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Casey

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[54] **CLAMPING MECHANISM FOR SIDE SHIFTABLE BACKHOE**

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[52] **U.S. Cl.** **280/456**, 214/138

[51] **Int. Cl.** **B60d 7/00**

[58] **Field of Search** 280/456; 214/138, 138 C, 730; 37/103; 172/274

[56] **References Cited**

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3,614,134	10/1971	Saran et al.	280/456 R
3,608,930	9/1971	Saran et al.	280/456 R
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FOREIGN PATENTS OR APPLICATIONS

975,029	11/1964	Great Britain	280/456

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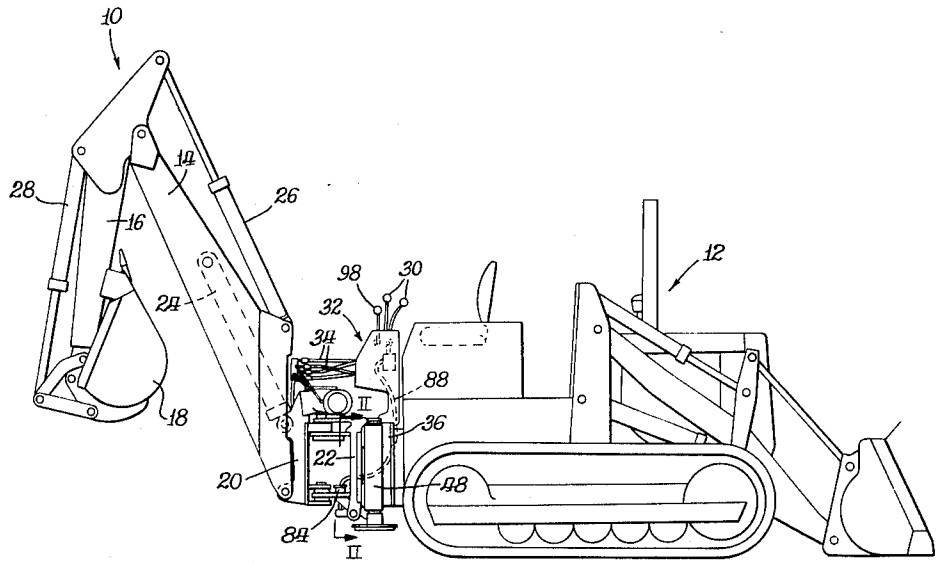
Assistant Examiner—Randall A. Schrecengost
Attorney, Agent, or Firm—Freling E. Baker et al.

[57] **ABSTRACT**

There is disclosed a backhoe having a base frame that is mounted to be stationary with respect to a vehicle. A shiftable frame is slidably mounted on the base frame and supports a digging arm and bucket at an infinite number of positions transverse to the axis of the vehicle. A hydraulically actuated clamp is operative to clamp the shiftable frame at selected positions on the stationary frame. The clamp is constructed and arranged to utilize the weight of the shiftable carriage to aid in clamping action and to thereby reduce clamping effort.

