Oct. 5, 1965 C. J. DAVIS 3,209,473

TRENCH DIGGING MACHINE WITH DIRT DEFLECTING ASSEMBLY

Filed March 21, 1963 2 Sheets-Sheet 1

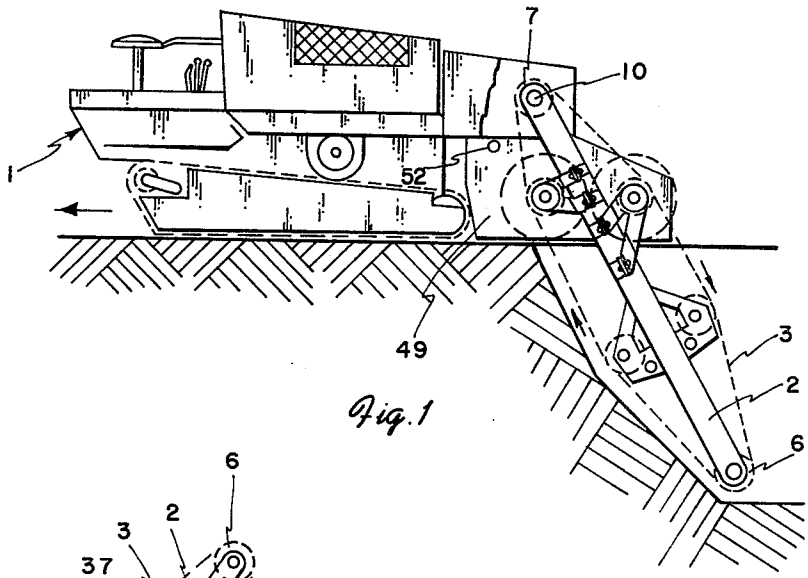


Fig. 1

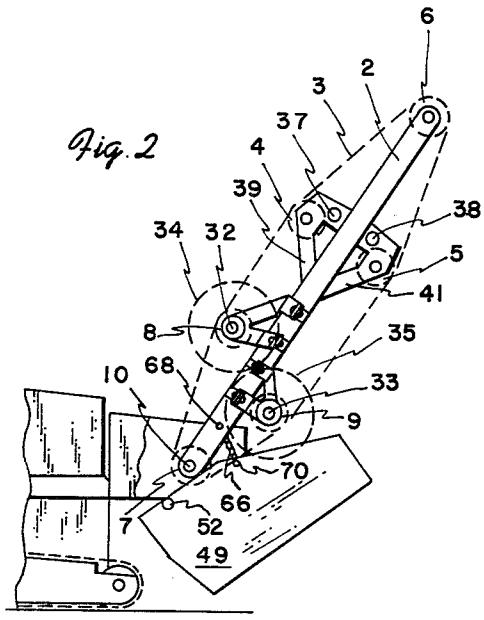


Fig. 2

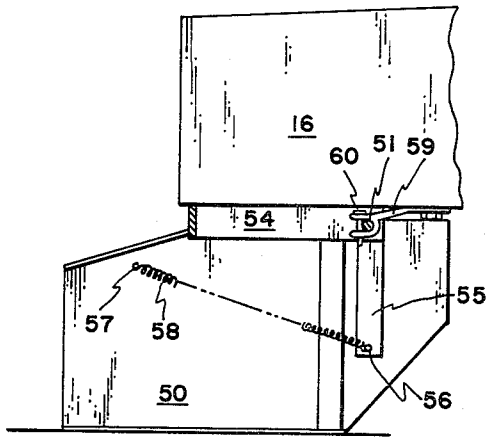


Fig. 4

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TRENCH DIGGING MACHINE WITH DIRT DEFLECTING ASSEMBLY

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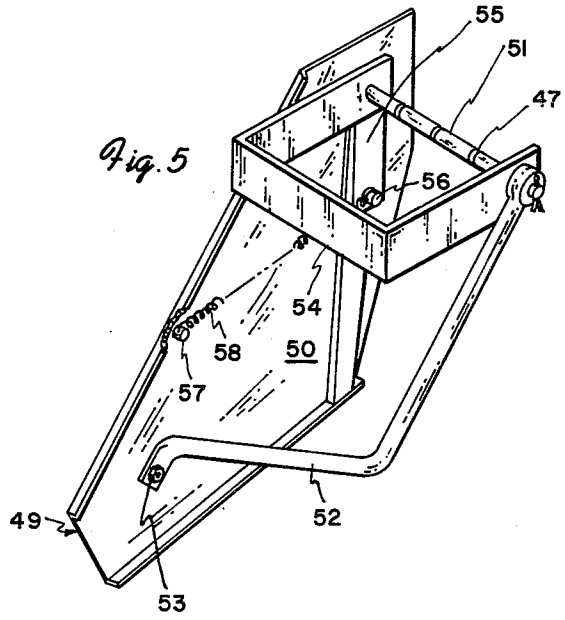


