

[54] PORTABLE VIBRATING SCREENER

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[22] Filed: Nov. 28, 1969

[21] Appl. No.: 880,707

[52] U.S. Cl. 209/259, 209/405, 209/409

[51] Int. Cl. B07b 1/28

[58] Field of Search.....209/346, 403, 405, 408, 319,
209/352, 353, 332, 331, 366.5, 259, 409

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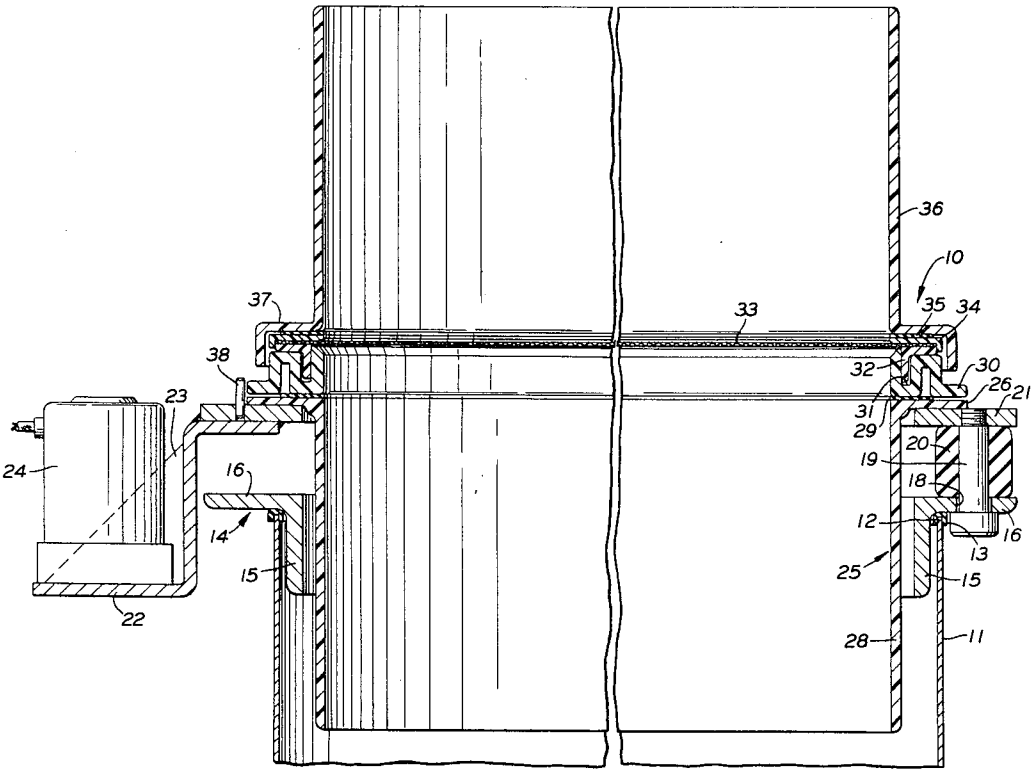
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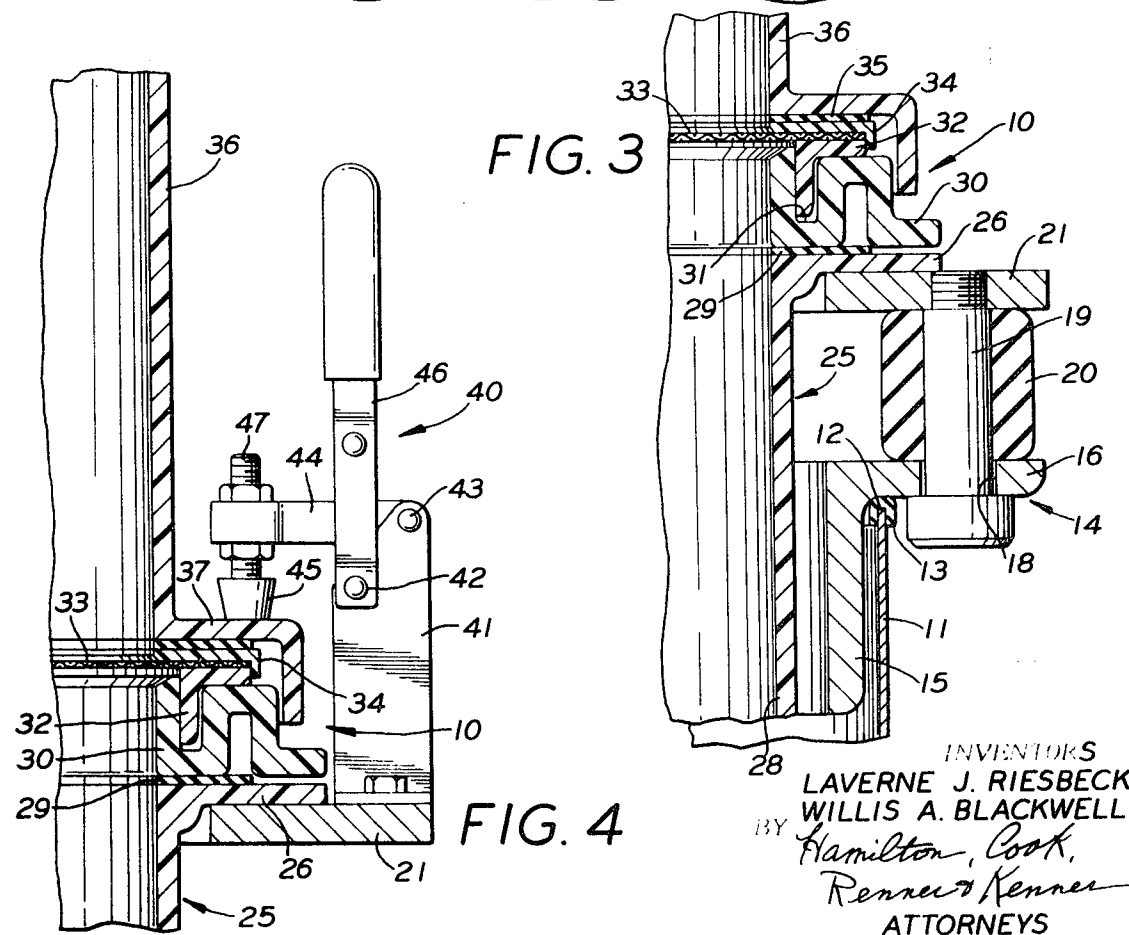
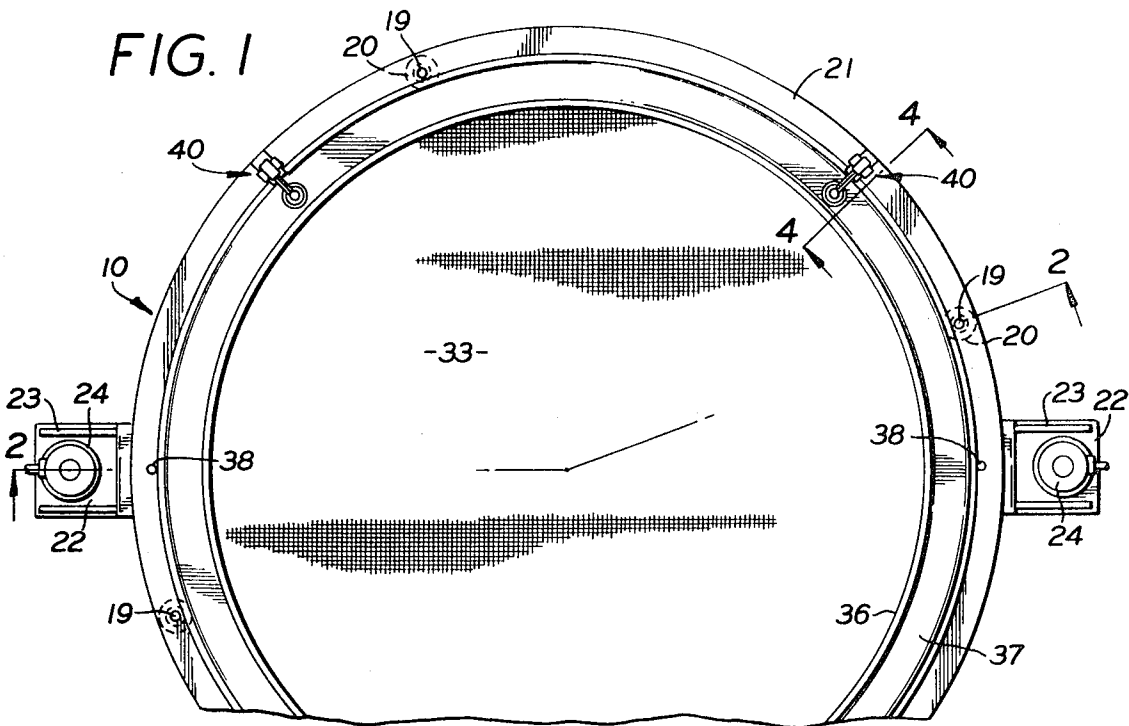
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[57] ABSTRACT