20 Claims, 7 Drawing Figures



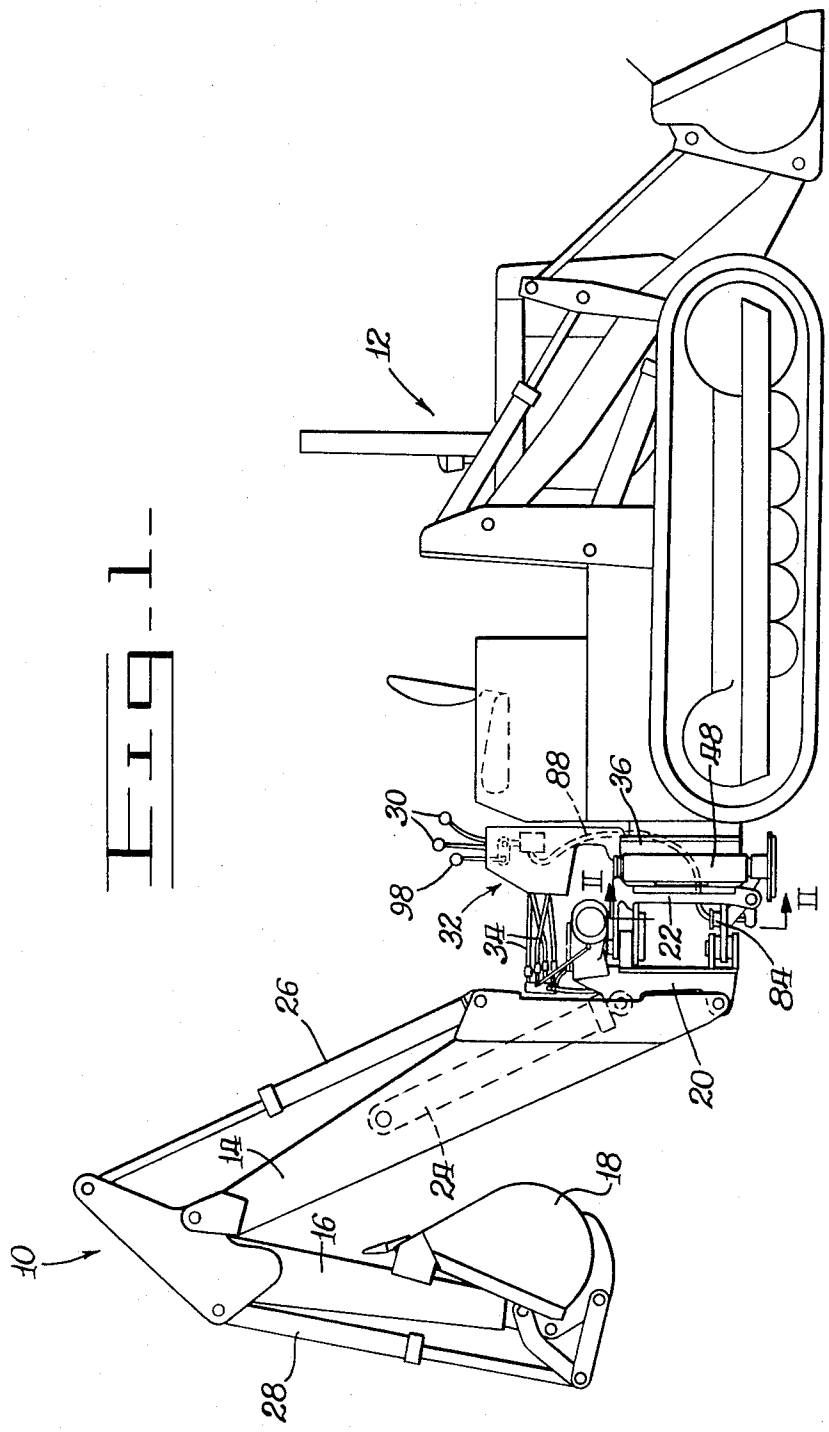


FIG. 1

Fig_2_

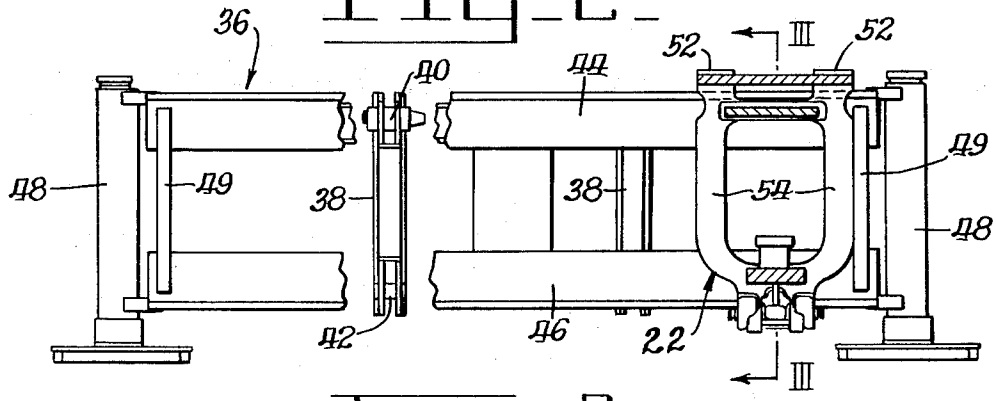

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