



## Description

[0001] The present invention concerns a concrete pump comprising means to modulate the speed of the piston stroke into the pumping cylinders, said means being electronically controlled according to the maximum concrete capacity allowed by the pump.

[0002] The object of the invention is to improve the characteristic of the concrete capacity fed into the concrete transport and delivery duct, at the different working speeds of the pumping unit.

[0003] There are known to be concrete pumps which comprise a pumping unit, fed from a hopper, and a transport and delivery duct to distribute the concrete on the working site. Generally, the pumping unit consists of a pair of concrete pumping cylinders, alternatively operated by a pair of hydraulic cylinders, and of a special rocking valve (S-valve) which connects the concrete transport and delivery duct to one of the two pumping cylinders, while the other cylinder draws concrete from the hopper. The rocking S-valve is alternatively moved by a second pair of hydraulic cylinders. By combining the movement of the S-valve with the movement of the pumping cylinders, the concrete flow is generated through the transport and delivery duct. Said concrete flow is apt to move through the duct in the two directions; the concrete is actually pumped when the flow is directed from the pumping unit towards the outlet end of the duct, so as to be delivered, while it is drawn when the flow is directed in the opposite sense. The two types of operations are obtained by suitably combining the movement of the pumping cylinders with the position of the S-valve.

[0004] This type of known pumps leads to cracks in the material drawn from the hopper, in the filling step of the pumping cylinders, thus involving discontinuities in the capacity of the concrete subsequently pumped into the transport and delivery duct.

[0005] The present invention proposes to overcome this drawback - highly unpleasant, for obvious reasons - by providing to modulate the speed at which the pistons of the pumping cylinders move into said cylinders by way of electronic control means.

[0006] More precisely, the present invention concerns a concrete pump - of the type comprising a pair of pumping cylinders alternatively operating under the control of a backflow hydraulic pump, to draw concrete from a hopper and feed it by way of a rocking valve (S-valve) into the transport and delivery duct, and wherein said cylinders are provided with stops to control the starting movement of the S-valve - characterized in that the speed of the piston stroke of said cylinders is modulated by being increased in the initial length of said stroke, and in that electronic means are provided to control said speed according to the maximum concrete capacity allowed by the pump.

[0007] In this pump, said electronic means preferably comprise a microprocessor unit, which receives the sig-

nals issued by said stops, detects and reckons the number of pumping cycles per minute, reckons the pump operating time with maximum capacity, and controls the movement of the S-valve and the reversal of the backflow hydraulic pump.

[0008] The invention is now described in further detail, with reference to the accompanying drawings, which illustrate a preferred embodiment thereof and in which:

Fig. 1 is a general diagram of a concrete pump comprising the means according to the invention; and

Fig. 2 diagrammatically illustrates how the means according to the invention are applied onto a pump as shown in fig. 1.

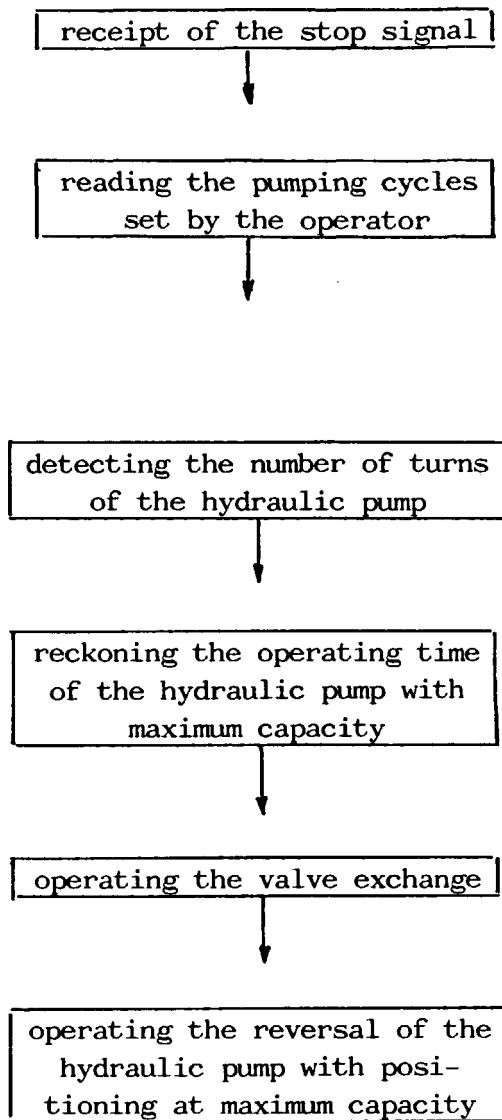
[0009] As shown on the drawings, a concrete pumping plant essentially comprises a pumping unit 1 fed from a hopper 2, and a transport and delivery duct (not shown) to distribute the concrete on the working site. The pumping unit 1 consists of a pair of concrete pumping cylinders 3 alternatively operated by a pair of hydraulic cylinders 4 controlled in the two directions by a backflow hydraulic pump 5 operated by a prime mover 6, and of a rocking S-valve 7 which connects the concrete transport and delivery duct to one of the two pumping cylinders 3, while the other cylinder draws concrete from the hopper 2. The S-valve 7 is alternatively moved by a second pair of hydraulic cylinders 8, fed by a hydraulic circuit with accumulator 9 and controlled by a set of solenoid valves 10. By combining the movement of the S-valve 7 with the movement of the pumping cylinders 3, a concrete flow is generated (the concrete being either pumped, or drawn) and moves, in a practically continuous but irregular manner, through the concrete transport and delivery duct.

