

Jan. 10, 1967

O. J. G. HEDBERG

3,297,263

FEEDING DEVICE FOR A WOOD PULP GRINDER

Filed Sept. 6, 1963

Fig. 1

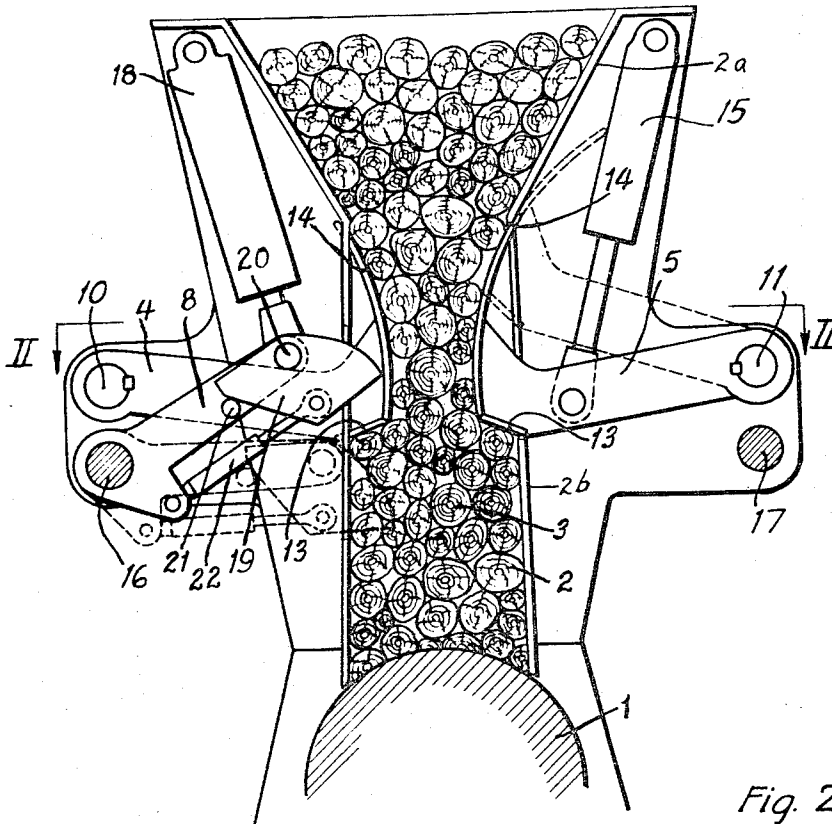
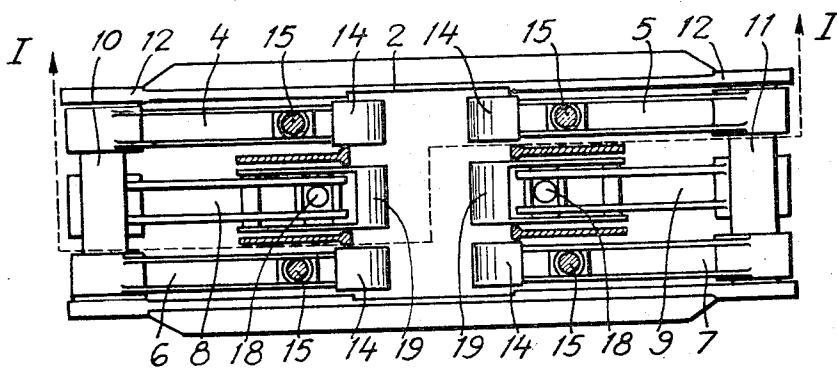


Fig. 2



INVENTOR
OLOF JOHAN GERHARD HEDBERG
BY

Brumbaugh, Free, Grane & Donohue

HIS ATTORNEYS

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FEEDING DEVICE FOR A WOOD PULP GRINDER
Olof J. G. Hedberg, Karlstad, Sweden, assignor to Aktie-
bolaget Karlstads Mekaniska Werkstad, Karlstad, Swe-
den, a company of Sweden

Filed Sept. 6, 1963, Ser. No. 307,175

Claims priority, application Sweden, Sept. 11, 1962,

9,721/62

9 Claims. (Cl. 241—281)

This invention relates to wood pulp grinders and, more particularly, to a novel and improved device for continuously feeding and pressing wood in a magazine or hopper toward the grinding wheel or the like of a grinder for making ground wood pulp.

