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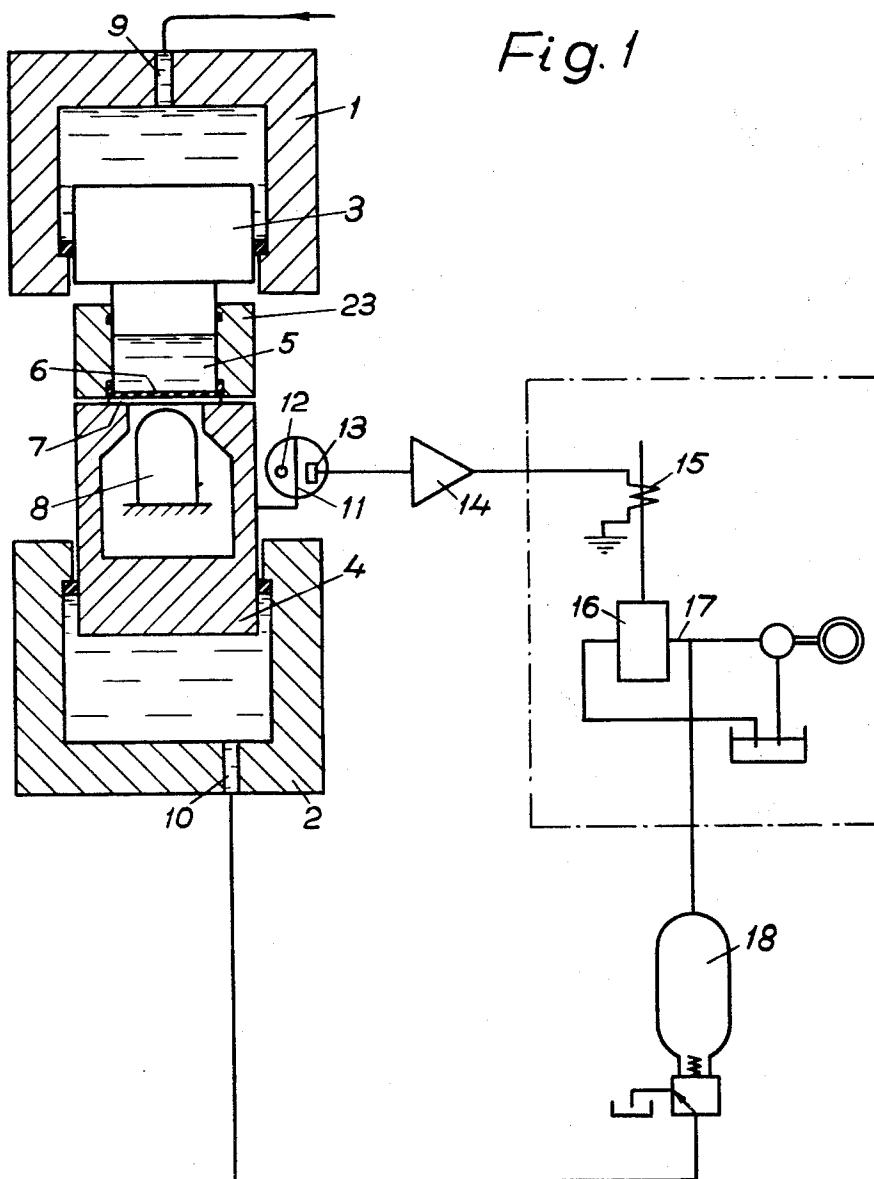
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HYDRAULIC PRESS WITH LIGHT-SENSITIVE CONTROL MEANS