A portable material separator to be used with a container having an opening of any shape in the top thereof. A vibrating device is attached to a plane which rests on a plurality of cushions. The cushions are mounted on a base plate which fits within the opening in, and rests on top of, the container. A screen spans the opening in the container and is mounted in a frame which rests on the plate and therefore receives vibrations therefrom. A clamping means holds the above described assembly in a properly spaced relationship.

9 Claims, 4 Drawing Figures





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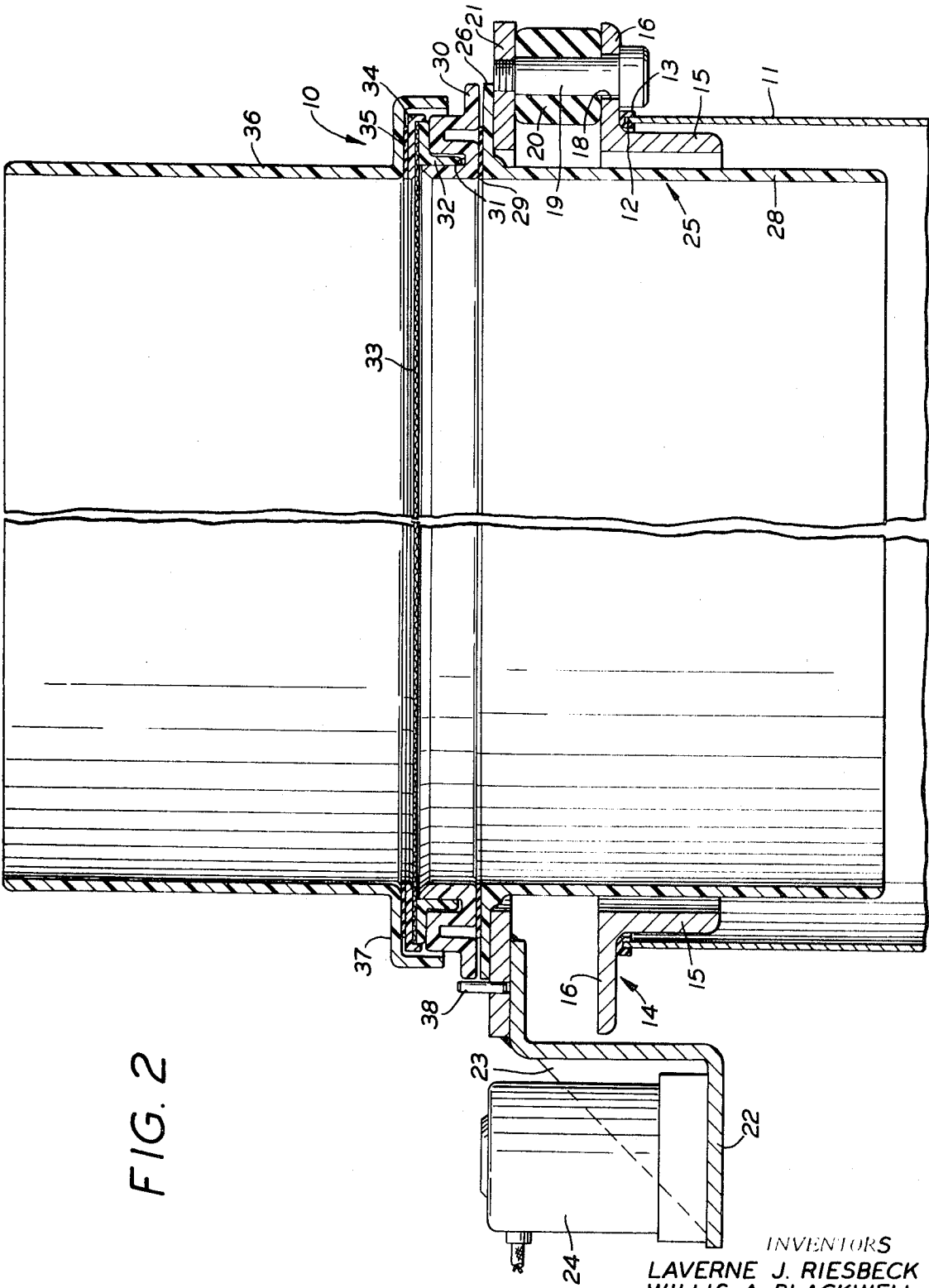


FIG. 2

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PORTABLE VIBRATING SCREENER

BACKGROUND OF THE INVENTION

This invention relates to a vibratory screening device such as that used in many industrial material separating applications. More specifically, this invention relates to a portable screening device for use primarily in batch separating procedures.