Many types of continuously operating magazine grinders are known which employ various forms of feeding devices, for example, feed chains with carriers, feed screws, feed wheels, press pistons, press plates and press frames. Such feeding devices convey and force the logs onto a rotating grindstone or grinding wheel. A frequent difficulty with many presently known feeding devices for such grinders is the tendency of the logs to become jammed in the magazine, that is, to form bridge-like structures which stop the logs from being fed to the grinding wheel. Additionally, these devices often apply an irregular grinding pressure to the logs, that is, the force with which the logs are fed to the grinding wheel is of variable magnitude.

These and other disadvantages of known forms of feeding devices for continuously operating magazine grinders are overcome, in accordance with the invention, by providing a novel and improved feeding device which prevents the jamming or "bridging" of the logs in the hopper and provides a uniform pressure urging the logs against the grinding wheel. More particularly, the feeding device comprises at least two separate pressing means disposed on each of the opposite sides of a hopper which are selectively operable in sequence, so that there is always a force applied to press the logs against the face of the grinder.

Preferably, the pressing means comprises a hopper, at least one rigid arm disposed on each side of the hopper and pivotally mounted so as to provide a pressing surface in the hopper which directs a generally downward and inward force against the logs in the hopper, and at least one arm pivotally mounted on each side of the hopper and having a pressing member thereon which is selectively movable into and out of the hopper. The latter arm is also arranged to provide, through the pressing member, a generally downward and inward force on the logs in the hopper.

Each of the rigid arms is preferably provided with a guard plate which extends upwardly from the pressing surface and has a curvature concentric to the axis about which the arm pivots. The guard plate also forms, generally, a continuation of an upwardly diverging top portion of the hopper.

At the beginning of a cycle of operation, the first arms are in their uppermost position, the pressing surface lying just within the wall of the hopper, and the second arms are in their lowermost position, with the pressing member thereon fully extended into the hopper. At this point, the first arms are urged downwardly, and after full pressure on the logs is built up, the pressing members on the second arms are withdrawn. During the further downward movement of the first arms, the second arms are returned to their uppermost position, the pressing member remaining retracted outside of the hopper during the return movement. After the first arms have been pivoted through a portion of their travel, the pressing members on the second arms are extended into the

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hopper and the arms pivoted to engage and apply pressure to the logs. At this point, the first and second arms are moved downwardly together to press the logs against the grinding wheel.

When the first arms reach the end of their stroke, but before the second arms reach their lower limit positions, the first arms are returned upwardly to their top positions. Preferably, the arms on one side of the hopper are withdrawn before those on the other side. As the first arms on each side are withdrawn the logs adjacent that side are permitted to fall downwardly to fill the empty space previously occupied by the pressing surface and the lower portion of the guard plate of the first arm. When the arms are withdrawn separately, the logs first fill one side and then fill the other side. If the logs in the first side start to jam or bridge, the jam will lose its support when the arms on the other side are moved upwardly.

Further, the curved guard plates on either side of the hopper form a continuation of the downwardly converging, funnel-like upper portion of the hopper. Accordingly, as each of the first arms is returned to its upper position, the logs are allowed to fall only one by one, at most, two or three at a time, through the constricted opening created as the arms move upwardly. Therefore, there is no tendency for a bridging in the hopper to occur, as there would be if a great many logs were to move down simultaneously. Additionally, the surface of the guide plate, inasmuch as it is concentric to the pivotal axis of the arm, is not displaced axially; therefore, there is no inward or upward movement of the logs during the return movement of the first arms which could cause a jam in the hopper.

As the first arms on each side are being returned to the upper positions, and after they have been returned, the second arms continue their stroke, thereby sustaining the force on the logs toward the grinding wheel. When the second arms reach the lower position, the cycle is complete and is thereafter repeated.

