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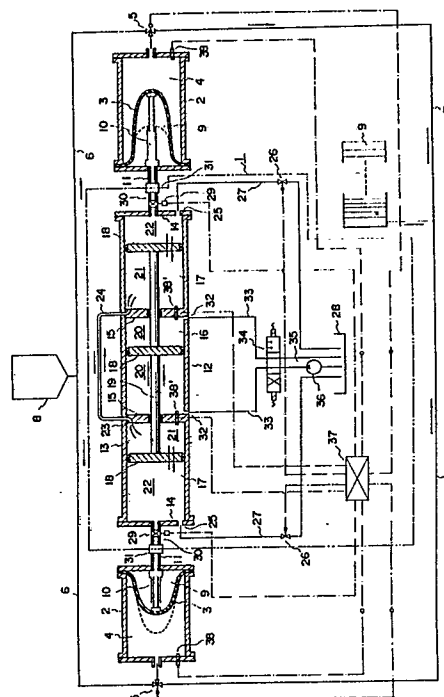
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Pressure-feeding apparatus.

This invention relates to a pressure-feeding apparatus (1) of the type wherein oil pressure chambers disposed on both sides of a barrel (13) of an oil pressure cylinder (12) are connected to a pressure-feeding apparatus main body (2) having swelling type flexible membranes (3) corresponding to the oil pressure chambers (17) through oil pressure passages (11). More particularly, the present invention relates to an oil pressure cylinder apparatus (12) which can be transported by a truck or the like and has a construction wherein an oil pressure cylinder (12) has three-dimensionally a pair of oil pressure chambers (21) having an equal capacity on both sides of a center oil chamber (20) through partitions, the piston (18) of each of these three oil pressure chambers is integrally connected by a rod (19), the oil pressure chambers (21) on both sides are connected by a bypass passage (24) while the center oil pressure chamber (20) is connected to an oil tank (28) through an oil pressure pump (36) and switch valves (34) such as electromagnetic valves are disposed in the passage of the oil pressure chambers (20) on both sides connected to the oil tank (28).



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SPECIFICATION

Title of the Invention

PRESSURE-FEEDING APPARATUS

Field of the Invention

The technique disclosed herein relates to a technical field of the construction of pressure-feeding apparatuses for pressure-feeding a slurry or the like to a solid-liquid separator such as a filter press.

Description of the Prior Art

Processing of a slurry such as a sludge has become a critical social problem with the progress of various industries and large capacity high pressure pressure-feeding apparatuses have become necessary for pressure-feeding various kinds of slurries. A pressure-feeding apparatus main body having a swelling type flexible membrane in place of a mere diaphragm pump has been developed and put into practical use as disclosed in many patent and utility model applications filed by the present Applicant. An oil pressure system pressure-feeding apparatus to be used in combination with such a pressure-feeding apparatus main body has been developed and put into practical use, too.

In a large plant where the pressure-feeding apparatus main body is connected to a filter press, or the like, an oil pressure system pressure-feeding apparatus is great in size and is installed fixedly.

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In the case of a portable pressure-feeding apparatus main body, on the other hand, a portable pressure-feeding apparatus becomes necessary and a demand has been increasing for a pressure-feeding apparatus which is simple in construction and is easy to operate. However, a compact oil pressure cylinder apparatus that satisfies such requirements has not yet been developed to this date.

Pressure-feeding apparatuses to be connected to the pressure-feeding apparatus main body are mostly of an oil pressure cylinder type but involve the problem that they need a complicated controlling apparatus when the initial stroke of the piston of the oil pressure cylinder is to be set at the initial stage. As a result, although they are portable, they are expensive and management control and maintenance are complicated.

Summary of the Invention

In order to solve the problems of the portable pressure-feeding apparatus of the prior art described above, the present invention is directed to provide an excellent pressure-feeding apparatus which is compact in construction, can be set easily at the initial stage, employs a closed circuit for an oil pressure circuit, has less oil leakage, can be easily

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connected and disconnected to and from the pressure-feeding apparatus main body and is advantageous for the field of fluid technique.

