July 15, 1969 R. C. ANDREW 3,455,039

ROTARY WHEEL DITCH FINISHING MACHINE

Filed May 11, 1967 3 Sheets-Sheet 1

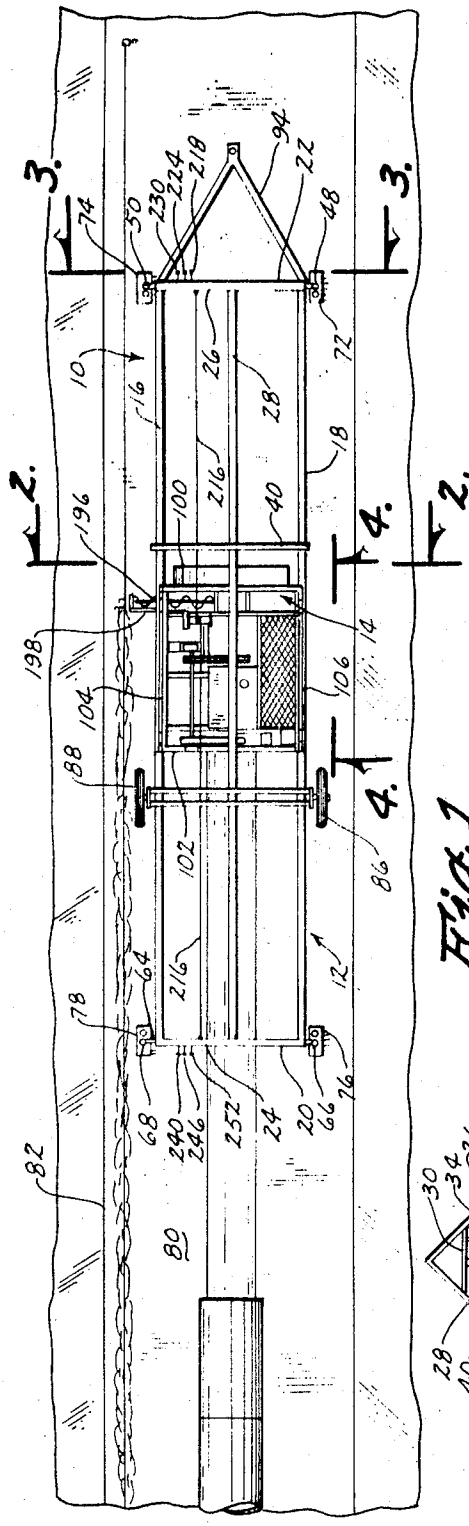


Fig. 1

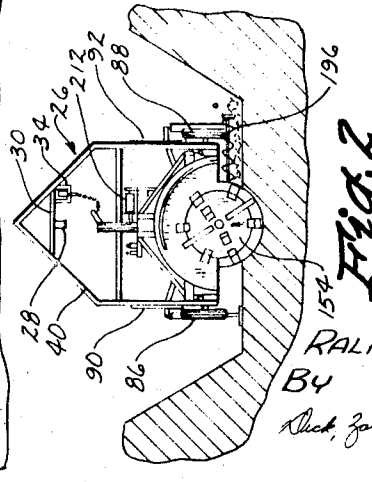


Fig. 2

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ROTARY WHEEL DITCH FINISHING MACHINE

