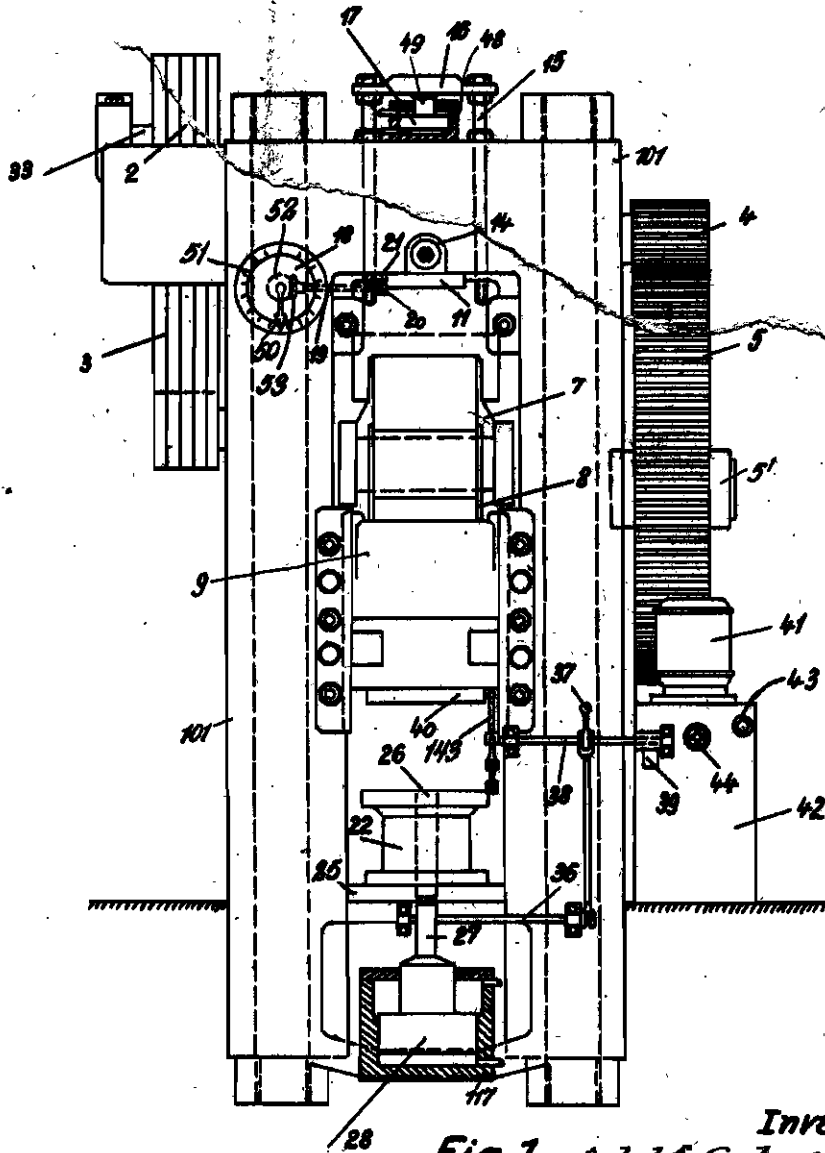


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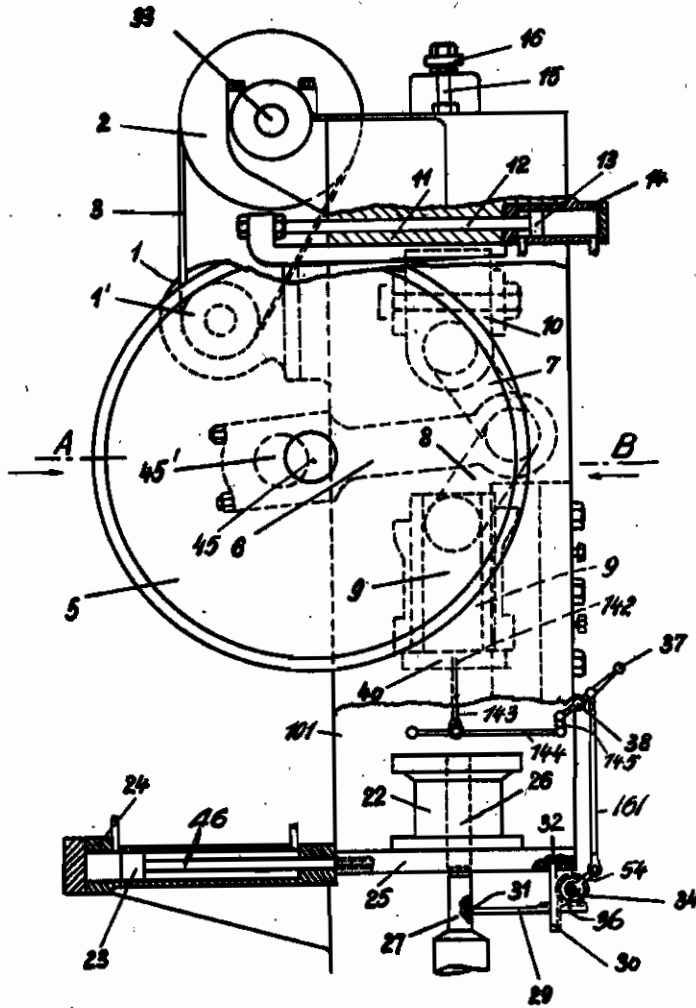


Fig. 2

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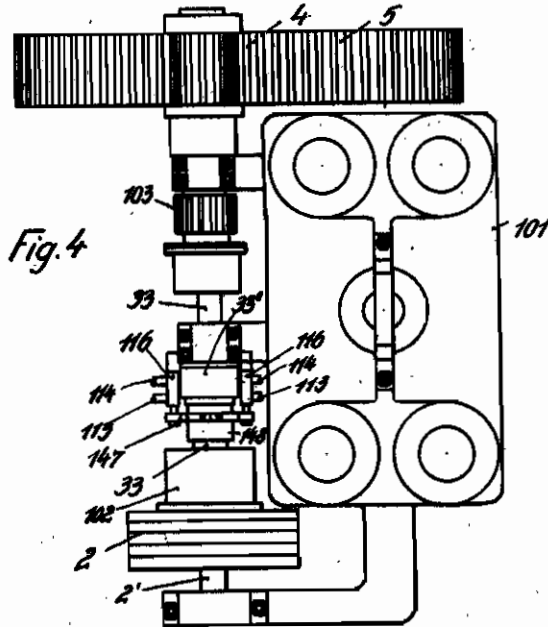


