

# Hydraulically Operated Ditching Unit

This ditching unit is equipped with two 14" hydraulic rams which raise and lower the depth of the unit as well as the angle of the cut being made. It is designed to quick couple to a rubber tire tractor and to cut ditches for irrigation of various farm crops. The curved mold board easily cuts through the hardest of soils and the wings at the ends of the mold boards push the soil outward away from the ditch.

The unit is designed for safe, rugged, and efficient operation.

## Bill of Materials

Quantity	Description
5'	2"x 5"x .250" tubing
4'	3"x 3"x .250" tubing
40'	2"x 2"x .250" tubing
8'	4"x 6"x .250" tubing
36"x72"	3/16" plate
7'	3/4"x 3" flat
2'	1/2"x3" flat
2'	1/2"x 4-1/2" flat
1'	1"x 2" flat
1'	1"x 4" flat
2	14" hydraulic rams
2	15" wheels
2	15" tires (9.51 x 15)
28'	1/2" hydraulic hoses
2	6' cutting blades
1	Furrow type point
2 qt.	Paint

## Main Frame

The first phase is the construction of the main frame. Cut a piece of 4"x 6"x .250" tubing, 60" long. Cut one end of this piece to a convex form so to serve as the pivot end. Cap both ends of the main frame tubing with 10 gauge sheet metal. Weld with a metal inert gas welder.

The next step is to cut 2 pieces of 4"x 6"x .250" tubing, 12" long. Taper one side of each piece to where it measures 6" on one end and 4" on the other end. Weld and cap the end of the 4" side.

The next step of the main frame is to take the axle bracket mounts and weld them to the 6" side of main frame with the tapered end facing down. These mounts should be 13-1/2" from the square end of the main frame.

The next step is to cut a 4" bushing with a 2" inside diameter. Then cut a 2-1/4" hole, 1" from the convex end of the main frame.

The first phase of constructing the main frame swivel arm is to cut a piece of 3"x 3"x .250" tubing, 43" long. Cut the center pivot end concave so that it matches the main frame center pivot end. Cap both ends with 10 gauge sheet metal. Weld caps.

Cut 2 pieces of 3"x 1/2" flat, 9" long. Drill a 2" hole on one end of each plate at 3/4" from the end. Convex both ends of the flat iron. These pieces will then have to be bent so that when they are mounted to the concave end of the swivel arm it measures 4" on the center pivot end of the plate.



The final step of main frame swivel arm is to cut a hole 1" from the hitch end. Cut it 2-1/2" outside diameter. Then cut a bushing 3" long with a 2" inside diameter. Insert the bushing and weld. This bushing will be used so that the hitch can swivel up and down.

## Construction of Hitch

The first phase of constructing the hitch is to cut 2 pieces of 3/4"x 3-1/2" flat, 7" long. Convex one end of each piece and drill a 2" hole on the convex end at 1-1/2" from the end. Then cut a piece of 3/4"x 3-1/2" flat, 5" long. Drill a 1-1/7" hole in the center of the flat and weld the convex piece to the 5" piece.

The back half of the swivel hitch is built the same, except that you use a piece of 3/4"x 3-1/2" flat for the back side. Then cut a piece of 1-1/2" shaft, 2-1/2" long. This shaft will be used to connect the 5" piece to the 4-1/2" piece of hitch. Cap the ends of the shaft with a bushing. Weld the bushing to the shaft. This will allow the hitch to swivel.

