July 20, 1965 M. J. KASHERGEN 3,195,747

BACKHOE AND BUCKET INCORPORATED THEREIN, AND METHOD OF DIGGING EARTH

Filed June 5, 1961 3 Sheets-Sheet 1

Fig. 1.

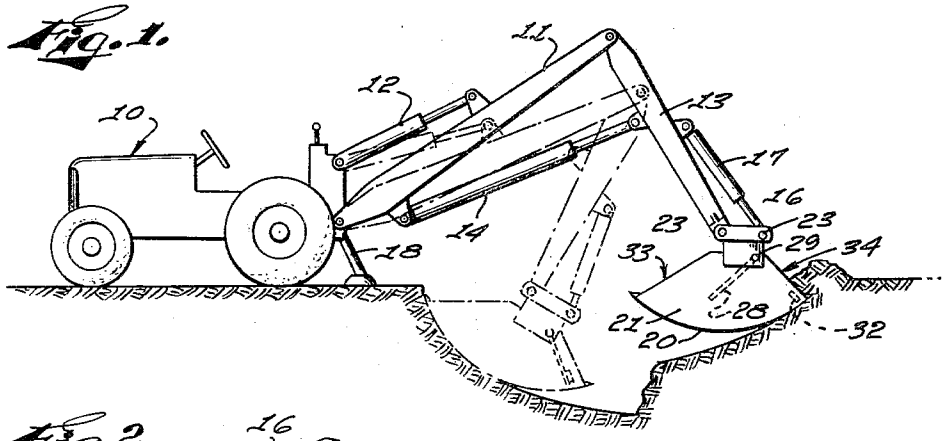


Fig. 2.

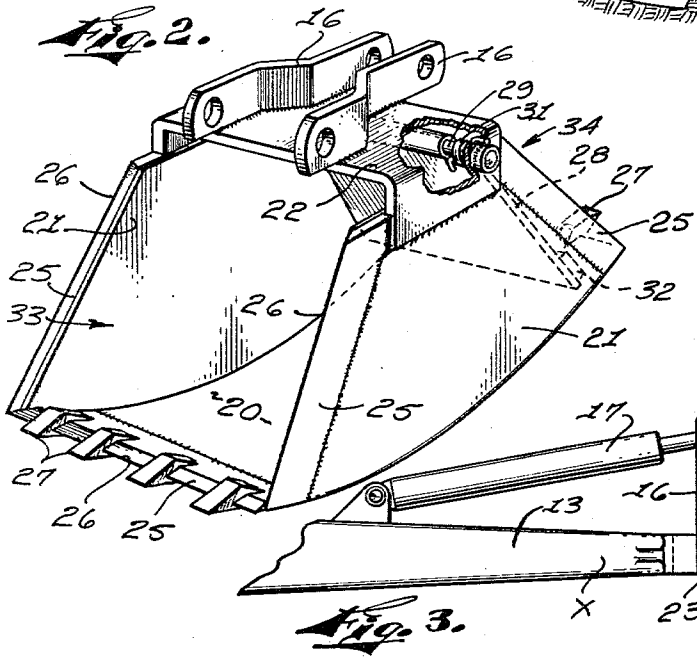


Fig. 3.

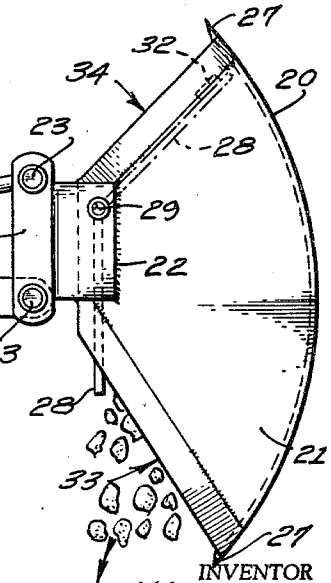
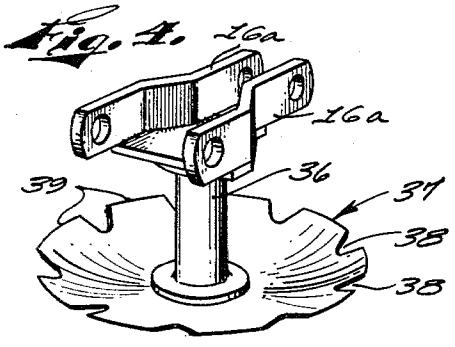


Fig. 4.



