

[54] **EXCAVATOR FOR GRAVES AND THE LIKE**

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[22] Filed: Sept. 27, 1971

[21] Appl. No.: 184,063

[52] U.S. Cl. 37/192 R, 37/DIG. 6, 198/99,
198/100

[51] Int. Cl. E02f 3/08

[58] Field of Search 37/DIG. 6, 142;
198/97-100, 88, 233

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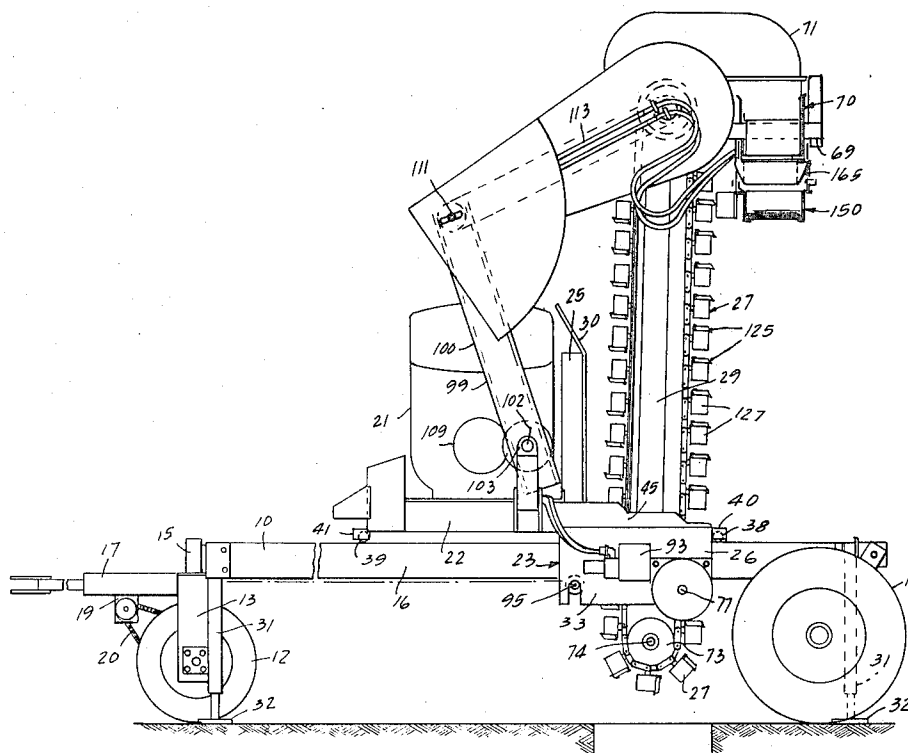
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ABSTRACT

Excavator forming uniform rectangular openings in the ground suitable for use as grave openings. A wheel mounted open frame forms the support for a carriage movable along the frame. The carriage forms a guide and mounting for a vertically extending bucket frame, guiding digger buckets in an endless path about the frame and positively sumping the digger buckets downwardly into the ground and elevating the digger buckets with respect to the ground at the termination of an excavating operation. The carriage supports and guides the bucket frame for vertical movement at a slight angle relative to the ground, advancing the lower end of the bucket frame in the direction of travel of the carriage. A positive rack and pinion type of drive sumps the bucket frame into the ground and holds the frame in position, as advanced to form an elongated excavation. An independently driven positive rack and pinion type of drive feeds the carriage and bucket frame along the main frame. The machine has a versatile discharge conveyor system, placing the diggings in selected positions along the side of the excavation, and retractable when moving the machine from place to place.

4 Claims, 12 Drawing Figures



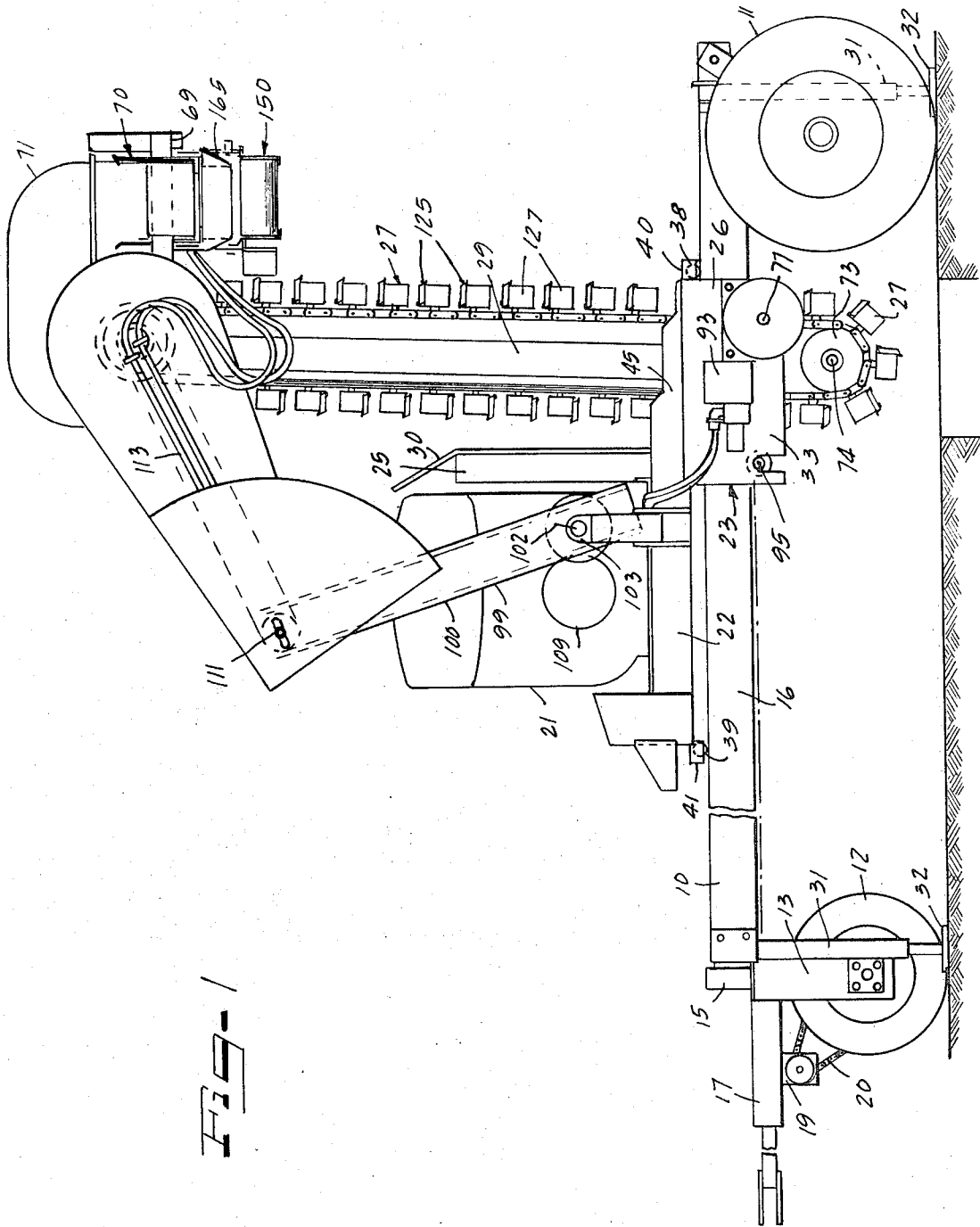
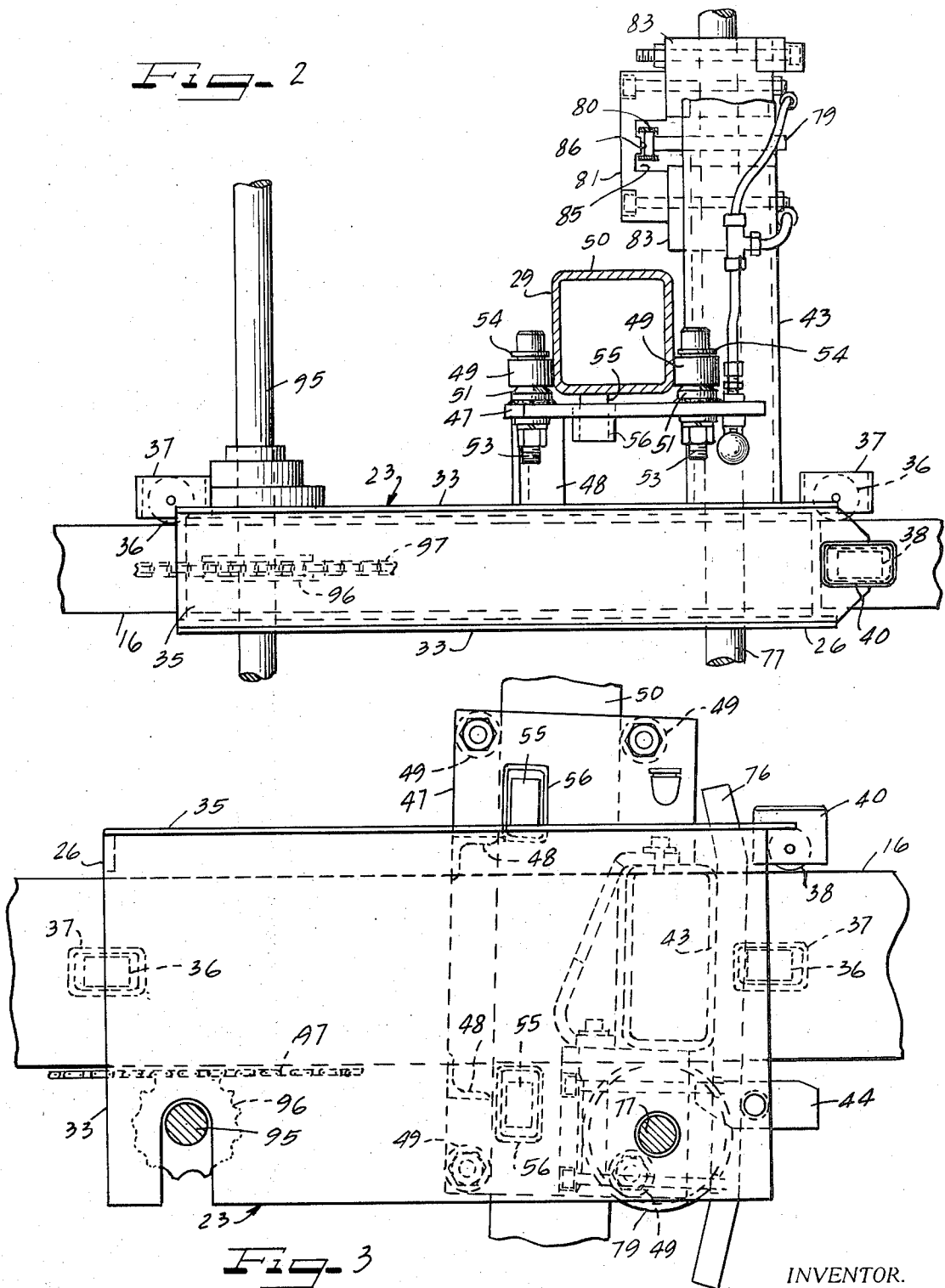


