Sept. 15, 1970 K. ULLNER 3,528,618

TWO-PRESS WOOD GRINDER

Filed April 29, 1968 2 Sheets-Sheet 1

FIG. 1

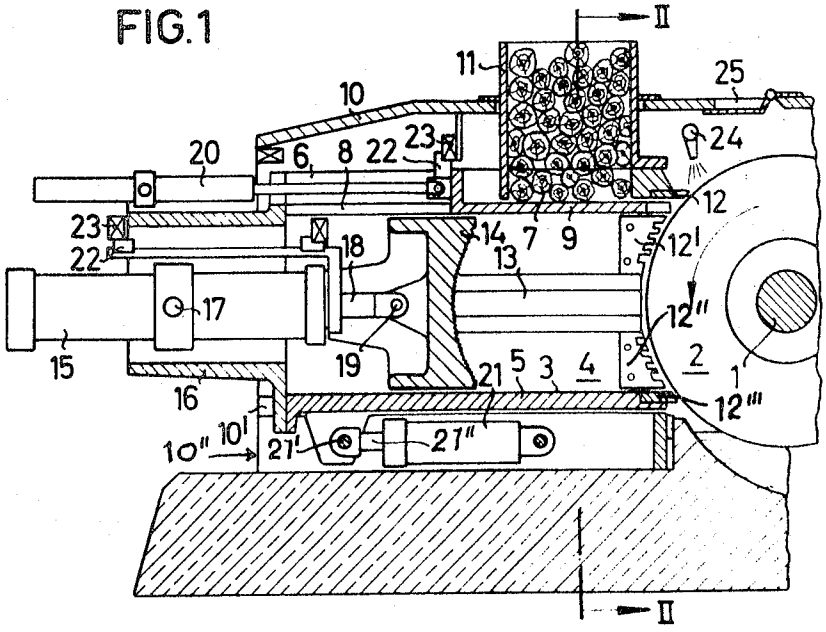
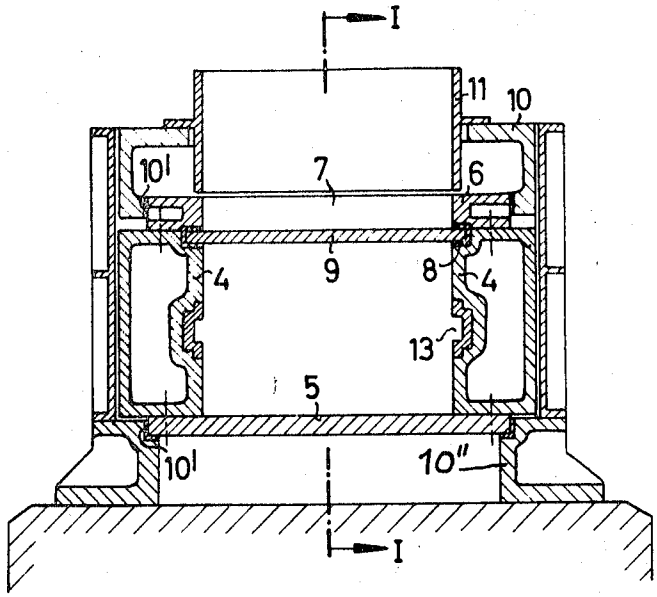


