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2,585,719

LIQUID SOLID SEPARATOR

Filed Jan. 3, 1947

2 SHEETS—SHEET 1

Fig. 1

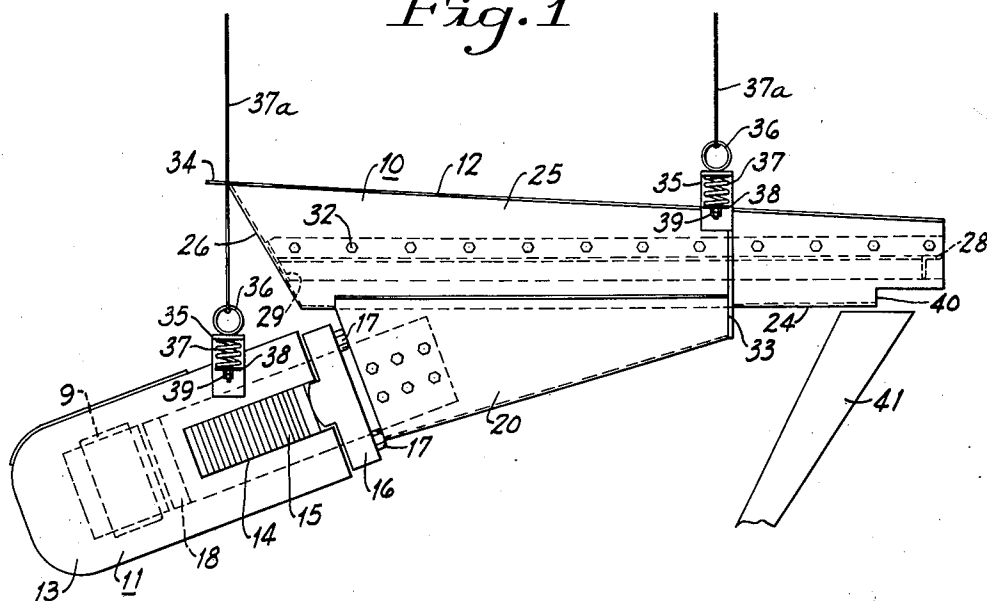
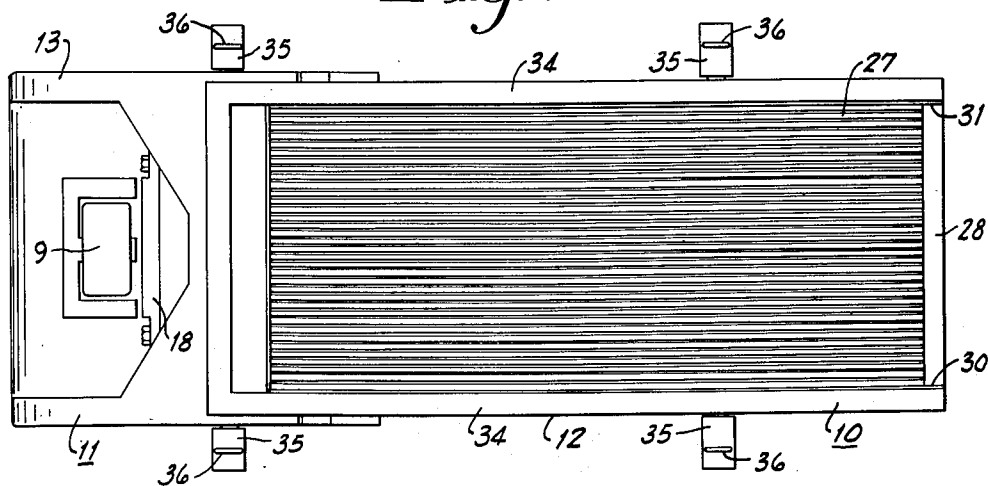


