

April 24, 1962

W. H. SASSMANN ETAL

3,030,714

EARTH HANDLING APPARATUS

Filed Nov. 24, 1958

4 Sheets-Sheet 1

FIG. 1.

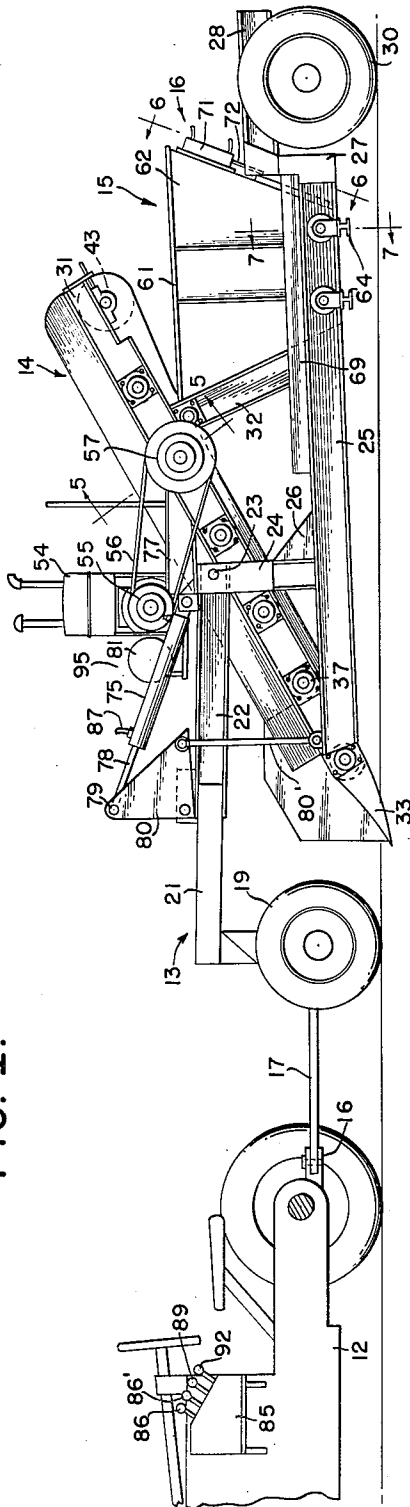
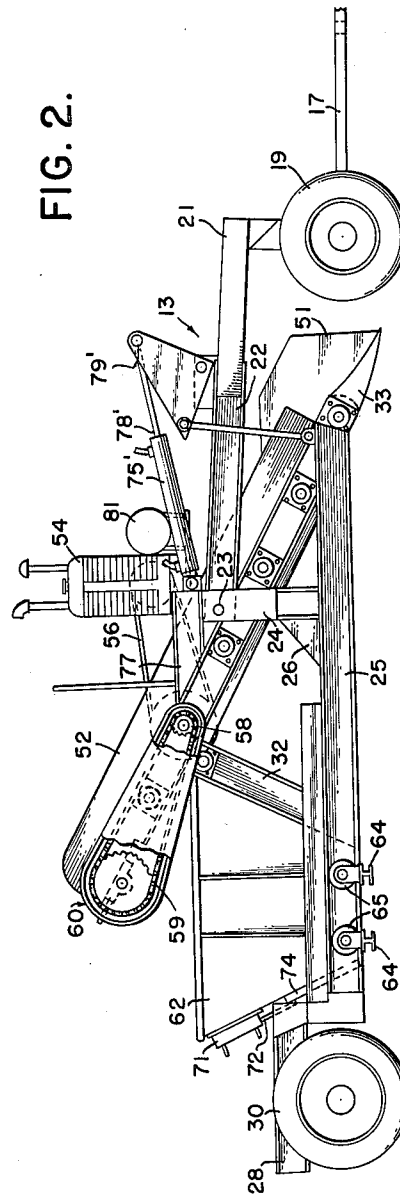


FIG. 2.



