

2,941,318

Filed Jan. 30, 1958

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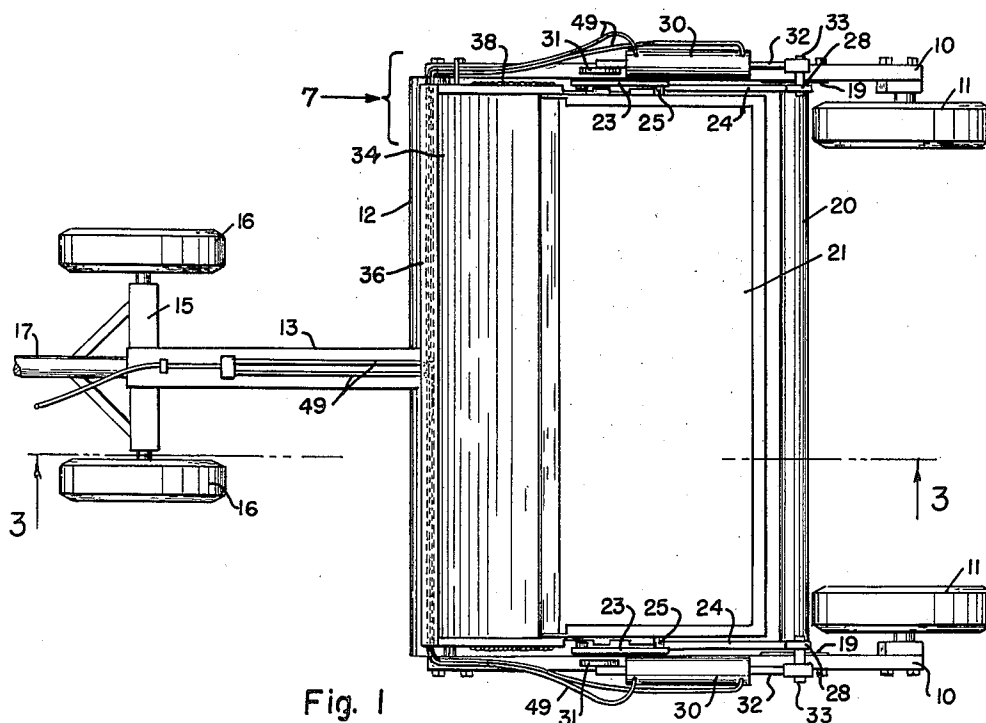