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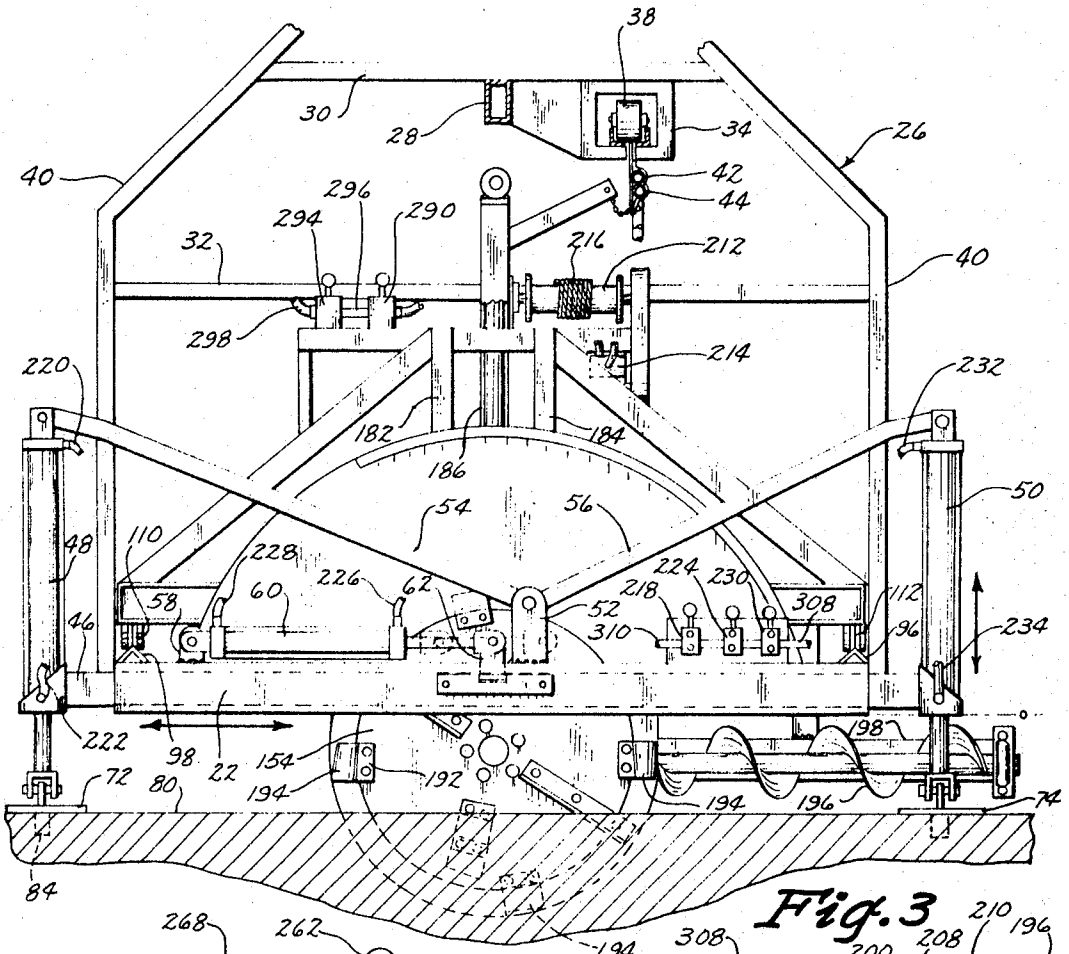