Brief Description of the Drawing

The accompanying sole drawing is an explanatory view of one embodiment of the present invention and is a schematic structural view.

Detailed Description of the Preferred Embodiment

Reference numeral 1 represents a pressure-feeding apparatus that constitutes the gist of the present invention and is adapted to be connectable to pressure-feeding apparatus main bodies 2 disclosed in many prior inventions and devices proposed by the Applicant of the present invention. A swelling type flexible membrane 3 made of rubber is disposed inside the barrel of each pressure-feeding apparatus main body 2 and defines a slurry chamber 4 on the swelling side. This slurry chamber 4 is selectively connected to a filter pressure 9 by a three-way changeover valve 5 through a passage 6, a slurry tank 8 and a passage 7 so that the slurry chambers 4 on both sides alternately suck and pressure-feed the slurry.

A support 10 which is slidable and expands and contracts the flexible membrane 3 is defined on the side opposite to the swelling side of the flexible membrane inside each pressure-feeding apparatus main body 2 and is connected to the pressure-feeding apparatus 1 through a passage 11.

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Inside the pressure-feeding apparatus 1, a pair of partitions 15, 15 are disposed between covers 14, 14 on both sides of the barrel 13 of an oil pressure cylinder 12 in such a manner as to separate a center oil pressure chamber 16 and oil pressure chambers 17, 17 on both sides from one another. A piston 18 is slidably disposed in each of these oil pressure chambers 16, 17, 17 and is connected integrally to each other through one rod 19 which is inserted through the partitions 15, 15 through respective seals. The piston 18 separates the center oil pressure chamber 16 from the pressure chambers 20, 20. Each of the oil pressure chambers 17, 17 on both sides is divided into an inner oil chamber 21 and an outer oil pressure chamber 22 and the inner oil chamber 21 is communicated with a bypass passage 24 through an opening 23 that is bored on the partition 15.

The outer pressure chamber 22 of each of the oil pressure chambers 17 on both sides is connected from the opening 25 to an oil tank 28 by a passage 27 that has a switch valve 26 such as an electromagnetic valve.

The pressure chamber 22 of each of the oil pressure chambers 14 on both sides is removably connected to the oil pressure passage 11 of the pressure-feeding apparatus main body 2 by a coupling 31 through an oil

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pressure passage 30 having a switch valve 29 such as an electromagnetic valve.

The pressure chambers 20, 20 on both sides of the center oil pressure chamber 16 are communicated with oil pressure passages 33, 33 through ports 32, 32, respectively, and from thence with an oil pressure passage 35 through a changeover valve 34 and with the oil tank 28 through an oil pressure pump 36. On the other hand, predetermined stroke sensors 37, 37 are disposed on the pair of partitions 15, 15.

Reference numeral 37 represents a predetermined controlling apparatus. This controlling apparatus 37 is connected to the sensor 38 for the flexible membrane 3 of each pressure-feeding apparatus main body 2, the sensor 38' for the piston 18 disposed on the partition 15 of each oil pressure cylinder 12, each switch valve 26, 29 such as the electromagnetic valve, the switch valve 5 and the switch valve 34 by respective cables in order to control them in a predetermined manner.

Incidentally, the mechanical portion of the pressure-feeding apparatus represented by two-dot-chain line is mounted to and transported by a truck, for example, and can be connected and disconnected to and from a pair of the pressure-feeding apparatus

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main bodies 2, 2 juxtaposed with the filter press 9 of a predetermined slurry processing plant, or the like, through the oil pressure passages 11, 11.

[Embodiment and Action]

As described above, after being transported by a truck or the like, the pressure-feeding apparatus 1 is disposed between the pair of the pressure-feeding apparatus main bodies 2, 2 of the predetermined slurry processing plant in such a manner that the oil pressure passage 30, 30 of its both oil pressure chambers 17, 17 can be coupled to the respective oil pressure passages 11, 11 through the couplings 31. Under this state, the electromagnetic valve 29 of each oil pressure passage 30 is kept closed by the controlling apparatus 37 and the both oil pressure chambers 22 of the oil pressure cylinder 12 are not communicated with each other pressure-feeding apparatus main body 2.

