

March 23, 1954

A. J. WERNER ET AL

2,672,994

HYDRAULIC IMPLEMENT CONTROL UNIT

Filed March 10, 1950

4 Sheets-Sheet 1

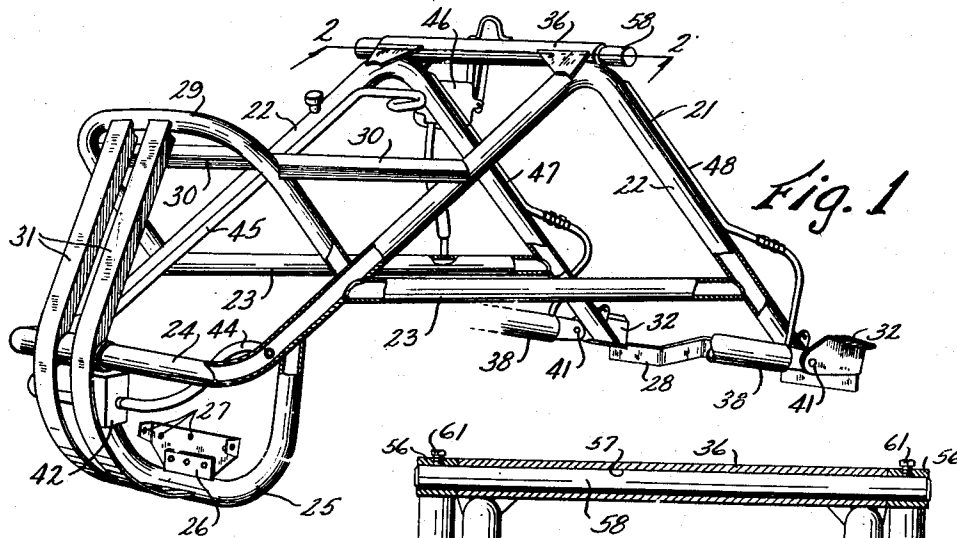


Fig. 1

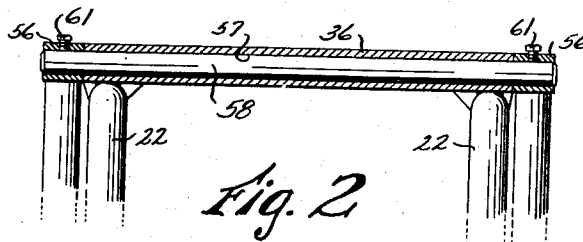


Fig. 2

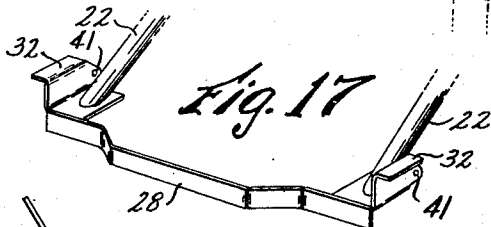


Fig. 17

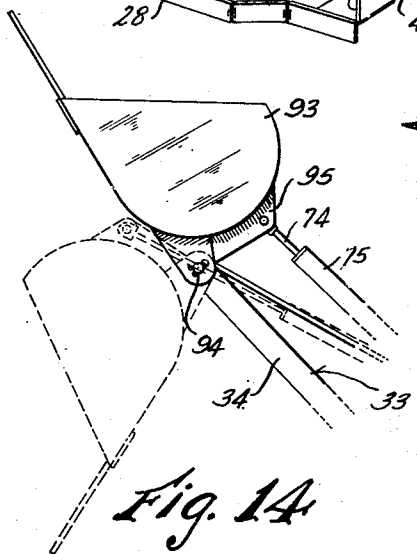


