July 3, 1962 M. C. WILLS 3,042,233

MULTIPLE JOINT BACKHOE

Filed Dec. 15, 1958 2 Sheets-Sheet 1

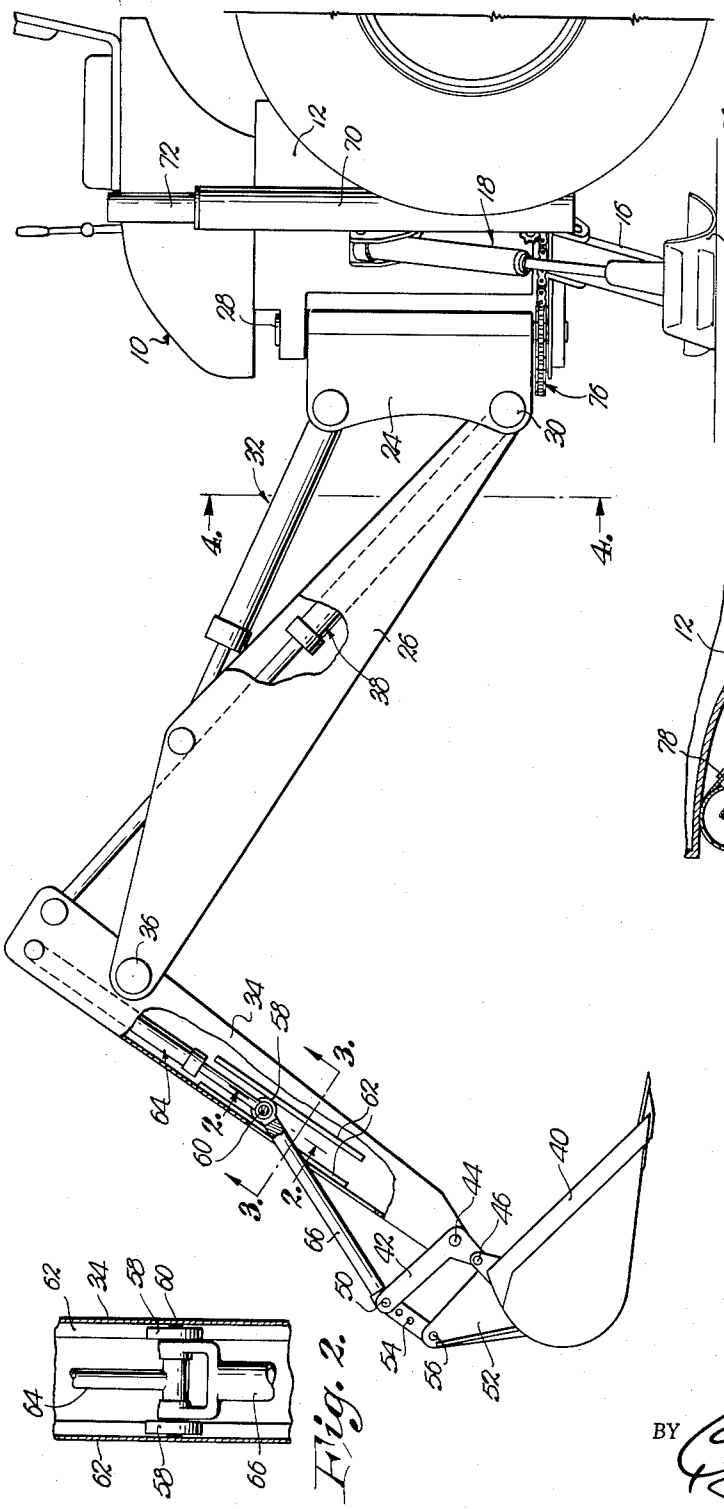


Fig. 1.

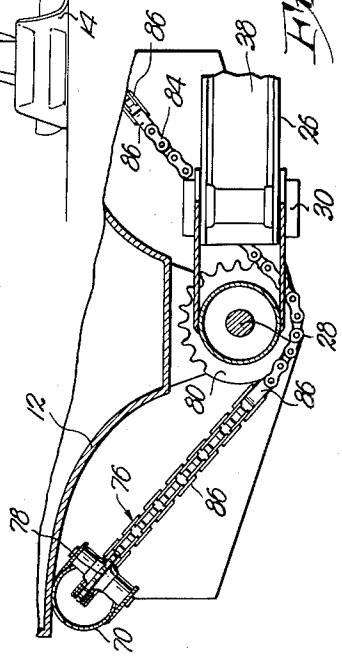


Fig. 6.

