

April 1, 1969

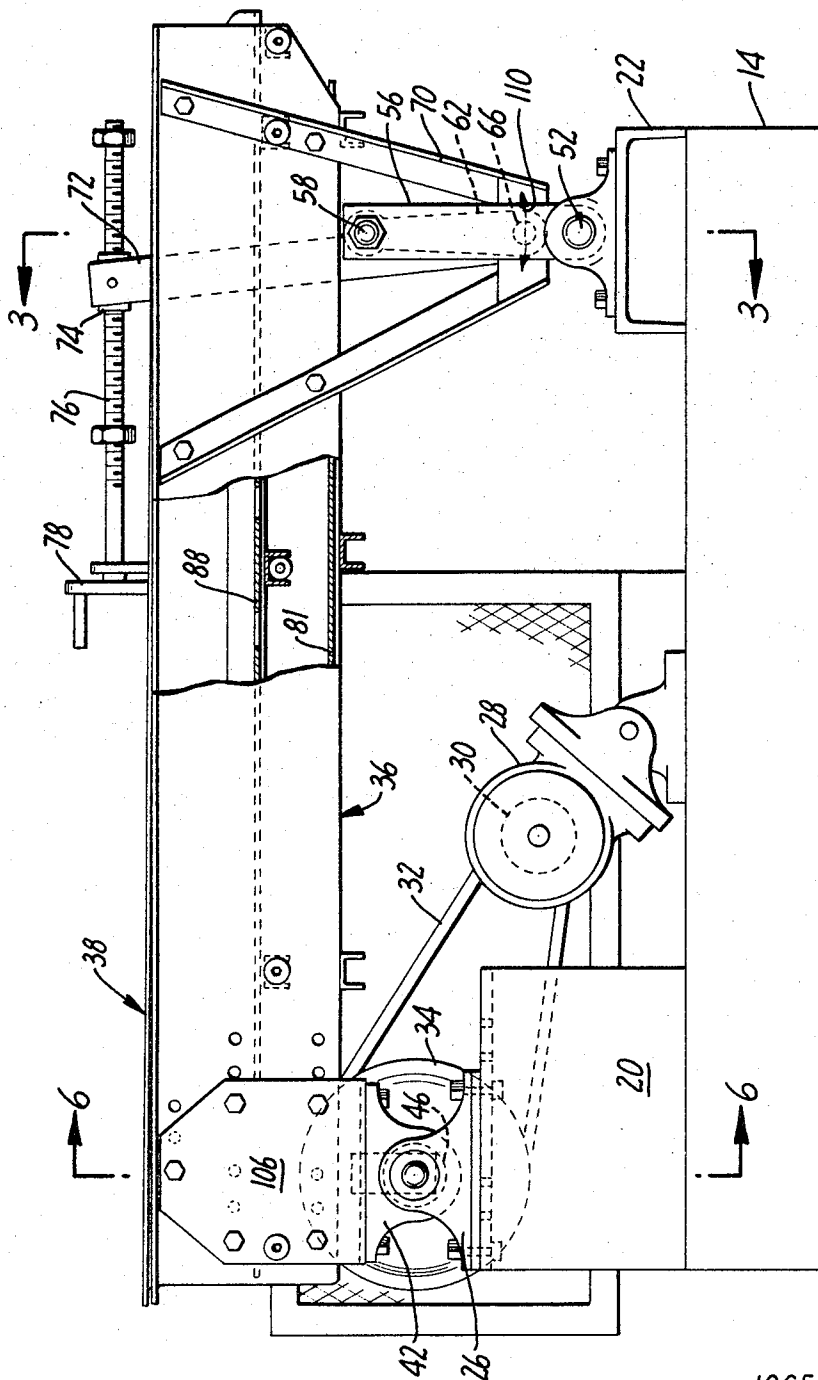
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3,435,690

SUSPENSION AND CONTROL MECHANISM FOR SHAKER TABLE

Filed Jan. 19, 1967

Sheet 1 of 5



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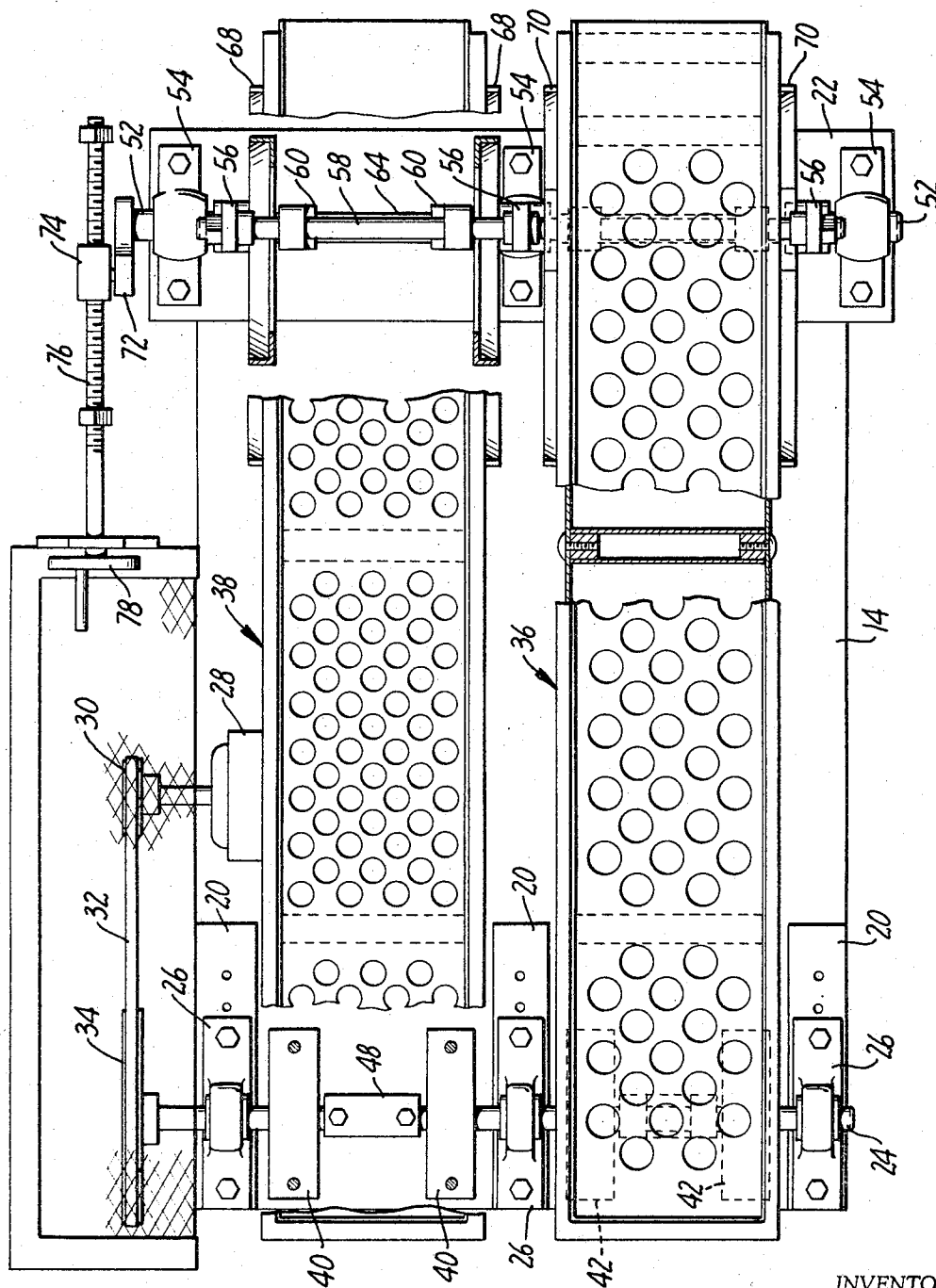
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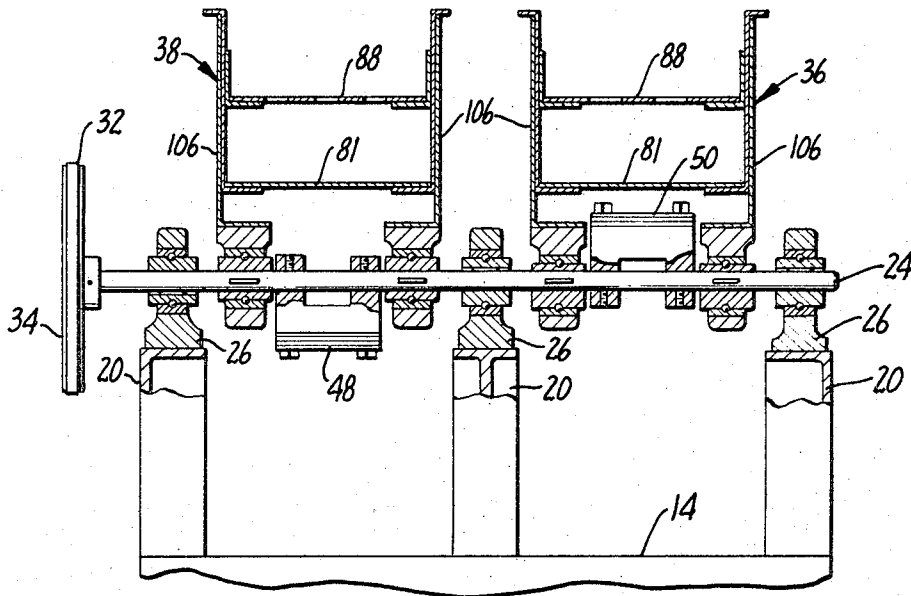


FIG. 6.

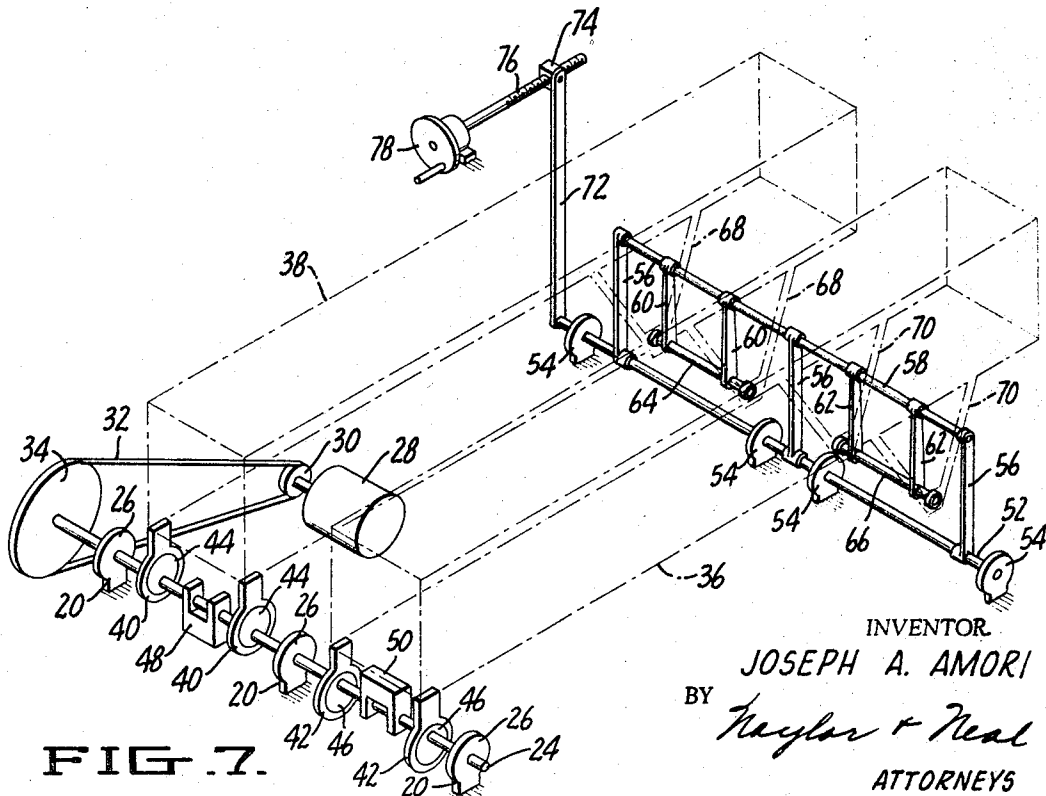


FIG. 7.

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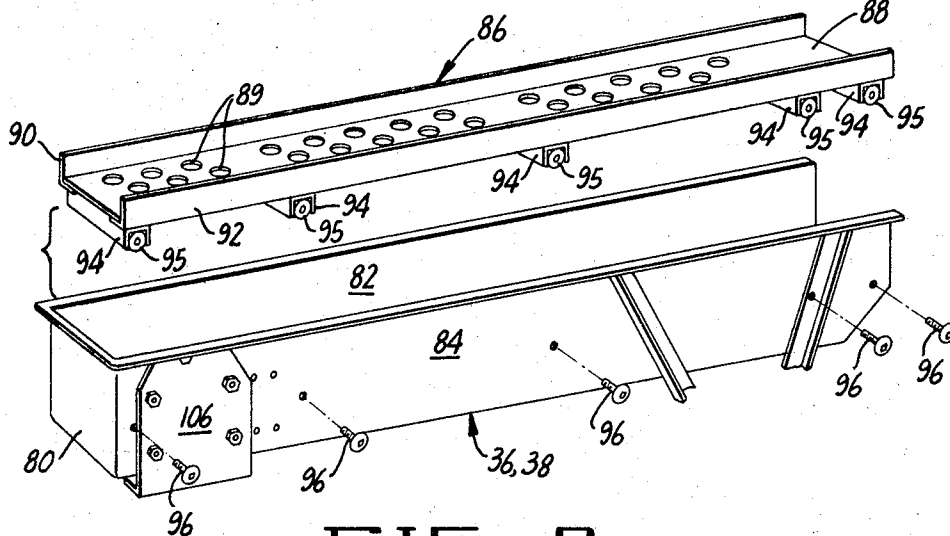


FIG. 8.

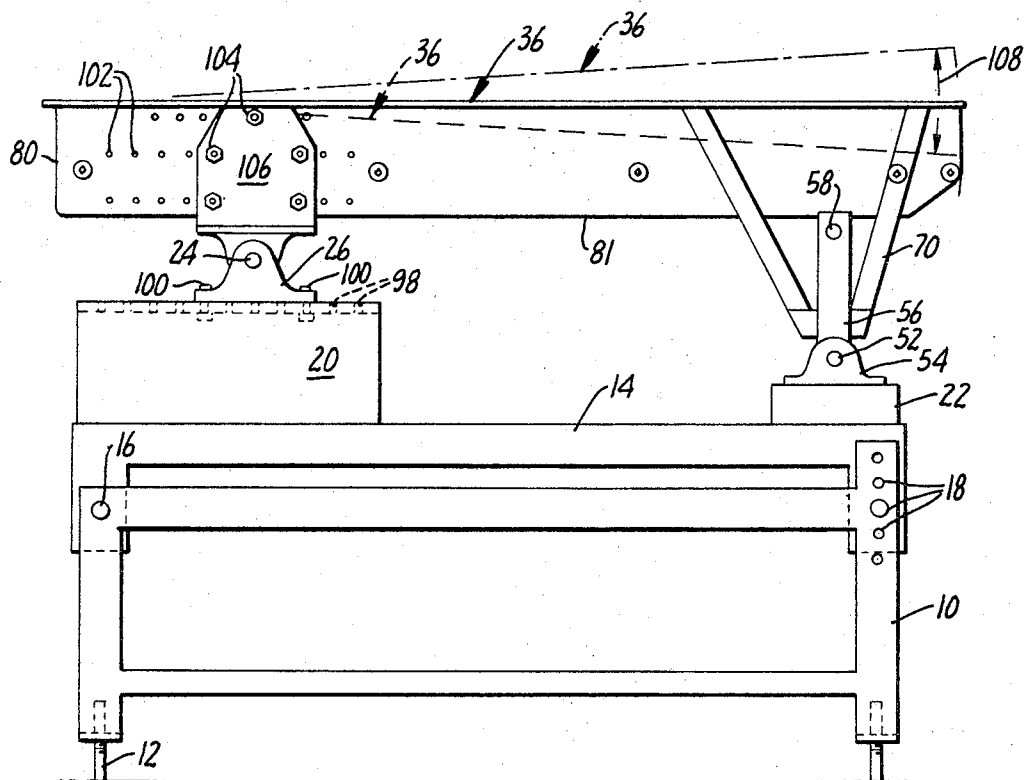


FIG. 9.

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SUSPENSION AND CONTROL MECHANISM FOR SHAKER TABLE

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5 Claims

ABSTRACT OF THE DISCLOSURE

A twin bed shaker table, the head ends of the beds being driven in circular paths of small radii by a common headshaft, through 180° offset eccentrics, having 180° offset counterweights, and the tail ends of the beds being adjustably supported for mutually offset arcuate oscillatory movement through a rigid linkage system and a single setting and control means therefor to control the rate and direction of material flow along the beds between zero rate and a maximum rate in each direction.

Summary of the invention

In a twin, or multiple pair, bed shaker table system, the provision of bed head mounting means enabling high speed operation with optimum balancing out of vibratory forces in combination with bed tail mounting and adjustment means enabling selective control of the amplitudes of horizontal and vertical movement of the tail ends of the beds and thereby the rate and type of movement of material thereover.

Brief description of the drawings

FIG. 1 is a partly broken away view in side elevation of a preferred form of the machine embodying the invention;

FIG. 2 is a partly broken away top plan view of the machine in FIG. 1;

FIG. 3 is a view, partly in section, taken along lines 3—3 of FIG. 1;

FIG. 4 is a view taken along lines 4—4 of FIG. 3 and illustrating one extreme position of adjustment of the bed tail supporting and movement controlling means;

FIG. 5 is a view similar to that of FIG. 4 but illustrating the other extreme position of the adjustment of the bed tail supporting and movement controlling means;

FIG. 6 is a view, essentially in section, taken along lines 6—6 of FIG. 1;

FIG. 7 is a view in perspective showing semischematically the bed head supporting and drive means and the bed tail supporting and movement controlling means;

FIG. 8 is an exploded view in perspective of the parts of one of the beds of the shaker table; and

FIG. 9 is a view in side elevation of a further modification of the invention embodying means for controlling over a substantial range of the angle of tilt of the beds.

Referring to the drawings, the machine comprises a base frame 10 (FIG. 9) which may be provided with adjustable feet 12, a bed frame 14 which may have a pivotal connection 16 and selective tilt adjustment connections 18 with base frame 10, vertically disposed flanged web members 20 (see FIG. 6) secured to bed frame 14, and a transverse frame member 22 secured to frame 14.

Shaft 24, rotatably supported in bearings 26 mounted

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atop web members 20, is provided with drive means comprising motor 28, motor output sheave 30, belt 32, and sheave 34 secured to shaft 24. Shaker units 36 and 38 are each connected to shaft 24 through a pair of bearings 40, 42 and a pair of eccentrics 44, 46 (FIGS. 6—7), the latter being keyed to shaft 24. Eccentric pair 44 is offset 180° from eccentric pair 46. Adjustably fixed to shaft 24 are eccentric weights 48 and 50, weight 48 being 180° offset from eccentric pair 44, weight 50 being 180° offset from eccentric pair 46, and the weights 48 and 50 being offset 180° from each other.

Shaft 52 (FIGS. 3 and 7) is rotatably supported for adjustment in bearings 54 mounted atop frame member 22. Fixedly secured to shaft 52 are the lower ends of support links 56, the upper ends of which support hanger shaft 58. Hanger link pairs 60, 62 are rotatably supported by hanger shaft 58, link pair 60 carrying a stub shaft 64 which has a rotative supporting connection with the tail end of shaker unit 38, and link pair 62 carrying a stub shaft 66 which has a rotative supporting connection with the tail end of shaker unit 36. More specifically the ends of stub shafts 64 and 66 are journaled in V-frame pairs 68, 70 which in turn depend from and are fixedly secured to shaker units 38, 36.