Fig. 1

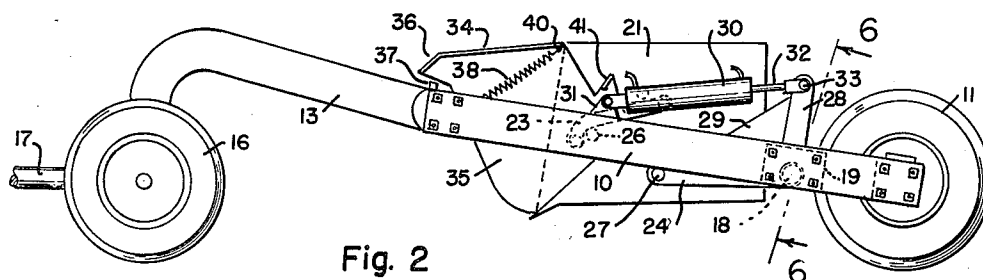


Fig. 2

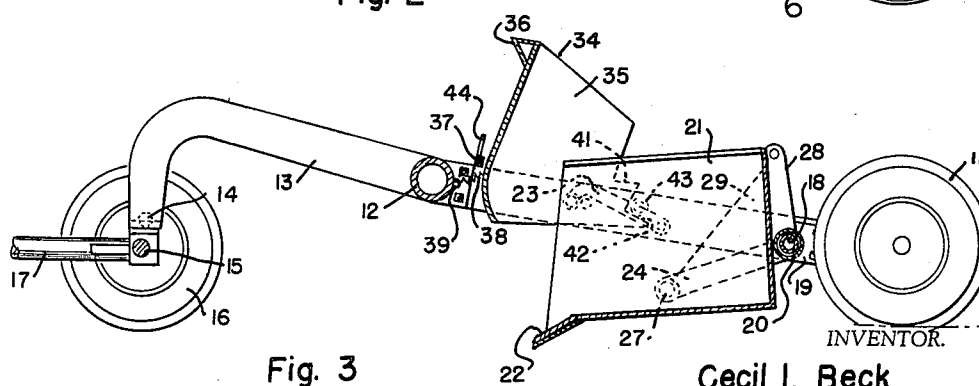


Fig. 3

INVENTOR

Cecil I. Beck

BY

ATTORNEY

June 21, 1960

C. I. BECK

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EARTH SCRAPERS AND MOVERS

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2 Sheets-Sheet 2

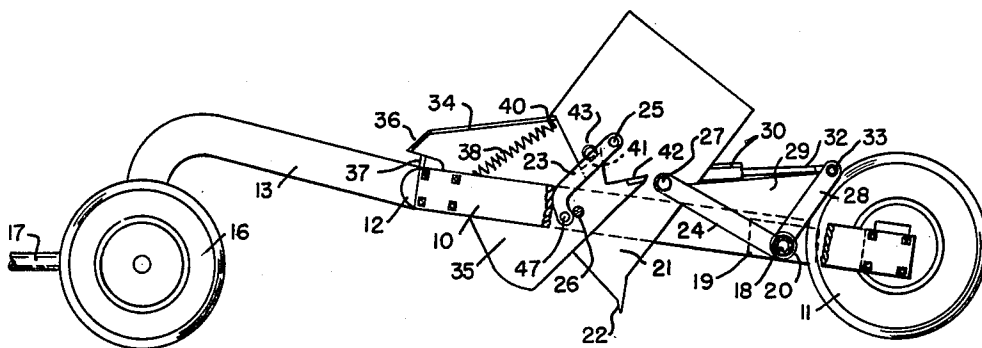


Fig. 4

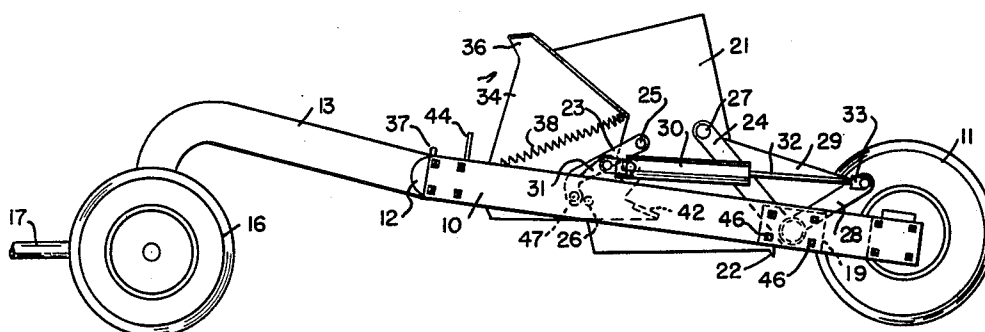


Fig. 5

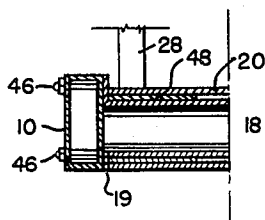


Fig. 6

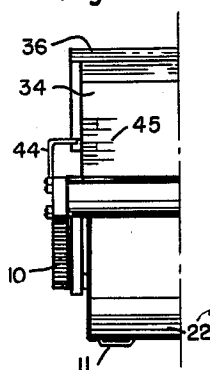


Fig. 7

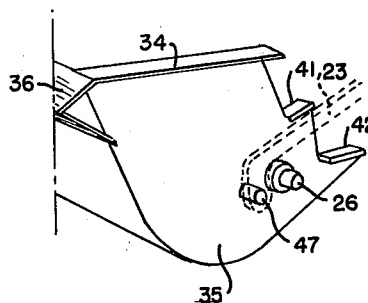


Fig. 8

INVENTOR.
Cecil I. Beck
BY *[Signature]*
ATTORNEY

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EARTH SCRAPERS AND MOVERS

Cecil I. Beck, Denver, Colo., assignor to Eversman Manufacturing Co., Denver, Colo., a corporation of Colorado

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5 Claims. (Cl. 37—126)

This invention relates to an earth mover and more particularly to an earth mover of the trailer type which can be drawn by any suitable towing vehicle such as a tractor. The principal object of the present invention is to provide an earth mover of the above type which can be controlled hydraulically from the towing vehicle to accurately scrape, and load earth, transport the loaded earth without loss or spillage, and which, when the desired destination is reached, will discharge and accurately spread the load to any desired thickness.

