May 9, 1967 D. GROW 3,318,446

CLEANING AND SEPARATING DEVICE

Filed May 14, 1965 2 Sheets-Sheet 1

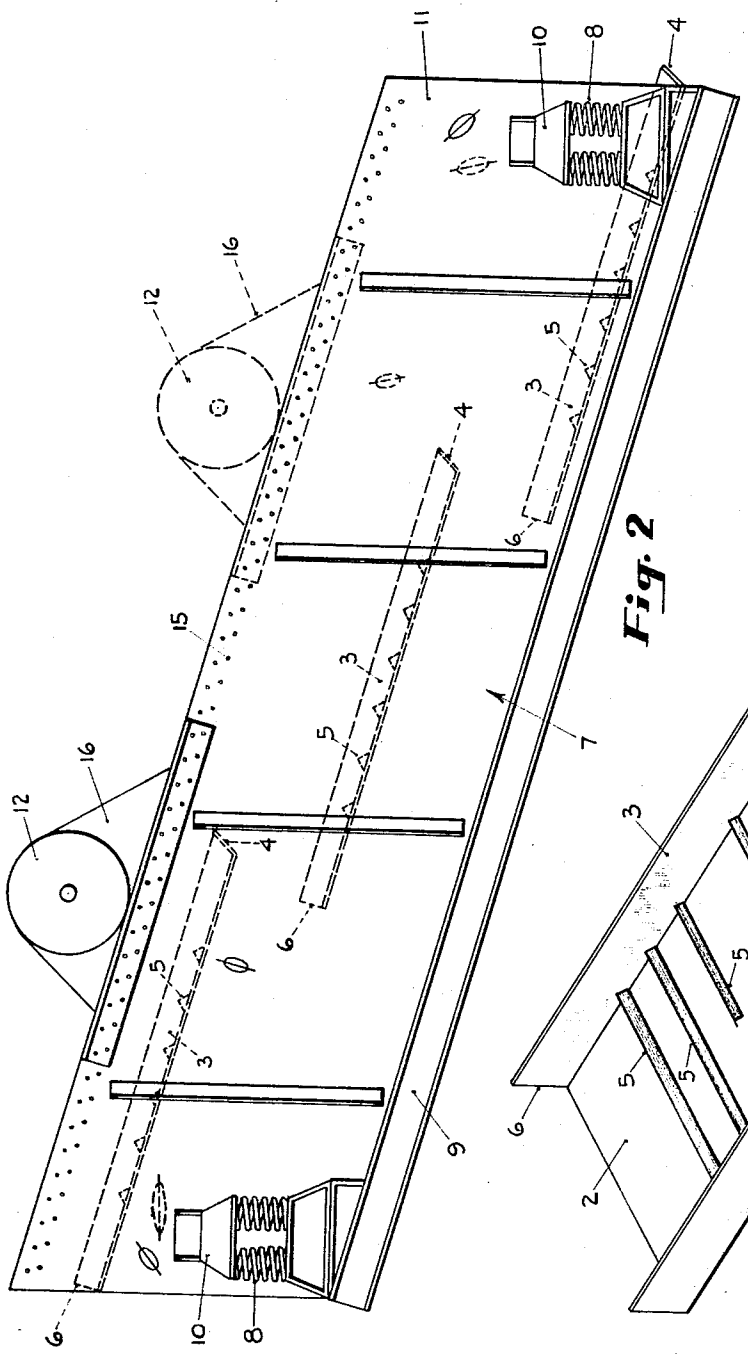


Fig. 2

Fig. 1

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CLEANING AND SEPARATING DEVICE