Means (FIGS. 1—3 and 7) are provided to rotatably adjust shaft 52 to thereby selectively position hanger shaft 58 forwardly of shaft 52 (FIG. 4), rearwardly of shaft 52 (FIG. 5) or directly above shaft 52 (FIGS. 1, 2 and 9), said means comprising crank arm 72 fixedly connected to shaft 52, block 74 pivotally connected to arm 72, jack shaft 76 threadably engaged with block 74 and supported, relative to the frame, for rotative movement but against endwise movement, and handwheel 78 secured to shaft 76.

The shaker units 36 and 38 are each comprised of head end wall 80, a bottom imperforate wall 81, side walls 82 and 84, and a removable screen deck assembly indicated generally by 86 (see FIG. 8). Screen deck 86 is comprised of a bottom wall 88 having selectively sized grading or sorting apertures 89, side support and stiffener channels 90 and 92, bottom support and stiffener channels 94, and resilient support plugs 95 housed within the ends of channels 94 and adapted to receive mounting bolts 96 through bolt apertures formed in side walls 82 and 84.

Means are provided to selectively position the eccentric drive mechanism 24—50 lengthwise of the head ends of the shaker units 36 and 38, said means comprising (see FIG. 9): a plurality of sets of selectively usable apertures 98 formed in the upper flange ends of web members 20 and adapted to accommodate the mounting bolts 100 for bearings 26; and a plurality of sets of selectively usable apertures 102 formed in the side walls 82 and 84 of the shaker units 36 and 38 and adapted to accommodate bolts 104 of mounting plates 106 connected to the eccentric bearings 40, 42.

Positioning of the eccentric drive mechanism 24—50 progressively farther away from the head ends of the shaker units causes a progressively greater lift action, or amplitude of vertical movement, to be imparted to the head ends of the units, and thus the provision for selective positioning of the eccentric drive mechanism increases the variety of movement controls which may be exerted over the material being handled. For shaker units of relatively short length, the optimum placement position for the eccentric drive mechanism is immediately below the center

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of weight of the units and their movement supporting and drive systems. When so located all of the vertical vibratory forces are damped out along with the horizontal vibratory forces.

The provision of pivot means 16 and adjustment means 18 (see FIG. 9) enables the control of screen slope within the range indicated by the double-headed arrow 108 (FIG. 9). This taken together with the adjustability of the support links 56 makes for a fine degree of control over the rate and pattern of movement of material in the shaker units.

The tail end support system of FIGS. 4-5, with links 56 extending upwardly and links 60, 62 extending downwardly, enables the angular positioning of links from their FIG. 1 position to their FIG. 4 or FIG. 5 position without materially changing the height or slope of the tail ends of the units, i.e., when the axis of shaft 64 is at the mid-point of each of the throw paths 110, 112 and 114, the tail end of unit 38 has the same height and is horizontally disposed.

In practice, the throw of the eccentrics may vary from a minimum of $\frac{1}{8}$ inch, for which throw the speed of shaft 24 is normally 2500 r.p.m. and above, to a maximum of about $\frac{5}{16}$ inch, for which throw the shaft speed is normally 1500-1600 r.p.m.

When the links 56 are in the vertical position, the bed frame 14 being horizontal, the path of movement of the stub shafts 64, 66, and hence the tail ends of the shaker units, is as is indicated by the double-headed arrow 110 (FIG. 1), there being essentially no movement of material toward the discharge ends of the units. When the links 56 are inclined as shown in FIG. 5, the path of movement of the stub shafts 64, 66 is as is indicated by the double-headed arrow 112 (FIG. 5), material flow being toward the head ends of the units. When the links 56 are inclined as shown in FIG. 4, the path of movement of the stub shafts 64, 66 is as is indicated by the double-headed arrow 114 (FIG. 4), this position, assuming it to be the maximum setting of the links 56 away from the vertical and toward the head ends of the units, providing for the highest rate of material discharge from the beds of the shaker units.

