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(54) Equipment for removing water and sediments from molds for producing single-layer cement tiles

(57) For the purpose of sucking excess water out of molds, there are provided two settling containers (1A, 1B) operating alternately under a vacuum, each combined with its own inlet valves (8; 10), suction valves (7, 9) and discharge valves (11, 13); means (12) for simultaneously operating the said valves to switch the identical valves into the two different states, so that, in an alternating way, one container is brought into the suction state and the other into the discharge state.

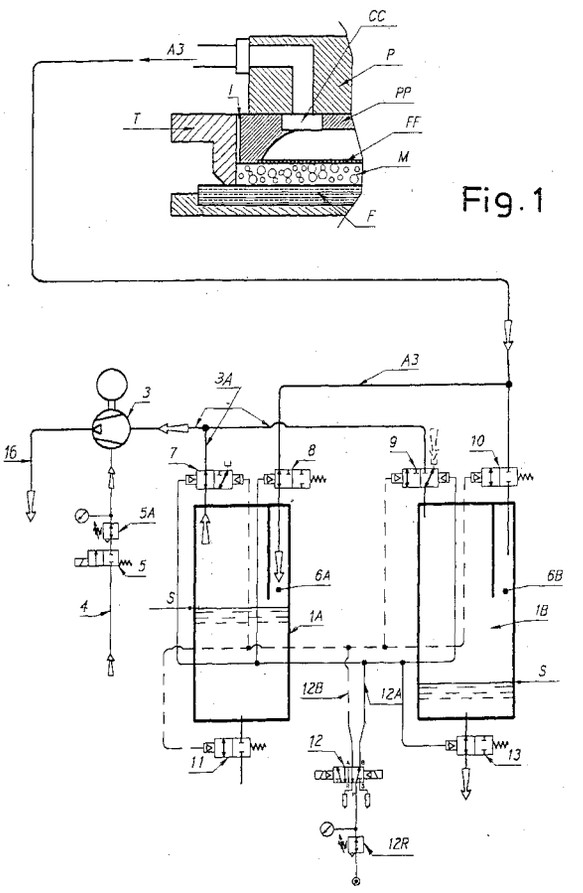

Fig.1

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Description

[0001] There are known presses for producing what are known as single-layer cement tiles, having molds into which cement slurry and any necessary inert materials are introduced with an excess of water. In order to remove the excess water, the excess water and residual solid fractions are sucked out during the pressing, by suction from the filter located on the sealing surface or partially from the gap formed between the frame and the press block, to avoid the presence of excess moisture on the periphery of the pressed body of pressed cement, for the purpose of forming what is known as a "single-layer tile".

[0002] The invention relates to equipment which enables excess water (and sediments and residues of cement and powdered marble in suspension) to be removed systematically and continuously during the working of the press, without the need for manual intervention for this operation. The equipment can also be used for similar applications.

[0003] These and other objects and advantages are clearly described in the following text.

[0004] The equipment for removing water from presses for producing single-layer cement tiles, comprising suction means and settling containers, according to the invention comprises two settling containers, operating with a vacuum, each combined with its own inlet valve, its own suction valve and its own discharge valve; and means for simultaneously operating the said valves to switch the identical valves between the two different states, in an alternating way, so that one container is brought into the suction state and the other into the state of discharging the waste substance which has been sucked into the container and accumulated there.

[0005] Advantageously, each of the suction valves is of a type which switches from the open state, for suction by means of a vacuum pump, to a state in which it is closed toward the vacuum pump but open toward the exterior, to eliminate the vacuum in the corresponding container and permit or facilitate its emptying.

[0006] At least the inlet valves and the discharge valves are preferably of the type comprising a portion of compressible tubing - made from rubber or other material - and a clamp means for squeezing the said portion of tubing. Valves df this type can operate without problems, even when sediments are present in the liquid (water) passing through them.

[0007] All the components of the equipment can be grouped together in a framework and connected by tubes of rubber or the like to the press, to the vacuum pump, to the outlet of the said vacuum pump, and to a store for the waste material discharged cyclically and alternately from the containers.

[0008] Each of the containers can be provided with at least one maximum level sensor, to enable the operation of the two containers to be switched over when a certain level of filling of the corresponding container is reached, and also a minimum level sensor if required. Advantageously, internal detectors are used for directly monitoring the level in each container. For practicality of operation, only one maximum level detector, causing a full container to be discharged, was used; if the bottom discharge valve fails to work, the maximum level is also reached in the second container, and the machine stops.

[0009] The invention will be more clearly understood from the description and the attached drawing, which shows a practical embodiment, without restrictive intent, of the invention. In the drawing,

Fig. 1 shows a diagram of the system;
Fig. 2 shows a front view of an embodiment of the equipment;
Fig. 3 is a vertical section, essentially taken through III-III in Fig. 2;
Figs. 4 and 5 show a view through IV-IV and a section approximately through V-V in Fig. 2.

[0010] In the various figures, equivalent elements are indicated by the same reference numbers.

[0011] In the diagram of Fig. 1, reference is made to an embodiment particularly suitable for the removal of excess water containing sediments (cement and powdered marble in suspension) which are formed during pressing, and consequently for the pressing of single-layer cement tiles M in a press which comprises a base F, at least one frame T and a corresponding press block P. In a solution proposed by the present patentee, and illustrated in a summary way, excess water containing suspended sediments is transferred, as a result of the pressing and the vacuum created above the filter FF, to the perimetric collector CC of the plate PP, and is then transferred to the containing vessels through tubes A3; a limited quantity is trapped in the gap I formed between the frame and the plate PP of the press block P, and is also sucked out through suction holes A1 in order to pass through the collector CC and into the tube A3.

[0012] The equipment in question serves to collect and remove water, with any sediments contained in it, arriving from the press block or blocks P through flexible tubes, collectors or other apparatus, which are all connected to a suction tube A3 leading to the equipment in question.

[0013] The equipment comprises two preferably transparent containers 1A and 1B, in which there is a vacuum to enable the water and sediments to be sucked from the tube A3; the vacuum in the two transparent containers 1A and 1B is created by a pump 3, particularly a liquid ring pump, which is supplied with pressurized water with a low rate of flow, to provide the seal between the impeller and the pump casing; the number 4 indicates the water supply; 4A indicates a flow controller which controls the actual passage of water; the number 5 indicates a valve for shutting off the supply and 5A indicates a pressure reducer.

[0014] The tube A3 is connected to the two containers 1A and 1B, opening from above in the areas 6A and 6B which are provided with suitable partitions.

[0015] During operation, as indicated in the diagram, the container 1A contains a vacuum and is therefore active, while the container 1B is discharging water and sediment which have been previously sucked into it and accumulated. A pneumatically operated suction valve 7 for the container 1A is open, while the identical valve 9 for the container 1B is closed for the purposes of suction and is open towards the exterior. The tube A3, running from the press, has a branch which is connected to a pneumatically operated inlet valve 8 for the container 1A, this valve being open, while the identical inlet valve 10 for the container 1B is closed. The water with the sediments and air flows, via the two valves 8 and 10, into the tubular or shielded areas 6A and 6B which are located at a certain height and are positioned away from (and particularly diametrically opposite) the suction valves 7 and 9, to prevent the direct suction of sediment which would rapidly damage the pump 3. At this stage, with a vacuum present in the container 1A, a discharge valve 11 of this container 1A is closed, while the identical valve 13 of the container 1B is open, because the container 1B is discharging.

[0016] The valves 8 to 10, 11 and 13 are pneumatically operated (with an elastic return system), being operated by a source of compressed air with a pressure regulator 12R. The use of all these pneumatically operated valves enables the operating logic to be significantly simplified. This is because the compressed air supply valve 12, which is electromagnetically operated and "bistable", according to whether its left-hand coil or its right-hand coil is energized, sends the pressure to the line 12A while the line 12B is in the discharge state, or vice versa. Since all the valves 7, 8, 9, 10, 11 and 13 have the "open" or "closed" function in their operating logic, it is simply necessary to connect the control lines 12A and 12B appropriately, as indicated in the diagram in Fig. 1, to provide a satisfactory automatic control system and the correct switching of the suction and discharge functions between the two containers 1A and 1B.

