

[54] APPARATUS FOR TAKING FLOATING AND SOLID MATERIALS OUT OF CHANNELS

[76] Inventor: Günther Abel, 10 Benzstrasse, 79
Ulm, Germany

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210/158, 160, 161, 162, 526, 159

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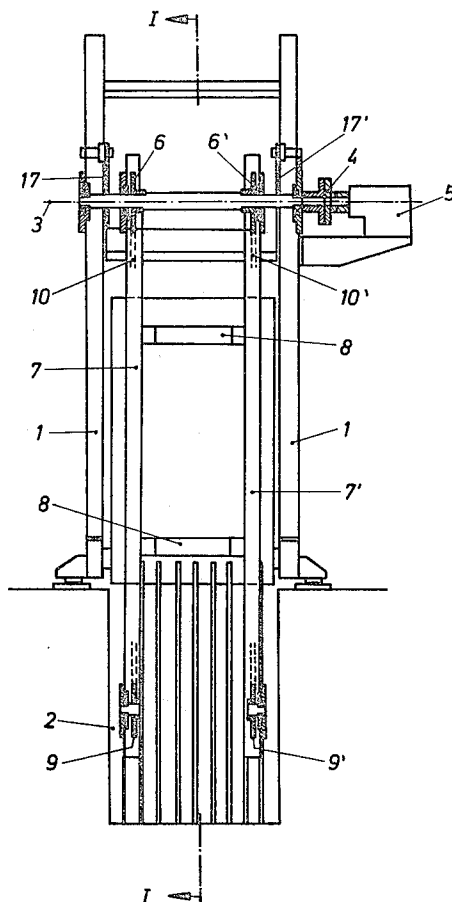
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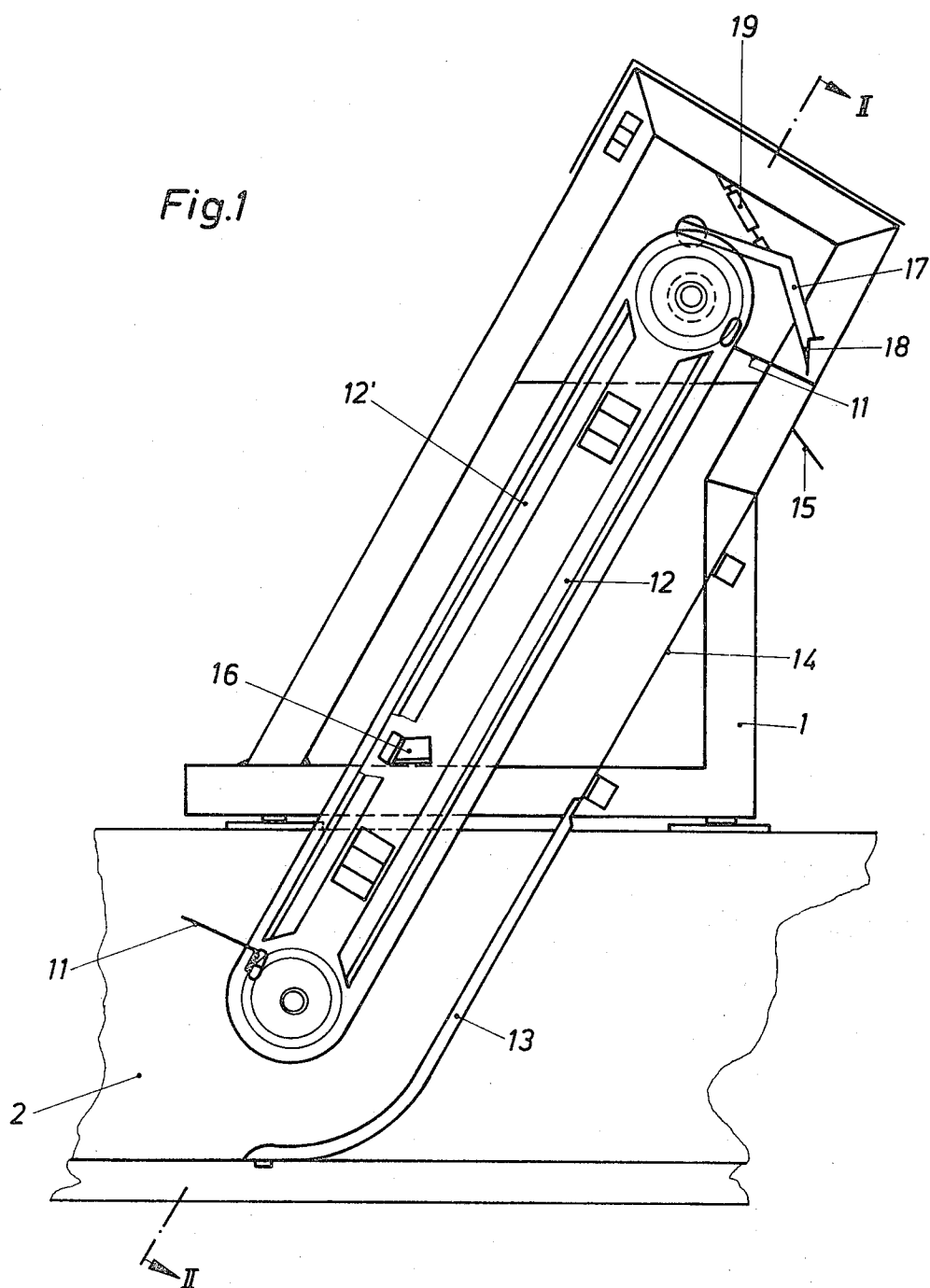
Primary Examiner—Theodore A. Granger
Attorney, Agent, or Firm—Roland I. Griffin

