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Bergendahl

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[54] **HYDRAULIC SUPPORT FOR THE MOVABLY SUPPORTED ROLLER IN ROLL PRESSES**

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[51] **Int. Cl.** **B30b 15/16;** B30b 3/04

[58] **Field of Search** 100/168, 169, 170, 47–51; 72/20, 21; 241/230, 231

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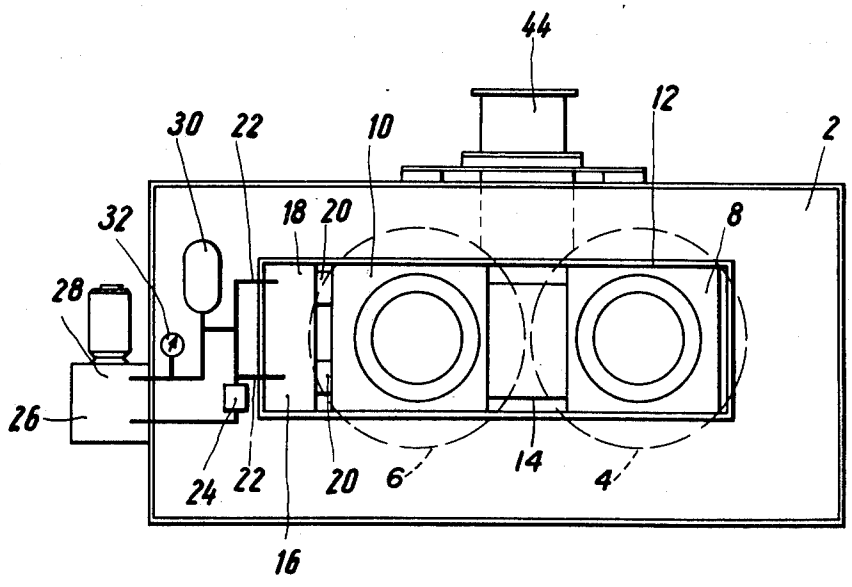
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[57] **ABSTRACT**

A hydraulic support for the movably supported roller in roll presses in which the hydraulic circuit includes a motor pump, a maximum-minimum pressure switch and a safety valve. The circuit further includes a pressure-limiting valve set for an operational pressure corresponding to a predetermined pressing force in the roller gap and slightly higher than the minimum pressure at which the maximum-minimum pressure switch is set. The operational pressure in the support may thus be kept constant notwithstanding fluctuations in the load pressure.

