March 24, 1959 J. S. PILCH 2,878,784

HYDRAULIC BRAKE FOR TRENCHER

Filed Feb. 2, 1956 3 Sheets-Sheet 1

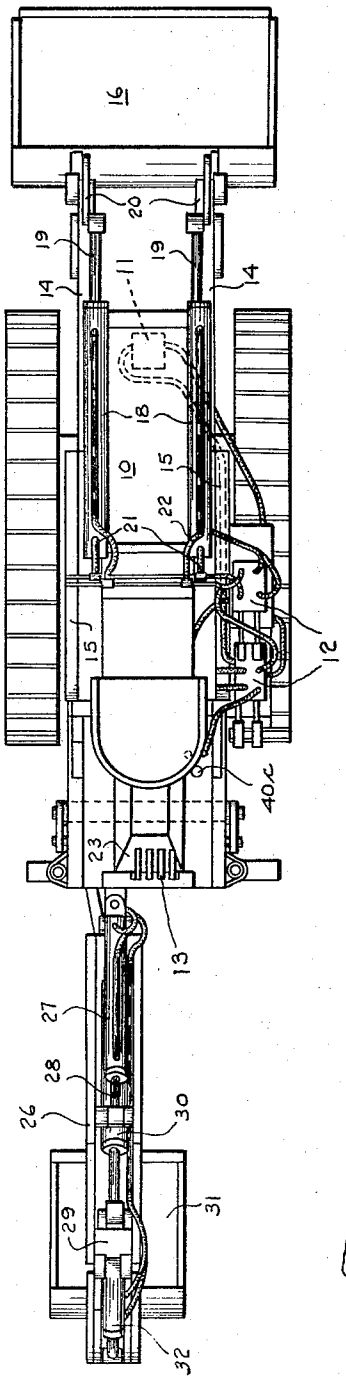


Fig. 2.

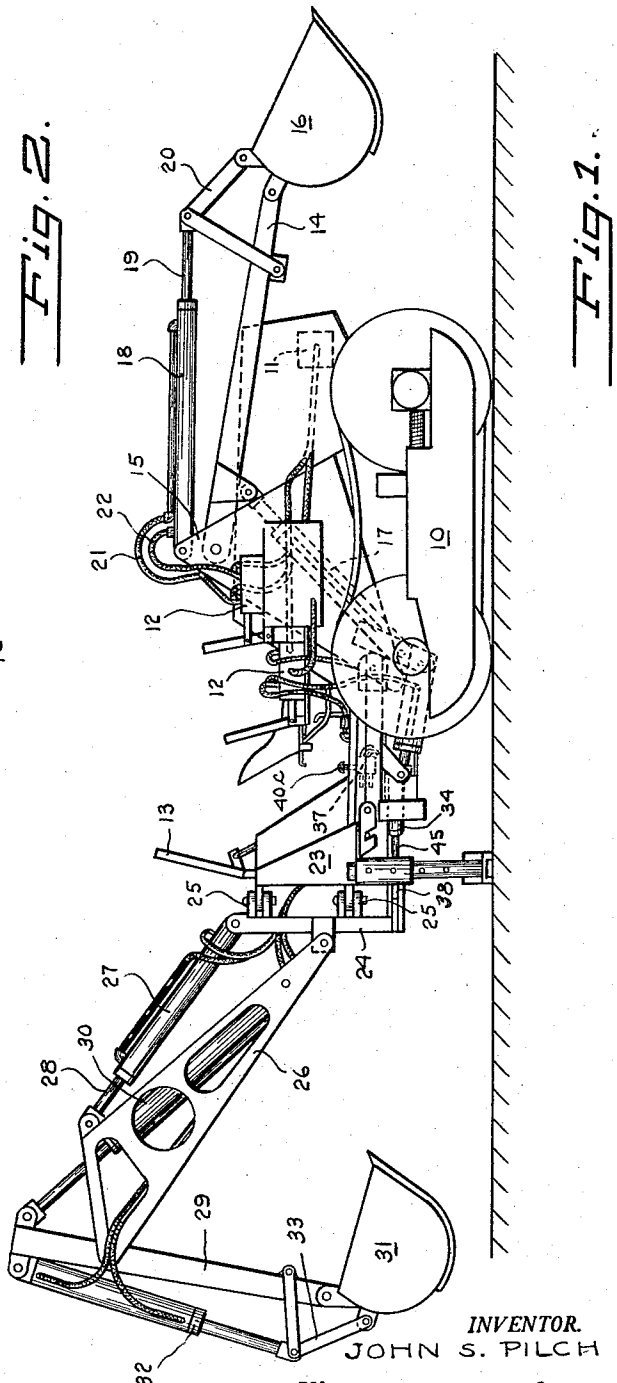


Fig. 1.

INVENTOR.
JOHN S. PILCH
BY
Raymond A. Paquin
ATTORNEY.

