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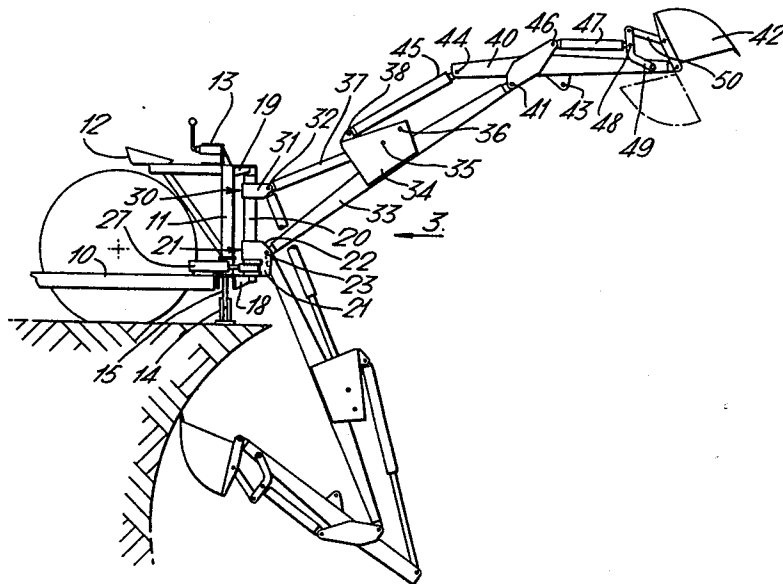
[54] **MECHANICAL HANDLING DEVICE FOR VEHICLES**
11 Claims, 7 Drawing Figs.

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 [51] Int. Cl. **E02f 3/75**
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 132, 145, 136, 133; 212/66; 37/103

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ABSTRACT: A tractor-mounted mechanical shovel or back hoe comprises a frame securable at the rear of a tractor having a king post movable about a vertical axis and provided with two vertically spaced identical attachment points. A boom member is adapted at one end to be connected pivotally to either of said attachment points. A dipperstick pivotally mounted at a point intermediate its ends on the other end of said boom has at one of its ends a pivotally mounted shovel or the like, and two attachment points, one positioned between the shovel or the like and the boom and the other at the opposite end of the dipperstick to the bucket shovel or the like. A first hydraulic jack is pivotally connected at one end to the other of the vertically spaced attachment points on the king post and at the other end to an attachment point between the ends of the boom, a second hydraulic jack is pivotally connected at one end to one of the two attachment points on the dipperstick and at the other end to an attachment point located between the ends of the boom and on the same face thereof as said first hydraulic jack. The boom, together with said first and second jacks, is detachable and invertible relative to the frame, king post and dipperstick to enable the device to be used efficiently as a digger-ditcher or alternatively as a digger-loader.



