Aug. 11, 1964 J. H. BOUGHTON 3,144,147

SIDE DUMP BUCKETS

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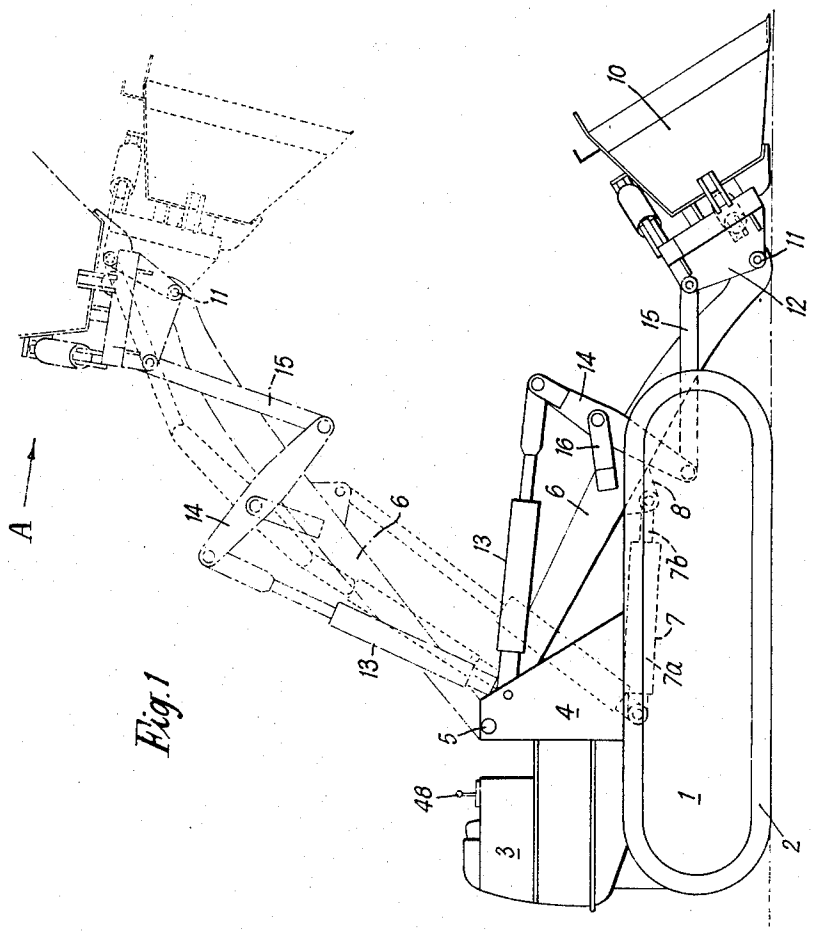



Fig. 1

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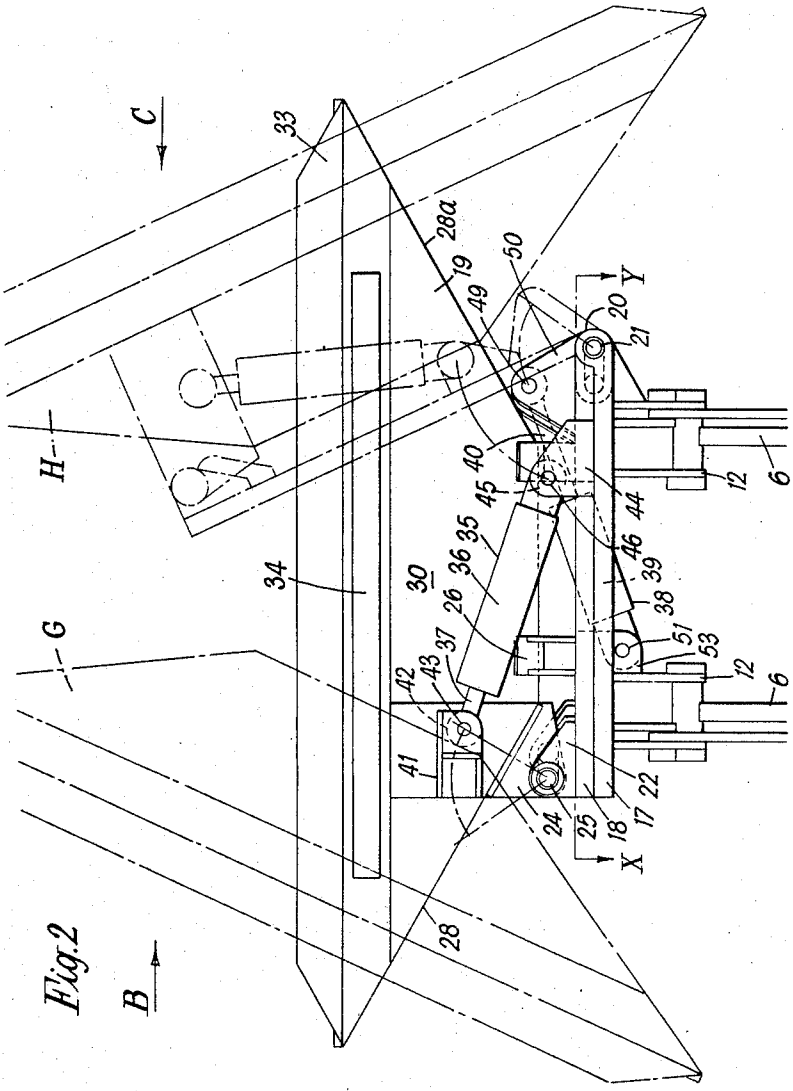



