July 1, 1941. O. J. MARTINSON ET AL 2,247,782

ANCHORING MEANS FOR MACHINES EMBODYING WALKING TRACTION MECHANISM

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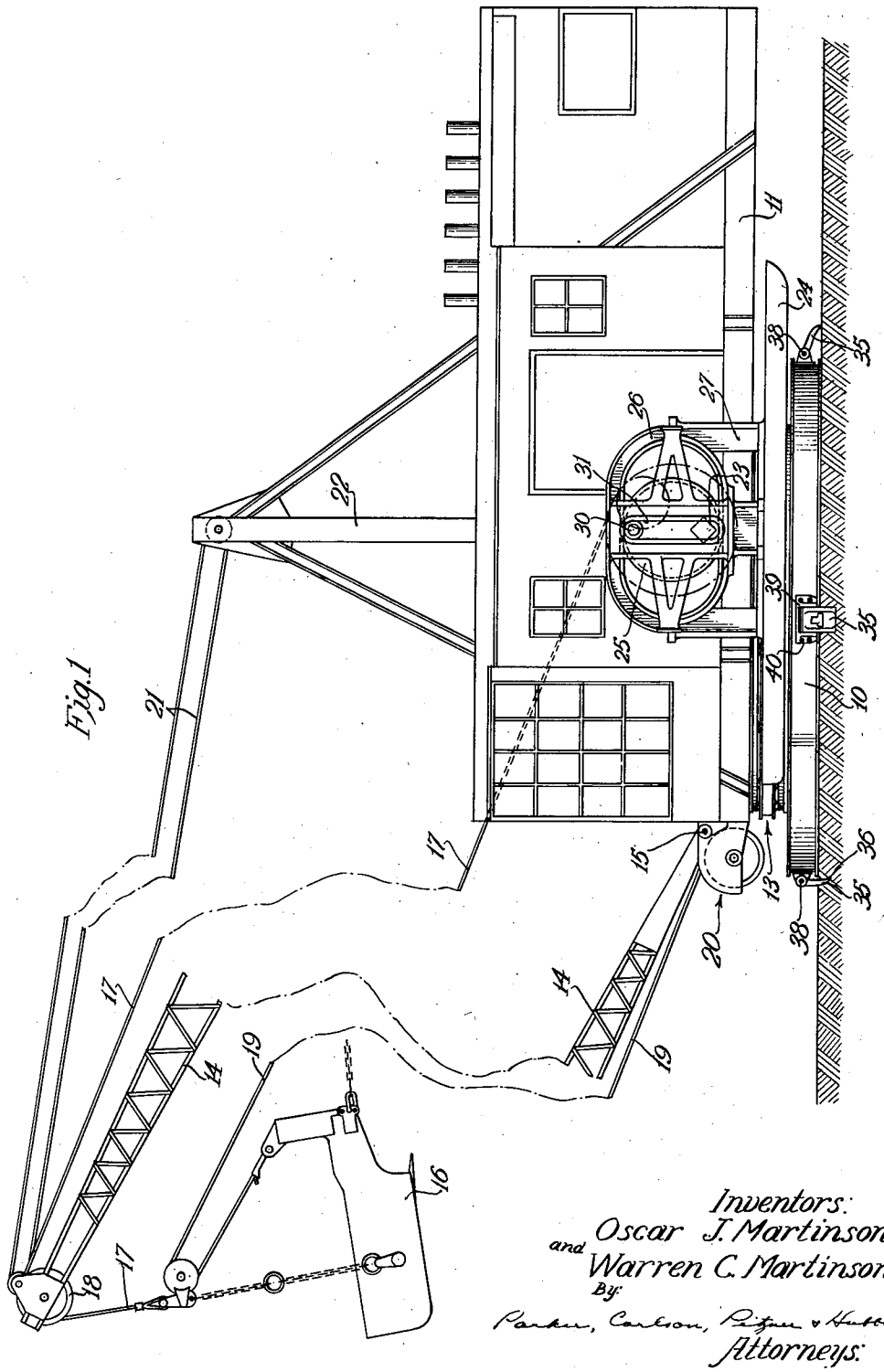


