A chip feeder comprising a holding tank receiving chips in the form of a slurry by means of a low pressure system and having associated therewith an alternatively operable high pressure recycling pump system forcing the slurry from the tank into a reactor by valving off the low pressure system and pressing the chips in the holding tank into the reactor under high pressure, characterized by the use of two-way valves having small bypass valves from inlet to outlet for the purpose of pressure equalization before the main two-way valves are operated.
CHIP FEEDER FOR HIGH PRESSURE PULPING SYSTEM

BACKGROUND OF THE INVENTION

Chip feeders used in this art to the present time generally operate against a pressure of 15 to about 250 PSIG but it may well be necessary to go to much higher pressures particularly if oxygen pulping is used, in which case pressures of a 1,000 to 3,000 PSIG may well be necessary.

However, if pocket feeders are used and if the limit of the differential pressure across one pocket feeder is in the order of 300 PSI, then to operate at a pressure of 1,500 PSIG, five such pocket feeders in series would be required to make up the pressure and this obviously would be very complicated and expensive.

It would also be possible to use a conventional plunger or piston type of pump but this would result in high power consumption and it is doubtful whether or not suitable valves could be constructed for such a pump.

SUMMARY OF THE INVENTION

The basic form of the present invention comprises a holding tank or cylinder connected to a chip supply system having a low pressure pump. The chips fed by the low pressure pump are in the form of a chip slurry which is essentially a slurry of incompressible material, the chips being impregnated with a liquor. However, the low pressure system supplies the holding tank and then it is valved off.

The holding tank is also in circuit with a recycling high pressure system from the reactor or digester, and when the low pressure system has been valved off, the valves in the high pressure system are manipulated to apply the full high pressure thereof to the holding tank, forcing the chip slurry into the reactor or digester, and proper two-way valves for this purpose are provided.

The holding tank is provided with an outlet screen for the liquor which can be recovered in the low pressure system and certain of the valves are provided with pressurizing bypass valves, equalizing the pressure across their main valves before the valves are operated making it easier to operate the valves and extending the life thereof. The use of these equalizing valves is important to this invention.

A variation is to provide a hydraulically operated piston in the holding tank or cylinder, this piston separating the clear liquor and the chip slurry, thus providing a more positive means of sweeping the chips at high pressure out of the tank into the reactor.

A still further variation comprises the use of the piston but with a mechanical positively actuated external device to operate it.

Although the invention as described herein refers specifically to feeding chips, it can be used also to feed slurried materials such as ore slurries, slurries of ground refuse, slurries of solid fuels, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic view illustrating the invention; and

FIG. 2 is a similar view illustrating a modification.

PREFERRED EMBODIMENTS OF THE INVENTION

First looking at FIG. 1 there is shown a holding tank or cylinder 10 in hydraulic circuit with which there is a two-way inlet valve 12 in a line 14 leading from a chip supply, hopper or the like 16, leading directly into the line 14, the same being powered by a low pressure pump 18 which pumps liquor from a tank 20 to carry the chip slurry into the head end or right-hand end as seen in FIG. 1 of the holding cylinder 10.

The reactor or digester is illustrated at 22 and this is in a closed circuit including the line 24 with a high pressure recycling pump 26. The pipe 24 has a branch 28 leading the recycling liquor through the two-way valve 30 to the head end of the holding cylinder 10, at the right hand end of the cylinder, and a line at 32 passing through valve 34 leads back into the reactor 22.

The holding cylinder may be provided with a screen, filter or the like 38 at its tail end leading through two-way valve 40 back to the liquor tank 20. The high pressure line has the intake valve 30 and an outlet valve 42 for blocking off the high pressure system from the holding cylinder. Each of the valves 30 and 40 are provided with by-pass branch lines as at 44 and 46, each by-pass being provided with a valve 48, 50, for equalizing the pressure. Valve 48 pressurizes the holding tank and valve 50 depressurizes the holding tank.

It will be seen that the low pressure system can be operated in the absence of the high pressure system with valves 30 and 42 closed and valves 12 and 40 open, in which case the chip slurry is forced at low pressure through line 14 into the cylinder 10 until it is appropriately filled, excess fluid being driven out through screen 38 to the liquor tank 20.

When the cylinder 10 is in condition for the operation of forcing the slurry at high pressure into the reactor, the valves 40 and 12 are closed, the cylinder 10 is pressurized by opening valve 48 after which valves 30 and 42 are opened, the pressure having been equalized across them, valve 34 is closed, in which case clear liquor under high pressure from the high pressure recycling pump 26 hydraulically forces the slurry through valve 42 into the reactor at the desired high pressure.

