

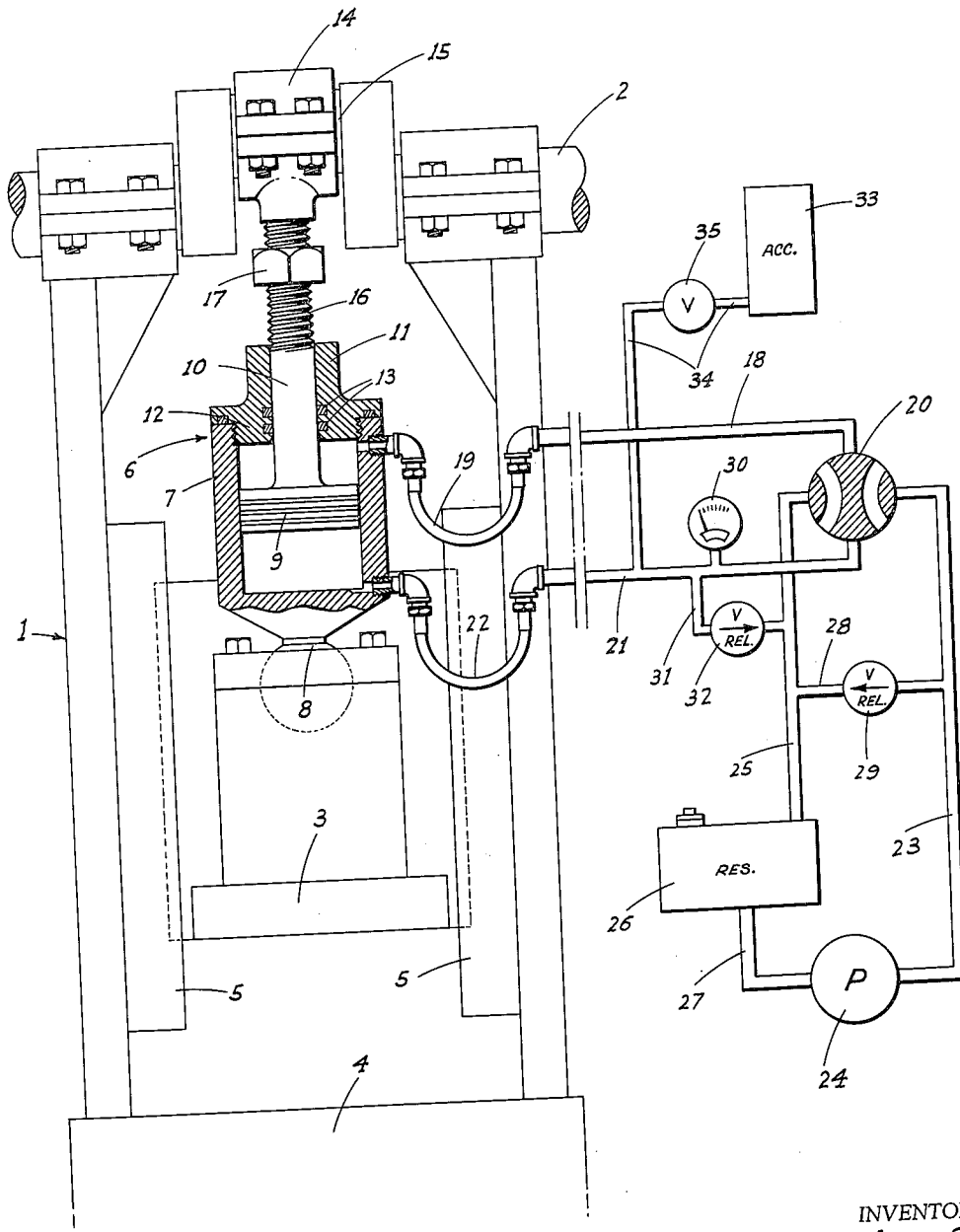
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HYDRAULIC CONNECTING UNIT FOR PUNCH-PRESS RAMS

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1

3,005,404 HYDRAULIC CONNECTING UNIT FOR PUNCH-PRESS RAMS

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This invention relates to power punch presses, and particularly to the connecting unit between the crankshaft and the ram of the press.

It is of course necessary, for different pressing operations, to adjust the length of such unit so that the spacing between the ram and the work supporting bed of the press is altered, while at the same time the stroke of the ram is held constant.

With the connecting units as at present constructed, such adjustment is effected by relatively laborious and time-consuming operations involving loosening, tightening, and turning of various screws and other parts.

The major object of my invention is to eliminate such operations by constructing the connecting unit in the form of an extensible and contractible hydraulic device, and providing a simple manually controlled hydraulic fluid-feed system connected to the device for thus extending or contracting the same, and so that the desired adjustment thereof is very speedily effected.

A further object of the invention is to arrange said device, in connection with the system, so that the desired adjustment of the device can be effected while the press is in operation and set for automatic trip, so that the operator may obtain the action of a forging steam hammer.

Further objects of the invention are to provide, in connection with such hydraulic device, a visual indication to the operator as to the pressure being exerted on the work, and an automatically functioning means to relieve an overload should it occur, so as to prevent damage being done to the press.

Another object of the invention is to provide, in connection with the hydraulic device and the supply and feed system, a manually controlled means which enables the press to be operated as a deep-draw press, as well of course as a conventional punch press.

It is also an object of the invention to provide an adjustable connecting unit for punch-press rams which is designed for ease and economy of manufacture.

An additional object of the invention is to provide a practical and reliable adjustable connecting unit for punch-press rams, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

The figure on the drawing is a fragmentary elevation of a conventional form of punch press, showing the improved connecting hydraulic cylinder unit between the crankshaft and ram of the press, together with the fluid control system for such unit, mainly in diagrammatic form.

Referring now more particularly to the drawing, and to the characters of reference marked thereon, the punch press to which the improved adjustment and control arrangement is applied includes the usual upstanding frame, indicated generally at 1; the horizontal driven crankshaft 2; and the ram 3 below the crankshaft on which the punch dies and the like are mounted, and which is slidable to and from the work supporting bed 4 between frame-mounted guideways 5.

2

The connecting structure between the crankshaft 2 and ram 3 comprises a hydraulic cylinder unit, indicated generally at 6. This unit includes a cylinder 7 on the lower end of which a ball 8 is mounted, which rockably engages in a seat in the upper end of the ram 3 in the customary manner. Slidable in the cylinder is a piston 9 having an upstanding piston rod 10 thereon which is slidable through an elongated sleeve 11 upstanding from the cylinder head 12. The head 12 carries seals 13 engaging the piston rod 10 in pressure holding relation.

The piston rod 10, at its upper end, carries a split head 14, which embraces the crank pin 15 of the crankshaft 2.

The rod 10 is threaded for a certain portion of its length from the head 14 down, as shown at 16, and a nut 17 is mounted on said threaded portion. This nut, when at the upper end of the threaded portion, does not prevent any necessary relative downward movement of the piston 9 in the cylinder, while the lower end of the threaded portion is at a point which allows of such relative downward movement without the threads coming in contact with the seals 13. The purpose of this arrangement will be seen later.

The position of the piston 9 in the cylinder, and which determines the distance between the crank pin 15 and the lower end of the ram, is controlled by the following hydraulic-fluid feed and control arrangement.

A conduit 18, which includes a flexible hose portion 19 adjacent the cylinder 7, leads from said cylinder adjacent the top thereof to a manually controlled fourway valve 20 mounted at a suitable point on the frame of the press or other stationary object.

Another conduit 21, which includes a flexible hose portion 22 near the cylinder 7, leads from said cylinder at the bottom thereof to the opposite side of valve 20.

A conduit 23 leads from the discharge side of a pump 24 to the valve 20 for alternate communication with the conduits 18 and 21, while another conduit 25 leads from the valve 20, also for alternate communication with said conduits 18 and 21, to a reservoir 26 to which the intake of the pump is connected by a conduit 27. The pump may be power or manually operated, as the cost or size of the press may determine to be the most feasible.

It will therefore be seen that upon manipulation of the valve 20 from a closed position to either open position so as to feed fluid to the cylinder 7 above or below the piston 10 as may be desired while draining the opposite side of the cylinder, the cylinder and ram 3 will be moved up or down relative to the bed 4. A very quick adjustment of the ram position may therefore be effected, which position will be maintained if the valve 20 is then returned to a closed position.

It will also be seen that since the unit 6 may be adjusted at any time and while the press is operating, said press may have the effect or action of a forging steam hammer.

A bypass conduit 28 connects conduits 23 and 25 intermediate their ends, with a pressure relief valve 29 therein, so that with the pump running constantly—as is customarily the case, and when valve 20 is closed—no harmful build-up of pressure will result.

A pressure indicating gauge 30 is connected to conduit 21 so that the operator can see what pressure is being exerted on the work with the down stroke of the ram.

A bypass conduit 31 connects the conduit 21 back from the gauge, and the conduit 25, with an overload pressure relief valve 32 therein, so that excessive pressure on the ram generated while the press is in operation and such as might damage some part of the press or control system, is avoided.

If, however, after setting the position of the cylinder 7 relative to the piston rod by manipulation of the valve 20, it is desired to maintain a high pressure without pos-

sible relief of the fluid, the nut 17 may be advanced on the rod 10 until said rod engages the upper end of the sleeve 11. If a constant pressure is then maintained in the cylinder above the piston, the unit 6 then functions as a rigid structure, without any hydraulic action being involved.

In order that the punch press may be operated as a deep-draw press if desired, a conventional accumulator 33 is provided at a convenient point, which is connected to conduit 21 at a point preferably close to the cylinder 7, by a conduit 34 in which a manually adjustable metering valve 35 is interposed.

From the foregoing description it will be readily seen that there has been produced such a device as will substantially fulfill the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations therefrom may be resorted to as do not form a departure from the spirit of the invention as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. In a punch press which includes a crankshaft, a ram below the crankshaft and a work supporting bed below the ram, an extensible and contractible hydraulic unit extending between the crankshaft and ram comprising a cylinder connected to and upstanding from the ram, a piston in the cylinder, and a piston rod upstanding from within the cylinder and connected to the crankshaft; the cylinder including a head having an upstanding rod-

engaging sleeve, means to feed hydraulic fluid under pressure to or withdraw the same from the cylinder above the piston while retaining any desired amount of fluid within the cylinder, the portion of the piston rod above the sleeve being threaded, and a nut adjustably mounted on the threaded portion of the rod for engagement with the upper end of the sleeve when the cylinder has been adjusted in position relative to the piston rod by admission or withdrawal of fluid to and from the cylinder.

2. In a punch press which includes a crankshaft, a ram below the crankshaft and a work supporting bed below the ram, an extensible and contractible hydraulic unit extending between the crankshaft and ram comprising a cylinder connected to and upstanding from the ram, a piston in the cylinder, and a piston rod upstanding from within the cylinder and connected to the crankshaft; the cylinder including a head, means to feed hydraulic fluid to or withdraw the same from the cylinder above the piston while retaining any desired amount of fluid within the cylinder, and an element on the piston rod mounted for longitudinal adjustment thereon and adapted for engagement with the cylinder head to limit downward movement of the piston rod and piston into the cylinder.

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