[57] ABSTRACT

Driven elevator chains are provided with blades passing along an inclined conveyor chute and adjoining grate to remove floating and solid materials from a channel in which the grate is positioned. These elevator chains are guided by lower and upper sprockets, the lower sprockets being mounted in independent suspension on side walls pivotally arranged about the axis of the upper sprockets thereby providing the blades with better mobility.

14 Claims, 5 Drawing Figures





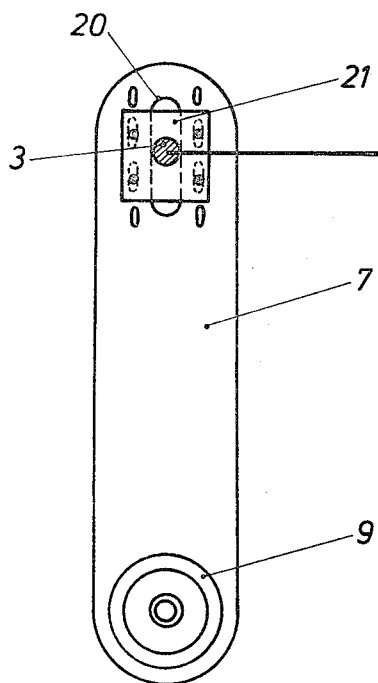


Fig. 3

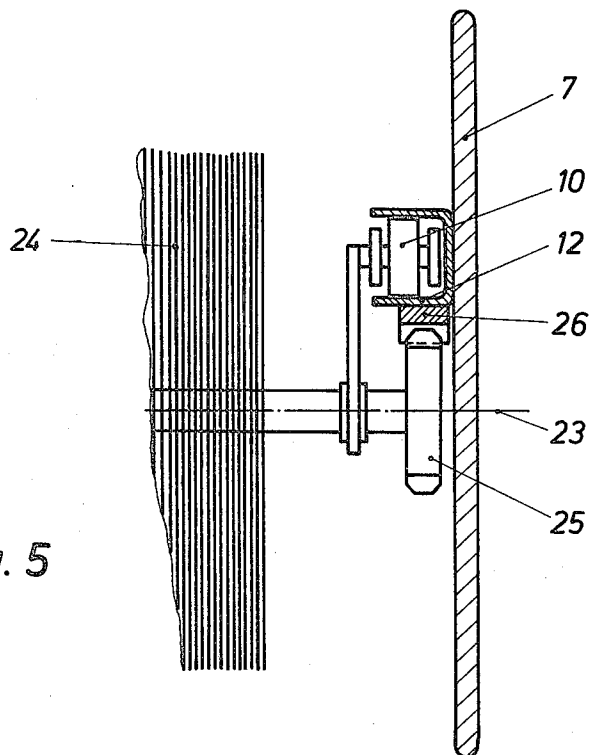


Fig. 5

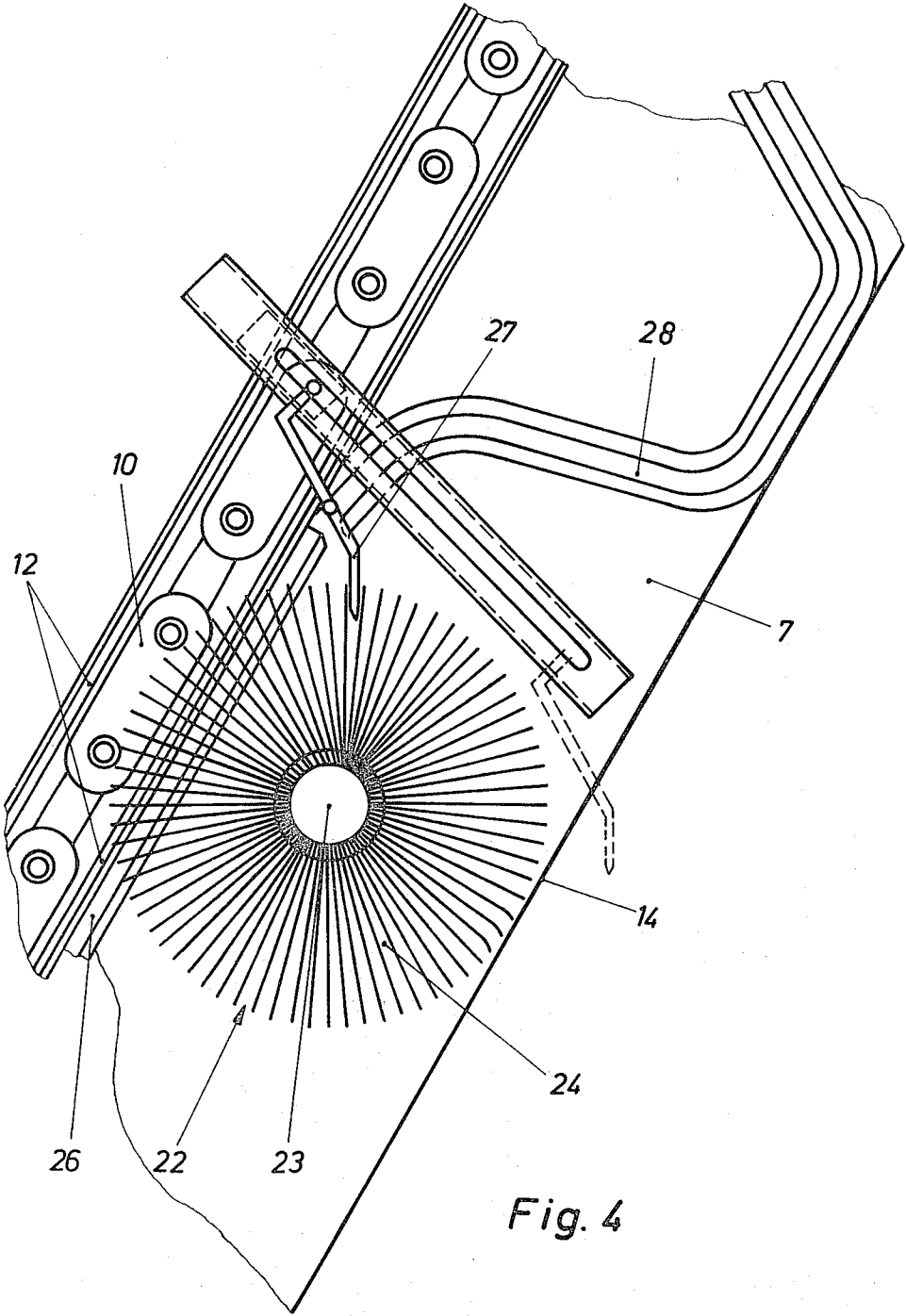


Fig. 4

APPARATUS FOR TAKING FLOATING AND SOLID MATERIALS OUT OF CHANNELS

BACKGROUND AND SUMMARY OF THE INVENTION

This invention is related to apparatus for taking floating and solid materials out of channels, especially channels of clarification plants. The apparatus includes an inclined grate that is transmissible for liquids and extends to the bottom of a channel, the grate changing over into a conveyor chute leading to a discharge outlet. The apparatus further includes a supporting frame and elevator chains guided in side walls by sprockets and provided with a drive motor, the elevator chains supporting blades passing along the grate and the conveyor chute. This apparatus may be used in clarification plants and in pumping plants to clean the pumping liquids before they enter the pump. It is also useful in the textile or leather manufacturing industries for removing fibers and fibre-like materials from liquids.