Fig. 1

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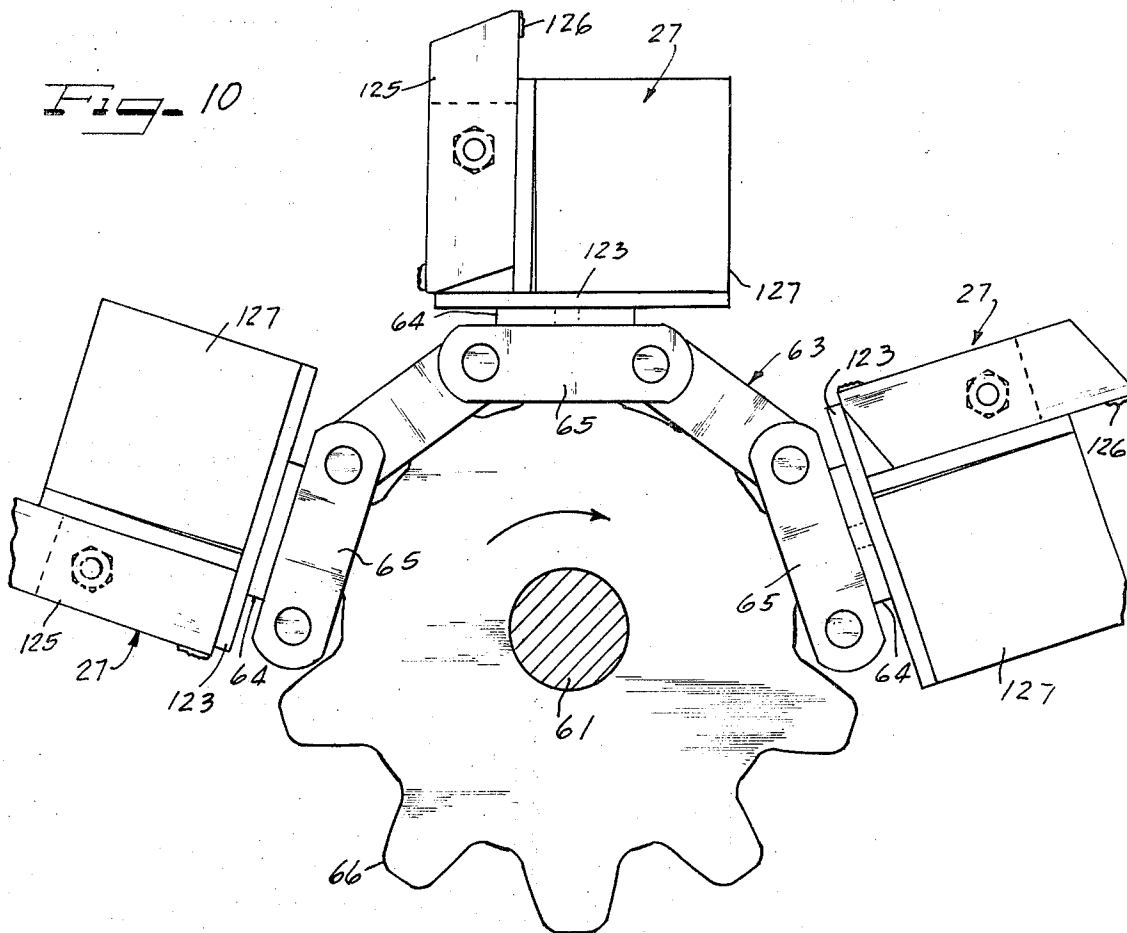


