and overlapping the front ends thereof for loosening ground material, parallel arms pivoted at their rear ends to said assembly, a shaft journalled on said arms near their free ends, a paddle wheel carried by said shaft between said arms to move loosened ground material onto the conveyor belt means, auger paddle wheel means carried by said shaft for moving loosened ground material into the path of the paddle wheel, means for urging said paddle wheels downwardly, side cutters secured to said upright portions on their remote faces and overlapping the front edges thereof to carve the sides of the trench, a solid rubber tired gauge wheel means carried by said assembly in front of and in alignment with one of said road wheels, and means for adjusting the height of said gauge wheel means above said horizontal cutter bar.

6. A road trencher comprising a motor grader having a frame extending beyond the rear road wheels thereof, a slope control member mounted transversely on the frame for pivotal movement about a horizontal axis adjacent one of the rear wheels, a torque member releasably secured to said control member, rear wheel gauge means disposed in approximate alignment with said one of the road wheels for supporting the torque member, conveyor belt means supported on said torque member for movement about a horizontal pivot axis and extending forwardly and downwardly along the side of the motor grader, trench cutting means on the front end of said conveyor for severing ground material to make a trench alongside the motor grader, means for gauging the depth of the trench including a front gauge wheel adjustably supporting the trench cutting means and the front end of said conveyor belt means, said front wheel being disposed in alignment with said rear wheel gauge means, said trench cutting means including a member engaging the severed material and propelling it onto the conveyor belt means, and means for receiving the loosened material from the conveyor belt means to discharge it behind the motor grader.

7. A road trencher comprising a power propelled vehicle having a frame extending beyond the rear road wheels, a slope control member mounted on the frame pivotally about a horizontal axis disposed adjacent one of the rear wheels, a torque member releasably secured to said control member, rear gauge wheel means for supporting the torque member at one end thereof in approximate alignment with said one of the road wheels, conveyor belt means supported on said torque member for movement about a horizontal pivot axis and extending forwardly along the side of the motor grader, trench cutting means on the front end of said conveyor for severing material to make a trench alongside the motor grader, means for gauging the depth of the trench cut including a removable front gauge wheel adjustably supporting the trench cutting means and the front end of said conveyor belt means, said front wheel being disposed in alignment with said gauge wheel means and being removable for securement to the other end of said torque member, said trench cutting means including a member engaging the severed material and propelling it onto the conveyor belt means, and means for receiving the loosened material from the conveyor belt means to discharge it to one side of the trench.

8. A road trencher comprising a motor grader having a frame extending beyond its pneumatic rear road wheels, a slope control member mounted transversely of the motor grader on the frame for pivotal movement about a horizontal axis disposed adjacent to one of the rear wheels, means for adjusting the slope incline of said member, a

torque member for movement about a horizontal axis solid rubber tired rear gauge wheel adjustable as to height for supporting the torque member in weight bearing relationship in approximate alignment with said one of the road wheels, conveyor belt means supported on said torque member for movement about a horizontal axis above said torque member, said torque member including a jack connected to the conveyor belt means for adjustably supporting said conveyor belt means in an inclined position, said conveyor belt means including a conveyor belt and trench cutting means at the front end for severing ground material to make a trench alongside the motor grader, means for gauging the depth of the trench including a solid rubber tired front gauge wheel adjustably supporting the trench cutting means and being disposed in alignment with said rear gauge wheel means, said trench cutting means including a member engaging the severed material and propelling it onto the conveyor belt of the conveyor belt means, and chute means for receiving the loosened material from the conveyor belt means to discharge it behind the motor grader.

9. A road trencher comprising a motor grader having a frame extending beyond its pneumatic rear road wheels, a slope control member mounted transversely of the motor grader on the frame for pivotal movement about a horizontal axis disposed adjacent to one of the rear wheels, means for adjusting the slope incline of said control member, a torque member releasably secured to said control member, solid rubber tired rear gauge wheel means adjustable as to height for supporting the control member in weight bearing relationship in approximate alignment with said one of the road wheels, conveyor belt means supported on said torque member for movement about a horizontal axis above said torque member, a jack interconnecting the conveyor belt means and torque member at spaced distances from said horizontal axis for adjustably moving said conveyor belt means toward and away from said torque member, said conveyor belt means including a conveyor belt and trench cutting means on the forward end of the conveyor belt means for severing ground material and comprising two right angle cutter support members having their lower portions disposed in alignment and their other portions disposed parallel and upright and inclined forwardly, a horizontal cutter bar joining the lower portions and overlapping the front ends thereof, side cutters secured to the upright portions on their remote faces and overlapping the front edges thereof, with outwardly diverging beveled edges, said jack urging said trench cutting means downwardly into the ground, means for gauging the depth of the trench including a solid rubber tired front gauge wheel adjustably supporting the trench cutting means and being disposed in alignment with said rear gauge wheel means, means for adjusting the height of said gauge wheel means above said horizontal cutter bar, said trench cutting means including a member engaging the severed material and propelling it onto the conveyor belt of the conveyor belt means, and chute means for receiving the loosened material from the conveyor belt means to discharge it behind the motor grader.