INVENTOR

MICHAEL J. KASHERGEN

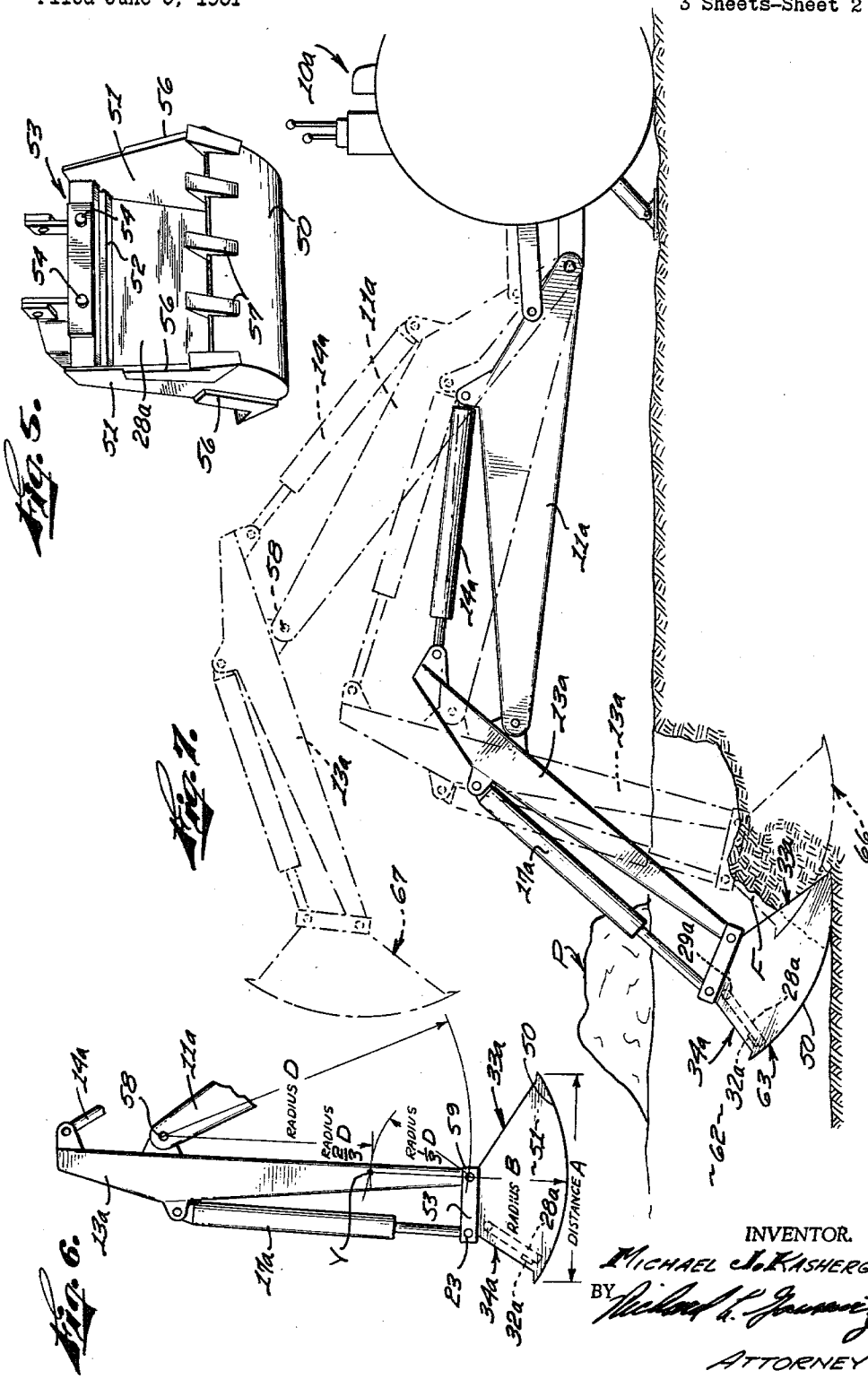
BY R. L. Jamieson

ATTORNEY

July 20, 1965 M. J. KASHERGEN 3,195,747

BACKHOE AND BUCKET INCORPORATED THEREIN, AND METHOD OF DIGGING EARTH

Filed June 5, 1961 3 Sheets-Sheet 2



INVENTOR.
MICHAEL J. KASHERGEN
BY
ATTORNEY

July 20, 1965 M. J. KASHERGEN 3,195,747

BACKHOE AND BUCKET INCORPORATED THEREIN, AND METHOD OF DIGGING EARTH

Filed June 5, 1961 3 Sheets-Sheet 3

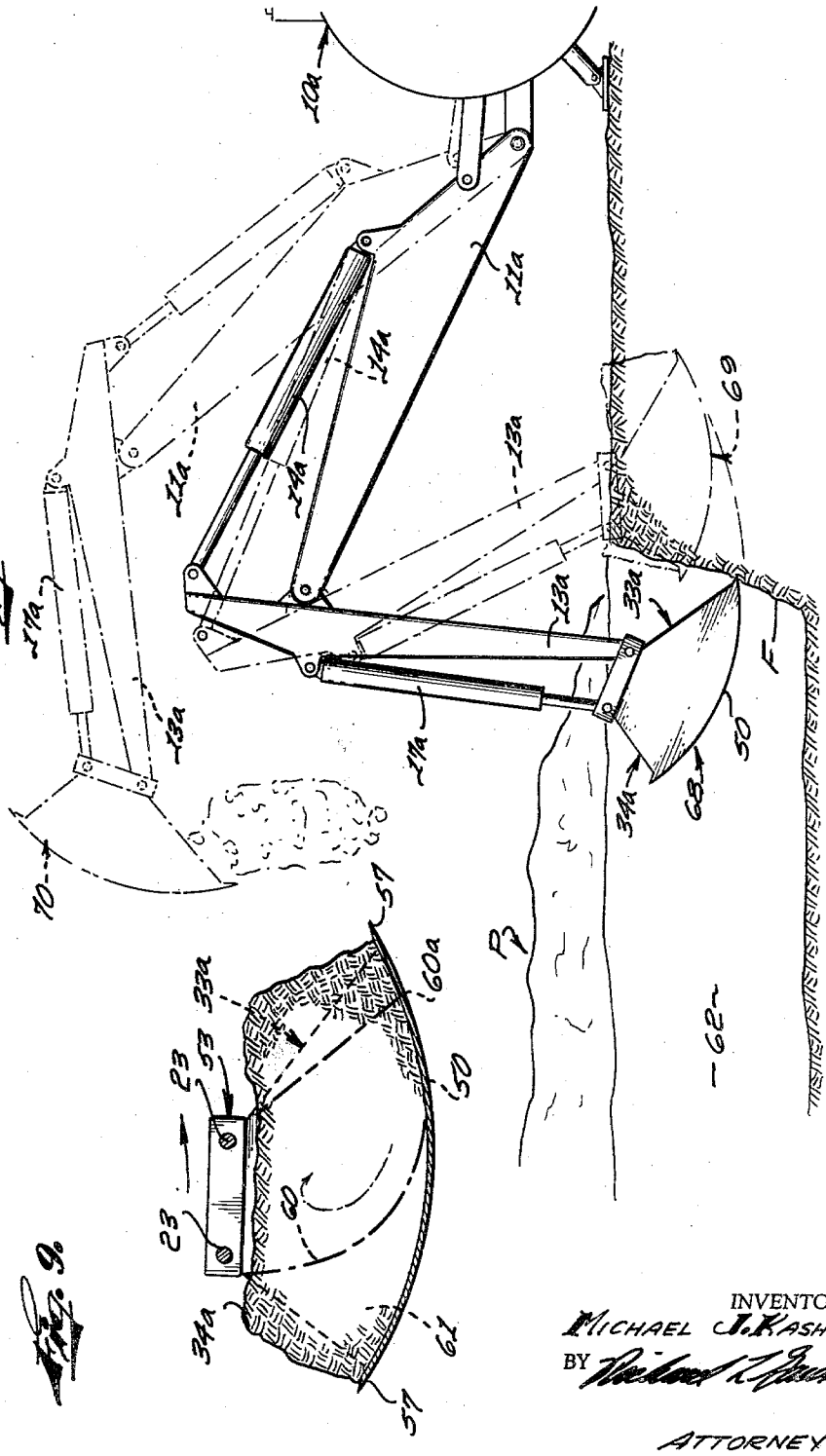


Fig. 8.

Fig. 9.

INVENTOR.
MICHAEL J. KASHERGEN
BY
ATTORNEY

United States Patent Office 3,195,747 Patented July 20, 1965

3,195,747

BACKHOE AND BUCKET INCORPORATED THEREIN, AND METHOD OF DIGGING EARTH

Michael J. Kashergen, Westminster, Calif., assignor to Kash Products Incorporated, Huntington Beach, Calif., a corporation of California

Filed June 5, 1961, Ser. No. 116,656
8 Claims. (Cl. 214—138)

This invention relates to a backhoe and to a bucket incorporated therein. The invention also relates to a method of digging. This application is a continuation-in-part of my co-pending patent application Serial No. 29,212, filed May 16, 1960, now abandoned, for Back Hoe, and Bucket Incorporated Therein.

An object of the invention is to provide a backhoe apparatus and method characterized by both high capacity and extremely short cycle time, as distinguished from prior art apparatus and methods.

Another object is to provide a backhoe apparatus incorporating an improved high-capacity bucket which enables the apparatus to operate both as a backhoe and as a power shovel, and without an excessive amount of operation of the bucket ram.

A further object is to provide a backhoe bucket characterized by increased capacity and by extreme ease of discharge.

A further object is to provide a backhoe apparatus which may be used for trenching, for shoveling, for digging bell holes, for undercutting, for uses normally requiring a mud pawl, for high-capacity skip loading, etc.

A further object is to provide a backhoe bucket which is so constructed that the load is balanced on opposite sides of the support means therefor.

Another object is to provide a backhoe bucket characterized by much faster and deeper penetration into the earth, due to the absence of the conventional back plate which blocks such penetration, and due to the provision of a curvature which permits primary use of the dipper stick during both digging and unloading.

Another object is to provide a backhoe bucket which does not cause earth to turn over upon itself during loading, so that the dipper stick may be used as the primary bucket-loading means, and so that earth will not pack in the bucket and make difficult the discharge thereof.

A further object is to provide a backhoe apparatus and method which produces much less fatigue in the operator, and wear on the apparatus, than prior-art structures and methods.

