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Bille

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[54] **APPARATUS FOR PUMPING LIQUID CONCRETE**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.²** **F04B 15/02;** F04B 35/00

[58] **Field of Search** 417/317, 338, 345, 516, 417/533, 900

[56] **References Cited**

UNITED STATES PATENTS

3,068,806	12/1962	Sherrod	417/317
3,146,721	9/1964	Schwing	417/900
3,398,693	8/1968	Schumann	417/900
3,580,696	5/1971	Schwing	417/900
3,588,294	6/1971	Schlecht	417/900
3,726,614	4/1973	Schellenberg	417/900

FOREIGN PATENTS OR APPLICATIONS

762,896	4/1934	France	417/900

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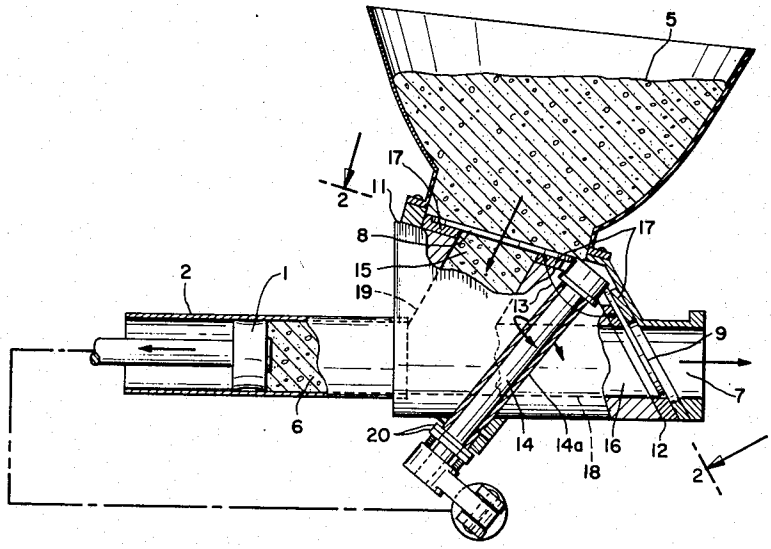
[57] **ABSTRACT**

An apparatus for pumping liquid concrete having a hollow housing with an inlet means for receiving the liquid concrete. Passageway means run through the housing and exit at a discharge. The inlet means and passageway means merge within the housing. Piston means are connected to one side of the passageway. A pair of blades is disposed along outside faces of the housing. One of the blades is placed so as to intermittently close the inlet means. The other blade is disposed at the discharge and intermittently closes it. Reciprocating means oscillate the blades in co-action with the movement of the piston means so that as the piston means moves from the housing, the blade disposed at the inlet means rotates permitting the liquid concrete to enter the housing. Simultaneously, the other blade rotates so as to close the discharge preventing pumped concrete from being impelled towards the housing. As the reciprocating means urges the piston towards the housing, the blade at the inlet means closes it preventing the liquid concrete from being pushed into the inlet means while the other blade opens the discharge permitting the concrete to exit the housing.