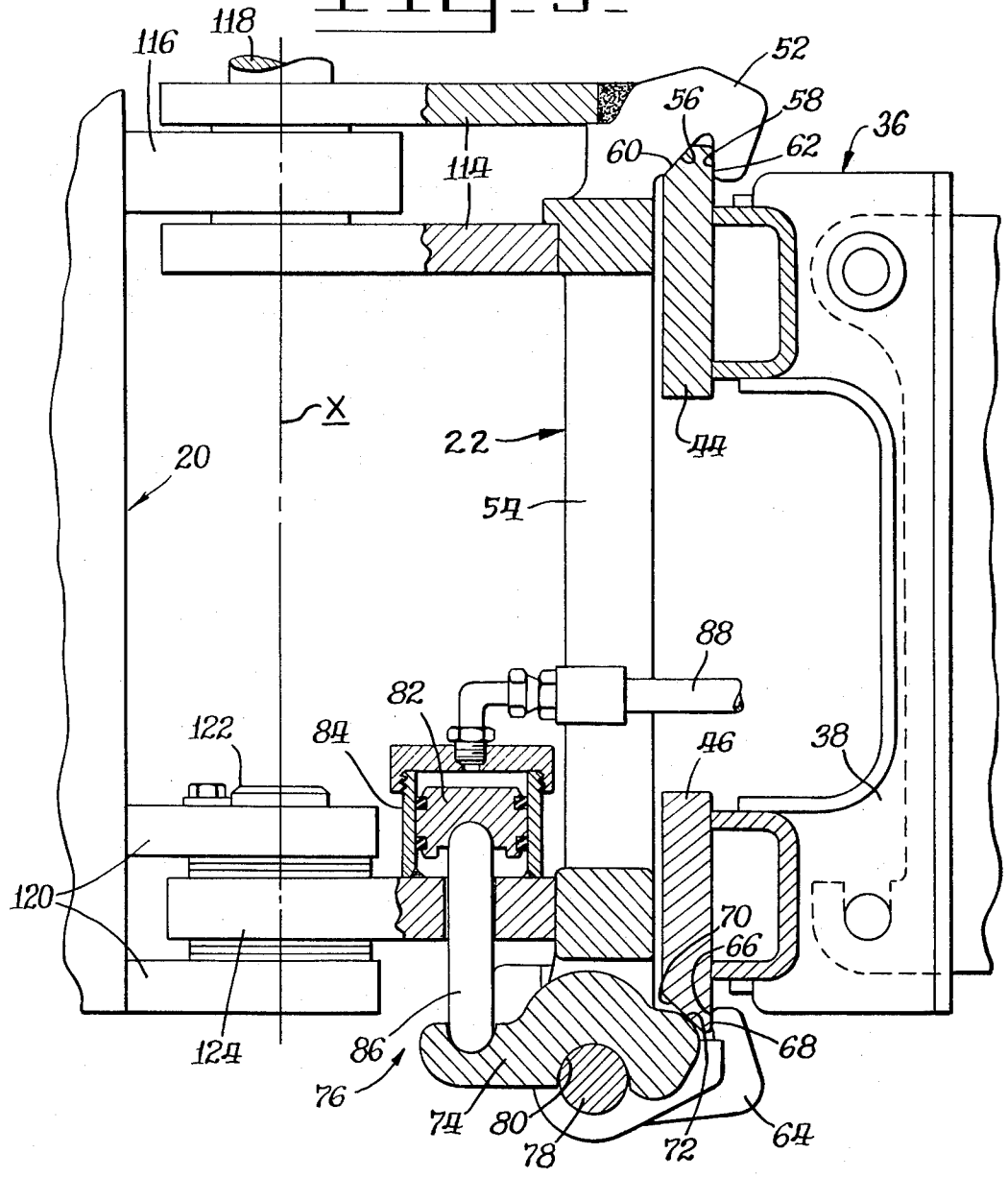
Fig_3_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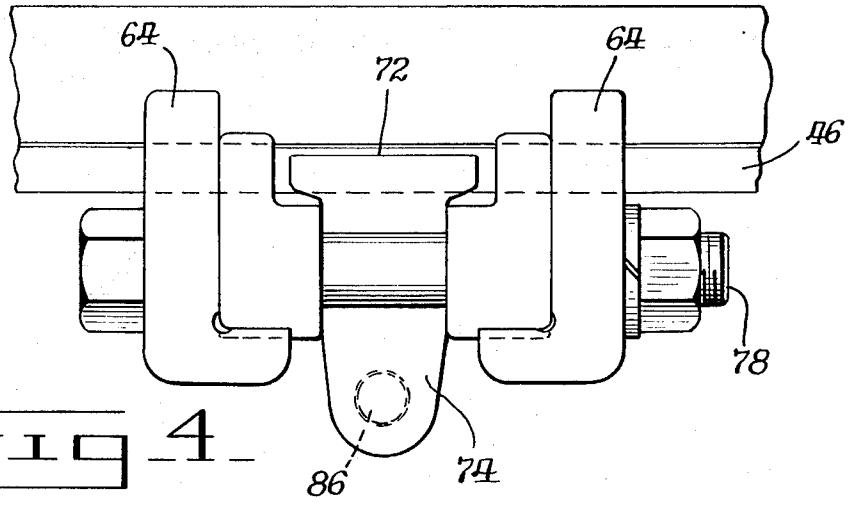