Known apparatus of this kind is provided with a stationary grate changing over into a conveyer chute. Floating and solid materials are led upward by an elevator and dropped at a discharge outlet. Floating material is all material that moves on or within the specific liquid above the bottom of the channel. Solid material is all material that is guided or moved by the liquid at the bottom of the channel. The elevator includes elevator chains guided in side walls by sprockets and is mounted so that it may turn aside or move toward the stationary grate and conveyer chute to pick up an obstacle of floating or solid materials. However, the two side walls of the elevator can only move at the same angle. Moreover, in some cases the elevator is not movable enough to pick up the obstacle the first time it engages a blade. This restricted mobility is a disadvantage of known apparatus. Arriving obstacles in the channel may therefore engage more than one blade and be brought to another position by these blades before a blade is able to take the obstacles out of the channel. This often causes breakdowns of the apparatus. The apparatus must therefore be cleaned manually to continue working.

It is the object of this invention to overcome these shortcomings of known apparatus and to provide an improved apparatus which permits arriving obstacles in channels to be removed in a short time and which prevents breakdowns of the apparatus even in the case of many obstacles arriving at the same time. Another object of this invention is to enable cleaning of the apparatus, especially the inclined grate and the conveyor chute, during working.

These objects are accomplished according to a preferred embodiment of this invention by mounting the sprockets serving as the lower guide rollers of the elevator chains in independent suspension on the side walls, which are in turn pivoted on the drive shaft supporting the upper sprockets. By the independent suspension of the lower sprockets there is much more mobility of the apparatus at the pick up point. This causes arriving obstacles to be taken out of the channel when they engage a blade the first time. The side walls pivoted on the drive shaft may each deviate at a different angle to the grate and the conveyor chute. This increases the mobility of the blades. Apparatus which is destined for use in wide channels especially includes one or more spacing bars made of or containing elastic material. These spacing bars connect the two side walls

together and give stability to the apparatus. They do not decrease the mobility of the independent suspension too much.

The sprockets serving as the lower guide rollers are tension rollers for the elevator chains and are adjustably and fixably secured to the side walls. It is still more simple where the sprockets serving as the lower guide rollers are to serve as tension rollers for the elevator chains and are pivoted on the side walls to adjustably and fixably secure the side walls to the drive shaft. This permits the radial distance from the ends of the side walls to the drive shaft to be adjusted and fixed for tensioning the elevator chains. Guide tracks are located on the side walls in the area of slack portions and tight portions of the elevator chains. The guide tracks in the area of the tight portions of the elevator chains preclude a lifting of the blades off the grate and the conveyor chute. Thus, during the upward movement of the blades, the picked up materials have no chance to leave the blades. The guide tracks in the area of the slack portions of the elevator chains preclude hanging of the elevator chains at this point and a rapid increase in their length. The guide tracks are rails outflanking the elevator chains from the outside or backside respectively.

The supporting frame is provided with stops for supporting the side walls pivoted to the drive shaft. It is also possible to arrange more stops to fix the angle of motion of the side walls about the drive shaft.

In the upper part of the supporting frame there is provided a stripper mounted on supporting arms. The stripper contacts each arriving blade at the discharge outlet and strips off and discharges the materials thereon. It moves along each blade to the outer edge thereof and then drops into a rest position. In the path of motion of the stripper there is provided a dashpot or a rubber block to produce a force holding the stripper in continuous contact with each successive blade during the stripping motion. Furthermore, the motion of the stripper into the rest position is decreased so that the stripper arrives in its rest position only after each successive blade has passed the area of the stripper.

The grate is transmissible for liquids and may be a comb, a punched-plate screen, a network, or the like. The fabrication of the grate depends on the kind and the size of the materials to be taken out of the channel.

It helps to preclude breakdowns if the elevator chains supporting the blades are provided with at least one cleaning brush. The shaft of the cleaning brush is connected to the elevator chains, and the body of the cleaning brush is occupied by bristles and fitted with a gear. At least one side wall in the area of the tight portions of the elevator chains is provided with a rack corresponding to this gear. The cleaning brush is rotably driven in the area of the tight portions of the elevator chains along the same path as the blades and cleans the grate and the conveyor chute continuously. A comb is also fixed to the elevator chains and located near the bristles of the cleaning brush. Particles removed by the cleaning brush are collected by the comb, which is pivoted on the elevator chains. A guideway in the area of the discharge outlet takes the comb out of contact with the cleaning brush and brings it into contact with the stripper. This cleans the comb during each revolution of the elevator chains.

The inventive concept can be embodied in different manners. A preferred one of these embodiments is shown in the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional side view of apparatus according to the preferred embodiment of this invention taken along the lines I—I of FIG. 2.