Referring to FIG. 2, the system is largely the same, but a piston is provided to force the slurry out of the holding tank to the reactor. The holding cylinder 10' has the cutoff valves 30' and 42' with respect to the high pressure liquor recycling system including the high pressure pump 26' and the line 24'. The low pressure pump 18' supplies the chip slurry as by means of the liquor receptacle 20' through the line 14' and valve 12' to the opposite end of the holding tank than as shown in FIG. 1, and in this case the screen 38' is located generally centrally of the cylinder 10' leading however to the valve 40' back to the liquor receptacle 20'.

A piston 52 floats between the clear liquor at 54 and the chip slurry at 56 and provides a more positive means of sweeping the chips out of the cylinder and into the reactor.

The operation of this system is as follows: When the piston is at the extreme left, valves 30' and 42' are open and the other valves are closed. Valves 30' and 42' are closed, valves 58 and 60 are open to depressurize both ends of the cylinder and are then closed. The valves 12', 40', and 62 are opened and the slurry under low pressure forces the piston to the extreme right, fill-
ing the left end of the tank with chip slurry. Excess liquor strained through the screen 38' returns to the liquor tank 20' through valve 40'.

Thereupon valves 12', 62, and 40' are closed, and bypass valves 64 and 66 are opened, pressurizing both ends of the tank. These valves are then closed and valves 30' and 42' are opened, which now forces the piston to the extreme left under influence of the high pressure recycling pump, and this discharges the chips into the reactor. The valve 34' acts as an orifice, increasing the pressure in the righthand end of the cylinder if this should be necessary. This system can also be used with a piston rod for piston 52.

By the use of the two-way by-pass valves in FIG. 1, the system is vented and pressurized so that the pressure is equalized on either side of the main valves that must be opened and closed in each cycle, making the present system suitable for operation at higher pressures compared to those used in the prior art.

I claim:

1. An apparatus for feeding chips into a high pressure system comprising a holding tank for holding chip slurry, means defining a chip supply, first connecting means connecting the chip supply to the holding tank, a liquor supply tank, second connecting means connecting the liquor supply tank to the chip supply and thereby to the holding tank, low pressure means located between the liquor tank and chip supply means for charging the holding tank with chip slurry through said first connecting means, valves between the holding tank and liquor supply tank and between the chip supply and holding tank for cutting off the low pressure means with respect to said holding tank, a high pressure system including the holding tank and a reactor, a valve on either side of said holding tank for cutting off the high pressure system with respect to the holding tank, said valves when open however directing high pressure at one end of the tank forcing the contents out of the other end of the tank through lines leading the slurry in the tank into the reactor, and bypassing valves for the valve at the incoming end of the holding tank and the valve between the holding tank and liquor supply tank to pressurize the holding tank or depressurize it prior to operation, the bypassing valves equalizing the pressure across the valves bypassed.

2. The apparatus of claim 1 including means to operate the low pressure means in the range of 0 to 100 PSIG and means to operate the high pressure liquor recycling system at a pressure of more than 100 PSIG.

3. The apparatus of claim 1 including a piston in the holding tank, said piston dividing the high pressure liquor from the chip slurry and being acted upon by the high pressure system to force the chip slurry toward the outlet of the holding tank leading to the reactor.

4. The apparatus of claim 3 including positive means for actuating said piston.

5. The apparatus of claim 3 wherein the high pressure liquor actuates the piston in the direction to evacuate the chip slurry from the holding tank to the reactor.

6. The apparatus of claim 3 wherein the piston is actuated by the low pressure means to move in the opposite direction to fill the holding tank with chip slurry.

7. Apparatus for transferring a chip slurry from a low pressure system to a high pressure system comprising a holding tank, means defining an inlet and an outlet for said tank, a low pressure system, a pair of two-way main valves controlling the low pressure system, a high pressure system, a reactor therein, a pair of two-way main valves controlling the high pressure system, means connecting both systems to the holding tank at the inlet and the outlet thereof, means defining a chip slurry supply in the low pressure system and means defining a liquor supply for the high pressure system, means for pumping the chip supply and the liquor supply to the holding tank, a bypass valve for each of said high pressure and low pressure main valves for equalizing pressures across the main valves before the latter are operated, the main valves being alternatively operative with relation to the high pressure and low pressure systems to fill the holding tank with chip slurry at low pressure, to seal the holding tank from the low pressure system, and for pressurizing the holding tank and moving the chip slurry to the reactor under impact of the high pressure.

8. The apparatus of claim 7 including a piston in the holding tank, the pumping means forcing the chip slurry into the holding tank at one side of the piston, and providing a high pressure impact against the opposite side of the piston.

9. The apparatus of claim 8 wherein the piston is free-floating.

10. The apparatus of claim 8 including a piston rod for the piston and means to power the piston rod.

** * * * **
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,874,996
DATED : April 1, 1975
INVENTOR(S) : Louis A. Pradt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Cover page, in the heading and at [75], "Pradi" should read --Pradt--.

Signed and sealed this 1st day of July 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks