United States Patent

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[54] **SELF-PROPELLED LOADER**
9 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** ..... **37/112,** 37/110, 180/79.2 R
[51] **Int. Cl.** **E02f 3/78,** E02f 5/26
[50] **Field of Search** 37/110–114, 8, 12, 95, 96, 97

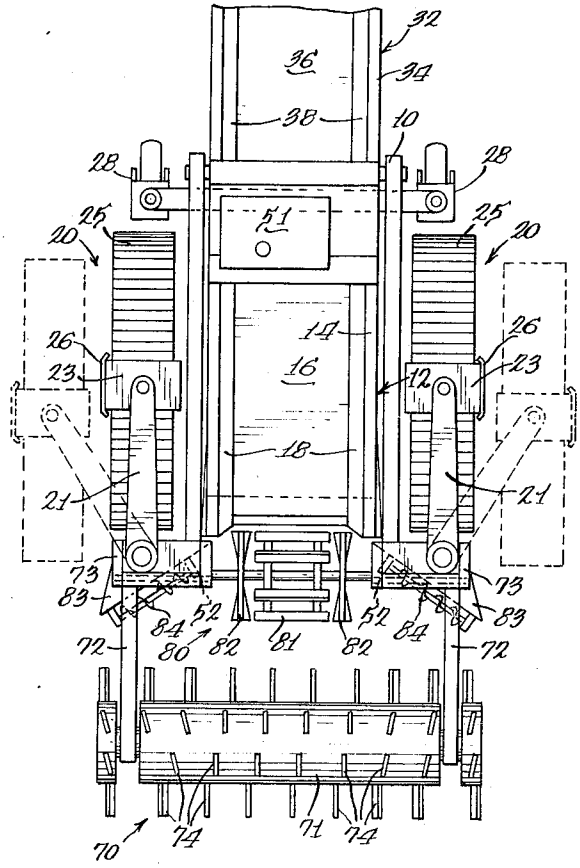
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ABSTRACT: Self-propelled earth materials loader comprising a frame, conveyor belt means mounted on said frame having a forward end and a rearward discharge end, a pair of arms swingably mounted on said frame adjacent the forward end and to opposite sides of said belt means, a pair of ground-engaging vehicle drive means turnably mounted on said arms, means for controllably swinging said arms, turning said drive means and operating said belt means and said drive means, and loading means forwardly of the forward end of said belt means for loading earth materials onto said belt means; said arms being swingable and said drive means being turnable to dispose said drive means in any of a plurality of positions parallel to, normal to and at inclinations to the axis of the belt means to accommodate a variety of loading operations.



