Aug. 2, 1966 R. E. HAUFF 3,263,839

HYDRAULIC HOSE MOUNTING FOR MATERIAL HANDLING APPARATUS

Filed April 5, 1965 2 Sheets-Sheet 1

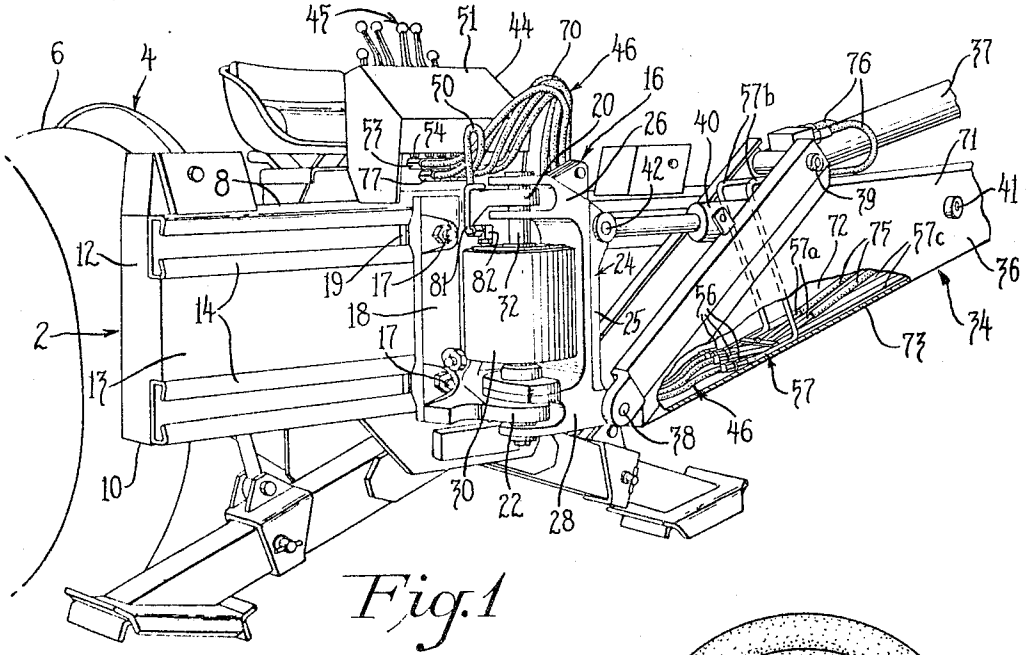