Further objects of the invention are:

To provide an earth mover which can be easily and accurately controlled in all of its functions by the operation of a single hydraulic valve and which can be accurately controlled to cut or scrape an earth layer of any desired thickness with a minimum of power consumption;

To provide an earth mover which will be exceedingly rugged in construction, which will have a minimum of working parts and which, when desired, can be rapidly dumped to pile the earth without delaying the forward motion, and which will empty completely even when used upon relatively adherent soils; and

To provide an automatically acting gate for retaining the earth in transport which will require no attention on the part of the operator and to so construct the gate that it will not obstruct the entry of earth and trash during the loading operation.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

In the drawing:

Fig. 1 is a plan view of the improved earth mover;

Fig. 2 is a side view thereof in the earth-transporting position;

Fig. 3 is a longitudinal section, taken on the line 3—3, Fig. 1, illustrating the device in the scraping or loading position;

Fig. 4 is a broken-away side view with a near side frame member removed, showing the loader in a minimum earth spreading position;

Fig. 5 is a side view showing the device in the full dumping position;

Fig. 6 is an enlarged detail section taken on the line 6—6, Fig. 2;

Fig. 7 is a fragmentary front view of the portion of the earth mover indicated by the arrow 7 in Fig. 1; and

Fig. 8 is a fragmentary detail perspective view of one extremity of a front end gate employed in the improved earth mover.

The improved earth mover is supported from a Y-shaped frame consisting of two side frame members 10 supported at their rear extremities on ground-engaging

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wheels 11 and connected at their forward extremities by means of a front cross beam 12 from which a medially positioned, forwardly-extending tongue beam 13 projects. A spacing pipe or tube 18 extends between the two side frame members 10 forwardly of the wheels 11. The spacing pipe terminates in flat mounting plates 19 which are bolted to the side frame members 10 by means of suitable clamp bolts 46 so as to maintain the side frame members in rigid spaced relation. The spacing pipe 18 is enclosed in a rotatable torsion tube 20 which rotates upon bearing sleeves 48 surrounding the spacing pipe 18.

A tongue beam 13 arches upwardly and downwardly terminating in any suitable conventional trailer hitch which can be attached to a tow ball mounted on the draw bar of a tractor or other suitable towing vehicle. As illustrated, the tongue beam 13 rests upon a tow ball 14 mounted on a two-wheeled dolly 15 provided with dolly wheels 16 and with a towing tongue 17.

A scraper bucket 21 is positioned between the side frame members 10 forwardly of the torsion tube 20. The scraper bucket 21 is provided with a rectangular bottom of greater width than length and with closed sides, and a closed back. The front and the top of the bucket 21 are open, and the leading edge of the bottom thereof is provided with a relatively sharp, horizontal scraper knife 22.

A curved, front end gate 34, provided with side plates 35 is employed to retain the earth in the bucket 21 when the latter is in the transport position. The end gate is reinforced against torsion by means of a triangular reinforcing roll 36 formed along its upper edge. The side plates 35 of the gate 34 are pivotally mounted on bearing studs 26 on the side frame members to tiltably mount the entire gate structure. A stop post 37 extends upwardly from the cross beam 12 with which the reinforcing roll 36 contacts to limit the extreme downward movement of the gate 34. A tension spring 38 at each side of the gate constantly urges the gate roll 36 downwardly into contact with the stop post 37. The tension springs 38 are connected, as shown at 39, at their forward extremities to the cross beam 12 and are connected, as shown at 40, at their rearward extremities to the side plates 35 of the gate 34.

The scraper bucket is supported upon the forward extremities of two lift arms 24 which are welded or otherwise secured to the extremities of the torsion tube 20 the side plates of the bucket being provided with bearing studs 27 which are rotatably mounted in the extremities of the lift arms 24.