Fig. 14

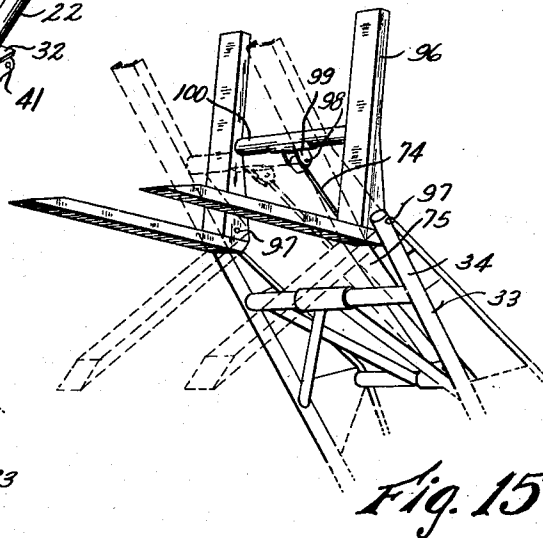


Fig. 15

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4 Sheets-Sheet 2

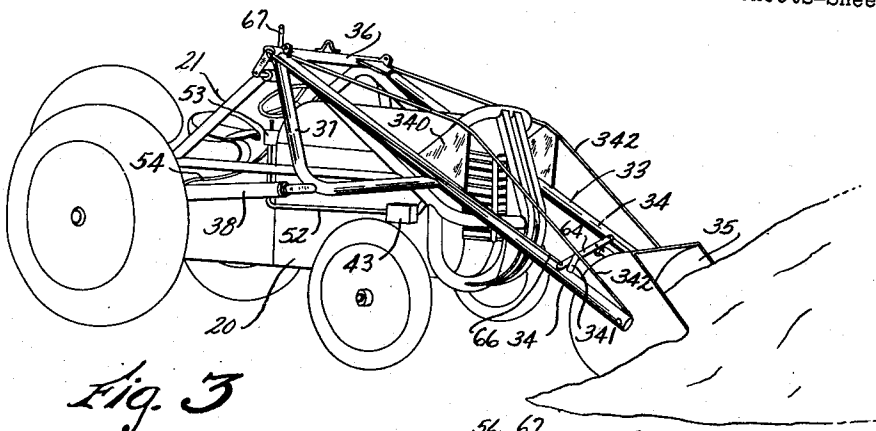


Fig. 3

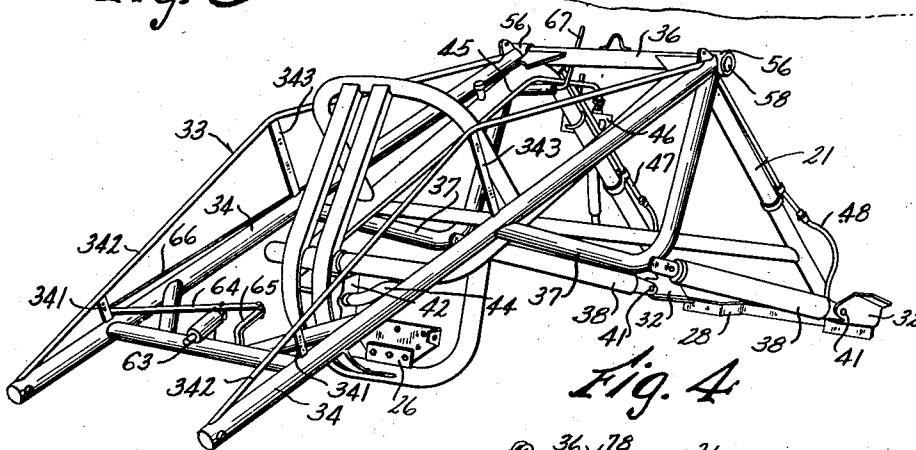


Fig. 4

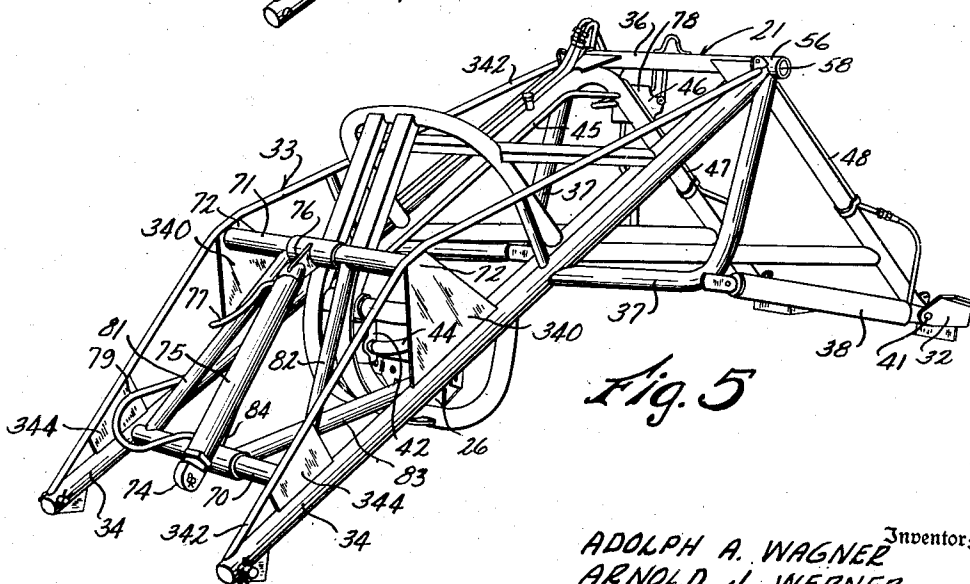


Fig. 5

