

(19)



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(11)

EP 1 306 550 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

02.05.2003 Bulletin 2003/18(51) Int Cl.7: **F04B 7/00, F04B 15/02**(21) Application number: **02102476.5**(22) Date of filing: **23.10.2002**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**

Designated Extension States:

AL LT LV MK RO SI(30) Priority: **25.10.2001 IT MI20012246**(71) Applicant: **Cifa S.P.A.****20026 Novate Milanese, Milano (IT)**

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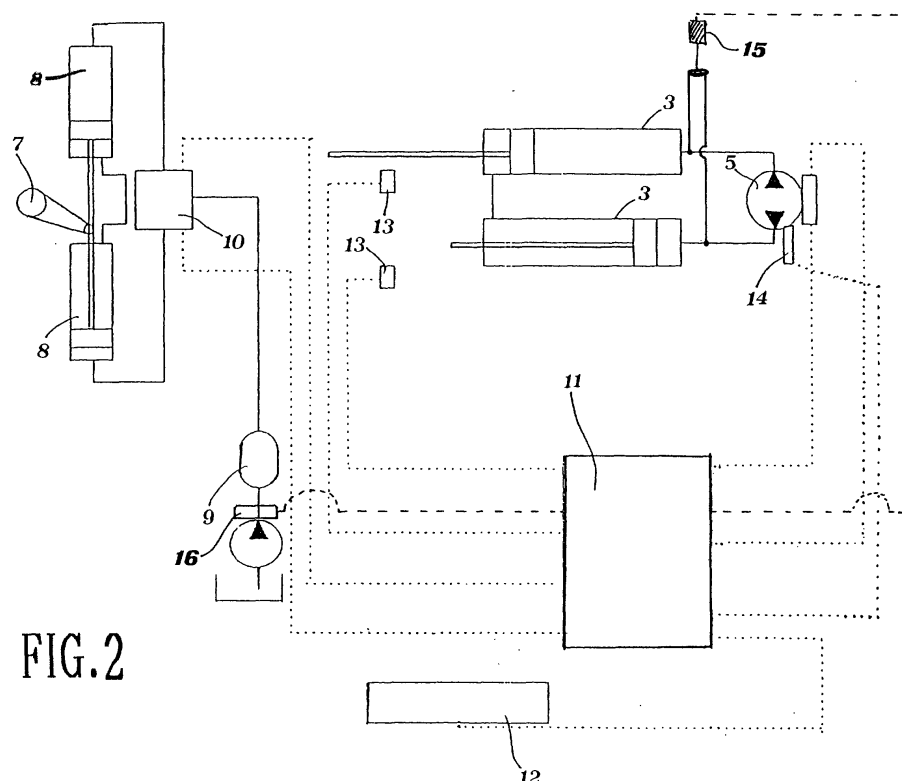
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(54) **Improved concrete pump with means to automatically adjust the working of the S-valve according to the type of concrete**

(57) The invention concerns a concrete pump, of the type comprising a pair of pumping cylinders (3) acting, alternately, to draw the concrete from a hopper (2) and introduce it, by means of an oscillating valve (S-valve 7), into a duct conveying and delivering the material, the movement of said S-valve (7) being controlled by an ac-

tuator (8) operated by a control unit. Said pump also comprises a sensor (15) of the working pressure which causes, by means of said control unit, the working of means (16, 9) to adjust the working pressure of said actuator (8) according to the type of concrete being pumped.

**FIG. 2****EP 1 306 550 A1**

Description

[0001] The present invention concerns improvements in concrete pumps to automatically adjust the working thereof and provide the best performances on changing of the working conditions. In particular, the invention concerns an improvement in the working system of the S-valve of the pumping unit.

[0002] As known, the so-called concrete pumps comprise a pumping unit fed by a hopper and a duct to convey and deliver the concrete on the working site. Generally, the pumping unit comprises a pair of cylinders apt to pump the concrete, alternately moved by a pair of hydraulic cylinders, and a special valve (S-valve) which alternately connects the concrete conveying and delivery duct with one of the two pumping cylinders, while the other draws the concrete from the hopper, and viceversa.

[0003] Such a pump is known, for example, from Italian Patents No. 1.301.562 and No. 1.301.563, in the name of the same Applicant, which are here taken as reference.

[0004] By combining the movement of the S-valve with the movement of the pumping cylinders, a more or less constant flow of concrete is fed along the conveying and delivery duct of the material. Said flow is apt to cross the duct in the two directions; the actual pumping action takes place when the flow is fed from the pumping unit towards the outlet end of the delivery duct, while the drawing action takes place when the flow is fed in the opposite sense.