[0017] The valves 8 and 10 and the valves 11 and 13 are chosen in accordance with their functions. Both water and sediment (as well as air) pass through the valves 8 and 10 and through the valves 11 and 13, and therefore the tubes cannot be closed by means of flat gate valves, cone valves, ball valves, or other types. It was therefore decided to use special "clamp" valves which operate by opening or closing - by means of a clamp operated by a pneumatic cylinder - a portion of rubber tube of suitable diameter through which the water and the sediment (and air) pass; these valves have a long service life, and are usually trouble-free. The two valves 7 and 9 are not of the aforesaid type, since they are used to create the vacuum in the suction connectors 3A, through which only air passes. The two valves 7 and 9 are of the gate type, and are characterized in that each of them, when stopping the suction by the pump 3, allows air to pass into the corresponding container to eliminate the vacuum and allow the corresponding valve 11 or 13 to discharge. It should be remembered that the suction and discharge take place alternately in the two containers.

[0018] The equipment is made from components which are, as far as possible, grouped together in a single structure 14 (see Figs. 2 to 5).

[0019] To reduce the overall dimensions and minimize the length of tubing, thus maximizing the vacuum created by the pump 3, flexible tubes are used between the pump 3 and the containers 1A and 1B. The pump 3 is positioned on the same supporting structure 14 as the containers 1A and 1B, and is fixed there by means of suitable elastic elements.

[0020] The tube 3A connects the pump 3 to the two valves 7 and 9; a vacuum gauge 15 indicates the degree of vacuum present in the containers 1A and 1B alternately.

[0021] Within the containers 1A and 1B, the two branches of the tube 3A are positioned at a distance from the inlets of the corresponding vacuum tubes 3A, in areas 6A and 6B which are suitably shielded, to prevent the risk of direct suction of water (and sediment) by the pump 3. A tube 16 serves to discharge the water for maintaining the seal of the pump 3. The water arriving from the supply 4, and the air which is sucked in by the pump after having passed from the tube 3A through the active container and the pump, are discharged along the said tube 16.

[0022] Two maximum level detectors S1A and S1B (Figs. 3 and 5), for the containers 1A and 1B respectively, detect the maximum level of the liquid in the corresponding containers. When the maximum level is reached in the active container, the operation is switched from this container to the other one during the first stage of rotation of the mold support of the press; it is preferable for the changeover to be carried out at this stage, because no pressing is taking place and thus, even if there is a brief interruption of the vacuum, this has no effect on the quality of the product. If the bottom valve (11 or 13) fails to operate, even though the command has been sent for the discharge of the liquid which has reached the maximum level, then an alarm signal is triggered as soon as the second maximum level detector enables it, and this also stops the installation so that the causes of the anomaly can be investigated.

[0023] Clearly, the drawing shows only a simplified diagram provided solely as a practical demonstration of the invention, which can be varied in its forms and arrangements without departure from the scope of the guiding principle of the invention. Any reference numbers present in the attached claims have the function of facilitating the reading of the claims with reference to the description and to the drawing, and do not limit the scope of protection represented by the claims.

Claims

1. Equipment for removing water and sediment from molds for producing single-layer cement tiles, provided with suction means and settling containers, **characterized in that** it comprises two settling containers (1A, 1B), operating alternately with a vacuum, each combined with its own inlet valve (8; 10), its own suction valve (7, 9) and its own discharge valve (11, 13); and means for simultaneously operating the said valves to switch the identical valves between the two different states, so that in an alternating way one container is brought into the suction state and the other into the state of discharging the waste substance which has been sucked into the container and accumulated there.

2. Equipment according to Claim 1, **characterized in that** each of the suction valves (7, 9) is of a type which switches from the open state, for suction by means of a vacuum pump (3), to a state in which it is closed towards the vacuum pump (3) but open towards the exterior, to eliminate the vacuum in the corresponding container and permit and facilitate its emptying.

3. Equipment according to Claim 1, **characterized in that** at least the inlet valves (8, 10) and the discharge valves (11, 13) are of the type comprising a portion of compressible tubing - made from rubber or other material - with a clamp means for squeezing the said portion of tubing.

4. Equipment according to at least one of the preceding claims, **characterized in that** all of its components are grouped together in a framework (14) and connected by flexible tubes or the like to the press, to the vacuum pump, to the outlet of the said vacuum pump, and to a store for the waste material discharged cyclically and alternately from the containers.