For a better understanding of the invention, reference may be made to the following description of an exemplary embodiment, taken in conjunction with the figures of the accompanying drawing, in which:

FIGURE 1 is a vertical section of a grinder having the feeding device thereon taken generally along the line 1—1 of FIG. 2; and

FIG. 2 is a top view in section of the feeding device of the grinder taken generally along the line 2—2 of FIG. 1.

The wood pulp grinder comprises a rotatable grinding wheel 1, above which is mounted a hopper 2 for receiving a large number of logs 3 in random side by side and vertically stacked parallel relation. The upper part of the hopper 2 has upwardly diverging walls 2a, and the lower part slightly downwardly diverging walls 2b.

For providing pressure and feeding the logs downwardly onto the grinding wheel 1, each side of the hopper 2 is provided with arms 4-9, which are located in pairs on opposite sides of the hopper 2. In the embodiment illustrated in the drawings, one such pair of arms is disposed adjacent each end wall of the hopper 2. The arms 4-7 are pivotally mounted on shafts 10 and 11, which are journaled in bearings 12 mounted on the end walls of the hopper 2. Each of the arms 4-7 includes a pressing surface 13 adjacent to the outer end which is disposed at an angle to the vertical axis of the hopper. Extending upwardly from the end of the pressing surface 13 of each of the arms 4-7 is a guard plate 14.

The surfaces of the guard plates 14 are uniformly

curved and lie generally concentric with the shafts 10, 11 so that the pivotal movement thereof does not result in any movement of the logs in a radial direction with respect to the shafts 10, 11. Additionally, lateral or upward movement of the logs, which could possibly result in jamming the hopper 2, is prevented by arranging the guard plate so that their upper ends provide, generally, a continuation of the slope of the upwardly diverging walls 2a of the hopper 2.

The arms 4-7 are selectively pivotable in both directions about the bearings 12 by pressure cylinders 15. While in the illustrated embodiment cylinders are provided for each of the arms 4-7, a single cylinder may be coupled to the arms 4-7 lying on each side of the hopper 2. However, it is preferable that separate cylinders be employed for moving the arms on each side of the hopper, so that the arms on one side of the hopper may be withdrawn separately from the arms on the other side of the hopper. In this way, the tendency of the logs to jam, as they move into the places occupied by the pressing surfaces 13 and the lower ends of the guide plates 14 before they were withdrawn, is effectively prevented.

A second arm 8 is pivotally mounted on one side of the hopper between arms 4 and 6 and another second arm 9 is mounted on the other side of the hopper between the arms 5 and 7. Each of the arms 8 and 9 is provided near its outer end with a pressing member 19 pivotally mounted on a bolt 20. The arms 8 and 9 and the respective pressing members 19 thereof are arranged so that the pressing member is selectively movable into the hopper through the upper portion of the lower sidewall 2b thereof. A stop 21 is provided on the arms 8 and 9 for preventing the rotation of the outer end of the pressing member in an upward direction beyond a predetermined angular position, thus providing a substantially rigid member to resist the reactive force of the logs 3 when the arms 8 and 9 are urged downwardly and inwardly in the hopper. The arms 8 and 9 are actuated by pressure cylinders 18. The pressing member 19 on the arms 8 and 9 are selectively retractable and extendable out of and into the hopper by cylinders 22. In their extended positions, the inner end of the arms are behind the guard plates 14, as shown in FIG. 1 to enable downward movement of the arms 8 and 9 without engagement with the logs disposed between the guard plates 14.

An operating cycle of the feeding device, which, of course, is repeated continuously, is described as follows. At the start of the cycle the arms 4-7 are in upper limit positions, as indicated by the dashed lines of FIG. 1, in which the pressing surfaces 13 and the lower ends of the guard plates 14 lie a short distance below the upwardly diverging portion walls of 2a of the upper two, hereby forming a somewhat wider opening through which the logs successively fall down and fill the spaces previously occupied by pressing surface and guide plate. At the same time, the arms 8 and 9 are at their lower limit positions, as indicated by the dotted view of the arm 8 in FIG. 1, with the pressing member extended outwardly into the hopper 2.