[0005] Generally, the alternate oscillating movement of the S-valve is obtained by means of one or more actuators which impart a pressure on the valve such as to guarantee the accelerations and speeds required to obtain the proper synchronism between the pump and the delivery duct, as well as a most regular pumping flow.

[0006] In known technique, the pressure imparted by the actuators is preset by being planned according to the specifications of the thickest concrete presumably meant to be pumped, that is, on the basis of the supposedly hardest working conditions.

[0007] For this reason, when having to pump concretes with different characteristics, for instance less thick than foreseen, the excessive pressure imparted by the actuators on the S-valve creates rattlings and excessive noise, as well as determining inertial forces and oscillations which affect the whole structure and involve useless losses of energy.

[0008] In some cases, the user has the possibility to manually preset this parameter, on the basis of the average effort presumably made by the pump in its activity. The requirement however exists to be able to adjust the working of the S-valve with continuity, in an automatic manner and also while pumping the same concrete lot, the conditions of which may vary during the operation.

[0009] The object of the present invention is to satisfy these requirements and to solve the problems of known

technique, by supplying a pumping unit in which the actuators of the S-valve may impart a pressure according to the specific momentary conditions of the concrete being pumped, so as to avoid any useless losses of energy and the consequent malfunctions pointed out above.

[0010] This is obtained by means of a concrete pump as briefly and basically described in the accompanying main claim.

[0011] Other aspects of the present invention are described in the subordinate claims.

[0012] Further characteristics and advantages of the concrete pump according to the present invention will anyhow be more evident from the following detailed description of a preferred embodiment thereof, given with reference to the accompanying drawings, in which:

[0013] Fig. 1 is a general diagram of a concrete pump to which the present invention is applied; and

[0014] Fig. 2 diagrammatically illustrates how the invention is applied to a concrete pump as shown in fig. 1.

[0015] With reference to the drawings, a concrete pumping plant essentially comprises a pumping unit 1, fed by a hopper 2, and a duct (not shown) to convey and deliver the concrete on the working site. The pumping unit 1 consists of a pair of cylinders 3 apt to pump the concrete, alternately moved by a pair of hydraulic cylinders 4 controlled in the two directions by a backflow pump 5 operated by a motor 6, and of a special S-valve 7 which connects the conveying and delivery duct with one of the two pumping cylinders 3, while the other cylinder 3 draws the concrete from the hopper 2. The S-valve 7 is alternately moved by an actuator 8, for example a second pair of hydraulic cylinders fed by a hydraulic circuit with accumulator 9 and controlled by a group of solenoid valves 10.

[0016] The movement of the S-valve 7 in combination with the movement of the pumping cylinders 3 produces a flow of concrete (being either pumped or drawn) which flows through the conveying and delivery duct in a practically continuous manner.

[0017] An electronic control box 11 controls the working of the different devices according to desired laws.

[0018] According to a preferred embodiment of the invention, the control circuit of the actuator 8 also comprises an electroproportional pressure reducing valve 16 and a sensor 15 of the working pressure.

[0019] By the term "working pressure" is meant a pressure which is somehow correlated with the work required to pump the specific concrete, which is in turn function of the thickness of the actual concrete. For example, as illustrated in fig. 2, the working pressure can be considered to be the hydraulic pressure acting inside the pair of pumping cylinders 3.

[0020] In the electronic control box 11 the signal issued by the pressure sensor 15 is used as a parameter to adjust the working of the electroproportional pressure reducing valve 16, and thus the charging pressure of the accumulator 9. This allows to adjust the pressure force of the actuator 8 according to the working pressure de-

tected by the pressure sensor 15.

[0021] In practice, the more the concrete is thick and resistant, the higher is the pumping pressure detected by the sensor 15 and the more does the pressure force of the actuator 8, acting on the S-valve 7, have to be adjusted; viceversa, the more the concrete is diluted, the lower will have to be the pressure force of the actuator 8 acting on the S-valve 7.

[0022] Thanks to the use of a sensor 15 of the working pressure and to a device allowing to adjust the pressure force of the actuator 8, it is possible to instantly and automatically control the movement of the S-valve 7, so as to reach the best working conditions according to the type of concrete being pumped, and thereby avoid losses of energy, noise and rattlings.

[0023] It is anyhow understood that there can be other embodiments of the invention, without thereby departing from the protection scope thereof.

[0024] In particular, the working pressure can be detected in a different way from that described heretofore, for instance also in a different position.

[0025] A technician of the field will moreover be able to apply the teachings provided herein to a different type of actuator for the movement of the S-valve - for example a compressed air actuator or an electrically controlled actuator - by suitably modifying the control system in order to adapt the invention to the specific application.