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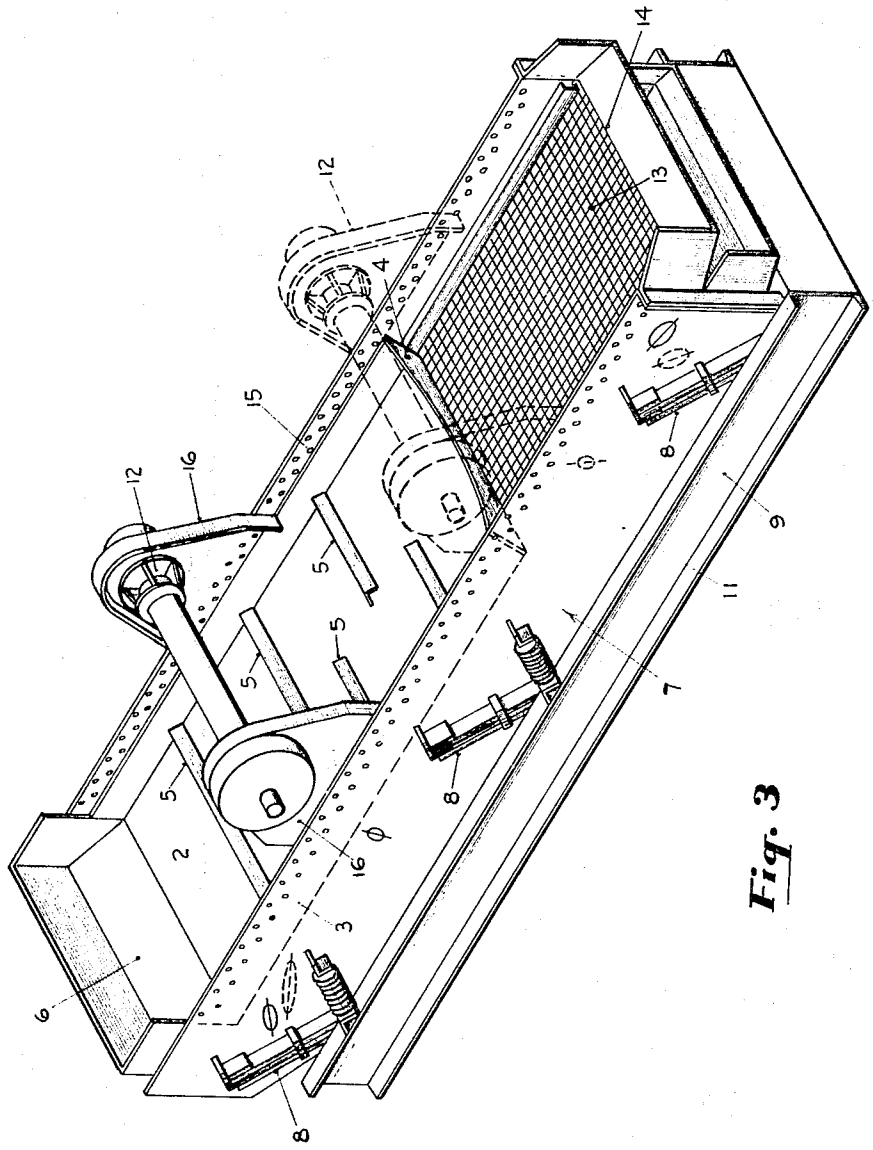


Fig. 3

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3,318,446

CLEANING AND SEPARATING DEVICE

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2 Claims. (Cl. 209—3)

This is a continuation-in-part of my patent application, Ser. No. 227,890, filed Oct. 2, 1962, now abandoned.

This invention relates to a method and apparatus for cleaning aggregate and more particularly to a method and apparatus for cleaning crushed stone to remove dirt, sand, and other extraneous matter therefrom.

In the cleaning of aggregates of this type, two systems have been utilized. In the one system, the aggregate is placed in a tumbler type of device such as rotating cylinder where it is tumbled in water so that the water removes the dirt from the aggregate material during a washing process. In this type of device, it has been found desirable to first remove the sand by a dry screening process. Because of the slow speed of this type of device, there is insufficient agitation to remove the light sand and dirt from its association with the stones. In the second system, the aggregate is continuously fed into a trough or tank having a helical agitator in the center thereof. The aggregate is passed through this device continuously with water. Here again it is desirable to remove as much of the foreign matter as possible by dry screening for the same reason as explained earlier. Both of these devices are slow speed causing the fine material to act as a cushion between the larger particles thereby impeding cleaning rather than assisting cleaning.