Fig. 4

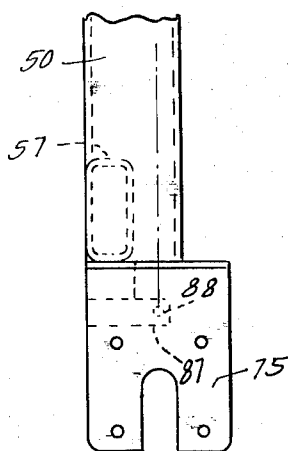
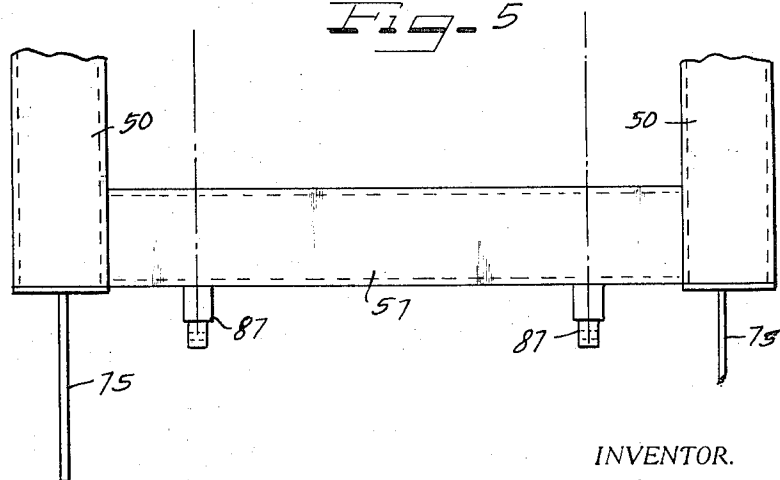


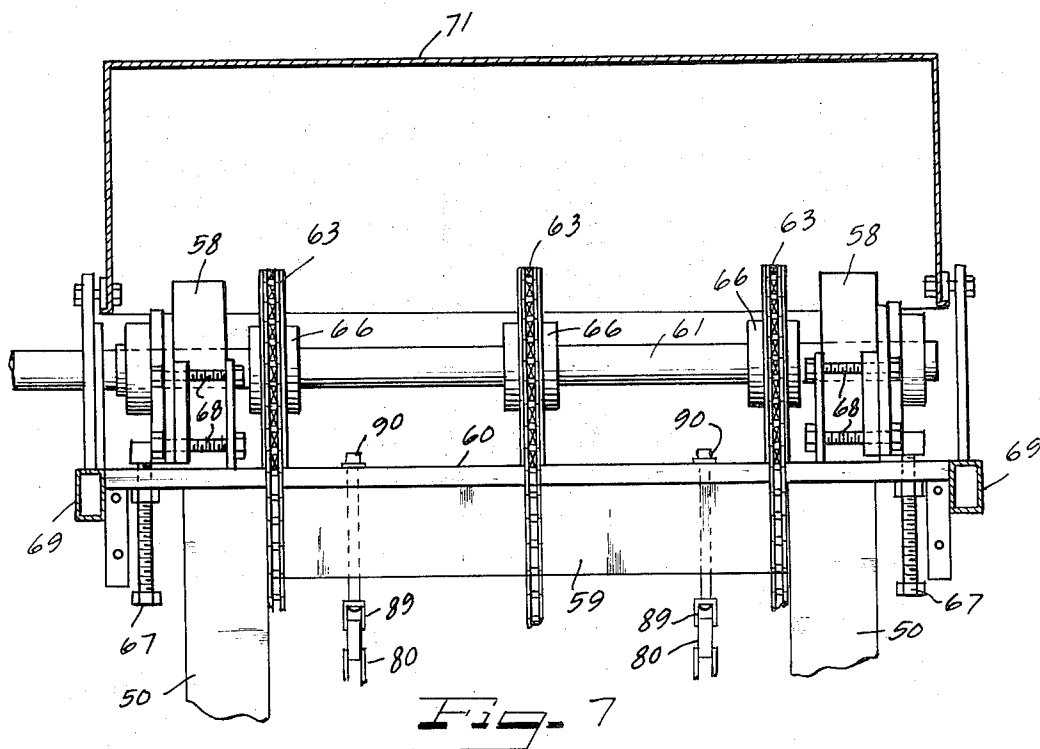
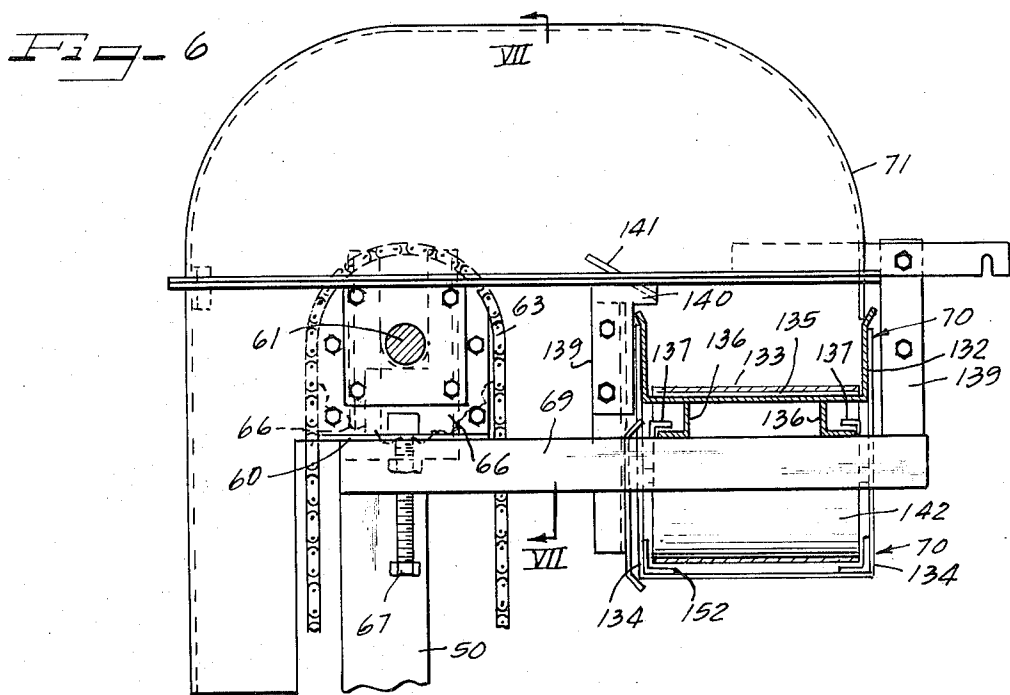
Fig. 5