5. Equipment according to Claim 1 at least, **characterized in that** each of the containers comprises a maximum level detector (S1A, S1B), to enable the operation of the two containers (1A, 1B) to be switched over when a certain level of filling of each corresponding container is exceeded.

6. Equipment according to Claim 5, **characterized in that** a simultaneous maximum level signal from the detectors of the two containers causes the machine to stop.

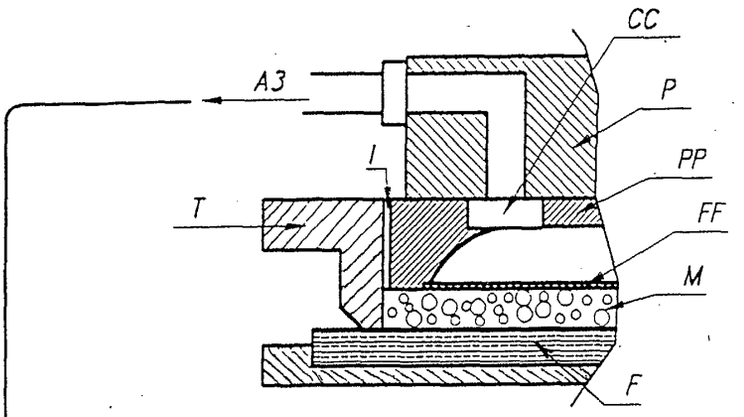
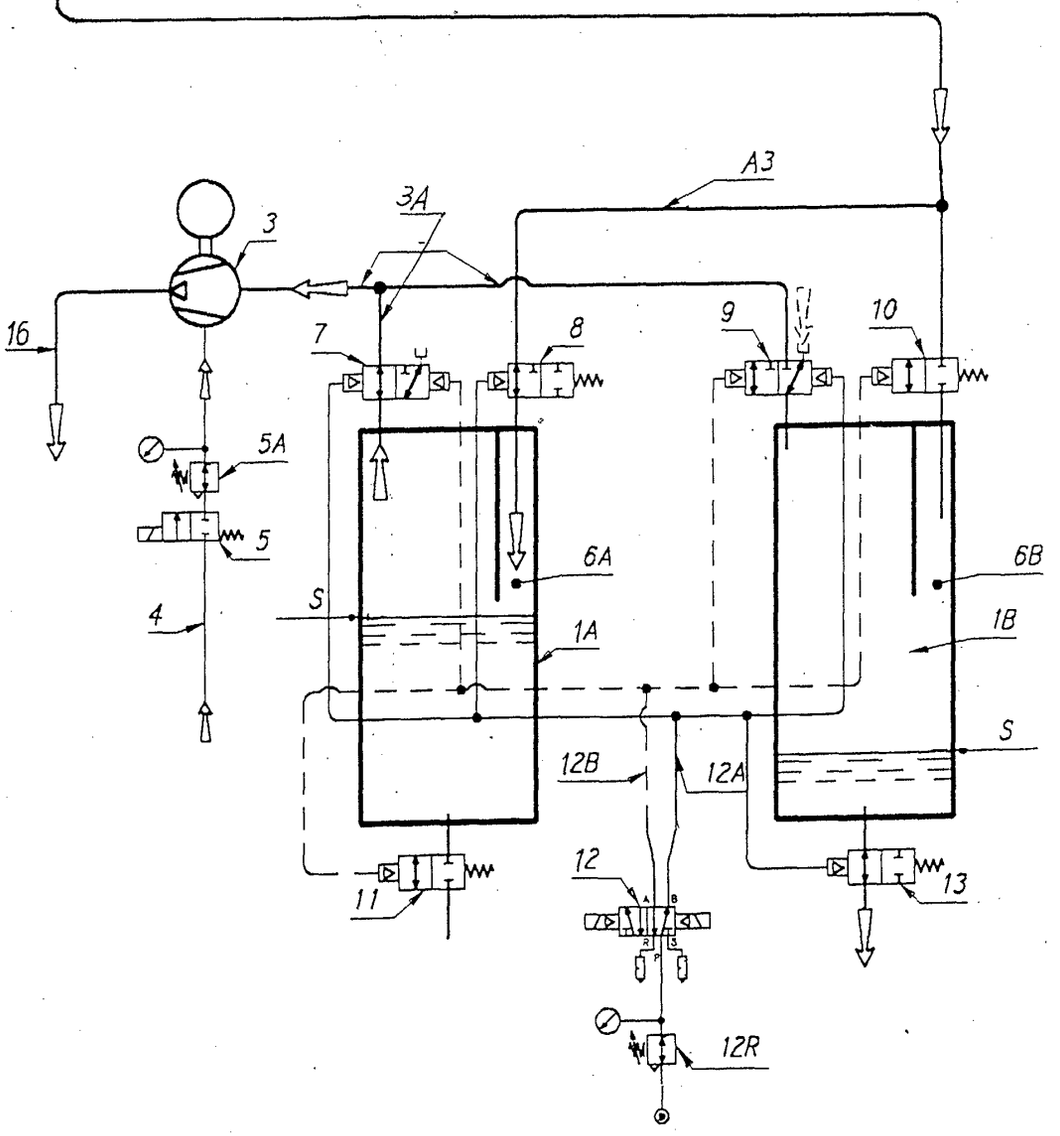

