May 16, 1967 F. F. VAN RADEN 3,319,807

DUMPING TYPE STORAGE BIN

Filed May 28, 1965 2 Sheets-Sheet 1

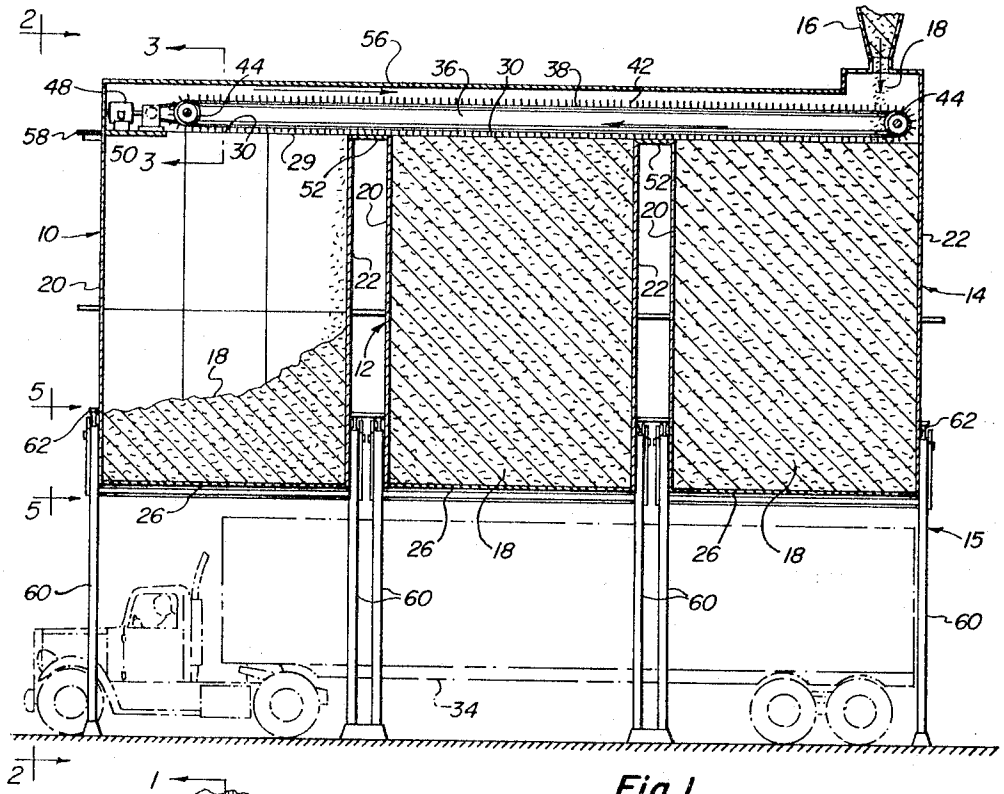


Fig. 1

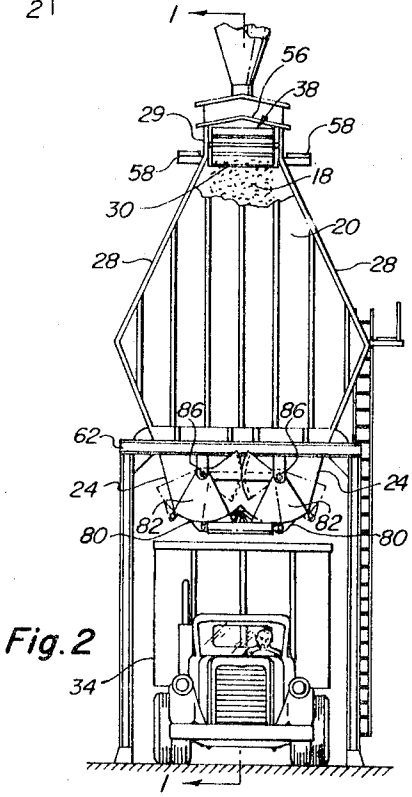


Fig. 2

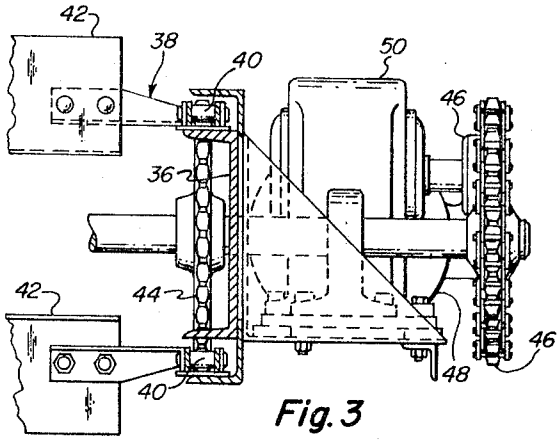


Fig. 3

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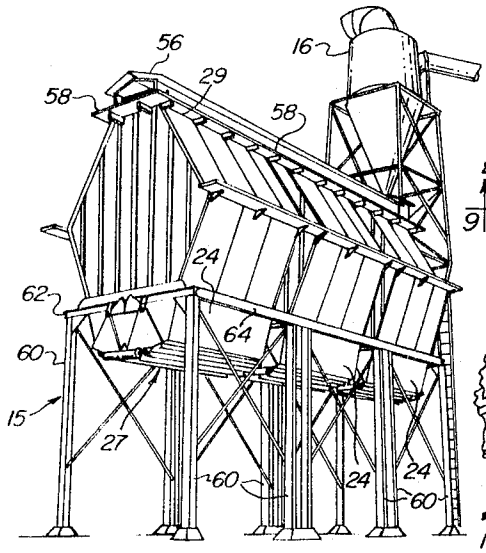