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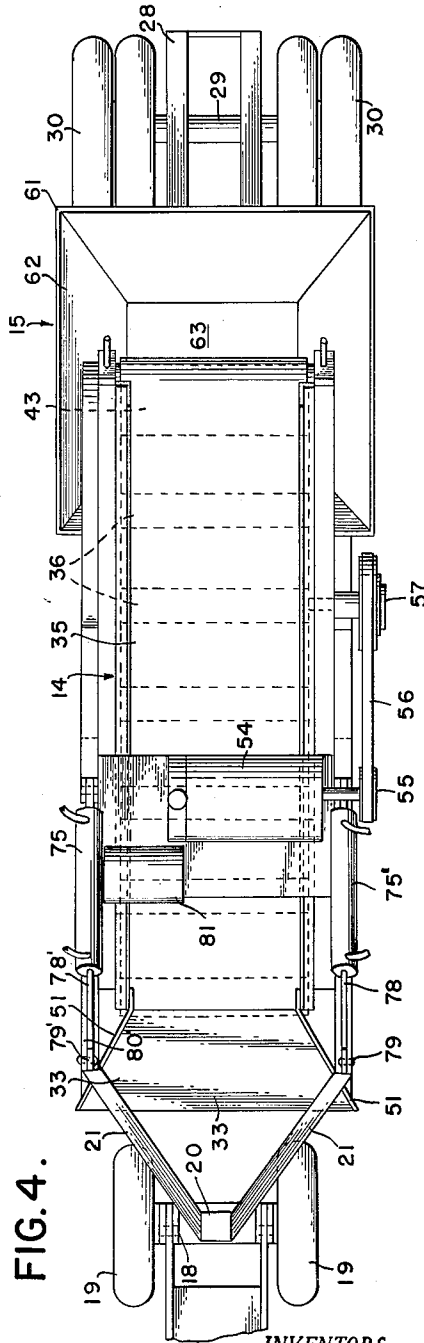
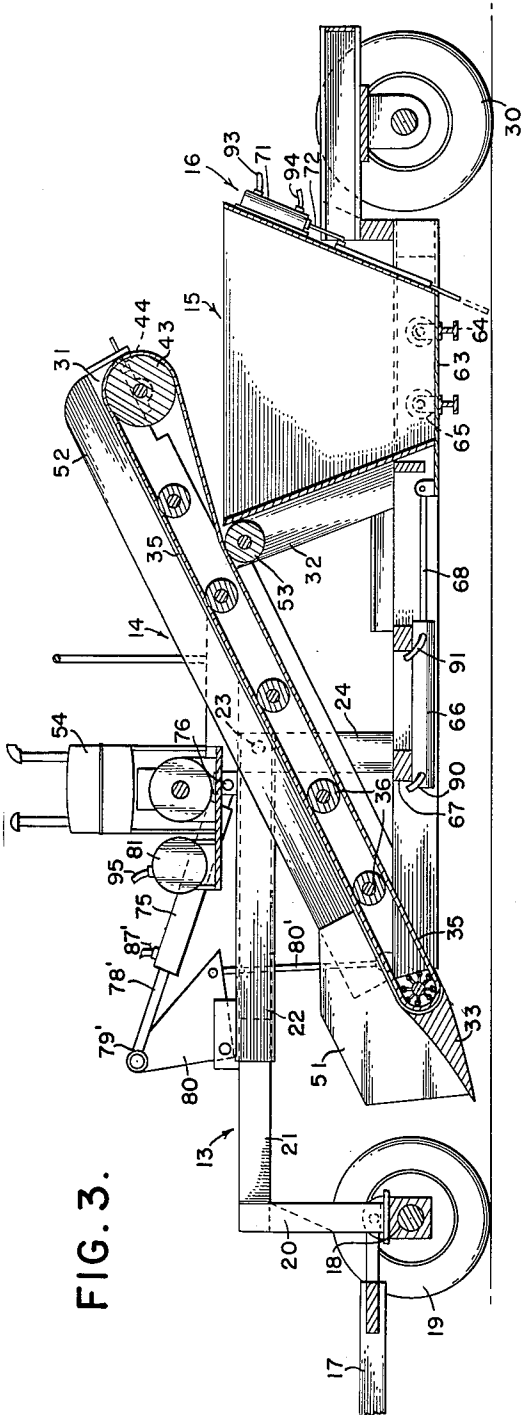
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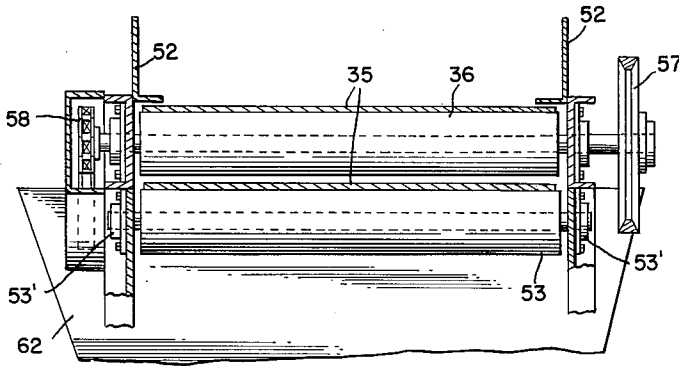