Fig. 1

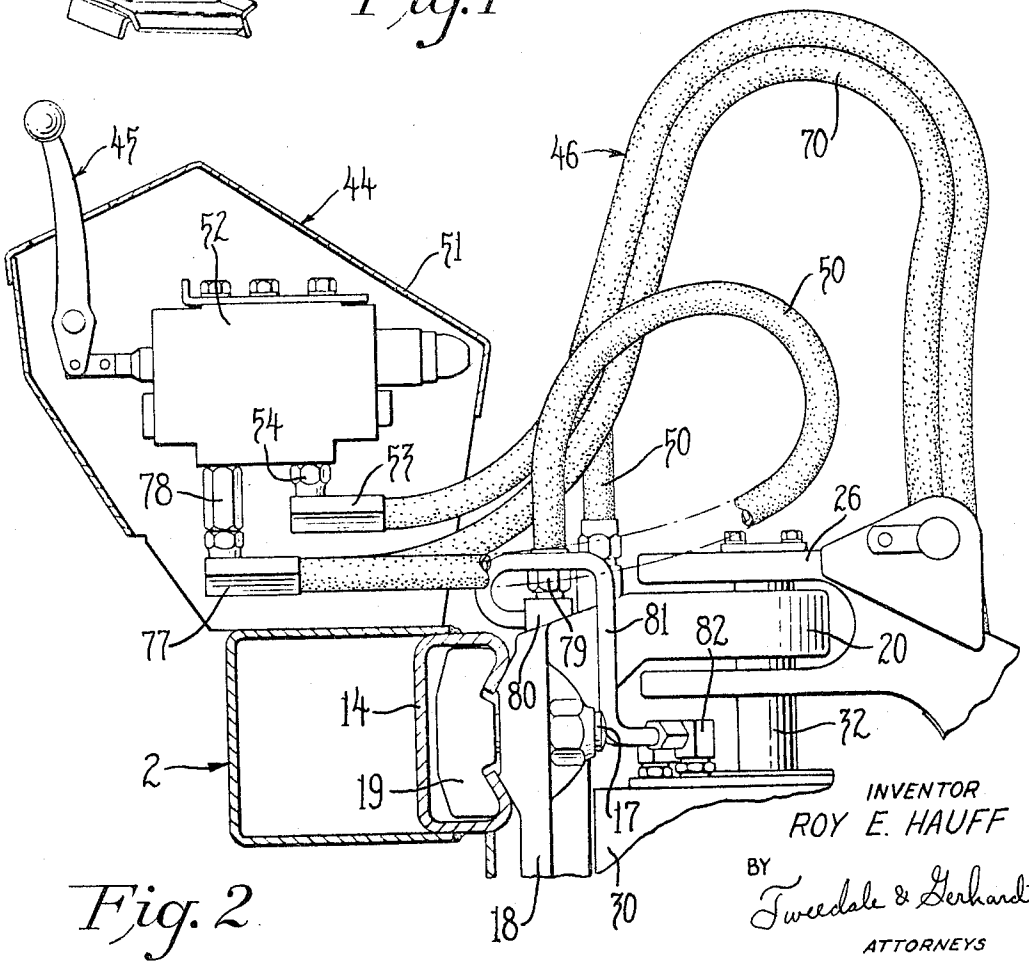


Fig. 2

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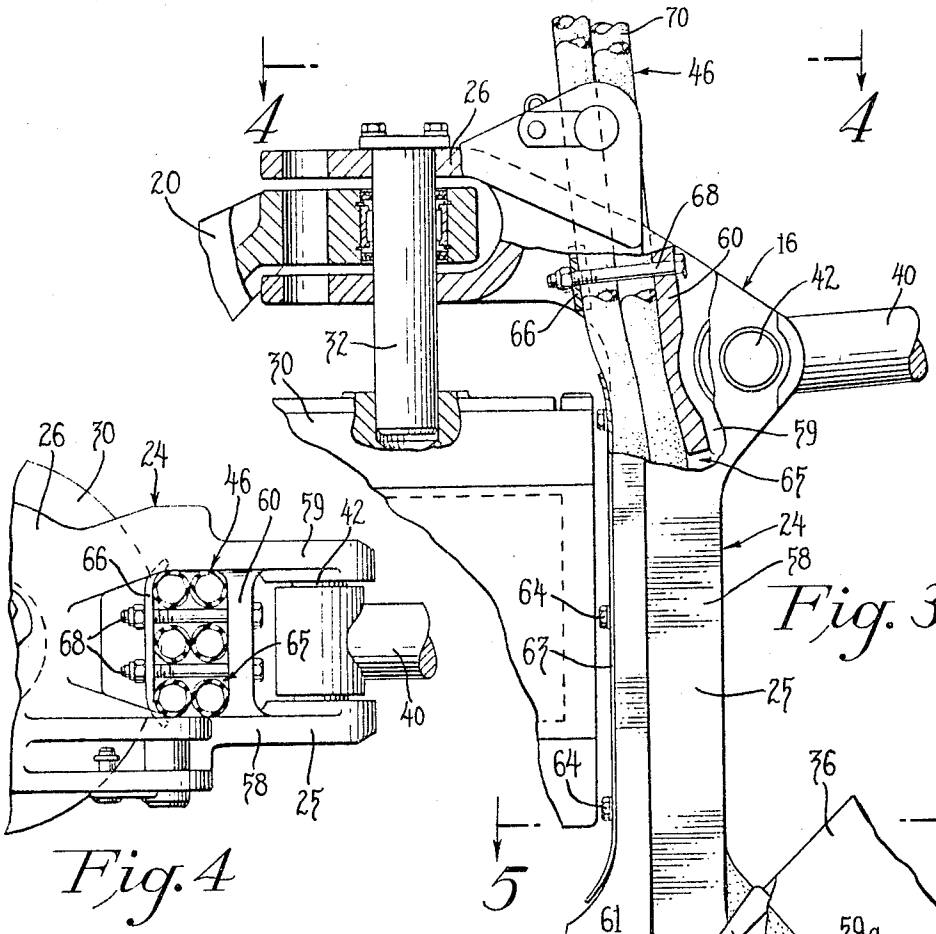