Fig. 5

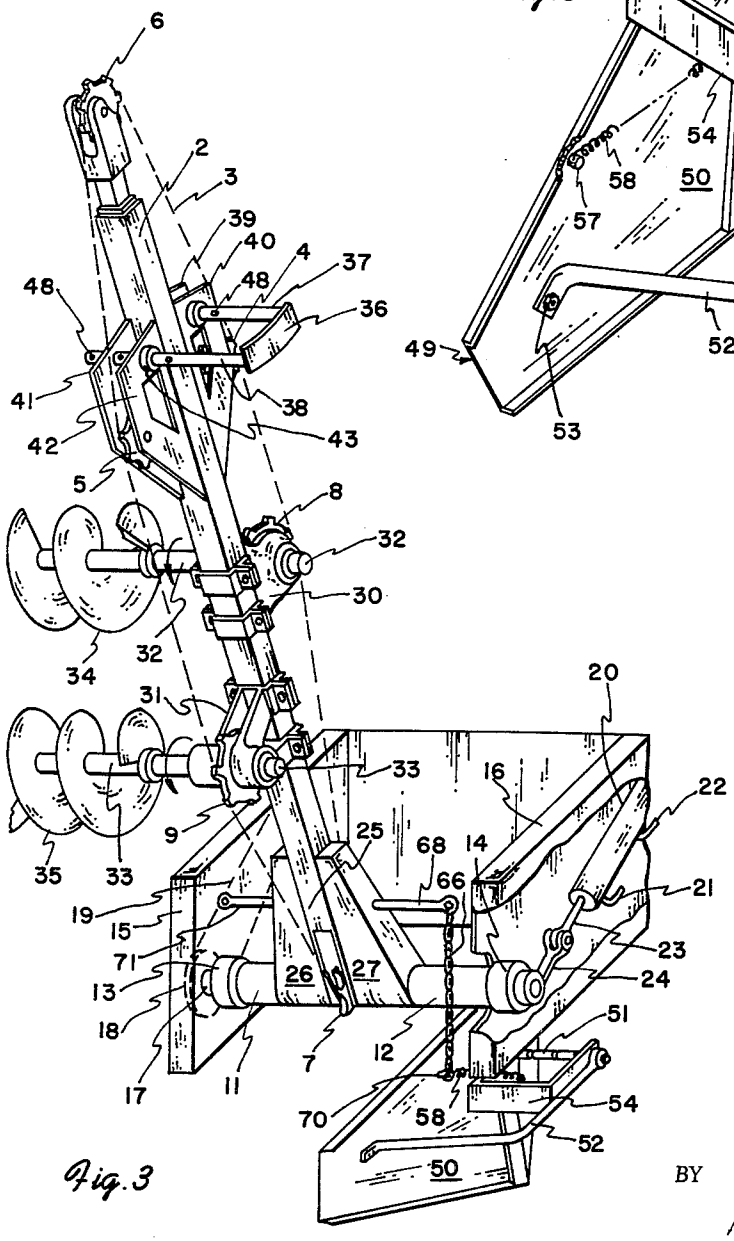


Fig. 3

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TRENCH DIGGING MACHINE WITH DIRT DEFLECTING ASSEMBLY

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4 Claims. (Cl. 37—86)

The invention relates to a self-propelled excavating machine designed particularly for digging trenches and to convey the dirt therefrom and deposit the same on the ground beside the trench.