FIG. 5.

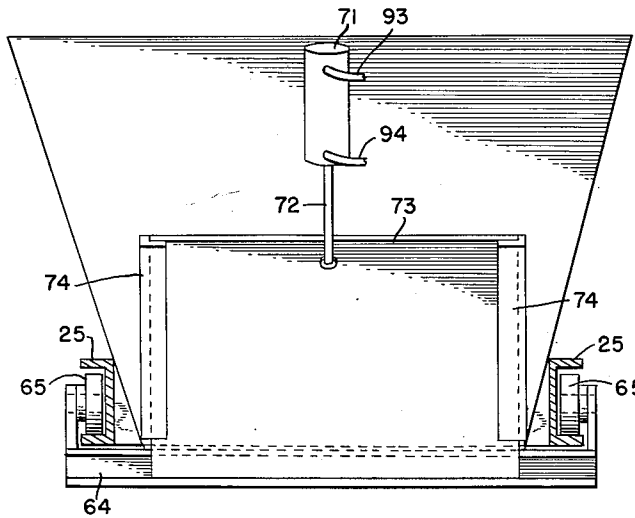


FIG. 6.

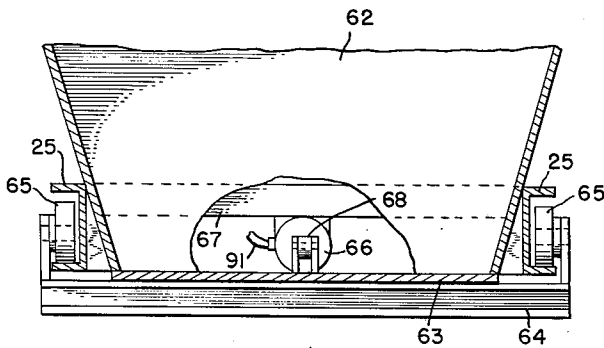


FIG. 7.

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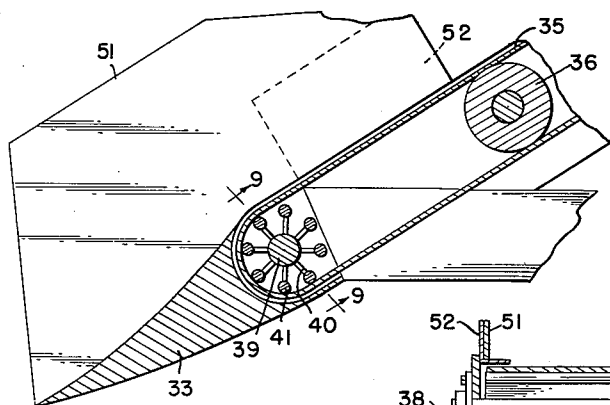


FIG. 8.