Fig. 1

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Fig. 2

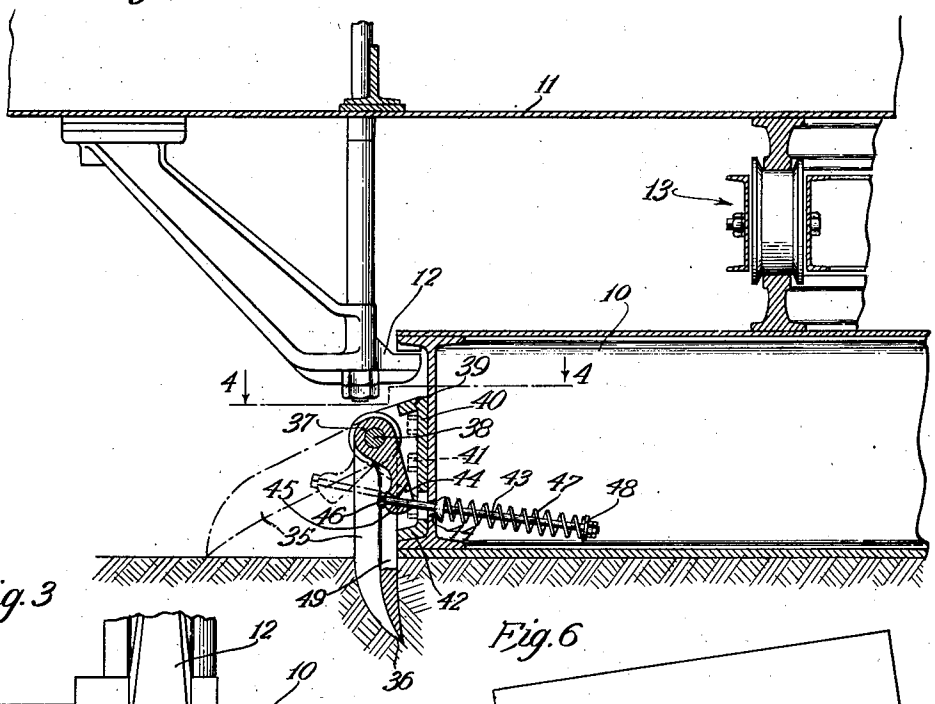


Fig. 3

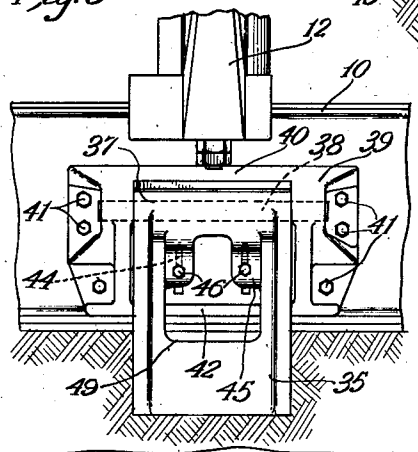


Fig. 6

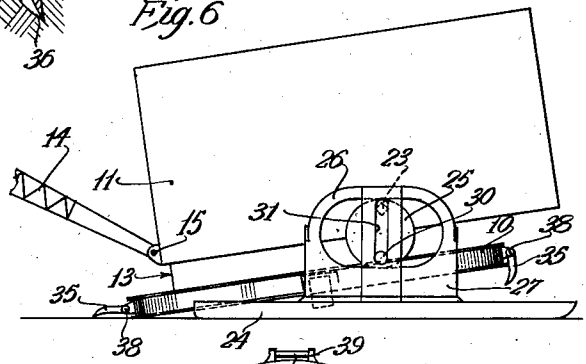
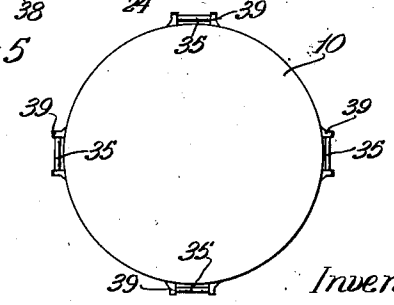