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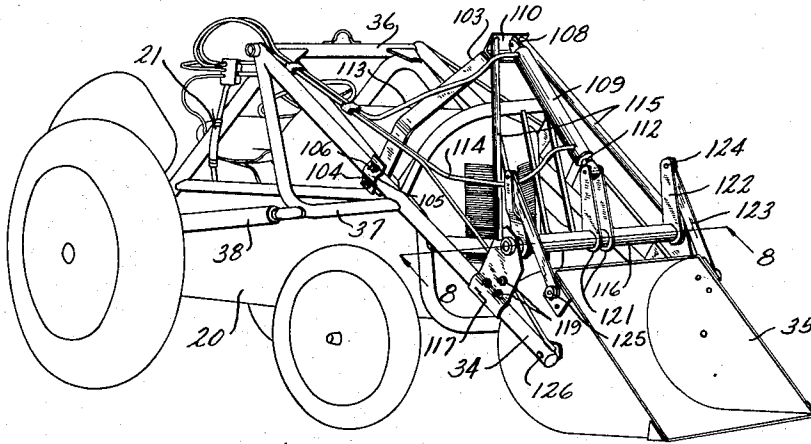


Fig. 6

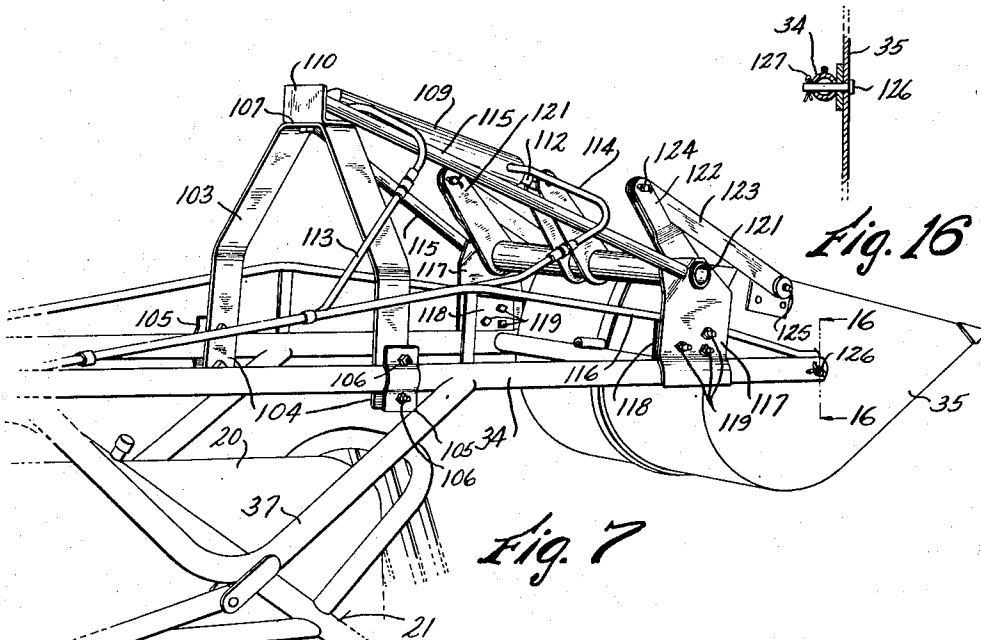


Fig. 7

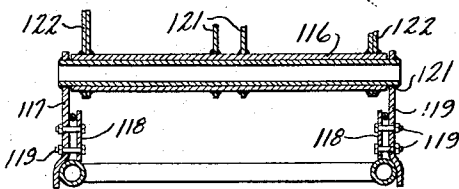


Fig. 8

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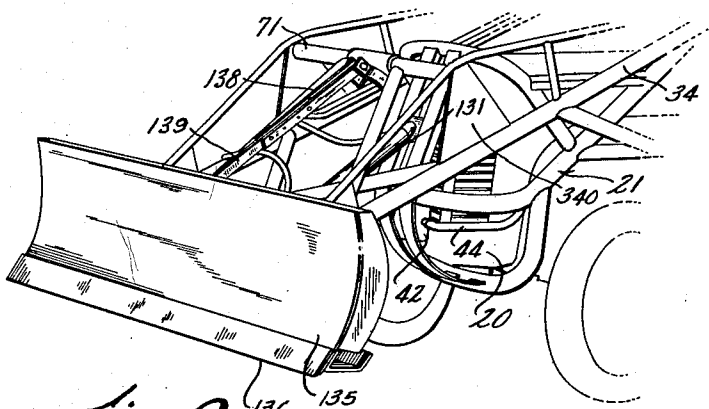