2 Claims, 2 Drawing Figures



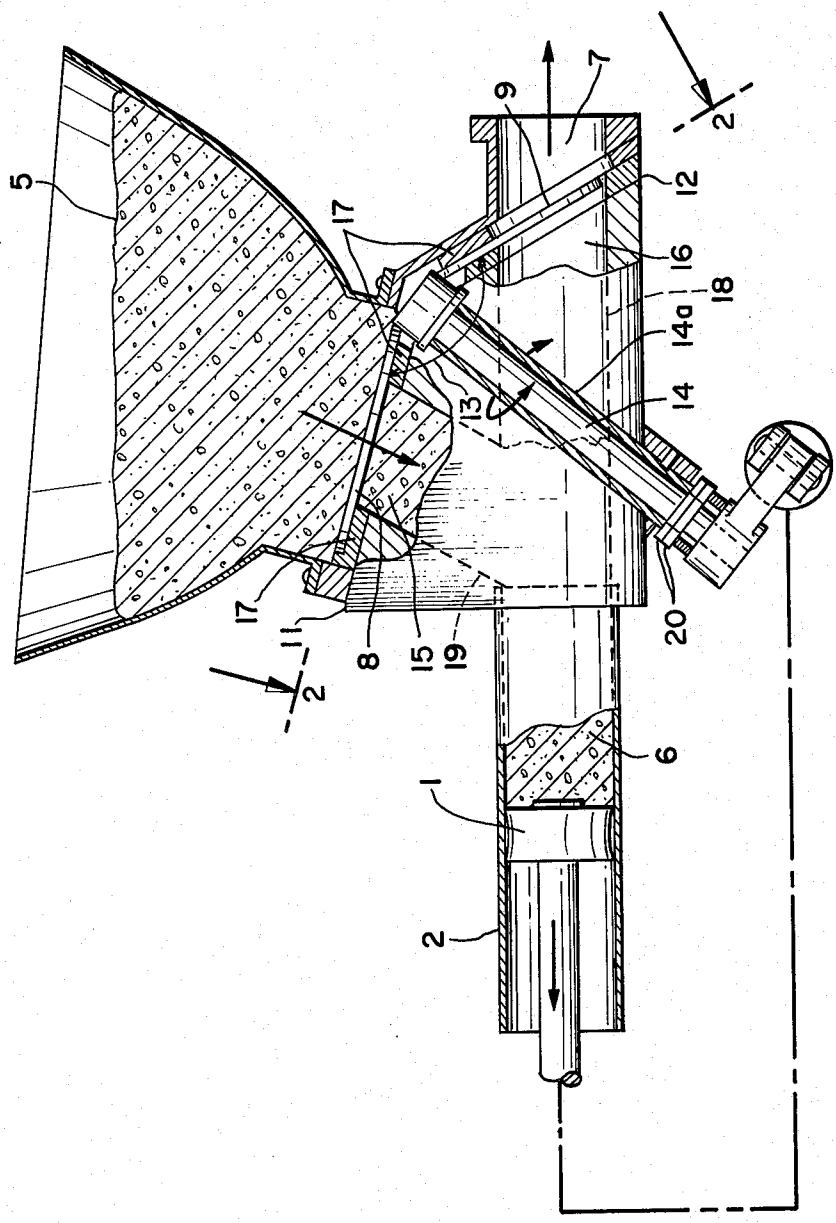


Fig. 1.

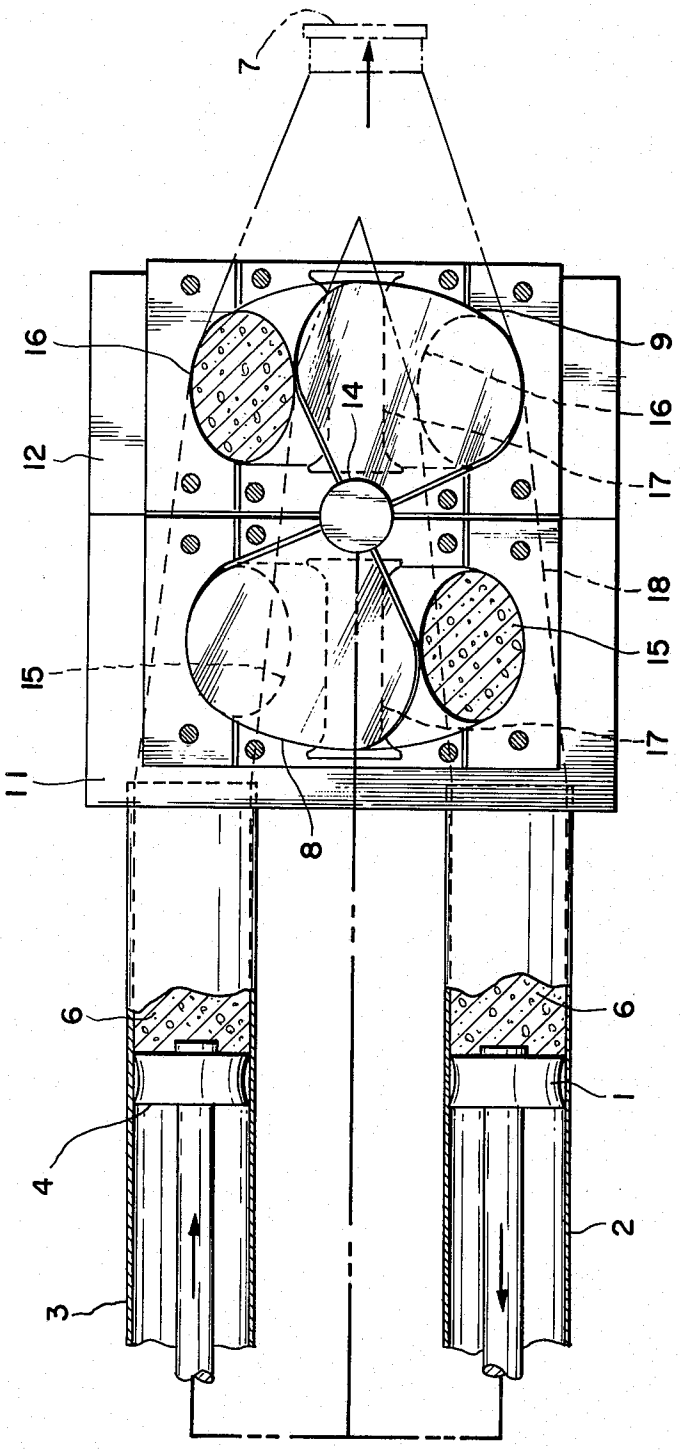


Fig. 2.