Under the connection state described above, each piston 18 does not generally reach the stroke end. Accordingly, each electromagnetic valve 26 is opened through the controlling apparatus 37 and the switch valve 31 is operated in a predetermined manner so as to pressure-feed the oil of the oil tank 28 through the oil pressure pump to either one of the pressure chambers 20 of the center oil pressure

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chamber 16. Next, when the oil of the other of the oil pressure chambers 20 is returned to the oil tank 28, the piston 18 of the center oil pressure chamber 16 moves towards one of the partitions 15 at a low speed from the middle of the stroke and reaches the sensor 38' at its stroke end.

Meanwhile, the oil of the inner oil chambers 21, 21 of both oil pressure chambers 16, 16 on both sides move from both sides to the other through the bypass passage 24 and the ports 23, 23 and a suction negative pressure is generated in the outer pressure chamber 22 of one of the oil pressure chambers 17 on both sides so that the oil from the oil tank 28 is charged fully into the oil pressure chamber 22 through the electromagnetic valve 26 and the port 25, while the oil is fed back from the pressure chamber 22 of the other of the oil pressure chambers 17 on both sides through the port 25 and the electromagnetic valve 26. Under this state, the sensor 32 generates the stroke end signal and the controlling apparatus 37 changes over the switch valve 34 to the neutral position, thereby completing the initial set state.

Incidentally, under this initial set state, the slurry from the slurry tank 8 fulfills in advance the slurry chamber 4 of one of the pair of the pressure-

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feeding apparatus main bodies 2, 2 while the slurry chamber 4 of the other is kept empty.

Though the initial state of the pressure-feeding apparatus main bodies 2 is not made, the initial setting is made on the processing plant side.

Then, the controlling apparatus 37 closes the electromagnetic valves 26, 26 but opens the electromagnetic valves 29, 29. The outer pressure chambers 22, 22 of the oil pressure chambers 17, 17 on both sides of the oil pressure cylinder 12 are communicated with the inner pressure chambers 9 of the flexible membranes 3 of the corresponding pressure-feeding apparatus main bodies 2. When the switch valve 34 is changed over at this time, the oil is pressure-fed into the oil pressure chamber 20 on the side of the stroke end of the piston 18 of the center oil pressure chamber 12 from the oil pressure passage 33 through the oil pressure pump 36, and each piston 18 moves forth. The oil pressure is applied to the pressure chamber 9 of the flexible membrane 3 of the pressure-feeding apparatus main body 2 that fulfills the slurry into the slurry chamber 4, while a negative pressure develops in the oil pressure chamber 9 of the other pressure-feeding apparatus main body 2, and the slurry from the slurry chamber 4 of the pressure-

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feeding apparatus main body 2 is pressure-fed into the filter press 9 while the three-way valves 5, 5 are controlled by the controlling apparatus 37. The slurry from the slurry tank 8 is sucked into the slurry chamber 4 of the other of the pressure-feeding apparatus main bodies and charged fully, and the sensors 38, 38' of the partitions of the oil pressure cylinder 12 detect the stroke end of the piston 18.

When the sensor 38 of the cover of the pressure-feeding apparatus main body 2 detects the swelling stroke end of each flexible membrane 3, the controlling apparatus 37 changes over the switch valve 34 and hence, changes over pressure-feeding of the oil to the pressure chambers 20, 20 of the center oil pressure chamber 12 and the oil tank 28. Therefore, the oil pressure cylinder 12 operates and the pair of the pressure-feeding apparatus main bodies 2, 2 are alternately changed over and controlled in order to alternately pressure-feed large quantities of slurry from the slurry tank 8 into the filter press 9.

Incidentally, the oil of the inner oil chambers 21, 21 of the oil pressure chambers 17, 17 on both sides in the oil pressure cylinder 12 is alternately moved through the bypass passage 24.

When pressure-feed of the slurry to the filter

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press 9 is complete in this manner, the pressure-feeding apparatus is removed from both pressure-feeding apparatus main bodies 2, 2 through the couplings 31, 31 and is transported to the next processing plant by the truck.