Fig. 9

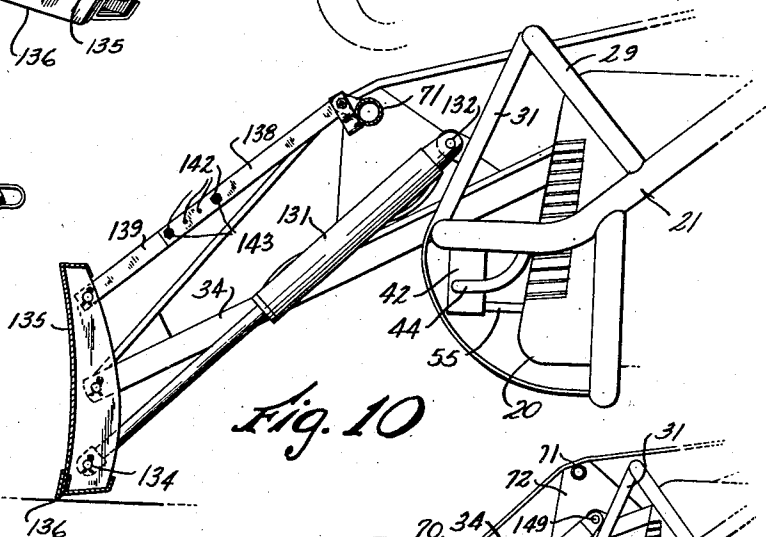


Fig. 10

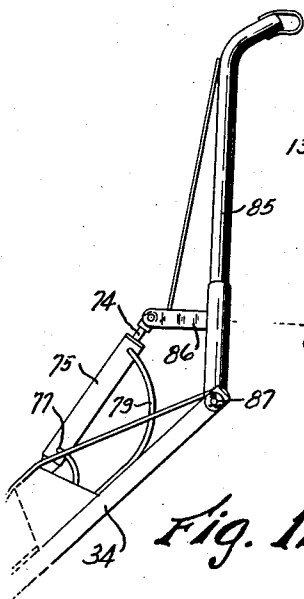


Fig. 12

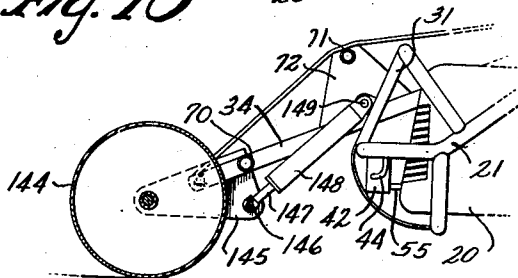


Fig. 11

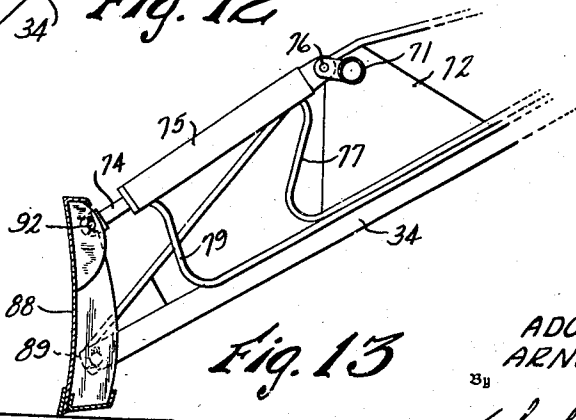


Fig. 13

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UNITED STATES PATENT OFFICE

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HYDRAULIC IMPLEMENT CONTROL UNIT

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Application March 10, 1950, Serial No. 148,961

3 Claims. (Cl. 214-140)

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This invention relates to dipper stick attachments for tractors and more particularly to a dipper stick attachment having hydraulic front end power lift apparatus.

