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(54) **Press for moulding products from ceramic materials**

(57) A press for moulding ceramic material, in particular for tiles and the like, said press comprising a structure (1) presenting opposing portal portions (2) supporting a fixed table (3) arranged to support lower moulds (3A) for said material to be subjected to moulding by pressure exerted on them by a pressing plate (4) movable relative to said table (3), said pressing plate (4) being subjected to a pusher member (5) associated with said press structure (1); said pusher member (5) presents at least two parts (10A, 10B) associated with the pressing plate (4) which are movable relative to and within corresponding fixed parts (11A, 11B) rigid with the press structure (1), said movable parts (10A, 10B) enabling the pressing plate (4) to act with equal pressure on a large surface of the material positioned on the fixed table (3).

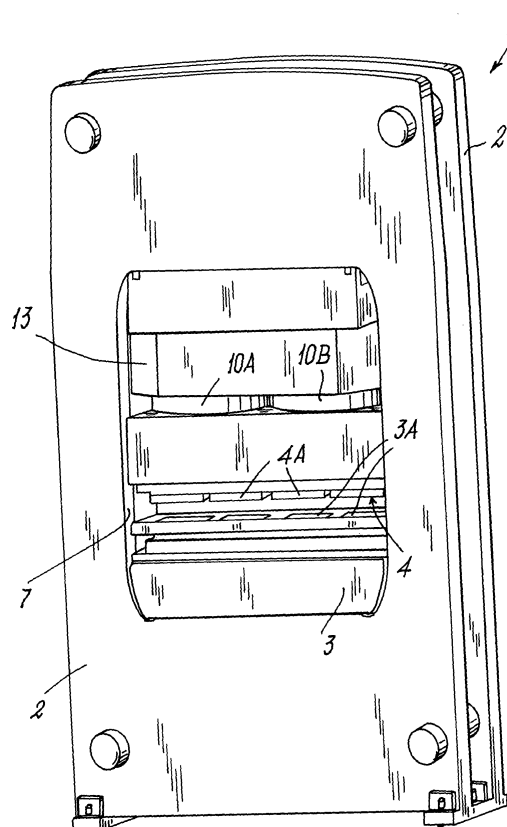


FIG. 1

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Description

[0001] The present invention relates to a press for ceramic products such as tiles and the like, in accordance with the introduction to the main claim.

[0002] After being loaded into suitable moulds, the material for tiles or other similar products is subjected to known compression to obtain particular thicknesses. The tiles are then dried and subjected to surface finishing, such as colouring. The said pressing operation is carried out in hydraulic presses presenting a portal structure having a table comprising a plurality of (lower) moulds which in known manner receive the powder material to form the ceramic product; above the table a pressing plate moves carrying a corresponding plurality of (upper) moulds arranged to surface-cooperate with the powder material so as to compress it and form tiles of various dimensions and of predefined thickness. The pressing plate is subjected to the action of a thrust member defined by two members movable relative to each other, one of which (for example a piston) is fixed to the plate and the other (for example a cylinder) is carried by the press structure. The fixed member, for example the cylinder, receives pressurized fluid (oil) from a suitable pressure feed source.

[0003] As stated, the pressing plate is usually subjected to the action of a movable member, for example the piston. This piston is located in a suitable position on the plate, for example centrally along the longitudinal axis of symmetry of the plate perpendicular to the plate pressing surface (i.e. that surface which acts on the powder material). Although this solution offers good results in terms of the pressing effect exerted by the plate on said material, it results in nonuniform pressure on the material contained in those moulds lying on the opposing ends of the fixed table. It follows that on these materials the pressing action is at a lesser pressure than the pressure acting on the powder material lying more centrally on the fixed table (i.e. in correspondence with that region in which the piston is fixed to the pressing plate. The result of this is that after those tiles lying "more peripherally" (on the fixed table) have been obtained they present lesser compaction than those lying "more centrally" (on said table). There is hence an off-gauging of said peripheral tiles, in that the more compact tiles shrink less than those less compact. Consequently there is greater deformation along the sides of each less compact tile and thus a difference in porosity. This different porosity has a considerable effect in the subsequent tile finishing operation: in this operation, for example colouring, the more peripheral (more porous) tiles present a different colour tone than that of the more central tiles.