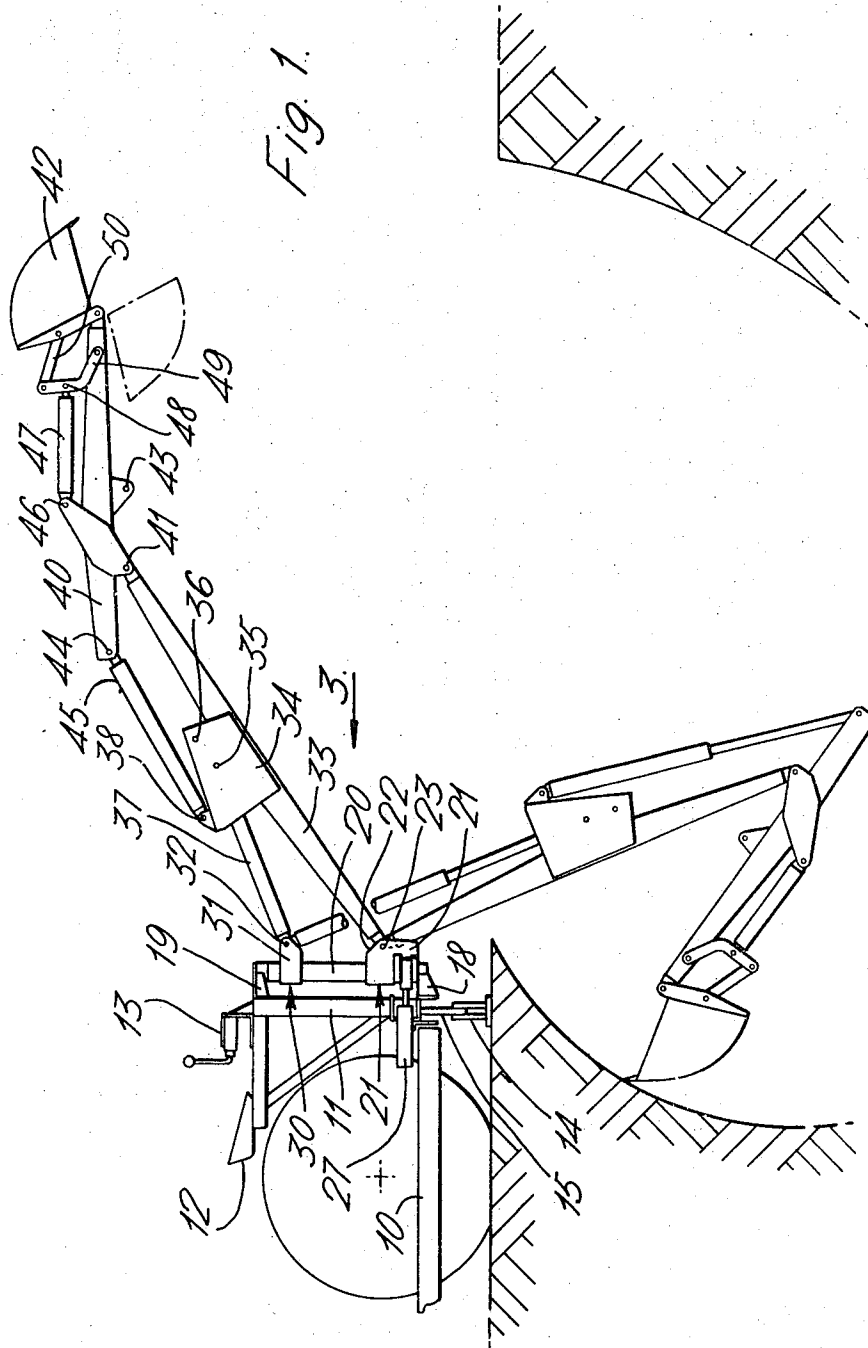


Fig. 1.

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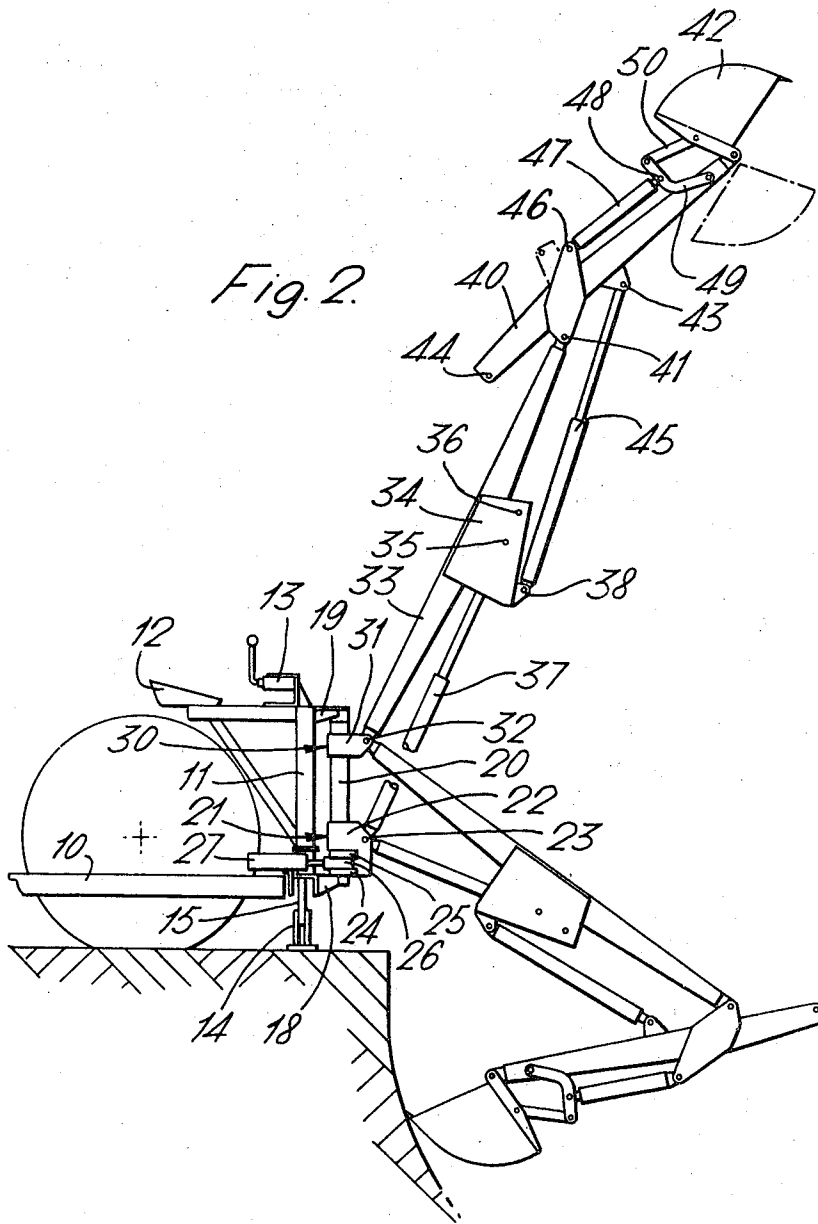
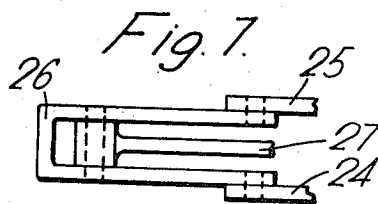
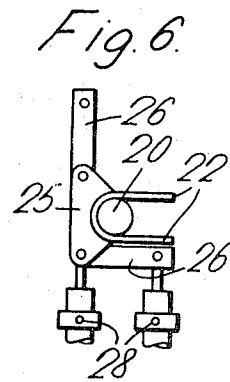
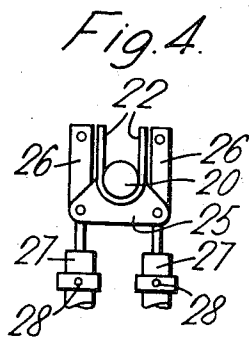
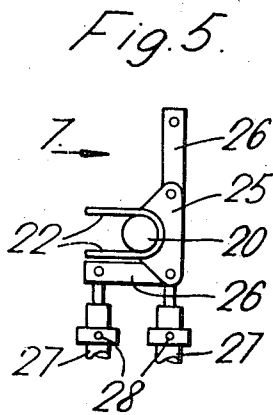
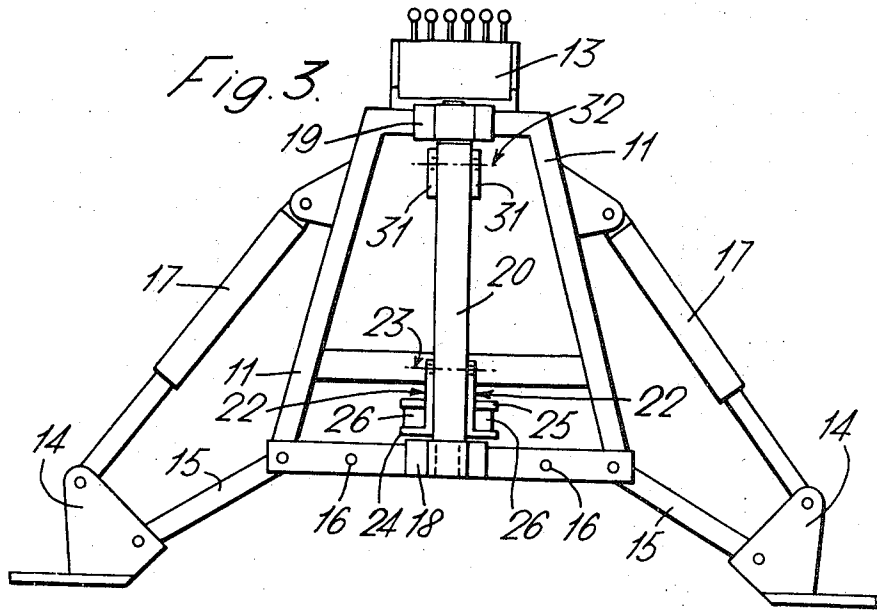


Fig. 2.

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MECHANICAL HANDLING DEVICE FOR VEHICLES

The invention relates to mechanical handling devices for mounting on vehicles, and more particularly to machines, hereinafter referred to as digger-ditchers, for excavating trenches and for cleaning out ditches.

