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LOADING DEVICE

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Fig. 1

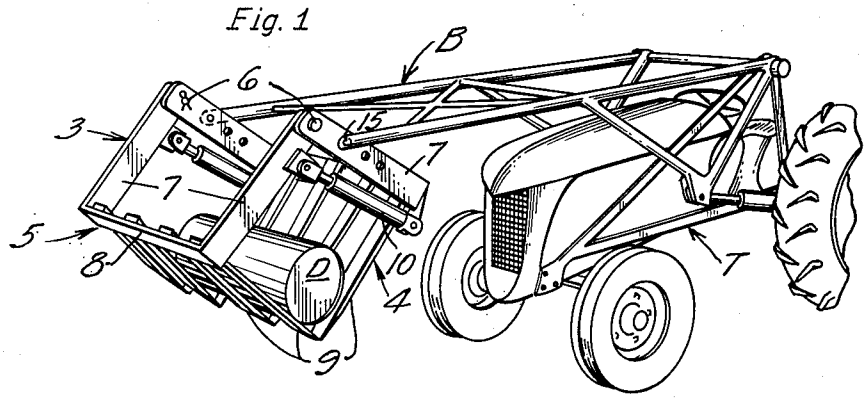
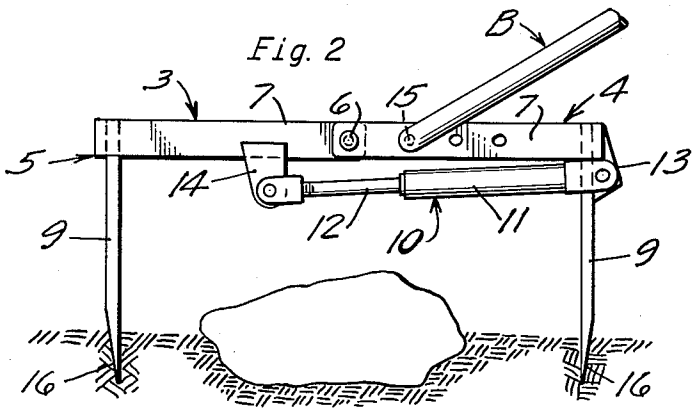


Fig. 2



INVENTOR

BY Harry A. Behrens

Williamson, Schroeder & Palmatier

ATTORNEYS

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LOADING DEVICE

Harry A. Behrens, Rte. 4, Minot, N. Dak.

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This invention relates to material handling apparatus and in particular to a loading unit freely suspended from a mounted boom element which is attachable to a mobile support.

An important object of my invention is a loading device for grasping and lifting materials which is readily attachable to a tractor mounted boom element and requires no mechanical devices for positioning the jaws.

Another object is a loading device comprising a pair of loader jaws freely suspended from a tractor mounted boom element so as to be always projecting substantially downwardly at any elevation in balanced relationship regardless of whether the jaws are open, closed or loaded.

Still another object is a boom mounted loading unit which can pick up and deposit large and/or heavy objects such as rocks, drums, tires, tubs, etc., at any height being limited only by the vertical displacement of the boom.

Still another object is a boom mounted loading device which can readily pick up objects partially embedded in the ground.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference of characters refer to the same or similar parts throughout the several views.

FIG. 1 is a perspective view of the loading device suspended from a tractor mounted boom element and in carrying position;

FIG. 2 is a detail side elevational view of the loading unit with the jaws in open position preparatory to picking up an object.