[0004] To overcome this problem it is known to provide a press in which the movable member or piston associated with the pressing plate has an elliptical section with its major axis positioned along an axis of said plate (the major axis of this plate is rectangular in plan view).

This known solution does not however solve the aforesaid problem of obtaining "more peripheral tiles" with different compaction than that of the "more central tiles" leaving the press. It also results in a press with larger dimensions, greater complexity and higher construction costs than presses with a piston and cylinder of circular section.

[0005] An object of the present invention is to provide a press for ceramic products, such as tiles, in which the product leaving presents a substantially constant and uniform compaction such that the subsequent finishing operations do not present the aforesaid problems.

[0006] Another object is to provide a press the dimensions of which are identical or at least comparable with already known presses.

[0007] Another object is to provide a press of the stated type which is of reliable use, and has construction and maintenance costs comparable to those of known presses with their piston and cylinder of circular section.

[0008] These and further objects which will be apparent to the expert of the art are attained by a press in accordance with the accompanying claims.

[0009] The present invention will be more apparent from the accompanying drawing, which is provided by way of non-limiting example, and in which:

Figure 1 is a front perspective view of a press according to the invention;

Figure 2 is a perspective view of the press of Figure 1 from above, some parts being removed for greater clarity;

Figure 3 is a view of a part of the press of Figure 1 seen from above;

Figure 4 is a section on the line 4-4 of Figure 3, with the press in a first operative stage; and

Figure 5 is a section on the line 5-5 of Figure 3, with the press in a second operative stage.

[0010] With reference to said figures, a press for moulding ceramic materials, such as tiles or the like, comprises a structure 1 presenting two portal-shaped vertical opposing portions 2 interconnected by a fixed table 3 for supporting the lower moulds 3A for the powder material to be subjected to pressing. Above the table 3 a movable (upper) table or plate 4 is present, supporting the upper moulds 4A, and subjected to the action of a pusher member 5 connected to a suitable source of pressurized fluid, such as oil. The (pressing) plate 4 is arranged to be brought into contact with the powder material (inserted into the moulds of the table 3) in order to subject this material to pressing.

[0011] According to the invention, the pusher member comprises at least two parts 10A, 10B movable relative to corresponding fixed parts 11A and 11B; the movable parts are for example two pistons which move relative to and within two corresponding cylinders provided in an element 13 secured to the portal portions 2 and located over the pressing mould 4. In a suitable position,

for example above the element 13, a reservoir 6 is present connected to the cylinders 11A, 11B by suitable channels 14. A hydraulic circuit 8 with pump 9 is connected to the reservoir 6 and to the channels 14 and acts as the circuit for filling the cylinders at low pressure to lower the plate 4 relative to the table 3, and for emptying the cylinders to raise the plate 4. On the top 11K of the cylinders 11A, 11B there are positioned corresponding filling valves 18 arranged to either enable or to interrupt and prevent passage of the fluid from the reservoir to said cylinders. When it reaches each cylinder, said fluid cooperates with the respective piston to move it towards the fixed table 3. Consequently the pressing plate also moves towards the table 3.

[0012] In detail, the pressing plate 4 comprises opposing faces 20 and 21, the first 20 arranged to come into contact with the ceramic material to be pressed and the second 21 to cooperate with the pistons or movable parts 10A, 10B. These latter are fixed to the plate 4 in any known manner (for example by bolts 25), they are of circular cross-section and are positioned with their longitudinal axes K parallel and lying in a vertical plane common with the major longitudinal axis W of the plate 4 (see Figure 3).

[0013] The pistons 10 are therefore side by side. They are connected to a hydraulic circuit 23 arranged to equalize the thrust which they exert on the pressing plate 4 in order to make uniform the pressure which this latter exerts on the underlying ceramic material (lying on the table 3) via its face 20. This latter hence exerts a pressure on the underlying material which is equal over its large surface, resulting in considerable uniformity in the thickness of the products on which the plate 4 presses. This is achieved by virtue of the fact that by acting with two side-by-side pistons on the plate, the pressing force of this latter on the underlying material is equalized over an area which also reaches the free edges of the face 20 of the plate 4.