An object of the invention is to provide a dipper stick attachment having an independently operable hydraulic front end power means for the powered manipulation of an implement pivotally attached to the dipper stick. In this connection, it is a particular object of the invention to provide novel mounting structure for the pivotal mounting of the hydraulic power means at the lift end of the dipper stick. A further particular object is to provide a hydraulic power means and novel mounting structure in a completely detachable unit or package which may be readily applied to dipper sticks not originally equipped with hydraulic power means.

Another object of the invention is to provide for the rapid interchange of a variety of dipper sticks on a single base frame. In this manner, a variety of dipper sticks having different functions, purposes, and applications of use may be readily interchanged upon a single base frame without requiring dismounting of the base frame from the tractor.

These and other objects of the invention will be more clearly apparent to one skilled in the art upon examination of the following disclosure.

In the drawings:

Fig. 1 is a perspective view of a base frame applicable to the tractor and upon which a dipper stick may be pivotally mounted, portions of the hollow frame members being cut away to expose the oil reservoir.

Fig. 2 is a cross sectional view of the novel pivotal connection between the base frame and a dipper stick frame, taken along the line 2-2 of Fig. 1.

Fig. 3 is a perspective view of a tractor equipped with a base frame and with one type of dipper stick frame pivotally mounted upon the base frame.

Fig. 4 is a perspective view of a base frame and a pivotally mounted dipper stick separate from the tractor.

Fig. 5 is a perspective view of a base frame and a different type of dipper stick pivotally mounted thereon, the dipper stick illustrated being provided with front end hydraulic power apparatus.

Fig. 6 is a perspective view of a tractor equipped with a base frame and dipper stick mounted thereon, a completely detachable hydraulic power apparatus being shown on the dipper stick.

Fig. 7 is an enlarged perspective view of the

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completely detachable power apparatus shown in Fig. 6.

Fig. 8 is a cross sectional view taken through the rotatable front cross member of the detachable power apparatus.

Fig. 9 is a perspective view of a modification of the hydraulic front end power apparatus wherein the hydraulic cylinder is connected between the implement and the base frame for the purpose of controllably transferring the weight of the tractor onto the implement.

Fig. 10 is a view in side elevation of the apparatus of Fig. 9.

Fig. 11 is a view in side elevation of similar apparatus showing a different type of implement.

Fig. 12 is a view in side elevation of a crane adapted to be pivotally mounted at the end of the dipper stick and to be controlled by the hydraulic power apparatus.

Fig. 13 is a view in side elevation, partly in cross section, of a scraper blade adapted to be pivotally mounted at the front end of the dipper stick and having a pivotal connection with one of the extensible members of the hydraulic cylinder.

Fig. 14 is a view in side elevation of a manure fork adapted to be mounted at the end of the dipper stick and to be manipulated by the hydraulic cylinder.

Fig. 15 is a perspective view of a fork lift adapted to be pivotally mounted at the end of the arms of the dipper stick and having a connection with the hydraulic apparatus.

Fig. 16 is a cross section taken on line 16-16 of Fig. 7.

Fig. 17 is a rear perspective view of the base frame showing the connective cross member or tie bar between the rear frame mounting brackets.

The principal attachments for the tractor illustrated diagrammatically at 20 comprise a base frame indicated generally as 21 and which is one of a number of such frames shown in the several views.

The base frame 21 comprises a pair of laterally spaced A-frames, each having an arched tubular member 22 and a connecting member 23. The frontal portions of the respective arched members 22 are curved to a mutual, and desirably integral, connection to provide a U-shaped front cross member 24 which embraces the front of the tractor 20. Depending from the arched members 22 is an underslung tubular U-shaped member 25 which fits beneath and receives support from the front of the tractor. Upstanding bracket 26

thereon provides a means for rigidly mounting the frame to the front part of the tractor. The laterally spaced bolt holes 27 in the bracket facilitate the secure and rigid mounting of the frame. An additional U-shaped tubular member 29 bows over the top of the tractor hood, and is reinforced in this position by the braces 30 which brace the members 29 from the arched elements 22 of the A-frames.

The respective members 24, 25 and 29 provide spaced supports for, and are further braced by, the laterally spaced curved angle members 31 which extend in front of the tractor for protection of the tractor engine and radiator and to mount the hydraulic cylinder as shown in the embodiments of Figs. 9, 10 and 11.

