

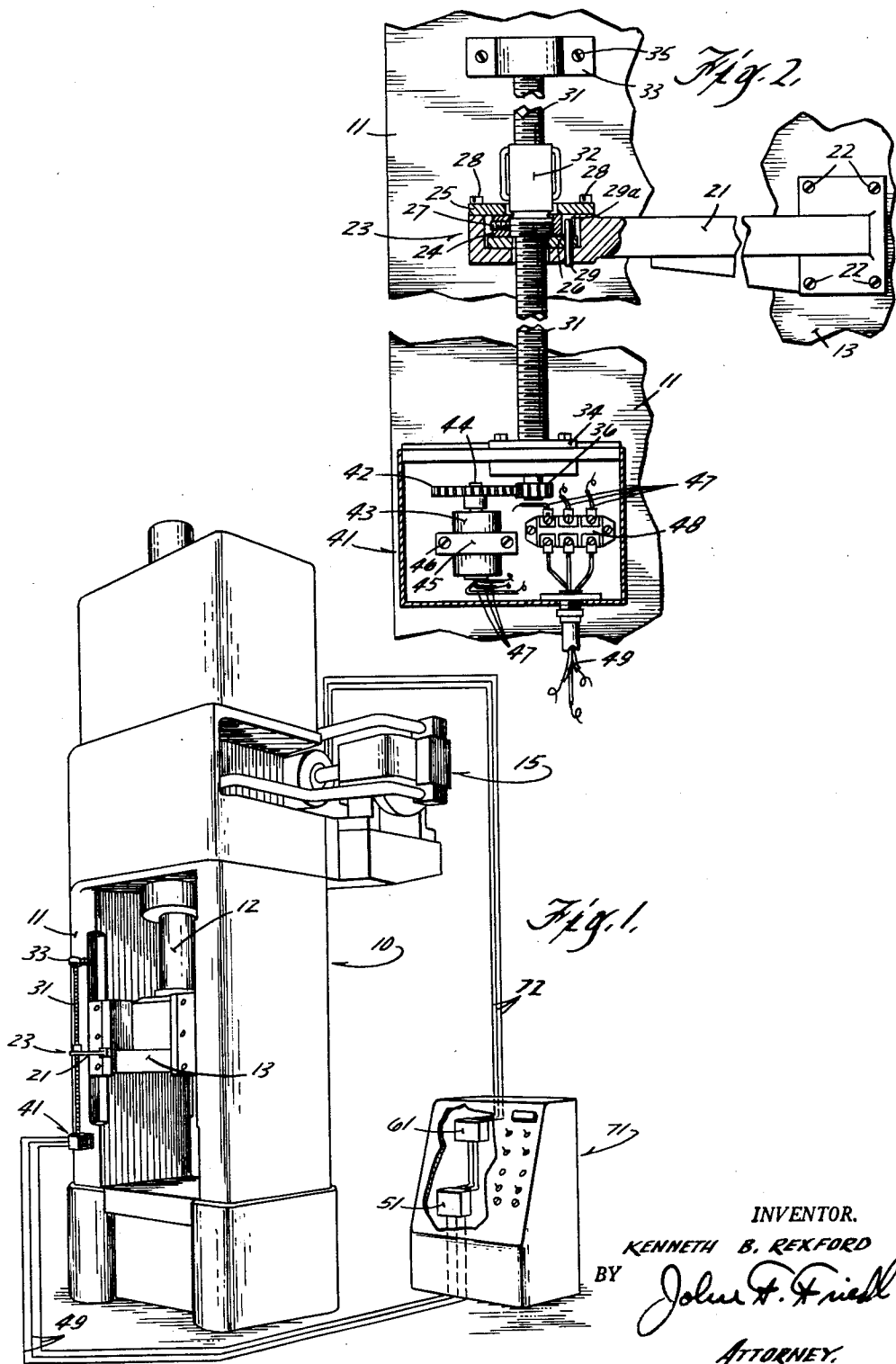
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PRESS CONTROL MECHANISM

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PRESS CONTROL MECHANISM

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The invention relates to presses and more particularly to position control of the moving member or platen of the press.