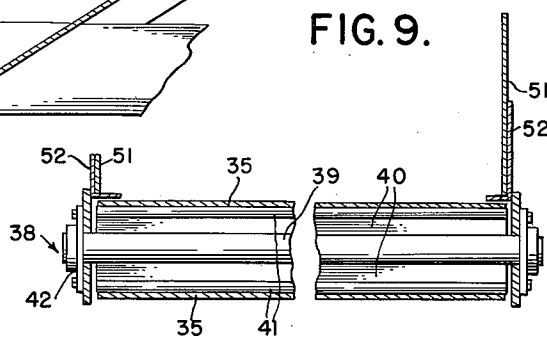


FIG. 9.

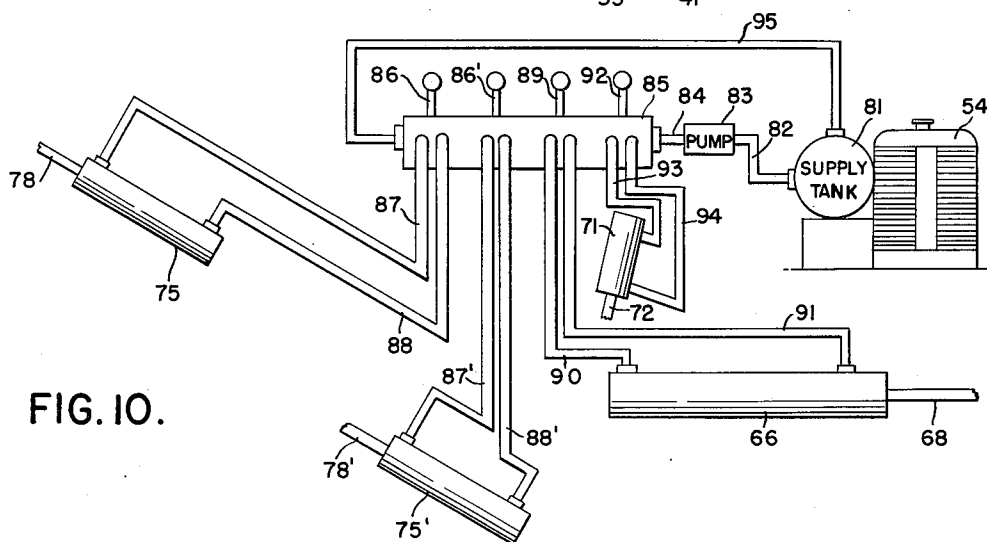


FIG. 10.

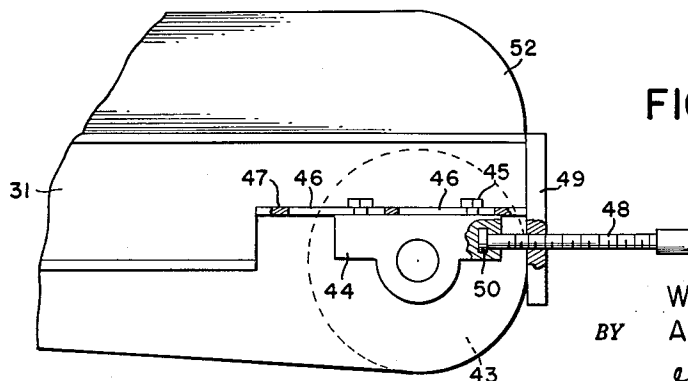


FIG. 11.

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EARTH HANDLING APPARATUS

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6 Claims. (Cl. 37-126)

This invention relates to earth handling apparatus and more particularly to a mobile machine for "borrowing" earth from one location and transporting it to another site in one continuous operation.

It is an object of this invention to provide an earth handling machine which successively excavates the earth, elevates it rearwardly to a storage station, and then transports the earth to a predetermined location, whereupon it is discharged and leveled to any desired height.