Fig. 5



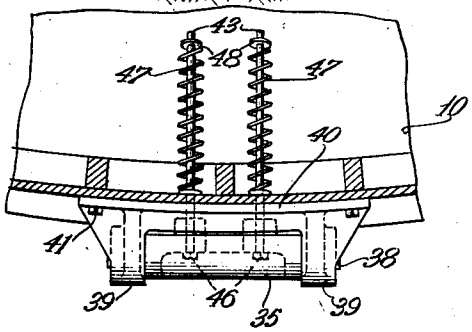


Fig. 4

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UNITED STATES PATENT OFFICE

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ANCHORING MEANS FOR MACHINES EMBODYING WALKING TRACTION MECHANISM

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8 Claims. (Cl. 180—8)

The invention relates to machines of the type used for excavating, stripping, dredging, and like operations, and which embody so-called "walking traction mechanism," and a general aim of the present invention is to provide new and improved means in a machine of this nature for automatically anchoring the machine securely to the ground immediately upon discontinuance of operation of the walking traction mechanism, the anchoring means being atuomatically disengageable from its securing relation to the ground upon initiation of the walking operation.

Machines of this nature are generally characterized by a main supporting base of relatively large ground-bearing area which supports the excavating or other operating equipment and which embodies self-contained walking mechanism operable to supplant the supporting action of the machine base and to shift the position of the base and the machine structure carried thereby during maneuvering movements. The walking mechanism includes auxiliary bases or shoes appropriately connected to the machine structure, and arranged to be lifted and advanced alternately with the main supporting base, the movement of the main base frequently being characterized by a tilting lift, a forward carry in the direction of the tilted edge with the opposite edge sliding along the ground and a lowering of the base. Although the main base is usually provided with a large bearing area, the base may have a tendency to slide or swivel on soft, slippery or inclined footings particularly when subjected to forces exerted thereon during excavating or like operations.

Accordingly, a more specific object of the invention is to provide new and improved means for firmly securing the main base to the ground between successive walking movements, said means comprising one or a plurality of anchoring devices secured on the periphery of the base and arranged and dimensioned so that those disposed on the tilted or advanced edge will be entirely freed from their ground engaging position by the lifting or tilting of the base, while those positioned farther back and remaining embedded when the base has tilted will be freed by the advancing movement, all of said devices being immediately and automatically operative when the base is again lowered to securely anchor the base on the footing against movement by forces exerted thereon from any direction.

It is a further object of the invention to provide an anchoring mechanism of the above mentioned type which will not become clogged or fouled with mud or clay and thus become ineffectual for its intended purpose.

Further objects and advantages of the invention will become apparent as the following detailed description proceeds, taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary side elevational view of a walking dragline excavator embodying the features of the invention.

Fig. 2 is a vertical sectional view on an enlarged scale of a portion of the main supporting base.

Fig. 3 is a fragmentary side elevation of the base shown in Fig. 2.

Fig. 4 is a fragmentary sectional view taken along line 4—4 of Fig. 2.

Fig. 5 is a diagrammatic plan view of the supporting base.

Fig. 6 is a diagrammatic side view of the traction mechanism during a maneuvering operation.

While the invention is susceptible of various modifications and alternative constructions, we have shown in the drawings and will herein describe in detail, the prefered embodiment, but it is to be understood that we do not thereby intend to limit the invention to the specific forms disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

While for purposes of exemplification, the invention has been shown herein as embodied in a walking dragline excavator, it will be understood that the invention in its essence is applicable to a variety of other machines of this type. In machines having walking traction mechanism, a main machine base usually supports the digging or operating equipment. Associated with this base is a pair of auxiliary bases or shoes and actuating mechanism therefor arranged to effect in sequence a shifting of substantially the entire weight of the machine to the shoes while tilting the advancing edge of the base upwardly, then advancing the machine in the direction of the tilted edge and finally lowering the base. The cycle may be repeated as desired and the machine may be placed in operation at the end of any cycle.