Fig.2

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Fig. 3

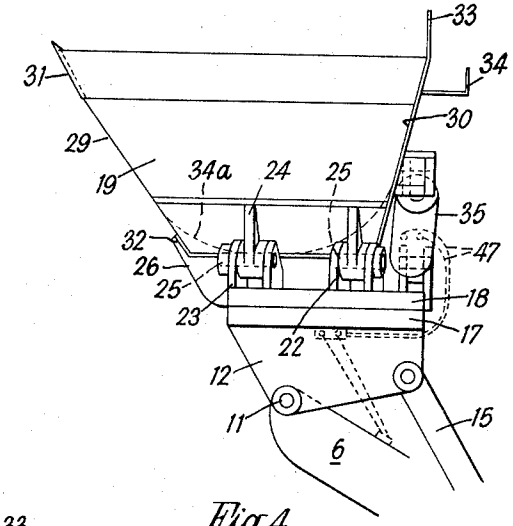



Fig. 4

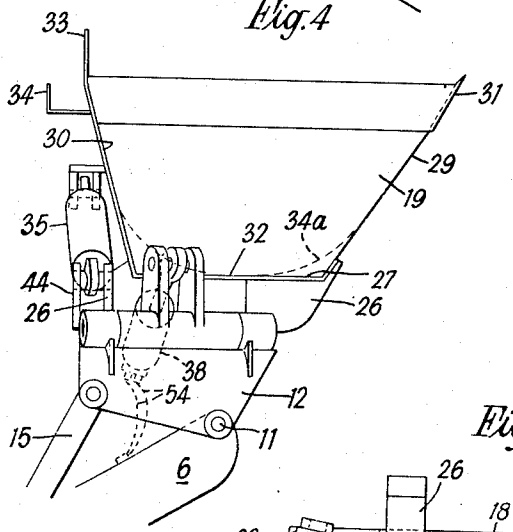
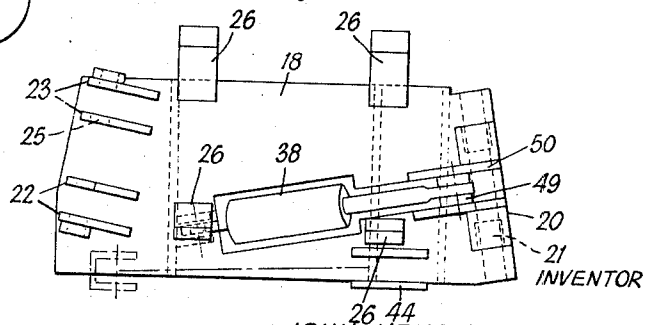



Fig. 5




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3,144,147

# SIDE DUMP BUCKETS

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Claims priority, application Great Britain Feb. 17, 1960
9 Claims. (Cl. 214—140)

This invention relates to side dump bucket assemblies and also to the application of such assemblies to load-handling vehicles.

One of the chief objects of the invention is to provide a bucket assembly of simple construction having a bucket which can be tipped into load discharge positions on either side.

A further important object of the invention is to permit lateral tipping of the bucket to either side to be effected through a greater angle than has hitherto been possible.

The present invention consists in a side dump bucket assembly including a first frame, a second frame and a bucket, wherein the second frame is pivotable about a first pivot axis occupying a fixed position relative to the first frame, and wherein the bucket is itself pivotable about a second pivot axis not normal to the first pivot axis and occupying a fixed position relative to the second frame.

Preferably the position of the first pivot axis is also fixed relative to the second frame, and the position of the second pivot axis is also fixed relative to the bucket.

Preferably also the second frame is substantially co-extensive with the first frame, and is at least four-sided, with the first and second pivot axes disposed respectively in the vicinity of two opposite sides of said second frame, one of said two opposite sides being connected to the first frame by a hinge having a hinge pin which defines the first pivot axis, and the other of said two opposite sides being connected to the bucket by at least one hinge having a hinge pin which defines the second pivot axis.