Filed Dec. 20, 1966

Sheet 1 of 2



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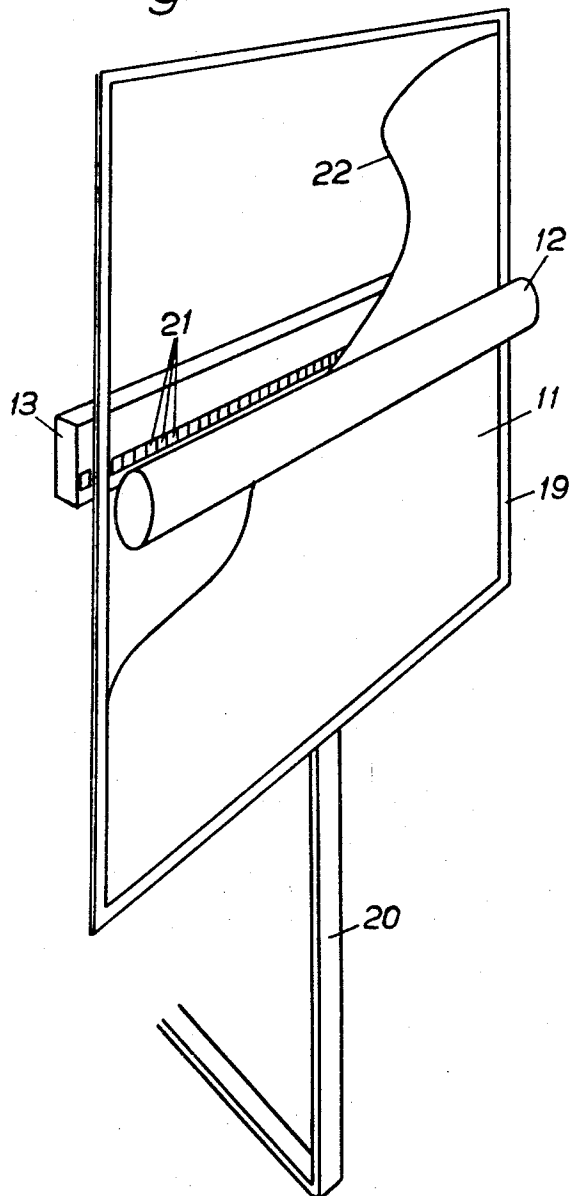
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Fig. 2



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HYDRAULIC PRESS WITH LIGHT-SENSITIVE CONTROL MEANS

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6 Claims

ABSTRACT OF THE DISCLOSURE

A hydraulic press has a frame connected to one of the pistons which can hold a piece of paper of varying shape between a tubular light source and a plurality of photocells arranged in a line; the signal from the photocells being used to control a valve which controls the movement of the piston according to a selected program.

The present invention relates to an arrangement in hydraulic presses for adjustable control of the hydraulic pressure as a function of the movement of one of the main movable parts of the press, for example a press piston.

During complicated pressing operations it is necessary, in order to avoid creases and fractures in the material, to regulate the hydraulic pressure in the operating parts of the press in dependence on the progress of the pressing operation. A characteristic magnitude for the pressing operation is usually most easily obtained directly from the movement of a press piston or some other main movable part of the press. The movement of this part can thus provide the basic value forming the starting point for the regulation of the hydraulic pressure. Different pressing operations require different pressure regulation. The pressure control must therefore be adjustable and there is also a need for the possibility of recording the required control data for each pressing operation so as to be able to carry out the same control if the pressing operation in question is to be repeated on a later occasion. The best pressure control for a pressing operation can usually only be roughly estimated in advance. In order to find the most favourable control or at least an acceptable control it is usually necessary to carry out several pressing operations and correct the control after each operation. A control system is therefore desired which allows continuous arbitrary adjustment of the pressing operation.

The object of the present invention is to effect an adjustable control of the hydraulic pressure in presses, which control fulfills the requirements indicated above. The invention is characterised in that in the control system is used a control unit, known in other connections, comprising a ray source, preferably a light source, a ray-sensitive emitter, preferably a photocell and a member for screening off the rays, the last mentioned member being exchangeable and arranged under the influence of one of the movable main parts of the press to move between said ray source and said ray-sensitive emitter. Since the screen member moves under the influence of, for example, a press piston, the earlier mentioned characteristic basic unit of the pressing process is introduced directly into the control system. Since the screen member is exchangeable it is easy to alter the control by changing or exchanging the screen member. The screen member is preferably shaped as a thin sheet; a paper placed in a suitable holder may constitute such a member. Such a paper can be cut or replaced by another when it is desired to change the control. The paper can also be easily filed with the press tools used for a certain pressing operation.

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The ray source is suitably formed as an elongated lamp or the like which produces an elongated ray in the direction of the ray-sensitive emitter. The output signal of the emitter is arranged to be proportional to the size of that part of the emitter hit by the ray. It is thus the edge of the screen member which determines the control. The proportionality between the part of the emitter hit by the beam and the output signal is most easily obtained by constructing the emitter as a number of adjacent emitter units so that the output signal of the emitter consists of the sum of the signals from the emitter units hit by the ray.