A principal object of the invention is to provide a trench digger of the character described including means for lifting dirt from the trench being dug and depositing it at one side only of the trench.

Another object of the invention is to provide a trench digger of the character described in which a power driven auger means coacts with a boom-carried endless digger means to dig a trench in which all of the dirt from the trench is disposed on the ground at one side of the trench to thereby leave the other side of the trench unobstructed. This facilitates the insertion of pipe, tile or the like into the trench from the unobstructed side thereof without causing excavated dirt to fall back into the trench.

Another object of my invention is to provide in a trench digger of the character described power driven auger means which can be journalled in the upper portion of the boom of the endless digger means at one side or the other thereof in order selectively to convey excavated dirt to either side of the trench as desired.

Another object of my invention is to provide in a trench digger machine of the character described, means in the form of a thrust shoe to resist the thrust of the auger means on the endless digger means, which shoe can be selectively and adjustably attached to either side of the digger boom.

A further object of my invention is to provide in a trench digger of the character described means in the form of a dirt deflector for directing dirt from the endless digger means to the auger means which deflector can be selectively and adjustably attached to the machine at either side thereof.

A further object of my invention is to provide in a trencher machine of the character described, a vertically swingable hydraulically actuated, digger boom including means interconnecting the digger boom and the dirt deflector whereby when the boom is elevated to a predetermined height, as, for example, when the boom is elevated to transport position, the dirt deflector will also be moved to a raised position clear of the ground, and will reassume its dirt deflecting position when the boom is lowered into trench digging position.

A still further object of my invention is to provide a trench digger and dirt conveyor attachment for a self-propelled tractor.

Further objects and advantageous features of my invention will become readily apparent to persons skilled in the art when reference is had to the following description and the accompanying drawings in which:

FIG. 1 is a side elevational view of a power trencher embodying my invention, with the trench digging assembly in digging position in a partially completed trench, the endless digger chain and the auger means being shown in phantom to aid in clarity;

FIG. 2 is a view similar to FIG. 1, but shows the digger and dirt deflecting assemblies in raised or transport position;

FIG. 3 is a three quarter rear perspective view of the digger, auger, and dirt deflecting assemblies in raised position, only the aft end of the transporting and supporting tractor being shown;

FIG. 4 is a side elevational view of the aft portion of the digger tractor, and illustrates the manner in which the dirt deflecting assembly is mounted thereon; and

FIG. 5 is a detailed perspective view of the dirt deflecting assembly.

Referring now more particularly, to the preferred embodiment of my invention as shown in the drawings in which like reference numerals are used throughout to designate like parts, reference numeral **1** designates generally a self-propelled tractor having a digger boom **2** pivotally mounted at one end thereof, which end, when the machine is digging a trench, becomes the rear end of the machine. The digger boom **2** has mounted thereon an endless digger chain **3**. Suitable digger teeth of selected width are fixed in a conventional manner to the links of the endless chain **3**. The chain **3** is trained over an idler sprocket **6** at the outer end of the boom **2** and over a drive sprocket **7** at the inner end of said boom **2**. Intermediate sprockets **4**, **5**, **8** and **9** are mounted on upper and lower faces of the boom **2** between the idler sprocket **6** and the drive sprocket **7**. These intermediate sprockets, **4**, **5**, **8** and **9** are in meshing engagement with the individual links of the top and bottom flights of the digger chain **3**.