APPARATUS FOR PUMPING LIQUID CONCRETE

This invention relates to an apparatus for pumping liquid concrete. More particularly, the present invention relates to a positive displacement pump having a plurality of alternately acting suction and pressing piston means coupled to co-acting plates. The mass flow is controlled by these co-acting slide plates. One plate is placed in an inlet to the pumping space. The other plate or blade is placed at a discharge of the apparatus. The discharge slide plate is positioned adjacent to where the cylinders merge to form a single output. Both plates or blades are fixed to, and angled from, a reciprocating rotatable shaft so as to be diametrically opposed. The blades assume an acute angle with respect to the shaft and an oblique angle with respect to each other. One blade comprises a separating wall which reciprocally moves to completely block the inlet to one cylinder pumping space. It slides in sealing engagement on a separating wall which supports an inlet funnel to the cylinders. When the blade is blocking the intake to one cylinder, it has opened the inlet to the other cylinder. Thus, while one piston is impelling fluid concrete as one blade opens its inlet, the other diametrically opposed blade seals off this cylinder from the downstream flow so that the slurry already pumped will not be drawn during the intake stroke. The width of the blade is such that as it opens the inlet flow to one cylinder and piston impelling, it closes the inlet to the cylinder and piston now pumping. This prevents the slurry from being pumped into the inlet funnel and instead, directs it out a now opened discharge to the pressure line.

Prior apparatus for pumping liquid concrete with a passageway of one or a plurality of alternately working suction and pressing piston means have had a number of disadvantages. Due to the inlet flow to both of the piston cylinders through an axial positioned wall at one slide blade, large switching paths do exist. This results in difficulties for a safe seal. Moreover, since the walls to be sealed are large, they are subjected to substantial wear. The reciprocating shaft which carries the switching blades cannot be adjusted in an axial direction. The switching elements have to be exchanged frequently in view of the aforementioned wear. This occasions frequent interruptions in their operation. Accordingly, the present invention overcomes the above-mentioned disadvantages. This is achieved in that the switching plane or surface at the inlet and the switching plane or surface at the discharge or pressure line form an oblique angle. Extending through the center of this oblique angle is a reciprocating rotatable shaft. The blades or plates are attached to the shaft and are angled therefrom.

It is, therefore, an object of the present invention to provide an apparatus for pumping liquid concrete that simultaneously impells and propels the fluid slurry.

It is another object of the present invention to provide an apparatus for pumping liquid concrete that effectively seals the pumping spaces from the concrete supply, and that permits easy adjustment of the sealing apparatus.

Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanying drawings. It is to be understood, however, that the drawings are designed for the purposes of illustration only and not as a definition of the limits of the invention to which reference should be made to the appended claims.

In the drawings, wherein similar reference characters denote similar elements throughout the several views:

FIG. 1 shows a partly longitudinal section through the embodiment of the invention; and

FIG. 2 is a plan view of the invention according to FIG. 1.

Referring now to FIGS. 1 and 2, there is shown the inventive apparatus for pumping liquid concrete having pistons 1 and 4 disposed in cylinders 2 and 3 respectively. In front of the working cylinders 2 and 3 are the regulatory mass passageways which are controlled by distributing plate or blade 8 in front of an inlet or funnel 5. Blade 9 regulates the opening of a working space 6 to pressure line 7. The distributing plates or blades 8 and 9 are provided at the ends of the reciprocating rotatable shaft 14. In accordance with the invention, the switch plane 11 at inlet 5 and the switch plane 12 at pressure line 7 form an oblique angle 13. Reciprocating rotatable shaft 14 extends through the center of the oblique angle 13 and through angled distribution slides or blades 8 and 9. Shaft 14 is obliquely arranged in the working space as shown.