3 Claims, 2 Drawing Figures



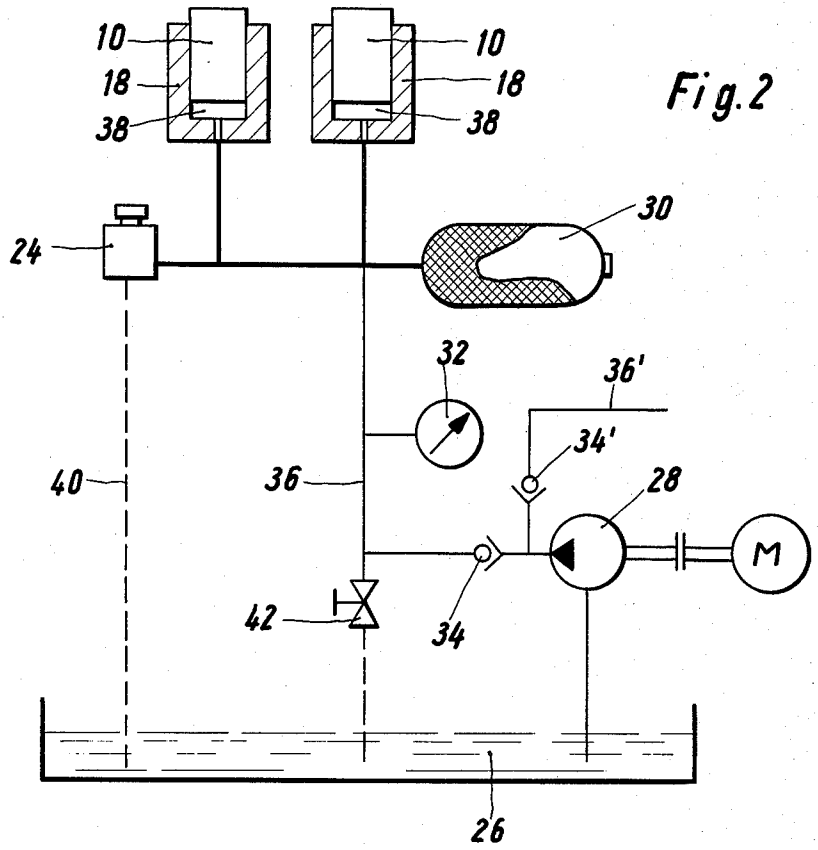

10
18
38
10
18
38
30
24
32
36'
34'
40
36
28
M
42
34
26

Fig. 2

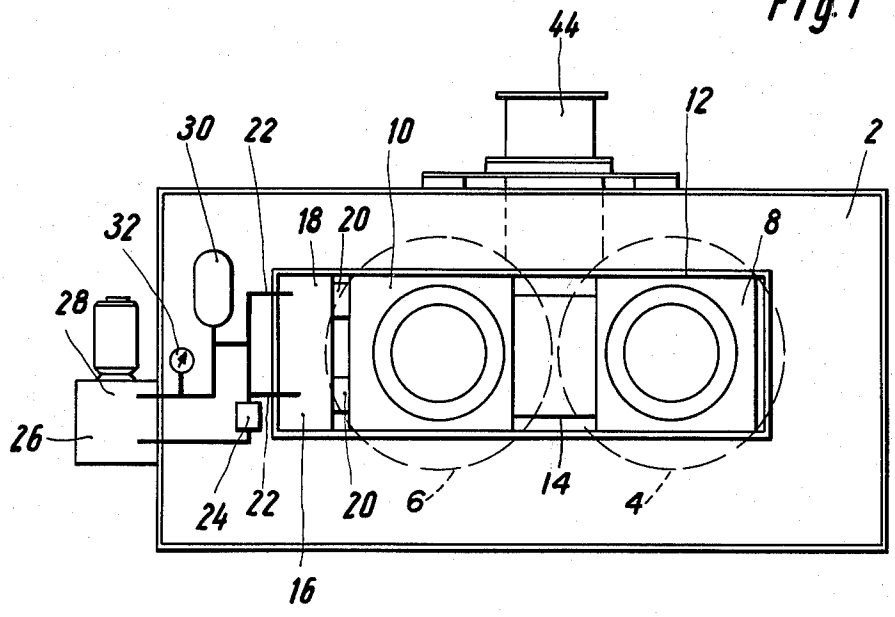

44
12
2
30
22
10
32
18
20
8
28
26
24
22
20
6
14
4
16

Fig. 1

HYDRAULIC SUPPORT FOR THE MOVABLY SUPPORTED ROLLER IN ROLL PRESSES

FIELD OF THE INVENTION

The present invention relates to a hydraulic support for the bearing blocks of a movable, supported roller in roll presses with at least one hydraulic cylinder for each bearing block mounted between the press frame and that side of the bearing block which is away from the roller gap, and more particularly to such a hydraulic support which is supplied from a motor pump and wherein a maximum-minimum pressure switch is connected in parallel to the hydraulic cylinder and where furthermore a hydraulic accumulator for storage and a safety valve are located, and further including means in the hydraulic circuit to automatically maintain the operating pressure notwithstanding fluctuations in load pressure.

BACKGROUND OF THE INVENTION

Hydraulic supports of the kind mentioned are used in roll presses for pressing briquettes and also in compacting presses as overload safety devices in order to prevent rupturing the press, as if, for instance, an alien body should happen between the rollers together with the briquettes or the material being compacted. If such an alien body finds its way into the roller gap, the safety valve will respond, being normally set for a pressure 15 to 20% above that which occurs in the hydraulic circuit for normal operation of the press. The oil expelled from the hydraulic cylinders in normal operation when pressure fluctuations and pressure pulses are encountered will be absorbed in the hydraulic storage because only minor shifts of the bearing blocks will occur in normal operation. Maintaining an essentially constant pressure will be achieved by one hydraulic storage of relatively small storage volume. A maximum-minimum pressure switch controls the drive motor of the pump. Ordinarily, the hydraulic circuit of the hydraulic support may be connected to the tank by means of a shut-off valve. The system pressure may be eliminated by means of this shut-off valve. A special hydraulic support is provided for each of the two bearings of the axially movable, supported roller in a roll press. Both hydraulic supports may be supplied from the same pump.