[0014] As stated, a characteristic of the invention is that the pressing force generated by the pistons 10 on the plate 4 is equal. This is achieved by the hydraulic circuit 23. This latter comprises a pump 30 connected to a conduit 31 formed within the plate 4 and connected to a conduit 32 provided within the piston 10A. The conduit opens into an annular chamber 33, of large transverse surface, provided below an internal part of the piston 10A. The conduit 31 is connected to channels 31A and 31B, the first connected to the pump 30 and the second to a reservoir 34 via opposing unidirectional valves 80.

[0015] The cylinder 11A within which the piston 10A moves is connected to the cylinder 11B within which the piston 10B moves, via a conduit 35 which opens into the top 11K of the cylinder 11B. Another conduit 36 is connected to the conduit 35 and terminates on the outside of the element 13 where it is connected to two parallel channels 38 and 39, provided with unidirectional valves 38A and 39A and connected respectively to a pump 40

and to a reservoir 41. Other conduits 42 and 43 connect each valve 18 (that above the pistons 10A) to a pump 44 via counter-flowing unidirectional valves 45 and 46. The valve 45 connects the conduit 42 to the pump 44, the valve 46 connecting this conduit to a reservoir 47. The conduit 43 is directly connected to the pump 44.

[0016] It will now be assumed that the aforescribed press is to be used. Firstly, the ceramic material for the tiles is inserted into the moulds of the table 3 by a suitable known feeder. The valves 18 are then activated to open them (by means of the circuit comprising the conduits 42, 43 and the members connected to them), so that the fluid (oil) passes from the reservoir 6 to the cylinders 11A and 11B. Said fluid is pressurized (also closing the valves 18) to 50 bar by the pump 40, and the pressing plate 4 is urged into contact with the material located on the table 3. The valve 38B is then opened and the pressure in the cylinders falls to zero. The plate 4 is in contact with the products on the table 3 and causes air to escape from them.

[0017] The pump 40 is reactivated to again pressurize the oil in the cylinders 11A and 11B, to the line pressure (200 bar). The valves 38A and 39B are closed. The pump 30 of the circuit 23 is then activated to feed pressurized fluid into the conduit 32 and into the chamber 33; this causes the piston 10A to further pressurize the oil of both cylinders to the final pressing pressure (for example a maximum of 400 bar) via the conduit 36 connecting the cylinders together, to hence equalize the pressure exerted by both the pistons on the plate 4. In this manner the products on the table 3 are pressed.

[0018] Having done this, the pressure is released from the conduit 32 and the plate 4 can be raised by feeding oil through the conduit 35 and from there through a conduit 56 connected to the cylinders 11A and 11B in a position close to that from which the pistons 10A and 10B emerge. The cylinders 11A and 11B are released by opening the valves 18, and by maintaining the pressure within the conduit 56, the pistons 10A and 10B and the plate 4 connected to them rise.

[0019] By virtue of the invention, a larger surface is obtained acting at constant pressure on the material located on the fixed table 3; this enables products of uniform thickness to be obtained in a greater number than obtainable with the known solutions.

[0020] A preferred embodiment of the invention has been described; others are however possible, such as one in which the pusher member 5 is associated with a pressing plate 4 with more than two movable parts (for example pistons), or in which the member 5 is defined by cylinders rigid with the plate 4 and pistons rigid with the structure 1.

Claims

1. A press for moulding ceramic material, in particular for tiles and the like, said press comprising a struc-

ture (1) presenting opposing portal portions (2) supporting a fixed table (3) arranged to support lower moulds (3A) for said material to be subjected to moulding by pressure exerted on them by a pressing plate (4) movable relative to said table (3) and carrying upper moulds (4A), said pressing plate (4) being subjected to a pusher member (5) associated with said press structure (1), **characterised in that** said pusher member (5) presents at least two parts (10A, 10B) associated with the pressing plate (4) which are movable relative to and within corresponding fixed parts (11A, 11B) rigid with the press structure (1), said movable parts (10A, 10B) enabling the pressing plate (4) to act with equal pressure on a large surface of the products positioned on the fixed table (3).

