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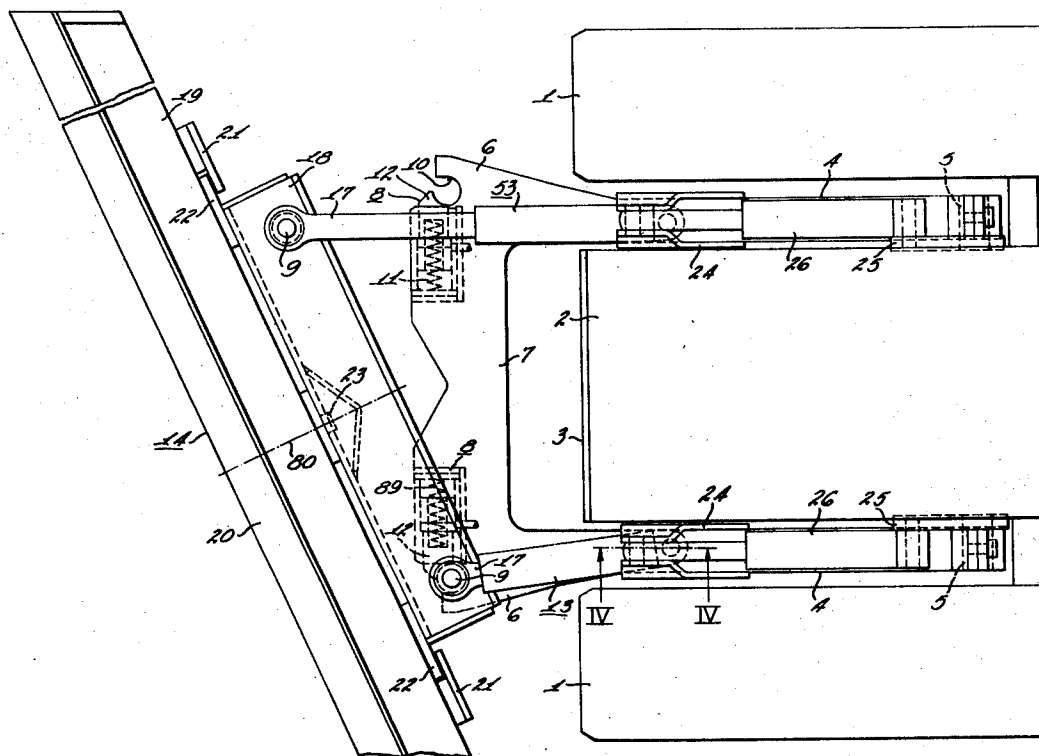
[54] EARTHMOVING ATTACHMENT MOUNTING
9 Claims, 10 Drawing Figs.