During the operation of the earth mover, the bucket is rotated about the axis of the bearing studs 27 by means of swinging links 23 which are mounted upon outwardly projecting pivot studs 25 on the side plates of the bucket and extend forwardly to link studs 47 projecting outwardly from the side plates 35 of the gate 34 forwardly of and in eccentric relation to the gate bearing studs 26. The relative lengths of the links 23, the arms 24 and the locations of their pivotal connections is such that, when the bottom of the bucket is elevated to the transport position, its bottom will be substantially horizontal and the pivot stud 25 will be substantially in vertical alignment with the bearing stud 27 at each side of the bucket, as shown in Fig. 2.

Each of the lift arms 24 is provided with an actuating lever 28 affixed to and extending radially from the torsion tube 20 in the plane of the lift arm 24. Each actuating lever 28 is rigidly braced from its respective lift arm 24 by means of a diagonal brace 29. A hydraulic cylinder 30 is hingedly mounted at its forward closed extremity in an anchor fitting 31 mounted on the side frame member 10 at each side of the bucket 21. A conventional hydraulically-actuated plunger 32 projects from each

cylinder 30 to a pivotal connection 33 on one of the actuating levers 28.

Hydraulic fluid is simultaneously conducted to and from the opposite extremities of the two hydraulic cylinders 30 through suitable conventional hydraulic lines 49 to simultaneously reciprocate the plungers 32 therein, by means of any conventional hydraulic conduits connected to a hydraulic pump and reservoir on the towing vehicle and controlled by a conventional hydraulic valve.

The rearwardly-extending portion of each gate side plate 35 is notched to form an upper cam ledge 41 and a lower cam ledge 42 at each side of the bucket. A cam roller 43 is rotatably mounted on, and projects outwardly from each side of the bucket 21, and during movements of the bucket, the cam rollers 43 contact the cam ledges 41 and 42 to actuate the gate, as will be later described.

Operation

Let us assume that the bucket 21 is loaded and that the device is in the transport position of Fig. 2. When in this position, the lower edge of the gate 34 is resting upon the front edge or scraper knife 22 of the bucket under the tension of the springs 38 and the roll 36 of the gate is elevated above the stop post 37 so that the bucket is completely closed against loss or spillage. Now let us assume that it is desired to spread the contained earth in a relatively thin layer over the ground. The hydraulic valve is operated to admit fluid to the forward portions of the hydraulic cylinders 30, to cause them to urge their plungers 32 outwardly to simultaneously swing the two actuating levers 28 rearwardly so as to rotate the torsion tube 20 rearwardly. The rearward rotation of the torsion tube 20 causes the attached lift arms 24 to rotate upwardly to lift the bucket 21.

As the bucket rises, the pivot studs 25 of the links 23 will swing forwardly about the axis of the link studs 47 while the bearing studs 27 on the arms 24 will swing rearwardly so as to lower the scraper knife 22 and tilt the bucket downwardly and forwardly as shown in Fig. 4. The scraper knife will level and spread the discharging earth, as the loader moves forwardly. The thickness of the spread layer of earth can be increased, if desired, by simply admitting additional hydraulic fluid to the cylinders 30. During the spreading positions, the gate 34 will remain stationary with the gate roll 36 resting on the stop post 37 under the influence of the springs 38, as shown in Fig. 4. Admission of hydraulic fluid can be continued, if desired, until the plungers 32 reach their full extension at which time the bucket will be in the complete dumping position of Fig. 5 with the bottom thereof tilted beyond the vertical position to completely dislodge the contents.

As the bucket rotates from the minimum spread position of Fig. 4 to the dumping position of Fig. 5, the cam rollers 43 will travel forwardly and downwardly into contact with the upper cam ledges 41 so as to depress the latter and swing the gate 34 upwardly against the bias of the springs 38, as shown in Fig. 5, to completely open the bucket so that the earth may freely discharge therefrom.

Now let us assume that it is desired to refill the bucket 21 by scraping surface earth. The hydraulic valve is actuated to discharge from the forward portions of the hydraulic cylinders 30, and admit fluid to the rear portions thereof to retract the plungers 32 to return the bucket through the transport position of Fig. 2, to the ground-engaging position of Fig. 3 so that the cutting edge of the knife 22 will enter and loosen the earth to the desired depth. The bucket bottom will slide beneath the loosened earth, piling the latter in the bucket in an upwardly growing pile until the bucket 21 is completely filled. As the bucket descends to the scraping position, the cam rollers 43 will descend against the second or lower cam ledges 42, to stretch the springs 38 and swing

the gate 34 forwardly and upwardly, as shown in Fig. 3, so as to allow unobstructed entry to the bucket.

The bucket is returned to the transport position of Fig. 2 by simply reversing the flow of hydraulic fluid to the hydraulic cylinders. It will be noted that when in the scraping position, the springs 38 are exerting an upward bias on the scraper knife 22 which tends to assist in offsetting the tendency of the knife to travel deeper in the earth so as to assist in maintaining the desired level of cut. The upward force imparted to the bucket by the springs 38 also assists the hydraulic cylinders in raising the bucket to the transport position so that the power required to lift the bucket from the loading position is reduced. As the bucket rises, the gate 34 will swing downwardly until it rests upon and is slightly lifted by the scraper knife 22 to completely close the open front of the bucket 21.

It will be noted that, due to the vertical relation of the studs 25 and 27 and to the substantially parallel arrangement of the links 23 and arms 24 when in the transport or loading positions of Figs. 2 and 3, the bottom of the bucket will remain substantially horizontal from the deepest scraping position to the transport position so as to facilitate entry of the bucket into the earth when loading and prevent spilling during transport. It will also be noted that, due to the terminal arcuate movements of the links 23 and the lifting arms 24, the bucket will rapidly rotate to and from the dumping position of Fig. 5 with a minimum of hydraulic plunger movement.

Since it is difficult for the operator to visually determine the vertical position of the scraper knife 22 and since the gate 34 moves in correspondence with the knife, a gauge pointer 44 is mounted upon one of the side frame members 10 to indicate positions on an index 45 on the end gate 34.

It is desired to call attention to the fact that the above-described construction for an earth scraping and loading device in which accurate control of the amount of cut, accurate control of the spread of the load, lift without spilling, and rapid and complete dump of heavy sticky soils is obtained by operation of a single control.

Attention is also called to efficient results of the use of the torque tube. This tube completely eliminates all stresses in the bucket due to unequal loading and to unequal stresses upon the cutting edge when scraping due to engaging rocks, roots, hard soil, etc. The torque tube eliminates the use of trusses and other structural members for resisting torque stresses.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. An earth mover comprising: a supporting frame including two side frame members; a bucket having two sides, a back and a bottom positioned between said side frame members; a first pivot member extending outwardly from each side of said bucket; a second pivot member extending outwardly from each side of said bucket in spaced relation to the first pivot member thereon; a connecting link pivotally mounted at its rear extremity on each of said first pivot members and extending forwardly therefrom; a lift arm pivotally mounted on each of said second pivot members and extending rearwardly therefrom to a pivotal mounting on said supporting frame; means for swinging said lift arms in unison about their pivotal mountings to cause said second pivot members to gyrate about said first pivot members to vary the position of said bucket; a front end gate positioned forwardly of said bucket; side plates in said end gate; a fixed pivot on each side frame member, the side plates of said end gate being rotatably mounted on said fixed pivots and the forward extremities of said

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connecting links being pivotally connected to the side plates of said end gate; and means for rotating said side plates about said fixed pivots to cause said end gate to swing toward and away from said bucket to open and close the front of the latter.

2. An earth mover as described in claim 1 in which the pivotal connections between the forward extremities of the links and the side plates of the end gate are positioned eccentrically of said fixed pivots.

3. An earth mover as described in claim 1 having a cam member mounted on and projecting outwardly from each side of said bucket and a cam ledge formed on each side plate of said end gate in the path of movement of one of said cam members so that said cam members will contact said ledges to rotate said end gate away from said bucket in consequence of the latter's approach to its terminal positions.

4. An earth mover as described in claim 3 in which

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said gate device is provided with two cam ledges at each of its sides, said ledges and said cam members being so positioned that the cam members will descend against the first ledges at each side of said gate device to elevate said gate device as the bucket descends to its loading position, and so that the cam members will descend against the second ledges at each side of said gate device to elevate said gate device as the bucket tilts forwardly to its dumping position.

5. An earth mover as described in claim 4 having an index carried by said gate device and an indicating device mounted on said frame cooperating with said index to indicate the various positions of said bucket.

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