It is of further advantage if the bucket is generally symmetrical about a plane perpendicular to the plane of the bucket mouth and disposed symmetrically with respect to said first and second pivot axes, and also, in this case, if the bucket is shaped to form a discharge chute on each side of said second plane.

A bucket assembly constructed in accordance with the invention conveniently may include means operable to effect pivotal movement of the second frame about the first pivot axis, and of the bucket about the second pivot axis.

These means preferably include a first hydraulic ram operable to effect pivotal movement of the bucket about the second pivot axis, and a second hydraulic ram operable to effect pivotal movement of the second frame, with the first hydraulic ram and the bucket carried thereon, about the first pivot axis.

In this case one end of the first hydraulic ram may be universally connected to the second frame and the other end of said first hydraulic ram may be universally connected to the bucket, while one end of the second hydraulic ram may be pivotally connected to the first frame, and the other end of the second hydraulic ram may be pivotally connected to the second frame, the arrangement being such that, when the first and second hydraulic rams are both retracted, the plane of the bucket mouth is substantially parallel to the plane of the first frame, and the bucket is supported upon supporting means provided on the second frame.

Alternatively, however, the pivotal movement of the ssecond frame about the first pivot axis and the pivotal movement of the bucket about the second pivot axis may both be effected by a single hydraulic ram.

In such an instance the said single hydraulic ram may



be universally connected at one end to the bucket, preferably to the bottom thereof and at a point on its longitudinal axis, and may be universally connected at its other end to an anchorage point fixed with respect to the first frame, releasable locking means being provided which are operable, preferably by a single control lever, selectively to lock the bucket to the second frame, and the second frame to the first frame, and the arrangement being such that when the said single hydraulic ram is retracted, the plane of the bucket mouth is substantially parallel to the plane of the first frame,

The invention also consists in a load-handling vehicle having operatively mounted thereon a bucket assembly having at least some of the characteristics hereinabove referred to. In such a vehicle the bucket assembly is preferably pivotable about a third pivot axis fixed relative to the first frame and normal to the longitudinal axis of said vehicle, while a mechanism operable to effect pivotal movement of the bucket assembly about said third pivot axis may conveniently also be included in the vehicle itself.

In a preferred embodiment of vehicle the said mechanism includes a first linkage pivotally connecting the third pivot axis to an anchorage point on the vehicle, and a second linkage operable to effect pivotal movement of the second frame about the third pivot axis, the arrangement being such that when the vehicle is on a level surface, the mechanism is capable of moving the first frame into a horizontal position.

In this case, when the vehicle is in said horizontal position and is provided with a bucket assembly having the first and second hydraulic rams, extension of the first hydraulic ram preferably causes the bucket to be pivoted about the second pivot axis into a first position in which the plane of the bucket mouth is inclined to the plane of the first frame and to the horizontal, and extension of the second hydraulic ram causes the bucket, carried with the first hydraulic ram on the second frame, to be pivoted about the first pivot axis into a second position in which the plane of the bucket mouth is inclined to the plane of the first frame and to the horizontal, the pivotal movement of the bucket about the second pivot axis on extension of the first hydraulic ram being in a counter-direction to the pivotal movement of the bucket about the first pivot axis on extension of the second hydraulic ram.

In a similar case, when the vehicle is in said horizontal position but is provided with a bucket assembly having only the single hydraulic ram, locking of the second frame to the first frame and subsequent extension of said single hydraulic ram preferably causes the bucket to be pivoted about the second pivot axis into a first position in which the plane of the bucket mouth is inclined to the plane of the second frame and to the horizontal, while locking of the bucket to the second frame and subsequent extension of the hydraulic ram causes the bucket, carried on the second frame, to be pivoted about the first pivot axis into a second position in which the plane of the bucket mouth is inclined to the plane of the first frame and to the horizontal.

By way of example, a preferred embodiment of the invention as applied to a load-handling vehicle is diagrammatically illustrated in the accompanying drawings wherein:

FIGURE 1 is a general view of a load-handling vehicle having a side dump bucket assembly operatively mounted thereon to enable three-way tipping;

FIGURE 2 is a detail end view of the rear of the bucket assembly shown in FIGURE 1 and as viewed in the direction of the arrow A thereon;

FIGURE 3 is a detail side view of the bucket assembly illustrated in FIGURE 2 and as viewed in the direction of the arrow B thereon;

FIGURE 4 is a detail view of the opposite side of the bucket shown in FIGURE 3 and as viewed in the direction of the arrow C of FIGURE 2; and

FIGURE 5 is a plan view taken along the line X—Y of FIGURE 2, with the bucket and certain other parts omitted in the interests of clarity.

