United States Patent [19]

Morris et al.

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[54] **WOOD CHIP WASHER**

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[73] Assignee: **Rex Chainbelt Inc.,** Milwaukee, Wis.

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[52] **U.S. Cl.** **209/17,** 209/159, 209/173

[51] **Int. Cl.** **B03b 7/00**

[58] **Field of Search** 209/159, 162, 173, 209/423, 446, 448, 17, 18, 172, 172.5

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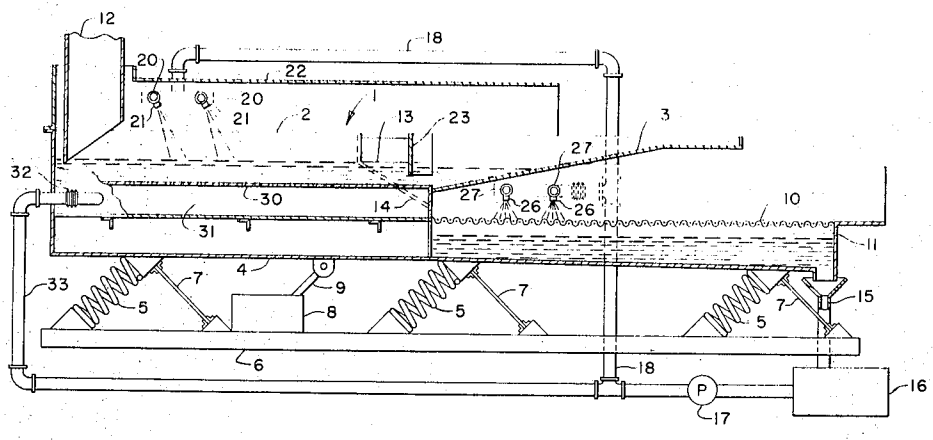
Primary Examiner—Frank W. Lutter
Assistant Examiner—Ralph J. Hill
Attorney—Marshall & Yeasting

[57] **ABSTRACT**

Wood chips are cleaned of foreign or tramp material such as sand and pebbles in a vibrating water bath. Optionally the chips are driven down into the bath by overhead downwardly directed jets of water. The vibration of the bath container conveys the heavy material, i.e. the sand, pebbles, etc., along the bottom of the water bath and up an inclined ramp at the downstream end. The washing action of the vibrating water bath and overhead jets may be enhanced, if desired, by upward flow of water issuing from a perforated deck forming the bottom of the vibrating trough containing the water bath. The water carrying the cleaned wood chips is discharged over a weir in a wall of the vibrating water bath container and is drained from the chips as they pass over a vibrating screen deck. The water, after passing through a settling tank to remove the sand, etc., is recycled through the jets and perforated deck. Optionally the wood chips may be subjected to a further spray wash during the initial portion of their travel across the vibrating screen deck.