Fig. 4

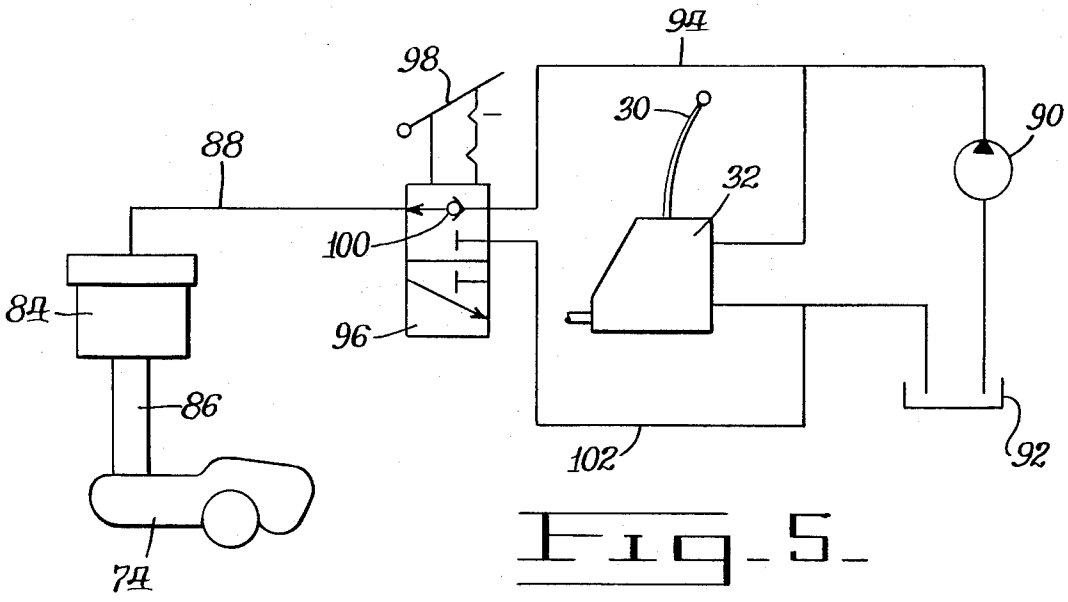


Fig. 5

Fig. 6

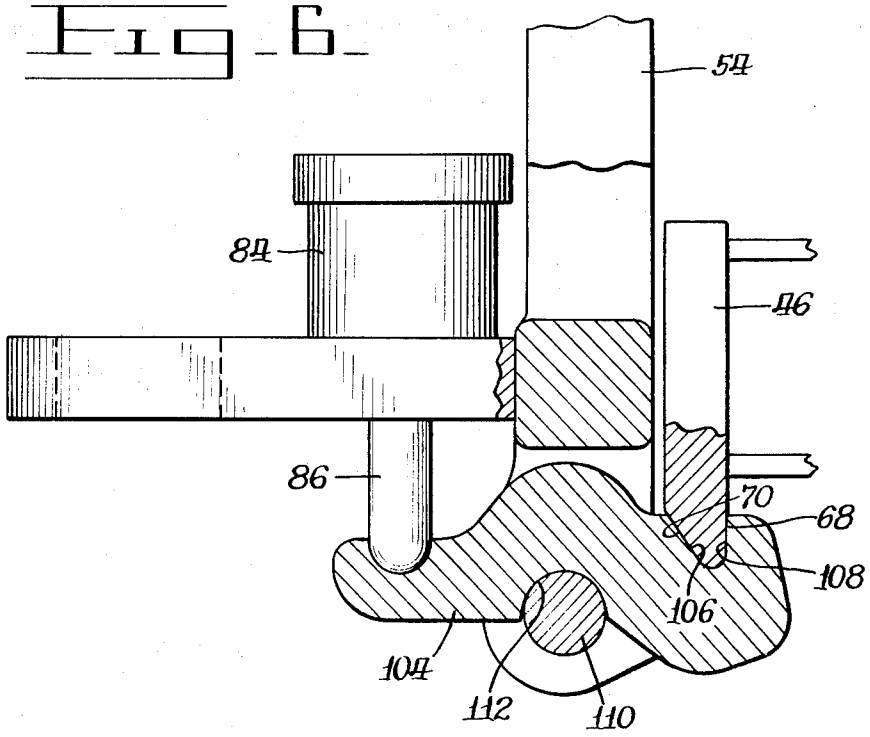
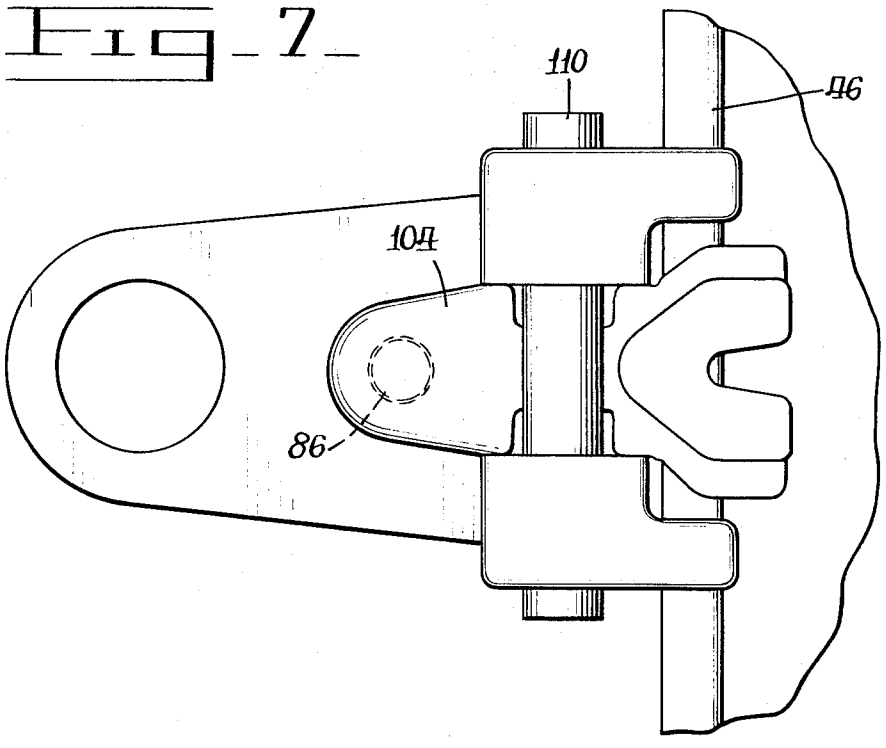


Fig. 7



CLAMPING MECHANISM FOR SIDE SHIFTABLE BACKHOE

BACKGROUND OF THE INVENTION

The present invention is directed to mechanical backhoes and excavators, and relates specifically to new and improved clamping means for the shiftable frame of a side shiftable excavator.

Mechanical shovels of the type known as backhoes or excavators have come into widespread use in recent years because of their versatility. These backhoes are normally constructed as attachments for conventional vehicles such as tractors. They normally comprise a base frame detachably secured to the back of a tractor, which provides power and mobility. In order to increase the versatility of such machines, a shiftable frame is movably mounted on the base frame, and carries the boom and shovel. The advantages of such an arrangement are set forth, for example, in U.S. Pat. No. 2,834,489, issued May 13, 1958 to C. J. Davis.

The shiftable frame must have some suitable means for locking it into position on the base frame when it is moved to the selected or desired position. Numerous mechanically actuated devices for locking the shiftable carriage or frame with respect to the stationary or base frame have been proposed. Many of these devices haVe the disadvantage of being time consuming in the adjustment of the movable carriage with respect to the stationary carriage. Many of these mechanical devices require that the operator have in his possession a suitable tool, such as a wrench, for releasing the clamping device. He must dismount the vehicle to release the clamp, and then remount the vehicle and shift the frame to the suitable position in the usual manner by means of the hydraulic shovel. He must again dismount the vehicle and resecure the clamping device.