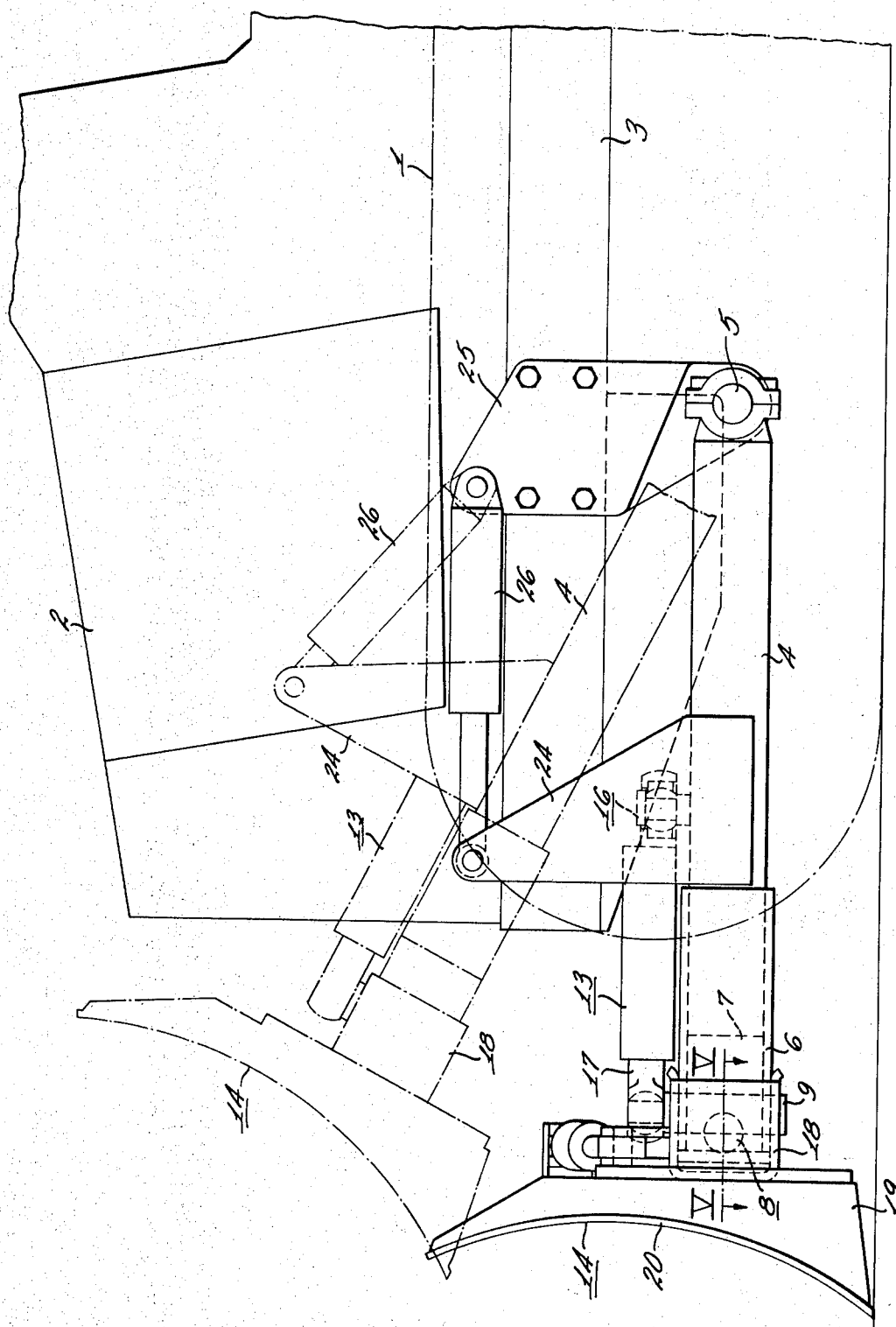
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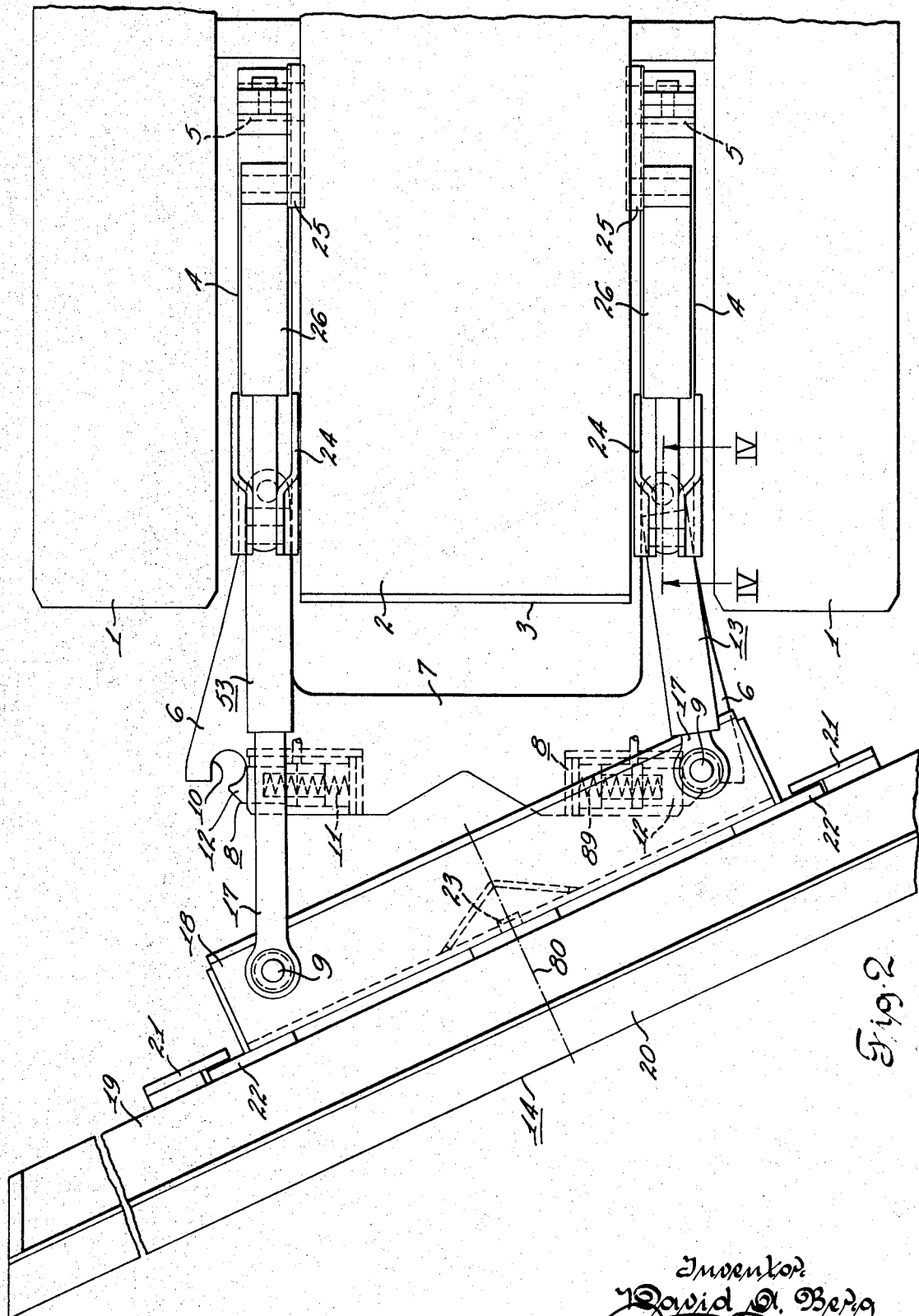
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ABSTRACT: An earthmoving attachment having a double pivot pin and ram anchor mounting with hydraulically actuated pin locks for improved control of the attachment.