1 Claim, 3 Drawing Figures



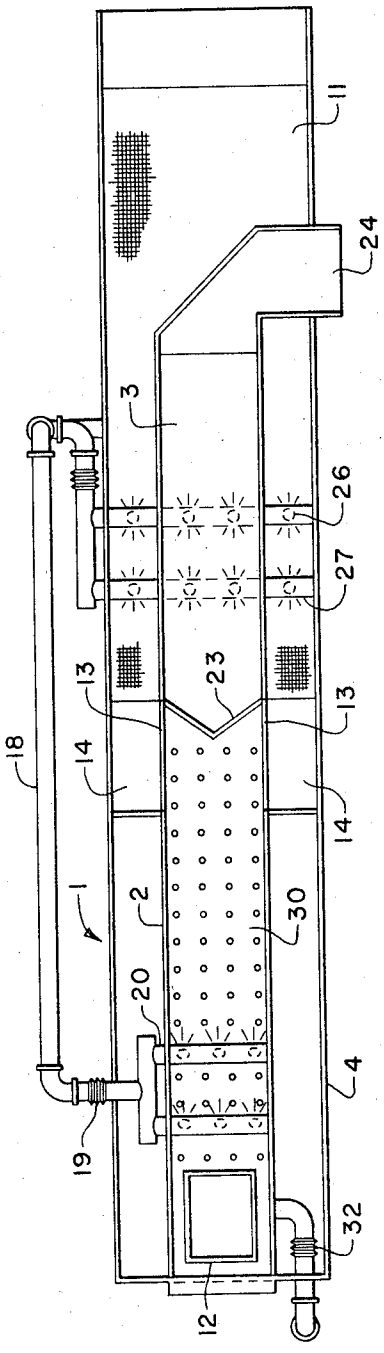

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Fig. 2

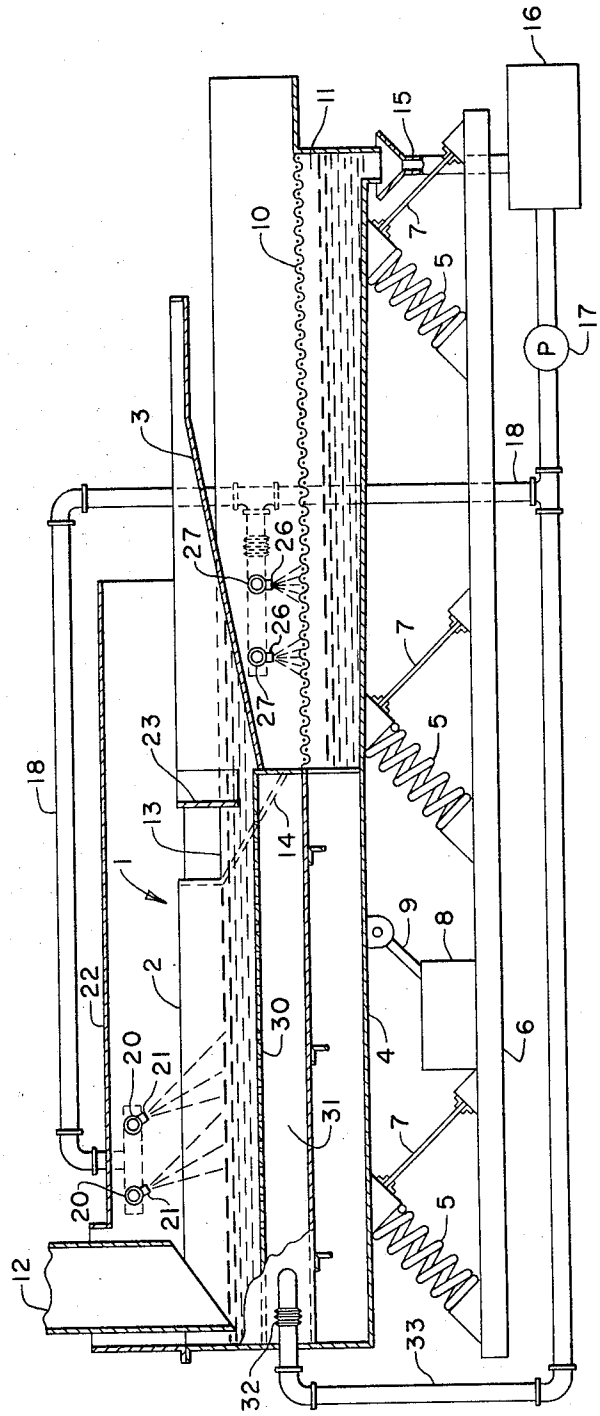
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Fig. 1