Referring to the drawings, FIGURE 1 shows in general a load-handling vehicle 1 in a preferred form of a crawler-tractor having dual caterpillar tracks 2. Supported on the tractor chassis (not shown) is a driving cab 3 and, forwardly thereof, a yoke member having a pair of spaced side plates 4 which carry respectively a pair of co-axial pivot pins 5, the axes of which are transverse with respect to the longitudinal axis of the tractor. Connected respectively to the pair of pivot pins 5, for pivotal movement thereabout, are corresponding ends of a pair of laterally spaced and interconnected lifting arms 6, capable of being raised and lowered in unison about said pivot pins 5 and longitudinally of the tractor, by operation of an associated pair of conventional hydraulic jacks 7, each of which comprises a jack cylinder 7*a* slidably mounted in which is a piston 7*b* extensible and retractible by application of hydraulic pressure from a source thereof (not shown) carried by the tractor. In each case, the jack piston 7*b* is pivotally connected to a fixed bracket 8 secured substantially midway along its respective lifting arm 6, and the jack cylinder 7*a* is pivotally connected to a respective fixed anchorage point on the tractor itself.

The outer ends of the lifting arms 6 are pivotally connected to a side dump bucket assembly, generally indicated at 10 and hereinafter to be described in detail. The connection of the lifting arms 6 to the bucket assembly 10 is by means of a pair of pivot pins 11 parallel to the pivot pins 5 and carried respectively by two sets of spaced mounting plates 12 secured to the bottom of the bucket assembly 10.

13 designates a second pair of hydraulic jacks which are of similar construction to the first-mentioned pair of jacks 7. The cylinder portions of these second jacks 13 are pivotally connected respectively to the side plates 4 of the yoke member, while the piston portions are pivotally connected respectively to corresponding ends of a pair of first links 14. These first links 14 are in turn pivotally connected respectively both to the two sets of mounting plates 12, by means of a pair of second links 15, and also to the lifting arms 6 by means of fixed arms 16 secured to said lifting arms 6 as illustrated. The said second pair of hydraulic jacks 13 together with the linkage systems associated respectively therewith, are operable to push and pull the bucket assembly 10 about the pivot pins 11, and thus to enable pivotal movement of said bucket assembly in the direction of the longitudinal axis of the tractor.

The construction and arrangement of the bucket assembly 10 is illustrated in detail in FIGURES 2 to 5. From reference to these figures, it will be seen that the said assembly essentially includes a first frame 17, directly connected to and supported upon which is a second frame 18, which in turn supports and is connected to a bucket 19. The first frame 17 is generally four-sided, said sides being of channel-shaped beams strengthened by means of a web of bracing struts overlaid by a flat sheet metal cover plate through which are formed apertures to accommodate the mounting of bucket-tipping mechanism hereinafter to be described.

The previously mentioned two sets of mounting plates 12, by means of which the complete bucket assembly is supported on the tractor, are secured respectively along two opposite sides of the first frame 17 which extend longitudinally of the tractor, the two sets of plates 12 depending from said opposite sides as clearly shown in FIGURES 3 and 4.

As stated, connected to and supported upon the first frame 17 is a second frame 18. This second frame 18 is constructed in a similar fashion to the first frame 17 and is co-extensive therewith, the connection between the two frames being by complementary hinge portions integrally formed on the right hand sides of the said frames as viewed in FIGURES 2 and 5, said complementary portions together forming a continuous hinge-barrel 20 through which extends a connecting hinge pin 21 which defines what will subsequently be referred to as the first pivot axis.



It will be apparent from the foregoing description, that the second frame 18 is pivotable with respect to the first frame 17 about the said first pivot axis.

Secured to the top of the second frame 18 along the side thereof opposite the hinge pin 21 are two spaced pairs 22, 23 of upstanding brackets into which pairs nest, respectively, depending single brackets 24, secured to the underneath of the previously mentioned bucket 19. The co-operating pairs 22, 23 of brackets and single brackets 24, act in effect as hinge members for pivotally connecting the bucket 19 to the second frame 18, a pair of co-axial connecting hinge pins 25 extending respectively through each set of co-operating brackets and defining what will hereinafter be referred to as a second pivot axis.

Also secured to the top of the second frame 18 in the vicinity of the four corners thereof are four upstanding irons 26 which are shaped so as to be complementary to the underneath of the bucket 19 and which serve to support the bucket when it rests directly on the second frame, as shown in full line in FIGURE 2.

It will now be further apparent from the preceding description that, in addition to the pivotal movement of the bucket about the first pivot axis, further pivotal movement of the bucket about the second pivot axis is also possible.

It is of interest to mention at this point that the single hinge pin 21 and the pair of co-axial hinge pins 25 (and thus the first and second pivot axes defined respectively thereby) are mutually convergent with respect to the longitudinal axis of the first frame 17, and, by reason of the disposition of said first frame 17 relative to the tractor, are similarly also convergent with respect to the longitudinal axis of the tractor in a direction towards the forward end thereof. This arrangement is obvious from FIGURE 5 and, as will be later explained results in certain functional advantages when tipping of the bucket about the said two pivot axes is carried out. In the arrangement illustrated the angle of said convergence of the two pivot axes is in the region of 10°, but similarly advantageous results are to be derived if the angle is between a minimum of 5° and a maximum of 30°.

The bucket 19 itself, which has an open mouth and is generally symmetrical about a plane perpendicular to the plane of said mouth and disposed symmetrically with respect to said first and second pivot axes, comprises a flat base plate 27 having a pair of opposite side walls 28, 28*a* each generally extending in the direction of the longitudinal axis of the tractor but upwardly and outwardly diverging so as to form a discharge chute on each side of the above-mentioned plane. The base plate 27 also has a similarly inclined front end wall 29 at the forward end of the tractor which serves to form a discharge chute to assist in forward tipping, and a substantially vertically disposed opposite rear wall 30. In the arrangement illustrated, the top of the front end wall is provided with a rigidly secured scraper plate 31 having a bevelled leading edge to facilitate use of the bucket for shovelling operations. The rear end wall 30 and the base plate 27 are strengthened by having secured thereto a co-extensive outer reinforcing skin 32, which is extended and wrapped upwardly so as also to overlay the lower portion of the front end wall 29 as clearly shown in FIGURES 3 and 4. The rear end wall 30 is further provided with a double thickness upstanding plate member 33 which serves as a guard at the rear of the bucket mouth to prevent overloading of the bucket, and also, as an extra precaution, with a channel-shaped spill trough 34, externally secured as shown, to protect from damage otherwise unguarded parts of a bucket-tipping mechanism which are mounted thereunder.

In order to avoid the likelihood of any load carried in the bucket **19** being trapped in the corners on discharge, a smoothly curved false bottom **34***a* is fitted to the inside of the bucket as indicated in FIGURES 3 and 4.

In the preferred embodiment illustrated, the above-mentioned bucket-tipping mechanism includes a first hydraulic ram **35**, operable to effect pivotal movement of the bucket **19** about the pair of co-axial hinge pins **25**, that is about the second pivot axis, and comprising a cylinder **36** having a piston **37** slidably mounted therein which is selectively extensible and retractible on suitable application of hydraulic pressure, and a second, separate hydraulic ram **38**, of similar construction to the first hydraulic ram **35**, but operable to effect movement of the bucket **19** about the single hinge pin **21**, that is about the first pivot axis, said second hydraulic ram comprising a cylinder **39** having a piston **40** slidably mounted therein.

The construction and arrangement of the first and second hydraulic rams **35** and **38** is clearly shown in FIGURE 2, from which it will be seen that protruding from the rear end wall **30** of the bucket **19** is a rigid, forked bracket **41** the inside of which is shaped to define a socket **42** within which a ball portion **43** formed on the end of the piston **37** is freely held. Upstanding from and secured to the second frame **18** at a location opposite to but substantially in alignment with the bracket **41** is a similarly constructed bracket **44**, the inside of which is shaped as a socket **45** into which a ball portion **46** formed at the end of the cylinder **36** is freely held.

A pressure supply line to the first hydraulic ram **35** for effecting powered extension and retraction of the piston **37** thereof in the conventional manner by delivering fluid under pressure selectively to the full and annular sides respectively of the piston **37**, is indicated diagrammatically at **47** in FIGURE 3 only. The said pressure line **47** is fed from a source carried by the tractor at a convenient location thereon and not illustrated and is remotely controlled by operation of a control lever **48** (FIGURE 1) mounted on the tractor within reach from the cab **3**.

When the piston **37** is fully retracted in the cylinder **36**, the bucket **19** is closed onto the second frame **18** and is supported on the irons **26** in what wil be referred to as its normal position in which the base plate **27** of the bucket is parallel to the second frame **18**. On powered extension of the piston **37**, however, pivotal movement of the bucket in an anticlockwise direction, as viewed in FIGURE 2, is effected, the bucket thus being tipped to the left of the tractor to occupy position G indicated in chain line.

Conversely, powered retraction of the piston **37** causes counter pivotal movement of the bucket in a clockwise direction about the second pivot axis back to its normal position.