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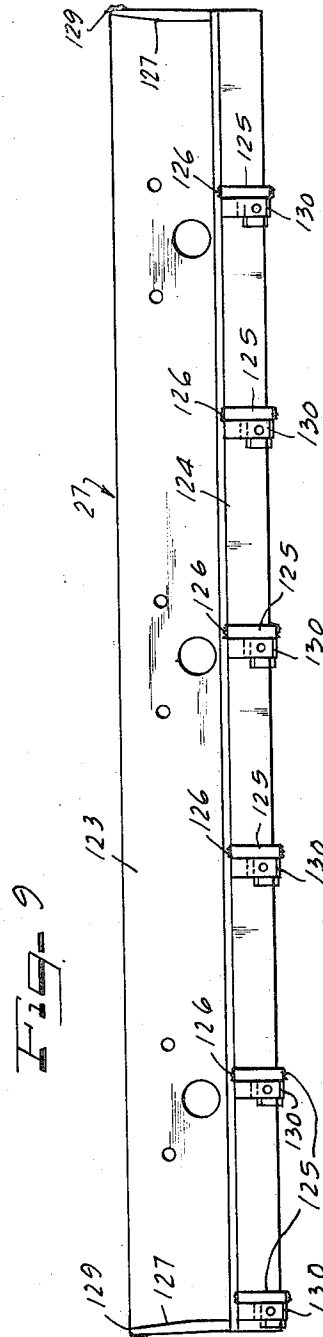
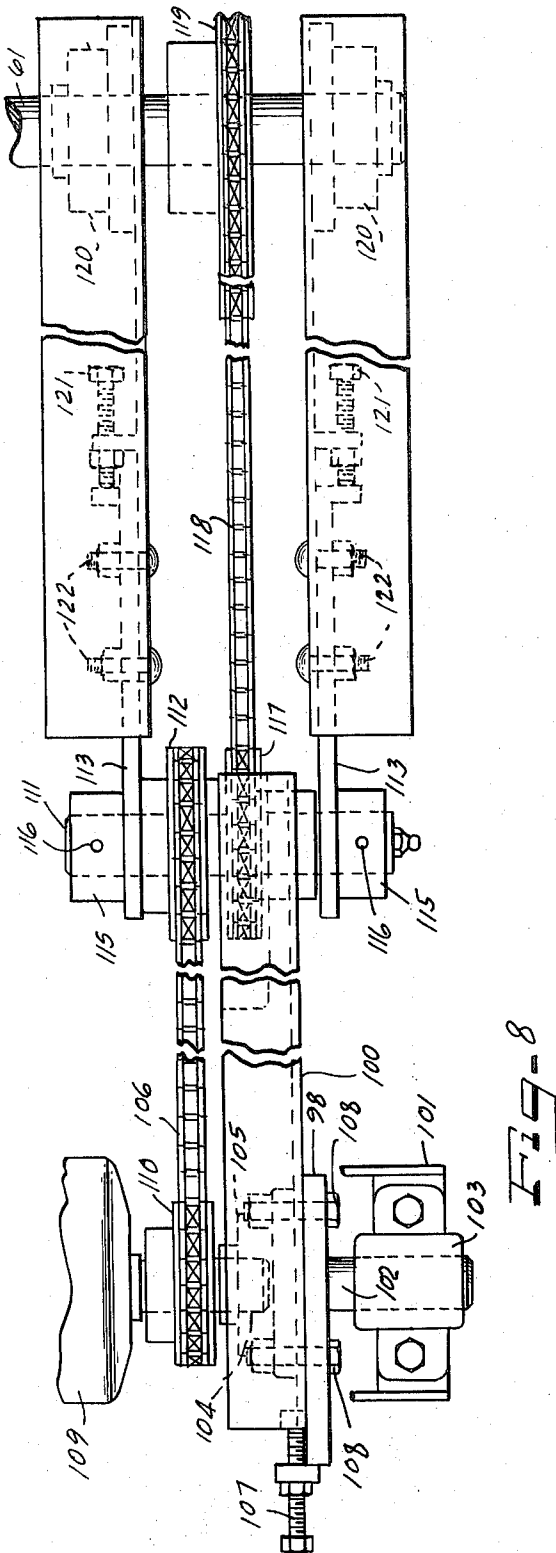
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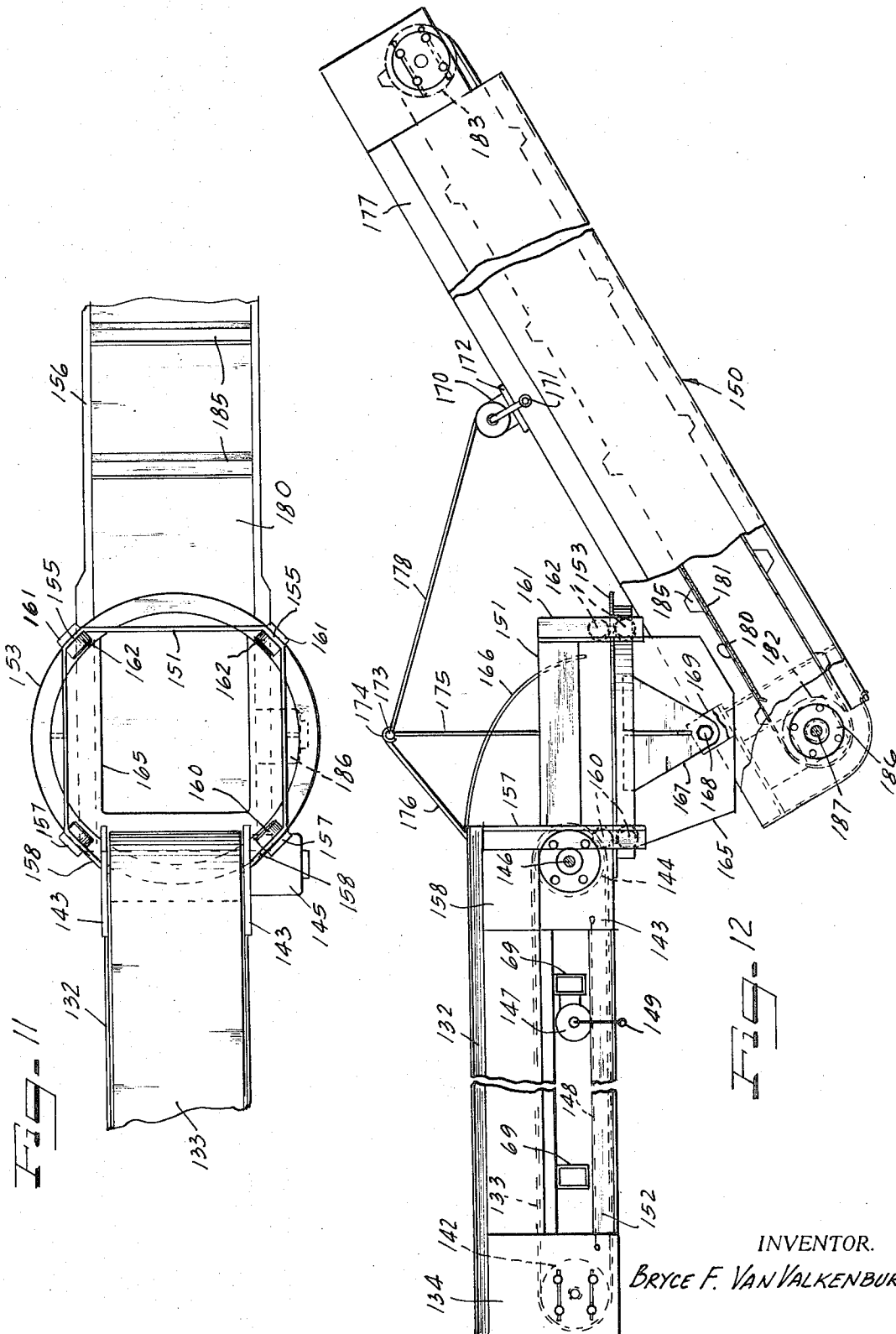
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EXCAVATOR FOR GRAVES AND THE LIKE

FIELD OF THE INVENTION

Self-propelled excavator of the type adapted to excavate graves in earth and rocky soil.

BACKGROUND AND OBJECTS OF INVENTION

The excavator of the present invention in some aspects is of the same general type of excavator as disclosed in such Patents as the U.S. Pat. No to Pearson 3,474,551 dated Oct. 28, 1969 and the U.S. Pat. No. to Smith 3,015,175 dated Jan. 2, 1962. The present excavator, however, is an improvement on these excavators in its simplicity of construction and the positive and independent drives to all operating parts of the machine, the pitch of the bucket frame pitching the bucket frame to advance the lower end thereof relative to the upper end thereof, to support the buckets to tend to dig in the direction of travel of the bucket frame and provide a sufficient angle of upward bucket travel to keep the excavated material to the buckets, and in the mounting of the source of power for all of the operating parts of the machine on the carriage, supporting the bucket frame and buckets along the main frame of the machine, as well as the retractable and versatile conveyor system in material receiving relation with respect to the buckets and carrying the excavated material for discharge along preselected areas to one side of the excavation.

