# United States Patent [19]

**Davis**

[11] **3,759,110**

[45] **Sept. 18, 1973**


[54] **HYDRAULIC ANGLE DOZER**


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[73] Assignee: **J. I. Case Company**, Racine, Wis.



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[21] Appl. No.: **216,366**

[52] **U.S. Cl.** ..... **74/99**, 172/805

[51] **Int. Cl.** ..... **F16h 21/44**

[58] **Field of Search** ..... 172/801, 802, 803, 172/804, 805, 806, 807, 809; 180/79.28; 74/99



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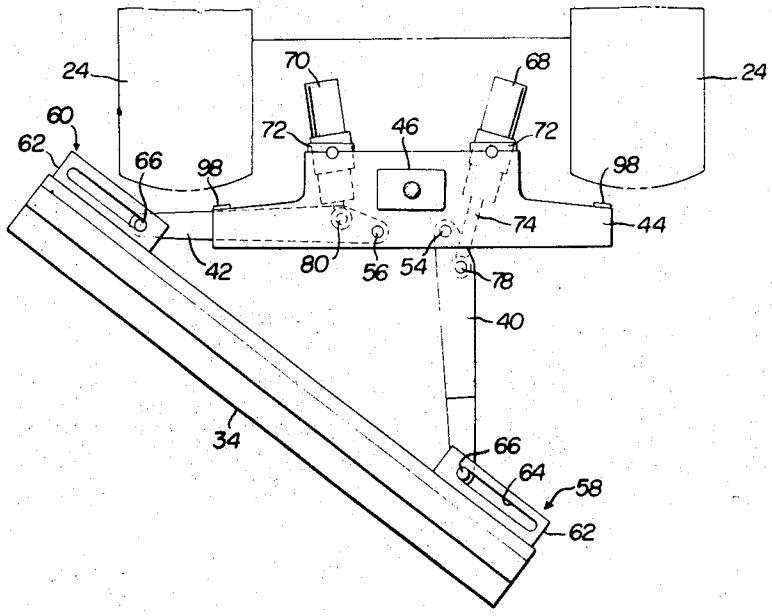
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*Attorney*—Daniel G. Cullen et al.

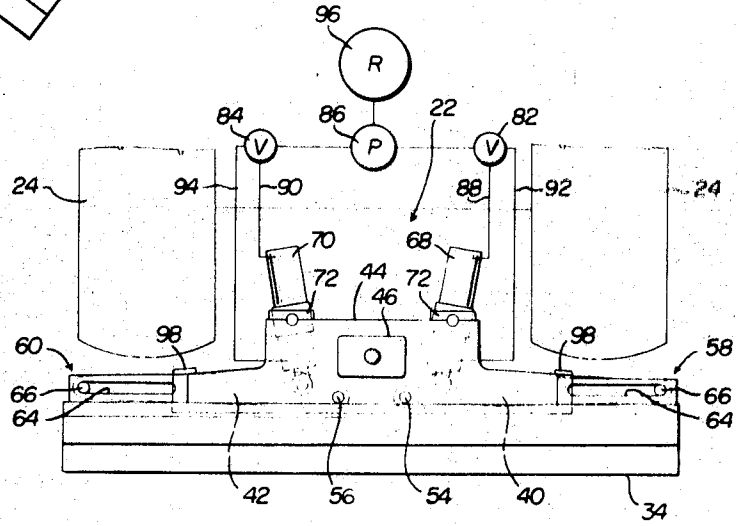


[57] **ABSTRACT**

This disclosure relates to an angling mechanism for a bull dozer blade, or the like, which is adapted to extend and angle the dozer blade and is capable of automatically shifting the blade laterally, in the angled position, to provide a blade over-hang. The angling mechanism includes a pair of arms which are pivotally supported at one end on the dozer frame for horizontal swinging movement; the opposed ends are attached to the dozer blade by pivotal connections. the dozer blade includes a pair of slots which receive the pivotal connections to the arms and permit angling of the blade and lateral movement as described above. The arms are rotated in the disclosed embodiment by hydraulic cylinders connected to the arms, between the pivotal connections, and the cylinders are operable, independently, to extend the blade in parallel relation to the dozer frame or angle the blade, as described above.