The pivotal mounting, generally designated **10**, for the digger boom **2** includes laterally extending sleeves **11** and **12** (FIG. 3), which are rigidly secured to the inner end of the boom **2**. The sleeves **11**, **12** are journalled in bearings **13**, **14** mounted in the spaced hollow side plates **15**, **16**, respectively, carried at the rear end of the self-propelled tractor **1**. The drive sprocket **7** is secured to a drive shaft **17** which, in turn, is rotatably mounted in sleeves **11**, **12**. A sprocket **18** is non-rotatably affixed to the extended end of the drive shaft **17**. Suitable power means, including for example, a chain **19**, drivingly connects the sprocket **18** to a conventional power take-off (not shown) on the tractor **1**.

In order to raise and lower the digger boom **2** there is provided a hydraulic cylinder **20** suitably mounted within the side plate **16** of the tractor **1**. Hydraulic lines **21**, **22** for supplying pressure fluid to the hydraulic cylinder **20** are suitably coupled to a conventional hydraulic power source (not shown) on the tractor **1**. The outer end of a piston rod **23** of the hydraulic cylinder **20** is pivotally connected in any convenient manner to a lever arm **24** rigid with the sleeve **12**. It is obvious from an inspection of FIG. 3, that when the piston rod **23** is reciprocated within the cylinder **20** the boom **2** will be rocked about the axis of the bearings **13**, **14** since the inner end of the boom is rigid with the rockable sleeves **11**, **12**. In this regard, the inner end **25** of the boom **2** is rigidly secured to spaced, wedge shaped, block members **26**, **27** which are formed rigid or integral with the sleeves **11**, **12**, respectively. The drive shaft **17** extends through aligned bores in the block members **26**, **27**. The drive sprocket **7** on the drive shaft **17** is disposed within the space between the block members **26**, **27** and the inner end **25** of the boom **2**.

The intermediate sprockets **8**, **9** are keyed respectively to auger shafts **32** and **33**, which in turn are journalled respectively in bearing brackets **30** and **31**. Bracket **30** is suitably clamped to the top side of the boom **2**, and the bracket **31** is suitably clamped to the bottom side thereof. Shafts **32** and **33** carry auger blades **34** and **35** on their respective outer ends. Bearing brackets **30** and **31** are reversible so that the auger blades and their shafts may be mounted to project from either the right or left side of boom **2**. Thus, when the pair of auger blades **34**, **35** are disposed on the left-hand side of the boom, as shown in FIG. **3**, and when the boom **2** is lowered into working position as shown in FIG. 1, the digger chain **3** will impart rotary motion to the auger blades **34**, **35** through the respective sprockets **8**, **9**, whereby said auger blades will

engage the earth raised by the digger chain and convey the same laterally to the left side of the ditch being formed.

A thrust shoe **36** is adapted to be adjustably positioned selectively on either side of the digger boom **2** to counteract the lateral thrust set up in the boom by the driven auger blades **34, 35** when they are moving earth to one side of the trench being formed. For example, when the auger blades **34, 35** are positioned on the left side of the digger boom **2**, as viewed in FIG. 3, the thrust shoe **36** is adjustably positioned on the right side of the boom so that when the boom is lowered into trench digging position the outer face of the thrust shoe **36** will slidably engage the right side wall of the trench being formed by the endless digger teeth, whereby the wall of the trench will absorb the lateral thrust forces set up in the boom by the augers **34, 35.**

The thrust shoe **36** includes a pair of apertured supporting legs **37, 38** which are adjustably mounted in spaced, apertured bracket plates **39, 40, 41** and **42**, welded to opposite faces of the boom **2** between the outer end of the boom and the auger shaft supporting bracket **30.** The spaced bracket plates **39, 40, 41** and **42** are similar and the manner of detachably and adjustably connecting the apertured legs **37, 38** of the thrust shoe **36** to the bracket plates is the same for each leg **37, 38.** Therefore, it will suffice if reference is made solely to the connection between the leg **38** and the pair of bracket plates **41, 42.** Collars **43** are mounted on the outer face of each bracket plate **41** and **42.** Each collar is drilled and threaded to receive a set screw, and the set screws extend into selected ones of a plurality of cross-bores **48** spaced along the leg **38** to thereby laterally and adjustably position the thrust shoe with respect to the boom. The lateral positioning of shoe **36** is, of course, dependent on the width of the trench being dug.