The over-riding objective of the invention is to provide an oscillation system for graders which enables the graders to shake the product being processed and grade the same with high efficiency without shaking the floors on which the graders are installed. With the machine described this objective is fully accomplished. The machine need not be anchored to the floor inasmuch as the vibrations are counterbalanced, or damped out, so well that any tendency of the machine to creep over the floor is more than offset by the mere frictional engagement between machine and floor.

Important to the attainment of this over-riding objective are the following features and characteristics of the machine: the twin beds, single headshaft drive for both of them, and the 180° offset relation of one bed to the other arising out of the similarly offset relation of one eccentric pair to the other, of one weight to the other, and of each weight with respect to its associated eccentric pair; and the provision of the rigid, i.e., nonfree floating, but freely swingable tail end support system comprising shafts 52, 58, 64 and 66 and links 56, 60 and 62.

The vibrational forces are so well damped out in the machine described that two or more sets of twin beds can be installed on the same frame, either in pyramid fashion, i.e., where an upper pair feeds the head ends of a lower pair, the discharge ends of the latter being below and underneath the head ends of the former, or in step-down fashion, i.e., where the upper pair feeds the head ends of a lower pair, both pairs feeding material in the same direction, without setting up objectionable vibrational forces.

It is to be pointed out the positional disposition of the eccentric drive mechanism as in FIG. 9, i.e., a substantial

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distance away from head end walls 80, provides for a variable multimotion of the grading screens throughout their length, the motion being ovaloid at the head ends of the screens, circular above and in the general region of shaft 24, and thereafter from ovaloid to essentially straight line.

What is claimed is:

1. In a machine of the class described including a pair of shaker beds having head ends and tail ends disposed in side by side relation, the combination thereof with of:

(A) support and drive means for the head ends of said beds including:

- (1) a single drive shaft rotatably mounted in frame-supported bearings;
- (2) two pairs of eccentrics carried by said shaft, one pair having a bearing connection with one of said beds and the other pair having a bearing connection with the other of said beds, said pairs being angularly offset 180° from each other;
- (3) a pair of counterweights fixed on said shaft, angularly offset 180° from each other, one of said counterweights being associated with one pair of eccentrics and being angularly offset 180° therefrom, the other of said counterweights being associated with the other pair of eccentrics and being angularly offset 180° therefrom; and

(B) support means for the tail ends of said beds including:

- (1) a first support shaft mounted in frame-supported bearings for rotative movement;
- (2) a plurality of first links fixedly secured to said support shaft and extending upwardly therefrom;
- (3) a second support shaft carried by said links; and
- (4) a plurality of second links pivotally connected at one end to said second shaft and at the other end to the tail ends of said beds.

2. The combination of claim 1, including means connected to said first support shaft to rotatably adjust the same and thereby control the angle of oscillation of the tail ends of said beds.

3. The combination of claim 2, said drive shaft, pairs of eccentrics and counterweights being disposed fully below the level of said shaker beds, and including means for selectively positioning said drive shaft, pairs of eccentrics and counterweights lengthwise of said beds.

4. The combination of claim 1, said second links extending downwardly from said second support shaft.

5. In a machine of the class described including a pair of shaker beds having head ends and tail ends disposed in side by side relation, the combination thereof with of:

(A) support and drive means for the head ends of said beds including:

- (1) a single drive shaft rotatably mounted in frame-supported bearings;
- (2) two pairs of eccentrics carried by said shaft, one pair having a bearing connection with one of said beds and the other pair having a bearing connection with the other of said beds, said pairs being angularly offset 180° from each other;
- (3) a pair of counterweights on said shaft angularly offset 180° from each other, one of said counterweights being associated with one pair of eccentrics and being angularly offset 180° therefrom, the other of said counterweights being associated with the other pair of eccentrics and being angularly offset 180° therefrom; and

(B) means supporting the tail ends of said beds for

oscillatory movement which is independent of the speed of rotation of said drive shaft.

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