As regards known roll presses, overloading of the press due to overfilling of the roll gap by the material to be compacted will be avoided by controlling the supply of the material to be compacted as a function of the pressure loading. Such control may take place furthermore as a function of motor load or also as a function of the bearing load, or again as a function of the stresses in the press structure.

As regards compacting presses which operate with rollers provided with smooth roller shells, a special problem arises because the press must be started with as small as possible a roller gap-width, so as to initiate formation of the material-shell. Ordinarily, one starts with a gap width of 0.5 to 1 mm. The material to be compacted which predominantly is highly fluid will be applied at this gap width. After a material shell has been formed by the initial gap width, increasingly more material will be grasped by the rollers. Thereby the rollers will be pressed apart until finally the material-shell will be of the desired thickness. This thickness may amount to 10 to 15 mm. The roller gap is increasingly wide in normal operation. Variation of the roller gap

from initial position when starting to the operational position may be as much as 2000%. Thereby, an appreciable increase in pressure will occur in the hydraulic support, which may no longer be economically absorbed by a hydraulic storage. On the other hand, precisely when starting a press, maintaining the predetermined operational pressure is critical and to date, this problem has been met manually letting out as much oil through the shut-off valve, while observing the manometer that an approximately constant pressure is being obtained. Obviously, such manual control of the operational pressure will only be feasible in exceptional cases when starting a press. Difficulties therefore will be unavoidable when there are fluctuations in material supply or when such are interrupted. In these cases then, the same manipulations must be carried out as when starting the press. Therefore, it is necessary to tie down an operator for observing and operating such a press.

SUMMARY OF THE INVENTION

The object of the invention is the creation of means allowing automatic starting of compacting presses and also automatically meeting fluctuations and interruptions in material supply, so that steady monitoring of the press on the part of an operator will become superfluous.

The problem of hydraulic supports of the abovementioned kind relating to presses will be solved by the present invention in that a pressure-limiting valve set to operational pressure would be connected to the hydraulic circuit. In order to maintain as constant as possible an operational pressure in the press, the connection between the hydraulic cylinders and the pressure-limiting valve should be as low as feasible in losses and, furthermore, the pressure-limiting valve should be so designed that there will be as low loss as possible under the given conditions. In practical terms, this means that the hydraulic cylinders are connected to the pressure-limiting valve by means of lines as short as possible and as large in cross section as possible.

The invention is illustratively shown in the drawing and described in detail below in relation to that drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows schematically a side view of a roller press with a hydraulic support in conformity with the present invention.

FIG. 2 shows the hydraulic circuit arrangement of the hydraulic support of the present invention.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

In the roll press shown in FIG. 1, two press rollers **4** and **6** are mounted next to each other in a press frame **2**. These press rollers are supported in bearing blocks **8** and **10** which are mounted in lateral openings **12** of the press frame. Bearing blocks **8** of roller **4** are stationary, whereas bearing blocks **10** of roller **6** may be moved between parallel guiding surfaces of the frame opening **12**. A spacer **14** is mounted between the bearing blocks. Bearing block **10** abuts a hydraulic support **16**, which in every case is provided with a cylinder block **18** with two cylinder bore-holes each holding one support-piston **20**. One line **22** each is connected to each of the cylinder bore holes said lines **22** belonging to a hydraulic circuit connected to a tank **26** via a pres-

sure-limiting valve **24** and into which hydraulic circuit oil under pressure is fed in by a motor-driven pump **28.** A hydraulic storage tank **30** and a maximum-minimum pressure switch **32** are connected to the hydraulic circuit.

The circuit of the hydraulic support is shown in a larger scale in FIG. **2.** Pump **28** conveys oil from tank **26** via a back-pressure valve **34** into a line **36,** to which are connected the maximum-minimum pressure switch **32** and the hydraulic storage tank **30.** Furthermore, cylinder chamber **38,** of the hydraulic drive, with pistons **20** are connected to said line, said pistons **20** being located in the cylinder block **18.** Furthermore, a pressure-limiting valve **24** is connected to line **36,** said pressure limiting valve also being connected by means of a return-oil line **40** to tank **26.** A shut-off valve **42** is appropriately provided as a further connection to the tank, emptying of the hydraulic circuit being feasible through said valve **42.** As is the case for the known hydraulic supports, such a hydraulic circuit is provided for each of the bearing blocks of the axially movable roller, as indicated in FIG. **2** by line **36'** and the back-pressure valve **34'** associated with said circuit.

