HANDLING OF PULP WOOD BY FORK LIFT TRUCK

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ABSTRACT

A charge of logs for storage or transfer to a wood grinder is moved from an open top hopper of a loading rack by forklift vehicle while the adjacent hopper of the loading rack is being filled with logs by a conveyor positioned above the loading rack. The loading rack incorporating the open top hoppers is horizontally shiftable so that when one of the hoppers is filled with a charge of logs, the rack is shifted to position an empty hopper beneath the conveyor to receive a subsequent charge of logs. During loading of a charge of logs in the empty hopper a forklift vehicle unloads the log charge from the filled hopper and transfers the charge to a charging rack above a magazine of a wood grinder or to a storage rack.

5 Claims, 7 Drawing Figures
HANDLING OF PULP WOOD BY FORK LIFT TRUCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a method and apparatus for handling charges of small diameter logs.

2. Prior Art Relating to the Disclosure

In mechanical pulp mills logs are sorted for feeding to wood grinders to be ground into wood fiber suitable for paper stock. Logs may be charged to the wood grinders (1) manually, (2) semi-automatically or (3) automatically. Manual charging of logs presents a labor cost problem. An automated system for loading wood into the magazines of a wood grinder is described in co-pending application Ser. No. 187,469, filed Oct. 7, 1971 and entitled “Log Feeding System for Wood Grinding Mills”. Certain types of wood grinders commercially available cannot be set up for charging logs on a fully automated basis. For this reason a semi-automated feed system is needed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall schematic layout of the transfer system of this invention;

FIG. 2 is a perspective view of the horizontally shiftable loading rack and the vertically adjustable log supporting and receiving platforms carried therein;

FIG. 3 is a front view of one hopper of the loading rack illustrating the position of the vertically adjustable platform in phantom on initial loading of logs therein and the final position of the log receiving platform when the hopper is fully charged;

FIG. 4 is a partial cross-sectional view illustrating the manner in which the piston of the fluid cylinder engages the underside of the log receiving platform to move it vertically;

FIG. 5 is a schematic view illustrating the manner in which a forklift vehicle picks up a charge of logs from a loaded hopper of the loading rack; and

FIGS. 6 and 7 are schematic representations illustrating transport of a charge of logs after pickup from a loaded hopper of a loading rack to a charging rack disposed above the magazine of a wood grinder.

SUMMARY OF THE INVENTION

The objects of this invention are: (1) to provide a convenient and efficient means of transferring pulp wood to a wood grinder, storage or other use location, from a receiving station; (2) to provide means of receiving a charge of logs in a hopper of a horizontally shiftable loading rack having more than one log receiving hopper therein for transfer to a wood grinder storage location; (3) to provide means for receiving logs in one hopper while the adjacent filled hopper is emptied by forklift vehicle or other suitable means; and (4) to provide means of charging a wood grinder utilizing the transfer system.

These and other objects are accomplished by an apparatus comprising: (1) a shiftable rack mounted for horizontal travel having more than one open top hopper therein in side-by-side relation, each hopper adapted to receive a charge of logs from a conveying means, (2) means to shift the rack from a first position wherein one of the hoppers is disposed to receive a charge of logs, to a second position, after receipt of the charge of logs, wherein the adjacent hopper is positioned to receive a subsequent charge of logs, (3) adjustable platforms mounted for vertical travel within each of the hoppers upon which the entering logs are received, and (4) power means adapted to engage the platform on which a charge of logs is to be received to raise the platform to receive an initial charge of logs and lower the platform incrementally as the hopper is filled. The charge of logs in the loading rack is transferred to a storage location or charging rack above a wood grinder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates an overall schematic of a log sorting and handling system. Logs entering on belt conveyor 10 are graded by an operator controlling a deflector 11 to direct logs of a particular grade onto conveyor 12. With deflector 12 retracted logs are carried by roller conveyor 13 to the end thereof where they strike a backstop and fall onto a downwardly inclined plate 14. The logs are picked up by upwardly inclined elevating flight conveyor 15, the flights secured to parallel chains to regularly space the logs received on belt conveyor 16. In line with conveyor 16 is indeed conveyor 17 terminating just above the horizontally shiftable loading rack to be described. The conveyor 16 is intermittently movable in a forward direction by power means (not shown) controlled by an operator to control the buildup of logs thereon for feeding into the open top hoppers of the loading rack. The conveyors are enclosed by side walls 18 and 19 as illustrated. At the terminating end of conveyor 17 is a vertically movable gate 20 movable between a lower position shown in FIG. 2 in solid lines and a raised position shown in phantom. The gate in raised position extends upwardly from the terminating end of belt conveyor 17 about three feet and functions to retain the logs on the surface of conveyor 17 until ready to be fed into one of the hoppers of the loading rack. In the lowered position the upper edge of the gate is at essentially the same level as the upper surface of conveyor 17 to allow the logs to flow thereover into one of the hoppers of the loading rack. An outwardly extending deflector lip 20a integral with the upper edge of the top surface of the gate aids in deflecting logs into the hopper directly beneath. The gate 20 pivots vertically about pivotal axis 21. A pair of double acting fluid cylinders 22 are secured to the side walls of the conveyor and have their pistons pivotally secured to the gate 20.