Fig. 3

Fig. 4

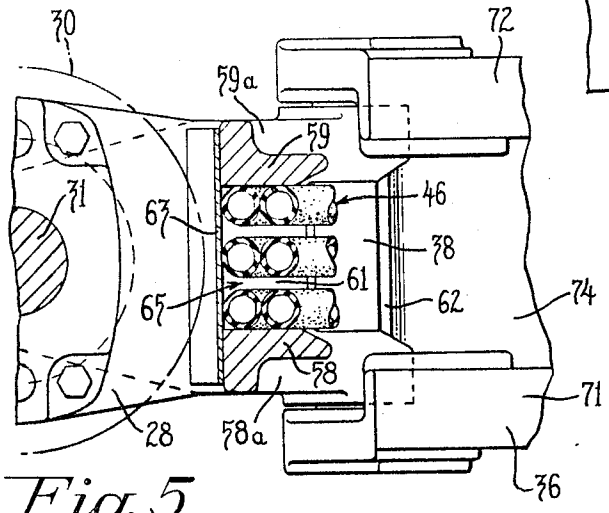


Fig. 5

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HYDRAULIC HOSE MOUNTING FOR MATERIAL HANDLING APPARATUS

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6 Claims. (Cl. 214—138)

This invention relates generally to material handling equipment and is particularly, but not exclusively, concerned with material handling apparatus of the type commonly referred to as "backhoes."

Presently available backhoes include the type mounted on a transverse supporting frame attached to the rear end of a tractor or similar vehicle, the backhoe boom assembly being mounted for side to side swinging movement on a swing unit carried by the transverse supporting frame. In some cases, the swing unit is mounted for transverse sliding movement on the supporting frame so that the entire backhoe assembly can be shifted laterally with respect to the longitudinal axis of the tractor. The hydraulic actuators for the backhoe and the swing unit are connected into the tractor hydraulic system by flexible conduits, and the operator causes the backhoe to swing about a vertical axis, and to perform excavating operations by conducting hydraulic medium to and from the actuators by manipulating hydraulic control levers.

A problem frequently encountered with such apparatus is that of protecting the various flexible hydraulic hoses and preventing them from fouling or otherwise interfering with the relative movement between the various parts.

It is therefore an object of this invention to provide a hydraulically actuated, horizontally swingable boom assembly having flexible hydraulic hoses supported in such a manner as to permit free articulation of the boom as well as relative movement between the swing unit and supporting frame without becoming entangled or fouled with the apparatus.

Another object is to provide a hydraulically actuated, horizontally swingable, articulated boom wherein the hydraulic hoses are partially enclosed and clamped against sliding movement relative to the metal supporting parts to protect them from wear and damage, the hoses being supported in such a manner as to permit free relative movement between the articulated members.

In achievement of the foregoing, and other objects, apparatus according to the present invention includes a supporting frame on which a swing unit is mounted for horizontal sliding movement. The swing unit includes a mast frame pivotal about a vertical axis and carrying a hydraulically actuated backhoe or other material handling assembly. For conducting hydraulic medium to and from the material handling assembly, a plurality of hydraulic hoses are coupled at one end to hydraulic connectors on the supporting frame in such a manner as to be freely rotatable about a vertical axis. The hoses extend from the connectors over the top of the swing unit and through a vertical channel formed in the mast frame. The hoses extend from the vertical channel to the material handling assembly for connection with hydraulic actuators. The intermediate portion of the hoses are clamped against movement relative to the channel and are slack between the hydraulic connectors and the vertical channel permitting swinging movement of the material handling assembly and permitting the swing unit to move from one end to the other on the supporting frame. The lower end of the vertical channel of the swing unit is substantially closed to protect the hoses from rocks or similar obstructions beneath the swing unit.

Other objects, advantages and features of the invention will become apparent from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of a tractor mounted backhoe embodying the invention;

FIG. 2 is an enlarged sectional view illustrating a portion of the boom mounting and hose arrangement;

FIG. 3 is a partial elevational view of the swing unit on an enlarged scale with certain portions being broken away; and

FIGS. 4 and 5 are sectional detail views taken along on lines 4—4 and 5—5, respectively, of FIG. 3.

While a single embodiment of the invention is described and illustrated in the foregoing specification and accompanying drawings, the invention is not limited to the exact construction shown, but includes numerous alterations in the construction and arrangement of parts as will be apparent to those skilled in the art, and all of which fall within the scope and spirit of the invention.

Referring to FIG. 1, a transverse supporting frame 2 is mounted on the rear end of a tractor 4 having rear wheels 6, only one of which is visible in the drawing. The supporting frame 2 includes top, bottom, and side walls 8, 10 and 12, respectively, and a rear wall 13. Mounted on frame 2 in vertically spaced, parallel relationship is a pair of tracks or rails 14 on which is slideably mounted a swing unit designated generally by reference numeral 16.

The swing unit 16 includes a support bracket 18 on which is pivotally mounted a mast frame 24. Bracket 18 is secured to the supporting frame 2 by bolts 17 which extend through slots in track members 14 into engagement with slide members 19. Projecting rearwardly from bracket 18 are upper and lower arms 20 and 22, respectively. Mast frame 24 includes a vertical body portion 25 having upper and lower bifurcated arms 26 and 28, respectively, projecting therefrom. The bifurcated arms 26 and 28 receive the upper and lower arms 20 and 22, respectively, of bracket 18. Arms 22 and 28 are pivotally connected together by the shaft 31 (FIG. 5) of a rotary motor 30, and arms 20 and 26 are pivotally connected by a pin 32 carried by arm 26. Upon actuation of the rotary motor 30, the shaft 31 thereof causes mast frame 24 to pivot about the vertical axes of pin 32 and the motor shaft.

Carried by the mast frame 24 is a backhoe assembly 34 including a main boom or mast 36 pivotally connected by a pin 38 with the lower end of mast frame 24. Boom 36 is actuated in a vertical plane about pivot pin 38 by a hydraulic piston and cylinder actuator 40 having one end pivotally connected with boom 36 at 41, and its other end pivotally connected at 42 with mast frame 24 near the upper end of body portion 25. The backhoe assembly 34 may be of the general type disclosed in U.S. Patent No. 3,117,685, dated January 14, 1964, including a dipper stick pivotally mounted at the end of mast 36, and a bucket pivotally mounted on the end of the dipper stick opposite mast 36. The dipper stick and bucket are each provided with hydraulic actuators for actuating them about their pivot points, an actuator 37 being shown in FIG. 1 for the dipper stick. Actuator 37 is pivotally connected at 39 with boom 36 as shown in FIG. 1.

Mounted on the top wall 8 of support frame 2 is a hydraulic control unit indicated generally by reference numeral 44. The control unit 44 is connected hydraulically with the hydraulic actuators 37 and 40 of the backhoe and the rotary motor 30 by flexible hoses 46 and 50, respectively. Hydraulic medium is conducted to and from the backhoe and rotary motor through hoses 46 and 50 by manipulation of a plurality of control handles 45 of control unit 44. By extending and retracting the hydraulic actuator 40, mast 36 pivots upwardly or downwardly about pin 38; extension and retraction of actuator 37 similarly causes the dipper stick (not shown) to pivot about mast 36; the bucket (not shown) is similarly actuated by a hydraulic actuator (not shown) in a well-known

manner. Motor 30 is hydraulically actuated to cause mast frame 24 to swing about the vertical axis of pin 32 to swing the backhoe from side to side. By loosening bolts 17, the entire swing unit 16 can be shifted transversely along tracks 14 from one end to the other of support frame 2 for excavating alongside buildings, foundations, and the like in a manner similarly disclosed in the above-mentioned U.S. Patent 3,117,685. The hoses 46 and 50 must therefore be supported in such a manner to permit mast frame 24 to swing about the vertical axis of pin 32 as well as to accommodate transverse shifting of the swing unit on support frame 2 and the articulation between the backhoe assembly 34 and mast frame 24.

Referring to FIG. 2, the hydraulic control unit 44 includes a housing 51 in which is supported a hydraulic valve unit 52 connected with the hydraulic system of the tractor. One end of each of the hoses 46 is provided with a terminal coupling 53 which is rotatably connected with a hydraulic fitting or connector 54 depending from valve unit 52. Coupling 53 is free to rotate with respect to fitting 54 about a vertical axis as viewed in FIG. 2. The other end of each hose 46 is provided with a terminal coupling 56 (FIG. 1) connected with one of a plurality of pipes or conduits 57 supported within boom 36. Valve unit 52 controls the flow of hydraulic medium to and from the tractor hydraulic system, through valve unit 52, connectors 54 and hoses 46.

Referring to FIGS. 3, 4 and 5, the vertical body portion 25 of mast frame 24 comprises a pair of laterally spaced plates 58 and 59 extending vertically between arms 26 and 28. Extending between the upper ends of plates 58 and 59 is a support plate 60. Projecting between the lower ends of plates 58 and 59 from arm 28 is a shelf or ledge member 61 formed with a cylindrically recessed lip 62. Pin 38 extends between plates 58 and 59 through apertured lug members 58*a* and 59*a* formed at their lower ends, and is received within the cylindrical recess of lip 62. Lip 62 encloses pin 38 on its lower side and protects it from rocks and other obstructions on the ground.

Mounted between the edges of plates 58 and 59 adjacent the rotary motor 30 is a guard plate 63 which is secured to plates 58 and 59 by screws 64. Plates 58 and 59 cooperate with guard plate 63 to define a channel 65 extending vertically between arms 26 and 28.

Hoses 46 extend from terminals 53 at valve unit 52 up and over the top of swing unit 16 into the upper end of channel 65. As shown in FIGS. 3 and 4, hoses 46 are securely clamped to the upper end of channel 65 by a clamp plate 66 which is connected with the support plate 60 by bolts 68 which extend between adjacent pairs of hoses 46. Guard plate 63 further cooperates with plate 60 to clamp hoses 46 against movement. The length of hoses 46 between the upper end of channel 65 and control unit 44 form a looped slack portion 70.

With reference to FIG. 1, mast 36 is formed with side walls 71 and 72, and a bottom wall 73 extending between the lower edges of the side walls. A shield plate 74 extends between side walls 71 and 72 at the lower end of bottom wall 73 adjacent the boom to bridge the space between the end of bottom wall 73 and lip 62. Hoses 46 extend downwardly through channel 65 and across pin 38 and shield plate 74 as shown in FIGS. 3 and 5 to their connection with pipes 57. Each of the actuators for mast 36, the dipper stick and bucket, are provided with a pair of hydraulic connections. The pair of hoses 46 for conducting hydraulic fluid to and from the cylinder of hydraulic actuator 40 are connected with a pair of pipes 57*a* (FIG. 1) clamped to bottom wall 73 of boom 36. Pipes 57*a* in turn are connected with a pair of flexible conduits or hoses 75 extending from pipes 57*a* to the cylinder of actuator 40. The pair of hoses 46 for actuator 37 are connected with a pair of pipes 57*b* which in turn have flexible conduits 76 coupled to the cylinder of actuator 37. The pair of hoses 46 for the bucket actuator are connected with pipes 57*c* extending along the bottom wall 73 of the boom. Thus, as boom 36 pivots in a vertical plane about pin 38, hoses 46 between clamp plates 66 and 60 and pipes 57 can flex freely from guard plate 63 towards the right as viewed in FIG. 3 to accommodate movement of mast 36 relative to mast frame 24.

Again referring to FIG. 2, hoses 50 are provided with terminals 77 which are rotatably connected with fittings 78 depending from valve unit 52, and extend from fittings 77 to a fitting 80 mounted on the upper surface of arm 20 of bracket 18. Terminals 79 are provided on the end of hoses 50 for rotatable connection with fittings 80. Pipes 81 conduct fluid from hoses 50 through fitting 80 to fittings 82 on the upper wall of the housing of motor 30. Hoses 50 are slack when swing unit 16 is positioned near the transverse center of support frame 2. When swing unit 16 is shifted toward one of the other ends of support frame 2, terminal couplings 77 and 79 rotate about vertical axes and the slack of hoses 50 is taken up to accommodate the transverse movement. Similarly, terminal couplings 53 of hoses 46 rotate about the vertical axes of fittings 54 and the slack portions 70 of hoses 46 tend to straighten out and lie flat across the top of the swing unit.

Clamp plates 66 and 60 prevent hoses 46 from sliding within channels 65 to reduce wear and prevent the hoses from becoming entangled with the articulating parts. The lower ledge 61 and its lip 62 protect the hose 46 from rocks, stumps or other obstructions on the ground beneath the swing unit.

It will be apparent to those skilled in the art that the invention is not limited to the specific embodiment shown, but that other equivalent forms of the invention may be adopted without departing from the scope and spirit of the invention as defined by the appended claims.