[0010] According to the invention, the backflow hydraulic pump 5 - which controls the hydraulic cylinders 4 - and the S-valve 7 are operated by a microprocessor unit 11, into which are set the working cycles by a panel 12 and which receives signals issued by stops 13 of the pumping cylinders 3, and by a sensor 14 detecting the number of cycles of the pump 5. The microprocessor unit 11 controls the speed of the piston strokes of the pumping cylinders 3 according to the maximum concrete capacity allowed by the pump 5, increasing said speed in the initial length of the stroke, so as to promptly remove the cracks produced in the concrete drawn from the hopper 2, when filling said cylinders 3, to the full advantage of a homogeneous and continuous concrete delivery from the respective duct.

[0011] This allows to obtain curves to modulate the speed of the piston strokes, apt to improve the pumping performances according to the operating conditions and to the concrete characteristics, particularly its consistency.

[0012] The concrete pumping plant is controlled by the microprocessor unit 11 according to the following flow

diagram:



said cylinders is modulated by being increased in the initial length of said stroke, and in that electronic means are provided to control said speed according to the maximum concrete capacity allowed by the pump.

2. Concrete pump as in claim 1), wherein said electronic means comprise a microprocessor unit, which receives the signals issued by said stops, detects and reckons the number of pumping cycles per minute, reckons the pump operating time with maximum capacity, and controls the movement of the S-valve and the reversal of the backflow hydraulic pump.

which perfectly synthesizes the sequence of the operating steps.

**[0013]** It is anyhow understood that the invention is not limited to the embodiment described heretofore, but other practical embodiments may fall within the protection scope thereof.

#### Claims

1. Concrete pump, of the type comprising a pair of pumping cylinders alternatively operating under the control of a backflow hydraulic pump - to draw concrete from a hopper and feed it, by way of a rocking valve (S-valve), into the transport and delivery duct - wherein said cylinders are provided with stops to control the starting movement of the S-valve, characterized in that the speed of the piston stroke of