Other advantages of the invention are the accessibility of the main engine on the carriage close to the main frame and of all of the operative parts of the machine, as well as the positive sumping and feeding drives, sumping the bucket frame and buckets into the ground by power and advancing the bucket frame and buckets along the ground when sumped thereinto, to enlarge the excavation.

Further advantages are in the positive drive to the buckets from the source of power on the carriage in all positions of elevation of the bucket frame and buckets relative to the carriage, and the shielding of the source of power from the loose material excavated.

Further advantages resides in the digger bucket construction cutting along the edges of the digger buckets to provide a straight line uniform wall of the excavation and the cutter bit arrangement at the backs of the buckets, in which the cutter bits are reversible and readily replaceable as worn.

A principal object of the present invention, therefore, is to provide an improved form of excavator, particularly adapted to excavate graves and the like, arranged with a view toward utmost simplicity in construction and compactness and efficiency in operation.

Other objects, features and advantages of the invention will be readily apparent from the following description of a certain preferred embodiment thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of an excavator constructed in accordance with the principles of the present invention.

FIG. 2 is a fragmentary plan view with certain parts in vertical sectional and illustrating parts of the car-

riage and the drive means for elevating and lowering the bucket frame, and feeding the carriage and bucket frame along the main frame.

FIG. 3 is a fragmentary detail view in side elevation showing the carriage and support for the bucket frame, in side elevation, with certain parts removed and certain other parts shown in vertical section.

FIG. 4 is a fragmentary detail end view of the lower part of the bucket frame.

FIG. 5 is a fragmentary detail side view of the lower part of the bucket frame shown in FIG. 4.

FIG. 6 is a fragmentary detail view of the upper part of the bucket frame and showing the hood confining the excavated material for discharge into the discharge conveyor, with certain parts shown in vertical section and the buckets removed from the bucket chains.

FIG. 7 is a transverse sectional view taken substantially along line VII—VII of FIG. 6 and illustrating certain details of the bucket frame not shown in FIG. 6.

FIG. 8 is a detail view illustrating the drive from the engine on the carriage to the bucket drive shaft.

FIG. 9 is a fragmentary plan view of a digger bucket.

FIG. 10 is an enlarged view in side elevation of the digger buckets and chain traveling about the drive sprocket therefor.

FIG. 11 is a fragmentary generally diagrammatic plan view of the discharge conveyor system, carrying away the cuttings from the digger buckets; and

FIG. 12 is a generally diagrammatic fragmentary view in side elevation of the conveyor system illustrated in FIG. 11.

DESCRIPTION OF PREFERRED EMBODIMENT OF INVENTION

In the embodiment of the invention illustrated in the drawings, I have shown in FIG. 1 an elongated main frame 10 mounted on rubber-tired wheels 11 at its rear end, and mounted on a single rubber-tired tramping wheel 12 at its forward end. The tramping wheel 12 is in the general form of a caster type of wheel, and is journaled and extends between the tines of a fork support structure 13. Said fork structure is vertically pivoted at its upper end in a bearing boss 15 at the front end of the main frame 10, intermediate parallel spaced side frame members 16 of said main frame. The fork 13 has a hitch 17 extending therefrom adapted to be coupled to a truck and the like when transporting the excavator over long distances.

The hitch 17 forms a support for a motor 19 for driving the front wheel 12 through a chain and sprocket drive 20 in the conventional manner. The motor 19 may be a suitable hydraulic motor supplied with fluid under pressure through a suitable source of power, which may be a pump (not shown) driven from an engine 21 diagrammatically shown in FIG. 1 as being an internal combustion engine and mounted on a platform 22 carried by a carriage 23, and extending transversely of the main frame 10 in front of the carriage 23. The engine 21 may be a conventional form of internal combustion engine. Hydraulic fluid may be obtained from a tank 25 extending transversely of the platform 22 to the rear of the engine 21. Said tank 25 is shielded from digger buckets 27 guided for movement about a vertically extending bucket frame or boom 29, by a shield 30 extending upwardly of the carriage 23 along the rear side of said tank. The tank 25 being shielded from the digger buckets, may be a relatively thin tank to facili-

tate cooling and may be located close to the engine 21 and fluid pressure pump (not shown) driven thereby, and connected therewith by a short suction line (not shown), making the pump self-priming.

The frame 10 is an open rectangular frame and is supported in generally parallel relation with respect to the ground during an excavating operation, on pedestals 31 at each corner of said main frame, and having adjustable bases 32 engagable with the ground, to provide a firm support for said main frame during an excavating operation. The pedestals 31 may be of any well-known construction, so need not herein be shown or described further.

The carriage 23 includes a saddle 26 extending along each side of and supported on each beam 16 and connected together by a transverse beam 43. Each saddle has parallel spaced side plates 33 extending downwardly along each side of a side frame member 16 beneath the bottom thereof and connected together at their upper ends by a plate 35. The side plates and top plate 35 form a saddle guided for movement along said side frame members on rollers 36 engaging the inner sides of the beam 16. As shown in FIGS. 2 and 3, the rollers 36 are mounted in bracket housings 37 extending inwardly of the inner side plate 33. The rollers 36 engaging the inner faces of the associated side frame member 16 cooperate with the rollers 36 on the opposite inner side frame member 33 to form rigid guide retainers for the saddles and carriage, guiding said carriage for movement along the main frame 10 and retaining said carriage in alignment with said main frame. The portion of the top plate 35 of each saddle, adjacent the digger buckets 27 extends rearwardly of the side frame members 33 and has a roller housing or bracket 40 mounted thereon, and extending forwardly therefrom, and forming a bearing support for a roller 38, supporting said roller to ride along the top surface of the frame 10. Rollers 39 are shown as disposed forwardly of the platform 22 and are each mounted at the forward end of said platform on a bracket member or roller housing 41, like the housing 40.

A reaction shoe 44 is bolted or otherwise secured to the inside of the outer side frame member 33, and is spaced beneath the bottom of the frame member 16, to come into engagement with said frame member when the digger buckets 27 encounter heavy loads. These shoes cooperate with the rollers 38 and 39, to retain the carriage 23 from tipping under excessive load conditions.

The platform 22 has spaced longitudinally extending beams 45 extending along the tops of the top plates 35 and suitably secured thereto, for supporting said platform in outboard relation with respect to the side plates 33 and in vertically spaced relation with respect to the side frame members 16.

As shown in FIG. 2, each inner side plate 33 has a vertically extending guide plate 47 spaced therefrom by vertically spaced laterally extending angles 48. The guide plate 47 is cut away to fit along and partially about the transverse beam 43, and may be welded or otherwise secured thereto. The plate 47 is shown in FIG. 3 as being pitched at a slight receding angle with respect to the vertical in the direction of feed of the carriage 23 along the main frame 10 to advance the digger buckets 27 at the lower ends of their paths of travel relative to the upper ends of their paths of travel, and position said buckets to dig in the direction of

travel of the carriage 23 as advanced along said main frame, and also to retain said buckets in such position as to keep dirt therein as traveling upwardly along the bucket frame 29. The guide plate 47 has a pair of upper and a pair of lower rollers 49 spaced inwardly therefrom, the axes of which upper and lower rollers are in the plane of inclination of a guide plate 47, to position said rollers to engage opposite sides of a rectangular hollow beam 50 of the bucket frame 29 and guide said bucket frame for vertical movement relative to the carriage 23. Each roller 49 is mounted on a bushing 51, for free rotation with respect thereto and welded or otherwise secured to the inside of the guide plate 47. A bolt 53 extends through the bushing and plate 47 and has a washer 54 at its inner end abutting the inner end of the bushing 51 and retaining the roller 49 thereto.