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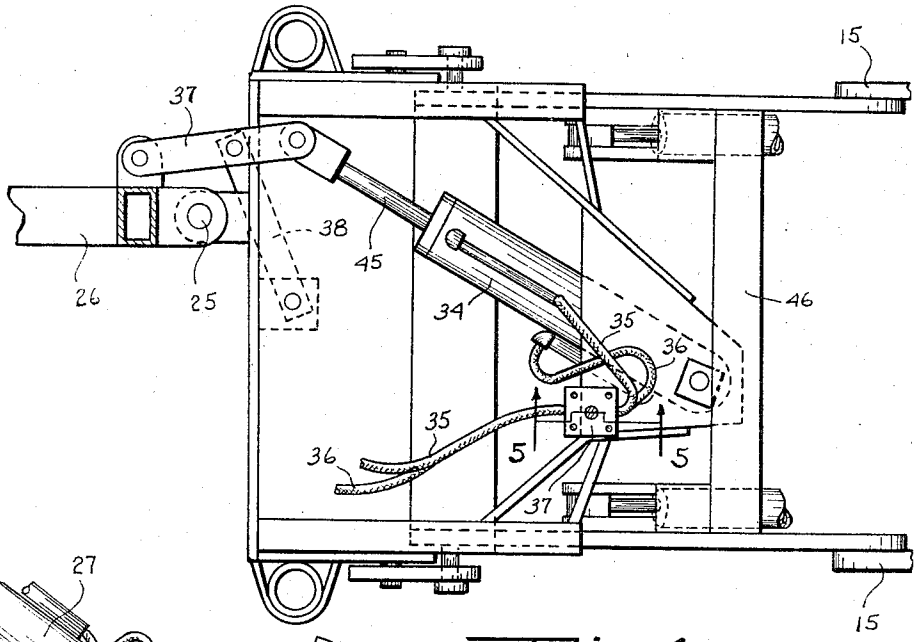


Fig. 4.

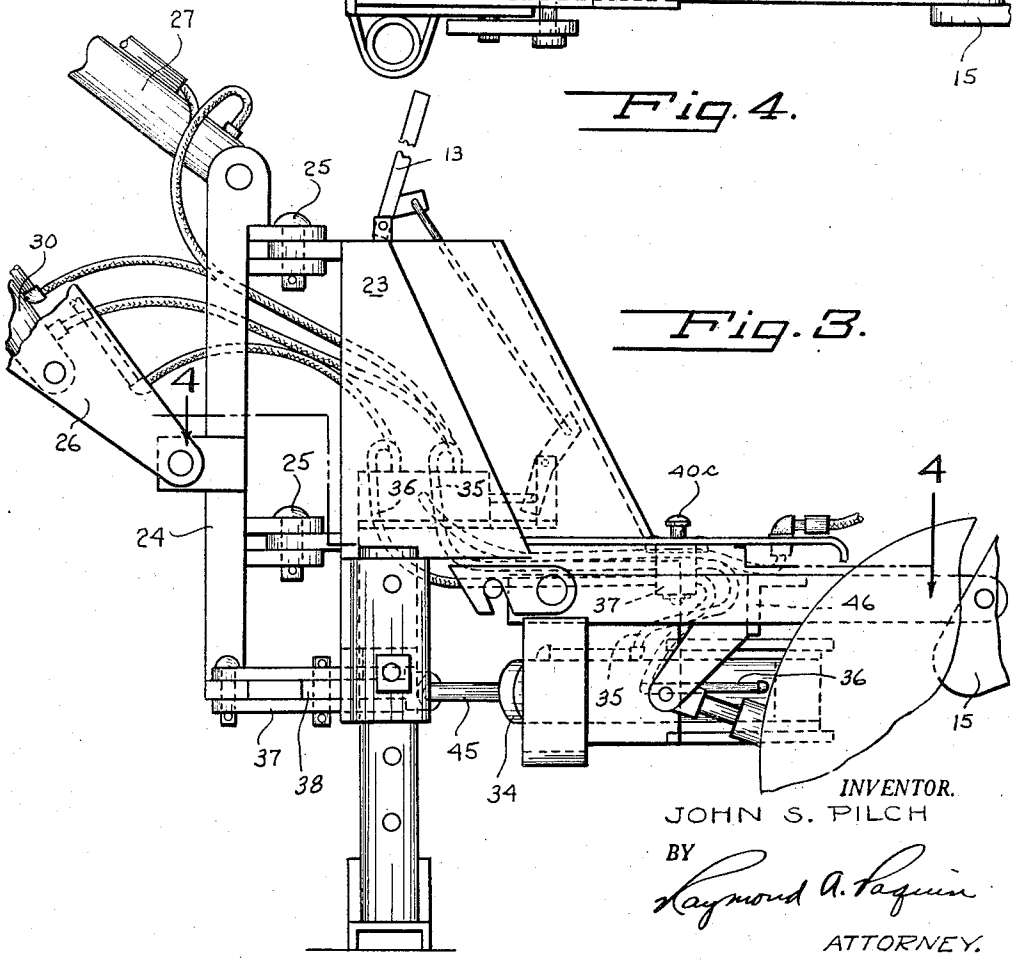


Fig. 3.