The pressure-limiting valve **24** is set for a pressure corresponding to the desired pressing pressure in the roller gap. The switch-on pressure of the maximum-minimum pressure switch **32** will be set somewhat lower than that pressure for which the pressure-limiting valve **24** itself is set. When starting the press, press rollers **4** and **6** will be in the position of the narrowest roll gap. This position will be given by spacer **14.** The roll gap amounts to 0.5 to 1 mm. The material to be compacted will be supplied to the rollers by means of the supply chute **44.** This material will be grasped by the rollers which at first will form a thickness corresponding to one shell. The moment there is shell formation the rollers will continuously draw in more material. Because the shell will increase in thickness, roller **6** will be moved away from roller **4.** This will simultaneously increase the real pressure in the hydraulic circuit of the hydraulic support. Because the overflow valve **24** is set for operational pressure, which is only slightly above the system pressure set by the maximum-minimum pressure switch **32,** the operational pressure of the movable roller **6** will be kept constant by means of pressure-limiting valve **24** over the entire adjusting range of the moving roller **6.** This means however, that the shell will already be generated at constant press pressure during the start of the press and also that during further operation of the press, the predetermined press pressure will be kept very accurately. Hydraulic storage tank **30** being pre-biased with the system pressure, there will be no discharging of this storage when the pressure-limiting valve **24** responds. In order to maintain a constant pressing force, the connection between cylinder chambers **38** and pressure-limiting valve **24** should be as low-loss as possible. Appropriately, lines establishing this connection should be of as little flow-resistance as possible, that is, they should be of the largest possible cross-section and as short as possible.

If the material supplied should be interrupted during operation, the oil under pressure in the hydraulic storage tank **30** will be released into the hydraulic circuit. This initiates the return setting motion of the movable roller in direction of the stationary one. The moment the pressure has fallen below the minimum pressure set at switch **32,** pump **28** will be switched on and oil under pressure will be supplied until that system pressure again is obtained, by means of which roller **6** will be brought into its end position, from which the shell-formation will be initiated again when material supply resumes.

If merely a reduction in material supply should occur during operation, a feed adjustment for the movable roller in the sense of a narrowing of the roller gap will be initiated in the same manner by means of the hydraulic support, so that, in this instance too, first, oil under pressure stored in storage tank **30** will be supplied and then, afterwards, the final adjustment will occur with respect to pump conveying. If the material supply is then increased again, release of oil under pressure through the pressure-limiting valve **24** will again achieve constant press pressure.

In order to initiate with as little delay as possible the feed adjustment of roller **6,** the pressure storage **30** should be connected in as low-loss a manner as possible with a cylinder chamber **38.** The difference between the pump switch-off pressure set at the maximum-minimum pressure switch **32** and the predetermined operational pressure obtained from the setting of the pressure-limiting valve **24** should be as small as possible. The minimum of said pressure difference is determined on one hand by the response tolerances of the pressure-limiting valve **24** and on the other by those of pressure switch **32.**

The hydraulic circuit furthermore can be made safe by a conventional safety valve which would be actuated in case of failure of the pressure-limiting valve **24.**

As regards the terminology of the oil circuits in hydraulic drives, operation of the hydraulic support of the invention may be designated as operation with open oil circuits, in contrast to known hydraulic supports, of which the operation then would be designated as closed oil circuits.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is described in the specification.

What is claimed is:

1. A hydraulic support for the bearing blocks of a movable roller in a roll press having a frame and two rollers having a gap therebetween, one of said rollers being radially movable away from and toward the other of said rollers, said support comprising:

at least one hydraulic cylinder for each bearing block, mounted between the press frame and the side of the bearing block which is away from the roller gap; and

a hydraulic circuit connected to said cylinder;

a motor pump for supplying hydraulic fluid through said circuit to said cylinder;

a maximum-minimum pressure switch within said circuit for starting said motor pump when a predetermined minimum pressure is reached in said circuit and for stopping said motor pump when a predetermined maximum pressure is reached in said circuit;

a pressurized hydraulic storage tank in said circuit; and

a pressure-limiting valve connected to said hydraulic circuit for releasing sufficient amounts of hydraulic fluid from said circuit, when the pressure within said circuit exceeds a predetermined operating

pressure, to keep the pressure within said circuit at said predetermined operating pressure.

2. A hydraulic support in accordance with claim 1 further including a safety valve connected to said hydraulic circuit.

3. A hydraulic support in accordance with claim 1 wherein said predetermined minimum pressure is slightly lower than said predetermined operating pressure.

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