**13 Claims, 5 Drawing Figures**



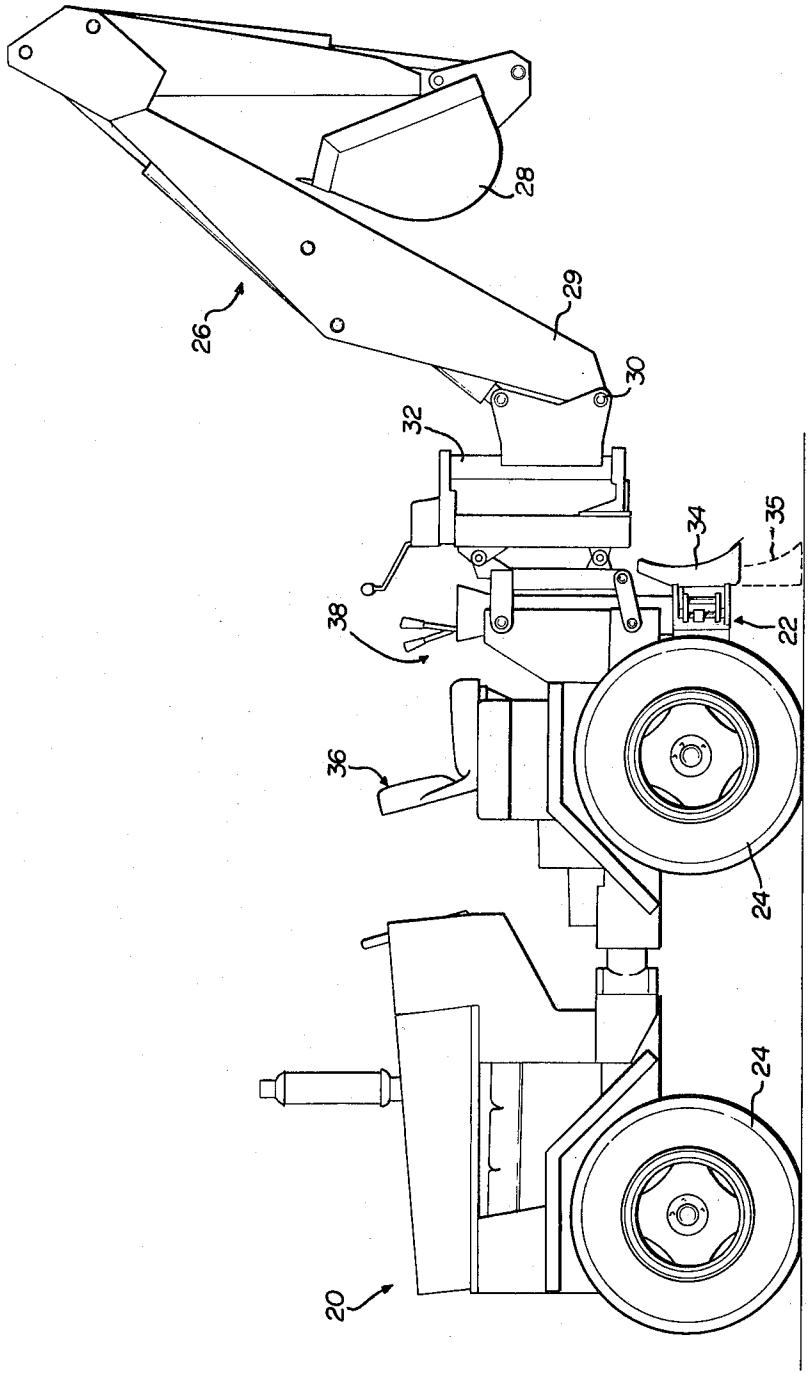



FIG. 1

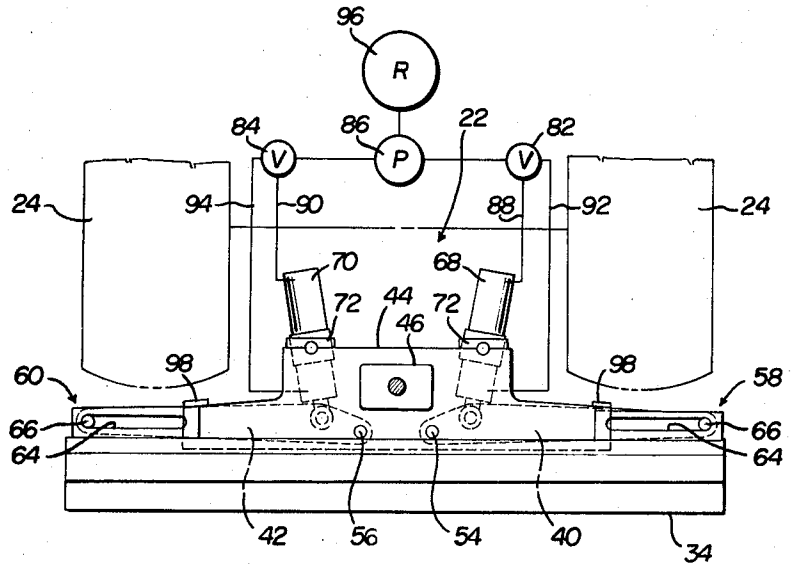

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FIG. 2

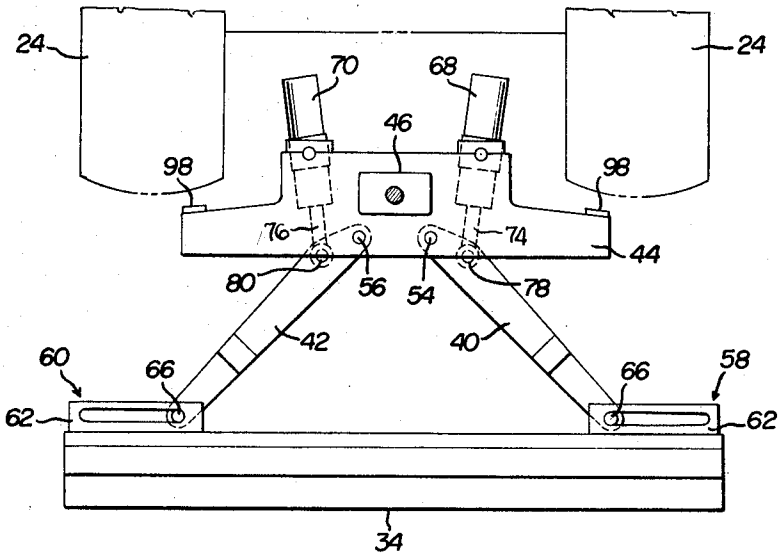

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FIG. 3