It is of course preferred to keep the switch valve 34 at the neutral position during the transportation.

Since the oil circuit is kept as a kind of closed circuits during the operation and transportation of the pressure-feeding apparatus 1, the leakage of the oil does not occur. However, when the oil leakage develops accidentally, the initial set of the pressure-feeding apparatus 1 can be accomplished reliably by the initial set of the stroke with respect to the center oil pressure chamber 12 at the initial stage as described previously.

Needless to say, the present invention is not particularly limited to the embodiment described above. For instance, lamps can be turned on and off at each stroke end of the piston.

The present invention can be applied not only to the slurry processing plant but to the pressure-feed of chemicals, water, and the like, and the rods of the oil pressure chambers on both sides can be of a double rod type from the aspect of the design change.

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In a pressure-feeding apparatus for supplying an operation oil to pressure-feeding apparatus main bodies for pressure-feeding a slurry to a solid-liquid separator such as a filter press, the present invention can always set the operation piston to the initial set position by use of the pressure-feeding apparatus itself. Therefore, the present invention provides an excellent effect that the pressure-feeding apparatus can be made transportable by a truck, or the like.

Since the pressure-feeding apparatus has three oil pressure chambers, its construction is extremely simple, and setting can be made by only operating the switch valves with respect to the center oil pressure chamber, thereby reducing possible trouble and making maintenance and inspection extremely easy. When the pressure-feeding apparatus is connected to the pressure-feeding apparatus main bodies, its initial set can be made always easily and flexibly.

Since the oil passages of the oil pressure chambers on both sides are connected to the oil tank through the switch valves, the switch valves are opened under the initial set state and when the pressure-feeding apparatus is connected to the pressure-feeding apparatus main bodies, they are closed whereby setting

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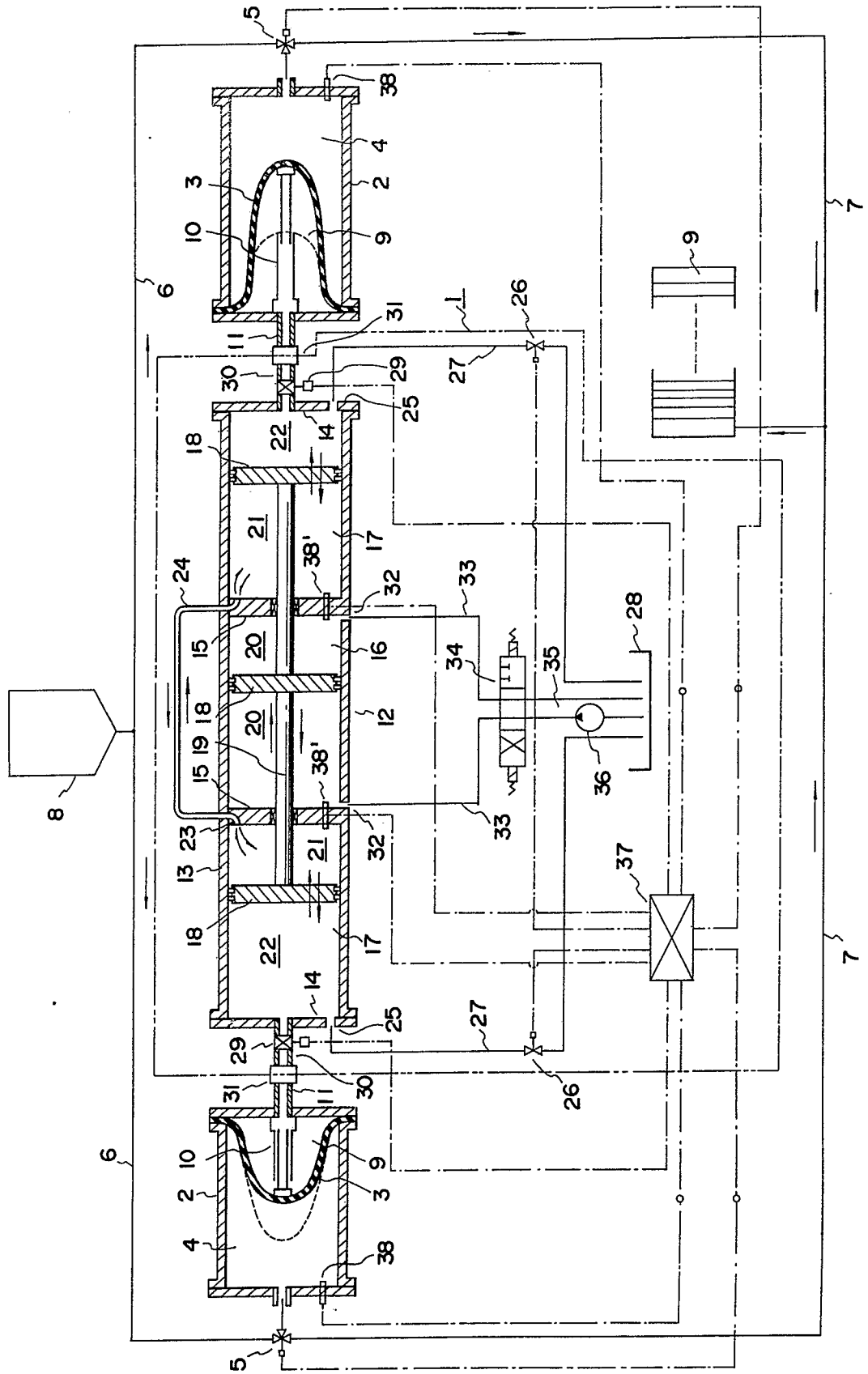
and the alternate change-over operation of the pair of the pressure-feeding apparatus main bodies can be made in a reliable manner.