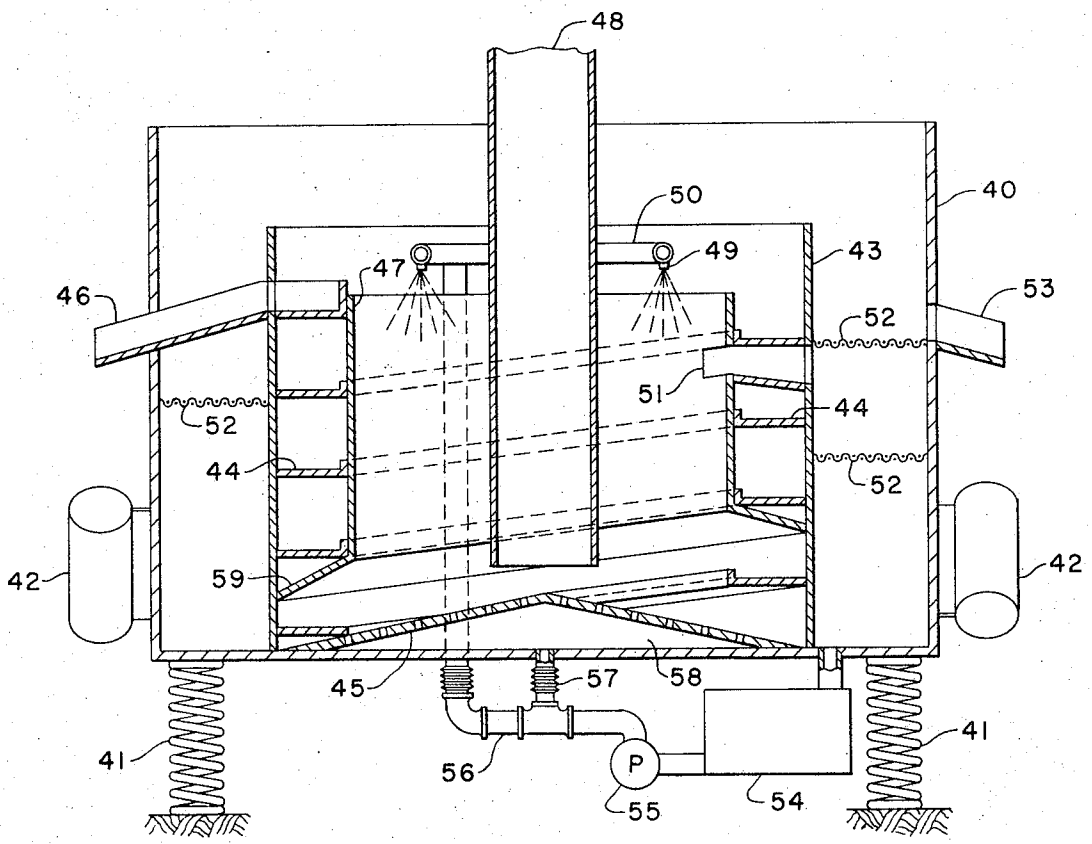
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Fig. 3

WOOD CHIP WASHER

SUMMARY OF THE INVENTION

This invention relates to a method and apparatus for washing wood chips and separating tramp material such as sand and gravel from the chips. According to the invention the wood chips along with adhering sand and gravel are fed into a vibrating water bath in a container such as a trough or tub subjected to linear or helical vibration. The cleaned chips are discharged over a weir in the periphery of the container wall along with some of the water. The sand, gravel, etc., is conveyed by the vibratory action upon an inclined ramp leading out of the vibrating container

The washing action induced by the vibration is enhanced by supplying water to make up for that lost over the weir, through overhead downwardly directed nozzles to ensure complete submersion of the wood chips and, optionally, by water flowing upwardly through perforations in the bottom of the container.

The cleaned chips are fed over a vibratory screen and the water drained through the screen is collected in a settling tank and then returned to the water bath by way of the overhead nozzles or through the perforated container bottom. Optionally, the chips may be subjected to a rinse by water sprays from nozzles located over a part of the vibratory screen.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a longitudinal vertical section of a vibratory apparatus including a vibrating water bath with water supply and a vibratory screen for washing wood chips.

FIG. 2 is a plan view of the vibratory apparatus shown in FIG. 1.

FIG. 3 is a vertical section of a generally circular vibratory tub and conveyor ramp for washing wood chips and similar materials.

SPECIFIC DESCRIPTION OF A PREFERRED EMBODIMENT

In a preferred embodiment of the invention the vibratory water bath container is in the form of a trough 1 comprising a generally constant depth section 2 and an ascending ramp section 3 is mounted on a vibratory conveyor frame 4. As is common practice, the conveyor frame 4 is carried on a plurality of coupling springs 5 connecting the frame 4 to a base 6 that is mounted on a foundation or other firm support. A plurality of inclined cantilever guide springs 7 also connect the conveyor frame 4 to the base 6 and confine the vibratory motion of the frame 4 to a direction generally along the longitudinal axis of the coupling springs 5. The coupling springs 5, while shown as helical springs, may be rubber shear springs or any other form of spring.

A conventional drive mechanism 8 acting through a connecting rod 9 drives the vibratory conveyor frame 4 through its normal vibratory stroke. Preferably, according to common practice, the spring rate of the coupling springs 5 is selected so that the vibratory system comprising the conveyor frame 4, with the parts attached thereto, and the coupling springs 5 has a resonant frequency at the frequency of the drive mechanism 8.