INVENTOR.
JOHN S. PILCH
BY
Raymond A. Paquin
ATTORNEY.

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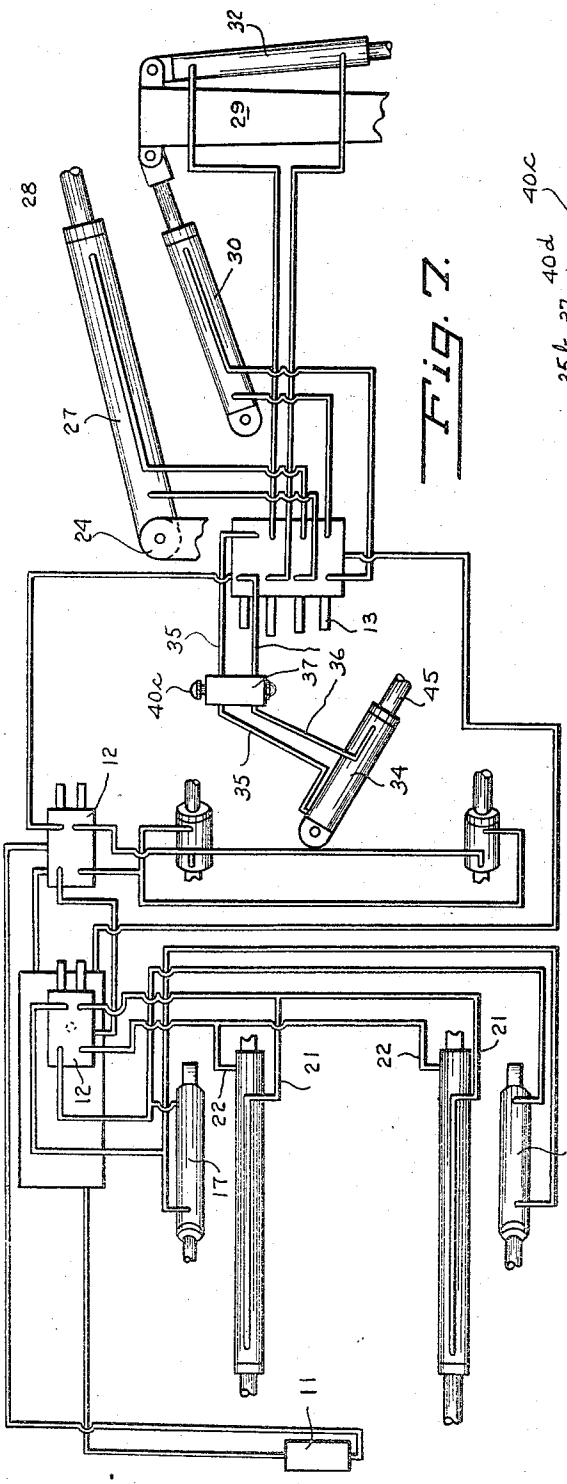


Fig. 7.

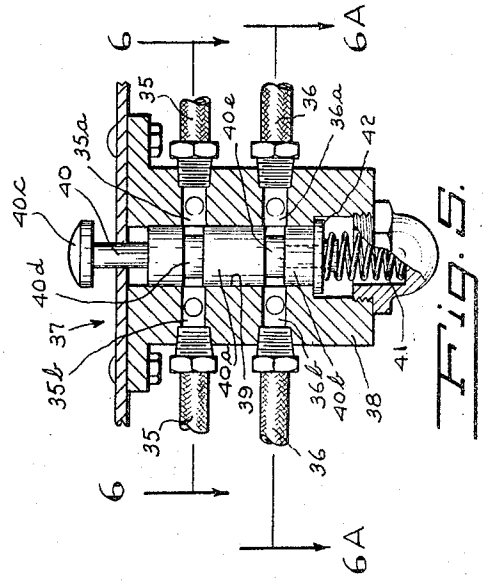


Fig. 5.

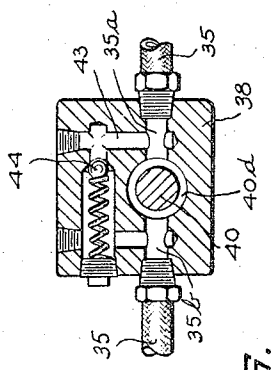


Fig. 6.

INVENTOR.
JOHN S. PILCH
BY
Raymond A. Laguni
ATTORNEY.

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HYDRAULIC BRAKE FOR TRENCHER

John S. Pilch, Ware, Mass.

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 as 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 pivots **25**. Boom **26** is pivotally connected to support **24** 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 **38** 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 the separated portion of hydraulic lines **35** and **36** by means of ports or ducts **35***a* and **35***b* and **36***a* and **36***b* respectively.

In bore **39** is positioned a valve member **40** having the spaced lands **40***a* and **40***b* and valve member **40** is provided with the protruding end **40***c* 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 **40***d* and **40***e* 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 stopshoulder.

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 **40***c* 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 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 slidable in a bore, and which includes a spring to normally hold said valve piston in open position.

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