In the press art it has been desirable to automatically obtain position control of the platen of the press so as to perform various functions at certain positions of the platen. It may be necessary to increase or decrease pressures at certain positions of the platen, limit the stroke, stop the platen or to employ various combinations of these functions. The usual method to obtain position control has been to obtain a signal for operating the valves, pumps and motors controlling the press through the opening or closing of contacts in an electrical circuit. This has involved the use of limit switches actuated by cams attached to the moving member of the press. It is readily apparent that for every type of control necessary a cam and corresponding limit switch has been required. This has entailed the expense of installing multiple cams and tracks and a myriad of electrical circuits for the limit switches. This method has certain other disadvantages in that there may be mechanical malfunction of a switch, difficulty in accurate setting, problems in obtaining access to the switches and cams, and design problems in the press itself because of location of the cams on the moving member.

An object of the invention is to provide a novel control mechanism employing a single compact unit providing electrical control signals for the entire gamut of platen travel.

Another object is to provide an improved control mechanism employing only a single actuating member connected to the movable platen of the press.

Another object is to provide an improved control mechanism that may be installed on existing presses without any change in design of the press.

Another object is to provide a novel control mechanism that facilitates installation, accessibility, maintenance, and accurate setting.

Another object is to provide an improved control mechanism that is less susceptible to malfunction, and inaccuracy.

Other objects and advantages of the invention will become apparent from the following description of the preferred embodiment illustrated in the accompanying drawings, in which:

FIGURE 1 is a perspective view of a press employing the control mechanism embodying the features of the invention, including a diagrammatic control circuit for the press.

FIGURE 2 is an enlarged view of the control mechanism, partially in section, showing portions of the press where appropriate.

By way of illustration, the preferred embodiment of the invention has been shown in use in a hydraulic press having a vertically reciprocable ram and platen. It is understood, of course, that this is merely exemplary and that the control device may be utilized on other types of presses or hydraulic devices having a movable member.

It is not intended that the disclosure should limit the invention to the specific structure shown. The intention is to cover all modifications of the control mechanism falling within the spirit and scope of the appended claims.

In FIG. 1 of the drawing, there is shown a hydraulic press 10, having a frame 11, a ram 12, and platen 13.

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The hydraulic controls for the press are shown generally at 15.

Attached to the platen is a cam or guide arm 21 which engages screw 31 that is mounted stationary on the frame 11. A control box 41 is located on the frame at the lower end of screw 31 and is connected electrically by wiring or circuitry 49 to the operator's console 71. The console 71 may be located at the press or at any remote position. Signals from circuitry 49 are transferred to a sensing control unit 51, which in turn transfers signals to a hydraulic control unit 61 which transfers by circuitry 72 a signal to appropriate valves, motors or pumps as will be explained.

The details of the control mechanism are shown more clearly in FIG. 2. The cam or guide arm 21 is affixed to the platen 13 at one end by bolts 22. At the opposite end of arm 21 is a collar or nut holder 23 which is slipped over screw 31. A ball bearing nut 32 engages screw 31 and is affixed to collar or holder 23 by means of a washer or collar 24 affixed to nut 32 and held between bearing rings 25 and 26 affixed to the collar 23. Collar 24 is threadably secured to nut 32 and locked in position by lock nut 27. Bearing ring 25 is secured to the collar 23 by bolts 28 and bearing ring 26, which is hard rubber or other resilient material, is retained by collar 23. Pin 29 passes through ring 26 and prevents collar 24 and nut 32 from spinning by engaging a groove 29a in collar 24. Pin 29 may be tack welded to collar 23. The yieldable ring 26 and the pin 29 and groove 29a arrangement allow for slight horizontal motion and/or misalignment. From the drawing it will be evident that the nut 32 will move vertically simultaneously with movement of the platen 13.

The screw 31 is affixed in a stationary position, relative to the movable platen 13, on frame 11 by retainers 33 and 34 which may be secured to the frame by means such as bolts 35. While the screw 31 is restrained from vertical movement it is journaled in retainers 33 and 34 on roller bearings (not shown) so as to freely rotate. Thus as the platen moves up or down the nut 32 will impart rotary motion to screw 31. Commercially available rolled screws and roller bearing nuts such as a Saginaw roller bearing screw assembly may be adapted for use in the disclosed mechanism. The embodiment shown employs a specially machined Saginaw roller bearing screw and nut assembly having a screw of one inch diameter with a one inch lead.

Enclosing the lower retainer 34 and the lower end of screw 31 is control box 41. The lower end of screw 31, within the box 41, has retained thereon a spur gear 36. The gear 36 meshes directly with spur gear 42 attached to the shaft 44 of linear potentiometer 43. The potentiometer is attached by bracket 45 and bolts 46 to box 41. Thus as platen 13 moves, nut 32 moving with arm 21 converts the straight line motion of platen 13 to rotary motion by rotating screw 31. The rotary motion of screw 31 is transferred directly to linear potentiometer 43 by gears 36 and 42. The potentiometer 43 shown may be of commercially available stock such as Beckman Helipot Series 7600 Model No. 7603. A fixed potential is applied to the full winding of the potentiometer 43 and a variable voltage signal is taken from the wiper and transmitted by lines 47 through terminals 48 to lines 49 which transmit the signal to sensing control 51.