CC
A3
P
I
PP
T
FF
M
F

Fig.1


A3
3A
3
16
7
8
9
10
5A
5
6A
6B
4
S
1A
1B
S
12B
12A
12
11
13
12R

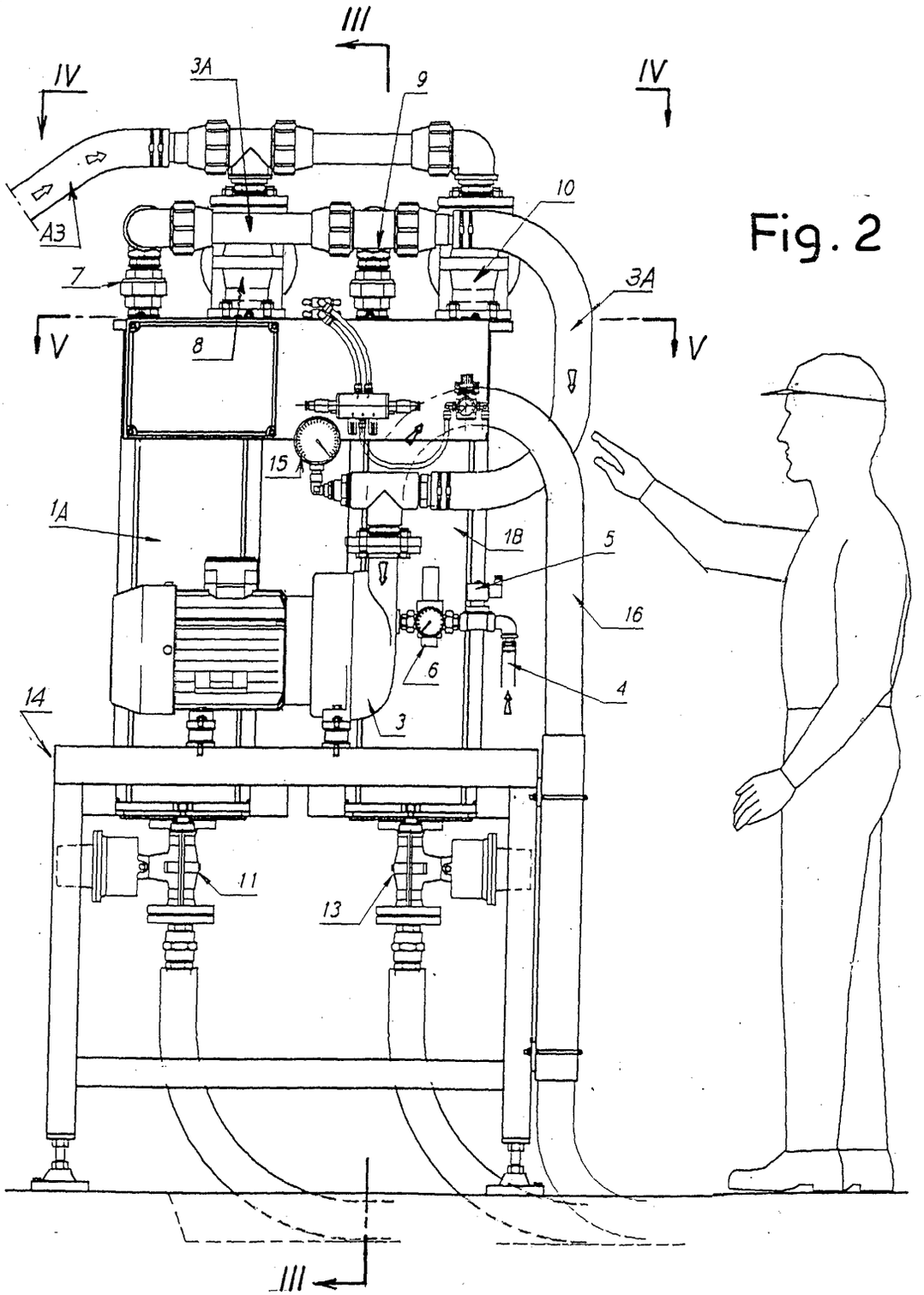


Fig. 2

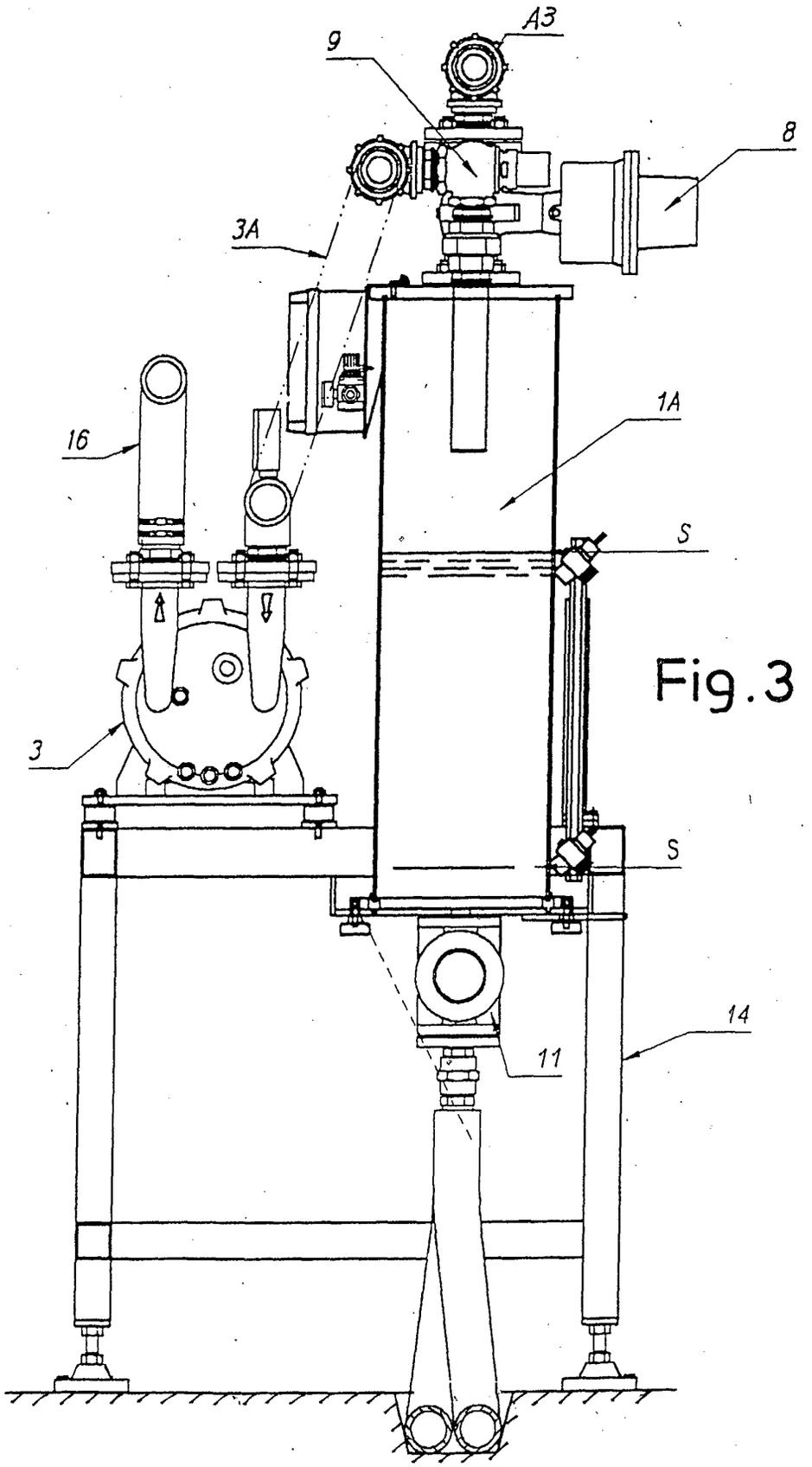