The object of the invention is to provide handling devices which are convertible into and from digger-ditchers to a machine, hereinafter referred to as a loader-ditcher, for loading material into a container and for cleaning out ditches.

According to the invention, a mechanical handling device for mounting on a vehicle comprises a boom pivotable about a horizontal axis at one of its ends, a dipperstick pivotable about a horizontal axis between its ends at the other end of the boom, a bucket or the like pivotable about a horizontal axis at one end of the dipperstick, power operated means for actuating the bucket or the like, a first double-acting hydraulic jack for actuating the boom, and a second double-acting hydraulic jack for actuating the dipperstick, wherein the two jacks are located alternatively either both above the boom or both below the boom.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings of which:

FIG. 1 is a diagrammatic side elevation of a mechanical handling device according to the invention when adapted to be used as a digger-ditcher;

FIG. 2 is a diagrammatic side elevation of the digger-ditcher in FIG. 1, when adapted to be used as a loader-ditcher;

FIG. 3 is a view in the direction of the arrow 3 in FIG. 1, drawn to a larger scale and with parts omitted for clarity;

FIGS. 4, 5 and 6 show respectively a central position and two extreme positions into which a pivotable member of the mechanism may be placed by hydraulic ram means; and

FIG. 7 is a part sectional view in the direction of the arrow 7 in FIG. 5.

Referring now to the drawings, a mechanical handling device according to the invention has a frame comprising a horizontal subframe 10 adapted to be mounted beneath the rear part of an agricultural tractor, and a vertical subframe 11 removably mounted on the horizontal subframe 10. The vertical subframe 11 carries an operator's seat 12 and a block 13 containing a bank of six hydraulic control valves with respective hand levers, and two stabilizing feet 14 are pivotally connected to opposite sides of its lower edge by means of links 15. Two alternative laterally spaced pivot points 16 are provided for each link 15 and a hydraulic jack 17 controlled by one of the aforementioned valves is connected between each foot 14 and the frame 11 to swing the feet 14 independently into and from their operative positions. The vertical subframe 11 has vertically spaced lugs 18 and 19 in which there are journaled the ends of a vertical king post 20. Near the lower end of the king post 20 there is rigidly secured a U-shaped bracket 21 the closed end of which embraces the king post and the legs 22 of which are parallel and project tangentially from the king post 20. Near the free end of each leg there is formed a hole, the two holes having a common horizontal axis constituting an attachment point 23 hereinafter referred to. Rigidly secured to the closed end of the bracket 21, at the opposite side of the king post 20 to the legs 22 of the bracket 21, are two vertically spaced plates 24 and 25 each lying in a plane perpendicular to the axis of the king post 20. Between the two plates 24 and 25 there are pivotally connected two short arms 26 (see FIGS. 4, 5 and 6) each of which can abut against one of the legs 22 of the bracket 21. The angle between the pivot points of said arms 26, seen in plan view and measured at the axis of the king post 20, is, say, 105°. Near the free closed end of each of the arms 26 there is pivotally connected within it the ram of a single-acting hydraulic jack 27 the cylinder of which is pivotally mounted on the vertical subframe 11 about the vertical axis of trunnions 28 located at that end of the cylinder from which the ram projects. Both of the single-acting jacks 27 are controlled by another of the aforementioned valves housed within the block 13. Near the upper end of the king post 20 there is

rigidly secured another U-shaped bracket 30 similar to the bracket 21. The upper bracket 30 has legs 31 which are vertically above those of the lower bracket 21, and are also provided with two holes having a common horizontal axis constituting an attachment point 32. The two attachment points 23 and 32 have the same hole diameter and the same distance between their legs. One end of a boom 33 is pin-jointed to the lower attachment point 23, and between the ends of the boom 33 two parallel plates 34 project from its upper side and are provided with two pairs of aligned holes constituting two identical alternative attachment points 35 and 36 to either of which there can be pin-jointed the ram of a hydraulic jack 37 the cylinder of which is pin-jointed to the attachment point 32 on the king post 20. Said jack 37 is controlled by yet another of the valves housed within the block 13 carried by the vertical subframe 11. The two parallel plates 34 projecting from the upper side of the boom are provided with a further pair of aligned holes constituting an attachment point 38. A dipperstick 40 is pivotally connected about a horizontal axis 41 to the other end of the boom 33, and a bucket 42 is pivotally connected about a horizontal axis to one end of the dipperstick 40. Between the boom 33 and the bucket 42, the dipperstick 40 is provided with two lugs constituting an attachment point 43, whilst a similar attachment point 44 is provided at the other end of the dipperstick remote from the bucket 42. The ram of a hydraulic jack 45 is pin-jointed to the attachment point 44, and the cylinder of said jack 45 is pin-jointed to the attachment point 38. Said jack is controlled by a further one of the valves housed within the block 13 carried by the vertical subframe 11. Between the boom 33 and the bucket 42, the dipperstick 40 is provided with two lugs constituting an attachment point 46 between which there is pin-jointed the cylinder of a hydraulic jack 47 the ram of which is pivotally connected to a point 48 between the ends of two parallel levers 49 which are pivotally connected at one end to the dipperstick 40. Said jack 47 is controlled by the remaining one of the valves housed within the block 13 carried by the vertical subframe 11. At the other end, said levers 49 are pivotally connected to one end of a link 50 the other end of which is pivotally connected to the bucket 42.