Fig. 4

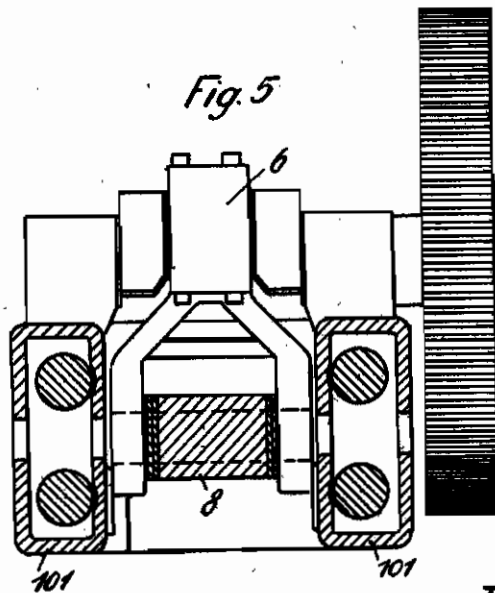


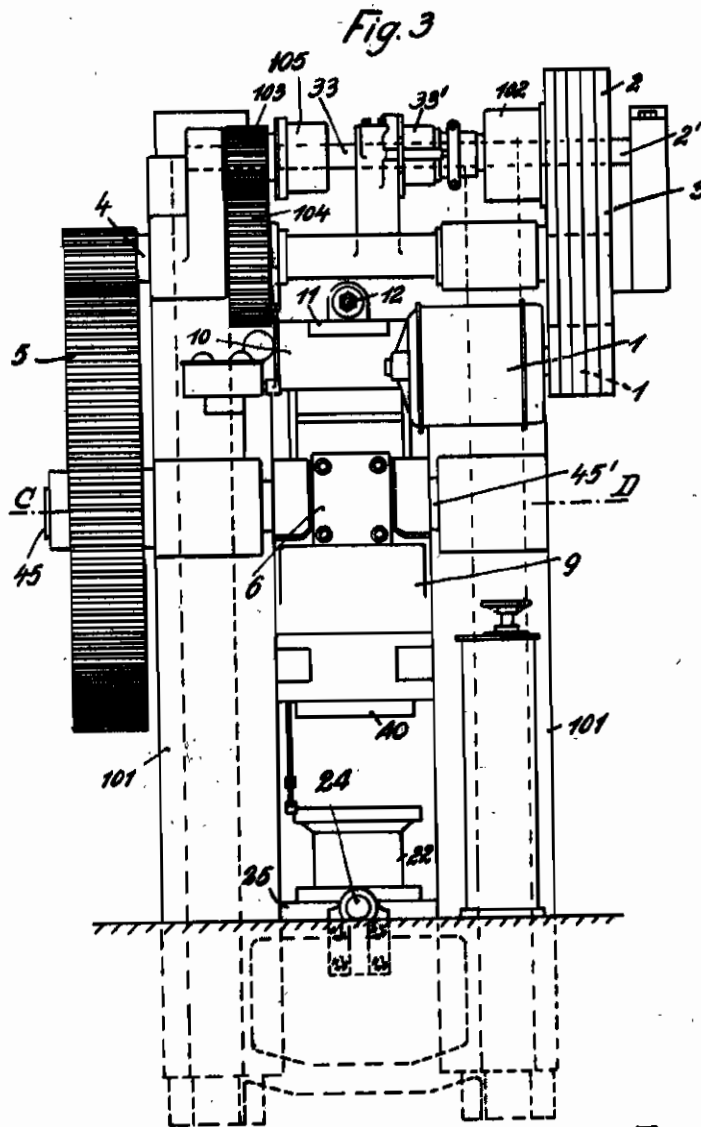
Fig. 5