2. A press as claimed in claim 1, **characterised in that** the movable parts are pistons (10A, 10B) movable relative to fixed cylinders (11A, 11B) rigid with the press structure (1). 20
3. A press as claimed in claim 1, **characterised in that** the movable parts are cylinders movable relative to fixed pistons rigid with the press structure. 25
4. A press as claimed in claim 1, **characterised by** comprising pressure equalization means (23) acting on the pusher member (5) such as to equalize the thrust of the movable parts (10A, 10B) on the pressing plate. 30
5. A press as claimed in claims 2 and 4, **characterised in that** the pressure equalization means comprise a hydraulic circuit (23) presenting pumping means (30) and a reservoir (34), said circuit being connected to a conduit (32) opening below a part (10A) movable within the respective fixed part (11A) into a chamber (33) of this latter, into the top (11K) of said fixed part (11A) there being connected a conduit (35) connected to the top (11K) of the other fixed part (11B) and arranged to transfer pressurized fluid present in the first fixed part (11A) when the pressure of the fluid originating from said hydraulic circuit (23) acts on the relative movable part (10A), said transfer increasing the pressure acting on the movable part (10B) of said second fixed part (11B) and equalizing the pressing forces of both the movable parts (10A, 10B) on the pressing plate (4). 40 45 50
6. A press as claimed in claim 5, **characterised in that** the conduit (35) connecting together the tops (11K) of the fixed parts (11A, 11B) is connected to a conduit (56) opening into those ends of said fixed parts (11A, 11B) from which the movable parts (10A, 10B) emerge. 55
7. A press as claimed in claim 5, **characterised in that**

the conduit (35) connecting together the tops (11K) of the fixed parts (11A, 11B) is connected to a pressurizing means, such as a pump (40).

- 5 8. A press as claimed in claim 1, **characterised in that** each fixed part (11A, 11B) is connected to a reservoir (6) via a channel (14) in which a controlled valve member (18) is positioned.
- 10 9. A press as claimed in claim 1, **characterised in that** the pressing plate is fixed to a pair of parts (10A, 10B, 11A, 11B) of the pusher member (5).