The mechanical handling machine described above is arranged to operate as a digger-ditcher, the two double-acting hydraulic jacks 37 and 45 both being located above the boom 33 so that the maximum power of each of said jacks, produced by supplying oil under pressure so that side of its ram having the larger area so as to extend the jack, is available for digging. Accordingly, a lower power, produced by supplying oil under pressure to the smaller area side of each ram to retract the jack of which it is part, is available for loading. The boom 33 can be slewed relative to the tractor by rotating the king post 20. The maximum angle through which the king post can be rotated is, say, 180° bisected by the longitudinal centerline of the tractor. In order to slew the boom 33 from one side of said center line to the other, oil under pressure is supplied to that one of the single-acting hydraulic jacks 27 on said one side of said centerline and the other of said jacks 27 is connected to sump. The pressurized jack 27 extends and during the first part of its extension pushes the boom 33 around the axis of the king post 20 due to the abutment of the arm 26 connected to its ram against one of the legs 22 of the bracket 21 on the king post 20 and during the second and last part of its extension it pulls the boom 33 around said axis by applying a tensile force to said arm 26 which no longer abuts against said bracket 21. Extension of the pressurized jack 27 is accompanied by simultaneous retraction of the other single-acting jack 27, and by the pivoting of both of said jacks 27 through a small angle about the vertical axes of the trunnions 28 of their cylinders. By varying the point of connection to the boom 33 of the hydraulic jack 37 the reach of the machine can be varied. For example, when said jack 37 is connected to the attachment point 36 in the plates 34, the maximum digging depth below ground level is, say, 8 feet 6 inches, but when said jack 37 is connected to the attachment point 35, the maximum digging depth below ground level is, say, 11 feet 9 inches.

In order to convert the mechanical handling machine into a loader-ditcher, the components are rearranged as follows:

The hydraulic jack 45 is disconnected from the attachment point 44, and the dipperstick 40 is disconnected from the boom 33 at the axis 41. The hydraulic jack 37 is disconnected from the upper attachment point 32 on the king post 20, and the boom 33 is disconnected from the lower attachment point 23. The boom 33 with the two jacks 37 and 45 still connected to it, is inverted relative to the tractor and then pivotally connected to the upper attachment point 32 on the king post 20, and the hydraulic jack 37 previously connected to said upper attachment point 32 pivotally connected to the lower attachment point 23 on the king post 20. The dipperstick 40 is then pivotally connected to the boom 33 at the axis 41 without being inverted, and the hydraulic jack 45 previously connected to the attachment point 44 is pivotally connected to the attachment point 43.

The mechanical handling machine is now arranged to operate as a loader-ditcher, the two double-acting hydraulic jacks 37 and 45 connected to the boom 33 both being located below the boom so that the maximum power of each of said jacks, produced by supplying oil under pressure to that side of its ram having the larger area so as to extend the jack, is available for loading. Accordingly, a lower power, produced by supplying oil under pressure to the smaller area side of each ram to retract the jack of which it is part, is available for digging.

The bucket can be replaced by a grab, manure fork, or the like.