The base frame 21 is further provided with angle brackets or shoes 32 at the rear ends of the arched tubular members 22 for the purpose of mounting the base frame at spaced points on the rear axle of the tractor. The rear shoes or brackets 32 are connected by the tie rod 23, as best shown in Fig. 17, which adds strength to the frame and does not interfere with the application of the frame to the tractor as the frame is lowered thereupon by means of a crane or the like.

The base frame provides a pivotal mount for a dipper stick, indicated generally in its different embodiments as 33 in Figs. 3 to 6. For this purpose, the A-frames 21 are cross connected at their apices by a tube 36 which has an internal bearing surface 57 for rock shaft 58.

A simple form of dipper stick having a manual trip control for manipulation of a working implement is shown in Figs. 3 and 4. The dipper stick frame comprises longitudinally extending spaced tubular levers 34 which are pivotally connected at their front ends to the implement, such as the material handling bucket 35, and at their rear ends to the base frame. Each dipper stick lever is of cantilever construction, having a central upstanding strut at 340, a shorter strut at 341, and a tension rod 342 (Fig. 3). Specifically different struts are shown at 343 (Fig. 4) and 344 (Fig. 5).

The levers 34 are provided with paired arms which may conveniently comprise downwardly arched tubular members 37 welded at spaced points to the respective levers 34, and which receive the thrust of the pistons of the paired hydraulic cylinders 38 and transmit such thrust to the dipper stick, desirably at approximately the location of the strut 340. The hydraulic cylinders 38 are pivoted on the pins 41 to the base frame mounting brackets 32. The dipper stick 33 is hydraulically lifted about its pivotal connection with the base frame member 36 when these cylinders are supplied with pressure by a hydraulic system to be described.

As best shown in Fig. 1, the interconnecting arched tubular members 22, the connective members 23, and the U-shaped members 25 and 29 of the base frame are hollow so as to provide a reservoir for the hydraulic fluid used to actuate the cylinders 38. Dependent upon the type of tractor used, and the pumping equipment supplied with the base frame, the fluid from the base frame reservoir is forced under control of a suitable valve, such as that shown at 46 in Fig. 1, into the respective hydraulic cylinders 38 either from a pump 42, mounted on the angle members 31 of the base frame as shown in Fig. 1, or a pump 43 mounted directly on the tractor 20 as shown in Fig. 3.

In the embodiment of Fig. 1, the pump 42 has its intake connected to the reservoir through the

line 44 and its outlet connected through line 45 to the valve 46 where the lines 47 and 48 branch to connections with the hydraulic cylinders 38. In the embodiment of Fig. 3, the pump 43 is connected through line 52 to a control valve 53 and thence to the hydraulic cylinders through lines 54.

As best shown in Figs. 10 and 11, the pump 42 mounted upon the base frame is actuated by a tractor engine crank shaft extension 55. The arrangement shown in Fig. 3 utilizes the pump 43 which is part of standard equipment supplied with the tractor for auxiliary power purposes.

Interchangeability between a variety of dipper sticks is accomplished by means of the novel pivotal mounting of the dipper sticks upon the base frame. As best shown in Figs. 2 and 4, the dipper stick is provided at the rear ends of the arms 33 with sockets 56 which when properly positioned upon the base frame are aligned with the axial bearing bore 57 of the base frame cross member 36. A pivot pin or rock shaft 58 is removably disposed in bore 57 and has its respective ends projecting into the respective arm sockets 56 of the dipper stick. The shaft 58 is clamped to turn with the sockets 56, and is also held against axial displacement, by means of the set screws 61 in the collars or sockets 56 of the dipper stick. Release of the set screws 61 permits the shaft 58 to be removed completely to permit interchange of dipper sticks.

A variety of different types of dipper sticks are illustrated in Figs. 3, 4, 5 and 6. In Figs. 3 and 4, the dipper stick 33 is supplied with a manually operable release catch 63, which engages an aperture in the pivoted implement 35 to normally hold the implement rigid with the dipper stick and release the implement to dump its contents when desired.

The manual implement release per se is understood to be old in the art. Catch 63 is connected to a link 64 which is pivoted at one end to a fixed bracket 65 and its other end to a control rod 66. A hand lever 67 positioned within the operator's reach controls reciprocating movement of the rod 66 to effectuate manual release of the catch 63.

The novel features of the invention directed to power lift apparatus disposed at the working end of the dipper stick are best illustrated in Figs. 5 to 15. In this apparatus, accurately controlled power for manipulating the implement independently of dipper stick movement respecting the tractor may be remotely applied by the operator. For this purpose, the dipper stick 33 is provided with a forward cross member 70 (see Fig. 5) which is welded or otherwise rigidly secured between the levers 34. A second cross member 71 is disposed relatively rearwardly of the cross member 70. Cross member 71 is supported somewhat above the level of the cross member 70 and the arms 34 at the top of struts 72.