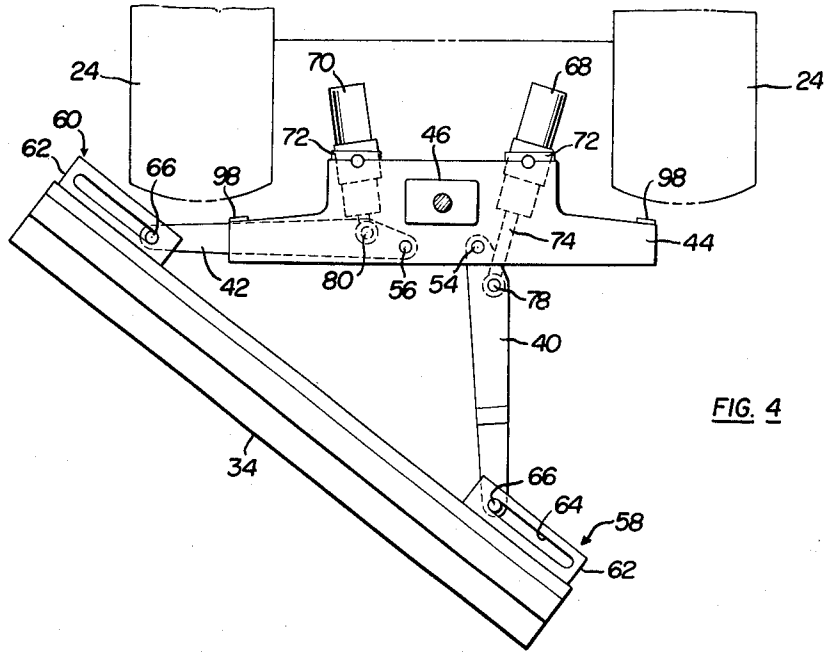
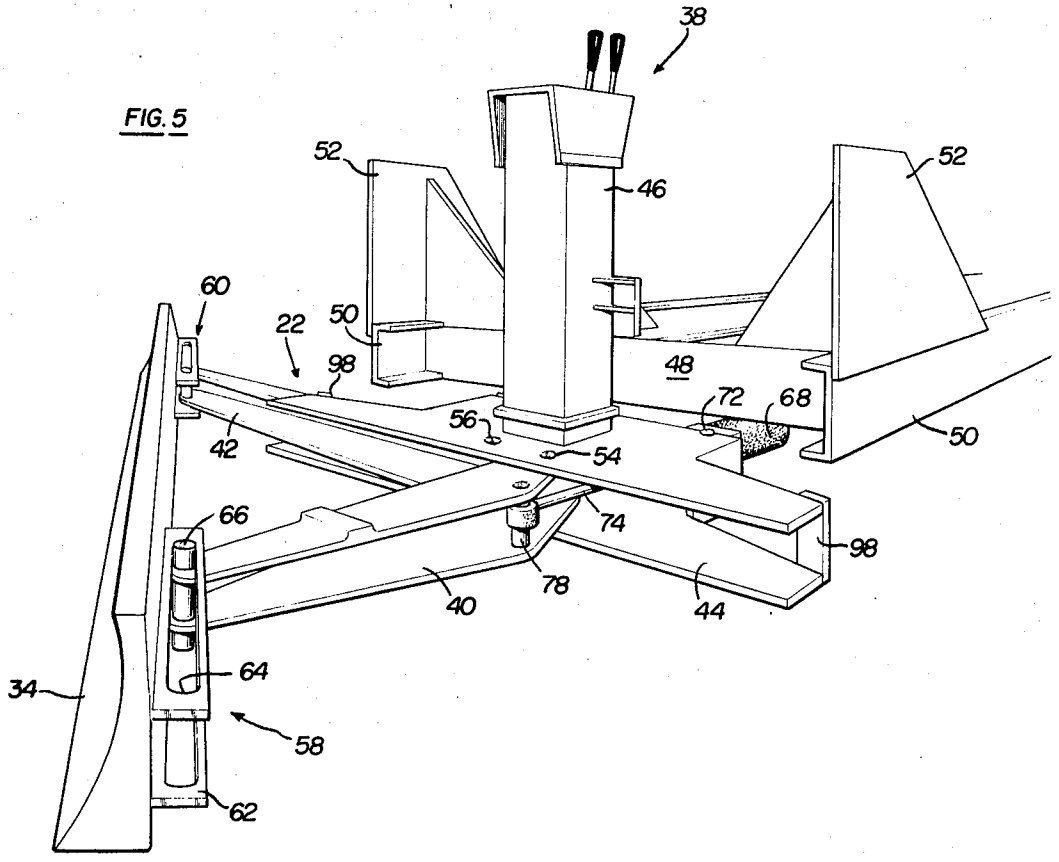

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FIG. 4

FIG. 5


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# HYDRAULIC ANGLE DOZER

## FIELD OF THE INVENTION

The angling mechanism of this invention is particularly, although not exclusively, adapted to angle the blade of a bull dozer or the like, wherein the blade may be retracted close to the bull dozer frame or shifted laterally, in the angled position, to provide an over-hang.