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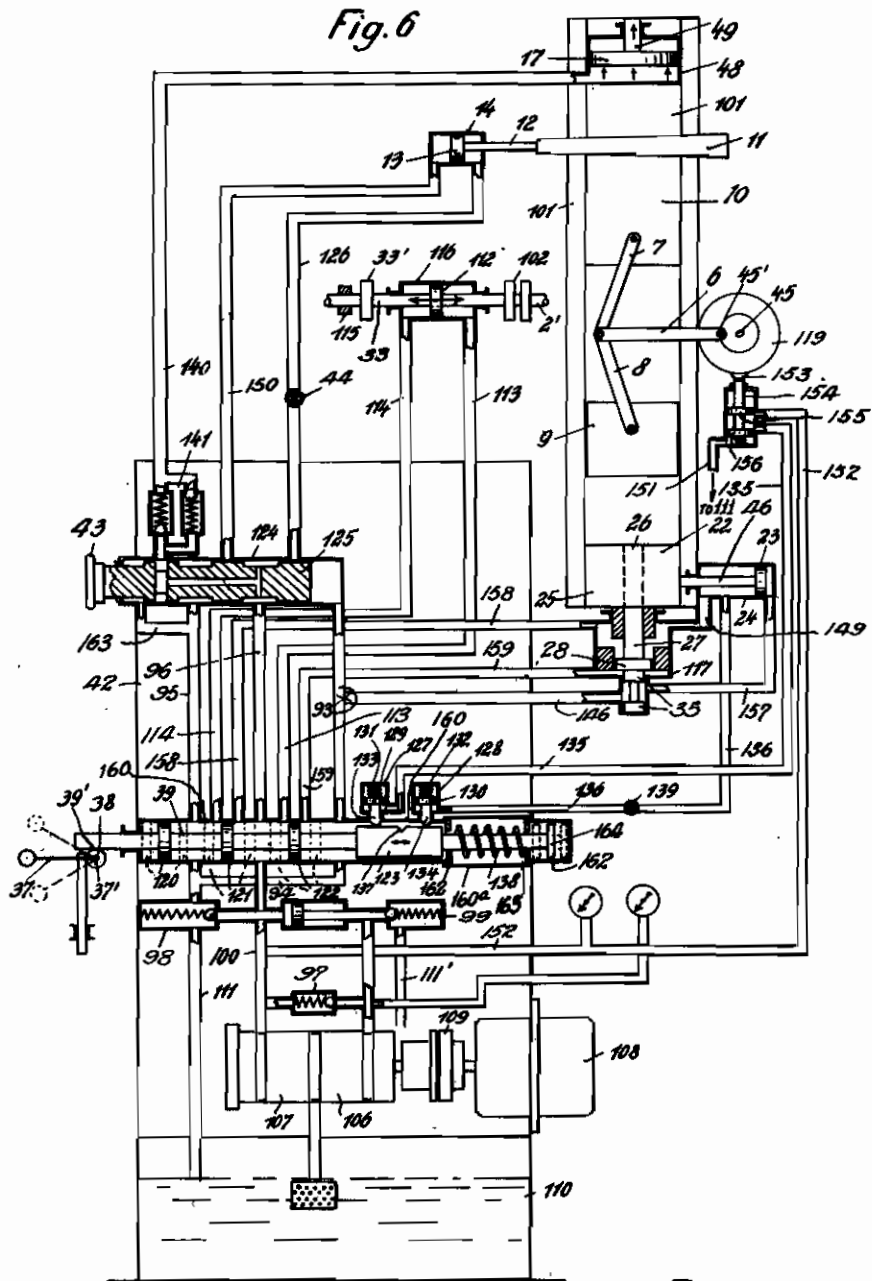