Fig. 4

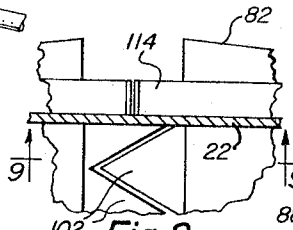


Fig. 8

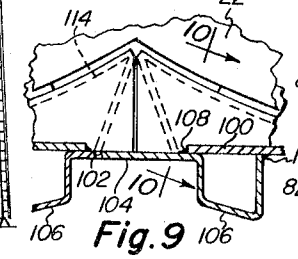


Fig. 9

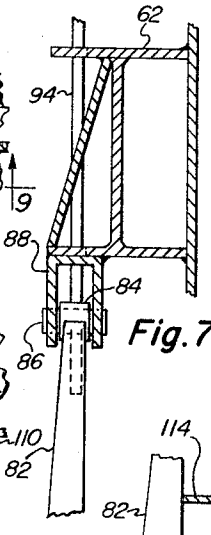


Fig. 7

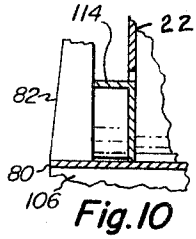


Fig. 10

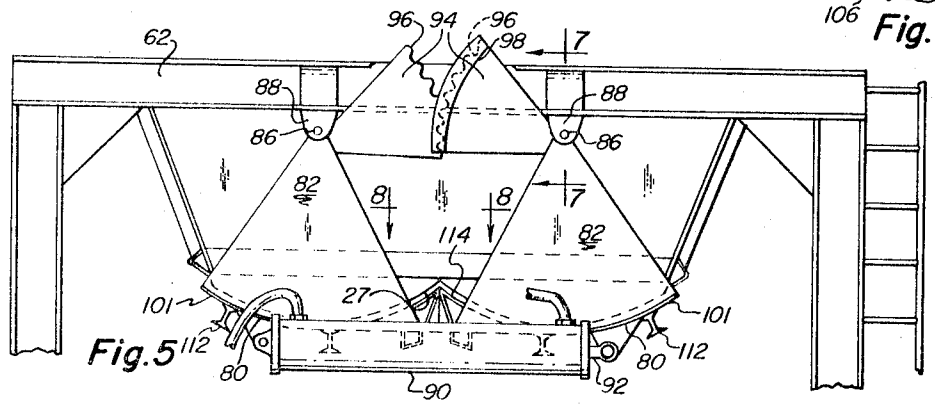


Fig. 5

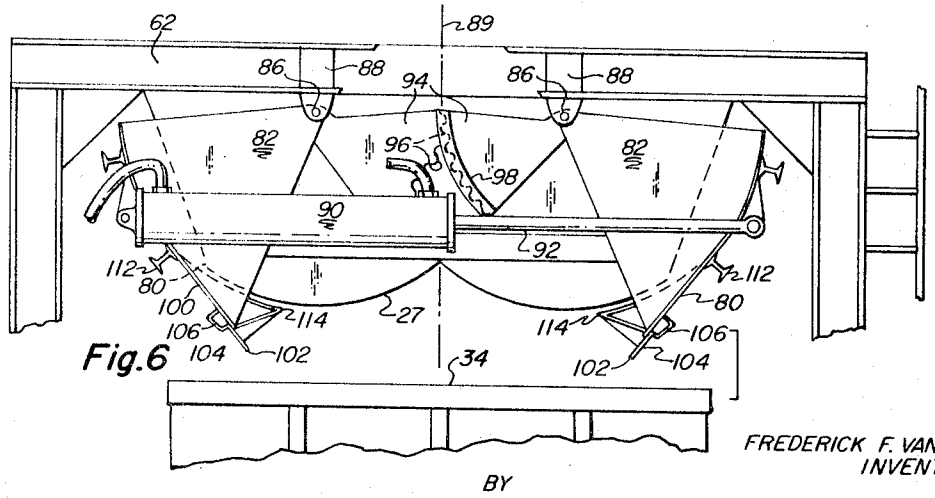


Fig. 6

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3,319,807

DUMPING TYPE STORAGE BIN

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Filed May 28, 1965, Ser. No. 459,719
4 Claims. (Cl. 214—16)

The present invention relates to a storage bin and more particularly to a storage bin or hopper for the temporary storage of wood chips or the like.

It is almost the universal practice at the present time to reduce waste wood products encountered in the making of lumber into chips for the production of paper pulp or compressed board products. Very frequently chips must be hauled from their point of production, such as a sawmill, to a pulp mill or board plant at some distant location.

It is an object of the present invention to provide a new and improved hopper into which chips can be accumulated and stored at a sawmill or the like for loading from time to time into a truck or other conveyance for hauling to the location at which they will be utilized.

Another object of the present invention is to provide a storage hopper of the class described that may be easily and completely emptied.

A further object is to provide storage facilities of the class described comprising a pair of bins or hoppers with a unique yet inexpensive means for feeding the excess product dumped into one of the bins into one of the other of the bins.