The excavator herein shown, includes a circularly shaped main base or turntable 10 (Fig. 1) upon which is suitably mounted a revolving frame

11 for the excavating machinery. A circular roller bearing track mechanism 13 permits relative rotational movement between the frame and the base, and cooperates with a centrally located king pin or pintle (not shown) to provide a unitary assembly of these parts for maneuvering purposes. A lifting hook 12 (Fig. 2), rigid with the revolving frame 11, is positioned thereon for cooperation with any portion of the flanged periphery of the main base further to insure conjoint vertical movement of the base and frame. A latticed boom 14, pivotally secured at its foot 15 to one end of the frame 11, extends outwardly and upwardly therefrom and a dragline bucket 16 is supported at the end thereof by a bucket hoist line 17 reeved on a pulley 18 and leading to suitable operating mechanism forming a part of the excavating machine. The bucket is controlled also by a dragline 19 which passes about a pulley 20 to the operating mechanism. Boom hoist lines 21 are suitably connected through a truss-type gantry 22 with driving mechanism on the frame.

The walking traction mechanism comprises a walking shaft 23 transversely journaled on the frame 11 and driven from the power mechanism through suitable gearing (not shown). A pair of auxiliary bases or shoes 24 are operatively connected to the respective ends of the shaft 23 through cams 25 which are rigidly eccentrically mounted on the shaft and coact with elongated enclosing tracks 26 carried by movable track frames 27 rigid with and projecting upwardly from the shoes. Disposed diametrically opposite from the walking shaft axis on the cam is a crank pin and roller assembly (indicated at 30) which cooperates with a vertical cam slot 31 formed in the track support. Operation of the eccentric roller by rotation of the walking shaft depresses the shoes in unison onto the footing and the cam action resulting from continued rotation of the walking shaft first lifts and then advances the frame and base (Fig. 6). The gravity mass of the machine is so located relative to the walking shaft as to cause the advancing edge of the base to be tilted upwardly during the pickup while the rearward portion of the base is dragged along the footing during the forward carry. When the cams reach the ends of the elongated track members the base is set down in a new position. Continued rotation of the shaft causes the cams and crank pins to raise, advance and depress the shoes to complete the cycle.

Although the base has a large bearing area which permits use of the machine on soft footings, there are unusual conditions under which the base has a tendency to swivel or slide when a considerable force is exerted thereon through the bucket and dragline. These conditions most frequently obtain on soft, slippery or inclined footings. A salient feature of the present invention is to provide a simple and effective automatic anchoring means which requires no power actuation, adjustment or attention between successive maneuvering operations.

Thus, means has been provided which obviates the above mentioned difficulties by the provision of a plurality of anchoring spikes or spuds pivotally mounted in a normally vertical position around the outer edges of the main base to project below the bottom plane of said base and into the footing when the base is resting substantially flat on the ground. The ground penetrating spuds are dimensioned to be lifted clear of the ground when they are disposed on the uplifted or advancing edge of the base and are pivotally supported on the base to permit swinging movement only outwardly and upwardly with respect to the base when they are disposed on the ground engaging or dragged edge of the base. The spuds thus automatically freed from anchoring engagement with the ground upon tilting and advancing of the base, again automatically secure the base to the ground when it is set down in a new position. Those spuds on the advanced edge which are freed by tilting of the base are driven into the footing under the weight of the machine while those spuds on the dragged edge which are freed by the advancing movement remain in their outwardly and upwardly pivoted position resting on the ground in readiness for ground penetration upon any movement of the base in the opposite direction to that in which it has been maneuvered.