Hydraulic clamping devices have been proposed for eliminating this time consuming chore of relocating the shiftable frame. Known hydraulically operated clamping or locking devices are exemplified by the following patents: U.S. Pat. No. 3,304,100, issued Feb. 14, 1967; U.S. Pat. No. 3,608,930, issued Sept. 28, 1971; and, U.S. Pat. No. 3,614,134, issued Oct. 19, 1971.

Many of these prior art devices simply use a hydraulic ram for biasing a clamping plate directly into engagement with the slide rails on the stationary frame. This has the disadvantage of requiring a very high hydraulic pressure to maintain the system in locked position against side loads. It further results in the locking device almost completely releasing, should a small amount of leakage occur in the clamping system.

Other hydraulic systems of this type are arranged to shift the entire weight of the shiftable frame and bucket apparatus against its own weight in the clamping operation. This has the obvious disadvantage of requiring the clamping apparatus to operate against the entire weight of the shifting carriage in order to achieve the clamping operation. It further permits the complete disengagement of one or more of the clamping surfaces, should a loss of pressure occur in the clamping system.

SUMMARY AND OBJECTS OF THE INVENTION

It is the primary object of the present invention to provide a clamping apparatus for a side shiftable excavator that overcomes the above problems of the prior art.

Another object of the present invention is to provide hydraulically actuated locking means for the shiftable carriage of a mechanical excavator that overcomes the above problems of the prior art.

A further object of the present invention is to provide clamping apparatus for a side shiftable excavator that utilizes the weight of the shiftable frame in the clamping operation.

In accordance with a primary aspect of the present invention, there is provided a clamping apparatus for a side shiftable excavator that comprises a hydraulically actuated lever that is arranged to provide or apply the predominant clamping force in the vertical direction, and in a manner to utilize the weight of the shiftable frame to assist in the clamping function.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will become apparent from the following description when read in conjunction with the accompanying drawings, wherein:

FIG. **1** is a side elevational view of a side shiftable backhoe incorporating the present invention;

FIG. **2** is a sectional view taken generally along lines II—II of FIG. **1** with portions broken away, to illustrate detail;

FIG. **3** is a view in section, taken generally along lines III—III of FIG. **2**;

FIG. **4** is a fragmentary bottom view of the clamping lever or movable jaw of FIG. **3** of the invention;

FIG. **5** is a schematic of a hydraulic circuit of the present invention;

FIG. **6** is a fragmentary view showing the details of an alternate embodiment of the clamping jaw of the present invention; and,

FIG. **7** is a bottom view of the clamping jaw of FIG. **6**.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIG. **1**, there is illustrated a preferred embodiment of the present invention incorporated into a backhoe attached to a conventional vehicle. As illustrated in FIG. **1**, a backhoe generally designated by the numeral **10**, is mounted on the rear of a conventional tractor **12**, which may be either the track type as shown or any other suitable type.

The backhoe comprises the usual boom **14**, to which is pivotally connected a dip stick **16**, which in turn pivotally carries a bucket **18**. The boom **14** is pivotally attached or carried for vertical swinging movement by a swing frame **20**, which in turn is pivotally mounted for horizontal swinging movement on a slide frame **22**. A plurality of hydraulic cylinders **24**, **26** and **28** are operatively connected for respective manipulation of the boom, dip stick and bucket. These cylinders are powered by suitable source of pressurized fluid which is controlled by means of suitable control levers **30** mounted on a control console **32**. The plurality of conduits **34** communicate the pressurized fluid from the control valves to the respective hydraulic cylinders.

The backhoe **10** includes a main or base frame **36** detachably secured by suitable means such as a pair of upright support members **38** and pins **40** and **42** to the chassis or main frame of a tractor. This main frame as-

sembly remains essentially stationary with respect to the tractor 12 to which it is attached.

The main frame comprises transversely extending parallel disposed upper and lower guide or slide rails, 44 and 46 (FIGS. 2 and 3). The frame 36 also includes a pair of stabilizer jacks 48 attached to the outer ends thereof, and operative in the usual manner to stabilize the machine when put in operation. A pair of stops 49 are disposed at the outer ends of the slide rails to limit the transverse movement of the slide frame 22.