The prior art includes a number of angling mechanism for bull dozer blades, and the like, however these mechanisms are generally not fully satisfactory for relatively small tractors or dozers, wherein the blade is preferably close to the dozer frame for stability and ease of handling. For example, the bull dozer blade is normally angled by hydraulic cylinders which are connected to the blade or to the pitch mechanism. This structure generally does not permit the blade to be retracted close to the bull dozer frame.

Further, the angling mechanisms shown by the prior art generally do not permit lateral adjustment of the blade without disconnecting the blade from the support. The angling mechanism of this invention will automatically shift the blade laterally to permit the filling of a trench, or the like, without manual adjustment of the blade.

The prior art does include rotatable link angling mechanisms for bull dozer blades, however these mechanisms do not provide the advantages of the angling mechanism disclosed in this application and generally require manual adjustment of the blade angle and disconnecting of the blade from the support during adjustment. Examples of the prior art include the following U.S. Pat. Nos.:

2,634,519;
2,967,364;
2,973,592.

The angling mechanism of this invention is supported on a frame or platform and, in the disclosed embodiment, the frame may be raised or lowered to adjust the vertical position of the bull dozer blade. The blade is supported on the frame by a pair of arms which are pivotally connected to the frame for horizontal swinging movement about a vertical pivot axis. Each of the arms are also connected to the blade by a pivotal connection, which may be shifted a limited predetermined distance, generally parallel to the plane of the blade. In the disclosed embodiment, the blade includes a pair of slots, generally parallel to the plane of the blade, which limit the movement of the pivotal connections as described hereinbelow.

The arms are individually controlled and rotated about the vertical pivot axis by a drive means connected to each of the arms, between the pivot axis and the pivotal connection to the blade. The arms thereby function as a lever to extend and angle the blade. The slots limit the movement of the blade and lock the blade in any desired angular position. Further, the slots will permit the blade to shift laterally to provide a predetermined over-hang. In the disclosed embodiment, the drive means includes two hydraulic cylinders, which are fixed relative to the frame, each having a piston rod pivotally connected to the arm.

In the disclosed embodiment, the arms are pivotally attached to the frame adjacent the longitudinal axis of the dozer and the blade is retracted, towards the frame, by pivoting the distal ends of the arms outwardly to engage a stop on the frame. The arms define an angle of



approximately 180° in this position. If the drive means is then operated to pivotally rotate the arms, simultaneously, the blade will be shifted away from the frame, in parallel relation, until the pivotal connections of the arms lock at the inner ends of the blade slots. Alternatively, if one of the arms is pivoted, away from the frame, and the other arm remains in the stop position, the blade will be angled, relative to the frame, until the pivotal connection of the rotating arm engages the inner end of the blade slot. The blade is then shifted laterally by the rotating arm, in the angled position, until the opposite arm engages the inner end of the blade slot. The blade is thus automatically angled and shifted laterally to provide the desired over-hang. Any angular position may be obtained by variation of this procedure. For example, the left arm may be rotated a relatively small distance and the right arm may be rotated the full extent of travel. The blade will thereby be extended and angled, but to a smaller angle than if the left arm remained at the stop position.

It can be seen from the above, that the angling mechanism of this invention provides many advantages which are not found in the prior art devices. These advantages include the ability of the angling mechanism to angle and lock a dozer blade in an almost infinite number of positions; the ability to automatically shift the blade laterally without substantially changing the blade; the ability to retract the blade against the dozer frame; and, the ability to extend the blade in parallel relation.