A further object is to provide a method of digging with relatively little travel in the bucket ram, so that the time required for each digging cycle is enormously reduced in comparison to prior-art methods.

A further object is to provide a method and apparatus adapted to dig a ditch in such manner that the bottom of the ditch maintains a predetermined grade.

Another object is to provide a method and apparatus for effecting penetration into the earth of a backhoe bucket and by means of the dipper-stick cylinder, despite the relative low power capability of small hydraulic backhoes.

Another object is to provide a backhoe apparatus and method capable of digging straight down, backward, forward, and sideways, as well as undercutting.

Another object is to provide a backhoe bucket characterized by the presence of a movable baffle plate for purposes including prevention of loss of the spoils, particularly in very loose and sandy soils.

A further object is to provide an adjustable backhoe bucket and method of using the same, and which is adapted to dig ditches of different widths without the requirement that the tractor be shifted laterally of the ditch.

These and other objects and advantages of the invention will be more fully set forth in the following specification and claims, considered in connection with the attached drawings to which they relate.

In the drawings:

FIGURE 1 is a side elevation illustrating a backhoe apparatus incorporating a bucket constructed in accordance with one embodiment of the present invention, the apparatus being shown in full lines as operating in the manner of a power shovel, and in phantom lines as operating in the manner of a backhoe;

FIGURE 2 is a perspective view of the bucket;

FIGURE 3 is a fragmentary elevation illustrating the primary manner of unloading the bucket after loading thereof in the manner of a power shovel;

FIGURE 4 is a perspective view illustrating a second embodiment of the invention, wherein the bucket may be loaded not only from either end but also from the side portions;

FIGURE 5 is a perspective view illustrating a third embodiment of the bucket, such embodiment constituting a modification of the embodiment of FIGURES 1–3;

FIGURE 6 is a fragmentary elevational view illustrating certain relationships relative to the bucket shown in FIGURE 5 as related to the backhoe apparatus;

FIGURE 7 is a schematic elevational view illustrating the bucket shown in FIGURE 5 as employed to dig a ditch in the manner of a backhoe;

FIGURE 8 is an elevational view corresponding to FIGURE 7 but illustrating the bucket in different positions relative to the tractor; and

FIGURE 9 is a vertical sectional view illustrating the bucket with earth contained therein, and showing in phantom lines a prior-art bucket configuration.