Other objects are to provide a machine of the character described including a frame or chassis on which an excavating assembly is fixedly mounted, the frame being articulate to permit adjustment of the excavating assembly to penetrate the earth to any desired depth, and power means on the frame acting in concert with forces exerted by the weight of component parts of the machine to urge the excavating assembly into digging engagement with the ground; and to provide an earth handler of durable construction designed to withstand destructive forces exerted thereon in operation by the ground and foreign objects.

Other objects of the invention will be manifest from the following description of the present preferred form of the invention, taken in connection with the accompanying drawings, wherein:

FIG. 1 is a side elevational view of the apparatus of the present invention, illustrating its operative position;

FIG. 2 is a side elevational view taken from the opposite side of FIG. 1, showing to advantage the assembly in inoperative position;

FIG. 3 is a longitudinal sectional view of the present invention, illustrating to advantage details of construction;

FIG. 4 is a top plan view of the present invention;

FIG. 5 is a sectional view taken along the line 5-5 of FIG. 1, looking in the direction of the arrows;

FIG. 6 is a sectional view taken along the line 6-6 of FIG. 1, looking in the direction of the arrows and showing to advantage, the leveling unit forming a part of the present invention;

FIG. 7 is a sectional view taken on the line 7-7 of FIG. 1, looking in the direction of the arrows, a part thereof being broken away to disclose details of construction;

FIG. 8 is an enlarged fragmentary sectional view of the excavating and conveying assembly;

FIG. 9 is a sectional view taken along the line 9-9 of FIG. 8 looking in the direction of the arrows;

FIG. 10 is a diagrammatic view of the hydraulic assembly of the present invention; and

FIG. 11 is an enlarged fragmentary side elevational view of the conveyor belt adjustment mechanism forming a part of the present invention, a portion thereof being broken away to disclose details.

Referring now in greater detail to the drawings, there is shown, in FIG. 1, a tractor of conventional construction 12, having a hitch at its aft end adapted for engagement with the earth handling apparatus of the present invention which includes an articulate frame generally designated 13 upon which is mounted an excavating and conveying assembly 14. Rearwardly of assembly 14 is an earth storage station 15 and an earth leveling unit 16.

Frame 13 includes a tongue 17 connected at its fore end to the hitch of tractor 12 and at its aft end to an

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axle 18 on which front wheels 19 are mounted. A vertical support 20 is fixed to axle 18 intermediate its length. A pair of horizontal arms 21 are welded or secured in any other suitable manner to the upper limit of support 20, which arms diverge outwardly and rearwardly to form a substantially V-shaped section. The outer terminals of arms 21 are, in turn, fixed to a pair of parallel arranged beams 22 which extend to a point approximately midway the length of the apparatus and together with arms 21, comprise the upper fore section of the assembly frame. Pivotaly connected at 23 to the free terminals of beams 22, are vertically arranged frame links 24 which links extend downwardly into fixed engagement with aft lower frame members 25 which are preferably of I-beam construction. Braces are indicated at 26. It will be noted from FIGS. 1 to 3 of the drawings, that beams 22 and lower frame members 25 lie in planes which are very nearly parallel and that links 24 are connected to the lower frame members 25 at a point intermediate their length, so that portions of lower frame members 25 extend beneath beams 22. The rear edges of frame members 25 are connected by a transverse bar 27, the upper edge of which extends above the plane of the frame members. A pair of spaced beams 28 are welded or secured in any other suitable manner to the upper edge of transverse bar 27 and extend rearwardly into supporting engagement with an axle 29 supporting rear wheels 30.

Excavating and conveying assembly 14 is interposed between the upper and lower frame members at approximately a thirty degree angle, and includes a pair of frame members 31, the lower margins of which are welded or bolted to the forward end of lower frame members 25. Frames 31 are braced in angular position by supporting members 32 which extend upwardly from lower frame members 25. A plow or blade 33 extends transversely between angularly disposed frame members 31 at their points of connection with lower frame members 25, the rearward edge of the blade being fixed by welding or other suitable means to the frame members.

For conveying the earth excavated by plow 33 to a storage station, a conveyor belt 35 of suitable resilient material is mounted on a plurality of conventional rollers, between frame members 31, the intermediate rollers being indicated at 36 and having their terminals journaled to frame members 31 as indicated at 37. As shown to advantage in FIGS. 8 and 9, the lowermost roller of the conveyor assembly is designated 38 and includes a central shaft 39 connected by radial plates 40 to a plurality of equally spaced and parallel rods 41 which conveyor belt 35 engages. This structure prevents collection of earth on the lower rollers. The terminals of shaft 39 are rotatably mounted in suitable bearings 42. It will be noted from FIG. 8 that shaft 39 and rods 41 are of such a size and so located that the circumferential path described by lowermost roller 38 is the same as that of the intermediate rollers 36. The uppermost roller 43 of the conveyor assembly is enlarged and, in order to permit adjustment of conveyor belt 35, its terminals are rotatably mounted in slidable bearing blocks 44. As shown in FIG. 11, bearing blocks 44 are suspended from pairs of bolts 45, the shanks of which are movable in longitudinal slots 46 in flanges 47 which extend outwardly at right angles from the upper margins of frame members 31. Movement of the bearing blocks to effect adjustment of the conveyor belt is made by means of adjustment members 48 which are threaded through stationary plates 49 fixed to the aft edges of frame members 31, the inner terminals indicated at 50 being rotatable within blocks 44.

It will be noted from FIG. 4 that blade or plow 33 tapers inwardly from front to back, the width of the

rear edge of the blade approximately corresponding to the width of conveyor belt 35. In order to guide the loosened earth from the fore to aft edges of the plow, the lateral edges of the latter are provided with guards 51 which extend rearwardly into engagement with the conveyor assembly and into overlapping relation with a second pair of guards 52 extending the length of the conveyor assembly. Assembly 14 further includes an idler roller 53 mounted in bearings 53' between supporting members 32 near their upper limit, said roller being engageable with the lower run of belt 35 to keep the latter in close proximity to frame members 31.

To operate conveyor belt 35, there is provided an internal combustion engine 54 which is suitably mounted on frame 13. Engine 54 includes a drive pulley 55 from which a drive belt 56 extends to driven pulley 57 which is fixedly connected to a terminal of one of the intermediate rollers 36 of conveyor assembly 34. A sprocket gear 58 is fixed to the opposite terminal of said intermediate driven roller 36. A sprocket chain 59 extends upwardly and rearwardly of conveyor assembly 34 into engagement with a second sprocket gear 60 affixed to a terminal of uppermost roller 43. This effects rotation of roller 43 which frictionally engages conveyor belt 35 to initiate movement.

Conveyor belt 35 serves to direct the removed earth rearwardly of the machine to storage station 15 comprising a bin 61 having sides 62 which slope inwardly from top to bottom, the bin being mounted in any suitable manner between frame members 25. Bin 61 further includes a sliding bottom 63 which permits egress of the earth from the bin. Bottom 63 is supported on supporting beams 64, the upper terminals of which beams are engaged with wheels 65 which roll on the horizontal flanges of the I-beams comprising roller frame members 25. Sliding movement of the bottom 63 is effected by means of a hydraulic ram 66 which is fixed to frame members 25 by cross bars 67. Ram 66 further includes a piston rod 68, the outer terminal of which is secured in any suitable fashion to bottom 63. Superjacent wheels 65 on frame members 25 are overhanging dirt shields 69 which prevent the accumulation of any matter on the beams which would be likely to interfere with the movement of wheels 65.

Earth leveling unit 16 is mounted at the rear of bin 61 on side 62. This unit includes a hydraulic cylinder 71 and a piston rod 72 which extends downwardly and has its lower terminal connected to a leveling blade 73. It will be seen from FIG. 6 that the lateral margins of blade 73 move within the channel guides 74 mounted on the sloping rear side 62 of bin 61. Blade 73 is substantially coextensive with bottom 63 and can be dropped to any predetermined point below bin 61.

In order to effect adjustment of plow or blade 33 of the present machine to excavate earth to any desired depth, there are provided a pair of inclined hydraulic cylinders 75 and 75' pivotally connected at their lower ends at 76 and 76' to horizontal brace beams 77. Beams 77 extend rearwardly into fixed engagement with frame members 31 at points intermediate their length. Piston rods 78 and 78' extend upwardly and forwardly from cylinders 75 and 75' and have their outermost terminals pivotally connected at 79 and 79' to the uppermost terminals of triangular brackets 80. Brackets 80 are pivotally connected at their front ends to the upper fore section of frame 13. Rods 80' are pivotally engaged at their upper ends to the rear terminals of brackets 80 and extend downwardly into pivotal engagement with frame 25. This construction affords greater leverage and stability in raising and lowering excavating and conveying assembly 14.

It is also within the contemplation of the present invention to provide a hydraulic control system for adjusting plow 33 and actuating slidable bottom 63 of bin 61 and leveling unit 16. As schematically shown in FIG. 10, this system includes a hydraulic fluid supply tank 81

suitably supported adjacent engine 54. From tank 81, a supply line 82 extends to the suction side of a pump 83 which may be connected to, and operated by, engine 54. A supply line 84 passes from the pressure side of pump 83 to a valve assembly 85. Assembly 85 includes a pair of control levers 86 and 86' for operating frame adjustment cylinders 75 and 75' through hydraulic lines 87, 88 and 87', 88', respectively. A third control lever 89 is connected to hydraulic ram cylinder 66 by hydraulic lines 90 and 91. A fourth control lever 92 is connected by hydraulic lines 93 and 94 to cylinder 71 of the leveling unit. A hydraulic return line is indicated at 95. Referring to FIG. 1, it will be seen that valve assembly 85 may be suitably mounted on tractor 12 adjacent the steering wheel to permit facile operation of the hydraulic components of the machine.

In use, the earth handling machine of the present invention is moved to the location where earth is to be "borrowed," in the inoperative position shown in FIG. 2, at which time plow 33 is in raised position. The operator then manipulates controls 86, 86' located adjacent his position on the tractor to effect lowering of the frame 13 about pivot point 23 until plow 33 penetrates the ground to the desired depth. Engine 54 is next actuated to move the upper run of conveyor belt 35 rearwardly of the machine. Forward movement of the machine under power of tractor 12 effects loosening of the earth and the movement thereof onto conveyor belt 35. When the earth reaches the aft end of conveyor belt 35, it drops into subjacent bin 61 of earth storage station 15. This operation continues until the desired amount of earth has been excavated or until the storage bin is full, at which time control levers 86, 86' are again manipulated to effect elevation of plow 33 into the inoperative position. The earth handler is then pulled by the tractor to a predetermined location for dumping whereupon the operator actuates control lever 89 to effect retraction of piston rod 68 and consequent sliding of bin bottom 63 to "open" position thereby permitting egress of the earth therein. To complete the cycle of operation, the operator actuates control lever 92 to drop piston rod 72 and connected leveling blade 73 to operative position for leveling the earth which has been discharged from the bin. It is of course to be understood that this blade may be dropped to any predetermined distance from the ground. Manipulation of control lever 89 to move bin bottom 63 to "closed" position completes the cycle of operation. This cycle is repeated as many times as is necessary to complete the excavating operation.