Referring to the drawings the loader unit indicated generally by 3 is suspended in free swinging and balanced relationship from the outer end of supporting boom B which is tiltedly mounted on tractor T. The loader unit 3 comprises a pair of loader jaws indicated generally by 4 and 5 which are pivotally connected by pivot pin 6 so that the jaws may swing towards each other into cooperating engagement with one another so as to support an object such as drum D therebetween as shown in FIG. 1. Each of the loader jaws consists of a semi-rectangular top frame consisting of side members 7 connected by end members 8 with teeth 9 being rigidly attached to end members 8 and projecting downwardly therefrom. The loader jaws 4 and 5 are opened and closed by means of a hydraulic motor indicated generally by 10 comprising hydraulic cylinder 11 and hydraulic piston 12, the hydraulic motor being operated from the tractor by means not shown. The hydraulic cylinder 11 is pivotally connected to bracket 13 which is rigidly attached to the top frame of loader jaw 4. Hydraulic piston 12 is pivotally connected to lug 14 which depends downwardly from and is rigidly secured to side member 7 of loader jaw 5. The loader unit 3 is freely suspended from boom element B by connecting boom B to side members 7 of loader jaw 4 by means of pivot pins 15.

Pivot pins 15 provide a horizontal axis which permits the loader unit 3 to swing and rotate freely on boom B and boom B is designed so as not to interfere with the free swinging of loader unit 3 on pivot pins 15 regardless of the position of the boom. As shown in FIGS. 1 and 2 hydraulic motor 10 is asymmetrically mounted so as to cause an overbalanced condition between the jaws on the side where the hydraulic cylinder 11 is connected, which in the drawings is the side where jaw 4 is located. To enable the jaws to be suspended from the boom in substantially

balanced relationship, boom B is pivotally connected to side members 7 of jaw 4 at a distance from pivot pin 6 sufficient to offset and counterbalance the weight of hydraulic cylinder 11. The gripping ends 16 of teeth 9 are preferably beveled or tapered to enable the teeth to readily penetrate a substance such as the ground where the object to be picked up might be embedded. Because the jaws are freely suspended in balanced condition from the boom they always project downwardly regardless of whether they are open, closed or loaded and regardless of their elevation. This enables the jaws to be readily positioned for picking up or depositing without the use of additional jaw positioning devices usually found on conventional loading or grasping apparatus.

To pick up an object the jaws are opened and lowered over the object as in FIG. 2. The jaws are then drawn together by the hydraulic cylinder piston until the object is gripped by or enclosed between the jaws and raised to carrying position as shown in FIG. 1. To unload the object, the jaws are positioned over the place of deposit and opened.

In some instances the object to be picked up may be unevenly embedded in the ground with a portion thereof being embedded deeper than the rest. In such a circumstance the offset condition of the boom with the jaws enables the operator to lower the open jaws over the object until the teeth penetrate the ground as in FIG. 2, with the overbalanced jaw 4 on the side of deepest penetration. Continued pressure applied by the boom to the jaws results in an uneven distribution of the downward force with jaw 4 receiving the major portion thereof causing jaw 4 to penetrate more deeply into the ground than jaw 5 so as to engage the more deeply embedded portion of the object to be picked up.

In other forms of my invention, the hydraulic motor may be mounted on the jaws in balanced relationship and the boom may be pivotally connected to the jaws in any manner which will suspend the jaws from the boom in substantially balanced and unrestricted vertically free swinging condition.

In operation, my device has a variety of applications. It readily picks up objects which are too heavy or too awkward to be handled manually, as well as objects which are so located or positioned as to be difficult to grasp by conventional means.

My device is not limited in use to picking up objects where the jaws must be positioned horizontally over the object, but may also be used in circumstances where the jaws must operate in a vertical or semi-vertical plane. An example of this is the removal of straw from a large pile thereof, where the straw pile is of such height that the jaws cannot be positioned horizontally above it. In such a situation, the outermost jaw (jaw 5 of the drawings) is moved into abutment with the pile. Additional forward movement of the tractor causes the jaws to pivot on the boom, swinging the innermost jaw (jaw 4 of the drawings) towards and into engagement with the pile, with the jaws then assuming a vertical or semi-vertical position for taking a bite from the pile. The same procedure can be followed to grasp any object which is so positioned that it is difficult or impossible to grasp from overhead, but which can be grasped by vertically aligning the jaws with the side thereof.