The conveyor frame 4 also carries a screening section 10 supported above a water collection trough 11 for separating cleaned chips from the cleaning water.

Wood chips to be cleaned are supplied through a chute 12 that leads into the upstream end of the constant depth vibratory trough. The water in the trough, as water is added, rises to the level of a weir 13 in a sidewall of the trough and flows down a chute 14 leading to the upstream end of the screening trough 10.

Water collected in a trough 11 under the screen 10 drains through a funnel and drain pipe 15 to a settling tank 16. While a funnel and drain pipe is shown, any means of directing the water draining from the collector trough 11 to the settling tank 16 may be employed so long as it allows for vibration of the trough with respect to the drain pipe. From the settling tank 16 the water is pumped through a pump 17 and pipes 18 leading through a flexible connection 19 to headers 20 having nozzles 21 arranged to direct jets of water into the surface of the water standing in the trough 2. The headers 20 are preferably carried in a splash shield 22 mounted on the vibratory trough 1.

As wood chips along with the extraneous sand and gravel are fed through the chute 12 into the water bath in the trough 1 the chips are subjected to a vigorous washing action because of the agitation of the bath resulting from the vibratory motion of the trough. Depending upon their moisture content most wood chips tend to float in water and means are preferably provided to insure that the chips are thoroughly submerged so that all surfaces of the chips are subjected to a washing action. In the structure illustrated the chips are driven down into the water bath by the water jets issuing from the nozzles 21. A copious supply of water is used at this point to enhance the washing action. As the chips and water move downstream they reach a V-shaped diverter plate 23 (see also FIG. 2) the sharp point of which is pointed upstream so as to divide the flow of chips on the surface of the agitated water bath into two parts, directing each part toward an adjacent one of the weirs 13. The diverter plate 23 extends down into the water bath but does not reach the bottom of the trough section 2 but rather leaves a gap through which sand, pebbles and other heavy debris may pass from the trough section 2 to the inclined ramp section 3. The vibratory conveying action resulting from the vibration of the trough along an inclined path moves the sand and gravel up the inclined ramp 3 to a laterally directed discharge trough 24 (FIG. 2).

The water and wood chips flowing over the weirs 13 and down the chutes 14 move on to the upstream end of the screening section 10. Optionally, the wood chips are subjected to a rinsing and washing operation as they pass through jets of water from nozzles 26 attached to headers 27 extending across the upstream end of the screen 10 and below the inclined ramp section 3. As the chips continue on the vibrating screening section 10 the water is drained into the collector trough 11 while the cleaned chips are discharged over the end of the screening section.

While most wood chips will float in the water bath some types of wood, particularly if waterlogged, may tend to sink in the water. If this occurs the system as described would tend to clog because of the chips collecting on the bottom of the trough. In the event there is a possibility of this occurring the trough 2 may be provided with a perforated bottom 30 and a subjacent ple-

num chamber 31 from which water may flow through the perforations to further agitate the water bath and chips submerged therein. As illustrated in FIG. 1 water is supplied to the plenum chamber 31 through a flexible connection 32 in pipe 33 connected to the pump 17.

In the arrangement shown in FIGS. 1 and 2 the screen 10 and water collecting chamber 11 extend as a continuation of the water bath trough 1. All of the force required to vibrate the frame 4 and the parts attached thereto is transmitted through the springs 5 to the base 6 and may in some installations cause vibration of the base and surrounding areas. In situtations where such radiation of vibratory energy is not acceptable the screen 10 and collecting trough 11 may be made as one or two separate conveyor sections located on one or either side of the trough 1 on separate vibratory structures erected from the base 6 and driven 180° out of phase with respect to the trough 1. By properly adjusting the weight of the trough or troughs with respect to the trough 1 and the associated parts for each it is possible to get a reasonably close dynamic balance between the two structures so that the base 6 is, in effect, a node in the system and is practically free of vibratory motion. In this arrangement the weirs at each side of the trough 1 are provided with short troughs extending laterally far enough to reach the associated vibratory screen or screens.