FIG. 2 is a sectional front view of the apparatus of FIG. 1 taken along the lines II—II of FIG. 1.

FIG. 3 is a side view of one side wall of the apparatus of FIGS. 1 and 2.

FIG. 4 shows a portion of the apparatus of FIGS. 1 and 2 with a cleaning brush.

FIG. 5 is a front view of the cleaning brush of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, the apparatus according to the preferred embodiment of this invention comprises a symmetrical supporting frame 1 which is fixedly mounted beside a channel 2. The supporting frame 1 includes a drive shaft 3, a coupling 4, and a motor 5. Upper sprockets 6 and 6' are fixedly mounted on the drive shaft 3. Side walls 7 and 7' are pivotally mounted on the drive shaft 3 and are connected to each other by one or more spacing bars 8 made of or containing elastic material. Lower sprockets 9 and 9' are also pivoted on the side walls 7 and 7' in independent suspension. The sprockets 6 and 9 are connected by elevator chain 10, while the sprockets 6' and 9' are connected by elevator chain 10'. Some blades 11 are fixed to these double arranged elevator chains 10 and 10', and guide tracks 12 and 12' are fixed to the side walls 7 and 7'. The guide tracks 12 are positioned in the area of the tight portions of the elevator chains to preclude the blades 11 from getting out of contact with upwardly inclined grate 13 and conveyer chute 14. The guide tracks 12' are positioned on the side walls 7 and 7' in the area of the slack portions of the elevator chains to prevent hanging of the elevator chains and a rapid increase in the length thereof. Especially in FIG. 1 it may be seen how the blades 11 work together with the grate 13 and the conveyer chute 14. As its upper end the conveyer chute 14 changes into a discharge outlet 15, at which the materials to be taken out of the channel drop down and are thereby discharged from the conveyer chute.

The elevator structure comprising the elevator chains 10 and 10' and the side walls 7 and 7' is pivotally mounted on the drive shaft 3. The side walls 7 and 7' may therefore pivot independently of each other about the drive shaft 3. This provides the elevator structure and the blades with good mobility in the area of the channel and causes arriving obstacles to be removed quicker than before. The arriving obstacles may even be removed the first time they come in contact with the blades 11. It is therefore unnecessary for one or more of the blades 11 to bring the obstacles in the area of the grate 13 to other positions several times before the obstacles may be removed by the following blades 11.

Stops 16 are provided on the supporting frame 1 for limiting the motion and, hence, the angle of the elevator structure containing side walls 7 and 7' in one direction relative to the grate 13 and the conveyer chute 14. Additional stops may be mounted on the supporting

frame 1 to block the motion of the side walls 7 and 7' in both directions.

A symmetrical stripper 18 is provided in the upper part of the supporting frame 1. The stripper 18 includes a stripping bar and supporting arms 17 and 17' pivotally mounted on the supporting frame 1. In operation, the stripper 18 contacts each arriving blade 11 at the discharge outlet 15 and strips off the materials thereon. The stripper 18 moves along each blade 11 to the outer edge thereof and then drops down in a rest position. A dashpot 19 or a block of rubber is provided in the path of motion of the stripper 18. This provides a force between the stripper 18 and each successive blade 11, thereby holding these parts in contact to clean the blades 11.

Referring to FIG. 3, there is shown the side wall 7 on which the sprocket 9 serving as the lower guide roller of the elevator chain 10 is pivoted in independent suspension. The side wall 7 includes a slot 20 in the area of the drive shaft 3. A bearing 21 permits the side wall 7 to pivot about the drive shaft 3. The bearing 21 may be adjusted and fixed relative to the side wall 7 to tension the elevator chain 10. A spindle screw may also be provided to simplify adjusting the bearing 21. This enables the distance of the lower sprocket 9 from the drive shaft 3 to be adjusted for tensioning the elevator chain 10.

As best shown in FIGS. 4 and 5, at least one cleaning brush 22 is provided on the elevator chains 10 and 10' in the same manner as the blades 11. The shaft 23 of the cleaning brush 22 is fixed to an elevator chain 10 or 10', and the body of the cleaning brush occupied by bristles 24 is fitted with a gear 25 corresponding to a rack 26 fixed to a side wall 7 or 7'. This rack 26 is positioned in the area of the tight portions of the elevator chains opposite to the grate 13 and the conveyer chute 14. The cleaning brush 22 is rotatably driven by the motion of the elevator chains 10 and 10' in the area of the tight portions of the elevator chains so that the bristles 24 clean the grate 13 and the conveyer chute 14. A comb 27 is also fixed to the elevator chains 10 and 10' to collect particles from the bristles 24. This cleans the brush 22. A guideway 28 is mounted in the area of the stripper 18 and the discharge outlet 15 to take the comb 27 out of contact with the cleaning brush 22 and bring it into contact with the stripper 18. The comb 27 is therefore also cleaned by the stripper 18 during each revolution of the elevator chains 10 and 10'.