Other advantages and meritorious features of the angling mechanism of this invention will more fully appear from the following Description of the Preferred Embodiments, the Claims and the Drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a bull dozer including the blade angling mechanism of this invention;

FIG. 2 is a top elevation, partially schematic of the angling mechanism of this invention, with the dozer blade at the "stop" position;

FIG. 3 is a top view of the embodiment of the angling mechanism of FIG. 2, with the dozer blade in the fully extended position;

FIG. 4 is a top view of the angling mechanism shown in FIG. 2, with the dozer blade in the extreme angled position; and

FIG. 5 is a perspective side elevation of the dozer angling mechanism of this invention with portions of the dozer removed.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The dozer-backhoe 20 illustrated in FIG. 1 is similar to a commercially available bulldozer manufactured by Davis Manufacturing, a Division of J. I. Case Company. The illustrated embodiment is a Davis "FLEETLINE" Model "70+4," except for the angling mechanism 22 which forms the invention described herein. The other details of the bulldozer illustrate some of the advantages of the angling mechanism of this invention, but do not form part of the invention, except as claimed hereinbelow.

The disclosed embodiment of the bulldozer or tractor 20 is relatively small by commercial standards, but is capable of preforming a number of operations. The dozer includes four wheels 24 which may be indepen-

dently driven for forward or reverse. The backhoe **26** is also commercially available from Davis Manufacturing and includes a bucket **28** for digging operations. The arm **29** is pivoted at **30** raising or lowering the bucket **28**, relative to ground and the backhoe assembly may be swung, on shaft **32**, out of the way for dozer operation.

The dozer blade **34**, in this embodiment, may be lowered for operation, as shown in phantom at **35**, or the blade may be raised out of the way for operation of the backhoe **26**, as shown in FIG. **1**. It can alos be seen from FIG. **1** that the dozer blade **34** is preferably retained close to the dozer **20**, beneath the backhoe assembly **26**. Further, the center of balance of the dozer backhoe, shown in FIG. **1**, will be affected by the position of the bulldozer blade, which is important because of the overhanging backhoe. When the apparatus is not being utilized as a dozer, therefore, the dozer blade **34** is preferably tucked away beneath the backhoe. This relationship is particularly important in a relatively small dozer assembly, such as shown in FIG. **1**.

The preferred embodiment of the angling mechanism **22** is best shown in FIGS. **2** to **5**, wherein FIGS. **2** to **4** illustrate three extreme positions for the dozer blade **34** and FIG. **5** illustrates certain details of the structure. In the disclosed embodiment, the blade **34** is supported by a pair of arms **40** and **42** on a frame **44**. The frame, in turn, is supported on a center mast **46** which includes the console **38**. As stated above, the frame **44** may be raised or lowered to adjust the vertical position of the blade. The center console is supported on the dozer frame including frame member **48**, as shown in FIG. **5**, cross frame members **50** and side frame sections or panels **52**.

The arms **40** and **42** are pivotally supported on the frame **44** by pivot pins **54** and **56**, respectively, which form the pivot axis for the arms as described hereinbelow. The arms are also pivotally connected to the blade **34** by pivotal connections **58** and **60**, respectively. In the preferred embodiment, the pivotal connections **58** and **60** are shiftable, generally parallel to the plane of the dozer blade **34**, to permit lateral shifting of the blade and locking of the blade in the angled position, as described above. In this embodiment, the blade includes a pair of U-shaped brackets **62** secured to the rearward face of the blade, adjacent the opposed ends. Each of the legs of the U-shaped bracket includes a slot **64**, as shown in FIG. **5**, which pivotally receives the pivot pins **66**. In the disclosed embodiment, the arms are channel-shaped and the pin **66** may be welded or otherwise secured to the opposed ends of the channel, as shown in FIG. **5**. The bracket **62** may be secured by any suitable means to the dozer blade, including rivetting or welding. The pivotal connections **58** and **60** may thereby be shifted laterally, relative to the dozer blade is shifted relative to the frame **44**.