Fig. 2



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2 SHEETS—SHEET 2

Fig. 3

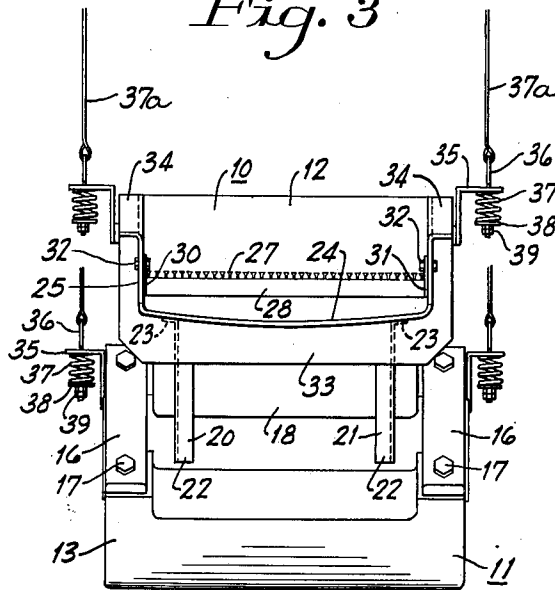
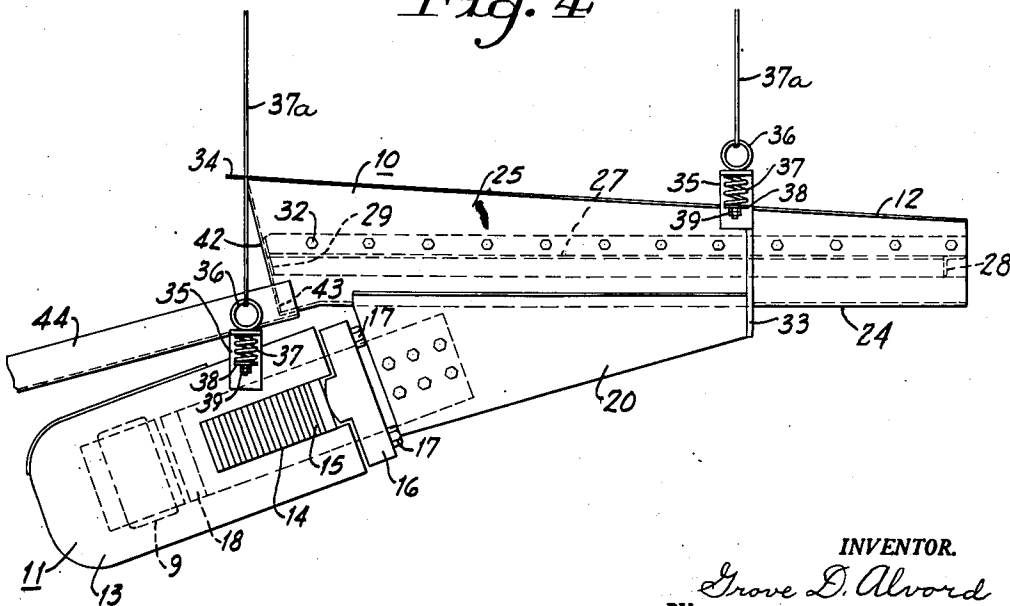


Fig. 4



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LIQUID SOLID SEPARATOR

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This invention relates generally to a method and apparatus for separating liquids and solids such as dewatering material, fragile materials including fruits and vegetables, gravel, coal and other similar materials, and more particularly directed to the method and apparatus for separating liquids from solids as the mixture is conveyed from one position to another.

The principal object of this invention is the method and apparatus for dewatering materials at the time that they are conveyed from one position to another.

Another object of this invention is the provision of a method and apparatus for separating liquids and solids while conveying the latter.

Another object is the provision of a feeder conveyor arranged to precipitate a liquid from a solid as the latter is being conveyed.

Other objects and advantages appear hereinafter in the following description and claims.

A practical embodiment illustrating the principles of this invention is shown in the accompanying drawing wherein:

Fig. 1 is a view in side elevation of a conveyor arranged for dewatering material.

Fig. 2 is a top plan view of the conveyor illustrated in Fig. 1.

Fig. 3 is an end elevation of the conveyor illustrated in Fig. 1.