The loading rack 30 includes a base frame 42 having two or more hoppers mounted thereon and disposed in side-by-side relation for receiving the logs from the infeed conveyor 17. The loading rack is mounted for horizontal movement in a direction transverse to the direction of movement of conveyor 17 on parallel rails 31 secured to a suitable base 32 such as a concrete pad. The rails extend a length equal to or greater than at least twice the length of the loading rack to allow shifting of the loading rack to load logs into the respective hoppers. A pair of pillow blocks 33 and 34 are mounted on base 32 at each of the terminating ends of the rails 31. Shafts 35 and 36 extend between the pillow blocks in the direction transverse to the direction of movement of the loading rack. On each of the shafts is secured a pair of sprockets 37 and 38 about which chains 39 and 40 are trained. The chains extend beneath the loading racks and are trained about the sprockets at
each end. The terminating ends of the chains are connected to the respective ends of the frame 42 of the loading rack as illustrated in Figs. 2 and 3. Reversible power means 41 operatively connected through suitable gear reduction means to shaft 36 shifts the loading rack in a forward or reverse direction.

The loading rack includes a base 42 supported on pairs of wheels 43 and 44 mounted for rotation at each end thereof on suitable shafts (not shown). The wheels are adapted to ride along the rails 31. The base of the loading rack is divided into two hoppers 45 and 46 having a width sufficient to receive logs fed thereinto from conveyor 17. The logs generally are about 45 to 50 inches in length. Each of the hoppers has vertical side walls 47, 48 and a rear wall 49. The front of each hopper has an opening therein of sufficient width to allow the forks 50 and 51 of conventional forklift vehicle 52 to be inserted therebetween to unload the logs. The upper portion 54 of one of the side walls 48 of each hopper is hinged about a pivotal axis 53 parallel to the base as illustrated in Fig. 3. Movement of the part of the wall 54 about axis 53 is controlled by double-acting pistons 55 to tamp the ends of the logs falling into the hopper to properly butt-align them using the opposite side wall of the hopper as the aligning surface.

Mounted for vertical movement within each hopper are adjustable log receiving platforms 56. Each platform has upstanding legs 57 and 58 on each end thereof, each of the legs having a horizontal upper surface to receive logs thereon, the legs being adjacent the respective side walls of each hopper. The distance between the legs should be sufficient to allow the forks of a forklift vehicle to be inserted therebetween and under the logs resting thereon to remove the logs from the hopper. On the underside of each platform is mounted a downwardly extending sleeve 59 adapted to receive the upper end of ram member 60 pivotally attached to piston 61 of a fluid cylinder 62. When the log receiving platform of one of the hoppers is positioned above the upper end of ram member 60, extension of piston 61 engages the upper end of ram member 60 in sleeve 59 and raises the log receiving platform 56 to an initial upper position to receive logs as illustrated in phantom in Fig. 3. As logs are received on the platform the platform is lowered incrementally by an operator or automatically by release of pressure medium from the fluid cylinder allowing the platform to move downwardly until the hopper is completely filled. The lowered position of the platform is illustrated by solid lines in Fig. 3.

OPERATION

Referring to Fig. 1 the right log receiving platform of one of the hoppers is raised by fluid pressure cylinder 62 to a log receiving position. The gate 20 is lowered to allow the logs to fall thereon. As the hopper is filled, the platform 56 is moved incrementally to a lowered position wherein the hopper is completely filled with a charge of logs. The upper end of ram member 60 is lowered until it disengages from sleeve 59 and is clear of the base 42 of the loading rack. While the right hopper is being loaded, the charge of logs in the adjacent or left hopper is being unloaded by a forklift vehicle 52 provided with an upended U-shaped frame 63, the outer leg 64 of which telescopically into the base of the U by a fluid pressure cylinder 65 to securely hold the charge of logs loaded onto the forklift truck. The inner leg 66 may also telescope vertically. The forklift truck is moved to position the forks 50 and 51 of the truck beneath the charge of logs resting on the log receiving platform. The forks of the truck are then lifted to the position shown in Fig. 6 to raise the charge of logs sufficiently to clear the top of the hopper. The logs are held on the forks of the vehicle by the frame arrangement 63.

As soon as the hopper is emptied and the adjacent hopper filled with a charge of logs, the loading rack is shifted by an operator to position the empty rack directly beneath conveyor 17 for receipt of a subsequent charge of logs.