A still further object of the invention is to provide a hopper construction which enables the quick and easy erection of the same.

Still other objects and advantages of the invention will become apparent hereinafter.

For a more complete description of the invention reference is made to the accompanying drawings wherein:

FIG. 1 is a longitudinal sectional view of the storage facility made in accordance with the invention, the view being taken substantially along line 1—1 of FIG. 2;

FIG. 2 is an end elevation of a storage facility made in accordance with the invention with a portion thereof broken away to facilitate showing details of the same;

FIG. 3 is an enlarged, fragmentary view of a portion of the drive system of a conveyor utilized in the apparatus, the view being taken substantially along line 3—3 of FIG. 1;

FIG. 4 is a perspective view on a reduced scale of a storage facility constructed in accordance with the invention;

FIG. 5 is an enlarged, fragmentary view of the structure of the gate means for dumping a load from the storage hopper of the invention;

FIG. 6 is a view similar to FIG. 5 showing the gate in open position;

FIG. 7 is an enlarged sectional view taken substantially along line 7—7 of FIG. 5 showing the pivot arrangements for supporting the gates;

FIG. 8 is an enlarged fragmentary section of a portion of the gate structure showing an edge on the bottom thereof, the view being taken substantially along line 8—8 of FIG. 5;

FIG. 9 is a sectional view taken substantially along line 9—9 of FIG. 8; and

FIG. 10 is a fragmentary sectional view taken substantially along line 10—10 of FIG. 9.