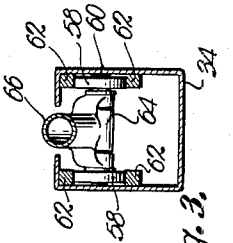


Fig. 3.

Fig. 2.

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Filed Dec. 15, 1958 2 Sheets-Sheet 2

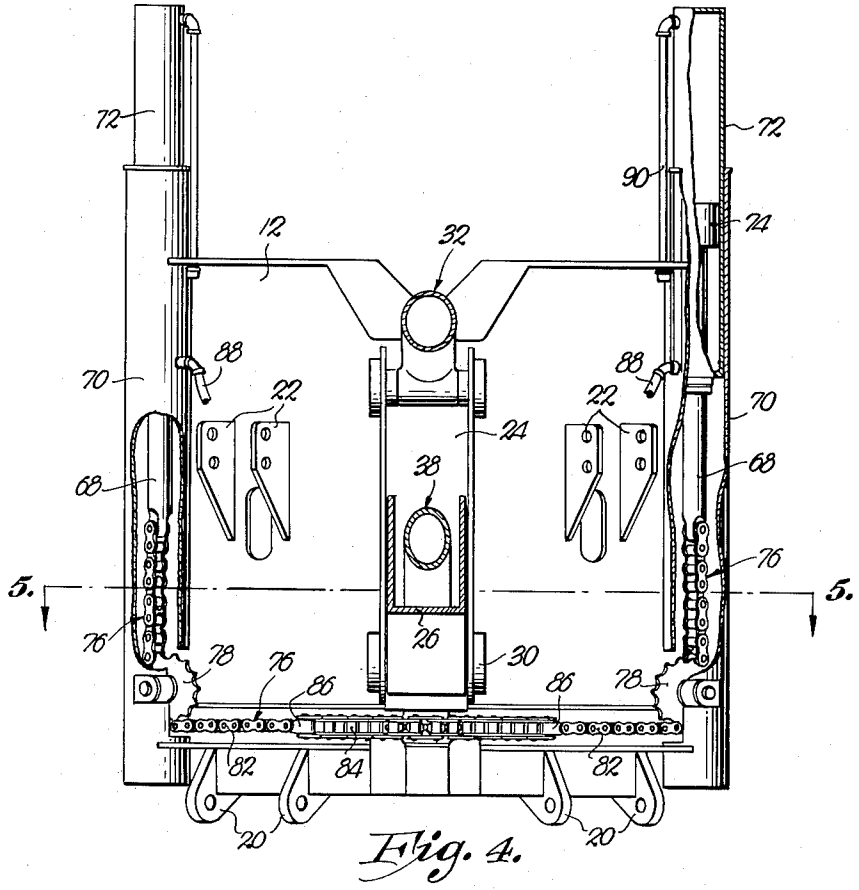


Fig. 4.

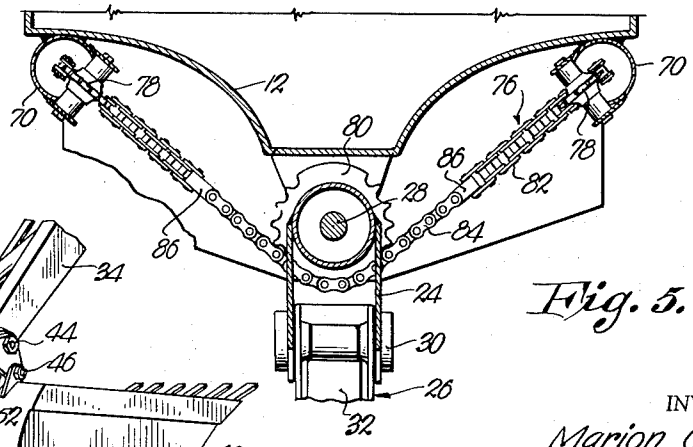


Fig. 5.

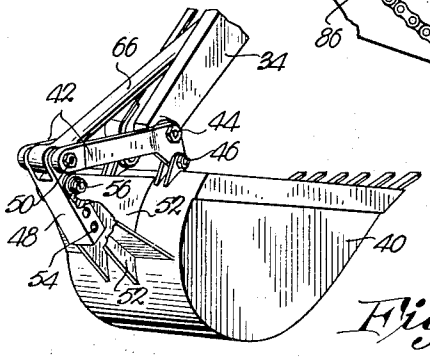


Fig. 7.

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MULTIPLE JOINT BACKHOE

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This invention relates to earth handling equipment, as for example, backhoes wherein a bucket, shovel or the like is carried by a boom through the medium of a bucket arm that in turn swings with respect to the boom.

It is a primary object of the present invention to provide boom-bucket structure having an arrangement of parts that permits housing of the various components for actuating the bucket as well as raising and lowering the boom and swinging the bucket arm, whereby to present an attractive appearance, but more especially to protect such components against damage as the machine is placed in operation.

A most important object of the present invention is the provision of a novel assembly for swinging the bucket with respect to the arm upon which it is mounted and including a reciprocable device housed within the bucket arm actuated by an enclosed piston-cylinder assembly, and coupled with the bucket itself through a link and a swingable crank.

A still further important object of the present invention is to provide novel means for adjusting the angularity of the bucket itself with respect to the aforementioned crank upon which it is swingably mounted.

Another important object of the present invention is to provide a novel arrangement for swinging the boom-bucket structure horizontally and including a chain-sprocket wheel unit that permits the use of vertically reciprocable piston rods as the means for actuating the chain.

In the drawings:

FIG. 1 is a fragmentary, side elevational view of a multiple joint backhoe made pursuant to my present invention, parts being broken away and in section to reveal details of construction;

FIG. 2 is a fragmentary, detailed, cross-sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a transverse, cross-sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a vertical, cross-sectional view taken substantially on line 4—4 of FIG. 1 on an enlarged scale, eliminating certain ground-engaging stabilizing means, parts being broken away and in section for clearness;

FIG. 5 is a fragmentary, horizontal, cross-sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is a fragmentary view similar to FIG. 4 but illustrating the boom swung to one end of its path of travel; and

FIG. 7 is a fragmentary, perspective view of the bucket and its mounting on the bucket arm.

The improvements of the instant invention are adapted for mounting on, and support by, a tractor or the like shown fragmentarily in FIG. 1 and broadly designated by the numeral 10. Framework 12 of any desired characteristics may be detachably secured to the tractor 10 and stabilized by a pair of ground-engaging shoes, one of which is shown in FIG. 1 and designated by the numeral 14.

Shoe 14 is secured to a vertically swingable bar 16 and a double-acting, hydraulic piston and cylinder assembly 18 is employed to ram the shoe 14 tightly against the ground or retract the same for transport purposes. Brackets 20 and 22 shown in FIG. 4 on the frame 12, swingably receive the bars 16 and the assemblies 18 respectively.

A support 24 for boom 26 is carried by the frame 12 for horizontal swinging movement through the medium of a vertical pintle 28. The elongated, hollow boom 26 is attached to the support 24 for vertical swinging movement through the medium of a horizontal pivot pin 30, and the means for controlling the vertical movement of the boom 26 is in the nature of a double-acting, hydraulic piston and cylinder assembly 32 overlying the boom 26 and pivotally connecting the latter with the support 24.

The outermost end of boom 26 remote from pivot pin 30 is bifurcated to receive an elongated, hollow bucket arm 34 which is in turn swingable vertically with respect to the boom 26 by virtue of a pivotal connection 36. A hydraulic, double-acting piston and cylinder assembly 38 pivotally connects with the arm 34 above the pivot means 36 to impart swinging movement to the arm 34. The innermost end of the assembly 38 pivotally connects with the pivot pin 30 to the end that assembly 38 swings with respect to the arm 34, the boom 26, and the support 24 when the assembly 38 is actuated. However, operation of the assembly 32 does not of itself, change the relative angle between boom 26 and arm 34.

A bucket 40 is swingably mounted on the arm 34 through the medium of a pair of cranks 42 that in turn swing with respect to arm 34 about pivot pin 44. Stub pins 46 attach the bucket 40 to the cranks 42 and swinging movement of the bucket 40 with respect to the cranks 42 is prevented by the operation of a bar 48 coupling the opposite end of the cranks 42 with the bucket 40. Bar 48 connects with the cranks 42 therebetween by means of a pivot pin 50 and is interposed between a pair of plates 52 rigid to the bucket 40. Any one of a number of openings 54 in the bar 48 is adapted to receive a readily removable connecting pin 56 for attachment of of the bar 48 to the plates 52. It is to be noted that the connection of plates 52 to the bar 48 is different in FIGS. 1 and 7 for the purpose of illustrating the action of the bar 48 in adjusting the angularity between bucket 40 and cranks 42.