Since the apparatus can be made compact as a whole, it can be minimized within the possible limit of design and can be applied to a slurry processing apparatus of a small scale plant and to plants for preventing environmental pollution of all the industrial fields.

What is claimed is:

1. In a pressure-feeding apparatus of the type wherein oil pressure chambers on both sides of an oil pressure cylinder are connected to a pressure-feeding apparatus main body through oil pressure passages, the improvement wherein said oil pressure chambers on both sides have an equal capacity to each other, a center oil pressure chamber is disposed between said oil pressure chambers, the piston of each of said oil pressure chambers is connected by a rod, said oil pressure chambers on both sides are connected by a bypass passage and switch valves are interposed in passage connected to said center oil pressure chamber through an oil pressure pump and extending from an oil tank to said oil pressure chambers on both sides.
2. The pressure-feeding apparatus as defined in claim 1, wherein said pressure-feeding apparatus main body has a swelling type flexible membrane.
3. The pressure-feeding apparatus as defined in claim 1 wherein said bypass passage is open to said oil pressure chambers on both sides through a partition of said oil pressure chambers.
4. The pressure-feeding apparatus as defined in claim 1 wherein said bypass passage is connected through said oil tank.

5. The pressure-feeding apparatus as defined in claim 1 wherein said switch valves are interposed in passage connecting said oil pressure chambers on both sides to said pressure-feeding apparatus main body.





DOCUMENTS CONSIDERED TO BE RELEVANT			EP 87107053.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE - A - 1 550 572 (VAUDT) * Totality; especially fig. 1,7,12 * --	1,2,3	F 04 B 43/06 F 04 B 9/08
	GB - A - 1 320 432 (WILLIAM ROY KING) * Totality; especially fig. 2 * --		1,4,5
	PATENT ABSTRACTS OF JAPAN, unexamined applications, field M, vol. 1, no. 141, November 17, 1977 THE PATENT OFFICE JAPANESE GOVERNMENT page 4 912 M 77 * Kokai-no. 52-81 605 (KOBE-SEIKOSHO) * -----	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 01 D 13/00 B 01 D 29/00 B 01 D 35/00 F 04 B 9/00 F 04 B 15/00 F 04 B 43/00
Place of search VIENNA	Date of completion of the search 21-09-1987	Examiner WERDECKER	
CATEGORY OF CITED DOCUMENTS		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 & : member of the same patent family, corresponding document	
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			