With reference first to FIGURES 1 and 4, the storage facility illustrated in the drawing comprises three bins or hoppers 10, 12 and 14 for storing wood chips or like products supported on frames 15. The bins are fed

through suitable means such as a pneumatic feed system including a cyclone separator 16 which is adapted to feed the chips 18 into the hopper 14 adjacent one end thereof remote from the bins 10, 12. Each of the bins is provided with a pair of opposite, parallel side walls 20, 22 with the bins arranged in side-by-side relationship with the vertical side walls of the endmost bins 10, 14 closely adjacent the side walls of the centermost bin 12. Each of the bins also comprises a pair of opposite bottom walls 24 which converge inwardly towards each other in a downward direction, each wall 24 being inclined to the horizontal at an angle substantially greater than the angle of repose of the wood chips or other product to be handled in the bins. The walls 24 terminate along horizontal bottom edges 26 which define with the side walls 20, 22 a rectangular bottom opening 27. Each of the bins also comprises a pair of upper walls 28 which are contiguous along their lower edges with the upper edges of the side walls 24. The upper walls are inclined to the vertical at an angle substantially equal to the angle of repose of the product being handled so as to facilitate filling of the bins, and terminate short of their line of convergence at 29 to define a rectangular top opening 30. As is apparent, the bottom openings 27 and the top openings 30 are aligned in their longitudinal direction.

Means are provided for distributing wood chips 18 into the bins 14, 12 and 10. To facilitate the rapid loading of a truck or other vehicle shown in dotted lines at 34, it is preferable that the filling be confined to one bin until it is completely filled and then the excess product diverted to the adjacent bin until it is filled, and finally to the third bin. With such a system more rapid loading of a vehicle having a capacity equal to that of two bins or less may be obtained since the vehicle frequently need be positioned only under two of the bins and need not be repositioned as would often be required if the three bins were filled simultaneously. In the embodiment shown, a conveyor structure is mounted on the top of the bins 10, 12 and 14 and which conveyor comprises a pair of side plates 36 mounted to the top edges 29 of the walls 28 and extending for the length of the three bins.

Suitably supported between the side walls 36 and extending the length thereof is a conveyor 38 comprising a pair of chains 40 between which are mounted flights or paddles 42. The chains 40 are trained over idler sprockets 44 suitably supported at the end of the facility at which the chips 18 are fed therein and by drive sprockets 46 at the opposite end of the facility, the sprockets being driven by a motor 48 through a suitable speed reduction device 50. As the product falls from the cyclone separator 16 into the bin 14 it will first pile up adjacent the wall 22. As it reaches the height of the path of the flights 42 in their lower run, the flights will propel the chips towards the side wall 20 eventually causing the bin to be completely filled. Thereupon the chips will be propelled by the flights 42 into the bin 12 causing the same to be filled, plates 52 being disposed beneath the flights and extending between the bins and upon which the chips are carried as they move from one bin to the next. To protect the chips from rain or the like a roof 56 is positioned over the conveyor 38 and a catwalk 58 may be positioned around the conveyor structure to facilitate maintenance work thereof.

The supporting frames 15 for the bins 10, 12 and 14 include legs 60 which support the bins at such an elevation that trucks 34 may pass beneath the bins to receive a load of chips therefrom. The legs 60 are connected at their upper ends by crossmembers 62 extending along the side walls 20, 22 of each bin and by crossbeams 64 which engage the bottom plates 24 and support the bulk of the weight of the bins.