The ray-sensitive emitter is suitably arranged, possibly through an amplifier, to influence an electro-hydraulic valve for direct or indirect control of the pressure in the hydraulic system of the press. For indirect control the electro-hydraulic valve is arranged as a pilot valve for a larger valve determining the pressure of the hydraulic system in question. Preferably the control system is arranged to influence the pressure of the hydraulic medium flowing out of the pressure means of the press since in practice it has been found easiest to effect the desired control in this way.

The invention will be more fully described in the following with reference to the accompanying drawings. FIGURE 1 shows schematically a control system according to the invention and FIGURE 2 shows the arrangement of the beam source, screen member and the ray-sensitive emitter.

In the figures 1 designates an upper press cylinder and 2 a lower press cylinder. An upper press piston 3 moves in the press cylinder 1 and a lower press piston 4 in the cylinder 2. A separate cylinder 25 surrounds a liquid filled pressure chamber 5 which is limited on the upper side by the press piston 3 and on the lower side by a yielding rubber membrane 6. A work-piece 7 is held clamped between the membrane 6 and the piston 4. The press also comprises a stationary press-stamp 8. The pressing operation is carried out by the pistons 3 and 4 moving downwards so that the work-piece 7 is pulled down over the stamp and deformed. The pressure in the chamber 5 presses the membrane 6 and the work-piece 7 evenly against the stamp 8 so that the work-piece receives the shape of the stamp. During pressing, pressure medium is supplied through an inlet 9 in the upper press cylinder 1 and is tapped off through an outlet 10 in the lower press cylinder 2. With this type of pressing especially the pressure in the chamber 5 is important. This pressure is controlled in the shown embodiment by allowing the outlet pressure, that is, the pressure in the lower cylinder 2 to vary in a desired manner.

The pressure in the cylinder 2 is controlled in dependence upon the movement of the piston 3 and 4. In the shown embodiment a screen 11 is attached directly to the lower piston 4. The screen 11 moves between a lamp 12 and a photocell device 13. The shape of the screen determines the quantity of light which reaches the photocell device 13 and consequently also the size of the output signal produced by the device. The output signal is led to an amplifier 14 which in turn influences an operating solenoid 15 in an electro-hydraulic control valve 16 which determines the pressure in a hydraulic auxiliary system 17. This pressure constitutes a pilot pressure in a larger valve 18 which directly controls the pressure in the lower cylinder 2 of the press.

FIGURE 2 shows in more detail the device for the exchangeable screen. The screen 11 is placed in a frame 19 which, by means of an arm 20, is directly joined to the lower piston 4. The lamp 12 has an elongated form and extends right across the screen frame 19. The photocell device 13 is parallel to the lamp 12 and situated on the opposite side of the screen. The photocell device consists of a large number of separate photocells 21, joined to-

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gether so that the magnitude of the output signal from the photocell will be dependent upon the number of cells 21 which are hit by the light. The screen 11 consists of a suitable paper and, when trying to find the correct control, it is easy to effect alterations by cutting the edge 22 of the paper or by arranging additional pieces at the edge 22. When the desired control has been reached in this way the pressing operation can be carried out with the same control an arbitrary number of times. When the entire pressing series is complete the screen paper can be filed with the press tools.

The invention is not limited to the shown embodiment, but several variations and modifications are feasible within the scope of the following claims.

I claim:

1. In an hydraulic press having two movable parts, driven by hydraulic pressure, means for adjustable control of said hydraulic pressure as a function of the movement of one of said means comprising movable parts said means comprising a ray source, a ray-sensitive emitter and a screen member for faulty screening off said rays with respect to said emitter, said screen member being exchangeably attached to a holder and movable by action of said press device between said ray source and said ray-sensitive emitter, said screen member being completed to one of said movable parts, said emitter determining said hydraulic pressure as a function of the amount of rays received from said ray source.

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2. Hydraulic press according to claim 1, said ray source being arranged to emit an elongated ray beam in the direction of said ray-sensitive emitter, said emitter being arranged to give an output signal proportional to the size of that part of the emitter which is hit by said beam.

3. Hydraulic press according to claim 2, said ray-sensitive emitter comprising several adjacent emitter units.

4. Hydraulic press according to claim 1, said screen member comprising a thin sheet of non-transparent material.

5. Hydraulic press according to claim 1, said ray-sensitive emitter being connected to influence an electro-hydraulic valve controlling said hydraulic pressure.

6. Hydraulic pressure according to claim 5, said hydraulic pressure being the pressure of hydraulic medium leaving said press device.

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