FIG. 2



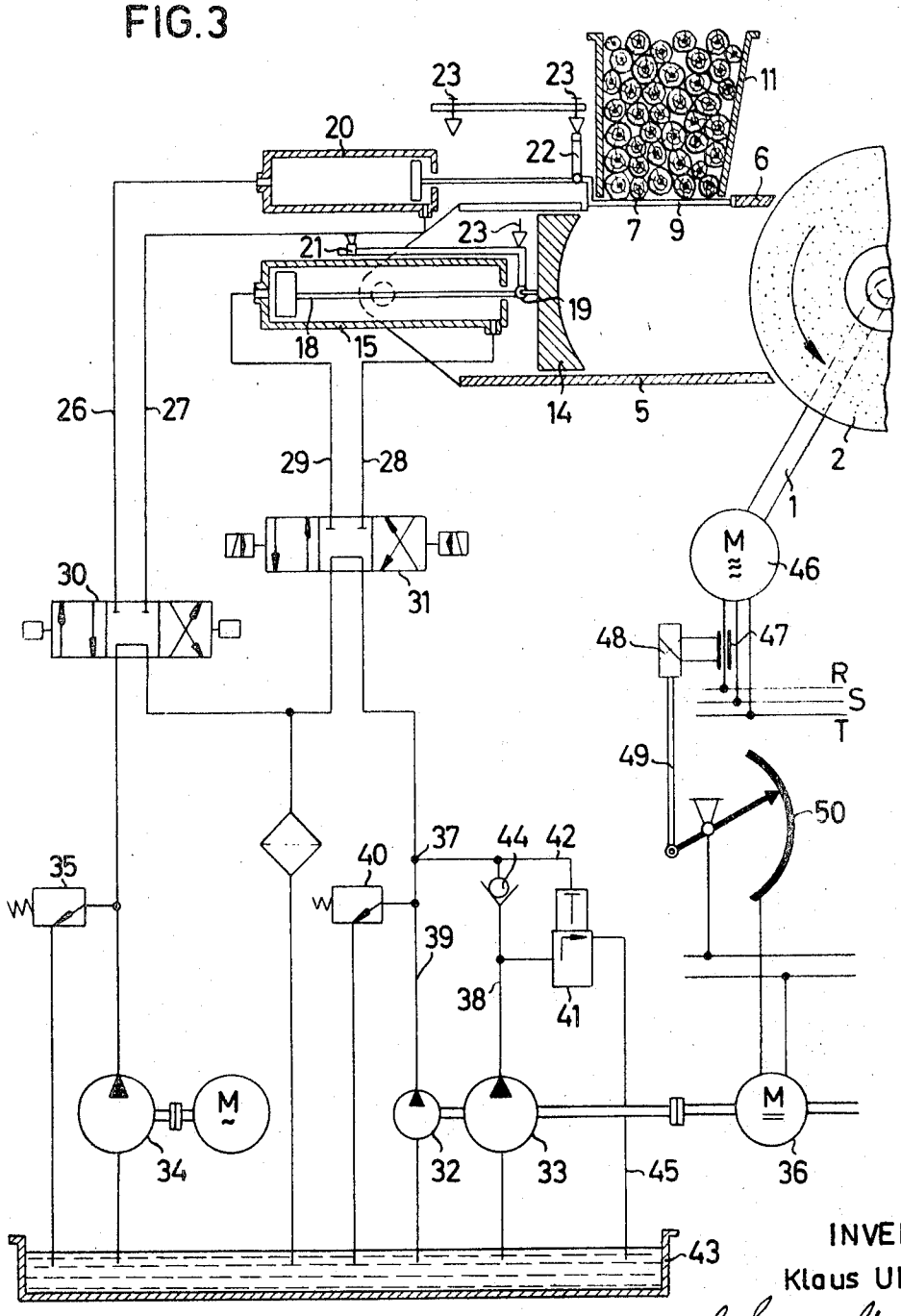
INVENTOR:
Klaus ULLNER,
by Singer, Stern & Carlberg,
Attorneys.

Sept. 15, 1970 K. ULLNER 3,528,618

TWO-PRESS WOOD GRINDER

Filed April 29, 1968 2 Sheets-Sheet 2

FIG.3



INVENTOR:
Klaus ULLNER,
by Singer, Stern & Carlberg, Attorneys.