In the preferred embodiment of the angling mechanism of this invention, the arms are rotated or swung about the pivot axes **54** and **56** by hydraulic cylinders **68** and **70** respectively. The hydraulic cylinders are supported on the frame by brackets **72**. Each hydraulic cylinder includes a piston rod, **74** and **76** respectively, which is pivotally connected by pivot pins **78** and **80**, respectively, to one of the arms, between the pivotal connections to the frame **44** and the blade **34**. The arms thus function as a lever to adjust the position of the blade, as described hereinbelow.

It is important to note that cylinders **68** and **70** may be operated independently to adjust the position of the arms, as shown in FIG. **2**. The control for the hydraulic cylinders **68** and **70** include conventional hydraulic valves **82** and **84**, respectively, which are each operatively connected to pump **86**. The piston rods **74** and **76**, see FIG. **3**, may be individually extended by pressure to lines **88** and **90**, respectively, which are independently controlled by hydraulic valves **82** and **84**. Lines **92** and **94** then function as return lines for the hydraulic fluid. Alternatively, the piston rods may be retracted by pumping hydraulic fluid to lines **92** or **94**. Reference **96** indicates a reservoir for the hydraulic fluid.

The blade may be retracted, as shown in FIG. **2**, simply by retracting both piston rods. In this position, the arms engage the frame stops **98**, best shown in FIG. **5**. The blade may be extended in parallel relation, as shown in FIG. **3**, by extending both of the piston rods **74** and **76**. As the piston rods are extended, the arms **40** and **42** will be pivoted about pivot axes **54** and **56**, respectively, rotating the arms to the position shown in FIG. **3**. As the arms are rotated, the pivot pins **66** will shift from the position shown in FIG. **2** to the inner end of the slots, as shown in FIG. **3**. In this position, the arms are locked against further movement.

If the blade is to be angled, as shown in FIGS. **4** and **5**, only one of the hydraulic cylinders is actuated to extend one of the piston rods. In the position shown in FIGS. **4** and **5**, the piston rod **74** is extended to rotate the arm **40** about the pivot axis **54**. As the arm is rotated, from the position shown in FIG. **2**, the pivot pin of arm **40** will shift in the slot **64** until the pin engages the inner end of the slot of pivotal connection **58**. In this position, the dozer blade **34** does not over-hang the lateral extent of the wheels **24**. Further rotation of arm **40** however shifts the blade laterally until the pin **66** engages the inner end of the slot in pivotal connection **60**, as shown in FIG. **4**, wherein the blade over-hangs the side of the dozer and the position of the arms is locked. The arm **42** is locked against the frame stop **98**.

The blade may also be angled in any position, relative to the frame **44**, between the positions shown in FIGS. **2** and **4**. This is accomplished by rotating the arm **42** some distance less than full extension and thereafter fully rotating arm **40**. Alternatively, arm **40** may be retained in the position shown in FIG. **2** and arm **42** rotated to angle the blade in the opposite direction. In any of the above positions, the blade is locked in position when both of the pivot pins **66** engage the inner end of the slots **64**. The blade may thus be angled and locked in any desired position.

What is claimed is:

**1**. An angling mechanism for an implement, comprising: a frame, a pair of arms pivotally connected adjacent one end to said frame for generally horizontal swinging movement, each of said arms pivotally connected adjacent the opposed end to said implement and defining an adjustable obtuse angle therebetween with said pivotal connections spaced further at said implement than at said frame, said pivotal connections on said implement shiftable a limited predetermined distance to permit lateral movement of said implement relative to said frame, and drive means pivotally connected to each of said arms on opposed sides of said pivotal frame connections and between said end pivotal connections, said drive means extensible toward said

implement to independently swing one of said arms to angle said implement relative to said frame and simultaneously shift said implement laterally or swing said arms in unison to shift said implement relative to said frame, in parallel relation.