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ALIEN PROPERTY CUSTODIAN

TOGGLE LEVER PRESS

Adolf Schneider and Ewald Ungethuem, Karlsruhe (Baden), Germany; vested in the Alien Property Custodian

Application filed April 5, 1938

This invention relates to a toggle lever press and to a method of operating such a press.

It is an object of the invention to increase the speed and output of toggle lever presses, to simplify the construction and to reduce the manufacturing cost of such a press.

Another object of the invention is to facilitate the operation of toggle lever presses.

Another object of the invention is to facilitate the ejecting operation.

Still another object is to provide a simple system and method for adjusting the end positions of the ram.

With these and further objects in view, we provide means for effecting the control of the press by hydraulic pressure. More particularly, we control the end positions of the ram, the press table, the ejector and the main shaft by hydraulic pressure.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawings showing by way of example and diagrammatically an embodiment of our toggle lever press.

Fig. 1 is an elevation, partly in section, viewed in the direction of arrow A in Fig. 2 of a toggle lever press having the invention applied thereto.

Fig. 2 is a side elevation, partly in section, of the press shown in Fig. 1.

Fig. 3 is an elevation of the same press viewed in the direction of the arrow B in Fig. 2.

Fig. 4 is a plan view of the press.

Fig. 5 is a section on line C, D in Fig. 3.

Fig. 6 is a scheme of the control system.

Referring now to the drawings in greater detail, and first to Figs. 1 to 5, the press comprises a main frame 101 in which the press table 22 is mounted for lateral slide motion under action of a hydraulic system 23, 24, 48, as will be hereinafter described. A ram 6 is mounted to slide vertically in suitable guides of the main frame, under action of a toggle lever system 6, 7, 8, 10, in the manner known per se.

The drive of the press will now be described. A pulley 2 fast on a shaft 2' is driven from a motor 1 with pulley 1', by a number of cone belts 3, and in turn drives, through coupling 102, main shaft 33, a slipping clutch 105 and gear wheels 103, 104 and 4, a gear wheel 5 on shaft 45. Mounted on a crank 45' of shaft 45 is a connecting rod 6 acting upon a toggle lever system comprising thrust rods 7 and 8, a stationary support or abutment 10 and a ram 6 upon which the pressure of said system is exerted. The support 10 bears against an adjustable wedge member 11

which in turn bears against the transverse or bridge portion of the main frame 101.

The wedge member 11 is mounted to be movable in a horizontal direction by a thrust rod 12 forming part of a piston 13 movable in a cylinder 14 by hydraulic pressure which is fed and controlled in the manner which will be hereinafter described, so as to control the vertical position of the support 10 which bears against the lower inclined face of said wedge member 11.