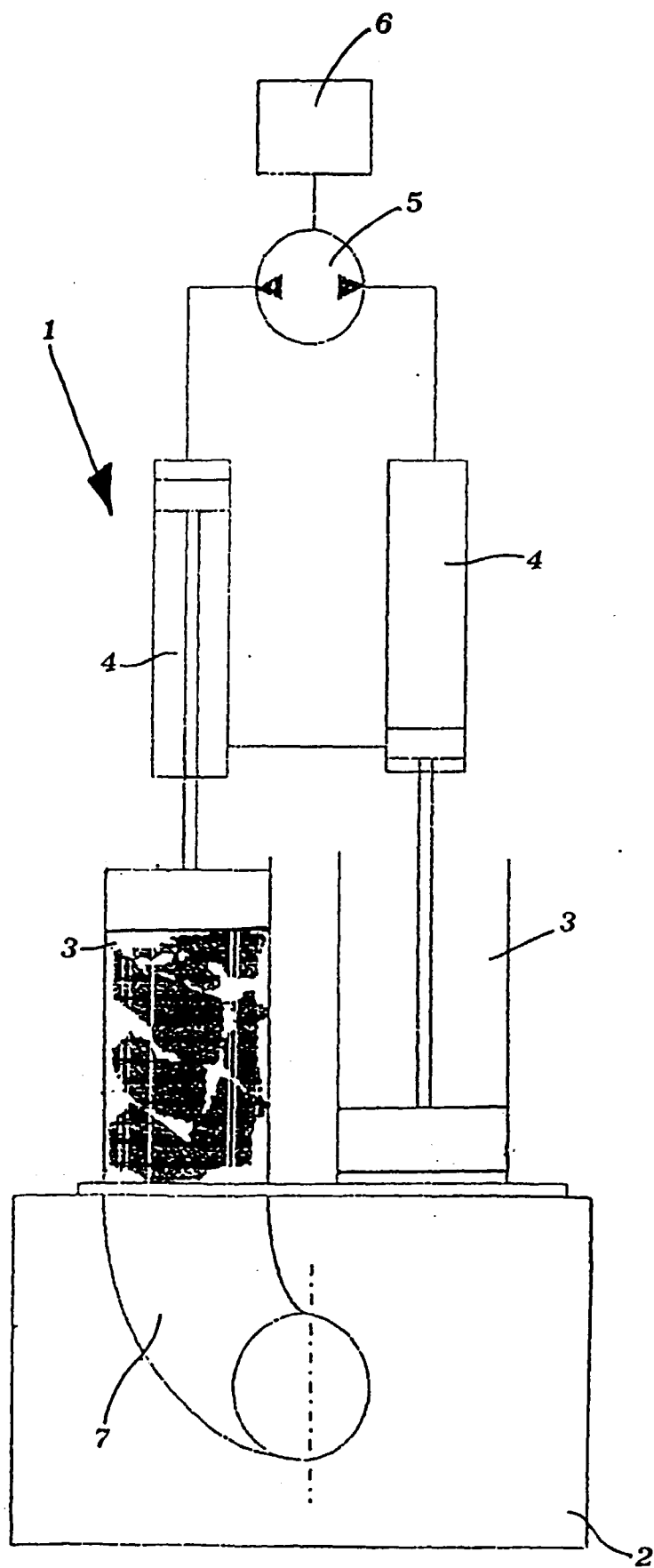
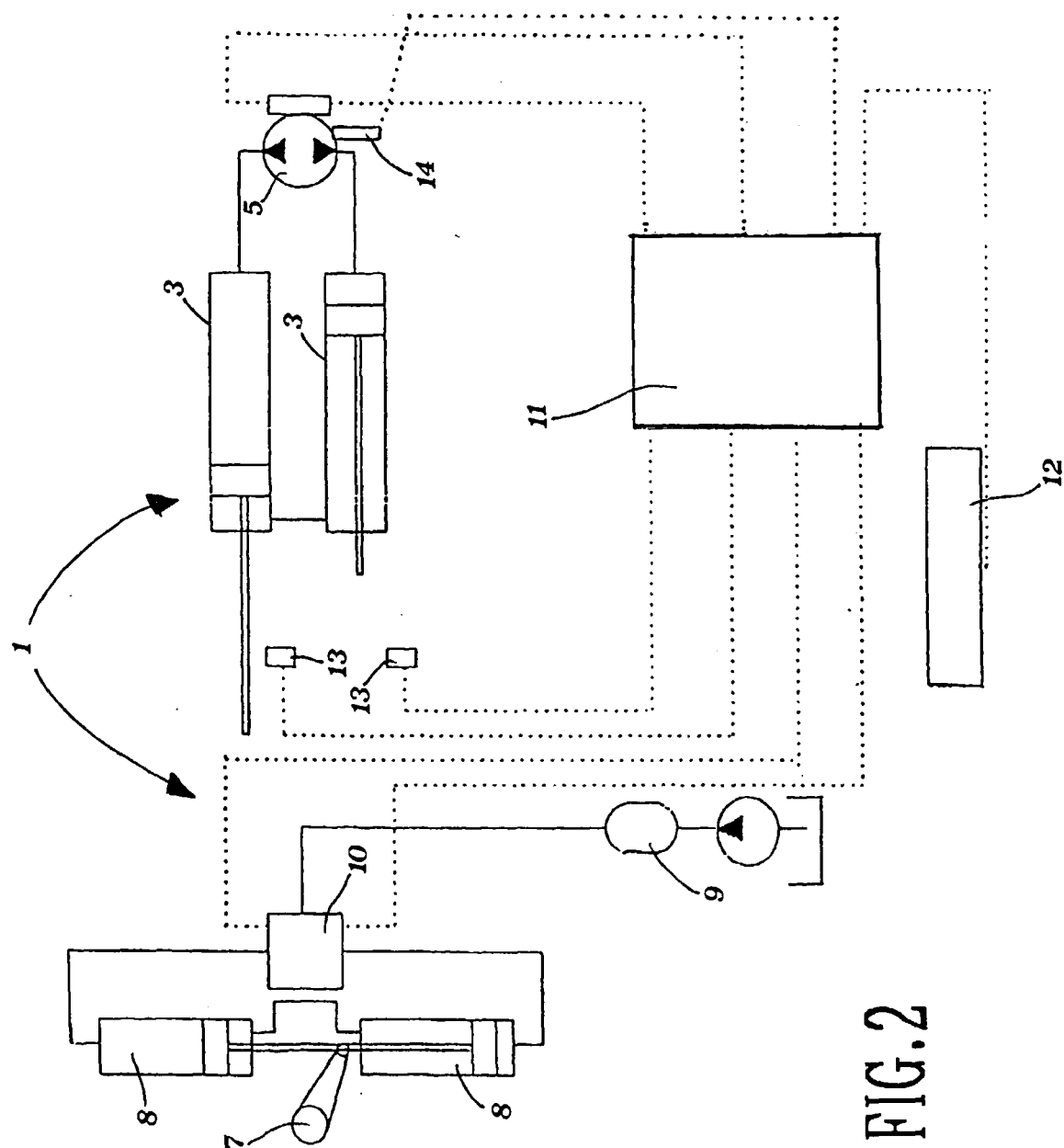


FIG.1





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 11 3575

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
X	US 5 332 366 A (ANDERSON THOMAS M) 26 July 1994 (1994-07-26) * column 4, line 5 - column 10, line 28 * ----	1,2	F04B15/02
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED
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Place of search <b>THE HAGUE</b>		Date of completion of the search <b>10 September 1999</b>	Examiner <b>Jungfer, J</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 99 11 3575

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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10-09-1999

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