2. The angling mechanism defined in claim 1, characterized in that said implement includes a pair of spaced, generally coaxially aligned slots which receive said arms for pivotal securement, said slots permitting said arms to shift laterally, relative to said implement.

3. The angling mechanism defined in claim 2, characterized in that said drive means is adapted to independently swing said arms from a position defining approximately 180° therebetween, and said slots restricting the relative movement of said arms to said movement, whereby said arms may be locked against the adjacent ends of said slots in any angular position.

4. The angling mechanism defined in claim 1, characterized in that said drive means includes a pair of independent fluid cylinders operably connected to said frame including a piston rod connected to said arms, between said pivotal connections, extendable to swing said arms about the pivotal connection to said frame.

5. The angling mechanism defined in claim 1, characterized in that said frame includes a longitudinal axis and said arms are pivotally connected to said frame on opposite sides of said axis, substantially equally spaced from said axis, said frame including a stop means preventing swinging movement of said arms beyond 180°, said drive means adapted to independently swing one of said arms approximately 90°, whereby said impleme0t is first angled relative to said frame and the other of said arms is then shifted, relative to said implement, to lock the arms in angled relation to said implement and shifting the implement laterally relative to said frame.

6. An angling mechanism for a bulldozer blade, or the like, comprising: a dozer frame having a longitudinal axis, a pair of arms pivotally attached to said frame substantially equally spaced from said axis and supported for generally horizontal swinging movement, each of said arms attached to said blade by spaced pivotal connections supporting the blade on the frame, said pivotal connections spaced a greater distance on said blade than on said frame to define an adjustable obtuse angle between said arms, means on said blade permitting said swivel connections to shift, relative to the blade and substantially in the plane of said blade, a limited predetermined distance on opposite sides of said axis, whereby said blade may be angled, relative to said frame, by swinging movement of said arms and a drive means connected to each of said arms between the swivel connections to said frame and said blade on opposed sides of said pivotal frame connections, said drive means adapted to independently swing each of said arms about the swivel connection to said frame, thereby angling the blade and shifting the blade laterally.

7. The angling mechanism defined in claim 6, characterized in that said drive means includes a pair of hydraulic cylinders fixed relative to said frame and each having a piston rod connected to one of said arms.

8. The angling mechanism defined in claim 6, characterized in that said means on the blade limits the swinging movement of said arms, about the swivel connection to the frame, from a position where the blade is adjacent the frame to a position where the arms define approximately a 90 degree angle.

9. The angling mechanism defined in claim 8, characterized in that said means on the blade is a pair of slots substantially equally spaced from said axis, said slots having an axis substantially parallel to the plane of the blade.

10. The angling mechanism defined in claim 9, characterized in that each of said arms include a pin which is received within one of said slots for pivotal and sliding movement therein.

11. The angling mechanism defined in claim 6, characterized in that said means of said blade includes a pair of slots adjacent the distal ends of said blade which receive the pivotal connections of said arms, said slots substantially equal in length and having an axis substantially parallel to the plane of said blade.

12. The angling mechanism defined in claim 11, characterized in that said frame includes a stop means which prevents swinging movement of said arms beyond 180° and said slots limit swinging movement of said arms to a position where the arms define an angle greater than approximately 90°, whereby said blade may be positioned by said drive means adjacent said frame or angled by swinging one of said arms about said pivotal connection to the frame, whereby the blade is first angled and thereafter shifted laterally in the angled position.

13. The angling mechanism defined in claim 11, characterized in that said slots limit the angular relation between the arms to an angle greater than about 90°, whereby said blade may be angled relative to said frame by swinging movement of one of said arms, about the pivotal connection to said frame, and the blade may thereafter be shifted laterally in the angled position.

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