Fig. 4 is a side elevation of a conveyor arranged to separate a liquid from a solid, a solid being conveyed in one direction and the liquid being discharged in the opposite direction.

Referring to Figs. 1 to 3 of the drawings, the conveyor 10 consists of the vibratory motor 11 and the conveyor trough 12. The vibratory motor 11 contains an electromagnetic field member 9 within the heavy motor casting 13. The sides of the casting 13 are provided with the slots 14 for receiving the ends of a series of leaf springs 15 which are secured at their ends to the base casting 13 by the T-shaped clamping bar 16 fastened by means of the bolts 17. The armature 18 of the vibratory motor is secured to the intermediate portion of the leaf springs 15 and is held in spaced relation with the electromagnetic field member 9 to provide a magnetic coupling therebetween. A pair of spaced rigid triangular plate members 20 and 21 are secured at one end to the armature member 18. The lower edges of the plate member 20 and 21 are provided with the inturned reinforcing flanges 22. The upper edges of the plate members 20 and 21 are provided with the outwardly projecting flanges 23 which are welded or otherwise secured to the underside of the floor 24 of the conveying trough 12. With this structure a lineal vibratory motion of the armature is transmitted to the conveyor at

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an angle of approximately 20° which provides a vibratory conveying action thereto. The side walls 25 of the conveying trough 12 are formed integral with the floor 24. The back end of the side walls and floor of the conveying trough are formed integral with the rear wall 26. This conveying trough must be made of relatively heavy material so that it is incapable of vibrating save as a unit.

A wedge bar screen conveying surface 27 is mounted in the conveying trough intermediate the floor and the top of the walls. As shown each of these wedge bars are shaped to provide a relatively wide top surface and a relatively narrow bottom edge as shown in Fig. 3 and are preferably welded in spaced relation to the cross members 28 and 29 which maintain the bars in fixed relation and provide a rigid conveying floor surface. The ends of the cross bars 28 and 29 are secured to the longitudinal members 30 and 31 which in turn are secured to the sides 25 of the trough by means of the series of the bolts 32.

The front end of the plates 20 and 21 together with the floor and side walls of the trough 12 are welded or otherwise secured to the U-shape hanger member 33 which terminates at the underside of the outwardly projecting flanges 34 along the top of the side walls 25 of the conveyor trough. Angle brackets 35 are secured to the upper end of the hanger member 33 which are provided with openings for receiving the hanger eye bolts 36. Resilient means such as the coil springs 37 are positioned between the spring seats 38 and the angle brackets 35 and are held by means of the nuts 39 for the purpose of resiliently supporting the front end of the feeder conveyor. The lower ends of the cables 37a are secured to the eye bolts 36 for the purpose of suspending the front end of the conveyor trough from the ceiling. The rear end of the feeder conveyor is supported by a similar angle bracket 35 secured to the sides of the motor base member 13 and provided with a similar resilient means for suspending the rear end of the feeder conveyor from the ceiling.

It will be noted that the floor 24 of the conveyor trough 12 terminates short of the end of the conveyor surface 27 as indicated at 40. When suspending the vibratory feeder on the cables 37a, the rear end of the feeder is made slightly higher than the front end of the feeder so that liquids will flow down the incline sloping conveyor trough floor 24 and will be discharged from the end 40 and received by the collector 41 which directs the liquid to any suitable receptacle. If the floor 24 and the material conveying surface 27 are disposed parallel with one another it is necessary to hang the feeder con-

veyor with the rear end tilted higher than the front end to produce an incline plane that will cause the water to be discharged at the front of the conveyor trough. An angle of one or two degrees to the horizontal is sufficient to effect the flow of liquid to the front of the conveyor trough. If it is desirable to maintain the material conveying surface 27 in a horizontal position, then the longitudinal members 30 and 31 may be secured to the side walls 25 of the conveyor trough to provide a slope of from one to two degrees relative to the floor 24 of the trough. With a structure of this character the suspension cables are adjusted to support the material conveying surface 27 in a horizontal plane and the floor 24 of the trough will then slope downwardly and forwardly at an angle from one to two degrees.