Claims

1. Concrete pump, of the type comprising a pair of pumping cylinders (3) acting, alternately, to draw the concrete from a hopper (2) and introduce it, by means of an oscillating valve (S-valve 7), into a duct conveying and delivering the material, the movement of said S-valve (7) being controlled by an actuator (8) operated by a control unit, **characterized in that** it also comprises a sensor (15) of the working pressure and means to adjust the working pressure of said actuator (8), said control unit causing the operation of said adjustment means on the basis of a signal issued by the pressure sensor (15), which signal depends on the type of concrete being pumped.
2. Concrete pump as in claim 1), wherein said sensor (15) of the working pressure senses the pressure of a circuit controlling said pumping cylinders (3).
3. Concrete pump as in claim 1) or 2), wherein said actuator (8) is of the hydraulic or pneumatic type and said adjustment means consist of a pressure reducing valve (16) apt to adjust the charging pressure of a pressure accumulator (9) of said actuator (8).
4. Concrete pump working method, wherein an alter-

nate pumping system is alternately connected with a concrete conveying and delivery duct by way of an oscillating valve (S-valve 7), the movement of said S-valve (7) being controlled by an actuator (8), **characterized in that** the pressure with which said actuator (8) acts on said valve (7) is adjusted on the basis of a signal issued by a sensor (15) of the working pressure.

5. Concrete pump working method as in claim 4), wherein said working pressure is the pressure of a circuit controlling the pumping system.