Many industries utilize material separators such as that shown in our U.S. Pat. No. 3,463,315 to classify their raw material, their final product or their intermediate product by size. Such machines generally consist of a plurality of stacked screening sections wherein the material to be separated is continuously fed into the machine to be passed through a plurality of screens, each successive screen having a finer mesh, until the material is classified by size. A rotary vibratory force on the screens forces the material out through a chute at the periphery of each screening section. Such a system can be known as a continuous classifying process, a plurality of products being continually obtained.

Other industrial uses of a material separator involve what can be known as a batch process where a certain quantity of material is fed through one screen to determine whether any over-size or undesirable product is present. In the paint and chemical industries, for example, this procedure is usually carried out just prior to packaging, as in 55 gallon drums, as a last minute check.

Heretofore, such batch operations have been carried out primarily on the expensive and heavy machinery described hereinabove which has its primary use in continuous processes. This is not satisfactory for many reasons. First, the plurality of screen sections found in the continuous process are unnecessary in most batch processes, only one product being obtained in the latter. Further, the vibrating means which imparts a centrifugal type force to the material in the classifying machinery is not necessary in the batch process, where most everything is "through" material, it only being necessary to break the surface tension with a smaller vibratory force having no horizontal component. Finally, it is not economically sound for the industrialist to purchase the large and expensive continuous classifying machinery for his packaging department (where much of the batch procedure is undertaken). Nor is it convenient to carry out the packaging process at the same location of the plant as the classifying process.

Further, if the continuous classifying machinery is utilized, it is often difficult to combine the packaging step with the batch screening check step since the continuously flowing output material would somehow have to be fed into the packages directly. Such a procedure would require a complex conveying system carrying a series of packages side by side so that none of the continuously flowing product would be wasted.

It should be evident from the above discussion that the continuous material classifying machines are heavy stationary devices neither suitable for economically justifiable batch operations nor for facile movement. The non-portable nature of these machines can often be detrimental. For example, it is nearly impossible to provide a material separating machine at a truck unloading site in a plant, yet it is often necessary to check a sample of the material being delivered before unloading to determine if it will meet specifications. It would be highly convenient if such a test could be run at the unloading site rather than at a remote laboratory, the latter process taking unnecessary time and effort.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a vibratory screening device which is lightweight, compact, and therefore portable for use primarily in batch operations but also usable in continuous separating operations.

It is another object of the present invention to provide a device, as above, which can be used directly in the packaging of the product being classified or checked.

These and other objects which will become apparent from the following specification are accomplished by the improvements hereinafter described and claimed.

In general, the screening device constructed according to the concept of the present invention consists of a frame member which is adapted to fit within and rest upon the opening in the top of any shaped container, the frame having a depending flange extending within the top of the container. A vibrator is mounted on a plate which is resiliently carried on the frame member by a plurality of cushioning means. A mounting frame carrying a screen therein is rested on the plate so that vibrations from the vibrator are transmitted to the screen. The mounting frame is kept in continued contact with the vibrating plate by means of holding devices such as clamps. A guiding frame may be provided to direct all the input material to the screen.

A preferred embodiment of the present invention is shown by way of example in the accompanying drawings and is hereinafter described in detail without attempting to show all of the various forms and modifications in which the invention might be embodied, the invention being measured by the appended claims and not the details of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary top plan view of the preferred embodiment of the vibratory screening device of the present invention.

FIG. 2 is an enlarged fragmentary sectional view taken substantially along line 2—2 of FIG. 1.

FIG. 3 is an enlarged section of a portion of the vibratory screening device shown in FIG. 2.

FIG. 4 is a sectional view taken substantially along line 4-4 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The portable vibrating screener constructed according to the concept of the present invention is indicated generally in the drawings by the numeral 10 and shown in FIGS. 2 and 3 as being used in conjunction with a standard 55 gallon cylindrical drum 11, chosen here only as representative of a number of containers with which the screener assembly 10 could be utilized. Placed on the top annular lip 12 of drum 11 is an annular rubber channel gasket 13 which, as will hereinafter become evident, cushions certain undesirable vibratory effects and otherwise dampens irritating noise.