The cylinders 15 then urge the arms 4-7 downwardly so that the pressing surfaces 13 urge the logs toward the rotating grinding wheel 1. It will be observed that the movement of the pressing surfaces is downward and toward the center of the hopper 2. The press plates 13 force the logs downwardly until the upper edges of the guard plates 14 approach the lower wall 2b of the hopper. During downward movement of the press plates 13, the cylinders 18 pull the arms 8 and 9 upwardly to their upper positions. During the withdrawal of the arms 8 and 9, the pressing members 19 are rocked clockwise by the cylinders 22 so that the ends of the pressing members remain outside the hopper and the upward movement of the arms 8 and 9 is not hindered by the logs 3, and the logs, in turn, are not moved or shifted by the pressing members 8 and 9. Further, during the upward movement of the arms 8 and 9, a downward and inward

force on the logs 3 is maintained by the arms 4-7, which continue to move the logs at the bottom of the hopper 2 downwardly against the grinding wheel 1.

Next, the cylinders 22 pivot the pressing members 19 into their extended positions, that is, until the rear edges contact the stop 21, and the arms 8 and 9 are rocked downwardly by the cylinders 18. The pressing members engage the logs when the pressing members reach or pass the pressing surface 13 of the arms 4-7. The cylinders 18 then aid in urging the logs downwardly. For a period of time, both the arms 4-7 and arms 8 and 9 cooperate to press the logs downwardly toward the grinding wheel 1.

Shortly before the arms 8 and 9 reach their lowermost positions, the cylinders 15 rock the arms 4-7 upwardly, the arms 8 and 9 continuing to press the logs 3 against the wheel 1. In order to prevent jamming or bridging of the logs, the arms 4 and 6 on one side of the hopper may be rocked upwardly before the arms 5 and 7 on the other side of the hopper. Referring to FIG. 1, upon rocking of the arms 4 and 6, the logs generally on the left side of the hopper successively roll downwardly and outwardly into the space previously occupied by the pressing surface 13 and the guide plates 14. In shifting downwardly and outwardly the logs tend to roll and remain parallel to each other, thereby preventing bridging, as compared to the possibility of jamming if the logs on both sides were simultaneously to shift. After the arms 4 and 6 have been rocked to their cylinders 15, and the logs on the right side of the hopper 2 roll into the space previously occupied by the pressing surface 13 and the guide plate 14. At the same time, the logs on the right side which have just shifted downwardly also can move, if necessary, thereby breaking up any jam or bridging which might have taken place at the left side, inasmuch as the logs on the right side lose their support when the arms 5 and 7 are moved up. When all of the arms 4-7 on both sides of the hopper have reached their uppermost positions, the cycle of operation is complete, the arms 8 and 9 having almost reached their lower limit positions.

It will be understood by those skilled in the art that the above-described embodiment of the invention is merely exemplary and is susceptible of considerable modification and variation without departing from the spirit and scope of the invention. For example, the use of the feeding device is not limited to feeding wood to a pulp grinding wheel, but may also be used for certain types of continuous chippers and the like. It is intended that such modifications and variations be included within the scope of the appended claims.

I claim:

1. A feeding device, comprising means defining a hopper, said hopper having lower downwardly diverging sidewalls and upper upwardly diverging sidewalls, at least one first arm disposed on each side of said hopper, each said first arm having a pressing surface at its outer end and being pivotally mounted so that the pressing surface is at least partially disposed in and pivotable in said hopper in a generally downward and inward direction, means for pivoting the first arm on one side of the hopper, means for pivoting the first arm on the other side of said hopper, each of said first arms having a guide plate mounted at the outer end thereof and extending upwardly from said pressing surface and having a curvature concentric to the axis about which the first arm is pivotable, said guide plate generally forming a continuation of said upwardly diverging walls of said hopper, at least one second arm pivotally mounted on each side of said hopper adjacent said first arm, said second arm having a pressing member pivotally mounted thereon which is arranged to be selectively movable at least partially into said hopper, means for selectively pivoting said second arm on one side of the hopper, means for selectively pivoting the said second arm on the other side of said hopper, and means coupled to each of said pressing members on said second arms for selectively

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withdrawing said second members to the outside of said hopper.