Swinging of the bucket 40 with respect to the arm 34 is accomplished through the medium of a reciprocable device including a pair of wheels or rollers 58 connected by a short shaft 60 and housed within the arm 34. A pair of spaced tracks 62 for each roller 58 respectively, is secured to the arm 34 therewithin, thereby guiding the rollers 58 and restraining the same to rectilinear reciprocation longitudinally of the arm 34. Such reciprocation is effected through the medium of a double-acting, hydraulic piston and cylinder assembly 64 within the arm 34, attached at one end thereof to the arm 34 and at its opposite end to the shaft 60 between the rollers 58 as is clear in FIGS. 1–3. A link 66 pivotally interconnecting the shaft 60 and the pivot pin 50, effects swinging movement of the cranks 42 and therefore, the bucket 40 as rollers 58 are caused to move along their respective tracks 62 when the assembly 64 is actuated.

The entire boom-bucket structure thus far described is swung horizontally by the swinging of the support 24 about the pintle 28. Such is accomplished through use of vertically reciprocable rods 68 housed within upright tubes 70 which are in turn fastened to the frame 12. Tubes 70 also support cylinders 72 receiving pistons 74, it being understood that each rod 68 has a piston 74 secured to its uppermost end.

Rods 68 are interconnected by a chain 76 which engages an idler 78 beneath each rod 68 respectively, together with a single horizontal toothed sprocket wheel 80. The wheel 80 is rigid to the support 24 therebeneath and when the same is in the position illustrated in FIG. 5, the boom 26 extends outwardly from the frame 12 intermediate the ends of the path of travel of boom 26 horizontally.

Chain **76** is provided with a series of end links **82** arranged to mesh with the teeth of idlers **78** which are vertically disposed and in the nature of sprocket wheels. An intermediate series of links **84** in the chain **76** mesh with the teeth of sprocket wheel **80**, it being noted that the links **82** are at right angles to the links **84** by virtue of suitable connections **86**.

The pistons **74** are forced upwardly within their respective cylinders **72** when hydraulic fluid is directed into the cylinders **72** beneath the pistons **74**, through flow lines **88**. Air may flow into and out of the cylinders **72** by virtue of the provision of pipes **90** connected with the cylinders **72** at their uppermost ends.

It is important to note at this juncture that the arrangement is such that pistons **74** never engage the uppermost or lowermost ends of their cylinders **72**. Consequently, the chain **82** is always held taut by the action of the hydraulic fluid within the cylinders **72** beneath the pistons **74**. Therefore, wear occurring in the chain **76**, as well as in the sprocket wheels **78** and **80**, is compensated.

The operation of the backhoe is obvious from the foregoing description and need not be repeated. It is important to note however, that all of the movements of the various components both horizontally and vertically, may be effected separately or simultaneously as the operator may desire, through use of conventional valving that in turn controls the flow of hydraulic fluid to the various extensible power assemblies above described. In this respect, the assemblies **72—74** are out of the way where damage thereto is unlikely during operation of the backhoe. By the same token, the necessary hoses and other lines to be coupled with the assemblies **32**, **38** and **64**, may be trained through the hollow boom **26** and the hollow arm **34** where the same are adequately housed and thereby protected against damage.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a backhoe provided with boom and bucket structure; a horizontally swingable support for said structure; a horizontal sprocket wheel secured to said support; a chain engaging the wheel for oscillating the same to thereby swing the support; power means secured to each end respectively of said chain for actuating the latter, each power means having a vertically reciprocable rod; and idlers between the rods and the wheel for guiding the chain, the idlers comprising vertical sprocket wheels, the chain having intermediate links meshing with the horizontal wheel and end links meshing with the vertical wheels, the intermediate links being turned at right angles to the end links.

2. In a backhoe provided with boom and bucket structure; a horizontally swingable support for said structure; a sprocket wheel secured to said support; a chain engaging the wheel for oscillating the same to thereby swing the support; an elongated, flexible member for each end of the chain and secured at one extremity to the corresponding end for movement therewith; power means secured to each member respectively for actuating the latter and thereby said chain, each power means having a vertically reciprocable rod secured to the opposite extremity of the corresponding member; and idlers rotatable about horizontal axes and disposed between said rods and said wheels for guiding the members.

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