As the guide arm 21 through nut 32 engages screw 31 for the entire travel of platen 13, the variable voltage signal from potentiometer 43 for any position of the platen can be determined. To utilize the variable voltage signal for actuating the press controls, preset potentiometers are used and are located in the sensing control 51. Sensing control 51 consists of a multiple of single turn potentiometers combined with an amplifier. Commercially

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available potentiometers such as Beckman Helipot No. SL-196 and a Minneapolis-Honeywell amplifier No. R7105B2X1 have proved satisfactory for use in the disclosed arrangement. When the variable voltage signal from the master potentiometer 43 reaches the signal level of a preset potentiometer a null signal output is used to produce a positive output signal that is transmitted to control unit 61. Control unit 61 is comprised of an electronic switching relay and a stepping switch. Commercially available components may be used in such control unit, a Minneapolis-Honeywell electronic switching relay No. R7111B100G1X and a Ledex stepping switch No. VS-5157-5 have proved satisfactory in the circuit disclosed. Thus, it will be apparent to one skilled in the art that the multiple of preset potentiometers in sensing unit (51) can be used to produce a corresponding multiple of output signals on both descending and ascending movement of the platen 13. Proper signals from unit 61 are then transmitted by lines 72 to motors, pumps, valves or combinations of these devices, depending on what particular function is desired for the determined position of the platen 13.

It will be understood from the drawings and description that signals may be obtained and utilized for particular controls for infinite positions of the platen with the use of the disclosed mechanism employing only a single actuating cam or guide 21 and a single actuated element or screw 31 located on the press.

Having explained the drawings a cycle of operation will now be described.

Assuming the press platen 13 is at its uppermost position the guide or cam arm 21 and nut 32 will be at the upper end of screw 31. When the press 10 is actuated by the operator for the platen 13 to descend the nut 32 traveling simultaneously with the guide arm 21 and platen 13 will cause screw 31 to rotate. Rotation of screw 31 will cause the shaft 44 of linear master potentiometer 43 to rotate through the direct connection of gears 36 and 42. As explained heretofore the potentiometer 43 will emit variable voltage signals as long as screw 31 is turned. Any number of preset potentiometers in sensing control unit 51 will be activated upon the proper voltage signal received through lines 49. These preset potentiometers will emit an output signal through hydraulic control unit 61 to the press controls 15 through lines 72. As the platen 13 reaches various points, pressure may be increased or decreased, the platen stopped before proceeding further, or reversed or any number of variations of these functions may be automatically accomplished dependent on the signal emitted by potentiometer 43.

When the platen ascends the rotation of the screw 31 is reversed and the press and control mechanism will be

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ready for another cycle. Any changes in positions of the platen 13 where certain functions are necessary or required may be accomplished by resetting the potentiometers in sensing control unit 51, no adjustment of the cam arm 21 or screw 31 being necessary.

What is claimed is:

1. Control mechanism for use with a hydraulic device having a frame member and a reciprocally movable member actuated by a ram; said mechanism comprising; regulating means for controlling actuation of said ram; a rotatable screw affixed axially with respect to said frame member; guide means including a nut for rotating said screw in relation to movement of said ram affixed to said movable member; means including a linear potentiometer actuated by said screw; and means actuated by a signal from said potentiometer for controlling said regulating means.

2. In a press having a frame member, a reciprocally movable platen member actuated by a ram and controls for actuating said ram, a control mechanism comprising a rotatable screw affixed axially with respect to said frame; means including a nut for rotating said screw relative to platen movement affixed to said platen; potentiometer means directly geared to said screw; and means actuated by a signal from said potentiometer for actuating said controls for said ram.

3. In a press having a frame member, a relatively movable platen member actuated by a ram and controls for actuating said ram, a control mechanism comprising; a rotatable screw affixed in an axial position to said frame member; means including a guide arm and ball bearing nut affixed to said platen member for rotating said screw; a linear potentiometer emitting a variable voltage signal geared to said screw; and preset potentiometers actuated by said voltage signal for emitting signals to operate said controls for actuating said ram at predetermined positions of said platen member.

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