HYDRAULIC BRAKE FOR TRENCHER
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Application February 2, 1956, Serial No. 563,106

3 Claims. (Cl. 121—40)

This invention relates to new and improved control means for hydraulic brake for trencher and to apparatus embodying such control.

An object of the invention is to provide new and improved brake and/or locking means for hydraulic systems or apparatus and to apparatus embodying such means.

Another object of the invention is to provide a device of the type set forth wherein piston play may be eliminated and whereby the apparatus may be retained in adjusted position.

Another object is to provide new and improved hydraulically actuated tractor mounted apparatus such as a trencher or loader or the like embodying the new and improved control for the hydraulic system thereof.

Another object is to provide a new and improved control for hydraulic systems or apparatus, which is relatively simple and economical in construction, yet efficient in operation.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that changes may be made in the details of construction and arrangement of parts without departing from the scope of the invention as set forth in the accompanying claims in the preferred form has been given by way of illustration only.

In the drawings the invention has been shown applied to a tractor mounted backhoe or trencher for the purpose of illustration only and it will be understood that the invention may also be applied to loaders and other hydraulically actuated apparatus.

Referring to the drawings:

Fig. 1 is a side view of a tractor having a trencher and a loader mounted thereon;

Fig. 2 is a top view of the device shown in Fig. 1;

Fig. 3 is a fragmentary side view of the apparatus of Fig. 1, on an enlarged scale;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a sectional view taken on either line 6—6 or line 6A—6A of Fig. 5, looking in the direction of the arrows; and

Fig. 7 is a schematic view of the hydraulic system of the apparatus shown in Fig. 1.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the apparatus shown embodying the invention comprises the tractor 10 carrying a hydraulic pump 11 and the usual regulating or control valves 12 for the loader and the usual regulating or control valves 13 for the trencher.

The loader comprises the usual loader arms 14 pivotally connected to support 15 on the tractor and having the bucket 16 pivotally connected thereto. The hydraulic cylinder and piston 17 are provided for raising and lowering the arms 14. Also pivotally connected to support 15, but above the connection therewith of arms 14 are the bucket rotating cylinders 18 which are connected through rams 19 and links 20 to the bucket 16 for effecting rotation thereof relative to arms 14.

Double acting cylinder 18 is connected by the hydraulic lines 21 and 22 to valve 12 which in turn is connected to hydraulic pump 11 by suitable hydraulic lines.

The trencher comprises upright support 23, to which is pivotally connected boom support 24 by pivot 25. Boom support 24 is pivotally connected to support 26 and is adapted to be pivoted upwardly and downwardly by double acting hydraulic cylinder 27 and ram 28 which are connected to the upper end of support 24 and boom 26 respectively.

Dipper stick 29 is pivotally connected intermediate its ends to boom 26 and is adapted to be pivoted by means of dipper stick cylinder and ram 30 which is connected adjacent its opposite ends to boom 26 and the free end of dipper stick 29.

Bucket 31 is carried by dipper stick 29 and pivotally connected thereto and adapted to be pivoted relative to dipper stick 29 by bucket actuating cylinder and ram 32 which are connected to bucket 31 through linkage 33.

To effect pivotal movement of support 24 and the boom, dipper stick and bucket relative to the support 23, and the tractor, the hydraulic cylinder 34 and ram 35 are provided. Cylinder 34 is pivotally connected to trencher frame 36 and ram 35 is pivotally connected to link 37 which is pivotally connected to boom 26. Link 38 is pivotally connected adjacent its opposite ends to link 39 and frame 36. It will be seen that actuation of ram 35 in cylinder 34 will effect pivotal movement of boom 26 relative to the tractor.

Double acting cylinder 34 is connected to control valve 13 by hydraulic lines 35 and 36 whereby boom 26 may be pivoted in either direction.

Interposed in hydraulic lines 35 and 36 is control valve member 37 which comprises a body portion 38 having a bore 39 which is connected to the separated portion of hydraulic lines 35 and 36 by means of ports or ducts 35a and 35b and 36a and 36b respectively.

In bore 39 is positioned a valve member 40 having the spaced lands 40a and 40b and valve member 40 is provided with the protruding end 40c adapted to be actuated by the operator's foot or hand to move valve member 40 into operative position.

Valve member 40 has the reduced portions or grooves 40d and 40e normally adapted to be aligned with lines 35 and 36 respectively to allow operation of the hydraulic system in the usual manner. The valve is retained in this normal position by spring 41 and the amount of movement of the valve is limited by flange 42 engaging a stop shoulder.

A limited or restricted bypass passage is provided around valve 40 for each hydraulic line 35 and 36. The bypass for hydraulic line 35 comprises a passage 43 in which is positioned a one way check valve 44. The check valves 44 open in a direction to allow fluid to enter cylinder 34 but not to escape therefrom.

When valve 40 is depressed by pressure on the head 40c of the valve, the valve is moved against the force of valve spring 41 to a position where the passage of fluid in either direction from one portion of line 35 into the other portion thereof is slowed down or stopped. Similarly, passage of fluid through line 36 in either opposite direction is slowed down a similar amount or stopped and thus movement of ram 45 in cylinder 34 is slowed down or stopped accordingly. While valve 40 is in such closed position, slight movement of control valve 13 allows the passage of a restricted amount of fluid through bypass 43 to the pressure side of cylinder 34 to apply pressure to the ram and lock it in such position as there is no escape of fluid from cylinder 34.
It will be seen that with the control valve 37 in the hydraulic system that this valve can be employed as a hydraulic brake to stop the movement of the ram in the cylinder and thereby lock the trencher boom in desired angular relation with the tractor or by partially depressing the valve, the speed of swinging of the boom can be controlled by restricting the passage of fluid to the pressure side of the cylinder with the speed controlled by the extent to which the valve is pressed.

After the movement of the ram in the cylinder has stopped, pressure on the piston can be built up through the bypass by actuating the proper control valve and by depressing the valve and applying pressure the piston can be locked in any position.

Furthermore the valve eliminates piston play as when digging or in transport and can be employed as an emergency brake.

It will be noted that this valve can also be employed with other hydraulically operated apparatus such as loaders.

The operation of the device is believed apparent from the foregoing description.

From the foregoing it will be seen that I have provided new and improved means for obtaining all of the objects and advantages of the invention.

I claim:

1. A device of the character described including a double acting hydraulic cylinder and piston, an hydraulic line connected to each end of said cylinder to operate as either a hydraulic supply or return line, means including a source of hydraulic fluid under pressure, a supply and a return line connected to said source of hydraulic pressure, control means selectively directing said hydraulic fluid under pressure to one or the other of said lines to each end of said hydraulic cylinder, and a valve interposed in said lines to said cylinder for simultaneously throttling or stopping flow through said lines to and from said hydraulic cylinder, and a pressure operated bypass valve in each said line to said cylinder around said valve, said pressure operated valves being operable to open only under the influence of pressure in the direction of flow toward said hydraulic cylinder.

2. In a device of the character described, a source of hydraulic fluid under pressure, a hydraulic pressure line from and a return line to said source of hydraulic fluid under pressure, a double acting cylinder and piston means, a hydraulic line to each end of said cylinder and piston means to be selectively used as pressure and return lines for hydraulic fluid to operate said cylinder and piston means, means to selectively connect said hydraulic lines to said cylinder and piston means, to said hydraulic pressure supply and said return lines from and to said source of hydraulic fluid under pressure, the improvement comprising a double valve means interposed in said lines to each end of said cylinder and piston means to simultaneously throttle and stop the flow of hydraulic fluid in said lines to and from said cylinder and piston means, and pressure operated by-passes around each portion of said double valve operable only in the direction of flow toward said cylinder and piston means.

3. The device of claim 2 in which said double valve is a piston valve including a piston slideable in a bore, and which includes a spring to normally hold said valve piston in open position.

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