FIG. 6 illustrates schematically the transporting position of a charge of logs after removal from the loading rack.

FIG. 7 illustrates schematically loading of the charge of logs into a charging rack 70 disposed above a magazine 67 of a wood grinder, the magazine being essentially at floor level 68. The charging rack 70 is seated directly over the magazine opening of the wood grinder and is approximately the same size and configuration of the hoppers of the loading rack. The rear wall 71 and right side wall 72 are about twice the height of the left side wall 73 and front wall 74 so that, in unloading the charge of logs from the forklift vehicle, the charge can be bumped against the rear and right side walls while in the transporting position to serve as reference points before removing the forks of the vehicle from underneath the logs and allowing them to fall into the magazine of the grinder. The front and rear walls 74 and 71 have vertically oriented openings therein of a width to allow the forks 50 and 51 of the forklift vehicle to extend therethrough.

The tamper 54 of the hoppers is used to maintain even loading of the log charge so that when the load is transferred to the charge rack, no dumping problems will occur.

The invention is not restricted to the described and shown preferred embodiments and may be varied within the scope of the claims.

The embodiments of the invention in which a particular property or privilege is claimed are defined as follows:

1. A log handling apparatus for receiving a charge of logs from a conveyor in a hopper and then moving the filled hopper to a transfer station adjacent the log receiving station for transfer by a vehicle provided with log holding means, comprising:
   a support base,
   a loading rack mounted for horizontal travel on the support base having more than one open-topped log holding hopper mounted thereon in side-by-side relation to receive logs from the conveyor, each log holding hopper having vertical side walls, a rear wall and a front wall interconnecting the side walls, the front wall having a vertically oriented opening therein sufficient in width to allow the log holding means of the transfer vehicle to be inserted therein to unload logs from the hopper,
   means to shift the loading rack from a loading position wherein one of the hoppers is disposed to receive a charge of logs from the conveyor to a transfer position and wherein the adjacent hopper is moved to the loading position to receive a charge of logs from the conveyor,
log receiving platforms mounted for vertical travel within each of the log holding hoppers, each of the log receiving platforms having log holding legs spaced a distance apart sufficient to allow the log holding means of the transfer vehicle to be inserted beneath the charge of logs in the hopper, and power means beneath the log receiving platform of the hopper in loading position contacting the log receiving platform to raise it to an upper position to receive logs, lower the platform incrementally as the hopper is filled, and then disengage from the platform for shifting of the loading rack from the loading position to the transfer position.

2. The log handling apparatus of claim 1 wherein the upper portion of one side wall is hinged and wherein means are operatively connected to the hinged portion of the side wall for deflecting it towards the opposite side wall to butt-align logs falling onto the log receiving platform in the hopper, using the opposite side wall as the aligning surface.

3. The apparatus of claim 1 wherein the power means is a fluid cylinder disposed beneath the loading rack, the piston of the fluid cylinder engaging the underside of the log receiving platform in loading position to receive a charge of logs.

4. The apparatus of claim 1 including parallel tracks mounted on the upper surface of the base, the loading rack including wheels mounted thereon adapted to ride on the track.

5. A semi-automated system for charging logs to the magazine of a wood grinder using a transfer vehicle provided with log holding means to transfer the logs to the grinder from a loading rack comprising, in combination:

1. a loading rack mounted for horizontal travel having two open-topped log holding hoppers mounted in side-by-side relation thereon, each hopper having vertical side walls, a rear wall and a front wall interconnecting the side walls, the front wall having a vertically extending opening therein extending the height of the hopper and of sufficient width to allow the log holding means of the transfer vehicle to be inserted therein to unload logs from the hopper, log receiving platforms mounted for vertical travel within each of the log holding hoppers having log holding legs spaced a distance apart to allow the log holding means of the transfer vehicle to be inserted beneath the charge of logs in the hopper, and power means beneath the log receiving platform of the hopper in loading position contacting the log receiving platform to raise it to an upper position to receive logs, lower the platform incrementally as the hopper is filled, and then disengage from the platform for shifting of the loading rack from the loading position to the transfer position.

2. conveyor means conveying logs from a receiving position to a position adjacent an open-topped hopper in loading position;

3. a movable gate at the terminating end of the conveyor adjacent the open-topped hopper in loading position moveable between a first position to retain logs on the surface of the conveyor until ready for feeding into the hopper and a second position allowing the logs to fall into the hopper and means to move the gate between the first and second positions;

4. a charging rack mounted over the magazine opening of a wood grinder having vertical side walls and interconnecting front and rear walls, the front and rear walls having vertically oriented openings therein of a width sufficient to allow log holding means of the transfer vehicle to extend therethrough; and

5. a transfer vehicle provided with log holding means for intermittently removing a charge of logs from a filled hopper, transporting the charge to the charging rack and dumping the charge into the charging rack and magazine of the wood grinder.

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