Vertically spaced rollers 55 extending in the vertical plane of travel of the hollow beam 50, are mounted on the plate 47, in roller housings 56 for engagement with the outer side face of the beam 50, and cooperating with similar rollers on the opposite side of the carriage to retain the bucket frame from lateral shifting movement relative to said carriage.

The digger bucket frame 29 includes the hollow parallel rectangular beams 50, connected together at their lower ends by a transverse hollow rectangular beam 57 (FIGS. 4 and 5) welded or otherwise secured thereto. The beams 50 are connected together at their upper ends by a hollow transverse beam 59, which may be welded or otherwise secured thereto (FIG. 7). A plate 60 extends across the tops of the hollow beams 50 and the top of the transverse beam 59 beyond opposite ends of said beams and forms a support for bearing housings 58, for a transverse drive shaft 61, forming a drive shaft for a series of endless bucket chains 63, having attachments 64, for the digger buckets 27, carried between certain links 65 of said chains (FIG. 10).

The bucket chains 63 are meshed with individual drive sprockets 66, keyed or otherwise secured to the shaft 61. The bearing housings 58 are mounted on the plate 60 for adjustable movement with respect thereto, to take up tension on the chains 63 when required, and to thereby maintain said chains under the proper tension, in a suitable manner. Said bearing housings are adjustably moved relative to the plate 60 by adjustment screws 67 and may be clamped in position relative to said plate by clamping screws 68.

Parallel beams 69 extend along opposite ends of the plate 60 beyond said plate toward the rear of the machine, and form an outboard support for a conveyor 70, supporting said conveyor in material receiving relation with respect to the buckets 27. The beams 69 and plate 60 also form a support for a hood 71 extending along the buckets 27 on their return paths upwardly along the digger bucket frame 29 and along the top portion of the return paths of said buckets and over the conveyor 70, to effect the discharge of the loose material excavated onto said conveyor as the buckets 27 turn about the top of the bucket frame.

The bucket chains 63 and digger buckets 27 thereon, are guided to move downwardly along the rear side of the bucket frame 29 and upwardly along the forward side thereof, and to turn about direction changing idlers 73 on an idler shaft 74. Said idler shaft is journaled in suitable bearing housings (not shown) mounted on plates 75 extending beneath the bottoms of the beams 50 (FIGS. 1, 4 and 5).

The bucket chains 63, as they pass downwardly along the insides of the inner side plates 33 of the saddles 26, are slidably guided along shoes 76 welded or otherwise secured to the rear face of the transverse beam 43 and extending above and below said beam to guide the chains to pass along the rear sides of said beam as they travel downwardly about the direction changing idlers 73.

Journalled in the carriage 23 beneath the beam 43 is an elevator shaft 77 extending across said carriage and having spaced sprockets 79 keyed or otherwise secured thereto. The sprockets 79 mesh with chains 80, which may be roller chains and are connected at their upper and lower ends to the digger frame 29 and serve as racks, to positively raise or lower the digger frame 29 relative to the carriage 23 and main frame 10, as the elevator shaft 77 and sprockets 79 are rotatably driven.

A chain retainer 81 extends along each sprocket 79, forwardly of said sprocket, to accommodate the chain 80 to mesh with its sprocket and to retain the chain thereto. As shown in FIG. 2, the chain retainer is bolted or otherwise secured to blocks 83, extending beneath the transverse beam 43 along opposite sides of the associated sprocket 79 and welded or otherwise secured to said beam. The chain retainer 81 has a recessed retainer portion 85 extending along opposite sides of the sprocket and across the sprocket and has a lug portion 86 slidably engaged by the chain and retaining the chain to its sprocket.

The elevator chains 80 are suitably secured at their lower ends to brackets 87, secured to the bottom of the beam 57 as by welding and extending rearwardly of said beam beneath the bottom thereof. Said brackets have transversely extending apertured portions 88, forming mountings for connectors (not shown) for the lower ends of said chains, as shown in FIGS. 4 and 5. The upper ends of the elevator chains 80 are connected to connectors 89 suspended from the plate 60 by bolts 90 (FIG. 7). The connectors 89 may be pivotally mounted on the lower ends of the bolts 90 and the bolts 90 may be threaded in the plate 60, to afford a means for taking up on tension of said elevator chains in an obvious manner.

A fluid pressure operated motor and speed reducer 93 are mounted on one side plate 33 of the carriage 23 on the outside thereof. The speed reducer has driving connection with the elevator shaft 77. The motor may be a reversible motor, to effect positive feeding movement of the bucket frame 29 up and down and the speed reducer may be a self-locking type of reducer, locking the shaft 77 from rotation upon the deactivation of the motor driving said speed reducer, to hold the digger bucket frame in position as the digger buckets are sumped into the ground to the proper depth to be advanced along the ground, by feeding or advancing movement of the carriage 23 along the frame 10.

The means for feeding the carriage 23 along the main frame 10 includes a transverse feed shaft 95 suitably journalled in said frame and extending thereacross. The shaft 95 has parallel spaced sprockets 96 keyed or otherwise secured thereto and meshing with strands of chain 97 extending along the bottoms of the side frame members 16, and welded or otherwise secured thereto. A motor and speed reducer (not shown), like the motor and speed reducer 93, is mounted on the opposite outer side plate 33 from the motor and speed reducer 93, and has driving connection with the feed shaft 95.

The drive to the bucket chains 63 and buckets 27 attached thereto is shown in FIGS. 1 and 8. The drive is carried by a longitudinally adjustable arm 100 pivotally mounted on the upper end portion of a pedestal 101, on a transverse shaft 102. Said transverse shaft is journalled in a suitable bearing (not shown), carried in a bearing housing 103. A sprocket shaft 104 is coaxial with the shaft 102 and journalled at its inner end in a bearing housing 105 mounted on the inside of a support 98 for the arm 100, on the shaft 102 (FIG. 8). The arm 100 is adjustably moved to take up tension of a chain 106 by means of an adjustment screw 107 in a conventional manner. Bolts 108 are provided to clamp said arm 100 to the support 98 in its adjusted position along said support. The sprocket shaft 104 may be the drive shaft of a speed reducer 109, driven by the engine 21, through a suitable clutch (not shown) of a conventional form. A sprocket 110 is keyed or otherwise secured to the shaft 104 and meshes with the drive chain 106, to drive a sprocket 112 rotatably journalled on a transverse shaft 111, supported at the outer end of the arm 100. The shaft 111 is pivotally movable about the axis of the sprocket 112 and forms a mounting for a pair of parallel spaced extensible arms 113, having bosses 115 secured to the lower ends thereof, and extending outwardly therefrom and pinned or otherwise secured to the shaft 111 as by pins 116 (FIG. 8).

Coaxial with the sprocket 112 and welded or otherwise secured to the hub thereof is a sprocket 117, meshing with an endless drive chain 118, extending between and along the arms 113 and forming a drive member for a sprocket 119 on the end of the digger chain drive shaft 61, for driving said shaft. The shaft 61 forms a pivotal support for the arms 113, adjacent the outer ends thereof, and is journalled on said arms in bearing housings 120. As shown in FIG. 8, the arms 113 are of a two part construction. One part is guided for slidably movement relative to the other, to afford a means for adjusting the tension of the chain 118, as by an adjustment screw 121. Bolts 122 are provided to hold the arms in fixed relation with respect to each other as the chain 118 is brought under the proper tension.