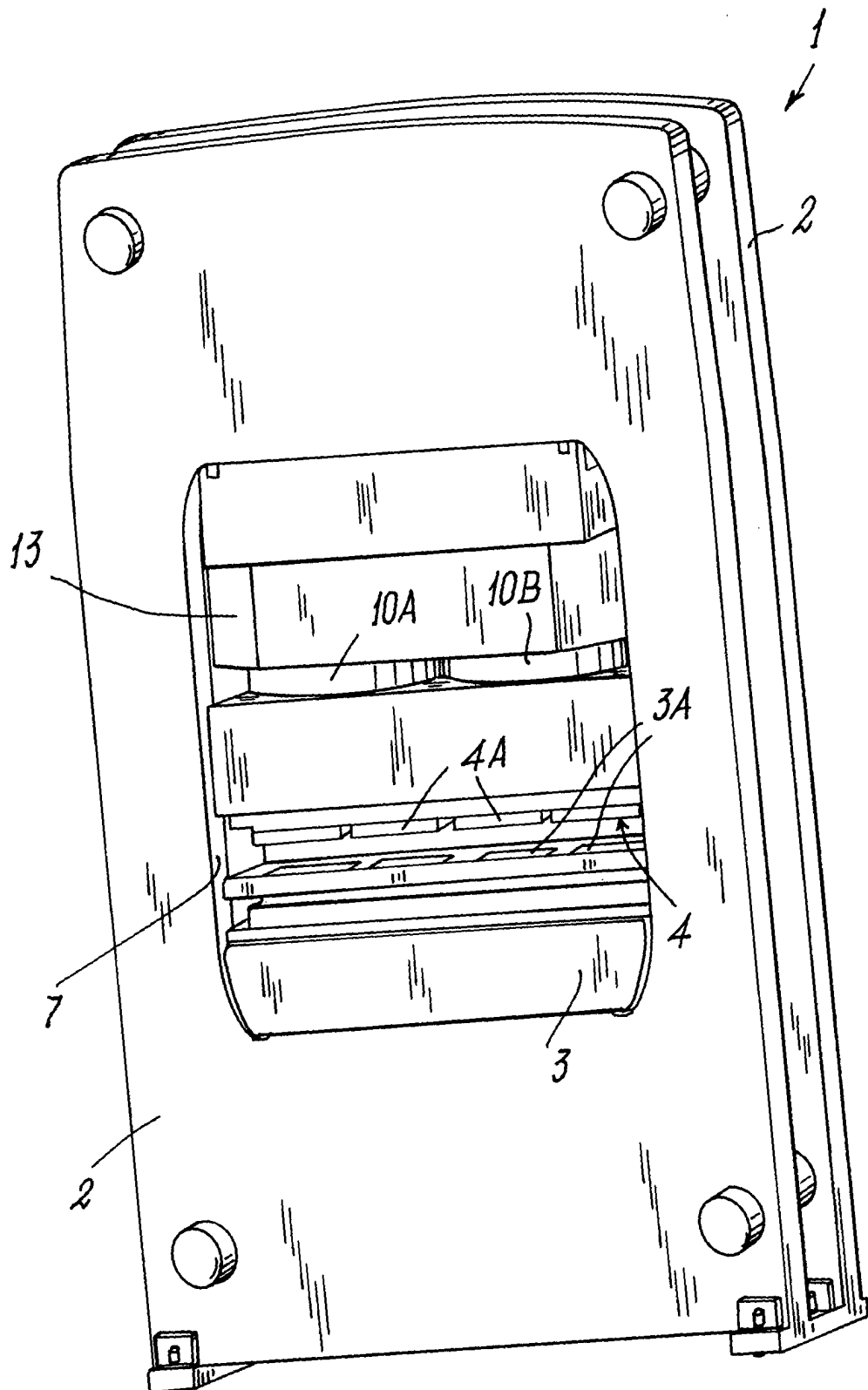


FIG. 1

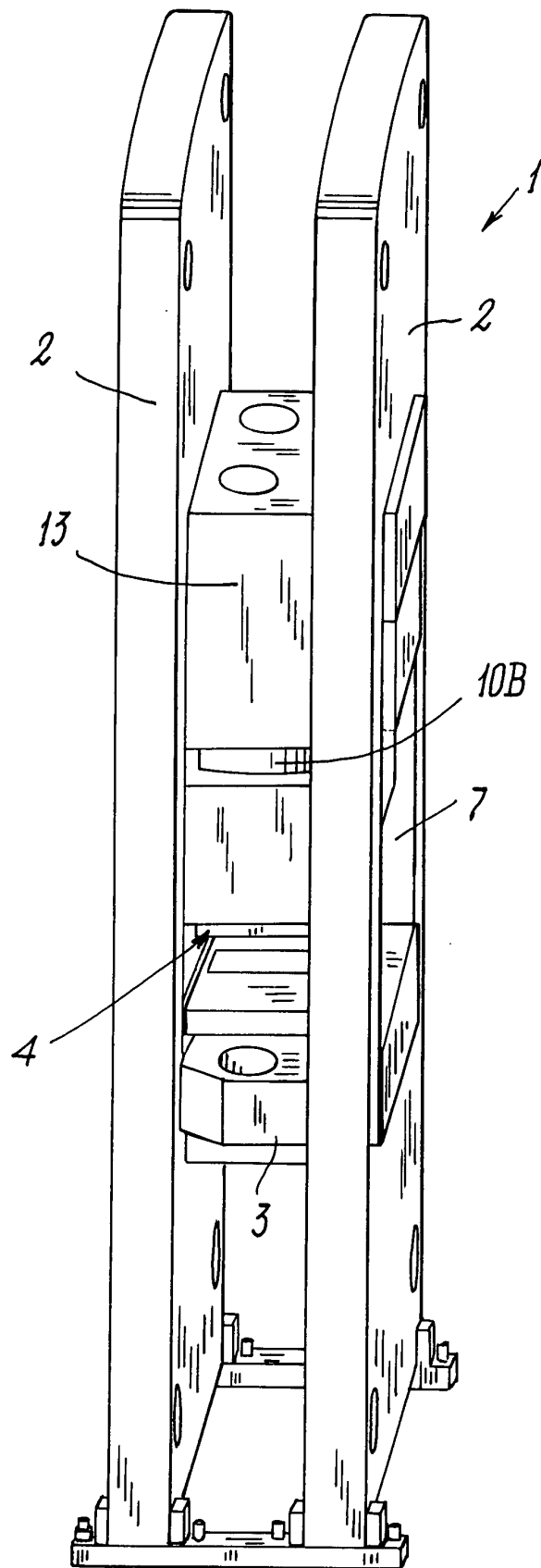