A laterally adjustable dirt deflector **49** is mounted on the trailing end of the tractor **1** at the side thereof opposite the mounting of the driven auger blades **35, 36.** With reference to FIG. 5 the dirt deflector **49** shown therein is of the type designed to be mounted at the right rear side of the tractor **1** (the far side as viewed in FIG. 1). It is of course understood that a second dirt deflector will be provided which is a mirror image, of that shown in FIG. 5 and when it is desired to pile the dirt on the opposite side of the trench, it will be mounted on the left rear side of the tractor **1** to cooperate with the auger blades **35, 34** when they are disposed on the right side of the boom **2.** However, since these dirt deflectors **49** are mirror images of each other and since their mounting on the tractor **1** is identical, a description of one only is deemed necessary.

As shown in FIGS. 4 and 5, dirt deflector **49** includes a fore and aft elongated heavy rigid plate **50** which is mounted for pivotal movement on one end of an annularly grooved outwardly extending transverse shaft **51.** A side thrust absorbing brace bar **52** has one end rigidly secured at **53** near the aft end of plate **50,** and its other end secured to the outer end of shaft **51,** thus providing a rigid triangular structure.

Pivotally mounted on shaft **51** between the brace bar and plate **50** is a bell crank lever, one arm **54** of which is in the form of a U-shaped frame, and the other arm of which is an integral depending rigid bar **55.** At the lower end of bar **55** is a pin **56,** and a similar pin **57** is anchored to plate **50.** A tensioned spring **58** has its opposite ends secured to the two pins **56** and **57.**

The above described dirt deflector assembly is mounted at the trailing end of the tractor, as shown in FIG. 4. Shaft **51** is rotatably received in a laterally disposed seat in the end of a rigid bracket **59,** one of which is rigidly secured to the lower edge of each of the plates **15** and **16.** Vertically aligned holes are provided in the aft end of bracket **59** to receive a lock pin **60.** The shaft **51** is manually adjusted laterally, depending on the width of

the trench to be dug, so that one of the spaced encircling grooves **47** on shaft **51** aligns with the lock pin holes. Thus, when the lock pin **60** is pushed into the holes in bracket **59,** a portion of the pin also seats in the selected aligned groove in the shaft. Lateral movement of the shaft and of the entire dirt deflecting assembly is thus prevented.

With the dirt deflecting assembly mounted as described, and as shown in FIGS. 3 and 4 it will be seen that the aft end of crank lever arm **54** is in contact with the lower edge of plate **16,** and is thereby prevented from rotating clockwise about shaft **51.** This prevention of movement of arm **54** thus maintains a tension on spring **58,** which in turn continuously urges the aft lower edge of plate **50** into firm slidable contact with the ground alongside a trench being dug. However, the plate **50** may be pivoted clockwise (FIG. 4) about shaft **51** with the boom **2,** when both are moved into ground transport position, as shown in FIGS. 2 and 3.

When the digging assembly is in the position shown in FIG. 1 and is performing its trench digging function, the digging blades on the lower run of chain **3** lift the loosened dirt from the trench and dump it on the uncut ground ahead of the trencher chain, between the forward portion of deflector plate **50** and the adjacent pick up end of auger blade **35.** The forward portion of plate **50** prevents the discharged dirt from moving toward the right hand side of the trench, and deflects the dirt toward auger blade **50.** Since the loosened dirt cannot fall back into the trench because it is continually being pushed upward and forward by the digger chain blades, it is confined by the digger chain blades and by the deflector plate **50,** and can only move forward and sidewise toward the auger blade **35.** The auger blade in turn moves the loosened dirt to the left hand side of the trench only. Any loose dirt dropped by auger blade **35** is picked up and moved to the left by the other auger **34.**