The exemplary arrangement and construction of the anchoring means herein disclosed, embodies four spuds 35 equally and oppositely spaced around the periphery of the base (Fig. 6) each spud being slightly tapered toward its depending end 36 to facilitate proper ground penetration. A pivotal support for the upper end 37 of each spud, permitting swinging movement thereof only outwardly and upwardly from the base, comprises, in the present instance, a horizontal pivot pin 38 journaled in bearings 39 integral with a supporting bracket 40 bolted (as indicated at 41) to the outer peripheral wall of the base 10. Spring means are provided for normally urging each spud into its downwardly projecting and ground-engaging position against a limiting stop 42 on the bracket which determines the spring urged position of the spud. Thus, a pair of elongated pins 43 extend through enlarged, alined apertures 44 in the base and in an offset 45 on the spud. The pins are headed (as indicated at 46) for abutment with the spuds. Springs 47, encircling the ends of the pins within the base, bear against washer assemblies 48 on the pins and against the base to urge the pins and the spuds normally toward the base and against the limiting stops 42. The normal position is preferably a substantially vertical one. To prevent accumulations of mud and clay, which would cause clogging between the bracket and the spud, a centrally located aperture 49 in the spud cooperates with at least a portion of the limiting stop which, as shown, is elongated in form and extends transversely across the aperture.

In maneuvering the base the spud or spuds adjacent the upwardly tilted or advancing edge are drawn out of the footing. The base is moved forwardly in the direction of the elevated edge, this movement causing the undisplaced spuds on the rear or opposite side from the elevated edge to be dragged out of the ground (Fig. 6) as they pivot away from the direction of movement of the base. When the base is lowered into its new position, the spuds on the advanced or upwardly tilted edge being in an upright or substantially vertical position against the limiting stops 42 are driven into the ground under the weight of the base and housing, as are any spuds located on approximately the front one-half of the base. When the dragline bucket is being operated, the forces acting upon the base tend to move it in the direction of the extended boom which carries the bucket. In the event that this direction is the same or approximately the same as that in which the excavator has been moved, the forward spuds which are driven into the footing in setting

the base down come into play and effectively anchor the base against any movement in said direction (see Fig. 1). In the event that this direction is different or opposite to that in which the excavator has been maneuvered, the spuds on the opposite side, which may under these conditions be resting on the surface of the footing in their upwardly pivoted position are, upon any movement of the base, forced into the footing and effectively anchor the base against sliding or swiveling. In most instances, however, the lateral spuds, driven into the footing as the base was set down, are sufficient to hold the excavator against any substantial movement. In this connection it has been found satisfactory to provide spuds of a length sufficient to extend below the bottom plane of the base to a depth equal to substantially one-half of the pickup or lift of the base.

It will be apparent from a consideration of the foregoing that a relatively simple but extremely efficient anchoring means has been provided for a machine embodying a walking traction mechanism which will secure the base on an inclined and slippery footing regardless of the direction in which the machine was last moved and regardless of the direction in which forces tending to cause sliding or swiveling of the base are exerted on the frame. Additionally it will be noted that effective ground penertating anchoring means in accordance with the present invention may be spaced around the entire periphery of the base despite the necessity for sliding at least one edge of the base during walking operations, which edge may be, under various conditions, any portion of the periphery of the circular base. This arrangement would be impossible with a plurality of peripherally spaced rigid ground penetrating spuds. The spuds are self operating to automatically anchor and release the base as an incident to the walking operations as distinguished from complicated power or manually actuated anchoring means. The spuds are kept clean and free from caked mud and clay by the apertures **43** therein which permit accumulated material to be discharged therethrough with the aid of the limiting stops **42** which in addition tend to break up caked accumulations, thus obviating the difficulty attendant upon the use of rigid cleats.

We claim as our invention:

1. In a machine embodying a walking traction mechanism, the combination including a generally circular main supporting base and means for tilting said base and advancing the machine in the direction of the uplifted portion of said base while the diametrically opposite portion slides along the ground, four ground-penetrating members pivotally mounted at equally spaced intervals peripherally of said base, means limiting the pivotal movement of said members only outwardly and upwardly with respect to said base, the relation being such that when two of said members are located on the central line of the direction of travel of said base the forward one together with the two lateral members will be lifted clear of the ground while the rear ground-penetrating member will pivot and be dragged from the ground, and when two of said members are located on the advancing portion of said base both will be lifted clear of the ground while the other two will pivot and be dragged from the ground.

2. In a machine embodying a walking traction mechanism, the combination of a machine base, means for tilting said base with respect to the ground and advancing it in the direction of the uplifted edge while the diametrically opposite edge slides along the ground, anchoring means including a plurality of ground-penetrating members supported at spaced intervals peripherally around the main base, each of said ground-penetrating members including pivotal supporting means permitting movement of the ground-penetrating means from a ground engaging position only outwardly and upwardly with respect to the base, said ground-penetrating means being dimensioned to be lifted clear of the ground when disposed on any part of the advancing edge portion of the base.

3. In a machine having a walking traction mechanism, the combination of a main supporting base and means for tilting said base upwardly along one edge, dragging it along the ground and setting it down again for each successive step of the mechanism, anchoring means automatically operative after each step for holding the base against sliding and swiveling movement on its footing, and automatically releasable when the mechanism walks, said anchoring means comprising a plurality of elongated spuds mounted at spaced intervals peripherally of said base normally to project below the bottom plane thereof and pivot means connecting said spuds with said base permitting each of said spuds to swing outwardly and upwardly from said base toward said plane.

4. A machine embodying a walking traction mechanism comprising, in combination, a base for the machine, means for tilting said base and advancing the machine in the direction of the uplifted edge while the diametrically opposite edge slides along the ground, anchoring means for said base including an anchoring member secured to the periphery of the main base and having a portion normally projecting vertically downwardly from said base for ground penetration when the base is resting substantially flat on the ground, said portion being dimensioned to be lifted clear of the ground when the anchoring means is disposed on the uplifted edge of the base, and a pivotal support for the ground-penetrating portion permitting said portion to swing out of the ground when said mechanism is located on the ground engaging part of the base and the base is advanced.

5. In a machine having a walking traction mechanism, the combination of a main supporting base, means for tilting said base upwardly along one edge, advancing it in the direction of the elevated edge and lowering said base to the footing for each successive step of the mechanism, a plurality of ground-penetrating spuds mounted peripherally around said base for projection below the bottom plane of said base, a pivotal support for each of said spuds permitting movement of the spuds from a ground-penetrating position only outwardly and upwardly with respect to the base, all of said spuds being dimensioned to be freed from the ground when the walking mechanism is operated either by the tilting or by the advancing movement of said base.

6. A machine having a walking traction mechanism comprising, in combination, a machine base, means for lifting said base from the ground, advancing and setting it down again for each successive step of the mechanism, anchoring means for said base including an anchoring member secured to the periphery of the machine base including a portion projecting vertically

downwardly from said base for substantial ground penetration when the base is resting on the ground, the projecting length of said portion being less than the extent of lifting movement of said base, whereby said portion is lifted clear of the ground when the base is elevated and advanced.

7. An anchoring means for the main supporting base of a machine embodying a walking traction mechanism, having in combination an anchoring member secured to the periphery of said main base for ground penetration, a pivotal support for said member permitting movement thereof outwardly and upwardly with respect to the base, said member having an aperture formed therein, and means on said base limiting the inward movement of said member toward said base, the limiting means including a portion in partial alinement with said aperture for breaking up and discharging therethrough material accumulated between said base and said member.

8. In a machine embodying a walking traction mechanism, the combination of a main supporting base and means for tilting said base upwardly along one edge, advancing it in the direction of the upwardly tilted edge with the opposite edge dragging along the footing, an anchoring member secured on the periphery of said base, and pivot means for mounting said member on said base for movement from a position in which a portion of said member projects below the bottom plane of the base and into the footing to a second position in which said portion is disposed outwardly from the base, said member having an aperture formed therein through which material tending to accumulate between said base and said member may pass.

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