Fig. 3

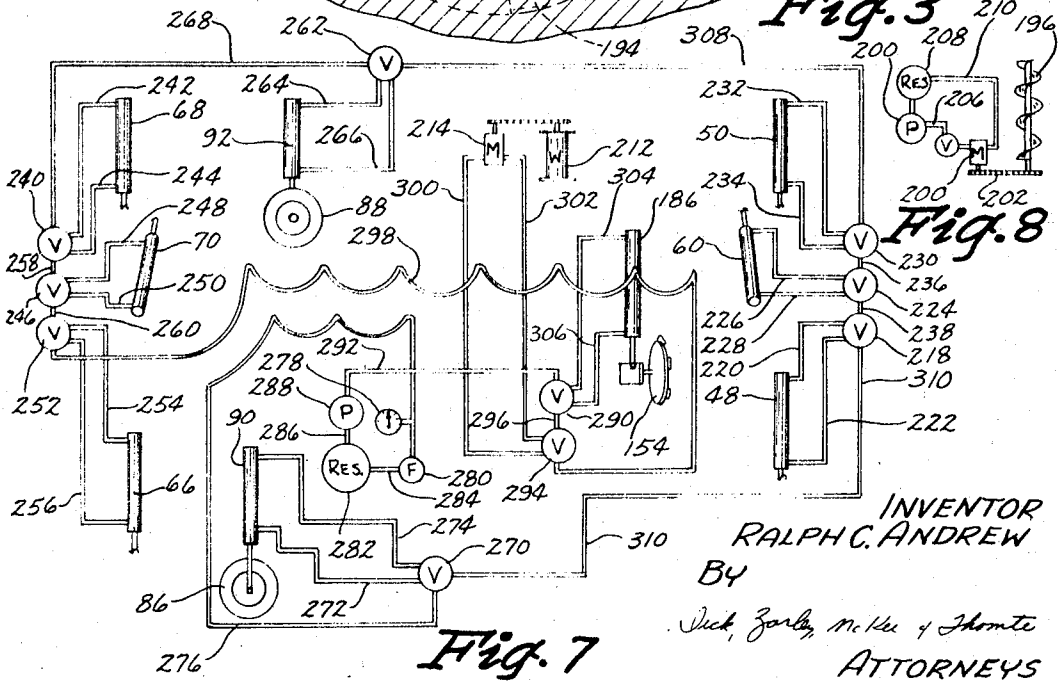


Fig. 7

Fig. 8

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ROTARY WHEEL DITCH FINISHING MACHINE