In the method and apparatus of this invention, a water slurry of the material to be cleaned is passed over a vibrating conveyor designed to convey the material therealong. This conveyor is provided with suitable baffles or obstructions to impede the progress of the slurry causing it to be agitated to a sufficient degree that the combination of the action of the vibrator and the agitator properly cleans the agregate. At the discharge end of the vibrating conveyor there is provided a barrier over which the clean aggregate moves and drops onto a suitable screen or storage area. This barrier retains a mass of the material in close proximity to it so that the particles in close contact with one another scrub one another and remove all the dirt and other loose material. The vibrating unit is movable along the length of the assembly to control the rate of travel of the material over the cleaning device to suit the specific requirements.

An object of this invention is to provide a device which will suitably clean aggregate material and render it unnecessary to dry screen the material prior to exposure to this process.

Another object of this invention is to provide a method of cleaning aggregate in which the material to be cleaned is placed in a slurry and vibrated and agitated simultaneously as it moves along a predetermined course.

In order that this invention may be more readily understood, it will be described in connection with the attached drawings; in which

FIGURE 1 shows a schematic view of the device of this invention;

FIGURE 2 shows a side view of a conventional screening device with several of the devices of this invention in position therein; and

FIGURE 3 shows an isometric view of a conventional two-deck sifting device in which a portion of the top deck embodies this invention and the remainder has a conventional screen.

Referring to FIGURE 1, there is shown a conveying surface for a vibrating conveyor comprising a plate **2**

made of steel or other suitable material having sides **3**, and an end barrier **4**. Fastened to the plate **2** are a plurality of baffles or obstructions **5**. The material to be cleaned is fed onto the plate from the end **6** and passes over the baffles **5** as it moves along the vibrating plate **2**. This movement is caused by the angle of vibration of the conveyor which causes the material to bounce along the conveyor in short increments. In the embodiment illustrated, the first two of these baffles **5** extend across the entire width of the plate **2** from one side **3** to the other side **3**. The remainder of the baffles **5** extend only to the center line of the plate **2** or slightly beyond and are staggered with respect to one another along the length of the conveyor.

As the material to be cleaned is fed in a water slurry onto the plate **2** at the end **6**, it first encounters the two horizontal baffles **5** which cause it to tumble thereover. The series of four staggered half-length baffles causes the material to weave from side to side as well as tumble. This action increases the intensity of agitation. The speed of vibration of the plate is about 1400 cycles per minute. It has been found that a better cleaning job is accomplished at this high cyclic rate if the sand and small gravel material is in the slurry. This is due to the scouring effect resulting from such action.

As the slurry moves up to the barrier **4**, the clean material tumbles over the top while the barrier retains a mass of the material and the continued vibratory motion causes the particles to contact one another and scrub themselves. As the material passes over the barrier it is clean and the water carries all the dirt with it through a suitable discharge system.

Referring to FIGURE 2, there is shown a conventional inclined screening device **7** mounted on springs **8** on the rigid support **9**. The springs engage the projections **10** secured to the side plate **11** of the frame of the screening device. A suitable ecentric drive **12** such as shown in Patent No. 2,312,477, provides the oscillatory cyclic motion for the screening device. In the embodiment shown in FIGURE 2, three of the devices shown in FIGURE 1 are provided so that the material passes over one and falls onto the second and moves from that onto the third. These devices in this embodiment function in exactly the same manner as described in connection with FIGURE 1. If desired, the bottom-most device of FIGURE 2 may be replaced with a screen of a mesh size suitable to retain the desired aggregate while permitting the dirt, etc. to pass through the screen and be accumulated on a suitable deck positioned therebeneath.

In FIGURE 3 there is shown a modification of the invention in which the plate **2** and the screen **13** are on the same plane on the top deck of a screening device. In this embodiment the aggregate merely passes over the barrier **4** and any dirt and water which passes over with the aggregate falls through the screen **13** onto the deck beneath while the clean material passes out the exit end **14** of the device. In this embodiment, the oscillatory motion is imparted by the eccentric **12** and the device is mounted on springs **8** which are anchored to the rigid support **9**. The cleaning takes place while the aggregate is passing over the solid plate **2** and the separation of the clean material from the dirt is accomplished as the material passes over the screen **13**.