Each of the bins is provided with gate means for opening and closing the lower end thereof to permit control

of discharge of the product from the corresponding bin. Referring more particularly to FIGURES 2, 5 and 6 such gate means comprises a pair of leaves **80** adapted to be moved from a closed position as shown in FIG. 5 in which they completely close the opening **27** to a retracted position as shown in FIG. 6 in which they are withdrawn to one side of the opening to permit the contents of the bin to fall through such opening. The leaves **80** are suspended by means of triangular side supporting pieces **82** provided at their upper ends with eyes **84** (FIG. 7) for receiving pivot pins **86** extending therethrough and supported in a bracket **88** mounted upon the side frame members **62**. The axes of the pivot pins **86** are perpendicular to the side walls **20, 22** and are spaced substantially equidistantly from the vertical central plane of the bins indicated in FIG. 6 at **89**. Connected between each pair of leaves **80** is a double-acting hydraulic cylinder and piston means, including a cylinder **90** and piston rod **92** which are pivotally connected one to each gate. Also fixed to each of the plates **82** are gear segments **94** which are provided with intermeshing teeth **96**. Upon the actuation of the piston and cylinder **90, 92** to open or close the leaves **80** the intermeshing of the gear segments **94** cause equal movement of the two leaves as will be apparent to those skilled in the art. One of the gear segments **94** may be provided with flanges **98** which overlap the other gear segment to maintain the two segments in an engaging relation.

Each of the leaves **80** comprises a substantially flat toe portion **100** and an upwardly curved heel portion **101**. In the closed position of the leaves the toe portions **100** are substantially horizontal and meet substantially along the central plane **89**. As is shown in FIG. 6, in the open position of the gate the toe portions swing downwardly to define a chute guiding the chips into the center portion of the receiving vehicle. Because the toe portions are flat rather than curved as in the case of a conventional clam shell gate leaf, the ends of the toe portions **100** swing downwardly between the discharging product and the sides of a receiving vehicle and prevent overflow of the vehicle. A further advantage resulting from the provision of the flat toe portions **100** is that the gate leaves do not have to be swung as far to provide the desired opening as would be required in the instance of curved toe portions. Preferably the meeting edges of the toe portions **100** are formed with interfitting triangular teeth **102** to facilitate closing of the leaves while product is still dumping. Such teeth are formed on plates **104** extending the length of the toe portions **100** and formed to define a channel **106** which extends the length of each leaf to strengthen the same. The plates **104** are welded to the toe portion **100** as indicated at **108** and **110**. Additional strengthening braces **112** may also be provided on each leaf.

As most clearly shown in FIG. 6, the bottom edges of the side walls **20, 22** are formed so as to be on each side of the central plane **89** arcuate and concentric with the swinging axis of the corresponding gate leaf **80**. Each of the leaves **80** is formed with flanges **114** along the opposite side edges thereof, which flanges are substantially coplanar with the bin walls **20, 22**. The upper edges of the flanges are arcuate and concentric with and closely adjacent to the edges of the side wall **20** or **22**. Hence, as the leaves open and close substantially constant spacing is maintained between the edges of said flanges and said side wall edges to preclude the entrance of a mass of chips therebetween which might otherwise interfere with closing of the leaves **80**.

The usual procedure in filling a truck or other vehicle is to position it first beneath the bin **14** or the bins **12, 14** if it is of sufficient length. The gates of such bins are then opened to dump the chips from the bins into the truck. If the truck is of lesser capacity than the quantity of chips within the bins, the gates are closed when the truck is filled, the design of the gates described facilitating such closing. If the truck is not completely filled upon dumping of bins **12** and **14**, the truck may then be moved beneath bin **10** to receive all or part of its contents as necessary.

Obviously, the bins of the invention may be used singly or in any multiples.

Having illustrated and described a preferred embodiment of the invention it should become apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim all such modifications as come within the spirit and scope of the appended claims.