It is to be noted that with the device of the present invention, the operation of all parts of the earth handling apparatus may be controlled by the driver of the tractor. It has also been determined through actual use that excavation of earth to a depth of at least eighteen inches, can be effected without danger of damage to the component parts of the machine. In fact, the present arrangement of parts whereby the excavating and conveyor assembly is rigidly mounted on the frame, affords a very durable construction. This arrangement further increases the effectiveness of the excavating operation since, when the frame assumes the operative position shown in FIG. 1, the weight of the aft end of the frame, together with the weight of the bin and its contents, is directed forwardly to the plow so that this force in concert with the force exerted by adjustment cylinders 75 and 75', enables the plow to penetrate and excavate the earth with ease.

While the machine of the present invention has been shown as being towed behind a tractor or other suitable operating device, it is of course to be understood that if desired, the earth handler may be self-propelled.

While we have herein shown and described the preferred embodiment of our invention, it is nevertheless to be understood that various changes may be made therein.

without departing from the spirit and scope of the claims hereto appended.

What we claim is:

1. An earth handling machine including an articulate frame comprising a plurality of sections pivotally connected, one of said sections including lower spaced frame members in substantially horizontal position, spaced parallel frame members fixedly connected to said lower frame members in angular relationship thereto, an earth excavating and conveying assembly mounted between said spaced parallel frame members in fixed relationship thereto, a storage member including a movable bottom mounted between said lower spaced frame members subjacent the aft end of said earth excavating and conveying assembly to receive the earth as it drops therefrom, power means engageable with said movable bottom to slide the latter to an inoperative position and permit egress of the earth from the storage member, the other of said sections including arms extending rearwardly of said machine, a portion thereof being in spaced, substantially parallel relationship to the forward portion of said lower spaced frame members, link means pivotally connecting said arms and said lower members, and power means carried by said arms and engaged with said lower frame members for lowering the latter together with the excavating and conveying assembly affixed thereto, to drop the lower end of the excavating and conveying assembly into engagement with the ground.

2. An earth handling machine, as set out in claim 1, wherein said power means includes vertically arranged triangular-shaped brackets, one corner of each of which is pivotally connected to each of said arms, power units carried by said arms including pistons pivotally engaged with the uppermost corner of each of said brackets, and rods extending from the other corners of said brackets downwardly into pivotal engagement with said lower frame members.

3. An earth handling machine, as set out in claim 1, wherein the excavating and conveying assembly includes roller members rotatably mounted between said spaced parallel frame members, the lowermost roller comprising a central shaft, like plates radiating from said shaft, rods affixed to the outer terminals of said plates, said plates and rods being coextensive with the length of said central shaft, and a conveyor belt mounted between said spaced parallel frame members and engageable with the rollers for transporting the excavated earth to the storage member.

4. An earth handling machine as set out in claim 3, wherein the terminals of the uppermost roller are journaled in bearing blocks, said bearing blocks being slidably adjustable to effect adjustment of the conveyor belt.

5. An earth handling machine including an articulate frame comprising a fore section and an aft section in substantially parallel planes, portions of said aft section extending beneath said fore section, means pivotally connecting said fore and aft sections, an excavating and conveying assembly fixed to said aft section, a storage member including a movable bottom mounted on said frame beneath the aft end of said excavating and conveying assembly to receive the earth as it drops therefrom, said bottom being mounted on rollers supported on said frame and movable longitudinally with respect thereto, means engageable with said movable bottom to slide the latter to an inoperative position and permit egress of the earth from the storage member, and power means carried by said fore section and engageable with said aft section for raising and lowering the latter together with the excavating and conveying assembly.

6. An earth handling machine including an articulate frame comprising a fore section and an aft section in substantially parallel planes, portions of said aft section extending beneath said fore section, an excavating and conveying assembly fixed to said aft section, means pivotally connecting said fore and aft sections at a point intermediate the length of the frame, and power means carried by said fore section and engageable with said aft section for raising and lowering the latter together with the excavating and conveying assembly, said power means including vertically arranged triangular shaped brackets, one corner of each of which is pivotally connected to said fore section, power units carried by said fore section including pistons pivotally engaged with the uppermost corner of each of said brackets, and rods extending from the free corner of each of said brackets downwardly into pivotal engagement with said aft section.

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