FIG. 2

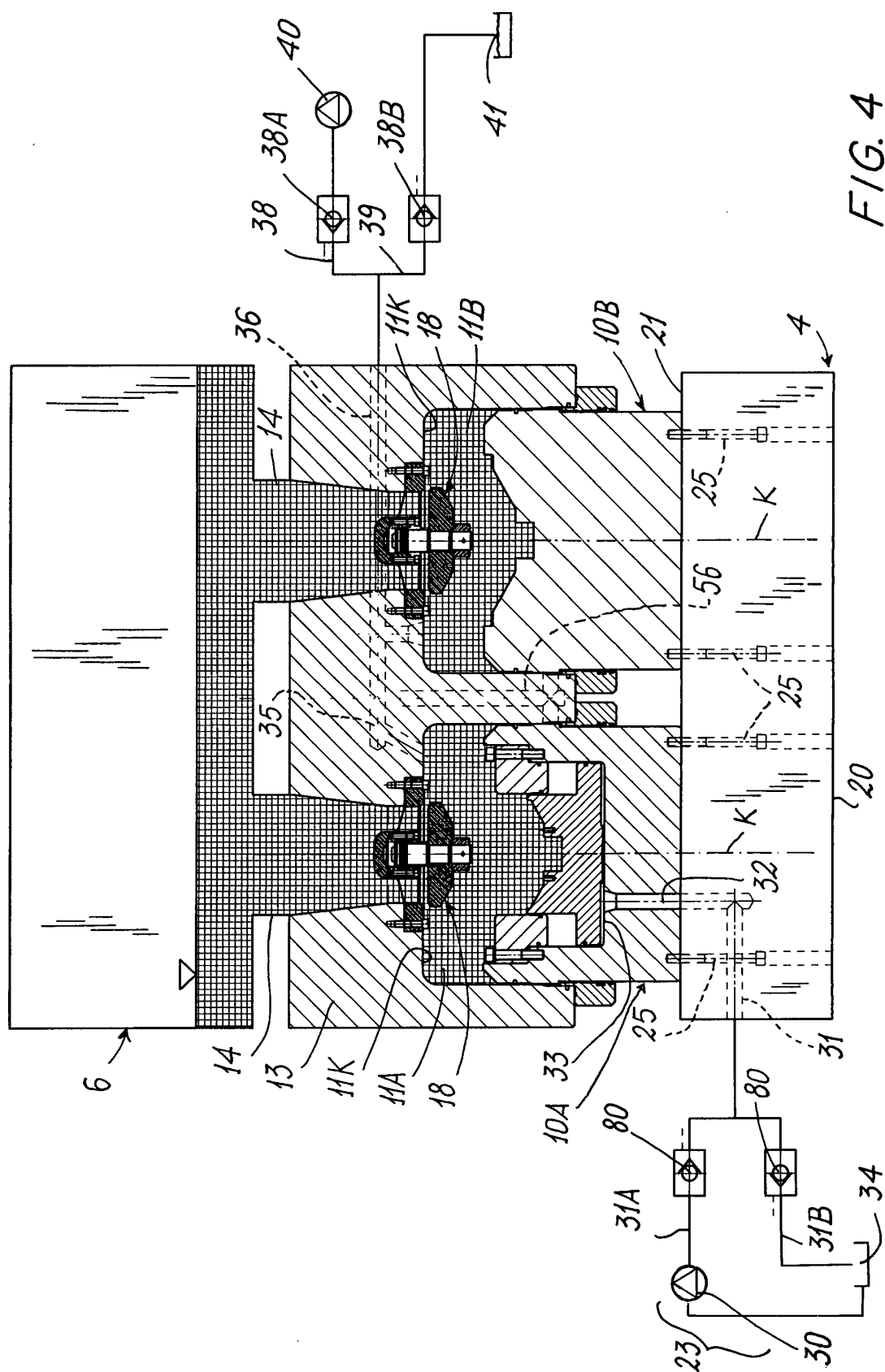


FIG. 4