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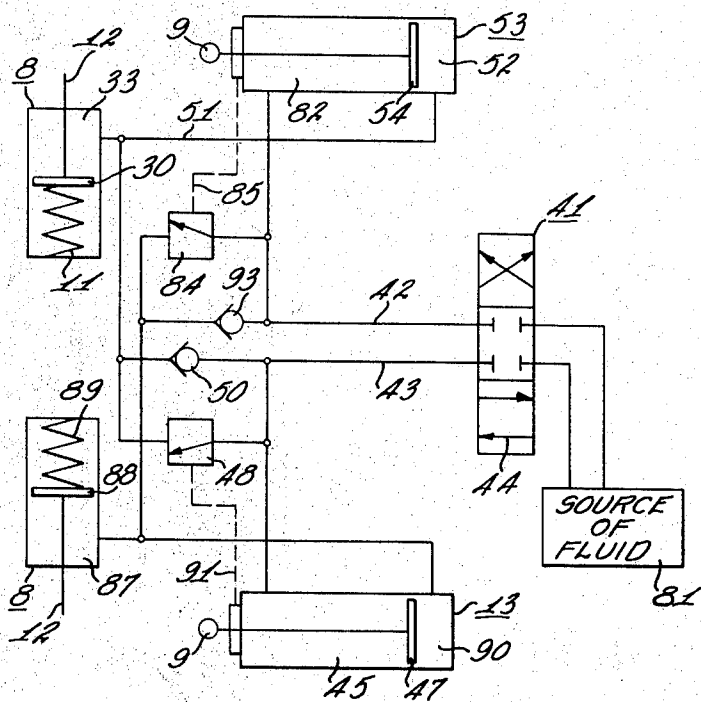