What is claimed is:

1. Material handling apparatus comprising: a supporting frame; a swing unit mounted on said support frame for horizontal sliding movement; a material handling member carried by said swing unit for side to side swing movement about a vertical axis; hydraulic control means mounted on said support frame; means defining a channel on the portion of said swing unit adjacent said material handling member with its open side facing away from the support frame and toward the material handling member; and a plurality of flexible hydraulic hoses each having one end connected with the hydraulic control means and extending therefrom up and over the swing unit into said channel, said hoses extending from the channel into connection with the material handling member for conducting hydraulic medium between the hydraulic control means and the material handling member; and means clamping said hoses against movement in said channel; the portion of said hoses extending up and over the swing unit forming a slack portion to accommodate sliding movement of the swing unit on the support frame; said swing unit including a bracket slideably mounted on the supporting frame with a pair of vertically spaced arms, and a mast frame pivotally connected at its upper and lower ends with the upper and lower bracket arms; said channel extending vertically between the upper and lower ends of the mast frame, a horizontal ledge on said mast frame closing the lower end of said channel; said one end of said hoses being connected with said hydraulic control means for rotation about a vertical axis during horizontal sliding movement of the swing unit on said supporting frame, and said hoses extending from said one end up and over the swing unit into the upper end of said channel and extending generally along the length of said channel into said material handling member.

2. Material handling apparatus as defined in claim 1 wherein said channel comprises a pair of laterally spaced plates extending between the upper and lower ends of said mast frame and a guard plate mounted between the edges of said plates opposite said material handling member, and said clamping means comprises a support plate

mounted between said plates adjacent their upper ends spaced horizontally from said guard plate; a clamping plate; a plurality of bolts securing said clamping plate to said support plate above the upper edge of said guard plate; said hoses being clamped between said clamping plate and support plate.

3. Material handling apparatus as defined in claim 2 wherein said material handling member includes a boom connected to the lower end of said mast frame having spaced walls, the other end of said hoses extending from said channel into the space enclosed within said spaced walls; a plurality of non-flexible conduits mounted on the inner walls of said space; and means connecting the other ends of said hoses with said non-flexible conduits.

4. Material handling apparatus as defined in claim 3 wherein said boom is mounted on the lower end of said mast frame for vertical pivotal movement relative to the mast frame; and further including a lip projecting from said ledge beneath the pivotal connection between the boom and mast frame; and means substantially closing the space between the bottom wall of the boom and said lip to protect the hoses in the channel and boom from obstructions beneath the swing unit.

5. A vehicle mounted boom support and actuating assembly comprising a transverse frame mounted on the vehicle, a swing unit slideably mounted on said frame, a boom movably mounted on said swing unit, a hydraulic actuator mounted between said swing unit and said boom extensible and retractable to move said boom relative to said swing unit, a hydraulic control unit mounted on said transverse frame, a vertical channel in said swing unit between the upper and lower ends thereof, a plurality of flexible hydraulic hoses each having one end swivelly connected with said hydraulic control unit and extending therefrom over the top of the swing unit and through said vertical channel, said hoses extending from the lower end of said vertical channel and having their other ends connected with said hydraulic actuator, and a clamping plate mounted in said vertical channel clamping the portions of the hoses within said channel against movement with respect to the swing unit, and the length of said hoses between said hydraulic control unit and the upper end of said vertical channel being sufficient to accomodate movement of said swing unit from one end to the other of said transverse frame.

6. Material handling apparatus comprising: a supporting frame; a bracket mounted on said supporting frame for horizontal sliding movement and having a pair of vertically spaced arms projecting therefrom; a mast frame having a pair of vertically spaced upper and lower arms pivotally connected respectively with the upper and lower arms of the bracket; a rotary hydraulic actuator mounted on said bracket between said arms and connected with said mast frame for actuating the mast frame to pivot from side to side about said bracket arms; hydraulic control means mounted on said supporting frame; a pair of hydraulic fittings mounted on the upper bracket arm; a pair of flexible hydraulic hoses each having one end connected with the hydraulic control means for rotation about a vertical axis and its other end connected with one of said fittings for rotation about a vertical axis; pipes hydraulic ally conecting said fittings with the rotary actuator the length of said pair of hoses being sufficient to accommodate horizontal sliding movement of said bracket, a hydraulically actuated boom mounted on the lower end of said mast frame for pivotal movement with respect to the mast frame about a horizontal axis; means defining a channel extending between the upper and lower arms of the mast frame; second pairs of hoses each having one end connected with said hydraulic control means for rotation about a vertical axis and extending therefrom over the top of said bracket and mast frame into the upper end of said channel and from said channel into hydraulic connection with said boom; and means clamping said second pairs of hoses against movement in said channel; the walls of said channel separating the hoses from the rotary actuator; and the length of said second pairs of hoses between the upper end of the channel and hydraulic control means being sufficient to accommodate sliding movement of the bracket on said supporting frame.

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