The toggle joint support 10 is connected, through two tension rods 15, with a cross bar 16 which can be acted upon by hydraulic pressure in the cylinder 48, through a piston 17 and piston rod 49, thus urging the toggle joint support 10 against the wedge face 11 and locking the wedge member in its adjusted position. The actual position of the adjustable wedge member 11 is shown by an indicator 18 consisting of an index 50 movable on a scale 51 and rotated, through a bevel gear 52 fast on the pointer shaft and a bevel gear 53 fast on the left hand end of shaft 19, from a rack 21 fast on the adjustable wedge member 11 and engaging a toothed wheel 20 fast on the opposite end of shaft 19. In this manner, the lower and upper end positions of the ram 9 are controlled, locked and indicated.

The press table 22 can be horizontally moved by means of a hydraulic piston 23 movable in a cylinder 24 and secured to a thrust rod 110 connected with the plate 25. An ejector rod consisting of an upper part 26 and a lower part 27 extends through the plate 25 and the table 22. Connected to said lower portion 27 is a piston 28 movable in a hydraulic cylinder 117 under control of the pressure of a liquid admitted to either side of the cylinder 52 by ducts and control valves, which will be hereinafter described. In order to ensure that the ejecting operation can take place only when the ejector member 28 is positioned accurately vertically above the member 27, partly toothed rods 29, 30 moved by a toothed wheel 34 on shaft 36, are provided to engage recesses 31 and 32 of the member 27 and the plate 25 respectively when said parts are in the correct positions. The shaft 36 is rotated by depression of the lever 37, pivoted at 38, through a rod 53 and a lever 54. The lever 37 is connected by shaft 36 with a valve controlling rod 89 controlling the press liquid for a hydraulic system 112, 116 (Fig. 6) by which the coupling 102 is operated as will be hereinafter described.

Referring now to Fig. 6, there is shown a diagram of the hydraulic control system. Two gear pumps 106 and 107, driven by an electromotor

108, through a coupling 108, supply oil or water under pressure from a storage tank 110 into the pipe system comprising the control valves, cylinders and pistons, while the excessive quantities of oil are fed back into the storage tank 108, through pipe 111. The elements of the hydraulic pipe system are known per se and need not be described in detail here. Therefore, it will be sufficient to refer to the typical parts of the machine illustrated in the diagram and forming part of the invention.

The main shaft 33 is mounted to be axially movable by means of a piston 112 arranged in a cylinder 116 and controlled by hydraulic pressure through pipes 113 and 114. Thus, when the pressure in pipe 114 exceeds the pressure in pipe 113, the piston 112 and shaft 33 will be moved in right hand direction and shaft 33 will be coupled with the driving shaft 2', by engagement of the coupling 102 so that the toggle lever system is operated. Again, when the pressure in pipe 113 exceeds the pressure in pipe 114, the piston 112 and shaft 33 will be moved in a left hand direction, releasing the coupling 102, and the flange or collar 33' on shaft 33 will engage the stationary brake disc 115, so that the press comes to a standstill. It will be understood that it is not necessary for the main shaft 33 to pass through the cylinder 116, but in practice the mechanical connection between piston 112 and shaft 33 or coupling 102 and brake 115 respectively will be established in the manner shown in Fig. 4, by means of a twin arrangement of cylinders 118 operating on shaft 33 by a cross bar 147 engaging a suitable annular groove in the shaft 33 or in a flange 148 on said shaft respectively.

The arrangement of the parts 37 and 38 hereinbefore mentioned with reference to Fig. 1 and controlling the brake and the coupling will now be described in greater detail with reference to Fig. 6. By the lever 37 pivoted at 38 a pinion 37' engaging a rack portion 39 of a rod 39' can be rotated, whereby the control pistons 120, 121, 122, 123 on rod 38' are moved in the casing 126 and open or close the respective channels of the hydraulic control system as will be clear from the drawing, whereby press oil of predetermined pressure is fed to the pipes 114 and 113 for control of the coupling 102 and brake 33', 115, as hereinbefore described.