10. A road trencher comprising a motor grader having a frame extending beyond the rear road wheels, a slope control member mounted on the frame and extending laterally from the motor grader adjacent one of the rear wheels, rear gauge wheel means adjustably vertically carried by said member in approximate alignment with said one of the road wheels for supporting said member, conveyor belt means supported on said member for movement about a horizontal pivot axis and inclined downwardly and forwardly along the side of the motor grader, trench cutting means on the front end of said conveyor for severing material to make a trench alongside the motor grader, tether means interconnecting said trench cutting means and the motor grader, means for gauging the depth of the trench cut including a front gauge wheel adjustably supporting the trench cutting means and the front end of said conveyor belt means, said front gauge wheel being disposed in alignment with said rear gauge wheel means, means for moving the severed material onto the conveyor belt means, and means for receiving the severed material from said conveyor belt means to discharge it to one side of the trench.

11. A road trencher for cutting a trench along the edge of a roadway as a step in the process of widening the roadway, said road trencher comprising a motor powered vehicle having front and rear road wheels carrying a frame extending rearwardly beyond the rear road wheels, a slope control member mounted on the frame for pivotal movement about a horizontal axis disposed adjacent one of the rear wheels and extending laterally beyond said one of the rear wheels, rear gauge wheel means supporting the control member and disposed in approximate alignment with said one of the road wheels to run therewith along the edge of said roadway, conveyor belt means supported on said control member for movement about a horizontal pivot axis and inclined forwardly and downwardly along the side of the motor grader, trench cutting means on the front end of said conveyor for severing material to make a trench alongside the roadway, means for gauging the depth of the cutting means including a vertically disposed front gauge wheel adjustably supporting the trench cutting means and the front end of said conveyor belt means, said front wheel being disposed in alignment with said gauge wheel means, said trench cutting means including a member carrying the severed material onto the conveyor belt means to leave an open trench, and means for receiving the severed material from the conveyor belt means to discharge it behind the vehicle.

12. A road trencher for cutting a trench along the edge of a roadway as a step in the process of widening the roadway and comprising a motor powered vehicle having an operator's seat between front and rear road wheels carrying a frame extending rearwardly beyond the rear road wheels, a slope control member mounted on the frame for pivotal movement about a horizontal axis disposed adjacent one of the rear wheels and extending laterally beyond said one of the rear wheels, gauge wheel means supporting the control member and disposed in approximate alignment with said one of the road wheels to run therebehind along the edge of said roadway, conveyor belt means supported on said control member for movement about a horizontal pivot axis and inclined forwardly and downwardly along the side of the motor grader, and including a conveyor belt, trench cutting means on the front end of said conveyor opposite said operator's seat for severing material to make a trench alongside the roadway, means for gauging the depth of the cutting means including a front gauge wheel adjustably supporting the trench cutting means and the front end of said conveyor belt means, said front wheel being disposed in alignment with said gauge wheel means, an engine and transmission on said trench cutting means, a paddle wheel member driven by said transmission for moving the severed material onto the conveyor belt means to leave an open trench, means for receiving the loosened material from the conveyor belt means to discharge to one side of the trench, and control means for said transmission carried by said trench cutting means accessible from said operator's seat.

13. A road trencher for cutting a trench along the edge of a roadway as a step in the process of widening the roadway, said road trencher comprising a motor powered vehicle having front road wheels and rear road wheels and a main frame supported thereby, a forwardly and downwardly inclined conveyor belt means disposed along one side of the main frame and having a support member mounted on said main frame and on endless conveyor belt to carry material thereon upwardly and rearwardly of said main frame, a trench cutting means

on the forward end of the conveyor belt means including a horizontal cutter bar tending to go deeper under an upward force component exerted by it in cutting and lifting ground material along the edge of the roadway and upright side cutters inclined forwardly with divergently beveled edges tending to lift the horizontal cutter bar under a downward force component exerted by them in carving the sides of the trench, a solid rubber tired gauge wheel means carried by the forward end of the conveyor belt means disposed to run along the edge of the roadway forwardly of the rear road wheels above said horizontal cutter bar, means for adjusting the height of said gauge wheel means with respect to the cutter bar to control the depth at which the horizontal cutter bar will cut, and feeder means for propelling rearwardly onto said conveyor belt ground material severed by the forward movement of the cutter bar and side cutters.

**14.** The combination called for in claim **13** in which said rear road wheels are pneumatic wheels and including a solid rubber tired rear gauge wheel means carried by said support member and main frame to run along the edge of the roadway and adjustable as to height with respect to the rear road wheels for supporting the conveyor belt means in weight bearing relationship at medium deflection of the rear pneumatic road wheels.

**15.** The combination called for in claim **13** in which



said feeder means includes parallel arms pivoted at their rear ends to the conveyor belt means, a shaft rotated on said arms near their front free ends, a paddle wheel means carried by said shaft, and means for urging said arms and paddle wheel means downwardly to engage said severed ground material.

**16.** The combination called for in claim **13** in which said side cutters comprise double plate members remote from said roadway secured together with their bevels disposed coplanar and plate members adjacent to the roadway adapted to receive shims therebetween with their bevels disposed coplanar.

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