It will, of course, be understood that various changes may be made in the arrangement, the form, details and proportions of the parts of the structure set forth herein without departing from the scope of my invention which generally stated consists in the matter set forth in the appended claims.

What is claimed is:

1. In grasping and lifting apparatus for use with boom means for raising and lowering same, a grasping unit in-

cluding, a pair of opposing jaws having upper frames and grasping members generally transverse to and projecting generally downwardly therefrom, means pivotally connecting said upper frames permitting said grasping members to swing towards and away from each other into and out of cooperative engagement so as to grasp an object therebetween, motor means consisting of a piston and cylinder asymmetrically interconnecting the opposing jaws for opening and closing said jaws and causing an unbalanced relationship between said jaws, and means pivotally connecting the boom only with the upper frame of the overbalanced jaw and thereby suspending both jaws from said boom in substantially horizontally balanced relationship to each other, said unit being thereby freely swingable about a horizontal axis transverse to said boom and maintaining said horizontally balanced relationship during vertical movement of said boom.

2. In apparatus for grasping and lifting materials for use with boom means for raising and lowering same, a grasping unit including a pair of opposed jaws and suspended from said boom means for free swinging movement about a horizontal transverse axis relative thereto, each of said jaws comprising a generally U-shaped frame member including spaced apart side members and an end member intermediate said side members and connecting the outer ends thereof, a plurality of tine-like grasping elements depending generally transversely from said end members, first pivot means pivotally connecting the inner ends of adjacent side members of said opposed jaws for relative swinging movement therebetween about a common horizontal axis transverse to said boom, and second pivot means connecting the side members of one of said jaws with the outer end portion of said boom means at a point offset from said first pivot means for horizontally balanced suspension of said unit from said boom at all times that said unit is freely suspended from said boom and for unrestricted free swinging movement of said unit about a horizontal axis transverse to said boom means, and power means carried by said unit interconnecting between and operating said jaw members for opening and closing same.

3. In apparatus for grasping and lifting materials for use with boom means for raising and lowering said apparatus, a grasping unit including a pair of opposed jaws and suspended from said boom means for free swinging movement of said unit relative to said boom, each of said jaws comprising a generally U-shaped frame member including spaced apart side members and an end member intermediate said side members and connecting the outer ends thereof, and a plurality of tine-like grasping elements depending generally transversely from said end members, first pivot means pivotally connecting the inner ends of adjacent side members of said opposed jaws for relative swinging movement therebetween about a common axis, and second pivot means connecting the side of one of said jaws with the outer end portion of said boom means at a point offset from said first pivot means for free unrestricted swinging movement of said unit with respect to said boom about a horizontal axis transverse to said boom and providing for greater distribution of pressure aganst one jaw member than the other when said boom applies force thereagainst when said other jaw member is anchored and motor means interconnecting said jaw members for opening and closing same, said motor means including cooperating piston and cylinder members extending between and interconnected with said jaws, said motor being asymmetrically mounted with respect to said jaws to maintain them in substantially horizontally balanced relationship when said unit is freely suspended from said boom.

4. In material grasping and lifting apparatus for use with supporting means for raising and lowering same, a grasping unit including a pair of opposed pivotally interconnected generally downwardly facing cooperating jaw members adapted for swinging movement towards and away from each other, means for opening and closing said jaws, and means for freely suspending said unit from said supporting means for free swinging movement of said unit with respect to said supporting means about a horizontal axis whereby said unit when freely suspended always maintains the same downwardly facing position regardless of its elevation, and whereby the major portion of downward force on said unit caused by the downward movement of said supporting means when one of said jaws is anchored is transmitted to said other jaw member.

5. In material grasping and lifting apparatus for use with supporting boom means for raising and lowering same, a material grasping unit including a pair of normally generally downwardly facing opposed cooperating jaw members adapted for swinging movement towards and away from each other about a horizontal axis transverse to said boom, means for opening and closing said jaws and means for freely suspending said unit in substantially horizontally balanced condition from said boom means for free swinging movement of said unit with respect to said boom about a horizontal axis transverse to said boom, whereby said unit maintains a constant horizontal disposition when in freely suspended state when said boom is raised and lowered.