Resting on gasket 13 is a lower annular base frame 14 being L-shaped in cross-section having an axially directed leg or flange 15 extending into drum 11 and a radially directed leg or flange 16 resting on gasket 13 and extending outwardly beyond the periphery of drum 11. The flange 15 can be made of a size to fit conveniently within the particular container 11 chosen and thus serves to center or align the screener 10 with the container 11. The radially directed leg 16 is provided with a plurality of circumferentially spaced bores 18 which receive a fastening means 19 therethrough. As shown in FIGS. 2 and 3, it should be evident that the head of each fastening means 19 being associated with the frame 14 also assures that proper centering or aligning of the frame 14 is maintained, much as flange 15 described above. Telescopically received around each fastening means is a cushioning means 20 shown herein as a rubber cylindrical spring-like member. Resting on the cushioning means 20 and attached to the fastening means 19 is an annular vibrator plate 21 which can be made of plastic or other suitable material. Welded or otherwise affixed to plate 21 are two S-shaped vibrator mounting brackets 22 located 180° of each other and having side supporting gusset plates 23. A vibrating means 24 is affixed to each mounting bracket 22. The vibrating means shown herein is an electromagnetic 3,600 r.p.m. vibrator of the type described in U.S. Pat. Nos. 3,404,299 and 3,345,525. However, it is evident that any standard vibrating device could be utilized; for example, an air vibrator could provide the necessary vibratory forces.

Further, any number of these vibrators could be employed. It has been found that for most applications only one vibrator is needed, and in almost all other situations, two vibrators will suffice. Therefore, a standard vibrating plate 21 is shown as having two brackets 22 mounted thereon. However, any number of brackets could be provided and the desired number of vibrators mounted thereon.

An annular L-shaped skirt 25 has a short radially extending leg 26 which rests upon plate 21, and an axially downwardly extending longer leg 28 which, as will hereinafter be evident, acts as a protecting skirt and guide so that material will not collect or lodge in the hollow areas near cushioning means 20 and its associated members. A flat annular gasket 29 is positioned atop leg 26 of skirt 25 which, like gasket 13, protects the vibrating parts from wear and otherwise deadens any undesirable vibration noise.

Resting on gasket 29 is an annular plastic vibrating ring 30 of the type more fully described in our U.S. Pat. No. 3,463,315 to which reference is made for such details as may be necessary to fully understand this invention, it being evident that any standard screen holding ring would operate satisfactorily. Mounting ring 30 has a substantially vertical recess 31 therein into which is received and fastened one leg of an angle iron 32. Welded or otherwise attached to the other leg of iron 32 is a screen cloth 33 which spans or overlies the opening in the container 11 and may be of any desired mesh. An annular screen protecting cap 34 is affixed to that portion of the outer perimeter of the screen which is fixed to the iron 32.

Another damping gasket 35 is positioned on protecting cap 34 and an upper input guiding frame 36, having a radially extending flange 37, rests on gasket 35. Frame 36 can be of plastic or stainless steel and can be made of any desired height depending on the amount of input material to be fed to the vibrating screen 33.

To place the members just discussed in proper alignment with the annular opening of the drum 11, there are provided at least two dowel-like pins 38 which, as shown in FIGS. 1 and 2, extend upwardly from plate 21. The two pins 38 shown in FIG. 1 are spaced at a diameter just greater than that of the mounting ring 30 so that ring 30 can be centered therebetween.

To maintain the proper horizontal alignment of the members between plate 21 and frame 36, and to maintain close vertical contact of said members so that the vibrations are transmitted to the screen 33, a plurality of circumferentially spaced holding means, such as clamps 40, are provided. Each clamp 40 is a commercially available item and will not be described in great detail. The body portion 41 of clamp 40 is bolted to plate 21 and has at its upper end two pivot points 42 and 43. A clamp arm 44 is rotatable on pivot 43 and has an adjustable rubber holding lug 45 thereon. A bifurcated locking handle 46 is pivoted about point 42. When the members between plate 41 and frame 36 are properly assembled, clamp arm 44 is positioned so that the lug 45 rests on the radial flange 37 of frame 36, the height and holding force being adjusted by the screw 47. The locking handle 46 is then lifted to its vertical position, shown in FIG. 4, and the clamp arm 44 is locked in place. It should be evident that the force of the clamps 40 should not be too great so as to hinder the vibratory forces imparted to the members by the vibrator 24.