Hydraulic power means comprising a hydraulic cylinder 75 including an extensible piston rod 74 is pivotally connected at 76 to the center of the cross member 71. The piston rod 74 is thus disposed for extension past the front cross member 70 and may, in certain embodiments of the invention, be connected directly to the various implements as shown in Figs. 12, 13, 14 and 15.

Hydraulic pressure may be applied or released from either end of the cylinder through the lines 77 and 79 which connect with the source of hydraulic liquid through independent control valve

78. The same pump which supplies the liquid to cylinders 38 may be used for the cylinder 75; however, the separate control valve 78 provides for independent control thereof. Mutually independent control valves 46 and 78 are illustrated as housed in the same casing.

The front end hydraulic cylinder mounting comprising cross member 71 is laterally braced by the forwardly extending angularly disposed braces 81 and 82 which are fixed to the member 71 near the cylinder pivot 76 and which diverge forwardly therefrom to a fixed connection near the ends of the front cross member 70. Front cross member 70 is diagonally braced by the obliquely disposed members 83 and 84, which extend from a fixed connection near the center of cross member 70 to a fixed connection intermediate the ends of the arms 34. The two sets of braces supplement and cooperate with each other in stiffening the dipper stick and third cylinder mounting.

This construction provides a strong and rigid mounting for the cylinder 75. All stresses resultant from either powered extension or withdrawal of the piston rod 74 are absorbed by the various stress members. In this manner, accurate manipulation of the implement may be effected with a minimum of lost motion.

Several applications of the hydraulic power means to the control of various implements are illustrated in Figs. 12 through 15. In Fig. 12, a crane arm 85, which is pivoted at 87 to the dipper stick levers 34, is connected through the link 86 to the piston rod 74. In Fig. 13, a scraper blade 88, which is pivoted to the dipper stick on the pintles 89, is connected by pivot pins 92 to the piston rod 74. In Fig. 14, a manure bucket 93, which is pivoted on pins 94 to the dipper stick, is connected through the bracket 95 to the piston rod 74. In Fig. 15, the fork lift 96, which is pivoted on the pins 97 to the dipper stick, is connected through the pivots 98, bracket 99, and cross member 100 to the piston rod 74. Various pivoted positions which the implement may be made to assume by hydraulic manipulation are illustrated in dotted lines in Figs. 14 and 15.

Completely detachable hydraulic power means and mounting unit or package may be purchased by a user and attached to a dipper stick not initially provided with implement power control means. In this manner, dipper sticks originally supplied with manual trip release means as shown in Figs. 3 and 4, may be inexpensively provided with front end power means. As best shown in Figs. 6 and 7, the unitary detachable apparatus includes an arched cross member 103 having its ends 104 provided with clamp plates 105 removably clamped to the arms 34 of the dipper stick by bolts 106 or the like. The intermediate top portion 107 of the cross member 103 is provided with a pivotal mounting 108 on fixed bracket 110, thus providing a pivotal connection for the hydraulic cylinder 109. The cylinder piston rod 112 is powered by the hydraulic fluid lines 113 and 114 which provide for fluid pressure in either direction. The fixed pivot 108 of the hydraulic cylinder is reinforced by rods 115 connected to the bracket 110 and which mutually diverge therefrom to a fixed connection with the paired brackets 117. Brackets 117 are provided with clamp plates 118 and bolts 119 to releasably secure the brackets 117 to the levers 34 forwardly of the cross member 103.

Linkage means for transmitting power from the piston 112 to the implement 35 desira-

bly comprises a front cross member 116 rotatable in bearing aperture 121 in the side bracket 117. The rotatable cross member 116 carries laterally spaced fixed cranks 121 and 122, the free end of crank 122 being pivotally connected through pin 124 to a link 123 which is in turn pivotally connected to the implement 35 on pin 125. Crank 121 is pivoted directly to the piston 112 to receive motion therefrom.

As best shown in Fig. 16, the pivotal connection between the implement 35 and the paired levers 34 comprises at each lever a pivot pin 126 and a cotter key 127.

The entire power means and mounting unit or package may be completely removed from the dipper stick levers by loosening the respective clamps 105 and 118.