Filed May 11, 1967 3 Sheets-Sheet 3

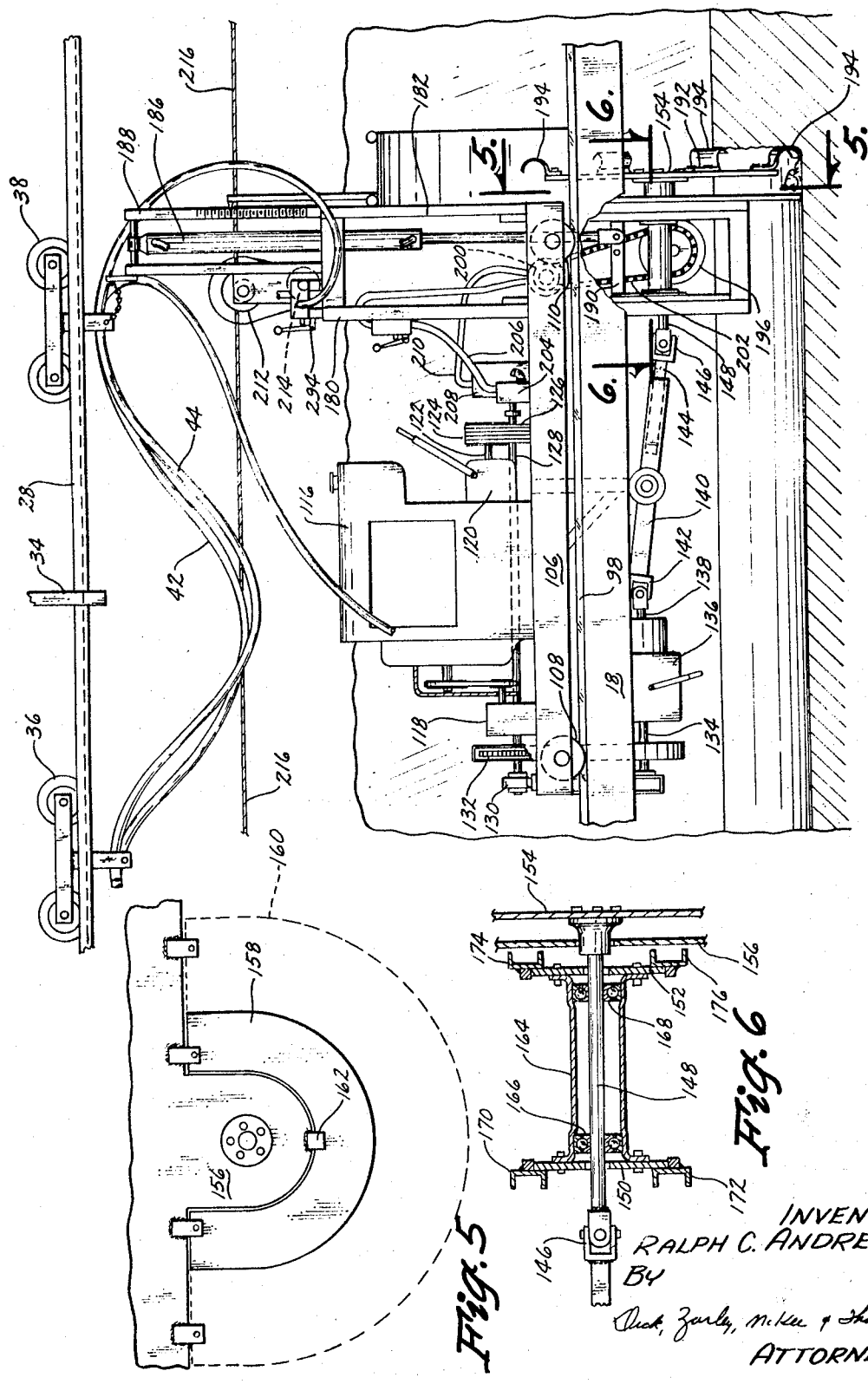


Fig. 4

Fig. 5

Fig. 6

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ROTARY WHEEL DITCH FINISHING MACHINE

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ABSTRACT OF THE DISCLOSURE

A ditch finishing device including an elongated first frame means adapted to be positioned within a ditch at a predetermined grade, a second frame means longitudinally movable on the first frame means and having a rotary cutting means mounted thereon adapted to cut an arcuate trench in the ditch, the arcuate trench being adapted to receive a plurality of pipe members or the like after the first frame means has been moved to its next position.

Culverts and the like must obviously be positioned at a particular grade in the ground. The culverts have previously been layed by first excavating a rough ditch by means of a bulldozer or drag line and then manually digging or filling the rough ditch to the proper grade. The culverts invariably settle when placed on fill and this setting obviously detracts from their efficiency and durability. The time consuming and tedious task of manual digging to lower the rough ditch to grade is obviously undesirable.

Therefore, it is a principal object of this invention to provide a ditch finishing device.

A further object of this invention is to provide a ditch finishing device which cuts an arcuate trench at a predetermined grade within a rough ditch.

A further object of this invention is to provide a ditch finishing device which insures that the pipe members will not be placed on fill dirt.

A further object of this invention is to provide a ditch finuishing device which is adapted to be moved successively along a rough ditch which has been previously dug and to cut an arcuate trench therein at the proper grade.

A further object of this invention is to provide a ditch finishing means including a first frame means having a rotary cutting means movably mounted thereon.

A further object of this invention is to provide a ditch finishing device having a conveyor means thereon adapted to move the excavated dirt laterally of the rotary cutting means.

A further object of this invention is to provide a ditch finishing device having a hydraulic means provided thereon for levelling and aligning the device.

A further object of this invention is to provide a ditch finishing device which is transportable.

A further object of this invention is to provide a ditch finishing device which is economcal of manufacture, durable in use and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is a top view of the device positioned within a rough ditch;

FIG. 2 is a sectional view as would be seen on line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view as would be seen on line 3—3 of FIG. 1;

FIG. 4 is an enlarged sectional view as would be seen on line 4—4 of FIG. 1;

FIG. 5 is an enlarged sectional view as would be seen on line 5—5 of FIG. 4;

FIG. 6 is an enlarged sectional view as would be seen on line 6—6 of FIG. 4;

FIG. 7 is a schematic illustration of the hydraulic circuitry of the device; and

FIG. 8 is a schematic illustration of the means for operating the conveyor on the device.

The ditch finishing device of this invention is designated in the drawings by the reference numeral **10** and generally includes a first frame means **12** and a second frame means **14** longitudinally movable thereon. Frame means **12** is comprised of spaced apart frame members **16** and **18** having frame members **20** and **22** extending between their opposite ends. Frame means **12** also includes an upstanding frame portion **24** at its rearward end and an upstanding frame portion **26** at its forward end as illustrated in the drawings. A beam **28** is secured to and extends between the upper end of frame portions **24** and **26** as best illustrated in FIG. 1. As seen in FIG. 3, frame portion **26** is provided with a pair of braces **30** and **32** extending therebetween. Frame portion **24** likewise is provided with braces corresponding to braces **30** and **32**. As seen in FIG. 3, a trolley support **34** is secured to beam **28** and brace **30** and is adapted to support a pair of trolleys **36** and **38** thereon for longitudinal movement therealong. Frame means **12** is also provided with an intermediate upright frame portion **40** similar to frame portions **24** and **26** and trolley support **34** is secured thereto in the same manner as it is secured to frame portion **26**. As seen in FIG. 4, trolleys **36** and **38** are adapted to support hydraulic lines **42** and **44**.