Fig. 3

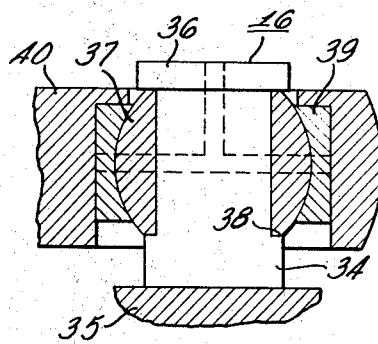


Fig. 4

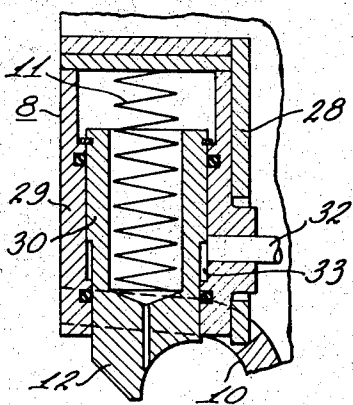


Fig. 5

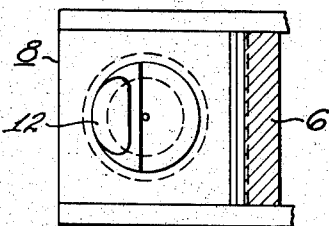


Fig. 6

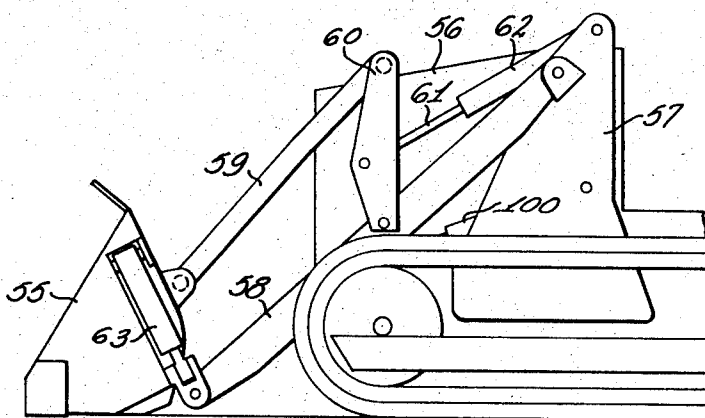
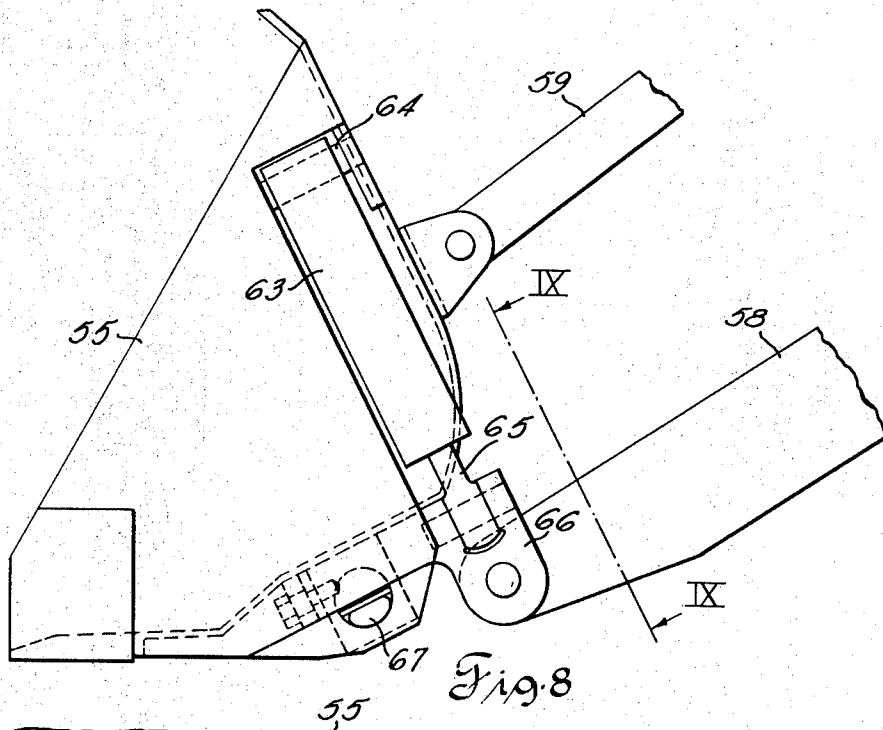
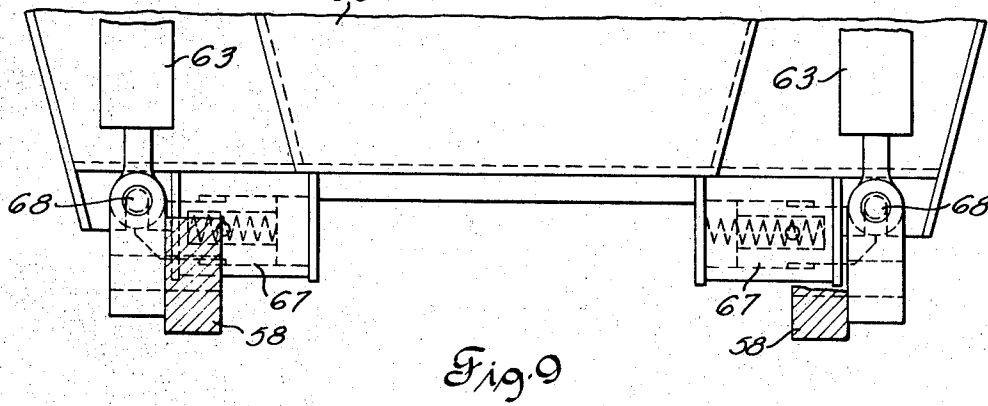
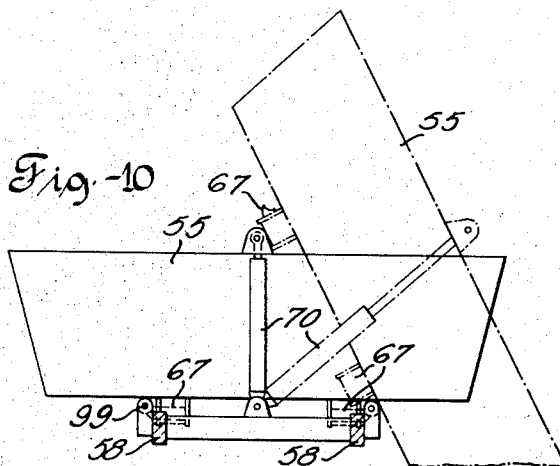


Fig. 7

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EARTHMOVING ATTACHMENT MOUNTING

This invention relates to earthmoving attachments and more particularly to the mounting and the maneuvering of the attachment.

Earthmoving vehicles should handle with ease and the earthmoving attachment such as a bulldozer blade or bucket should be maneuverable as well. The conventional bulldozer blade pivots at a central point in the front of the tractor. This in turn causes the side portions of the blade to pivot backwardly toward the vehicle body and necessitates the mounting of the pivoting axis for the blade a substantial distance forward of the vehicle body. Accordingly, the overall length of the vehicle and the blade is extended to accommodate blade pivoting. This invention provides a means whereby two pivoting axes are provided in the blade supporting structure, which operate as ram anchors and permit the blade to pivot forwardly in front of the vehicle body and rearwardly on the side about the corner of the vehicle. Any portion of the blade forwardly of the vehicle does not pivot rearwardly but only the portion that is to the side of the vehicle pivots rearwardly. A ram anchor is also provided on the pivoting axis of the blade. Also, the supporting structure of the blade is connected to a U-shaped member which pivots over the side beams to control the horizontal movement of the blade while the hydraulic actuator on the opposite side of the blade angles the blade.

The same general mounting may be used on an attachment such as a bucket for scooping material and loading on a cargo carrying vehicle. In using this type of an attachment the bucket pivots about one axis which is locked while the hydraulic actuator on the opposite side of the bucket raises its mating end of the bucket and unloads the bucket into the vehicle such as a truck. The attachment whether it be a blade, or a bucket, or otherwise will also have additional hydraulic means to tilt or raise the bucket as is customary in this type of an attachment on a vehicle.

It is an object of this invention to provide a tractor operated earthmoving attachment constructed with a ram anchor and blade pivot on the same pivotal axis.

It is another object of this invention to provide a hydraulically operated attachment having hydraulically actuated angling means and anchor pin locking means operated simultaneously.

It is a further object of this invention to provide a double pivot axis for a power operated earthmoving attachment having hydraulically operated unlatching means and angling means.

It is a further object of this invention to construct a tractor having a bulldozer blade mounted closely to the front corners of the vehicle body on double anchor pins with hydraulically actuated unlatching means and angling means with vertical support during angling of the blade to maintain positive control during maneuvering of the blade.

The objects of this invention are accomplished by providing a double ram anchor on opposing sides of the vehicle which operate as pivot axis for the blade. The ram anchor is constructed with a latching and an unlatching means whereby the ram anchor is unlatched hydraulically before the hydraulic actuating means drives the side of the blade forwardly to provide angling of the blade. The hydraulic system provides for seating of one side of the blade on its ram anchor prior to unlatching of the opposite side and a forward movement of the blade to provide horizontal angling.

The preferred embodiment of this invention will be illustrated in the attached drawings and described in the following paragraphs:

FIG. 1 illustrates a side view of a bulldozer blade mounted on a tractor;

FIG. 2 is a plan view of the bulldozer blade mounted on a tractor;

FIG. 3 is a schematic illustration of a hydraulic system to be used with the attachment mounted on the vehicle;

FIG. 4 is a cross section view taken on line IV-IV of FIG. 2 showing a ball joint connection between a hydraulic actuator and the side beam;

FIG. 5 is a fragmentary cross section view taken on line V-V of FIG. 2;

FIG. 6 is an end view of FIG. 5 with a portion shown in cross section;

FIG. 7 is a side view of a bucket attachment connected to a vehicle;

FIG. 8 is an enlarged side view of the bucket to show its connection to the vehicle;

FIG. 9 is a rear view of a portion of the bucket attachment taken along line IX-IX to show the related connecting parts; and

FIG. 10 is a modification of FIG. 9 showing the bucket with a single hydraulic actuator both in its reposed and tilt position.

Referring to FIG. 1, a bulldozer blade is shown mounted on a crawler type tractor. The track 1 and related structure support the vehicle body 2 on a frame 3. The frame 3 pivotally supports the side beams 4 on a pivotal connection 5 on each side of the vehicle frame. The side beam 4 extends forwardly to form a ram anchor 6. The ram anchor is formed by the cross member 7 supporting a hydraulically controlled latch 8 to receive a pin 9 in the pin socket 10. The latch 8 consists essentially of a spring 11 biasing the latch 12 to retain the pin 9 seated within the socket 10. The latch 12 is hydraulically retracted against the force of the biasing spring 11 to release the pin 9 and permit it to move forwardly in response to actuation of the hydraulic cylinder 13. It is understood that the latch might be released electrically or by other means and the invention is not limited to a hydraulic release. The hydraulic system is operating as shown in FIG. 2 so that the control valve is positioned to provide forward movement on the right-hand side of the bulldozer blade 14. The hydraulic cylinder on the left side fully retracts the blade and the socket 10 receives pin 9 so latch 12 closes to lock pin 9 in the socket prior to any release of the latch 12 on the right-hand side. When the pin 9 on the left-hand side is fully retracted and seated in the socket 10 and locked then the latch 12 on the right-hand side is retracted against the biasing force of the spring 11 and the hydraulic actuator 13 on the right-hand side moves the pin 9 out of the socket 10 causing an angling of the blade 14 in a manner as shown in FIG. 2.

The hydraulic actuator 13 on either the right- or left-hand side operates in the same manner and so the description will relate to either the right- or left-hand side of the vehicle. The numbering of either cylinder and corresponding mechanism on either the right- or left-hand side is the same. The hydraulic cylinder 13 is connected by a ball joint connection 16 which is illustrated in FIG. 4 and will be described subsequently. A similar ball joint connection is provided for the rod 17 which connects the U-shaped subframe supporting the bulldozer blade 14. A ball joint connection is used to accommodate freedom of movement in the connection between the side beam and the U-shaped member 18 supporting the bulldozer blade. The hydraulic circuitry actuating the bulldozer blade will be described in a subsequent portion of this application. The side beams 4 are shown pivotally connected to the frame 3 of the vehicle. The frame is fabricated with suitable cross members to reinforce the frame providing a solid construction which will not permit any distortion of the frame and will maintain alignment of a pivotal axis of each of the side beams 4 in their pivotal connections 5.

The anchor pin 9 is securely connected to the U-shaped member 18 which is open on its rearward side and member 18 is pivotally connected to a boxlike structure 19 supporting the moldboard 20 of the bulldozer blade. This type of construction provides a durable support for the blade 14. The boxlike structure 19 carries plate 21 on either side of the rearward portion which extends over a flange 22 on a U-shaped structure 18. The U-shaped member 18 is open on its rearward end to receive the forward end of the beams 4 and cross member 7 when it pivots. The forward end of the cross member 7 pro-

vides a guided movement of the U-shaped member connected to the boxlike structure 19 and blade 14. In other words, as the bulldozer blade is pivoted on either the right- or left-hand pivot pin 9 the U-shaped member 18 must move in a plane substantially parallel with the side beams 4. This construction prevents any tilting of subframe 18 during angling of the blade. As previously mentioned, either one or the other of anchor pins 9 is always seated in its socket when the blade is being angled and consequently the pivotal motion of the member 18 is also guided to eliminate strain on the pin 9. Any tilting of the blade 14 is accomplished by another hydraulic actuator shown in FIG. 1 which pivots the blade about means defining a pivotal axis 23. The flange 22 is permitted to slide through a guided movement under a plate 21 fastened to the boxlike structure 19 supporting moldboard 20 as the blade pivots.

FIG. 1 illustrates the lowered position of the bulldozer blade and also a phantom view illustrates the bulldozer blade in its raised position. The side beams 4 are fabricated with a mast 24 welded to each of the side beams 4 and a bracket 25 welded to the side of the frame 3. A hydraulic actuator 26 is pivotally connected between the mast 24 and the bracket 25 and is actuated by hydraulic means to pivot the side beams 4 on the frame 3. The bulldozer blade is raised and lowered by a circuit other than the circuit illustrated for angling of the blade. The angling of the blade more specifically refers to causing the blade to move in a manner whereby the angle of the blade is changed relative to the longitudinal axis of the vehicle.

Referring to FIG. 3, the hydraulic system is illustrated for angling the blade. FIGS. 5 and 6 also illustrate the latching means which is spring biased to a close position and hydraulically moved to an open position.

The base member 28 supports a cylinder 29 in which reciprocates a piston 30 having a latch portion 12 mounted thereon. The latch portion 12 is biased to an extended position as shown by the spring 11. When the latch 12 is extended, the pin 9 is retained within the socket 10 and the blade pivots about the axis defined on this pin.

When the bulldozer blade is angling, hydraulic fluid enters the conduit 32 and passes into the chamber 33 biasing the piston 30 to a retracted position against the biasing force of spring 11 causing the latch portion 12 to retract and permitting pin 9 to leave the pin socket 10 when the hydraulic actuator 13 is actuated.

Referring to FIG. 4, a connector for the hydraulic actuator which operates the angling of the blade is shown. A pin 34 is fastened to a metal support 35 and extends upwardly from the support. An end plate 36 biases the sleeve 37 downwardly against a shoulder 38 on a pin 34. A bushing 39 is received on the outer periphery of the sleeve 37 to form a ball-and-socket joint. A portion of the housing 40 of the hydraulic actuator encircles the sleeve 39. In this manner strain caused by movement other than the actual pivotal movement about the pin 34 is eliminated.

Referring to FIG. 3, the hydraulic system is illustrated. The system consists essentially of a control valve 41 which is manually controlled to operate the angling of the blade. The hydraulic conduit 43 receives pressurized hydraulic fluid from passage 44 in the valve 41 when the valve is moved to the upper position. The fluid passes into chamber 45 of the hydraulic actuator 13. The piston 47 is biased to a rearward position and pin 9 is received within the socket 10 at which point the valve 48 opens permitting the passage of fluid into the chamber 33 of the latch 8. It is noted that the pressurized fluid on both sides of the check valve 50 have no effect and the fluid will pass into the chamber 33 of the latch mechanism. The latch portion 12 is biased to a contracted position permitting the pivot pin 9 on this side of the vehicle to be released. As the piston 30 moves against the biasing force of the spring 11, pressurized fluid then passes through the conduit 51 into the chamber 52 in the actuator 53. The pin 9 is released from its socket 10 and the piston 54 moves forwardly within the actuator 53 causing the angling of the blade. The

reverse process is accomplished when the blade is counter rotated about the other anchor pin.

Referring to FIG. 7, a bucket 55 is mounted on a vehicle 56. The mast 57 is mounted on the vehicle frame to provide supporting means for the linkages carrying the bucket 55. The boom 58 is pivotally supported on a mast 57 and extends downwardly to pivotally support the bucket. An arm 59 is also connected to the bucket 55 and extends upwardly to connect a cross link 60 by means of ball joint connectors. The cross link 60 has an intermediate pivot connection to the rod 61 of the actuator 62 which in turn is pivotally connected to the mast 57. The raising and lowering of the bucket 55 is accomplished through the actuation of the actuator 100. A more detailed illustration of the means by which the link 59 and the boom 58 are connected to the bucket 55 is illustrated in FIG. 8 and FIG. 9. A hydraulic actuator 63 is pivotally connected by the pin 64 to the bucket 55. The lower end of the actuator 63 is formed by a rod 65 which is pivotally connected to the bracket 66. A latch 67 is fastened to the bucket 55 on its underside. The latch 67 is hydraulically connected to a system illustrated in FIG. 3. The pin 68 is similar to the anchor pins 9 as described in FIGS. 1 and 2. The latch mechanism 67 releases the pin permitting the one end of the bucket to be elevated with respect to the opposite end of the bucket in which the pin 68 is still retained in its latch position. A bucket 55 may be elevated upon being filled with material for unloading in a truck. The pin 68 which is adjacent the truck remains in a latch position while the pin 68 on the side away from the truck is released. The hydraulic actuator 63 is actuated to tilt the bucket 55.

The operation of tipping the bucket 55, shown in FIG. 10, to unload the material is basically the same as the device illustrated in FIG. 9. FIG. 10 is a modification from that shown in FIGS. 8 and 9. Referring to FIG. 10, a single hydraulic actuator 70 tilts the bucket 55 subsequent to releasing of the latch 67.

The operation of this device will be described in the following paragraphs.

The bulldozer blade illustrated in FIGS. 1 and 2 will operate basically on the same principle as that of the bucket illustrated in FIGS. 7, 8 and 9 and also the bucket illustrated in FIG. 10. The basic function common to all of these attachments is that the attachment pivots about one or the other of a pivot pin connected to the attachment. The attachment is pivotal about one or the other pivot pin and only a single hydraulic actuator produces angling of the attachment at one time. In other words, the hydraulic actuators which drive the attachment away from the vehicle body or away from the attachment support operate singly. A guided movement is provided for angling of the bulldozer blade or tipping of the bucket. As shown in FIGS. 1 and 2, the beams 4 are of a slightly smaller vertical dimension than the internal dimension of the U-shaped member 18 which provides a guide for firmly controlling the angular motion of the bulldozer blade. In other words, member 18 and blade 14 are held to a movement lying within a plane parallel to or coincidental with a plane including the longitudinal axis of the beams 4.

Referring to FIGS. 1 and 2, the bulldozer blade is mounted on a reinforcing boxlike structure for maintaining rigidity of the moldboard. The member 18 supports the rearward portion of the boxlike structure which provides a supporting structure for the blade in connection with the side beams 4 which are pivotally mounted on the vehicle. The blade may be raised and lowered as illustrated in FIG. 1 through the use of the hydraulic actuators 26 which operate between the brackets 25 and the masts 24. The raising and lowering of the blade is a pivotal movement about the pivoting axis of the side beams 4.

A tilting motion of the blade is accomplished by a hydraulic means rotating the moldboard and the boxlike supporting structure 19 supporting the moldboard about a pivotal axis 23 between a boxlike structure 19 and the member 18. This tilting motion provides a maneuverability of the blade by lifting one end or the other end to accommodate movement of the blade in a vertical plane.

The angling of the blade more specifically known as the pivotal movement in a horizontal plane or pivoting in a plane coincidental or parallel with the side beams 4. This action is accomplished through the use of the hydraulic circuit illustrated in FIG. 3 which operates the actuators 13 forwardly or rearwardly in response to the action of the valve 41. The valve 41 is manually controlled and permits the flow of fluid from the source of pressurized fluid 81 to actuate the actuators 13. The valve may be positioned in its neutral position in which no operation or change of position of the blade is accomplished or either of the extreme positions. When the valve is in the extreme lower position pressurized fluid passes through the conduit 42 into the chamber 52 on the forward side of a piston 54 which biases the piston 54 to a retracted position. When the piston 54 is in its fully retracted position, the valve 84 is opened in response to the pressurized fluid passing through conduit 85. The pressurized fluid is then permitted to pass into the chamber 87 on the fluid side of the piston 88. Pressurized fluid in chamber 87 biases spring 89 to a compressed position which permits unlatching of the anchor pin 9 on the left-hand side of the vehicle. As the anchor pin is unlatched the pressurized fluid simultaneously enters the chamber 90 on the rearward side of the piston 47 biasing the piston to the forward position as the anchor pin 9 leaves the socket on the left-hand side of the vehicle. The blade pivots in a plane parallel with the longitudinal axis of the side beams 4 which in turn produces an angling of the blade 14.

When the blade is angled in the reverse direction, the reverse cycle is complete. The piston 47 receives pressurized fluid when the valve 41 is in the upper position and the pressurized fluid in chamber 45 causes the pin 9 to seat in its socket 10 when the blade is fully retracted. In response to the flow of pressurized fluid through the conduit 91 the valve 48 opens permitting the flow of pressurized fluid into chamber 33 of the latch 8. Simultaneously with the seating of the anchor pin 9 on the left-hand side of the vehicle, the pressurized fluid in the chamber 87 is vented through the check valve 93 to return to the reservoir. The pressurized fluid will cause the latch 8 on the right-hand side to unlatch and the fluid motor 13 to angle the blade forwardly on the right-hand side.

A latch 8 as shown in FIGS. 5 and 6 operates in the same manner as the latch 67 as shown in FIGS. 8, 9 and 10. The system shown in FIG. 3 is also used for the operation of bucket 55 as shown in FIGS. 8 and 9.

The hydraulic actuators 63 on the right- and left-hand side of the bucket 55 serve to lift one side of the bucket while the bucket pivots on a pin on the opposite end.

Referring to FIG. 10, a single actuator 70 is shown operating centrally on the bucket 55. The pin of the latching means 99 on either side of the bucket serves as a pivotal axis depending on which side the bucket 55 is to be tilted. The central actuator 70 is a simplification of the two actuators 63 as shown in FIGS. 8 and 9.

I claim:

1. A material moving attachment mounted on a vehicle comprising a vehicle body means, support means including a cross member fastened to a pair of side beams connected to said vehicle body means, an attachment adapted for moving material, a hydraulic actuator having a connection pin means pivotally connected to and extending from each of said side

beams, a pivot pin pivotally connecting one of said actuators on each end of said attachment for supporting said attachment through said pins, anchor means on the sides of said support means defining a pair of sockets each receiving one of said connection pin means and limiting the return movement of each of said pivot pins relative to said support means, a latching means on said support means selectively restraining the extending movement of each of said pivot pins relative to said support means, means for selectively controlling said latching means and said actuators for selectively pivoting said attachment about one of the axes of said pivot pins while an actuator extends the other pivot pin relative to said support means.

2. A material moving attachment mounted on a vehicle comprising a vehicle body means, support means including a cross member fastened to a pair of side beams connected to said vehicle body means, an attachment adapted for moving material, a hydraulic actuator pivotally connected to and extending from each of said side beams, a pivot pin pivotally connecting one of said actuators on each end of said attachment for supporting said attachment through said pins, anchor means on the sides of said support means defining a pair of sockets receiving said pins and limiting the return movement of each of said pivot pins relative to said support means, a latching means on said support means selectively restraining the extending movement of each of said pivot pins relative to its mating anchor means, means for selectively controlling said latching means and said actuators for selectively pivoting said attachment about one of the axes of said pivot pins while an actuator extends the other pin relative to its mating socket.

3. An earthmoving attachment as set forth in claim 2 wherein said attachment includes a subassembly reinforcing said blade and having a U-shaped cross section receiving the forward end of said support means firmly guiding the movement of said attachment in a planar movement and providing firm support of the attachment during angling.

4. An earthmoving attachment as set forth in claim 2 wherein said hydraulic actuators retract one of said pins to seat on its mating anchor, said latching means include a hydraulic actuating means to sequentially unlatch the other of said pivotal pins for angling said attachment about the pivotal axis of the anchored pivot pin.

5. An attachment as set forth in claim 2 including said anchor means mounted at the proximity of the front corners of said vehicle body means to cause a forward movement of the attachment in front of the vehicle body means and rearward movement of the attachment to the side of the vehicle body means to permit a close mounting of the attachment to the front end of the vehicle body means.

6. An attachment mounted on a vehicle as set forth in claim 2 wherein said pivot pin defines a substantially vertical axis.

7. An attachment mounted on a vehicle as set forth in claim 2 wherein said support means comprises a U-shaped member including said side beams extending along said body means.

8. An attachment mounted on a vehicle as set forth in claim 2 including ball joint connectors pivotally connecting said actuators to said side beams of said support means.

9. An attachment mounted on a vehicle as set forth in claim 1 wherein the attachment comprises a bucket.