United States Patent Office 3,528,618
Patented Sept. 15, 1970

3,528,618

TWO-PRESS WOOD GRINDER

Klaus Ullner, Braunschweig, Germany, assignor to Miag Muhlenbau und Industrie G.m.b.H., Braunschweig, Germany, a corporation of Germany

Filed Apr. 29, 1968, Ser. No. 724,694
Claims priority, application Germany, May 19, 1967, M 58,878
Int. Cl. B02c 7/00
U.S. Cl. 241—282 1 Claim

ABSTRACT OF THE DISCLOSURE

A wood grinder in which the wood pieces to be ground are introduced through an opening in the upper walls of a horizontal cylinder which terminates with one of its ends at the circumference of a grindstone rotating about a horizontal axis. The cylinder contains a piston which is reciprocable by a double acting hydraulic press pivotally supported in an outwardly projecting tubular extension at the outer end of said cylinder. The piston rod of said hydraulic press is pivotally connected with a press piston slidable in guides provided in said horizontal cylinder so that the wood pieces may be pressed by said press piston against the rotating grindstone. The opening in the upper wall of said horizontal cylinder is adapted to be closed by a hydraulically operated gate valve. The cylinder is slidably mounted in guides arranged in the grinder housing so that the cylinder as a unit may be moved toward and away from said grindstone.

The invention relates to a wood grinder with preferably two hydraulically operated pressure pistons which primarily are moved horizontally from opposite directions toward a rotating grindstone.

Press grinders for producing mechanical wood pulp for paper and cardboard manufacture are well known. Such grinders being equipped with two or more presses have the disadvantage that the two finger plates on each press which form the extension of the upper and lower cylinder wall toward the grindstone and which prevent the injection of barks while keeping the passageway open for the wood pulp, require for their adjustment necessary due to the wear of the grindstone a complex guide mechanism and an elaborate adjustable linkage. At each change of the grindstone these finger plates have first to be returned to their starting position. A further disadvantage is that the side walls of the press cylinders which conform to the circumference of a new grindstone will permit a lateral slit to become larger with increasing abrasion of the grindstone and through this slit pieces of wood may be ejected.

Furthermore, in known press grinders the return movement of the pistons into their starting position, in which the supply opening is opened up and a fresh load of wood chunks is received by the press cylinder, is too slow and causes too much lost time thus lowering the efficiency of the grinder. Also, the forward motion of the pistons until sufficient grinding pressure is built up, takes place at the normal forward speed by which the idle time of the grinder is further prolonged.

It is the object of the invention to overcome the aforementioned disadvantages of known press grinders.

This is accomplished according to the invention in that the cylinders of the two presses are slidable in guides extending radially with respect to the grindstone and that the rearward cylinder portions contain the counter-bearing for the hydraulic operating presses of the pistons whereby the doubly effective hydraulic operating press of each piston is acted upon by a twin-pump and the press cylinders by way of hydraulic adjustment presses are each acted upon by a separate pump. Thus, the press cylinders including the finger plates and the operating presses are now displaceable. The guides for such displacement of the press cylinders are much easier to make as for flat parts, for example the finger plates, which are subjected to strong lateral forces.

According to the invention, the twin pumps include a high pressure portion delivering a small flow and a low pressure portion carrying a large flow. The two pump portions may each be provided with a maximum pressure valve and beyond these valves they may be united to form a single pressure pipe. At the return stroke the two flows are combined since neither of the two maximum pressure valves responds and within a very short time the piston reaches its starting position so that by the opening of the supply opening the press cylinder can again load a fresh supply of wood. Also during the subsequent forward motion of the piston, until the grinding pressure is reached, the increased fluid flow remains effective so that the piston also during this part of its total motion moves speedily. The maximum pressure valve of the low pressure part opens up only when the counter pressure increases and permits the pressure medium to flow unused back into a sump or suitable container. Due to cutting down on the idle periods, this novel construction of the press grinder improves the grinding efficiency considerably.

In order to prevent producing mechanical wood pulp of unsatisfactory quality during the time in which only one of the two pistons is operating while the other returns to its starting position, the invention employs a direct current variable speed motor for driving the twin pumps which operate the hydraulic presses and move the pistons. This motor by way of a current regulator is connected to a current gauge located in the circuit of the motor rotating the grindstone. If the regulator is adjusted to supply the grindstone motor with a predetermined amount of electric current, any deviation of this current from the desired value causes an adjustment of the motor in a manner such that the number of revolutions or speed is increased when the desired value has not been reached yet and is decreased when the actual value is in excess of the desired value. This has the effect that during the return stroke of one press the speed of the direct current motor is increased whereby due to the increase in the amount of pressure medium the moving speed of the operating piston is also increased. A lowering of the quality of the wood pulp being ground need not be feared provided an empirically ascertained permissible maximum speed of the stroke of the pressure piston is not exceeded.