The parts of the table control, 22, 25, 118, 23, 24, of the ejector control, 28, 27, 28, 117, and of the controls 11, 12, 13, 14 and 17, 48, 48 for the position of support 10 have been hereinbefore described with reference to Figs. 1 and 2 and will not require further explanation. The manner in which said controls are inserted in the hydraulic control system will be clear from Fig. 6.

Mounted on shaft 45 (Fig. 6) is a cam 119 controlling a rotary piston valve 120 which is connected with press oil pipes 121 (the connection of which with the pressure oil system has been omitted for simplicity's sake), 122 and 123. Thus the supply of press oil to the different control points can be automatically controlled in accordance with the position of the knee lever system operated by shaft 45. The handle 43 which has been described with reference to Fig. 1 operates on a valve arrangement 124 in such a manner that in the position shown in Fig. 6 the wedge member 11 is locked in its position by the support 10 upwardly urged by the piston 17 in the manner hereinbefore described, while in the extreme left and right hand positions of the

piston or slide 125 the wedge member 11 is moved in the right or left hand direction respectively, by admission of press oil into the pipes 125 and 126, through the respective outlets of the valve casing 124.

Mounted on the valve casing 124 are piston valves 127 and 128, the pistons 129 and 130 of which are downwardly acted upon by springs 131 and 132 and with the points of their rods 133 and 134 rest on the member 123 acted upon by a spring 138, whereby the piston valves are held open and admit press oil from the valve casing 126 to the pipes 135 and 136 as long as said points engage the upper face of member 123. When the rod 39' is laterally displaced so that either of the two rods 133, 134 engages the recess 137 or no more engages the upper face of member 123 at all, the respective piston valve will be closed.

Inserted in pipe 136 is a retardation valve 139 and inserted in pipe 140 is a tension valve 141.

The operation of the press is as follows: When the coupling 102 is engaged, in the manner hereinbefore described, the press makes one stroke and, by action of the described control system, the coupling is then automatically released and the brake put on, whereby the press is locked in its upper position.

In this moment the ejector piston 28 is upwardly pressed, under action of the press liquid admitted from said source of hydraulic pressure by said control valves. Now, the press liquid is delivered, by said control valves, into the cylinder 24 and moves the piston 23 together with the plate 25 and the table 22 in which the upper part of the ejector is positioned, in a right hand direction (Fig. 2). The work piece is now removed from the table 22 and another work piece is put on. In the meantime the lower ejector part 27 has been withdrawn to its lowest position, by action of the hydraulic pressure admitted on top of the piston 28 in cylinder 117. Provided on the plate 25 is a stop (not shown) by which a valve is operated in the extreme right hand position of the plate 25 and admits press liquid into the right hand chamber of the cylinder 24, whereby the plate 25 is withdrawn into its operative position. The whole procedure is now repeated and takes place automatically by suitable operation of the control valves for the press liquid which are interconnected in the manner shown in Fig. 6.

Where it is intended to use several tools, for example, one punch each for the first, second and finish-pressing operation, three different punches may be mounted on the tool carriage which can be moved manually for bringing the punches successively into their operative position. After the first and second pressing operation the ejector and press table remain in their normal position while, after the third tool has been operated, a valve is operated by a stop member at the carriage, whereby the press oil is admitted into the cylinder 117 and thereafter into the cylinder 24.

In order to ensure that the tool carriage is in the correct position when the press is operated, a recess 142 is provided in the carriage 40 and a lock member 143 is provided to engage said recess when the carriage is in its working position, thereby releasing the control members 37, 38 for the drive of the machine, through rods 144, 145.

The hand wheel 44 serves to operate a throttle

valve or nozzle through which the press oil flows, whereby the movements of the piston 13 for the stroke adjustment can be accelerated and retarded.

While we have herein shown and described 5 certain preferred embodiments of our invention, we wish it to be understood that we do not confine ourselves to all the precise details herein set forth by way of illustration, as modification

and variation may be made without departing from the spirit of the invention or exceeding the scope of the appended claims. More particularly it is within the purview of our invention to operate only a part of the control motions by hydraulic pressure instead of all of them as hereinbefore described.

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EWALD UNGETHUEM.