It will be understood, of course, that a plurality of decks of screens **13** may be provided so that various sizes of aggregate can be segregated simultaneously with this cleaning operation.

The rate of passage of the material over the cleaning device can be carefully controlled by adjusting the horizontal angle of the device or by properly locating the vibratory unit **12** with respect to the overall length of the device. In the latter case, the vibratory device **12**

imparts orbital motion to the particles passing over the cleaning device. The portion of the device immediately beneath the vibratory device has a circular orbital motion. The orbital path of particles at the ends of the device will be elliptical with the axis of the ellipse tipped at an angle toward the course of the vibratory motion. The greater the distance between the vibratory unit and the point in question, the more the angle of the major axis of the elliptical orbit approaches the horizontal. The more horizontal the angle, the greater effect it has on the speed of the material moving over the device.

With this arrangement, if material is fed to the scream which requires a great deal of initial vibratory motion to break up caked material prior to cleaning, the vibratory unit **12** should be placed close to the entrance end of the device. By this arrangement the material is held for a longer period of time at the entrance end of the device.

In those instances where it is desirable to slow the discharge of material from the device, this can be accomplished by placing the vibratory unit **12** over the discharge end. In this manner a device of this type can be used in instances where the supply of material to the end of the device is slow and intermittent while it is desired to have a continuous even flow from the discharge end.

In order to move the vibratory unit **12** to its desired location, the top edge of the sides **11** is provided with a series of holes **15** in staggered arrangement for anchoring the vibratory unit **12**. The upright supports **16** which mount the vibratory unit **12** on the device are provided with complimentary holes along their lower edges so that anchoring bolts can pass through the holes in the sides of the screening device and the support and hold the support in firm engagement with the screening device. It is essential that this mounting arrangement be firm to prevent any movement between the upright supports **16** and the sides **11** because such movement would shear the bolts.

In the operation of this device the aggregate to be cleaned is fed on to the end of the device **2** in the form of a water slurry. The device **2** is vibrated at an angle so as to cause any material in engagement therewith to advance along the bottom surface at a predetermined rate of speed. This rate of speed is determined by the cyclic rate of oscillation and the angle at which the oscillation is applied. As the material moves along the device the oscillating device sets up vibrations in the slurry causing a scouring or abrasive action between any fine granular material and the larger aggregate. The baffles insure a tumbling and weaving action as the material moves along the device, insuring a thorough agitation of the material while it is being vibrated. Also, the barrier at the end of the device insures a close commingling of the particles to insure a scrubbing action just prior to the final separation of the aggregate from the fluid carrier.

It will be obvious from the foregoing that this invention provides a method and apparatus which may be suitably used for cleaning and separating aggregate all in one simple operation.

I claim:

1. A device for cleaning crushed stone in a mixture of said crushed stone, dirt, sand and other extraneous matter associated therewith comprising, a vibrating conveyor provided with sides at right angles to the bottom plate of said conveyor and extending on a line parallel to the direction of vibration of the conveyor, means for introducing a water slurry of said mixture onto said bottom plate at one end thereof, barrier means positioned across the other end of said conveyor, and a plurality of baffles affixed to the bottom of said conveyor spaced along the conveyor from feed in end to the discharge end, said baffles at the feed in end extending the entire width of the conveyor, and the remainder of the baffles extending from the sides to the center-line of the conveyor and being staggered with respect to one another along a portion of the length of said conveyor means for imparting vibratory motion to said vibrating conveyor, and means for positioning said vibratory unit at any desired location along the length of said conveyor, said barrier means impeding the progress of the mixture and causing particle contact and scrubbing just prior to discharge from said conveyor.

2. The cleaning device of claim **1** further including means for separating the cleaned stone from the mixture flowing over said barrier means.

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