2. The feeding device as claimed in claim 1, wherein said second arms include means for preventing the pivoting of said pressing means in a direction such that the outer end moves upwardly beyond a predetermined angular position.

3. In a continuously operating magazine grinder for making wood pulp, the combination therewith of a feeding device, comprising means defining a hopper, a plurality of arms pivotally mounted on opposite sides of said hopper, each of said arms having a pressing surface thereon and being positioned such that the pressing surfaces extend into and are movable in said hopper in a direction generally downwardly and inwardly, and means for selectively pivoting said arms between predetermined positions in said hopper, at least one of said arms on each side of said hopper having a guard plate extending upwardly from the outer ends of the pressing surface, said guard plate being curved and being disposed generally concentrically to the axis about which the arm is pivoted.

4. The combination claimed in claim 3, wherein said hopper is provided with upwardly diverging sidewall portions at the upper end thereof, and the guard plates of the arms generally define a continuation of the slope of said sidewall portions.

5. In a continuously operating magazine grinder for making ground wood pulp, the combination therewith of a feeding device comprising means defining a hopper, at least one first arm pivotally mounted on each side of the hopper, each first arm having a pressing surface at its outer end and a uniformly curving guard plate extending upwardly from the end of said pressing surface, each of said first arms being pivotally mounted so that the pressing surface is disposed at least partially in the hopper and movable therein in a generally downward and inward direction, and each said guard plate lying generally concentrically to the axis of pivotal movement of the corresponding first arm, first means for pivotally moving each first arm on one side of said hopper, second means for moving each first arm on the other side of said hopper, at least one second arm pivotally mounted on each side of the hopper, each said second arm having a pressing member mounted thereon to be selectively extended at least partially into the hopper, means for pivoting each said second arm generally downwardly and toward the center of said hopper, and means coupled to each of said pressing members for selectively extending them into and withdrawing them from said hopper.

6. In a continuously operating magazine grinder for making wood pulp, the combination therewith of a feeding device comprising a frame, means joined to the frame defining a hopper, a plurality of arms pivotally mounted on the frame for rotation about a fixed axis and disposed on opposite sides of said hopper, each arm having a pressing surface thereon, the arms being positioned so that the

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pressing surfaces extend into said hopper and are movable generally downwardly and inwardly therein, and means coupled to said arms for selectively pivoting them about said axes into and out of said hopper.

7. In a continuously operating magazine grinder for making ground wood pulp, the combination therewith of a feeding device comprising a frame, means joined to the frame defining a hopper for receiving a plurality of logs in random side-by-side and vertically stacked parallel relation, first pressing means including first arms pivotally mounted on the frame for rotation about fixed axes and having pressing surfaces thereon, said pressing surfaces entering into said hopper means from each side thereof upon pivotal movement of said arms, means coupled to each of said first arms for pivoting them about said axes to move said pressing surfaces into the hopper and urge a group of said logs downwardly a first predetermined distance as the lowermost ones of said logs are being ground, and second pressing means selectively extendable into the hopper from opposite sides thereof and retractable therefrom for pressing said group of logs in said hopper downwardly a second predetermined distance, the operating cycle of said first pressing means being different from the operating cycle of said second pressing means, thereby providing a continuous downward pressure on said group of logs.

8. The combination claimed in claim 7, wherein said second pressing means includes at least one second arm pivotally mounted on the frame at each side of the hopper, each second arm having a pressing member mounted thereon so as to be selectively extended and withdrawn into and from said hopper, means coupled to said second arm for pivoting it generally downwardly and inward in the hopper, and means coupled to said pressing member for selectively extending and withdrawing it into and from said hopper.

9. The combination claimed in claim 8 wherein the first plurality of arms is positioned at a different vertical position in the hopper from the second plurality of arms, whereby one plurality continues the pressing action of the other plurality as said other plurality is pivoted out of the hopper.

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WILLIAM W. DYER, JR., *Primary Examiner*.

ROBERT C. RIORDON, *Examiner*.

H. F. PEPPER, *Assistant Examiner*.