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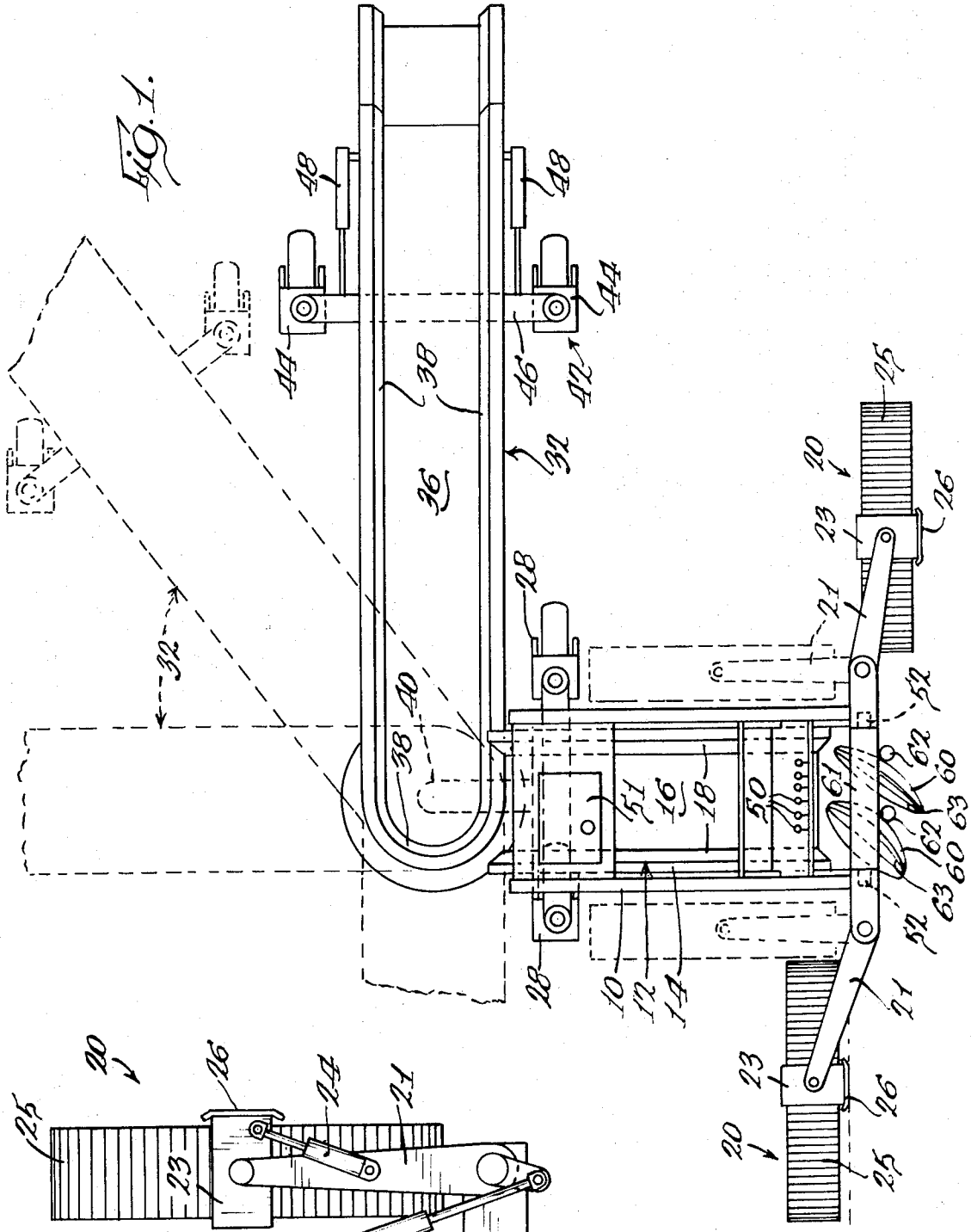
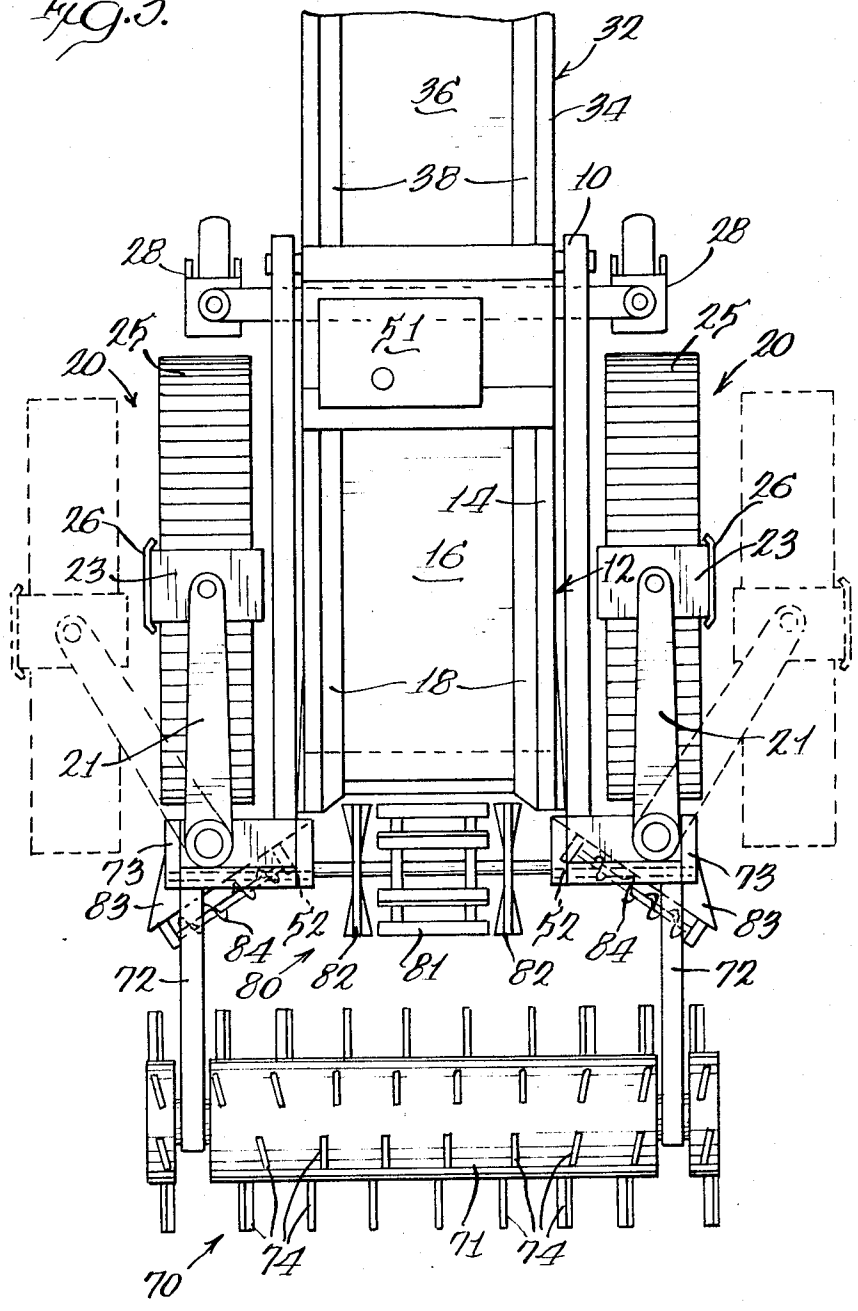


Fig. 1.

Fig. 2.

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Fig. 3.



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SELF-PROPELLED LOADER

Ancillary features include detachable mounting means on said frame accommodating a variety of loading instrumentalities, and a two-section conveyor belt assembly including a swingable and elevatable rearward section facilitating loading into stockpiles and loading into a variety of carrying vehicles traveling at various directions relative to the loader.

Other features and advantages will become apparent from the drawings and the following description, which are given to acquaint those skilled in the art with the best mode presently contemplated by me for carrying out my invention.

THE DRAWINGS

FIG. 1 is a plan view of the preferred embodiment of my loader as equipped with loading discs adapted to excavate earth from the side of a bank;

FIG. 2 is a fragmentary plan view showing one of the steering and driving assemblies; and

FIG. 3 is a plan view of the loader equipped with a rotary excavator for head-on excavation of earth materials, followed by impeller means for pushing loose earth materials onto the conveyor belt means of the loader.

DESCRIPTION

The loader is comprised of a main frame **10** mounting therein the first section **12** of a two-section conveyor belt means. This first section is relatively short and comprised, as is conventional, of a subframe **14**, a conveyor belt **16**, rollers (not shown) for supporting the belt and including a roller at the rear end of the belt for driving the belt, and sidewall means **18** for maintaining earth materials on the belt. The forward end of the belt (i.e., toward the bottom of FIG. **1**) is disposed relatively close to the ground and the belt extends rearwardly and upwardly therefrom. For purposes of orientation, the forward end and the longitudinal axis of the belt **16** shall be treated herein as the forward end and the longitudinal axis of the machine and its frame **10**.

The frame **10** is drivingly supported at its forward or front end by a pair of combined steering and driving assemblies **20** disposed to opposite sides of the frame and the belt section **12**. Each assembly comprises an arm **21** which may be either pivoted on or articulated to the front end of the respective side of the frame, motor means **22** in the form preferably of a hydraulic cylinder or jack for moving the arm relative to the frame, a clevis or like device **23** turnably or pivotably mounted on the outer end of the arm, motor means **24** in the form preferably of a hydraulic cylinder or jack for turning the clevis relative to the arm, a ground-engaging drive assembly or mechanism **25** such as an endless track or a bogey assembly of drive wheels mounted on the clevis **23**, and reversible power means such as self-contained hydraulic motors (not visible in the drawings) for operating said drive mechanisms in reverse directions. By appropriate manipulation of the motor means **22** and **24**, the arms **21** and drive mechanisms **25** can be disposed at a variety of positions with the mechanisms **25** normal or parallel to the machine, as indicated in the drawings, or with the mechanisms inclined to the axis of the machine should that prove desirable.

At its rearward end, the frame **10** may be supported in any of several different ways, such for example as by one or more of the assemblies **20** or one or more of the mechanisms **25**. However, in the preferred structure, swivel or caster wheels **28** are provided at the rear corners of the frame.

At its rearward elevated end, the first conveyor section **12** extends over the lower forward end of the second section **32** of the two-section conveyor belt means. This second section, like the first, comprises a subframe **34**, a conveyor belt **36**, rollers (not shown) for supporting the belt and including a roller at the rear end thereof for driving the belt, and sidewall means **38** for maintaining earth materials on the belt **36**. At the forward end of this section, its subframe is pivotally mounted on a rearward extension **40** of the frame **10**, whereby the second section **32** may be swung 90 degrees to either side of a position

wherein the second section is axially aligned with the first section. A lock (not shown) is preferably provided for releasably securing the second section in desired angular position relative to the first section. Thus, the second section may extend axially rearward from the first (FIG. **2**) or at right angles to the first (FIG. **1** solid lines) or at any intermediate angular position as depicted by dotted lines in FIG. **1**.

To support the rearward end portions of the second belt section **32**, and also to accommodate angular adjustment and travel of the same in adjusted position, the second section is preferably equipped with a supporting structure **42** including swivel or caster wheels **44**. In addition, to accommodate adjustment of the inclination of the second section, and thus the elevation of the rearward discharge end of the belt **36**, the supporting structure preferably includes a cross-shaft **46** rotatably mounted on the subframe **34** of the section **32**, and motor means **48** (such as extensible and retractable piston means and appropriate crank means) for rotating the shaft to vary the vertical disposition and effective height of the structure **44**.

Preferably, all of the motor and power means of the machine are connected to appropriate individual controls, indicated generally at **50**, provided at an operator's station on top of the frame **10** above the forward end of the belt **12**, whereby the operation of the entire machine may be governed by a single operator. Power for all the power operated components of the machine is suitably provided by a power plant **51** mounted on the frame **10**, the power plant preferably including an internal combustion engine as its prime mover.

At its forward end, forwardly of the belt **12**, the machine frame includes means, indicated diagrammatically at **52**, of practically any form conventional and known to the art for the detachable mounting of earthmoving attachments. Such means may for example comprise brackets detachably bolted to the frame or may, as shown, comprise a pair of stub shafts on which the attachments may be detachably and pivotally mounted by split bearings provided on the attachments. Thus, the frame is adapted for detachable reception of a variety of earth-excavating and/or impelling means for feeding to the belts material to be loaded into trucks or stockpiles.

Referring to FIG. **1**, one such excavating means may comprise a pair of cutting discs or circular plows **60** which are employed in known manner for excavating earth materials for a wide variety of purposes. Such plows are shown and described in detail in the copending application of John and Solomon Ulrich, Ser. No. 725,574, filed Apr. 17, 1968.

For use with the machine of this invention, a plow frame **61** is detachably mounted in the means **52** of the frame **10**, the plow frame **61** including a pair of posts **62** on which the plows or discs are mounted. Preferably, each disc is rotatably and slidably mounted on a respective post to a respective side of its center so that each disc can be set to an upper and inner leading disc position (the left-hand disc in FIG. **1**) and a lower trailing disc position (the right-hand disc in FIG. **1**). By virtue of this structure, the machine can operate in either direction, i.e., toward either the left or the right, by simple adjustment of the two discs.

Assuming that the machine as shown in FIG. **1** is moving to the left with the discs removing earth from the vertical wall of a bank, it will be observed that the leading (left) steering assembly **20** has been set so that its drive mechanism **25** is closely adjacent and parallel to the face of an as yet uncut part of the bank; the discs are disposed to cut a wide swath from the bank rearwardly of this assembly; and the trailing (right) steering assembly **20** has been set so that its drive mechanism **25** is closely adjacent and parallel to the fresh face of the newly cut part of the bank. Both of the mechanisms **25** are equipped with a guide or push plate **26** adapted to be brought to bear firmly against the respective faces of the bank to aid in maintaining the machine in desired position relative to the bank.

As shown, the arms **21** and the mechanisms **25** are so turned or positioned as to dispose the frame **10** and belt section **12**

perpendicular to the face of the bank. However, if desired or necessary (because of space limitations for example), the frame could as easily be disposed at an inclination to the bank.

In any event, the structure provides a pair of traction means, one exerting a pulling force and the other a pushing force on the discs, and both acting essentially to apply an in-line force to the discs.

As the discs are moved along the bank, the leading (left) disc cuts away the upper part of the bank and due to its inclination discharges most of the thus excavated material laterally therefrom onto the leading end of the belt **16**. Simultaneously, the trailing (right) disc cuts away the lower part of the bank and forces the thus excavated material (plus any overflow from the first disc) onto the leading end of the belt **16**. The belt **16** continuously carries the excavated material upwardly and rearwardly and dumps the same onto the leading or forward end of the belt **36**. To assist in reducing the material to granular form, or at least to break up the larger chunks of the excavated material, breaker knives **63** may be provided on the discs **60** and additional breaker means (not shown) may be provided between the upper rearward end of belt **16** and the lower forward end of belt **36**.

The provision of a short leading belt section **12** affords the advantages that the majority of the abuse of the excavating operation is carried by one firmly supported belt, i.e., the belt **16**, which may be formed of much greater bulk and strength than would be feasible for the entire conveyor assembly, and which can quite easily and economically be replaced when necessary (at least in contrast to replacement of the entire length of the belts **16** and **36**). Additionally, of course, the benefit is obtained of diverse angular extension of the belt **36** from the frame.

Upon receiving material from the belt **16**, the belt **36** carries the material upwardly and rearwardly for discharging it into trucks, trailers, or like earth carriers. By virtue of the fact the belt **36** can be extended in any direction through an arc of 180° from the rear of the frame **10**, the carrying vehicles may be driven in practically any desired path of movement rearwardly of the frame **10**.

When the machine reaches one end of the bank being excavated, the disc or plows are turned and adjusted so that the right-hand disc becomes the upper leading disc and the left-hand disc becomes the lower trailing disc. Then, the mechanisms **25** are operated in the reverse direction to move the machine toward the right, whereupon the arms **21** and mechanisms **25** are steered to force the discs into the bank and to dispose of the now leading (right) mechanism in rearwardly spaced relation to the discs and the now trailing (left) mechanism directly behind the discs. Also, the second section **32** of the conveyor belt means can now be adjusted to such position as desired or required, whereupon excavation may proceed in the opposite direction (i.e., to the right in FIG. **1**) without turning the machine around or making any other clumsy or time consuming maneuver. Thus, the machine may be reversely reciprocated across the face of the bank in a most expeditious and efficient excavating operation.

While fixed disc excavators or plows **60** have been shown in FIG. **1**, it is to be understood that the same are representative of excavating or plowing devices that discharge onto a belt extending generally normal to the direction of machine movement. The discs could as easily be replaced by a laterally discharging bucket wheel or tandem assembly of bucket wheels associated in conventional or known manner with the frame **10** and the belt **16**.

Referring now to FIG. **2**, I have also shown a representative type of head-on excavator or loader that may be used on my machine. As before, this attachment may be mounted in the means **52** provided on the frame **10** of the machine. The attachment illustrated comprises two instrumentalities, namely, a bladed excavator roll **70** and an impeller assembly **80** for feeding loose earth materials to the belt **16**. As will become apparent hereinafter, the roll **70** may be removed or lifted up out of the way when the machine is working on loose earth materials, at which time the assembly **80** will suffice.

As shown, the excavator assembly **70** comprises a rotary drum **71** and a pair of arms **72** supporting the drum in forwardly spaced relation to the frame **10** and the belt **16**. The arms are pivotally mounted at their rearward ends on an attachment supporting frame **73** (which is mounted in the means **52** of the machine) and are preferably provided with means (not shown) such as hydraulic jacks for raising and lowering the outer ends of the arms in known manner. The drum is journaled, at reduced portions inwardly of the outer ends thereof, on the forward ends of the arms, and drive means are provided in one or both of the arms for rotating the drum.

The drum **71** is of a length slightly in excess of the overall width of the machine and carries on the periphery thereof a plurality of outwardly radiating cutting blades **74**. These blades are preferably inclined in such directions that the earth materials cut thereby are driven inwardly and rearwardly toward the forward end of the belt **16**, where the now loosened earth is readily picked up and fed to the belt by the impeller assembly **80**.

The assembly **80** is also mounted on the attachment frame **73** and comprises an impeller or paddle wheel **81** having rotary cutting or lump-breaking blades **82** at the sides thereof, a pair of inwardly and rearwardly inclined guides or plows **83** extending respectively from the outboard edge of the respective one of the assemblies **20** to adjacent the forward end of the belt **16**, a rotary screw auger **84** forwardly of and parallel to each of the guides **83**, and means (not shown) for rotating the wheel **81** and the augers **84**. Manifestly, the augers and the wheel will force feed loose earth materials onto the forward end of belt **16**. If the material is already loose, they will feed it to the belt without need for the excavator **70**, in which case the excavator may be removed or raised upwardly to an inoperative position. If the earth material is solid, he excavator is lowered to break up the earth material and then feed it to the belt by means of the impeller assembly.

As previously noted, the assemblies **70** and **80** are simply representative of head-on excavators and loaders that can be used with my machine.

Whatever type of excavating or loading means is employed in conjunction with the machine, the earth materials that are delivered to the belts **16** and **36** may be discharged into transport carriers or may, by appropriate manipulation of the second section **32** of the conveyor assembly, be stockpiled for future use.

While I have thus shown and described what I regard to be the preferred embodiments of my invention, it is believed apparent that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A self-propelled loader comprising a frame, conveyor belt means mounted on said frame having a forward end and a rearward discharge end, loading means forwardly of the forward end of said belt means for loading earth materials onto said belt means, a pair of elongate arms swingably mounted on said frame adjacent the forward end and to opposite sides of said belt means, each said arm extending generally horizontally from said frame and having an inner end pivotally mounted to the frame on a substantially upright axis and an outer end spaced a substantial distance from said inner end and defining bearing means having a substantially upright axis, a pair of reversibly operable ground engaging vehicle drive means each having support means turnably mounted in said bearing means at the outer end of a respective one of said arms, turning means for controllably turning each said drive means about the axis of the respective bearing means relative to the respective one of said arms, and arm swinging means for controllably swinging each said arm about its pivot axis on said frame through an arc of movement in excess of 90° whereby each arm may be disposed adjacent said frame in a position substantially parallel to said belt means, at an obtuse angle projecting outwardly and forwardly from said belt means, and at intermediate angles relative to said belt means, said drive

means being controllably turnable relative to said arms by said turning means to accommodate loader movement in directions generally parallel to said belt means when said arms are in positions parallel to and within predetermined arcs of movement of parallelism with said belt means and in directions generally normal to said belt means when said arms are in positions normal to said belt means and within predetermined arcs of movement to opposite sides of such normal position.

2. The loader of claim 1 wherein said frame includes detachable mounting means for said loading means whereby to facilitate substitution of various types of loading means.

3. The loader of claim 1 wherein the loading means comprises earthmoving means discharging laterally therefrom onto said belt means, and said arms and said drive means are disposed in positions generally normal to said belt means.

4. The loader of claim 3 wherein said earthmoving means are reversibly mounted on said frame and said drive means are reversibly operable to drive the loader in opposite directions, whereby the loader may be moved in alternate reciprocal strokes without necessity for turning around.

5. The loader of claim 4 wherein said drive means include guide plate means engageable with the faces of the material being excavated for guiding the loader therealong.

6. The loader of claim 3 wherein one of said drive means leads said earthmoving means in the direction of loader travel and is adjustably movable by said means for controllably swinging said arms and said means for turning said drive means to be offset from said earthmoving means in the direction toward the frame and the belt means to accommodate engagement of said earthmoving means with a bank of earth, and the other of said drive means trails said earthmoving means and is adjustably movable by said means for controllably swinging said arms and said means for turning said drive means to be located and to push from directly behind said earthmoving means.

7. The loader of claim 1 wherein the loading means comprises impeller means and said drive means are adjustably movable by said arm-swinging means and said turning means to be disposed parallel to the direction of impelling movement of said impeller means rearwardly thereof.

8. The loader of claim 7 wherein the impelling direction of said impeller means is parallel to the belt means, said drive means are adjustably movable by said arm-swinging means and said turning means to be disposed parallel and adjacent to the opposite sides of said belt means, and guide means are disposed forwardly of said drive means and angled rearwardly toward the forward end of said belt means.

9. The loader of claim 8 wherein said impeller means comprises earth material cutting means of a length equal substantially to the combined width of said belt means and said guide means disposed forwardly thereof, and means disposed between said guide means at the forward end of said belt means for feeding cut material to said belt means.

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