Referring now to FIGS. 9 and 10, the digger buckets 27 carried by the attachments 64 on the links 65 of the bucket chain 63, each include a bottom plate 123 bolted or otherwise secured to the attachments 64 on the bucket chains 63. A back wall 124 forms a mounting for a plurality of laterally spaced cutter bits 125. Said back wall is inclined with respect to the bottom plate 123 in the direction of travel of the bucket, to pitch the cutter bits 125 at a slight angle relative to the bottom plate 123, and pitch cutting tips 126 of the cutter bits 125 at the proper angle to efficiently cut through dirt, loose rock and the like.

Side cutters 127 define opposite ends of the bucket and extend at right angles with respect to the bottom wall, and abut the back wall 124 at their upper ends. Said side cutters may be welded or otherwise secured to said bottom and back wall and are inclined outwardly with respect to said bottom wall at slight angles and have front sharpened cutting edges 129 tipped along their advance outer ends with carbide, or any other suitable alloy, used to provide hardened surfaces for trimming the sides of the excavation and cutting clearance for the bucket.

The bottom plate 123 extends rearwardly of the back wall 124 to form a stop for the cutter bits 125 and to also form abutment surfaces for attachment ears 130, extending perpendicular to said bottom wall and rearwardly of said back wall and welded or otherwise secured to said walls. The cutter bits 125 abut the sides of the attachment ears 130 and are detachably secured thereto as by studs 131. The studs 131 may extend through drilled holes in the cutter bits 125 and may be welded or otherwise secured thereto. Said studs may extend through suitable holes in the attachment ears 130 and may have nuts threaded on the ends thereof, which project through said attachment ears.

Opposite ends of the cutter bits 125 are inclined downwardly from the forward to the rear ends thereof in the cutting direction of said cutter bits to define cutting tips for said cutter bits. The cutting tips of the cutter bits 125 may be tipped with a hardened material, such as a carbide or any other suitable material, welded thereto in a conventional manner.

The attachment ears and cutter bits 125 may be spaced along the back walls of the buckets of the various buckets, to position the bits of one bucket to come between the bits of the next forwardly disposed bucket, and may be arranged to position the bits of a series of buckets in wave-like patterns from the leading bucket to the trailing bucket of the series of buckets, or in wedge-like patterns from the leading bucket to the trailing bucket of the series of buckets, depending on the cutting conditions to be encountered. The studs 131 are centered relative to the cutter bits 125, to accommodate ready reversal of the cutter bits, as the tips thereof become worn.

Referring now in particular to FIGS. 1, 6, 11 and 12 of the drawings and the conveyor 70 and its mounting on the outboard support formed by the beams 69, said conveyor is shown as a belt conveyor. The conveyor 70 includes a trough 132 having a belt 133 movable along a bottom plate 135 thereof. The bottom plate 135 is shown in FIG. 6 as supported on the beams 69 on legs 136 in the form of angle irons extending along said bottom plate to position the horizontal flanges of said angle irons to supportingly engage the beams 69 and extend outwardly toward the outer sides of the trough 132. Retainers 137 are secured to the beams 69 and extend along and over the outer sides of the legs of the angle irons 136, and inwardly over said legs to retain the trough 132 to the beams 69 and to accommodate movement of said trough transversely of said beams, to extend the discharge end of the conveyor to one side of the machine in the desired discharge location during digging, and accommodate retraction of said trough when the machine is travelling from place to place. Spaced retainers 139 extend upwardly of each beam 69 and slidably engage the sides of said trough. The inner retainer has a portion 140 extending over the top of the trough 132 to act as a further retainer for said trough. A comb 141 extends between the inner retainers 139 and is mounted thereon to extend angularly upwardly from the portions 140 in overhanging relation with respect to the trough 132 towards the digger buckets to be engaged by the cutter bits 125 for the digger buckets and comb dirt therefrom and deflect the dirt carried about the drive sprockets 66 by said buckets into the trough 132. The comb 141 may be made from a heavy flexible material, such as a piece of conveyor belting or other material, with slits therein (not shown) to wipe

the cutting tips of the cutter bits 125 as they pass thereby.

Side plates 134 extend downwardly of the outer walls of the trough 132 adjacent the inby end of the conveyor and beneath said trough and form bearing supports for a roller 142. Said roller forms an idler for the belt 133. The roller 142 and mounting of said roller between the side plates 134 may be of a conventional form so need not herein be shown or described in detail. Side plates 143 extend downwardly along the outby or discharge end portion of the trough 132 and form a mounting for a drive roll 144 for driving the conveyor belt. The plates 134 and 143 on each side of the trough 132 are connected together by angle irons 152, along which the return run of the belt 133 may ride.

The drive roll 144 is journaled in the side plates 143 in suitable bearings (not shown) carried in bearing housings 144a mounted on said side plates. A motor 145, which may be a fluid pressure operated motor, may have direct connection with a shaft 146, through a suitable coupling (not shown).

As diagrammatically shown in FIG. 12, a winch 147 is rotatably mounted on the inner side of a beam 69. The winch 147 has a cable 148 wrapped thereabout, attached at one end to a side plate 134 and at its opposite end to a side plate 143. The winch 147 may be a conventional form of ratchet type winch and may be operated by a hand crank 149 for moving the conveyor trough 132 along the beams 69 in one direction or another as required and to hold said trough in position.

At the discharge end of the conveyor 70 and spaced therebeneath in material receiving relation with respect to said conveyor 70 is a laterally swingable conveyor 150 having a vertically adjustable discharge end. The conveyor 150 is suspended from the discharge end portion of the conveyor 70 in overhanging relation with respect thereto on an outboard support frame 151 and a flanged ring 153 supported thereon adjacent the bottom thereof, for movement about a vertical axis, to accommodate swinging movement of the conveyor 150 from side to side into position to discharge the loose material along the side of the grave or into a truck or other material carrying vehicle, when desired. The support frame 151 is shown as being a generally open rectangular frame having angled corners 155. Extending along the angled corners 155 adjacent the plates 143 of the conveyor 70, and upwardly and downwardly from said angled corners are suspension bars 157. The upwardly extending portions of the suspension bars 157 have plates 158 extending along the insides thereof to the side plates 143 and may be suitably braced and welded or otherwise secured thereto. The depending portions of the suspension bars 157 form mountings for vertically spaced rollers 160 rotatable about horizontal axes and extending inwardly therefrom to engage above and below the flange of the flanged ring 153.

Suspension bars 161 extend along and depend from angled corners 155 and form supports for vertically spaced rollers 162 extending inwardly therefrom and engaging the top and bottom sides of the flange 153. The suspension bars 157 and 161 thus position the rollers 160 and 162 to support the ring 153 for turning movement about a vertical axis.

Extending downwardly of the ring 153 and angularly inwardly therefrom is a hopper 165, open at its front end, to accommodate upward tilting movement of the conveyor 150. A shield 166 extends from the plates

143 above the top of the trough 132 over a hopper 165 and is curved downwardly as it extends towards said hopper to retain the loose material to discharge through said hopper into the conveyor 150.

Welded or otherwise secured to the ring 153 and hopper 165 are trunnion support brackets 167 depending therefrom and forming mountings for trunnion pins 168 forming pivotal supports for ears 169 extending upwardly of the side walls of the conveyor 150.

A winch 170 operated by a hand crank 171 is mounted on a plate 172 extending across the top of the frame for the conveyor 150. Said hoist extends upwardly of said plate and has a cable 178 wound thereon. The free end of said cable has a hook 173 thereon, hooked to a transverse bar 174. Said transverse bar is mounted at its opposite ends on posts 175 extending vertically from opposite sides of the frame 151 and welded or otherwise secured thereto. The posts are braced by braces 176 welded or otherwise secured to opposite sides of the discharge end portion of the conveyor trough 132.

The winch 170 may be a reversible ratchet type of winch, operable by turning of the hand crank 171 to raise or lower the discharge end of the conveyor and to hold the discharge end of the conveyor to its elevated position.