These and other objects of the invention will further be described with reference to the accompanying drawings in which:

FIG. 1 is a longitudinal sectional view of a press cylinder along the line I—I of FIG. 2;

FIG. 2 is a cross-sectional view of a press cylinder along the line II—II of FIG. 1, and

FIG. 3 is a diagrammatic illustration of the hydroelectric drive mechanism.

Referring to the FIGS. 1 and 2, at both sides of a rotary grindstone 2 driven by a horizontal shaft 1 are arranged press units consisting of cylinders 3 with rectangular cross-section. These cylinders 3 of which only one is shown in FIG. 1 for the purpose of a simplified manufacture consist each of four individual parts, namely two hollow vertical side walls 4, a horizontol bottom plate 5 and a horizontal cover plate 6, the latter being provided with a supply opening 7 and oppositely arranged guide grooves 8 for a flat slide valve 9. Above the supply opening 7 is arranged a hopper 11 integrally connected with the grinder housing 10. The edges of the cylinder walls 4, 5 and 6 closest to the grindstone 2 are provided with so called finger plates 12, 12', 12'' and 12''' (FIG. 1) having slits through which water and wood pulp may pass but no solid pieces of wood. Since they are subject to wear and have to be changed from time to time, they are connected to the cylinder walls by means of screws. The side walls 4 of the cylinder housing further are provided on their inner faces with grooves 13 for guiding therein a horizontally movable pressure piston 14. The bottom plate 5 and therewith the side walls 4 of the cylinder 3 are slidable in horizontal guides 10' provided in the bottom portion 10'' of the grinder housing 10 and in the upper portion.

For the operation of the piston 14 there is provided a hydraulic press 15 which has its counterbearing in a tubular extension 16, preferably of rectangular cross-section of the press cylinder where it is pivotally mounted on a horizontal rotatable pin 17. The piston rod 18 is also loosely connected to the piston 14 by means of a pivot bolt 19. This movability of the press has the purpose of preventing the motions of the piston 14 made possible by its lateral play from acting as bending forces of the press 15.

Another hydraulic press 20 is required for operating the slide valve 9, while a still further hydraulic press 21 serves to slidably adjust the total press unit. The piston rods of the two hydraulic presses 15 and 20 have slidably arranged thereon sheet metal lugs 22 which cooperate with solenoid limiting switches 23.

Each press unit comprises a cylinder 3, its tubular extension 16, a press piston 14 in the cylinder 3 and a hydraulic press 15 pivotally supported at 17 in the tubular extension. These press units are slidable in the guides 10' of the housing 10 and are attached at 21' to the piston rods 21'' of the hydraulic press 20 (FIG. 1).

Above the grindstone 2 are arranged in known manner spray nozzles 24. The grinder housing 10 has in its top wall above the grindstone 2 a closable opening 25 through which may be introduced an implement for dressing the grindstone.

As is substantially diagrammatically shown in FIG. 3, the press 15 is connected with pressure medium pumps 32, 33 by means of supply pipes 28, 29 and a reversing arrangement 31, while the press 20 is connected with a pressure medium pump 34 by means of supply pipes 26, 27 and a reversing arrangement 30. The reversing mechanisms 30 and 31 comprise primarily multistage servo valves having three operating positions, namely for forward and backward motion and for standstill with pressureless backflow of the pressure fluid.

In order to avoid any injury to the gate valve 9 which may be caused by pieces of wood jammed in the supply opening, a maximum pressure valve 35 is arranged between the pressure medium pump 34 and the reversing mechanism 30 so that upon response of this valve 35 the gate valve 9 comes to a halt and the disturbance may be removed.