Referring first to the embodiment shown in FIGURES 1–3 of the drawing, a backhoe is indicated as having a tractor portion 10 on which is mounted a boom 11 for pivotal movement in a vertical plane due to operation of the boom cylinder 12. A dipper stick 13 is pivotally connected at the outer end of the boom and is also adapted to pivot in a vertical plane under control of the dipper-stick ram or cylinder 14, the latter being pivotally connected between the dipper stick and the boom. Mounted at the outer end of the dipper stick is a head 16 having one end pivoted to the dipper stick and another end (relatively remote from the tractor portion) pivotally connected to the bucket or head ram or cylinder 17, the latter also being pivotally connected to the dipper stick.

All of the indicated cylinders are controlled by the operator disposed on tractor portion 10. Means are provided to pivot the boom about a vertical axis, and stabilizer or outrigger means 18 are provided to prevent undesired movement of the tractor.

Referring particularly to FIGURE 2, the bucket comprises a piece of heavy gauge sheet metal bent into the general shape of a channel which is open at both ends. The web 20 of the channel is arcuate or concave, being curved about an axis which is perpendicular to the common plane of the boom and dipper stick. The side

flanges 21 of the channel are generally trapezoidal, except that the bases of the trapezoids are arcuate where the web 20 is joined. The flanges 21 do not lie in parallel planes, but instead converge upwardly (FIGURE 2) so that the upper and smaller ends thereof are substantially closer to each other than are the base portions which merge with web 20. An inverted channel-shaped mounting bracket 22 is mounted over the upper edges of side flanges 21 and is securely welded thereto. Such bracket has fixedly mounted thereon (as by welding) a pair of elements which form the head 16 previously indicated, being suitably apertured to receive pins 23 (FIGURE 3) which connect the bucket to the dipper stick 13 and the cylinder 17.

A generally U-shaped cutting and reinforcing element 25 having sharp beveled outer edges 26 is welded at each end of the bucket, along the web 20 and side flanges 21, as best shown at the left in FIGURE 2. The lower or base portion of each cutting element 25 is provided with a plurality of sharp cutter teeth 27. Each element 25 is at an acute angle to web 20.

When the head elements 16 are perpendicular to dipper stick 13, the axis (extended) of the dipper stick intersects the arcuate web 20 at its center portion. The web 20 thus extends forwardly and rearwardly for substantial distances, permitting it to support a very large load in a balanced manner. In a bucket for a conventional hydraulic backhoe, the distance between opposed toothed cutting edges may be on the order of 40 inches.

Again referring to the condition with elements 16 perpendicular to dipper stick 13, the axis of web 20 intersects dipper stick 13 and at a point (indicated in FIGURE 3 at X) which is spaced a substantial distance from head elements 16. The curvature of web 20 thus greatly facilitates loading thereof when cylinder 14 is operated. Furthermore, the curvature is such that the bucket may be employed in cutting vertical walls at either side of a bell hole. The distance from point X to web 20 may be on the order of 3 feet, on a conventional hydraulic backhoe and when elements 16 are perpendicular to the dipper stick.

A baffle plate 28 is pivotally mounted on a rod 29 which is secured between the flanges of the mounting bracket 22, as shown in FIGURE 2. A torsion spring 31 is mounted around rod 29 and is adapted to bias the baffle plate 28 toward the position shown in FIGURE 2 and also in phantom lines in FIGURE 3, the baffle then engaging a stop 32 which is fixedly mounted on one flange 21 of the bucket. The spring 31 has barely sufficient strength to counteract the weight of the baffle plate, the result being that the baffle plate will pivot automatically away from stop 32 when earth is introduced into the adjacent mouth of the bucket as shown at the right in FIGURE 1. The plate is sufficiently narrow that it may thus be pivoted away from stop 32 until it is generally parallel to web 20, as shown in full lines in FIGURE 3, so that earth may be discharged from the opposite mouth of the bucket.

For purposes of description, the mouth of the bucket which is normally remote from the tractor 10 will be designated the "shovel mouth 34." The mouth which is normally adjacent the tractor will be designated the "backhoe mouth 33."

Let it first be assumed that the apparatus is operating as a power shovel. Referring particularly to the solid line portion of FIGURE 1 and to the showing of FIGURE 3, the various cylinders 12, 14 and 17 are so operated that the shovel mouth 34 is forced (away from the tractor) into an embankment to effect introduction of earth through the shovel mouth 34 and into the bucket. During this operation, as previously indicated, the plate 28 pivots automatically away from stop 32. The various cylinders are then so manipulated that the load of earth is moved to a desired discharge point, during which time the bucket 21 is caused to remain substantially in the carrying position shown in solid lines in FIGURE 1. Thus, for example, if the load is to be lifted to a substantial elevation, bucket cylinder 17 is so operated that the head elements 16 become generally in line with dipper stick 13. When the discharge point is reached, cylinder 17 is operated to pivot the head 16 and the bucket to the position shown in FIGURE 3, at which time the load drops by gravity out the backhoe mouth 33. The discharging load is not impeded by the plate 28, which pivots to the downwardly extending position shown in full lines in FIGURE 3. Such operation as a power shovel is very useful in a number of ways, for example in "squaring" corners at the ends of ditches, and performing numerous other shovel functions.

When the apparatus is used as a backhoe, the cylinder 14 is so operated that the dipper stick 13 pivots toward the tractor, as shown in phantom lines in FIGURE 1. A bite is thus taken from an embankment adjacent the tractor, and a load of earth is introduced into the bucket through the backhoe mouth 33 thereof. The plate 28 then remains adjacent the stop 32, so that substantial quantities of earth may not be discharged through the shovel mouth 34. After the bucket is loaded it is moved to a desired discharge point. The cylinders are so operated that the bucket moves to the dumping position shown in FIGURE 3, except that in this instance the baffle 28 remains adjacent stop 32 due to the bias of spring 31.

It is pointed out that, during certain operations when the bucket is to be unloaded at a relatively low elevation, earth introduced through the shovel mouth 34 may also be discharged through such mouth. This is effected by causing the dipper stick 13 to incline downwardly and then extending the bucket cylinder 17.

In forming a vertical wall on the side of a bell hole, either adjacent the tractor or on the opposite side of the hole therefrom, the appropriate toothed cutting edge is caused to engage such side. The various cylinders are then operated in a manner causing the bucket to move vertically and with the bucket in such position that the bell hole wall remains generally tangential to the portion of web 20 adjacent the operative cutting edge.

It is emphasized that the bucket is readily discharged, this being because of the absence of walls against which the earth will pack during loading. There being no packing, the earth remains loose and will readily discharge. Even during backhoe operation, baffle 28 is so located that little or no packing occurs. Furthermore, such baffle may be omitted when the bucket is used in certain types of soils.

Embodiment of FIGURE 4

In the embodiment of FIGURE 4, a head (or connectors) 16*a* is illustrated which is adapted to be connected to the cylinder mechanism 17 and dipper stick 13 as in the case of head 16. Head 16*a* is rigidly welded at the upper end of a stem 36 which, in turn, is rigidly secured at the axis or pole of a dish-shaped bucket 37. Bucket 37 is a relatively shallow dish having a substantial diameter, being shaped (together with stem 36) generally as a mushroom or a certain type of boat anchor. The bucket 37 is a segment of a sphere or spheroid, such sphere having a radius which is substantially longer than stem 36. The peripheral edge of bucket 37 is sharp, and is provided with spaced notches 38 so that the bucket portions between the notches form teeth 39.

The bucket apparatus illustrated in FIGURE 4 may be loaded or unloaded from either side, namely remote from the tractor or adjacent thereto, and furthermore operates effectively both as a side digger and as an undercutter. The bucket has a substantial capacity and may be employed for general backhoe or power-shovel digging as well as for specialized digging operations. It is emphasized that material loaded onto bucket 37 from either side may be discharged from the same side, or from the dia-

metrically opposite side as in the case when the bucket of the previous embodiment operates in the manner of a power shovel.

Embodiment of FIGURES 5–9

The bucket illustrated in FIGURES 5–9 has a curved bottom plate or web **50** which is relatively flat (FIGURE 9) in comparison to what is illustrated in FIGURE 3, that is to say that the radius of the imaginary cylinder in which the bottom plate or web **50** lies is substantially larger than is shown in FIGURE 3 relative to web **20**. Generally trapezoidal side plates or flanges **51** are welded at their curved bases to the opposed side edges of bottom plate **50**, and extend upwardly to crossbar or brace means **52** (FIGURE 5) welded rigidly between the upper edges of the flanges. A head or adapter **53**, various models of which are adapted to fit all existing commercial small hydraulic backhoes, is removably secured to the crossbar or brace means **52** by means of pins **54** which are secured in place by cotter keys, not shown. Head or adapter **53**, correspondingly to the head **16** previously described, is adapted to receive the pins **23** which associate the bucket with the dipper stick and bucket ram of the backhoe. The head or adapter **53** also permits the bucket to be mounted in a position the reverse of that illustrated, for special skip-loading and other operations.

The end edges of the bottom plate **50**, and side flanges **51**, are beveled and sharp, being provided with brace elements **56** and teeth **57**. Correspondingly to the embodiment of FIGURES 1–3, the "shovel mouth" is indicated at **34***a*, and the "backhoe mouth" at **33***a*.

The illustrated backhoe bucket is constructed somewhat differently from the one shown in FIGURE 1, but functions in a substantially identical manner. It has been given the same reference numerals as in FIGURE 1, but each numeral is followed by the letter "*a*." The baffle plate **28***a* and stop **32***a* are not shown in FIGURES 8 and 9.

Referring particularly to FIGURE 6, it is pointed out that when the head or adapter **53** is perpendicular to the dipper stick **13***a*, the extended axis of the dipper stick intersects the bottom plate **50** approximately midway between the toothed cutting edges. Since the illustrated head **53** is substantially parallel to a straight line (disposed in the plane of the boom and dipper stick) extending between the cutting edges, the statement made in the previous sentence may also be made with reference to such straight line instead of with reference to the head. Such straight line is then substantially perpendicular to the dipper stick.

As in the embodiment of FIGURES 1–3, the center or horizontal axis of curvature (numbered Y in FIGURE 6) of the bottom plate or web **50** lies intermediate the pivot axes **58** and **59** at opposite ends of the dipper stick. More specifically, center Y is located approximately one-third the distance (indicated at D) from pivot **59** to pivot **58**. For small hydraulic backhoes the radius B from center Y to the curved bottom plate or web **50** is between about three feet and about five feet, being normally approximately four feet. Such small backhoes normally have dipper sticks which extend on the order of seven feet between their axes **58** and **59**.

The linear distance A between the toothed cutting edges of the bucket is generally the same as radius B. Thus, for example, in a bucket wherein the radius B is approximately forty-six inches, the linear distance between the toothed cutting edges may be approximately forty-four inches. In such a bucket, the distance between the head or adapter **53** and the center portion of bottom plate **50** may be approximately eighteen inches.

The angle between the shovel mouth **34***a* and the adjacent portion of bottom plate **50** may be approximately seventy-five degrees, whereas the angle between backhoe mouth **33***a* and the adjacent portion of the bottom plate may be approximately fifty-five degrees. The edges of flanges **51** which form shovel mouth **34***a* extend to points adjacent the pin **23** connecting the bucket to ram **17***a*. The edges of flanges **51** which form backhoe mouth **33***a* extend to points adjacent pin **23** connecting the bucket to the distal end of the dipper stick. The opposed toothed cutting edges lie in a plane which is generally parallel to that of head or adapter **53**.