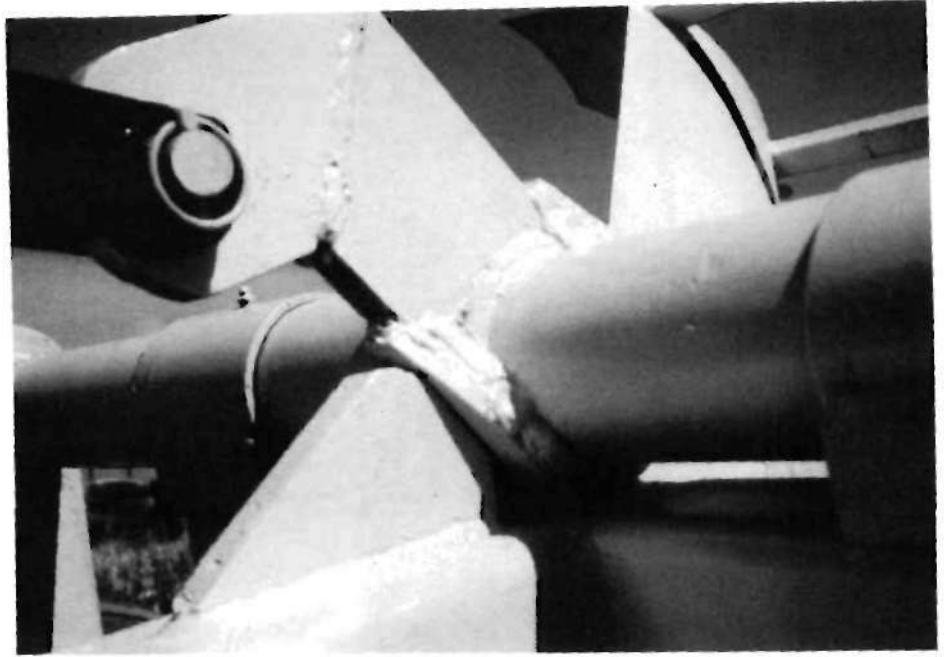
## Mounting Hitch to Main Frame Swivel Arm

The first phase of mounting the hitch to the main frame swivel arm is to cut a 2" shaft, 4-1/2" long. Connect the hitch to the square end of the main frame swivel arm with the shaft. Weld the end of the shaft to the hitch. This type of hitch will allow it to act as a universal type joint for unlevel working conditions.

## Construction of Axle

The first phase of construction of the axle is to cut a piece of 4" outside diameter pipe 60" long. Then cut two pieces of pipe 4" inside diameter 4" long. These will be used as axle bearings.

The next step is to cut two pieces of 2"x 5"x .250" tubing, 28" long. Cap both ends with 10 gauge sheet metal and weld. Cut a hole 1" from one end of each tubing 4-1/2" in diameter. Cut it on the 5" side of the tubing. This hole will be used in mounting the axle pipe to the axle arm.



Cut a 2"x 2" square hole 1" from the bottom of the 2"x 5" tubing on the 5" side. Mount the spindle into the hole and weld.

The next phase is to cut a piece of 1"x 4" flat, 8" long. Convex one end and drill a 1" hole, 1" from the convex end. Concave the other end so that it fits the axle pipe. Weld it to the center of the axle pipe at 57° from the axle arms going downward.

#### **Construction of Ditcher Angle Ram Bracket Arm**

The first phase of the Ditcher angle ram bracket arm is to cut two pieces of 3/4"x 3" flat, 29" long. Convex both ends of the bracket arm and drill a 2" hole, 1" from the end of one end of each arm. On the opposite ends drill a 1" hole, 1" from the end. These arms will have to be bent.

The second phase is to cut a piece of 1"x 2" flat, 8" long. Drill a 1" hole, 1" from each end of the ram bracket. The ram bracket will be welded to the angle arm at 15-1/2" from the top of the angle arm to the center of the hole of the ram bracket.

#### **Mounting of the Center Pivot Pin**

The first phase is to cut a 2" shaft, 7" long. Drill a 1/2" hole into the center of the pin and tap it with a 1/2" tap. Weld a 1" bushing on the other end of the shaft. This pin will be used to connect the main frame, the swivel arm, and the ditcher angle bracket arms together. Use a 1/2"x 2" bolt and a 2"x 2"x 1/2" plate to hold the shaft in place.

#### **Mounting Axle to Main Frame**

The first phase of mounting the axle to the main frame is to weld a piece of 4" channel iron, 4" long, to the top of the axle bearing mounts. Weld them flush with the end of the mount. Then weld the bearing to the channel.

The second phase is to center the axle on the frame and weld a stopper on each side of each bearing. This will hold the axle in the center of the frame.