To move the deflector plate into transport position, chain **66** is hooked at one end to a member **68** extending laterally outwardly of the digger boom **2.** The other end of the chain **66** is suitably connected to an eye bolt or the like **70** secured to the plate **50.** It will be apparent that when the boom **2** is raised to transport position by proper actuation of the hydraulic cylinder **20,** the chain **66** will cause the plate **50** to be simultaneously pivoted upwardly about shaft **51** as an axis to an elevated position above the ground, as shown in FIG. 2. Of course, when piling dirt on the other side of the trench, a left-hand type dirt deflector (previously described but not shown) will be mounted on the side plate **15** in a manner identical with that described for mounting the right-hand type dirt deflector **49** on the side plate **16.** In this regard a projecting member **71,** similar to the member **68,** extends outwardly to the left of the boom **2,** as seen in FIG. 3.

From the above description is will be seen that my invention comprises primarily the combination of a dirt deflecting plate mounted to one side of a trencher boom and digger chain assembly, and serving to deflect dirt removed from the trench toward a cooperating auger which is mounted on the opposite side of the boom and digger assembly, and which picks up the deflected dirt and conveys it further in the same direction to pile the dirt in a single ridge along one side only of the trench, leaving the other side of the trench clear for workmen, and also making it much easier to fill the trench.

The embodiment of the invention described and illustrated herein includes two side delivery augers, but only one auger is essential to the practical use of the invention.

An additional feature of the invention, while not essential, is a thrust shoe projecting laterally from that side of the boom opposite the auger, to contact one side wall of the trench being dug to thus absorb the side thrust produced by the side delivery auger, and to aid in the digging of a linear trench by keeping the boom and digger

chain assemblies centered laterally in the trench being dug.

The auger or augers may be mounted to project from either side of the trencher boom to thus pile dirt along a selected side of the trench. Since the auger is made to convey dirt laterally away from the boom, the dirt deflector and the thrust shoe are always mounted on that side of the boom opposite the side from which the auger shaft projects.

Having described and illustrated the invention with sufficient clarity to enable those familiar with this art to construct and use it, I claim:

1. A trench digging machine comprising:
a digger boom;
an endless digger chain entrained about the ends of the digger boom;
drive means operatively connected to drive the digger chain;
auger means mounted on the digger boom in a position intermediate the ends thereof and extending laterally at ground level to one side of the boom when the boom is in digging position, said auger means being adapted to convey dirt excavated by the digger chain from the trench to said one side thereof at ground level;
means drivingly interconnecting the digger chain and the auger means for rotating the latter in a direction to move dirt away from the trench;
and a dirt deflecting plate fixed on the machine substantially at ground level on the side thereof opposite that from which the auger means is extended, and disposed in a plane substantially normal to the axis of rotation of said auger means, said dirt deflecting plate including a forward portion disposed in advance of said auger and adjacent to the path of advance of said digger chain whereby said forward portion directs dirt dug by the digger chain toward a position in the path of advance of said auger means and in advance thereof.

2. A trench digging machine as set forth in claim 1 wherein a trailing portion of said deflector plate extends rearwardly of said boom at ground level adjacent to the edge of the trench and is effective to prevent spillover dirt dislodged by said machine on the outboard side of said deflector plate from entering the open ditch.

3. A self-propelled trench digging machine as set forth in claim 1 in which the dirt deflecting plate is carried by the machine on a transverse pivot axis disposed near the upper forward corner of said forward portion thereof; and means interconnecting the swingable digger boom and the trailing portion of said pivotally mounted dirt deflecting plate whereby swinging of the digger boom to a raised transport position will simultaneously raise the dirt deflecting plate to a position clear of engagement with the ground.

4. The machine described in claim 3, and means on said pivot axis affording selected positioning of said heavy rigid plate to vary its transverse distance from said path of advance of said digger chain.

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