Pressure line 7 is connected with switching plane or face 12 forming an oblique angle with switching plane 11 of inlet funnel 5. Pressure line 7 is coupled with the liquid concrete connecting passageways for each piston and cylinder combination 1, 2 and 4, 3, respectively. These are closable by distribution plate 8. The passageway 16 to pressure line 7 is closable by distribution plate 9. Both distribution plates 8 and 9 are mounted on the reciprocating shaft 14. The distribution plates 8 and 9 are mounted in an angled position on shaft 14 and comprise the cutting tools which regulate the slurry flow, during its pivoting. A flange 17 is provided in both planes 11 and 12 of inlet 15 and discharge 16 respectively. The diametrically arranged distribution plates 8 and 9 are in sliding and sealing engagement with flanges 17 as shown. The blades 8 and 9 are curved at their circumference, corresponding to the turning of shaft 14.

In accordance with the invention, the reciprocating rotatable shaft 14, supporting diametrically (opposed) plates 8 and 9, is axially movable by adjusting element 20. This is used to regulate the tensioning of blades 8 and 9 against flange 17.

The housing for the switching arrangement comprising switch planes 11 and 12 forms the oblique angle 13. The housing may be made from a block of rolled iron. The housing is provided with a plurality of straight bores 18 connecting the working spaces 6 of cylinders 2 and 3 with switch plane 12 at the pressure face of line 7. Bores 18 also connect and merge with oblique bores 19 toward the switching plane 11 of inlet 5. Between these bores or conduits 18 and 19, there is included a duct or bore for a journal bearing 14*a*. An adjusting element 20 is used axially to displace shaft 14 insuring an effective seal of both blades 8 and 9 against their respective switch planes 17 as shown. As seen in FIG. 1, bearing 14a is arranged so that shaft 14 extends through the center of the oblique angle 13 measured between switching planes 11 and 12.

In operation, a fluid or slurry (not shown) remains stored at inlet means 5. As piston means 1 is drawn in the direction shown, shaft 14 rotating in conjunction with means 1, causes blade 8 to open one of the inlet

passages **15.** This opening allows the fluid slurry to enter working space **6** of cylinder **1.** As shaft **14** causes blade **8** to open the aforesaid inlet, it causes blade **9** to close discharge opening **16** communicating with pressure line **7.** Thus, as piston **1** impels the slurry to working space **6,** blade **9** closes the pressure line **7** from the reduced pressure existing on the piston side of blade **9.** This prevents the slurry already pumped from being impelled back towards the pump housing.

As piston **1** is moving in cylinder **2** as just described, piston **4** in cylinder **3** is moving in the opposite direction. As means (not shown) pushes piston **4** towards the housing, shaft **14** in conjunction therewith has already urged blade **8** into closing the other inlet **15** connecting cylinder **3** with inlet means **5.** As seen in FIG. **2,** the rotation of shaft **14** that closes inlet means **15** causes blade **9** to open discharge **16** to pressure line **7.** Consequently, piston **4** pushes the concrete out the discharge into pressure line **7** as blade **8** prevents the slurry from being pumped into inlet means **5.**

The co-action of shaft **14** with piston means **1** and **4** is such that the pistons oscillate to and from the pump housing while blades **8** and **9** oscillate from side to side in the manner above described.

In the event that operation of the blades causes an undesirable amount of axial play along the direction of shaft **14,** adjusting means **20** can be utilized to urge shaft **14** to seat blades **8** and **9** against their respective flanges **17,** as shown.

While only a single embodiment of the present invention has been shown and described, it is apparent to those skilled in the art that many changes and modifications may be made thereunto without departing from the spirit and scope of the invention.

What is claimed is:

1. An apparatus for pumping liquid concrete comprising:

a housing having a pair of spaced-apart passageways exiting at a common discharge at one end thereof, a pair of inlet ducts each merging with one of said passageways at an oblique angle within said housing, and a concrete receiving hopper coupled to said inlet ducts;

a pair of cylinders each connected to said pair of spaced-apart passageways at the other end of said housing;

a piston disposed in each of said cylinders;

a reciprocating shaft angularly disposed through said housing and having a pair of blades, diametrically opposed and disposed at an oblique angle about one end of said shaft so that one blade intermittently closes one inlet duct and the other blade intermittently closes one passageway adjacent to the common discharge, means for axially adjusting said shaft with respect to the inlet ducts and the passageways, said reciprocating shaft co-acting with each of said pistons so that one of the blades opens one of the inlet ducts to permit liquid concrete to enter the housing as its corresponding piston is withdrawn in one of the cylinders while the other blade opens the other passageway adjacent to the common discharge while its corresponding piston is urged towards the housing permitting the liquid concrete to exit from the passageway into the common discharge.

2. The apparatus as recited in claim **1** wherein said inlet ducts and the passageways adjacent to the common discharge include flanges, for sliding and sealing contact with said blades and said means for axially adjusting said shaft urges said blades in sealing contact with said flanges.

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