Frame member **22** is hollow and has a support **46** slidably extending therethrough. A hydraulic cylinder **48** is secured adjacent its lower end to one end of support **46** and a hydraulic cylinder **50** is secured adjacent its lower end to the other end of support **46** in a manner best illustrated in FIG. 3. A bracket **52** is secured to support **46** and extends upwardly through a slot formed in the upper surface of frame member **22** and has a pair of braces **54** and **56** secured thereto which extend therefrom and which are secured to the upper ends of hydraulic cylinders **48** and **50** respectively. The numeral **58** designates a bracket which is secured to the upper surface of frame member **22** which has a hydraulic cylinder **60** pivotally secured thereto as seen in FIG. 3. The rod end of cylinder **60** is pivotally secured to a bracket **62** which extends downwardly through the upper surface of frame member **22**. The lower end of bracket **62** is secured to support **46** by any convenient means. The upper surface of frame member **22** is provided with a slot formed therein to permit the lateral movement of bracket **62** and bracket **52** upon the extension or retraction of the rod of cylinder **62** as illustrated by broken lines in FIG. 3.

Frame member **20** at the rearward end of frame means **12** is also hollow and has a support **64** slidably extending therethrough which is identical to support **46**. A pair of hydraulic cylinders **66** and **68** are operatively secured to the opposite ends of support **64** in a manner identical to the attachment of cylinders **48** and **50** to support **46**. A hydraulic cylinder **70** is secured to frame member **20** and support **64** in a manner identical to the attachment of hydraulic cylinder **60** to frame member **22** and support **46** and operates in identical fashion thereto. Hydraulic cylinders **48**, **50**, **66** and **68** are provided with plates **72**, **74**, **76** and **78** pivotally secured to the lower end of the piston rods thereof respectively and are adapted to engage the bottom surface **80** of a rough ditch **82** at times. As seen in FIG. 3, plate **72** is provided with a downwardly extending finger **84** which is adapted to penetrate the

ground to prevent lateral movement of plate **72** with respect to the ditch. Each of the other plates **74, 76** and **78** are also provided with a similar downwardly extending finger. As seen in FIGS. 1 and 2, a pair of wheel assemblies **86** and **88** are vertically movably secured to frame means **12** and are raised and lowered with respect thereto by means of hydraulic cylinders **90** and **92** respectively. Wheel assemblies **86** and **88** are provided to permit the device to be readily transported upon a lowering of the wheel assemblies into a ground engaging position. As seen in FIG. 1, a hitch assembly **94** is secured to frame means **12** and extends forwardly therefrom and is provided to permit the device to be towed behind a prime mover. As best seen in FIG. 3, frame members **16** and **18** have an inverted angle member **96** and **98** secured thereto and extending upwardly therefrom along the length thereof respectively.

Frame means **14** includes front and rear frame members **100** and **102** and side frame members **104** and **106** secured at the opposite ends thereof and extending therebetween as best seen in FIG. 1. Side frame member **106** has a pair of roller elements **108** and **110** rotatably secured thereto which are adapted to roll upon angle **98** as best illustrated in FIG. 3. A pair of roller elements **112** and **114** (not shown) are rotatably secured to side frame member **104** and are adapted to roll upon angle **96** as illustrated in FIG. 3.