As best seen in FIG. 3, the slide frame 22 is slidably supported on the upper slide rail 44 by means of spaced hook or bearing members 52 extending forwardly from the upper end of upright support member 54, and including bearing surfaces 56 and 58 in engagement with complementary bearing surfaces 60 and 62 formed on rail 44. The lower end of the slide frame 22 is supported on lower rail 46 by means of hooks 64 having bearing surfaces such as 66, in engagement with bearing surfaces 68 of the slide rail 46. The lower rail 46 further includes a downwardly directed bearing surface 70 which is engaged by cam means or surface 72 formed on one end of a lever 74 which forms part of the latching or clamping mechanism generally designated by the numeral 76, to be described.

The latching or clamping mechanism 76 generally comprises the aforementioned lever 74, which is pivotally mounted in a substantially horizontal position on a cylindrical shaft or pin 78 by means of semi-cylindrical bearing means 80 formed in the lever 74. The clamping mechanism further includes a hydraulic ram comprising a piston 82 reciprocally disposed in a cylinder 84 and operatively connected by means of a link 86 to lever 74. Hydraulic fluid is introduced into the cylinder 84 for acting on piston 82 by means of suitable fittings or conduit means 88, which in this instance is preferably of the flexible, expandable type so as to function as an accumulator for cylinder 84.

The use of an expandable conduit 88 provides an inexpensive technique for providing an accumulator to insure the maintenance of hydraulic pressure, to insure continuous actuation of cylinder 82 despite small leakage that may occur from the cylinder. Pressurization of the hydraulic ram results in transmittal of force by way of link 86 to lever 74, pivoting it around the shaft 78, resulting in camming surface 72 coming into engagement with the surface 70 of guide rail 46. This action results primarily in a downward force being applied to the shaft 78 to pull the side frame 22 downward and pull bearing surfaces 56 and 58 into tight engagement with bearing surfaces 60 and 62 of the upper slide rail 44.

This arrangement utilizes the weight of the entire implement supported on slide frame 22 to assist in the clamping action. The force applied by way of cam means 72 of lever 74 to the lower slide rail 42 is predominantly in a vertical direction, but with some biasing of the bearing surfaces 68 and 70 of the lower guide rail 42 between surfaces 66 and 72. Thus, this arrangement utilizes the weight supported on the slide frame 22 to assist in the clamping action by applying the vertical force to the slide rails. This vertical force is further desirable in that it applies the forces directly to the slide rails in the direction of their greatest dimension, so as to avoid bending of the rail as might occur should the forces be applied transverse thereto.

A suitable hydraulic control system is disclosed in FIG. 5, and comprises a pump 90 drawing fluid from a reservoir 92 and supplying it by suitable conduit means 94 to a multi-position selector valve 96 which is operated by a suitable control lever 98. The control valve means includes a check valve 100 to prevent back flow or fluid from conduit 88 and the ram 84 when valve 96 is in the indicated position. This arrangement will also maintain hydraulic pressure to the clamping mechanism 76 in the event hydraulic pressure is lost on the pump side of valve 96 due to machine shutdown or hydraulic failure. A suitable conduit 102 is provided for return of fluid from the ram by way of control valve 96 to the sump or reservoir 92.

An alternate embodiment of the clamping mechanism is disclosed in FIGS. 6 and 7, wherein like structures will be designated by like numbers. In this embodiment, a lever 104 is provided with a hook defining faces 106 and 108 engaging surfaces 68 and 70 at the lower end of slide rail 46. The lever 104 is pivotally journaled, as in the previous embodiment, on a pin 110 by way of semi-cylindrical bearing portion 112. With this embodiment, the force applied by the clamping mechanism comprising lever 104 is more fully in the vertical direction than in previous embodiments, resulting in the clamping action being solely between the upper surface of the upper slide rail 44 and the lower surface of the lower slide rail 46. Thus, the clamping action, as in the previous embodiment, is achieved by the application of a force comprising both the weight of the assembly carried on the slide frame and the force developed in the clamping mechanism transmitted through the lever 104. This results in avoiding the application of any transverse forces to the guide rails which may result in bending them, which would cause difficulty in adjusting the slide rail transversely of the guide frame.

With reference now to FIG. 3, the swing frame 20 is pivotally connected to the slide frame 22 by means of upper pivot comprising a bifurcated bracket member 114 pivotally supporting a bracket member 116 by means of a pin 118. The lower pivotal connection comprises a bifurcated member 120 or bracket extending from swing frame 20 and pivotally connected by means of a pin 122 to a bracket 124 extending outward from frame 22. Thus, the swing frame 20 is pivotally mounted to the sliding frame 22 by means of pins 118 and 122 for swinging movement about an axis X extending through the pins 118 and 122.