The foregoing embodiment utilized a water container in the form of a trough and a linear vibratory motion to agitate the water bath. A generally similar arrangement may be made utilizing a helical vibration and a generally circular water container provided with suitable spiral ramps for the conveyance of the wood chips and the sand, gravel, pebbles or similar material.

In this arrangement, shown in FIG. 3, an outer tube 40 is carried on a plurality of isolator springs 41 shown as helical steel springs. Obviously other types of springs such as rubber or air springs may be substituted for the steel coil springs. The tub 40 is vibrated in a helical path by a pair of eccentric weight loaded motors 42 attached to opposite sides of the tub 40 with the motor axes inclined from the vertical. In such an arrangement there is no need for mechanically interconnecting the motor shafts since the vibratory force transmitted from one motor to the other through the tub 40 is sufficient to insure synchronization.

An inner tub 43 constituting the vibratory water bath container is concentrically mounted within the outer tube 40. The inner tub 43 is provided on its inner wall with a helical ramp trough 44 leading from the outer periphery of an upwardly convex conical floor 45 of the tub to a discharge chute 46 leading to a sand and gravel disposal system. A cylindrical baffle or partition 47 separates the spiral ascending ramp or trough 44 from the remainder of the interior of the inner tub 43. The partition or baffle 47 extends downwardly to cover all but the last convolution of the spiral trough.

Wood chips to be cleaned are introduced into the apparatus through a centrally located chute 48 that terminates a short distance above the apex of the conical tub bottom 45. The chips discharging from the bottom of the chute 48 spread laterally and tend to float upwardly in a water bath contained in the inner tub 43 in the space between the chute 48 and the baffle 47. As the chips rise through this portion of the water bath they are subjected to the washing action of the agitated water bath in the vibrating tub. Since some chips tend to rise quite rapidly because of their bouyancy, a plurality of nozzles 49, downwardly directed from a header 50, are provided to drive the chips back down into the water bath and to create turbulence to dislodge any sand or gravel adhering to the chips. The helical vibration causes the chips to move around the annular space between the baffle 47 and the chute 48 and some of the chips and water are then discharged over a weir 51 and onto a screen 52 fitted into the annular space between the inner tub 43 and the inner wall of the outer tub 40. The chips on the screen 52, because of the vibratory motion, travel along the length of the screen around the inner tub 43 and are discharged at a higher level through a discharge chute 53.

Water draining from the chips on the screen 52 flows into a settling tank 54 from which it is pumped through a pump 55 and pipes 56 to the header 50. To increase the turbulence in the agitated water bath, particularly if heavy wood chips are being cleaned, some of the water being pumped through the pump 55 may be introduced through a flexible pipe 57 into a chamber 58 immediately below the conical tub bottom 45. In this case the tub bottom 45 is perforated over a substantial portion of its area so that the water flowing through such perforations tend to fluidize or agitate any material tending to come to rest on the bottom of the tub.

Any wood chips in the outer marginal space in the inner tub 43 are deflected radially inwardly in the tub 43 by a downwardly inclined and outwardly extending extension 59 of the baffle 47 thus eliminating any pockets within the tub where such chips could collect.

In each embodiment the wood chips or similar material is washed and separated from tramp material by passing through a water bath in a vibratory container and the chips and refuse material are conveyed through and out of the bath by the vibration of the container.

We claim:

1. An apparatus for cleaning wood chips, and similar material, comprising, in combination, a vibratory conveyor frame, means for resiliently mounting the frame and driving it through a vibratory stroke adapted to convey material along the frame, a first trough mounted on said frame, said trough having a first portion of constant depth and a second portion of decreasing depth in the direction of vibratory conveying, means supplying a cleaning liquid upwardly through the bottom of the constant depth portion of the trough, a weir in a side wall of the trough adjacent said first and second portions, a diverter plate extending across the trough on the downstream side of the weir, a second trough on said conveyor frame for receiving material discharged over said weir, a screen covering said second trough to separate the solid material from the liquid discharged from the first trough, and a plurality of downwardly directed nozzles arranged over an intermediate part of the constant depth portion of the first trough supplying jets of liquid to drive any material floating in said trough into the liquid agitated by the vibration of the trough whereby wood chips or similar material introduced with the upstream end of said first trough are immersed and agitated in vibrating liquid in said trough for cleaning and then separated from the debris and liquid while the debris is vibratorily conveyed through the second portion of the first trough.

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