6. The apparatus set forth in claim 5 wherein the grasping unit is suspended from the boom in such fashion that when one of the jaw members is anchored, the major portion of the force on the unit occasioned by vertical movement of the boom is transmitted to said other jaw member.

7. In material grasping and lifting apparatus for use with supporting boom means for raising and lowering same, a material grasping unit including a pair of generally downwardly facing cooperating jaws having upper and lower ends, means pivotally interconnecting the upper ends of said jaws to permit convergent and divergent swinging movement of the jaws with respect to each other, means carried by said unit for opening and closing the jaws, the center of gravity of said unit being disposed closer to one jaw member than the other, and means pivotally suspending said unit from said boom for free swinging movement of said unit with respect to said boom about an axis in vertical alignment with said center of gravity whereby said unit is normally in horizontally balanced condition when freely suspended from said boom regardless of the position of said boom.

8. In material grasping and lifting apparatus for use with boom means for raising and lowering said apparatus, a material grasping unit including a pair of opposed cooperating generally downwardly facing jaw members adapted for relative swinging movement therebetween about a horizontal axis transverse to said boom to open and close said jaws, means for opening and closing said jaws, and means for suspending said unit from said boom for free unrestricted swinging movement of said unit relative to said boom about a horizontal axis transverse to said boom whereby said unit maintains a constant horizontal disposition during raising and lowering of said boom.

9. In material grasping and lifting apparatus for use with boom means for raising and lowering said apparatus, a material grasping unit including a pair of opposed cooperating generally downwardly facing jaw members adapted for relative swinging movement therebetween about a common horizontal axis transverse to said boom to open and close said jaws, means for opening and closing said jaws, said unit being overweighted and unbalanced on one side with respect to said axis, and means pivotally interconnecting said boom with the overweighted side of said unit at the center of gravity of said unit for free swinging movement of said unit relative to said boom about a second horizontal axis transverse to said boom whereby said unit maintains a constant balanced

horizontal disposition as it is raised and lowered by the boom.

10. In material grasping and lifting apparatus for use with boom means for raising and lowering said apparatus, a material grasping unit including a pair of opposed cooperating generally downwardly facing jaw members adapted for relative swinging movement therebetween about a horizontal axis transverse to said boom to open and close said jaws, said jaws being capable of substantially completely enclosing an article therewithin, said jaws consisting of upper frame portions normally in substantially horizontal alignment with each other when the jaws are opened and grasping members extending generally transversely downwardly from the outer ends of said frames, means for opening and closing said jaws, and means for freely suspending said unit from the end of said boom for free swinging movement of said unit with respect to said boom about a horizontal axis transverse to said boom, the point of pivotal interconnection between said boom and said unit being offset from the horizontal geometrical center of said unit with the major portion of said unit extending outwardly beyond said point of pivotal interconnection, the center of gravity of said unit also being offset with respect to said geometrical center and corresponding to said point of pivotal interconnection so that the unit is in constantly balanced condition when freely suspended from the boom, regardless of the movements of the boom, said point of interconnection also being disposed at or below the horizontal centerline of said aligned upper frame portions.

11. In material grasping and lifting apparatus for use with boom means for raising and lowering said apparatus, a material grasping unit including a pair of opposed cooperating generally downwardly facing jaw members adapted for relative swinging movement therebetween about a common horizontal axis transverse to said boom to open and close said jaws, said jaws being capable of substantially completely enclosing an article therewithin, means for opening and closing said jaws, the center of gravity of said unit being offset from the geometrical center thereof, and means for pivotally interconnecting said boom and one of said jaw members to thereby suspend said unit from said boom for free swinging movement of said unit with respect to said boom about a horizontal axis transverse to said boom and common to both said boom and said jaw member with which it is interconnected and in alignment with said center of gravity whereby said jaws are in substantially horizontally balanced condition.

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