I claim:

1. Apparatus for storing wood chips or like product comprising:
- a pair of bins each having a pair of opposite, parallel vertical side walls;
- said bins being arranged in side-by-side relation with said one of said vertical side walls of one of said bins closely adjacent said vertical side walls of the other bin;
- said bins each comprising further walls extending between said vertical side walls including a pair of opposite bottom walls inwardly converging in the downward direction and a pair of opposite upper walls inwardly converging in the upper direction;
- said bottom walls and said upper walls having contiguous edges;
- said bottom walls being inclined to the horizontal at an angle substantially greater than the angle of repose of said product;
- said upper walls being inclined to the vertical at an angle substantially equal to said angle of repose;
- said bottom walls terminating short of their line of convergence and defining a bottom opening in each of said bins;
- gate means mounted on said bins operable to open and close said opening;
- said top walls terminating short of their line of convergence and defining a rectangular top opening in each of said bins;
- said top openings of said bins being aligned in the longitudinal direction;
- vertical inlet means adjacent the end of one of said bins remote from the other bin for feeding product into said one bin through the said top opening thereof;
- and conveyor means mounted on said bins for distributing product in said one bin and carrying excess product into said other bin;
- said conveyor means comprising a pair of side plates mounted on said bins along the edges of said top openings and extending upwardly therefrom;
- an endless conveyor belt mounted between said side plates with a horizontal flight spaced just above said top openings and extending substantially the length of each;
- scraper means on said belt to engage said product and move the same;
- means for driving said belt with said flight moving in the direction from said one bin to said other bin so that as excess product is fed into said one bin at one end thereof said scraper means propels said excess product toward the other end of said one bin and as said one bin becomes completely filled said scraper means propels the excess product into said other bin and distributes the product therein;
- and means extending between said bins defining a trough for said scraper means on which said excess product may be conveyed from one bin to the other.

2. In a storage bin of the class described;
- a pair of opposite, parallel, vertical side walls;
- a second pair of opposite side walls extending between the first mentioned side walls;
- said side walls defining at their bottom edges an opening for the release of product from said bin;
- a gate means for opening and closing said opening including a pair of leaves;

pivot means for supporting said leaves for swinging movement about axes perpendicular to said vertical side walls, and spaced equidistantly on opposite sides of the vertical central plane of said bin;

said leaves each comprising a substantially planar toe portion which, in the closed position of said leaves, are substantially horizontal and which meet substantially along said central plane and an arcuate shaped heel portion;

the bottom edges of said vertical side walls on each side of the said central plane being arcuate and concentric with the swinging axis of the leaf on such side;

each of said leaves having flanges along the opposite side edges thereof coplanar with said vertical bin side walls, the upper edges of said flanges being concentric with said arcuate side wall edges and spaced relatively closely thereto;

said leaves being adapted to swing about said axes to an open position in which said toe portions are inclined downwardly toward each other to define a chute for guiding the contents of said bin discharging through said bin opening;

and means for swinging said leaves between their open and closed positions.

3. In a storage bin of the class described:

a pair of opposite, parallel, vertical side walls;

a second pair of opposite side walls extending between the first mentioned side walls;

said side walls defining at their bottom edges an opening for the release of product from said bin;

a gate means for opening and closing said opening including a pair of leaves;

pivot means for supporting said leaves for swinging movement about axes perpendicular to said vertical side walls, and spaced equidistantly on opposite sides of the vertical central plane of said bin;

said leaves each comprising a substantially planar toe portion which, in the closed position of said leaves, are substantially horizontal and which meet substantially along said central plane, the meeting edges of the toe portions being provided with interfitting triangular teeth;

said leaves being adapted to swing about said axes to an open position in which said toe portions are inclined downwardly toward each other to define a chute for guiding the contents of said bin discharging through said bin opening;

and means for swinging said leaves between their open and closed positions.

4. The apparatus according to claim 2 wherein the substantially planar toe portions of said leaves are provided with interfitting triangular teeth where said toe portions meet substantially along said central plane.

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