I claim:

1. A mechanical handling device comprising a frame securable to the rear of a tractor, a king post having two identical vertically spaced attachment points carried by said frame, means for moving said king post about a vertical axis, a boom member adapted to be pivotally connected at one end to one of said vertically spaced attachment points, a dipperstick pivotally attached between its ends to the other end of said boom, a bucket pivotally mounted at one end of said dipperstick, means for moving the bucket relative to the dipperstick, a first attachment point on said dipperstick between the bucket and the pivot point and a second attachment point on said dipperstick at that end of the dipperstick remote from the bucket, a first hydraulic jack adapted to be pivotally connected at one end to the other one of said two vertically spaced attachment points on the king post and at the other end to an attachment point between the ends of the boom, and a second hydraulic jack adapted to be pivotally connected at one end to one of said two attachment points on the dipperstick and at the other end to an attachment point located between the ends of the boom and on the same face thereof as said first hydraulic jack, said boom being capable of being located in two alternative positions in said device, in which respective positions it is pivotally connected to a different one of said attachment points on the king post; and in one of which boom positions the first hydraulic jack is connected at one end to the other attachment point on the king post from that to which the boom is connected and at its other end to the boom, and the second hydraulic jack is connected between the boom and the attachment point on the end of the dipperstick; and in the other of which boom positions the first hydraulic jack is connected between the other attachment point on the king post from that to which the boom is connected and the boom, and the second hydraulic jack is connected between the boom and said first attachment point on the dipperstick.

2. A mechanical handling device comprising a frame securable to the rear of a tractor, a king post having two identical vertically spaced attachment points carried by said frame, means for moving the king post about its vertical axis comprising two single acting hydraulic jacks pivotally mounted on the frame and connected to the king post by means of respective link arms, a boom member adapted to be pivotally connected at one end to one of said vertically spaced attachment points, a dipperstick pivotally attached between its ends to the other end of said boom, a bucket pivotally

mounted at one end of said dipperstick, means for moving the bucket relative to the dipperstick, a first attachment point on said dipperstick between the bucket and the pivot point and a second attachment point on said dipperstick at that end of the dipperstick remote from the bucket, a first hydraulic jack adapted to be pivotally connected at one end to the other one of said two vertically spaced attachment points on the king post and at the other end to an attachment point between the ends of the boom, and a second hydraulic jack adapted to be pivotally connected at one end to one of said two attachment points on the dipperstick and at the other end to an attachment point located between the ends of the boom and on the same face thereof as said first hydraulic jack, said boom being capable of being located in two alternative positions in said device, in which positions it is pivotally connected to a different one of said attachment points on the king post; and in one of which boom positions the first hydraulic jack is connected at one end to the other attachment points on the king post from that to which the boom is connected and at its other end to the boom, and the second hydraulic jack is connected between the boom and the attachment point on the end of the dipperstick; and in the other of which boom positions the first hydraulic jack is connected between the other attachment point on the king post from that to which the boom is connected and the boom, and the second hydraulic jack is connected between the boom and said first attachment point on the dipperstick.

3. A mechanical handling device according to claim 1, wherein the boom is pivotally connected to the lower one of the two vertically spaced attachment points on the king post the first hydraulic jack is pivotally connected to the upper one of said attachment points, and the second hydraulic jack is pivotally connected to the attachment point located at that end of the dipperstick remote from the bucket.

4. A mechanical handling device according to claim 2, wherein the boom is pivotally connected to the lower one of the two vertically spaced attachment points on the king post, the first hydraulic jack is pivotally connected to the upper one of said attachment points, and the second hydraulic jack is pivotally connected to the attachment point located at the end of the dipperstick remote from the bucket.

5. A mechanical handling device according to claim 1, wherein the boom is pivotally secured to the upper one of the two vertically spaced attachment points on the king post and the first hydraulic jack is pivotally secured to the lower one of said attachment points and where the second hydraulic jack is pivotally secured to the attachment point located on the dipperstick between the bucket and its pivotal connection to the boom.

6. A mechanical handling device according to claim 2, wherein the boom is pivotally connected to the upper one of the two vertically spaced attachment points on the king post, the first hydraulic jack is pivotally connected to the lower one of said attachment points, and the second hydraulic jack is pivotally connected to the attachment point located on the dipperstick between the bucket and its pivotal connection to the boom.

7. A mechanical handling device according to claim 1, wherein an additional attachment point for the first hydraulic jack is provided on the boom.

8. A mechanical handling device according to claim 2, wherein an additional attachment point for the first hydraulic jack is provided on the boom.

9. A mechanical handling device according to claim 1, wherein said means for moving the kingpin post about its vertical axis comprises two single acting hydraulic jacks flexibly pivotally connected to opposite sides of the king post.

10. A mechanical handling device according to claim 1, wherein retractable ground engaging support means is connected to said frame.

11. A mechanical handling device according to claim 1, wherein said boom is rotated substantially 180° on its longitudinal axis in said alternative positions.