In order to carry out the operation in accordance with the present invention, pressurized fluid is exhausted from cylinder 84, resulting in the relieving of the force applied to the clamping levers 74 or 104. This action relieves the clamping forces so that the operator can then move the slide frame 22 along the guide rails 44, 46 simply by placing the bucket 18 in engagement with the ground or any other suitable structure, and applying or activating suitable ones of the hydraulic cylinders 24, 26 or 28 to apply a transverse force to the slide frame 22 along the guide rails. Once this slide frame 22 is in the desired position, the operator simply manipulates control lever 98 to activate the hydraulic ram 84, resulting in a re-application of the clamping forces, so that the frame 22 will be clamped into its selected position.

From the above description, it can be seen that there is provided a novel and improved hydraulically actu-

ated clamping mechanism for a slide frame of an excavator that is simple and easy to operate, and effective in clamping an excavator slide frame in a desired position. The clamping mechanism of the present invention is further utilized to take advantage of the weight of the excavator assembly itself to aid in the clamping function.

What is claimed is:

1. In an excavating machine having a side shiftable frame slidably mounted on upper and lower vertically spaced parallel slide rails of a stationary frame and a pressurized fluid source, the improvement comprising:

hydraulically operated locking means for locking said shiftable frame in any one of an infinite number of positions along the stationary frame;

said locking means comprising a lever pivotally mounted on said slide frame adjacent to said lower slide rail; and,

a hydraulic ram operatively connected to pivot said lever into engagement with a downwardly directed face of said lower slide rail to thereby clamp said shiftable frame into engagement with an upper surface of said upper slide and said downwardly directed surface of said lower rail so that said clamping forces are substantially vertically directed.

2. The invention of claim **1** wherein said lever is substantially horizontally disposed.

3. The invention of claim **2** wherein said slide frame comprises a horizontally disposed shaft and said lever is journaled on said horizontally disposed shaft spaced from and extending parallel to said lower slide rail.

4. The invention of claim **3** wherein said shaft is disposed below the lower surface of said lower slide rail.

5. The invention of claim **4** wherein said lever includes a semi-cylindrical bearing surface engaging said shaft.

6. The invention of claim **2** wherein said lever includes camming means engaging said surface of said lower rail.

7. The invention of claim **6** comprising a horizontally directed bearing face directed in opposition to said camming means and engaging a face of said lower rail.

8. The invention of claim **1** wherein said source comprises a selector valve and a flexible conduit operative to direct pressurized hydraulic fluid to operate said ram.

9. The invention of claim **8** wherein said conduit comprises an expandable portion to thereby function as an accumulator.

10. The invention of claim **9** wherein said valve means comprises a check valve.

11. The combination of an excavating machine having a side shiftable frame slidably mounted on upper and lower vertically spaced parallel slide rails of a stationary frame and a pressurized hydraulic fluid source, and locking means for locking said shiftable frame in any one of an infinite number of positions along the stationary frame comprising:

a lever pivotally mounted on said slide frame adjacent to said lower slide rail; and,

a hydraulic ram operatively connected to force one end of said lever into engagement with a downwardly directed face of said lower slide rail to thereby clamp said shiftable frame into engagement with an upper surface of said upper slide and said downwardly directed surface of said lower rail so that said clamping forces are substantially vertically directed.

12. The invention of claim **11** wherein said lever is substantially horizontally disposed.

13. The invention of claim **12** wherein said slide frame comrpises a horizontally disposed shaft and said lever is journaled on said horizontally disposed shaft spaced from and extending parallel to said lower slide rail.

14. The invention of claim **13** wherein said shaft is disposed below the lower surface of said lower slide rail.

15. The invention of claim **14** wherein said lever includes a semi-cylindrical bearing surface engaging said shaft.

16. The invention of claim **12** wherein said lever includes camming means engaging said surface of said lower rail.

17. The invention of claim **16** comprising a horizontally directed bearing face directed in opposition to said camming means and engaging a face of said lower rail.

18. The invention of claim **11** wherein said source comprises a selector valve and a flexible conduit operative to direct pressurized fluid to operate said ram.

19. The invention of claim **18** wherein said conduit comprises an expandable portion to thereby function as an accumulator.

20. The invention of claim **19** wherein said valve means comprises a check valve.

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