As best shown in Figs. 9, 10 and 11, the front end hydraulic cylinder is alternatively mountable somewhat differently to adapt it to other purposes. For example, when added down pressure on a back fill blade 135 is desired, the hydraulic cylinder 131 may be connected at one end to frontal member 31 of the base frame 21 and at its other end to the implement. The connection to the base frame includes a fixed pivot 132, and the connection to the blade 135 includes a pivot 134. In operation of the back fill blade, forward or backward thrust on the blade is transmitted from the tractor along a line defined by the co-planar arms 34. In the particular arrangement just described, the respective pivots 132 and 134 are mutually offset from the line of thrust and are disposed at opposite sides of the plane of the levers 34. Pivot 134 is disposed below the lever plane, and pivot 132 is disposed above the lever plane. Consequently, when fluid pressure is applied to the extensible parts of the cylinder, the weight of the tractor may be transferred from the tractor wheels to the base frame and thence to the working edge 136 of the blade 135. In this manner, maximum downward pressure on the working edge 136 of the blade may be readily applied.

The general inclination of the blade 135 may be varied by means of the adjustable links 138 and 139, which are provided with a plurality of registering apertures 142 and with interchangeable connecting bolts 143.

A somewhat similar arrangement is shown in Fig. 11 where a roller 144 is pivotally mounted upon the levers 34 of the dipper stick 33 and is provided with paired brackets 145 for pivotal connection at 146 to the piston rod 147 of hydraulic cylinder 148. The cylinder is pivotally connected at 149 to the frontal members 31 of the base frame 21. As in the case of the back fill blade attachment, the respective pivotal connections 145 and 149 are oppositely offset from the lever arms 34 of the dipper stick so as to insure the development of downwardly thrust upon the roller to the extent of the weight of the tractor.

From the foregoing description, taken in connection with the accompanying drawings, it is seen that we have made novel provisions for a hydraulic power means at the forward end of a tractor dipper stick attachment so as to permit remotely controlled manipulation of an implement pivoted thereto. The various features of the invention wherein the hydraulic means may be embodied as a permanent unitary part of the dipper stick, or as a completely detachable unit to be added at the user's option, have been pointed out. The provision of the third cylinder

7 parts as a separate applicable unit is particularly desirable to permit progress gradually from a relatively inexpensive manually operated dipper stick to a more costly power equipped frame. The interchangeable pivotal connection between the base frame and the dipper stick is further provided to facilitate this and other interchanges of dipper stick frames.

The specific provisions for mounting and alternate disposition of the third or forward cylinder of the hydraulic power means respecting the implement and the dipper stick or the base frame will increase its range of use. When said cylinder is connected to the dipper stick, it is useful for independent manipulation of the supported implement throughout the course of movement of the dipper stick respecting the base frame. When the hydraulic cylinder is connected to the base frame, it is useful primarily as a means for transferring the weight of the tractor to the implement. In both positions, the particular positions of the braces and the cantilever construction of the dipper stick have been found to contribute maximum strength and adaptability.

As compared with other dipper stick attachments for tractors, the arrangement whereby dipper sticks of various types are freely interchangeable on the mounting frame has also been found to be of unusual service. Moreover, the connection between the rear ends of the mounting frame holds the various parts in accurate alignment during shipment and use.

We claim:

1. In a tractor attachment comprising a base frame applicable to a tractor, a boom pivotally attached to the base frame and comprising truss structure including laterally spaced boom arms having upwardly extending strut parts and tension rod parts above the arms immediately supported on the struts and connected with the arms at longitudinally spaced points, an implement mounted on the ends of said arms and having a movable element, and means detachably mounted

on the boom arms for the operation of the element, said means comprising a support having a leg portion constituting a clamp member engaged with the truss structure of one of said arms and provided with a cooperating clamp member engaged oppositely with said truss structure of the same arm, and means for drawing the said clamp members together upon the intervening truss structure, an actuator on the support in operative motion transmitting connection with the said implement element, and means for operating the actuator, said clamp members engaging different parts of said truss structure at spaced points for the secure positioning of said actuator on the boom during operation of said implement element.

2. The device of claim 1 in which said support further include means laterally spanning the boom and having like leg and clamp members engaged with the arm and truss structure at the opposite side of the boom.

3. The device of claim 2 in which said actuator comprises a rock shaft mounted for oscillation on said support and having a power receiving arm, in further combination with a second support having detachable clamp connection with the boom arms, and a ram mounted on the support having an operating rod connected with the power receiving arm, and means connecting said implement element and said rock shaft.

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