Fig.3

Fig.4

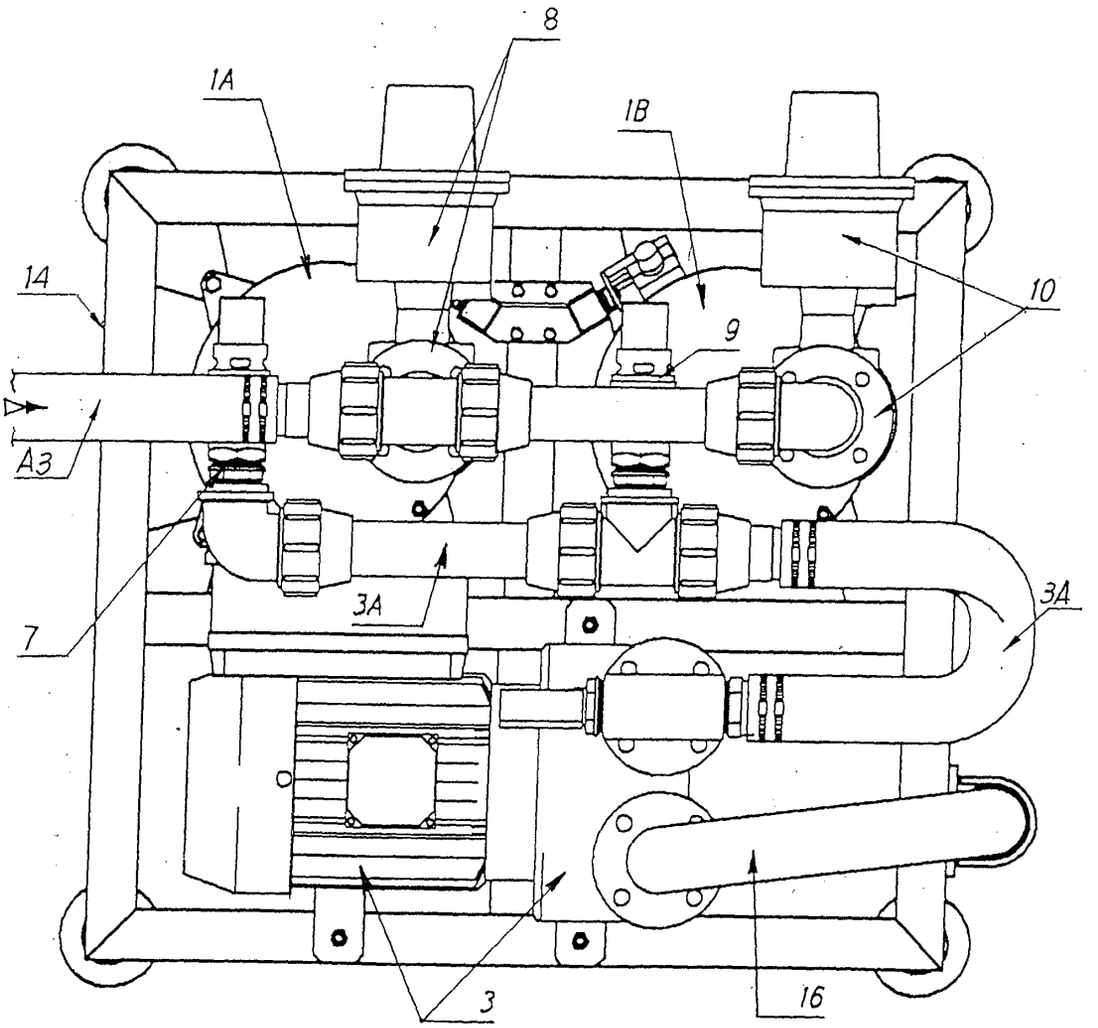


Fig.5