I claim:

1. Apparatus for removing floating and solid materials from a channel, said apparatus comprising a support frame; a first vertically inclined member supported by the support frame; said first vertically inclined member including a lower portion comprising a liquid-transmissible grate for extending to the bottom of the channel and further including an adjoining upper portion comprising a conveyer chute leading to a discharge outlet; a drive shaft supported at opposite end portions thereof above the conveyer chute by the support frame; spaced second and third vertically inclined members comprising opposite side walls for the liquid-transmissible grate and adjoining conveyer chute; each of said side walls being supported at the upper end portion thereof by the drive shaft for pivotal movement about the longitudinal axis of the drive shaft independently of the other side wall; first and second pairs of spaced sprockets; each of said first pair of spaced

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sprockets being operatively connected to the drive shaft adjacent to the upper end portion of an associated different one of the side walls; each of said second pair of spaced sprockets being supported at the lower end portion of an associated different one of the side walls; a pair of spaced endless elevator chains supporting a plurality of successively arranged blades adjacent to the liquid-transmissible grate and adjoining conveyer chute; each of said conveyer chains being supported in operative engagement with the sprockets supported at the upper and lower end portions of an associated different one of the side walls to guide the blades supported by the elevator chains along the transmissible grate and adjoining conveyer chute and thereby permit removal of floating and solid materials from the channel; whereby the side walls and, hence, the elevator chains may be independently displaced at different angles relative to the liquid-transmissible grate and adjoining conveyer chute to facilitate removal of floating and solid materials from the channel.

2. Apparatus as in claim 1 wherein the side walls are connected to each other by one or more spacing bars of elastic material.

3. Apparatus as in claim 1 wherein the sprockets supported at the lower end portions of the side walls are tension rollers for the elevator chains and are adjustably and fixably spaced from the sprockets operatively connected to the drive shaft.

4. Apparatus as in claim 1 wherein the sprockets supported at the lower end portions of the side walls are tension rollers for the elevator chains and are pivoted on the side walls about the longitudinal axis of the drive shaft, and wherein the side walls are adjustably and fixably secured to the drive shaft to permit adjustment of the spacing between those sprockets and the sprockets operatively connected to the drive shaft.

5. Apparatus as in claim 1 wherein the elevator chains are provided with guide tracks supported on the side walls in the areas of slack and tight portions of the elevator chains.

6. Apparatus as in claim 5 wherein the guide tracks

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are rails outflanking the elevator chains from one side thereof.

7. Apparatus as in claim 1 wherein the support frame is provided with stops for supporting the side walls at a predetermined position relative to the liquid-transmissible grate and adjoining conveyer chute.

8. Apparatus as in claim 1 wherein the support frame is provided with a stripper mounted on supporting arms in an upper part of the support frame to contact the blades arriving at the discharge outlet and strip the floating and solid materials therefrom, said stripper moving along each successive blade and then dropping into a rest position.

9. Apparatus as in claim 8 including means supported in the path of motion of the stripper for forcing the stripper against each successive blade.

10. Apparatus as in claim 1 wherein the liquid-transmissible grate comprises a comb.

11. Apparatus as in claim 1 wherein the liquid-transmissible grate comprises one of a punched-plate screen and a network.

12. Apparatus as in claim 8 including at least one cleaning brush having a shaft connected to one of the elevator chains, having a body occupied by bristles, and having a gear for rotatably driving the body of the cleaning brush, said apparatus further including a rack corresponding to the gear, said rack being supported on the side wall associated with said one of the elevator chains and being positioned for engaging the gear to rotatably drive the cleaning brush along the liquid-transmissible grate and adjoining conveyer chute.

13. Apparatus as in claim 12 including a comb connected to at least one of the elevator chains and positioned for engaging the cleaning brush.

14. Apparatus as in claim 12 wherein the comb is pivotally mounted on the elevator chains, and wherein a guideway is supported adjacent to the discharge outlet for engaging the comb and moving it out of contact with the cleaning brush and into contact with the stripper.

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