In operation, the vibrator or vibrators 24, being attached to brackets 22 which are in turn mounted on plate 21, impart vibrations to plate 21 which is resiliently mounted on the circumferentially spaced cushions 20. Vibrations to plate 21 are, of course, transmitted to screen 33 and the material fed into frame 36 will pass therethrough.

It should now be evident that the structure disclosed herein can be readily assembled and disassembled for cleaning the parts, for portable use, and for storage when not in use. Further, use with one type of standard container in many industries, the 55 gallon drum, has been shown. If other containers are used, the diameter or shape of the screening members need only be changed to correspond thereto. It is evident

that packaging departments could utilize a number of the devices described herein and that the final step of checking for oversize particles before packaging can now be readily combined with the packaging process. It should also be clear that the barrel and frame assembly being quite lightweight could be mounted on a wheeled chassis to be transported by hand anywhere in the plant where power is available, including a truck discharge bay. Further, while the above device has been described for batch operations, it is evident that one skilled in the art could readily adapt the structure disclosed herein to design a portable continuous separator. For example, one would only need to provide a second screen and a discharge port at some point along the height of a specially designed container 11 to provide a device having outlets for two particle sizes.

It has been found that a portable screener constructed according to the concept of the present invention will carry out the aforementioned objectives and substantially improve the screening art.

We claim:

1. A material screening device for use with a container capable of collecting material passing through the screen and having an opening in the top thereof defined by a lip comprising, base frame means resting on the lip of the container having associated therewith a means for aligning the screening device with the container and having an opening therein substantially corresponding to the opening in the top of the container, a vibrator plate resiliently mounted on said base frame means and having an opening therein substantially corresponding to the opening in the top of the container, vibrating means attached to said vibrator plate, screen mounting means carrying a screen for overlying the opening in the container and resting on said vibrator plate, and means holding said screen mounting means on said vibrator plate so that vibrations from said vibrating means are transmitted to said screen whereby at least some of the material placed on said screen will pass through said screen and the openings in said vibrator plate and base frame means and into the container.

2. A material screening device according to claim 1 having an input guiding frame resting on said screen mounting means and held thereagainst by said means holding said screen mounting means on said vibrator plate.

3. A material screening device according to claim 1 wherein said means for holding said screen mounting means on said vibrator plate is a clamp permanently affixed to said base frame and adapted to selectively engage and hold said screen mounting means.

4. A material screening device according to claim 1 wherein cushioning means between said base frame and said vibrating plate provide the resilient mounting therebetween.

5. A material screening device according to claim 1 having means for centering said screen over the opening in the container.

6. A material screening device according to claim 5, wherein said means for centering said screen comprises dowel pin means extending upwardly from said base frame adapted to center said screen mounting means on said base plate.

7. A material screening device for use with a container having an opening in the top thereof comprising, base frame means for resting on the top of the container, a vibrator plate resiliently mounted on said base frame means, vibrating means attached to said vibrator plate, screen mounting means carrying a screen for overlying the container and resting on said vibrator plate, skirt means extending downwardly into the container so as to guide the material into the container and prevent the material from lodging between said base frame means and said vibrator plate, and means holding said screen mounting means on said vibrator plate so that vibrations from said vibrating means are transmitted to said screen.

8. A material separating device comprising, a container means for receiving material through an opening in the top thereof, a base frame resting on the upper edge of said container and having an opening therein, said base frame includ-

ing a means for maintaining alignment with said container means, a vibrator plate resiliently mounted on said base frame and having an opening therein, vibrating means attached to said vibrator plate, screen mounting means carrying a screen which spans the opening in said container means and rests on said vibrator plate, and means holding said screen mounting means on said vibrator plate so that vibrations from said vibrating means are transmitted to said screen whereby a selected portion of the material to be separated placed on said screen is passed through said screen, base frame and vibrator plate and into said container means.

9. A device for screening material into a container comprising, a base frame having an opening therein, a vibrator plate

resiliently mounted on said base frame and having an opening therein, means to align said base frame and said vibrator plate with the container, means to vibrate said vibrator plate attached to said vibrator plate, screen mounting means for carrying a screen means for overlying the openings in said base frame and said vibrator plate and resting on said vibrator plate, means holding said screen mounting means on said vibrator plate so that vibrations from said vibrating means are transmitted to said screen means whereby at least some of the material placed on said screen means will pass through said screen means and the openings in said vibrator plate and said base frame and into the container.

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