A power means **116** is mounted on frame means **14** and is operatively connected to a hydraulic pump **118** as seen in FIG. 4. Power means **116** is provided with a gear box **120** having a power shaft **122** rotatably extending outwardly therefrom as seen in FIG. 4. Power shaft **122** has a pulley means **124** secured thereto which is connected by a belt means to a pulley means **126** mounted on shaft **128**. Shaft **128** extends rearwardly from pulley means **126** and has its rearward end rotatably mounted in a bearing means **130** which is secured to frame member **102**. A sprocket **132** is mounted on shaft **128** forwardly of bearing means **130** and is adapted to drive shaft **134** by means of a chain extending therearound and around a sprocket (not shown) on shaft **134**. Shaft **134** is operatively connected to a gear box **136** having a power shaft **138** rotatably extending outwardly therefrom. A hollow shaft **140** is connected to shaft **138** by a universal joint **142** and extends forwardly therefrom. A shaft **144** is slidably mounted in the forward end of shaft **140** and has a universal joint **146** secured to the forward end thereof. A shaft **148** extends forwardly from universal joint **146** through plates **150** and **152** and has a circular cutting means **154** secured to its forward end. As seen in FIGS. 5 and 6, shaft **148** extends through a shield **156** which is positioned rearwardly of cutting means **154**. The numeral **158** designates a U-shaped backing plate which is detachably secured to shield **156** in the manner illustrated in FIG. 5 and is designed to be positioned rearwardly of the cutting means **154** to prevent loose dirt from falling into the trench being dug. FIG. 5 illustrates a backing plate designated by the reference numeral **160** which would be secured to shield **156** when a larger cutting means is utilized. A separate backing plate would be utilized for each size cutting means. As seen in FIG. 5, shield **156** is provided with a downwardly extending stop means **162** which is adapted to prevent movement of the lower end of backing plate **158** with respect to shield **156**. A hub means **164** extends between plates **150** and **152** and encloses shaft **148**. A pair of bearings **166** and **168** are mounted within hub **164** and rotatably embraces shaft **148**. A pair of spaced apart guides **170** and **172** are secured to the opposite sides of plate **150** and extend vertically upwardly and downwardly therefrom. A pair of guides **174** and **176** are secured to the opposite sides of plate **152** and extend vertically upwardly and downwardly therefrom. Guides **170, 172, 174** and **176** are slidably mounted in tracks **178, 180, 182** and **184** respectively to permit the vertical movement of cutting means **154** at times. A hydraulic cylinder **186** is operatively connected at its upper end to a support means **188** and has its rod end secured to arm member **190** which is operatively secured to plates **150** and **152**. The operation of hydraulic cylinder **186** causes the guides to be moved within their respective tracks thereby causing shaft **148**, hub means **164**, shield **156**, and cutting means **154** to be vertically moved.

Cutting means **154** is comprised of a circular plate **192** having a plurality of arcuate cutting blades **194** secured thereto adjacent the periphery thereof and extending therefrom as best seen in FIGS. 2, 3 and 4. An auger means **196** is rotatably mounted in a transverse frame means **198** which is secured to frame means **14** and extends laterally from adjacent the periphery of cutting means **154** to a point outwardly of frame means **12** as best seen in FIG. 3. Auger means **196** is powered by a hydraulic motor **200** and as seen in FIG. 4, a chain **202** operatively extends from hydraulic motor **200** to auger means **196**. Hydraulic motor **200** is connected to a pump **204** by a conduit **206** and is connected to a reservoir **208** by a conduit **210**. Pump **204** is powered by shaft **128** as seen in FIG. 4.

A winch means **212** is rotatably mounted on support means **188** and is powered by a hydraulic motor **214**. Winch means **212** has a cable **216** wrapped therearound as seen in FIG. 3, the opposite ends of which are secured to frame members **24** and **26** respectively.