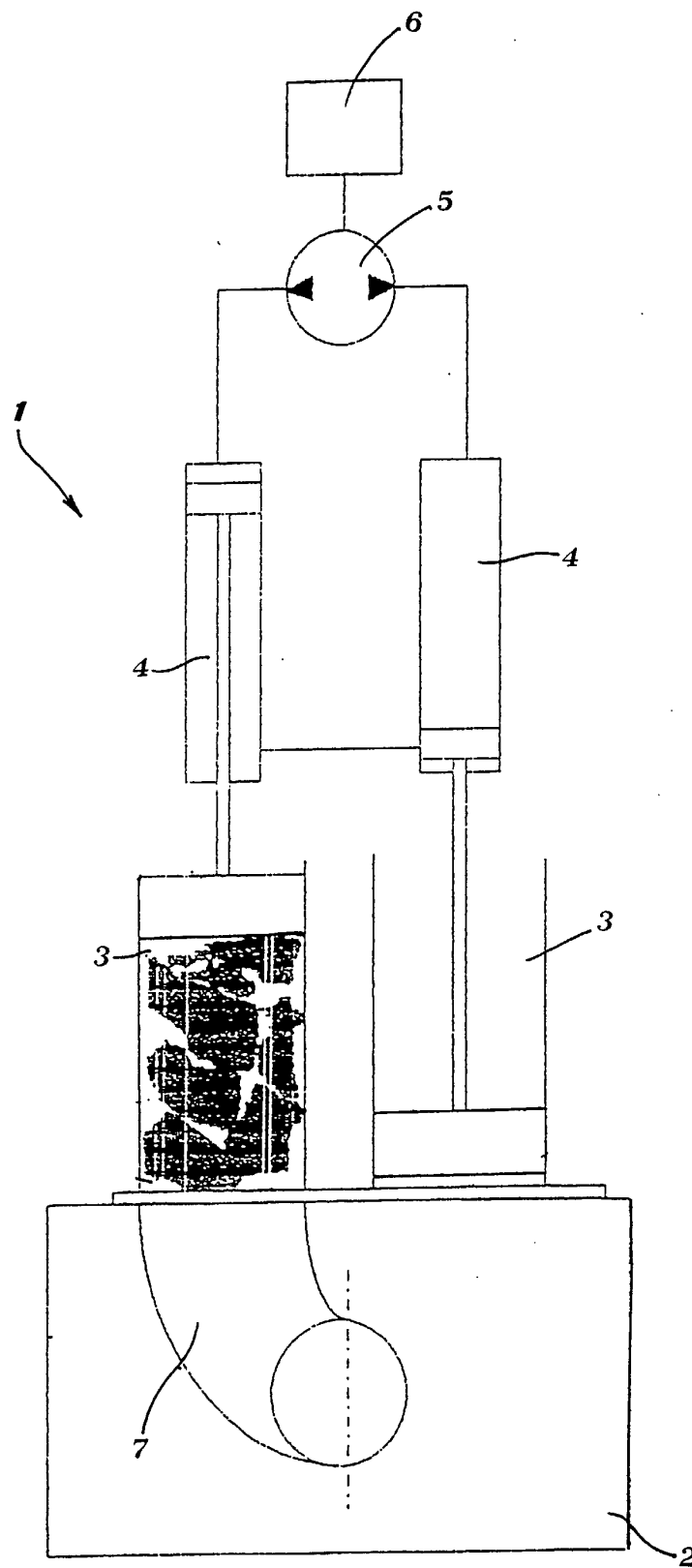


FIG.1

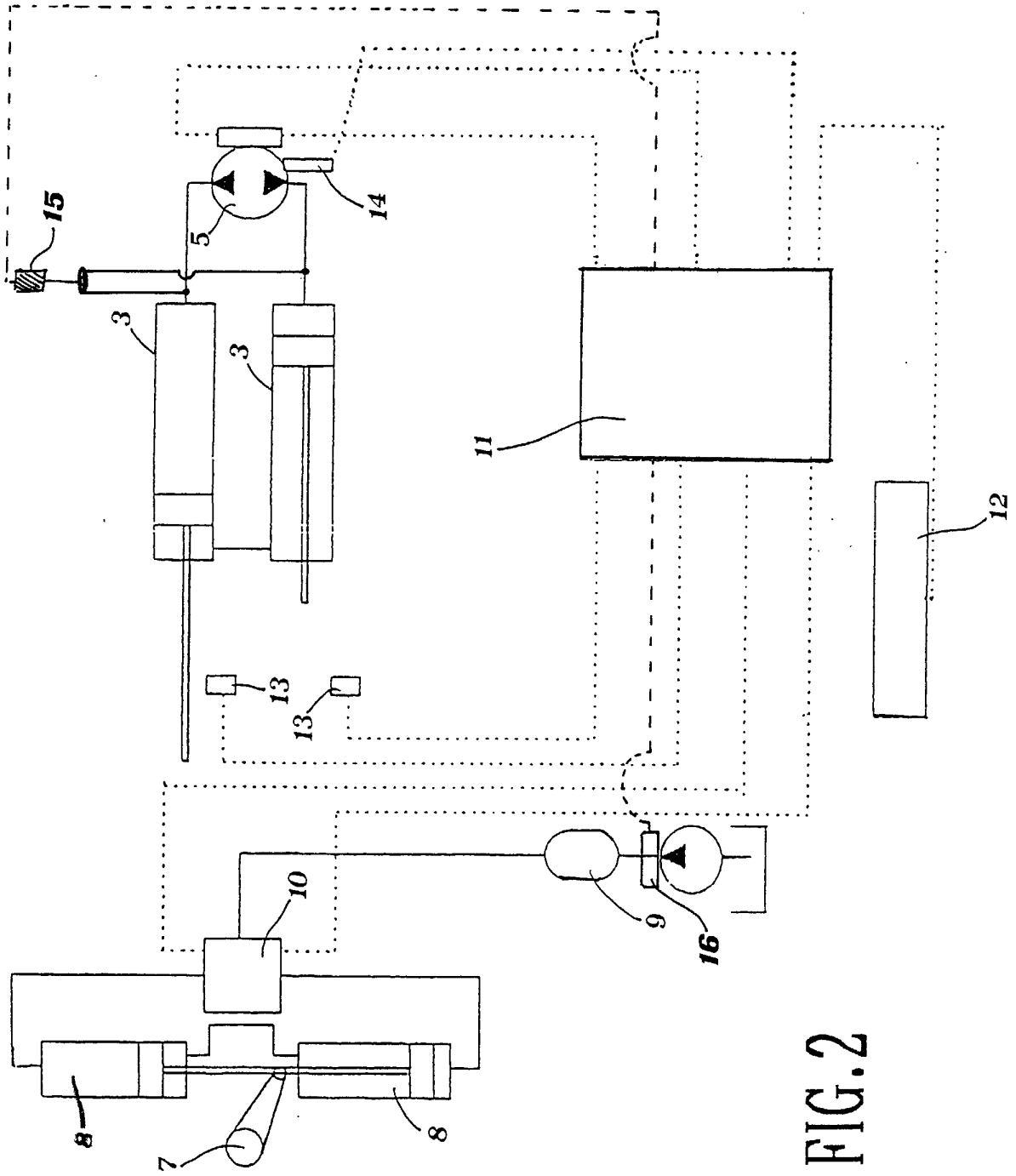


FIG.2



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EUROPEAN SEARCH REPORT

Application Number
EP 02 10 2476

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Place of search THE HAGUE		Date of completion of the search 13 January 2003	Examiner Ingelbrecht, P
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EPO FORM 1503 03 82 (P04C01)

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