The conveyor 150 is shown as being a belt conveyor including a trough-like frame 177 having an endless belt 180 movable along a plate 181 of said conveyor and extending about a drive roller 182 at the receiving end of the conveyor and about an idler roller 183 at the discharge end of the conveyor. The belt 180 may have spaced lugs 185 extending thereacross in spaced relation with respect thereto, to form flights to carry the loose material for discharge particularly when the conveyor 150 is upwardly inclined at a relatively steep angle with respect to the horizontal. A fluid pressure operated motor 186 suitably supported on a side wall of the conveyor 150 may have direct driving connection with a drive shaft 187 for the roller 182, through a suitable coupling (not shown). Said motor like the motor 145 may be of a conventional construction, and is no part of the present invention so need not herein be shown or described further.

The motor and speed reducer 93 for elevating the bucket frame 29, the motor and speed reducer for feeding the bucket frame along the main frame 10, the motor 145 for driving the belt conveyor 70 and the motor 186 for driving the belt conveyor 150, as well as the motor 19 for driving the traction wheel 12, may be controlled by independent fluid pressure valves disposed adjacent the controls for the engine 21 and for the speed reducer and clutch 109, on the platform 22. The valves, controls and fluid pressure connections from the valves may be independently operated and may be of forms well known to those skilled in the art so need not be shown and described herein.

In operation of the excavator, the machine may be towed close to the grave site, and then may be propelled by the wheel 12 driven by the fluid pressure operated motor 19 to the actual location of the grave. During positioning of the excavator over the grave site, the wheel 12 may be steered by a person holding the hitch 17. An auxiliary valve may be provided adjacent the motor 19 and hitch 17 to enable the person steering the excavator to turn the motor 19 on and off.

When the excavator is at its digging location, the feet 32 of the pedestals 31 are engaged with the ground. The carriage 23 is then moved along the main frame 10 into the position shown in FIG. 1 adjacent the rear wheels 11. The digger buckets are then started in operation, and the bucket frame 29 is lowered towards the ground to engage the cutter bits with the ground and commence the excavating operation. Lowering movement into the ground is continued, to sump the bucket frame and buckets into the ground to the required depth.

The sumping operation is then stopped and the carriage 23 and bucket frame is then advanced along the main frame 10, as the buckets are driven about the bucket frame, to elongate the opening to the required length. As the excavation reaches its required length, the bucket frame is elevated above the ground as the buckets are driven, to trim the end of the excavation. The machine may then be transferred to a new location.

During the entire digging operation, the conveyors 70 and 150 are in operation to collect the loose material excavated and deposit the material along the side of the grave in a uniform pile, or into a suitable receptacle in certain instances. As the material is collected and deposited along the side of the grave, the depositing operation may be controlled by elevating or lowering the discharge end of the conveyor and moving the conveyor about its axis of suspension to the frame 151 by hand.

At the termination of the excavating operation, the apparatus may be moved along the grave by the traction wheel 12 with the rear wheels straddling the grave. When it is desired to transfer the excavator to a new location, the winch 147 may retractably move the conveyor 70 along the beams 69 to bring the conveyor 150 as close to the elevator frame as possible. The conveyor 150 may then be elevated to its full extent, and turned to extend along the main frame 10 during transportation.

I claim as my invention:

1. In an excavator for graves and the like, a wheel-supported generally rectangular open main frame having,
 - parallel spaced longitudinally extending side frame members connected together adjacent their ends,
 - a carriage guided for movement along said main frame,
 - a generally vertically extending bucket frame guided in said carriage for vertical movement relative thereto,
 - a plurality of endless bucket chains guided for movement about said bucket frame,
 - digger buckets attached to and spaced along said bucket chains and extending transversely of said carriage and main frame and having side cutters, cutting clearance for said buckets,
 - a bucket drive shaft journaled at the upper end of said bucket frame and having bucket drive sprockets thereon, meshing with said bucket chains,
 - an idler shaft journaled at the lower end of said bucket frame and having idlers thereon, forming direction changing members for said bucket chains and buckets,
 - a motor on said carriage remote from said bucket frame and drive shaft and adjacent and in fixed ver-

tically spaced relation with respect to said main frame,
 extensible drive means driven by said motor independently of movement of said carriage along said main frame for driving said bucket drive shaft and sprockets for the full extent of vertical movement thereof, 5
 power means for positively moving said bucket frame vertically to sump said digger buckets into the ground and elevate aid digger buckets relative to the ground, 10
 other power means for moving said carriage along said main frame to feed said bucket frame and digger buckets to elongate the opening attained by the sumping of said bucket frame and buckets into the ground, 15
 conveyor means in material receiving relation with respect to said digger buckets and having a discharge portion positionable to select the area of discharge of the cuttings, 20
 said bucket frame comprising parallel spaced vertically extending beams connected together at their upper and lower ends, and
 roller means mounted on said carriage, guiding said beams for vertical movement relative to said carriage and inclining said beams to tilt relative to the vertical, at a relatively small angle, to advance the lower end of said bucket frame with respect to the upper end thereof in the direction of advance of said carriage along said main frame during a digging operation, 30
 the power means for advancing said carriage and bucket frame along said main frame comprising rack means extending along said bucket frame, a transverse feed shaft, pinion means on said feed shaft meshing with said rack means, reversible drive means for said shaft and pinion means for moving said carriage along said rack means, and the means for raising and lowering said bucket frame comprising rack means extending between said beams and secured thereto, a transverse elevator shaft journaled in said carriage, pinion means on said shaft meshing with said rack means, and reversible drive means for said elevator shaft and pinion means to elevate and lower said bucket frame relative to said carriage, and 45
 said extensible drive means including a sprocket drive from said motor, a control arm pivoted for movement about the axis of said sprocket, a pair of coaxial sprockets supported by said control arm for bodily movement about the axis of the first-mentioned sprocket, a drive chain driving one of said coaxial sprockets from the first-mentioned sprocket, a second control arm for movement at 55

one end about the axis of said coaxial sprockets and at its opposite end about the axis of said bucket drive shaft, a chain and sprocket drive connection from the other of said coaxial sprockets to said bucket drive shaft, said control arms each being adjustable in length, and means associated with each of said control arms selectively operable to adjust the length of said control arms to maintain tension on said chains.

2. The excavator of claim 1,

wherein the conveyor means includes a generally horizontally extending belt conveyor having an upper material carrying run and a downwardly spaced return run,

wherein outboard supports extend from said bucket frame between the runs of said belt conveyor and form a slidable support therefor,

wherein means are provided for moving said belt conveyor laterally of said bucket frame along said supports to extend or retract said conveyor relative to said bucket frame,

wherein a second belt conveyor is mounted beneath said first belt conveyor adjacent the discharge end thereof in material receiving relation with respect thereto,

wherein the means mounting said second conveyor in material receiving relation with respect to said first conveyor comprises a trunnion support for said second conveyor and a vertical pivot support for said trunnion support, supporting said trunnion support and discharge conveyor for pivotal movement about a vertical axis, and

wherein means are provided for raising and lowering said second conveyor about the axis of said trunnion support.

3. The excavator of claim 1,

wherein the rack means extending along the main frame are in the form of link chains secured to said main frame,

wherein the pinion means are in the form of sprockets meshing with said chains and rotatably driven by said feed shaft,

wherein the rack means extending between said beams are in the form of link chains connected between said beams at their opposite ends, and

wherein the pinion means are in the form of sprockets meshing with said drive chains and rotatably driven by said elevator shaft.

4. The excavator of claim 3,

wherein reversible drive means for said feed shaft and said elevator shaft include reversible fluid pressure operated motors.

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