The pressure medium pump for the pressure piston 14 comprises a high pressure portion 32 and a low pressure portion 33 which are commonly operated by a direct current motor 36. The two pressure portions 32, 33 of

the pump are joined at 37 to form a single pressure pipe. The partial pressure pipes 38, 39 ahead of the junction 37 are provided with maximum pressure valves 40, 41 respectively of which the valve 41 associated with the low pressure pump portion 33 is constructed as a switch valve and by a control pipe 42 is switched either to a free return flow of the pressure medium into the container 43 or to a locking position. The partial pressure pipe 38 has arranged therein between the switch valve 41 and the control pipe 42 a check valve 44 which permits free passage only in the direction toward the reversing mechanism 31.

In operation the two partial pumps 32, 33 work additively, namely during the return stroke and at the beginning of the work stroke. As soon as all intermediate spaces are filled with wood by the advancing piston 14 and thereby a pressure is built up between grindstone and piston, the pressure in the supply pipe 29 increases and propagates through the control pipe 42 to the maximum pressure valve 41 and when the adjusted pressure is reached, the valve 41 is switched to permit the pressureless return of the pressure medium. All of the pressure medium pumped by the low pressure pump portion 33 flows through the return pipe 45 back into the container 43. The pressure in the pipes 39, 42 and 29 increases further up to the required working pressure, whereby the check valve 44 is simultaneously closed to prevent pressure medium from flowing out of the pipe 39 into the container 43.

In order to effectively control the piston 18 and the gate valve 9 in dependence of each other, there are provided limit switches 23 and stops 22 fixed at the piston rods. The limit switches 23 are connected with each other and with the reversing valves 30, 31 in such a manner that when the press piston has arrived at the foremost position it automatically reverses itself to a return movement, and in its rearmost position engages the gate valve 9 and opens it and only after the same is automatically closed again takes up its work stroke at an increased speed.

In the current supply line of the motor 46 driving the shaft 1 on which the grindstone 2 is mounted, there is positioned a current gauge 47 the measuring values of which are transferred to a current regulator 48. The output of the regulator 48 is formed by an adjusting member 49 which is in connection with a device 50 for adjusting the speed of the direct current motor 36.

Increasing the speed of the motor 36 at the beginning of the return stroke of one of the two pistons 14 will also increase the work speed of the other piston still operating so that the load on the grindstone 2 remains about the same. From this increase in speed of the motor 36 benefits also the twin-pump of the returning press piston, enabling the latter to move backward and subsequently forward also at an increased speed with the result that the production of wood pulp is again taken up speedily.

What I claim is:

1. A wood grinder comprising a grindstone rotatably mounted within a housing about a horizontal axis, means for rotating said grindstone, a horizontal cylinder in said housing and having one end facing the circumference of said grindstone, and a press piston slidably mounted in said cylinder to move toward and away from said grindstone, said cylinder (3) having an upper supply opening closable by a flat slide valve, a supply hopper above said supply opening, said cylinder being slidable in horizontal guides (10') provided in said housing and extending toward said grindstone, a tubular extension on the outer end of said cylinder, a double-acting hydraulic press (15) pivotally supported in said tubular extension and having a piston rod connected with said press piston in said cylinder, said double-acting hydraulic press being connected with pump means, another hydraulic press (21) connected to a separate pump for slidably adjusting said cylinder along said horizontal guides in said housing,

said pump means for operating said hydraulic press being connected with said press piston is provided with a high pressure portion (32) and a low pressure portion (33), and including two pressure pipes (38, 39) for said high and low pressure pump portions (32, 33), said pressure pipes being joined together between a reversing valve (31) connected with said hydraulic press and a maximum pressure valve, whereby one of said two pressure pipes, namely the one connected to said low pressure portion (33) of said pump means, is provided with a check valve (44) between the junction (37) of said two pressure pipes (38, 39) and said maximum pressure valve, and in rear of said check valve a control pressure pipe (42) for said pressure valve is branched off.

References Cited

UNITED STATES PATENTS

1,766,548	6/1930	Schnitzer	241—34
1,917,420	7/1933	Bachman	241—34
2,545,260	3/1951	Cole	241—34
2,703,206	3/1955	Lyall	241—34
2,918,224	12/1959	Hornberger	241—38
2,965,315	12/1960	Lyall	241—34

GERALD A. DOST, Primary Examiner

U.S. Cl. X.R.

241—34, 64