It will be appreciated that the ball and socket mountings of the above described first hydraulic ram **35** are provided to accommodate the universal movement of the ram which is required by reason of the convergent second pivot axis.

A somewhat similar arrangement is used to effect tipping of the bucket **19** about the first pivot axis. In this case the second hydraulic ram **38** has the end of its piston **40** pivotally connected to a pivot pin **49** carried by an upstanding bracket **50**, secured to the top of the second frame **18**, and the end of its cylinder **39** pivotally connected to a pivot pin **51** carried by a bracket **53** secured to the underside of the first frame **17**. It will thus be appreciated that the pistons **37** and **40** of the first and second hydraulic rams respectively occupy as clearly seen in FIGURE 2, a crossed relationship, the body of the cylinder **39** extending through suitable apertures provided, as previously mentioned in the cover plates of the first and second frames **17**, **18**.

The piston **40** of the second hydraulic ram **38** is also capable of powered extension and retraction in a similar manner as the piston **37** of the first hydraulic ram **35**, a pressure supply line to the said second hydraulic ram **38** being diagrammatically shown at **54** in FIGURE 4 only, and, like the supply line **47**, having its feed remotely controlled by operation of the control lever **48** (FIGURE 1). When the piston **40** of the second hydraulic ram **39** is fully retracted, the second frame **18** is held in a position in which it is closed down on top of the first frame **17** and parallel thereto. On powered extension of the piston **40**, however the second frame **18** is caused to pivot about the first pivot axis and since, as previously described, the bucket **19** and the first hydraulic ram **35** are carried on the top of said second frame **18**, the bucket **19** is thus tipped laterally to the right of the tractor in a clockwise direction, as viewed in FIGURE 2, to occupy position H indicated in chain line.

Conversely, powered retraction of the piston **40** causes the second frame to be closed onto the first frame and the bucket thus to be restored once again to its original position.

It will be recalled that earlier mention was made of the fact that the first and second pivot axes were arranged so as to be mutually convergent in a forward direction with respect to the longitudinal axis of the tractor. The purpose of this is to obviate the need for the operator of the tractor to manoeuvre his vehicle in attempts to align either of the longitudinally extending sides of the bucket **19** exactly with the area into which the load being handled is to be laterally tipped, such manoeuvering previously being necessary if the load was to be accurately discharged into said area. This precise manoeuvering is no longer required with the arrangement described, since it enables the operator to approach the tipping area in question at a generally inclined angle, the convergent arrangement of the said first and second pivot axes ensuring that, on lateral tipping to either side, the load from the bucket **19** is discharged accurately.

It will be appreciated that by means of the construction hereinbefore described, three-way tipping of the bucket **19** is possible, lateral tipping to the left and right with respect to the centre line of the tractor being achieved by operation respectively of the first and second hydraulic rams **35**, **38**, and forward tipping being effected by pivotal movement of the complete bucket assembly **10** about the pivot pins **11** which define what will be referred to as a third pivot axis.

It will be understood that this pivotal movement about the third axis is achieved by the mechanism including the lifting arms **6** and the hydraulically-actuated linkage systems associated therewith which were previously described in detail. When the tractor is on a level surface, this mechanism is operable not only to move the bucket assembly **10** so that the first frame **17** thereof is in a relatively horizontal position, but is also operable to raise and lower the whole bucket assembly with respect to the tractor itself. This can be seen for example in FIGURE 1 which shows in chain-line the tractor supporting the bucket in an elevated position, and in dotted-line, the bucket held in said elevated position but tipped forwardly about said third pivot axis.

As has also been stated the bucket **19** may be used for shovelling operations, and a view of the tractor with the arms **6** and bucket assembly in a suitable lowered, ground-level position for such operations is shown in full line, in FIGURE 1.

In this context, it may be remarked that the above described arrangement lends itself very conveniently for use in earth moving and to what in that art is known as "crowding," that is to say to driving the bucket, in a tipped-forward position and at ground level, as shown in full line in FIGURE 1, into an earth mound and, at the same time, pivoting the bucket back into a substantially horizontally disposed position so that earth is thus scooped from said mound and is ready to be transferred, still at ground level, to a new location.

Mention should also be made of an alternative embodi-

ment of the tipping mechanism for effecting lateral tipping of the bucket **19** of the bucket assembly **10**. In this alternative embodiment, which is not illustrated on account of its simplicity, the first and second hydraulic rams **35**, **38** are replaced by a single conventional hydraulic ram, one end of which is pivotally secured to the base plate **27** of the bucket at a point on the longitudinal axis thereof and the other end of which is pivotally secured to an anchorage point fixed with respect to the first frame **17**.

In this construction, releasable locking means are provided, operable, preferably by a single control member, selectively to lock the second frame to the first frame and the bucket to the second frame, the arrangement being such that when the single ram is retracted the plane of the bucket mouth is substantially parallel to the plane of the first frame.

In this arrangement lateral tipping to the right about the first pivot axis is achieved by locking the bucket **19** to the second frame **18** and by subsequently extending the single ram, while lateral tipping to the left is achieved by locking the second frame **18** to the first frame **17** and subsequently extending the single ram whereby the bucket is pivoted about the second pivot axis.

In conclusion it may also be remarked that obviously if required, an arrangement may be provided which is identical to those previously described except that the relative positions of the first and second pivot axes are interchanged. That is to say, as will best be understood by reference to FIGURE 2, the single hinge pin **21** may be formed on the left hand side of the first and second frames **17**, **18** so that the second frame opens away from the first frame to left rather than to the right as shown, in which case the coaxial hinge pins **25** will be formed on the right hand side of the second frame and bucket **19**, so that the bucket opens away from said second frame to the right instead of to the left.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A side dump bucket assembly comprising a first frame; a substantially co-extensive second frame having at least four sides; a first hinge pin hingedly connecting one of two opposite sides of said second frame to a corresponding side of said first frame and defining a first pivot axis about which said second frame is pivotable; a bucket; at least one second hinge pin hingedly connecting the other of said two opposite sides of said second frame to said bucket and defining a second pivot axis, said second pivot axis being convergent with said first pivot axis and about which second pivot axis said bucket is pivotable.

2. A side dump bucket assembly as claimed in claim 1, including first and second extensible means; means for pivotally connecting one end of said first extensible means to said first frame; means for pivotally connecting the other end of said first extensible means to said second frame; means for pivotally connecting one end of said second extensible means to said second frame; and means for pivotally connecting the other end of the second extensible means to said dump bucket.

3. A side dump bucket assembly comprising a first frame, a substantially co-extensive second frame having at least four sides; a first hinge pin hingedly connecting one of two opposite sides of said second frame to a corresponding side of said first frame and defining a first pivot axis about which said second frame is pivotable; a bucket; at least one second hinge pin hingedly connecting the other of said two opposite sides of said second frame to said bucket and defining a second pivot axis and which latter pivot axis is convergent with said first pivot axis, and about which second pivot axis said bucket is pivotable; a first hydraulic ram connected at one end to said bucket and at the other end to said second frame and operable to effect pivotal movement of said bucket about said second pivot axis; and a second hydraulic ram connected at one end to said second frame and at the other end to said first frame and operable to effect pivotal movement of said second frame about said first pivot axis.

4. A side dump bucket assembly comprising a first frame; a substantially co-extensive second frame having at least four sides; a first hinge pin hingedly connecting one of two opposite sides of said second frame to a corresponding side of said first frame and defining a first pivot axis about which said second frame is pivotable; a bucket; at least one second hinge pin hingedly connecting the other of said two opposite sides of said second frame to said bucket and defining a second pivot axis and which latter pivot axis intersects said first pivot axis at an angle between 10° and 60°; a first hydraulic ram universally connected at one end to the bucket and at the other end to said second frame and operable to effect pivotal movement of said bucket about said second pivot axis; and a second hydraulic ram connected at one end to said second frame and at the other end to said first frame and operable to effect pivotal movement of said second frame about said first pivot axis.

5. A load-handling vehicle comprising in combination a chassis; a lifting arm at one end pivoted to and extending lengthwise of the chassis; a first frame mounted on the other end of said lifting arm for pivotal movement about an axis normal to the longitudinal axis of said lifting arm; a second frame pivotable about a first pivot axis occupying a fixed position relative to said first frame; a bucket pivotable about a second pivot axis occupying a fixed position relative to the second frame and convergent with the first pivot axis towards the forward end of said vehicle; and at least one pivot pin, occupying a fixed position relative to said first frame, normal to the longitudinal axis of said vehicle and defining a third pivot axis about which said pivotal movement of the first frame is effected, said bucket being symmetrical about a plane both perpendicular to the plane of the bucket mouth and disposed symmetrically with respect to said first and second pivot axes.

6. A load-handling vehicle comprising in combination, a chassis; a first frame; longitudinally extending carrying means for said first frame pivotally connected at one end to said chassis and at the other end to said first frame for pivotal movement thereof about an axis normal to the longitudinal axis of said carrying means; a second frame substantially co-extensive with said first frame and having at least four sides; a first hinge pin hingedly connecting one of two opposite sides of said second frame to a corresponding side of said first frame and defining a first pivot axis about which said second frame is pivotable; a bucket; at least one second hinge pin hingedly connecting the other of said two opposite sides of said second frame to said bucket and defining a second pivot axis, said second pivot axis being convergent with said first pivot axis towards the forward end of said vehicle and about which second pivot axis said bucket is pivotable; a first hydraulic ram connected at one end to said bucket and at the other end to said second frame and operable to effect pivotal movement of said bucket about said second pivot axis; a second hydraulic ram connected at one end to said second frame and at the other end to said first frame and operable to effect pivotal movement of said second frame about said first pivot axis; at least one pivot pin occupying, relative to said first frame, a fixed position normal to the longitudinal axis of said vehicle, and defining a third pivot axis about which said pivotal movement of said first frame is effected; a linkage pivotally mounted on said carrying means and pivotally connected at one end to said first frame; and a third hydraulic ram pivotally connected between the other end of said linkage and a fixed anchorage point on said vehicle and operable to cause said pivotal movement of said first frame about said third pivot axis.

7. A load-handling vehicle comprising in combination, a chassis; a first frame; a carrying means comprising at least one pair of lifting arms each mounted at

its lower end on said chassis and at its upper end supporting said first frame so as to allow pivotal movement thereof longitudinally of the vehicle; a second frame substantially co-extensive with said first frame and having at least four sides; a first hinge pin hingedly connecting one of two opposite sides of said second frame to a corresponding side of said first frame and defining a first pivot axis about which said second frame is pivotable; a bucket, at least one second hinge pin hingedly connecting the other of said two opposite sides of said second frame to said bucket and defining a second pivot axis, said second pivot axis being convergent with said first pivot axis towards the forward end of said vehicle and which intersects said first pivot axis at an angle between 10° and 60°; a first hydraulic ram universally connected at one end to said bucket and at the other end to said second frame and operable to effect pivotal movement of said bucket about said second pivot axis; a second hydraulic ram connected at one end to said second frame and at the other end to said first frame and operable to effect pivotal movement of said second frame about said first pivot axis; a bracket member fixedly secured to the underneath of said first frame; at least one third hinge pin hingedly connecting said bracket to said upper ends of said supporting arms disposed normally with respect to the longitudinal axis of said vehicle, and defining a third pivot axis about which third pivot axis said pivotal movement of said first frame is effected; a linkage pivotally mounted on said carrying means and pivotally connected at one end to said first frame; and a third hydraulic ram pivotally connected between the other end of said linkage and a fixed anchorage point on said vehicle and operable to cause said pivotal movement of said first frame about said third pivot axis.

8. Transportable load lifting and forward and bilateral side dumping means, comprising a swinging boom, a bucket carried by a free end of said boom, first and second frames normally superimposed one upon the other, means pivotally connecting the first frame to said boom, said pivotal connection comprising the axis of articulation of the bucket to the boom, said axis being normal to the longitudinal center line of the boom, remote control means to apply leverage to said first frame to tilt the bucket up and down about said axis of articulation relative to the boom, the second frame having a unilateral pivotal connection to a complementary opposed pivot forming unilateral part of said first frame,



said second frame being free at its lateral part remote from its said pivotal connection to the first frame, a pivotal connection of said free lateral part to a unilateral part of the base of the bucket, the opposed lateral part of the base of the bucket being free relative to the said frames, the said pivotal connections at the lateral parts of said frames having their axes not normal but symmetrical relative to the axis of articulation of the first frame to the boom, power actuated means operable to tilt the bucket in one direction laterally outwards relative to both frames, and further power actuated means operable to swing the second one of said frames laterally relative to said first frame to tilt the bucket outwardly in an opposite direction.

9. A load-handling vehicle comprising in combination, on a chassis; a lifting arm unit pivoted at one end to the said chassis, a first frame mounted on the other end of said lifting arm unit for pivotal movement about a first pivot axis normal to the longitudinal axis of said lifting arm unit; a second frame rested upon said first frame and having a perimeter including two sides disposed laterally relative to the said lifting arm unit; a hinge pin hingedly connecting one of the two opposite lateral sides of said second frame to a corresponding side of the said first frame and defining a second pivot axis about which said second frame is pivotable uni-laterally relative to the longitudinal axis of the lifting arm unit; a bucket; a hinge pin hingedly connecting the other of the said opposite sides of the said second frame to said bucket and defining a third pivot axis about which said bucket is pivotable uni-laterally oppositely to the aforesaid pivotal movement of the second frame; said second and third pivot axes converging forwardly relative to the longitudinal axis of the lifting arm unit, and pivot means connecting the underneath of the first frame to the lifting arm unit and forming the said first pivot axis.

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