#### **Fabrication of Vee Mold Board**

The first phase of vee mold board is to cut two pieces of 3/16" sheet metal 18" x 72" then bend on a brake press to form the mold board.

The second phase of the mold board fabrication is to weld both mold boards with a metal inert gas welder at 165 amperes in a "V" shape. The end welded together must be concaved to make the proper fit.

The third phase is the mounting of the blades to the mold board. First take two blades 4"x 1/2"x 64" long and bolt them to the bottom of the mold board with 5/8"x 1-1/4" bolt. Holes must be drilled on the mold board according to the hole pattern on the blades. The blades must be flush with the wing end of the mold board.

The fourth phase is bracing the mold board. Cut two pieces of 2"x 2"x .250" tubing, 60" long, and 2 pieces of 2"x 2"x .250" tubing, 30" long. Weld one of the 60" pieces 2" from the top rear of the mold board and the other 2" from the bottom. Then weld one of the 30" pieces to the center of the mold boards 2" from the top and the other 2" from the bottom.

The fifth phase is to mount the wings on the mold boards. Cut two pieces of 3/16" sheet metal 18"x 18". Bend them to fit around the mold board. When mounting the wings they must be 75° from the mold boards.

The sixth phase is the mounting of point to the concave end of the mold board. The point is a 9" furrow listing type point. It must be mounted according to the type of the hold pattern on the point.

#### **Mounting Mold Board to Main Frame**

The first phase in mounting the mold board to the frame is to raise the rear of the mold board 3 feet off the ground. Use a 3



foot stand for support. Then mount the square end of the main frame on top of the concave end of the mold board. The top of the rear main frame should be flush with the top of the mold board.

The outermost point of the mold board must be 9" to the bottom of the main frame.

The outermost point of the mold board must be 24" to the bottom of the rear of the main frame.

The next step is to cut four pieces of 1/2"x 6" flat, 8" long. These will be welded to the side of the main frame. Next, cut two pieces of 1/2"x 6", 7" long. These pieces will be mounted horizontally to the mold board. The 8" braces will then be welded to the horizontal pieces.

### **Mounting Ram Brackets to Frames**

The first phase is mounting the ram bracket to the top of the main frame swivel arm 25" from the center pivot end. Cut a piece of 1"x 3" flat, 4" long. This piece will have to be shaped to allow clearance on the ram. Then drill 1" hole in center.

The second phase is mounting the ram bracket to the top of the main frame 28" from center pivot end. Cut a piece of 1"x 3" flat, 4" long. This piece will have to be shaped like a ramp to allow enough clearance on the ram. Then drill a 1" hole in center of the ramp.

### **Construction of Axle Pivot Arm**

The first step is to cut a piece of 2"x 2"x .250" tubing, 4-1/2 feet long. Cut two pieces of 1"x 2" flat, 4" long and drill a 1" hole on one end of each piece. Then weld 4" pieces to the 2"x 2"x .250" tubing, leaving a 2-1/2" overhang.

The second phase is to cut a piece of 1"x 2" flat, 4" long. Drill a 1" hole on one end of the flat, then notch making the end of the 2"x 2"x .250" tubing 1" so that the 1"x 2" flat slides into the tubing. Then weld. Mount the axle pivot arm from the ditcher ram bracket arm to the axle.

### **Mounting of Tires**

Mount the 3500 pound rated capacity hubs to the spindles and mount the tires to the spindles. A heavy duty implement tire is used.

### **Mounting of Axle Stoppers and Rams**

When project is completed, hitch the implement to a tractor. Mount the rams and hoses, then lift the implement until the axle arm is square with the main frame. Weld a stopper. This will keep the implement from going too far over when the rams are operated.

### **Painting Ditching Unit**

The first phase of painting the unit is to wire buff all rust off of the unit. Wipe clean with a metal prep solution. Then prime with gray lacquer with an air gun at 40 pounds. Then remove ram, angle ram bracket arm, point, blades and tires. Paint these gloss black. The rest of the ditching unit is painted caterpillar yellow. Allow the unit to dry and reassemble parts.