If it is desired to remove the liquid from the conveyor trough at the back end the rear wall 42 of the conveyor trough may be provided with an opening 43 arranged to discharge the liquid into the chute 44 which may be directed to any suitable container. In this instance the conveyor trough is supported with its front end slightly higher to permit the water to flow back along the floor 24 and be discharged into the chute 44 whereas the material is fed along the conveying surface 27 to the front of the conveyor trough. If the conveyor surface 27 and floor 24 of the conveyor trough are disposed at an angle to one another converging at the front end of the feeder, the feeder trough will of course be supported to position the conveying surface 27 in a horizontal plane and the liquid will then travel rearwardly down the floor 24 of the trough to the chute 44.

The conveying rate of the spaced wedge bar screen conveying surface 27 of solid particles is substantially the same as that obtainable by the use of a solid trough surface. The flowing motion transmitted to the material by the vibratory action of the conveyor causes the solid particles of material to move forwardly at a substantially uniform rate while inertia and gravity are effective on the liquid portion of the material causing it to flow vertically downwardly through the wedge bar screen conveying surface 27 to the bottom 24 of the conveyor trough. Owing to the fact that the wedge bar conveying surface 27 is substantially horizontal or disposed at a small angle, the liquid will not flow along the upper and under surface of the bars but will drop to the trough floor 24. Thus as the conveyor feeds the material forwardly the liquid is caused to precipitate downwardly with no tendency to flow horizontally with the solid.

Vibratory conveyors of the type shown when operated on 60 cycle alternating current will produce 3600 vibrations per minute which will rapidly draw the water from the material as it is conveyed over a relatively short distance on the conveying surface 27. With the vibratory movement of the character provided by the angular disposed motor 11, there is no splattering of the liquid in the air or relative to the solid as the latter flows along the conveyor and the water flows down and along the bottom 24 to discharge.

A vibratory feeder movement is obtained on the wedge bar screen conveying surface, such as shown at 27, when it is substantially horizontal and very fine material may be conveyed along this surface even though it is materially smaller in diameter than the spacing between the wedge bars. For example approximately ninety per cent of certain materials of 100 mesh size may be

conveyed along the wedge bar conveying screen surface 27 when the spacing between the wedge bars is substantially greater than that of a 40 mesh size. Thus a feeder conveyor of this type is decidedly inefficient as a dry classifier but highly efficient as a dewaterer or liquid and solid separator and it allows the use of a much larger screen mesh for a conveying surface than would be otherwise possible with any other type agitating separator.

When separating relatively large particles of clay from clay slip or slurry the wedge bar conveying surface 27 may be replaced by screen cloth conveying surface of a mesh incapable of passing the undesirable sized particles. The material is then passed over the screen and the usable slurry is withdrawn, the larger particles being discarded or returned for crushing and reprocessing. This structure is also applicable for use in removing unslacked lime from milk of lime. The separation of liquids from solids by this method is speedy and efficiently accomplished.

I claim:

1. A dewatering apparatus for wetted fruit and vegetables comprising a rigid unitary structure including a trough having solid bottom and side walls and a rigid screen of spaced parallel bars secured to each other and providing a smooth continuous longitudinal conveyor surface in the trough, said screen conveyor surface being supported from said side walls of said trough and spaced above the trough bottom with the bars disposed longitudinally of the trough, resilient means supporting the rigid unitary structure of the trough with the screen in a substantially horizontal plane, and an electromagnetic motor mounted to reciprocate the trough and screen at a high frequency and low magnitude to precipitate the liquid from the wetted fruit and vegetables to the bottom of the trough where it is run off while simultaneously conveying the fruit and vegetables from one end of the screen to the other, and a discharge means for directing the precipitated liquid from one end of the trough bottom and in spaced relation from the position where the materials are discharged from the screen to independently control the liquid and materials from the time immediately after they are separated.

2. The structure of claim 1 characterized in that said discharge means includes means defining a recess in said trough bottom adjacent the position where the materials are discharged from the screen.

3. The structure of claim 1 characterized in that said discharge means is located at the opposite end of the screen from the position where the materials are discharged.

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