The described bucket does not incorporate a back plate or any other means causing the earth to turn over upon itself when the cutting edge penetrates therein. Conventional backhoe buckets, on the other hand, incorporate a back plate such as is indicated in phantom at **60** in FIGURE 9, which causes the earth to ride up and tend to fold over upon itself. The front edge of such a conventional bucket is shown at **60***a* in FIGURE 9. This back plate **60** enormously increases the resistance to penetration, and requires (in order to overcome the penetration resistance caused by the back plate) a very large and substantial use of the bucket ram or cylinder **17***a* both while the bucket is loaded and while it is discharged. It is conventional, with small hydraulic backhoes, to use the dipper-stick cylinder **14***a* primarily to position the cutting edge adjacent the earth, and to perform the main loading operation by pivoting the bucket through use of the bucket ram **17***a*. Since the bucket ram is employed to a great extent and through long travels during loading of the bucket, it must be similarly employed during unloading of the bucket after lifting thereof out of the ditch. This greatly increases the time required for each digging cycle.

Not only does the back plate greatly increase the penetration resistance, it causes the earth to pack so tightly that it is frequently difficult to discharge from the bucket, so that additional time is lost in unloading.

It is thus an essential characteristic of the present apparatus and method that there is no back plate **60** or similar means preventing or limiting penetration of the bucket into the earth in response to pivoting of the dipper stick **13***a* caused by operation of cylinder **14***a*. The baffle plate **28** (FIGURES 1–3), when it is employed, is spaced so far back from the backhoe mouth **33***a* that it does not limit penetration into the earth, at least until the bucket is completely full, and does not cause packing of earth in the bucket. In the present method and apparatus, the bucket cylinder **17***a* is normally employed through only a few inches of stroke, to cause the cutting teeth to be at the precise angle required for optimum digging action. The primary loading and unloading functions are performed substantially entirely by the dipper stick **13***a* due to operation of the cylinder **14***a* it being understood that the boom **11***a* is raised at appropriate times to lift the bucket out of the ditch.

Not only do conventional back plates **60** prevent proper penetration into the ground due to operation of the dipper-stick cylinder, but they reduce the capacity of the bucket. Thus, the area indicated at **61** in FIGURE 9 is not utilized or present in conventional buckets of the type indicated. Also, it is emphasized that the present bucket and method cause much dirt to be supported even above the mouth **33***a* and (when no baffle plate is used) mouth **34***a*. This relationship, shown in FIGURE 9, gives the bucket an enormous capacity.

The above-described curvature of bottom plate or web **50** is adapted to provide proper penetration of the bucket in response to actuation of the dipper stick **13***a* by its cylinder **14***a*, the center or axis Y of the plate or web **50** being spaced a substantial distance upwardly from head or adapter **53**, intermediate the pivot axes **58** and **59** (FIGURE 6). If the radius B of bottom plate **50** is too small, the earth tends to fold over on itself and pack as stated above. If the radius B of bottom plate **50** is too large, the earth presents an excessively high resistance to penetration as the dipper stick **13***a* is pivoted by its cylinder **14***a*.

The method of using a small hydraulic backhoe to dig a ditch **62**, in accordance with the present invention, will

now be described, with particular reference to FIGURES 7 and 8. Referring first to FIGURE 7, the boom **11***a* and dipper stick **13***a* are shown as being in such positions that the teeth of the backhoe mouth **33***a* are adjacent the face F of earth at the end of the ditch. One "bite" of earth has already been taken from the upper part of face F, the bucket being in a position (indicated at **63**) to take a bite from the bottom of face F. The illustrated ditch is on the order of three feet deep, so that it may be dug in two bites with a standard size bucket. Deeper ditches may be dug by increasing the number of bites or steps, or the depth of the bucket.

The bucket ram **17***a* is operated until the portion of web **50** at backhoe mouth **33***a* is substantially tangential to the bottom of the ditch. Dipper-stick ram **14***a* is then operated to pivot the dipper stick counterclockwise until the bucket is buried in face F, that is to say until position **66** is reached. At least when no baffle plate is employed, the entire web **50** is sunk into face F. During such pivoting, the bucket ram **17***a* is not operated, or is operated through only a short distance such as in order to maintain a precise grade at the bottom of the ditch.

The boom **11***a* is then raised to lift the bucket out of the ditch, and the dipper stick is pivoted clockwise until the bucket is at a position (such as is indicated at **67**) where it may discharge its load onto a pile of earth at one side of the ditch. Of course, prior to discharge of the bucket the boom is pivoted about its vertical axis until the bucket is over the pile of earth. It is emphasized that when the bucket is thus lifted out of the ditch, it carries with it substantially all the earth which is above web **50**. This is illustrated in FIG. 9.

FIGURE 8 illustrates the making of the first (top) cut of earth at a point much nearer the tractor **10***a*. In such condition, the boom **11***a* is much higher than is illustrated in FIGURE 7 relative to position **63**. The bucket angle is adjusted, through use of bucket ram **17***a*, until the portion of web **50** adjacent face F is tangential to the arc described by the teeth when the bucket is shifted (due to counterclockwise pivoting of the dipper stick) from position **68** (adjacent face F) to position **69** (buried therein). After such pivoting of the dipper stick, the boom and dipper stick are lifted and pivoted clockwise as before, so that the load discharges onto pile P. The bucket ram **17***a* is only operated through a short travel, if at all, for example to prevent dropping of spoils from the bucket until it is over pile P. The discharge position is shown at **70**.

On the order of three operations may thus be conducted (at each elevation) before it is necessary to move the tractor **10***a*. Each full cycle (bite) requires on the order of 7–10 seconds, including bucket discharge time. Thus, six bites may be taken in less than a minute.

The described cycle is very much faster than cycles utilizing ordinary or conventional methods and buckets. The excessive cramping of the bucket (in convention methods) due to operation of its cylinder **17***a* requires a large amount of time, and produces a very substantial amount of wear on the apparatus. The speed of the present cycle is also increased because the bucket discharges readily, even in adverse soils. This is because, as previously stated, there is no packing of the earth against a back plate. Not only is the described cycle faster, but more earth is removed during each cycle because the bucket has a substantially greater capacity than conventional buckets, as indicated previously.

The time required for the present cycle is less than half that required for a conventional cycle. With the present method and bucket, the same backhoe will dig a ditch at least two or three times as fast as a backhoe using conventional methods.

It is emphasized that the load carried by the full bucket is balanced on opposite sides of the pivot connection to dipper stick **13***a*. This balanced load distributes the stresses in accordance with the design of the backhoe apparatus, and results in fewer breakdowns.

A feature of the invention is that, when the baffle plate **28** (FIGURES 1–3) is not utilized, the apparatus may be employed to dig a shallow ditch without removing any earth therefrom. It frequently occurs, for example, in digging trenches for foundations of houses, that the ditch is back filled immediately after it has been dug. Trucks may be then driven over the ditch, subsequent to which the earth is removed manually immediately prior to pouring of the concrete foundation. With the present apparatus, the bucket is moved into the earth, which flows in the backhoe mouth **33***a* and out the shovel mouth **34***a*. The earth thus circulates through the bucket, it being understood that the bucket is maintained at such an angle (due to operation of the bucket cylinder **17***a*) that the earth will not be lifted into the air as the boom is elevated. The need for a separate back-filling operation is thus eliminated.

It is to be understood that the embodiment of FIGURES 5–9 may also be operated in the manner of a shovel, as well as in digging bell holes, as a mud pawl, as a skip-loading bucket, etc. Operation as a shovel (using shovel mouth **34***a*) is generally the reverse of that described relative to backhoe operation, except that the amount of cramping required of the bucket cylinder **17***a* is considerably greater during the shovel operation than during backhoe operation.

Various embodiments of the present invention, in addition to what has been illustrated and described in detail, may be employed without departing from the scope of the accompanying claims.

I claim:

1. A bucket for mounting on a backhoe apparatus, comprising a generally channel-shaped metal element having a shovel mouth at one end thereof and a backhoe mouth at the other end thereof, means to form earth-cutting edges at the ends of at least the web of said channel-shaped element, said web being curved from one of said earth-cutting edges to the other, a baffle plate pivotally mounted in said channel-shaped element to block substantial flow of earth therethrough in one direction only, and stop means to limit movement of said baffle plate in said one direction.

2. The invention as claimed in claim **1**, in which spring means are provided to bias said baffle plate toward said stop means with sufficient force to counteract the weight of said baffle plate but with insufficient force to prevent pivotal movement of said baffle plate during loading of the bucket to force dirt against said baffle plate in a direction moving the same away from said stop means.

3. An earth-working apparatus in the nature of a hydraulic backhoe, which comprises a movable support having a boom mounted thereon for movement in a vertical plane and also about a vertical axis, a dipper stick pivotally connected at the outer end portion of said boom for pivotal movement in said vertical plane, a dipper-stick ram connecting said boom and dipper stick to each other to effect pivotal movement of said dipper stick in said vertical plane, a bucket pivotally connected at the distal end of said dipper stick, and a bucket ram pivotally connected between said dipper stick and said bucket to effect pivotal movement of said bucket about a pivot axis perpendicular to said vertical plane, said bucket being generally channel-shaped and having cutting edges at both ends of the web portion of the channel, a baffle plate pivotally mounted in said channel and disposed at all times in said channel, and stop means to limit movement of said baffle plate in one direction only, said baffle plate and stop means being so constructed and mounted that earth may move gravitationally from one end of said web portion to the other end thereof but may not move from said other end of said web portion to said one end thereof.

4. A bucket for a backhoe or the like, which comprises a generally channel-shaped element having earth-cutting edges at opposite ends of the web portion thereof, means movably mounted in said bucket to control the move-

ment of earth therein in at least one direction, said means comprising a baffle plate pivotally mounted adjacent one mouth of the bucket and adapted to pivot in a direction away from said one mouth to permit flow of earth into said one mouth and thence out the other mouth, and means to prevent pivotal movement of said plate in a direction permiting flow of earth into said other mouth and thence out said one mouth.

5. An earth-working apparatus in the nature of a hydraulic backhoe, which comprises a moveable support having a boom mounted thereon for movement in a vertical plane and also about a vertical axis, a dipper stick pivotally connected at the outer end portion of said boom for pivotal movement in said vertical plane, a dipper-stick ram connected to said boom and dipper stick to effect pivotal movement of said dipper stick in said vertical plane, a bucket pivotally connected at the distal end of said dipper stick, a bucket ram pivotally connected between said dipper stick and said bucket to effect pivotal movement of said bucket about a pivot axis perpendicular to said vertical plane, said bucket being generally channel-shaped and having cutting means at both end of the web portion of the channel, the flange portions of the channel being generally parallel to said vertical plane, said web portion being curved about an axis which is parallel to said pivot axis and is disposed between said pivot axis and the pivot connection between said boom and said dipper stick, said axis of curvature of said web portion being spaced a substatnial distance from said pivot axis, the linear distance between opposite ends of said web portion corresponding generally to the distance between said web portion and said axis of curvature thereof, a baffle plate pivotally mounted in the bucket channel and disposed at all times in said channel, and stop means to limit movement of said baffle plate in one direction only, said baffle plate and stop means being so constructed and mounted that earth may move gravitationally from one end of said web portion to the other end thereof but may not move from said other end of said web portion to said one end thereof.

6. A bucket for a hydraulic backhoe, which comprises two spaced pivot means one of which is adapted to be pivotally connected to the end of a dipper stick and the other of which is adapted to be pivotally connected to a bucket ram, a generally channel-shaped bucket having the flange portions thereof connected to said pivot means in such relationship that when the bucket is mounted on a backhoe a plane containing the dipper stick of the backhoe is substantially midway between said flange portions and generally parallel thereto, the web of said bucket being a substantially continuous curve about an axis of curvature which is disposed a substantial distance on the opposite side of said one pivot means from said web, said bucket being so shaped that a straight line extending in said plane between opposite ends of said web is much longer than the distance between said web and said one pivot means, said web having cutting teeth at at least one end thereof, said pivot means and said web being so related to each other and to the backhoe that said web may be pivoted, when in mounted condition on the backhoe, to a position at which a hypothetical extension of the axis of said dipper stick is substantially perpendicular to said straight line and intersects the same substantially midway between the ends thereof.

7. An earth-working apparatus in the nature of a hydraulic backhoe, which comprises a self-propelled movable support, a boom pivotally connected to said support, means on said support to move said boom pivotally in a vertical plane, a dipper stick pivotally connected to the distal end portion of said boom for pivotal movement in said vertical plane, hydraulically-operated means to effect relative pivotal movement between said dipper stick and said boom in said plane, pivotal mounting means provided at the end of said dipper stick remote from said boom to pivotally associate a bucket with said dipper stick, said pivotal mounting means being adapted to permit pivotal movement of said bucket about a pivot axis perpendicular to said plane, a channel-shaped bucket having side flanges and a bottom web, said side flanges being on opposite sides of said plane and generally parallel thereto, portions of said side flanges remote from said web being connected to said pivotal mounting means for movement therewith, at least a major portion of said web at the end thereof adjacent said support being curved about an axis of curvature which is parallel to said pivot axis and is disposed between said pivot axis and the pivot connection between said boom and dipper stick, said axis of curvature being spaced a much greater distance from said web than is said pivot axis, cutting means provided at at least said end of said web adjacent said support whereby the apparatus may operate in the nature of a backhoe, said pivotal mounting means being pivotable to a position at which a hypothetical extension of said dipper stick intersects said web generally midway between the ends thereof, the channel in said bucket being open between said cutting means and the end portion of said web remote from said cutting means, the distance between the opopsite ends of said web being much greater than the distance between said web and said pivot axis, and hydraulically-operated means provided on said dipper stick to effect said pivotal movement of said bucket about said pivot axis.

8. A combination backhoe and power shovel, which comprises a movable support, a boom pivotally connected to said movable support, means to effect pivotal movement of said boom in a vertical plane and also about a vertical axis, a dipper stick having one end portion thereof connected to the distal end portion of said boom for movement of said dipper stick in said vertical plane, a dipper-stick cylinder connected between said boom and dipper stick to effect said pivotal movement of said dipper stick relative to said boom in said vertical plane, pivot means provided at the distal end of said dipper stick and adapted to mount a bucket on said dipper stick for pivotal movement of said bucket about a pivot axis perpendicular to said vertical plane, a bucket ram pivotally connected to said dipper stick and adapted to be pivotally connected to a bucket, a channel-shaped bucket having generally parallel side flanges and a bottom web, portions of said side flanges remote from said bottom web being pivotally connected to said pivot means, other portions of said side flanges remote from said bottom web being pivotally connected to said bucket ram at the end thereof remote from the pivotal connection between said bucket ram and said dipper stick, whereby operation of said bucket ram effects pivotal movement of said bucket about said pivot means, said side flanges of said bucket being disposed on opposite sides of said plane and generally parallel thereto, the distance between the end portions of said bottom web being much greater than the shortest distance between said bottom web and said pivot axis at the distal end of said dipper stick, said bottom web being substantially continuously curved about an axis of curvature which is disposed on the opposite side of said pivot axis from said bottom web, the distance between said bottom web and said axis of curvature being much greater than the distance between said bottom web and said pivot axis, cutting teeth provided at the opposite ends of said bottom web and cooperating with said side flanges to form a backhoe mouth relatively adjacent said support and a shovel mouth relatively remote therefrom, a swinging baffle plate pivotally associated with said bucket in the vicinity of the pivotal connection between said side flanges and said bucket ram, said baffle plate being sufficiently large to substantially block the passage through said bucket, and stop means provided on said bucket to limit swinging movement of said baffle plate toward said shovel mouth, whereby earth entering said shovel mouth may pass therefrom to said backhoe mouth whereas earth entering said

backhoe mouth is blocked by said baffle plate from passing out said shovel mouth.

References Cited by the Examiner

UNITED STATES PATENTS

218,427	8/79	Canan	214—145
1,302,857	5/19	Sabina	214—138
1,824,989	9/31	Fundom	214—145 X
2,107,895	2/38	Lundstrom	214—138
2,489,898	11/49	Kluckhorn	214—137
2,742,165	4/56	Pilch	214—138

2,890,806	6/59	Pilch	214—138 X
3,032,900	5/62	Kashergen	214—145 X
3,042,236	7/62	Pilch	214—132 X
3,057,494	10/62	Holopainen et al.	214—138
3,072,272	1/63	Howlett	214—140 X

OTHER REFERENCES

Sherman Power Digger, Form SP 547, received Oct. 24, 1955 (4 sheets).

HUGO O. SCHULZ, *Primary Examiner.*