As seen in FIG. 7, hydraulic cylinder **48** is connected to a valve **218** by conduits **220** and **222**. Hydraulic cylinder **60** is connected to valve **224** by conduits **226** and **228**. Hydraulic cylinder **50** is connected to a valve **230** by conduits **232** and **234**. As seen in FIG. 7, valves **230** and **224** are connected by a conduit **236** while valves **224** and **218** are connected by a conduit **238**. Hydraulic cylinder **68** is connected to a valve **240** by conduits **242** and **244** while hydraulic cylinder **70** is connected to a valve **246** by conduits **248** and **250**. Hydraulic cylinder **66** is connected to a valve **252** by conduits **254** and **256** and valves **240** and **246** are connected by a conduit **258**. Valves **246** and **252** are connected by a conduit **260**. Hydraulic cylinder **92** is connected to a valve **262** by conduits **264** and **266** and valve **262** is connected to valve **240** by a conduit **268**. Cylinder **90** is connected to a valve **270** by conduits **272** and **274** and a conduit **276** connects valve **270** with a pressure gauge **278** and filter **280**. A reservoir **282** is connected to filter **280** by conduit **284** and a conduit **286** connects reservoir **282** with a pump **288**. Pump **288** is connected to a valve **290** by a conduit **292** and valve **290** is connected to a valve **294** by a conduit **296**. Valve **252** is connected to valve **294** by a conduit **298**. Valve **294** is connected to motor **214** by conduits **300** and **302** and hydraulic cylinder **186** is connected to valve **290** by conduits **304** and **306**. Valve **262** is connected to valve **230** by a conduit **308** and valve **218** is connected to valve **270** by a conduit **310**.

I claim:

1. In a ditch finishing device:

an elongated first frame means having opposite ends and sides and adapted to be positioned within a ditch at a predetermined grade,

a second frame means longitudinally movable on said first frame means,

a cutting means mounted on said second frame means adapted to cut an arcuate trench along and in said ditch, said trench being adapted to receive a plurality of pipe members after said first frame means has been moved to its next position in said ditch,

at least a pair of spaced apart levelling hydraulic cylinders operatively secured to said first frame means at each side thereof adjacent the opposite ends thereof, said cylinders having a ground engaging support means secured to the cylinder rods thereof whereby the extension of said rods will cause said ground engaging support means to engage the ground to permit said first frame means to be raised and lowered with

respect to the ditch and be positioned at a predetermined grade,

said first frame means being laterally movable with respect to said levelling hydraulic cylinders,

an aligning hydraulic cylinder operatively connected to said first frame means and the levelling hydraulic cylinders at one end thereof adapted to laterally move said one end of said first frame means with respect to said levelling hydraulic cylinders,

and an aligning hydraulic cylinder operatively connected to said first frame means and the levelling hydraulic cylinders at the other end thereof adapted to laterally move said other end of said first frame means with respect to said levelling hydraulic cylinders.

2. The device of claim 1 wherein said cutting means is comprised of a rotary cutting blade means rotatable about a horizontal axis and positioned adjacent one end of said second frame means, said cutting means having a hydraulic cylinder means operatively secured thereto adapted to vertically move said cutting means with respect to said second frame means.

3. The device of claim 2 wherein an arcuate backing plate is secured to said second frame means and is vertically movable with said cutting means and being positioned rearwardly thereof, said backing plate adapted to be longitudinally moved on said first frame means with said second frame means and to force debris from said trench.

4. The device of claim 1 wherein a conveyor means is mounted on said second frame means below said first frame means and extends transversely therefrom rearwardly of said cutting means to convey material from said cutting means from said trench.

5. The device of claim 1 wherein said first frame means has a pair of vertically movable ground engaging wheels at opposite sides thereof which may be lowered with respect to said first frame means to move said first frame means to another location, said ground engaging wheels being vertically moved by a hydraulic cylinder means operatively secured thereto.

6. The device of claim 1 wherein said second frame means has a hydraulically operated winch means secured thereto which is operatively connected to a cable means extending between the opposite ends of said first frame means, said winch being operable to cause said second frame means to be longitudinally moved on said first frame means.

7. The device of claim 1 wherein said first frame means includes a hollow laterally extending frame member at each of its opposite ends, a support slidably mounted in each of said frame members and having its opposite ends extending outwardly of said frame member, one of said aligning hydraulic cylinders being secured to and extending between one of said frame members and the support slidably mounted therein, the other of said aligning hydraulic cylinders being secured to and extending between the other frame member and the support slidably mounted therein, the operation of said aligning hydraulic cylinders causing said frame members, said first and said second frame means to be laterally moved in said ditch with respect to said levelling hydraulic cylinders.

8. The device of claim 7 wherein a levelling hydraulic cylinder is secured to each of the ends of said supports.

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U.S. Cl. X.R.

173—43; 299—55