July 23, 1940. W. J. PARKS 2,208,596

RECIPROCATING SCREEN

Filed Sept. 1, 1937 2 Sheets-Sheet 1

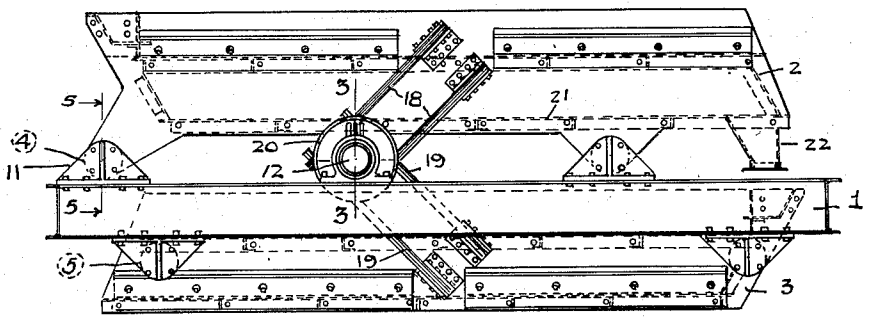

Fig. 1

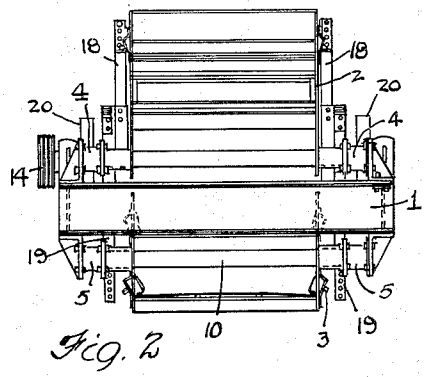

Fig. 2

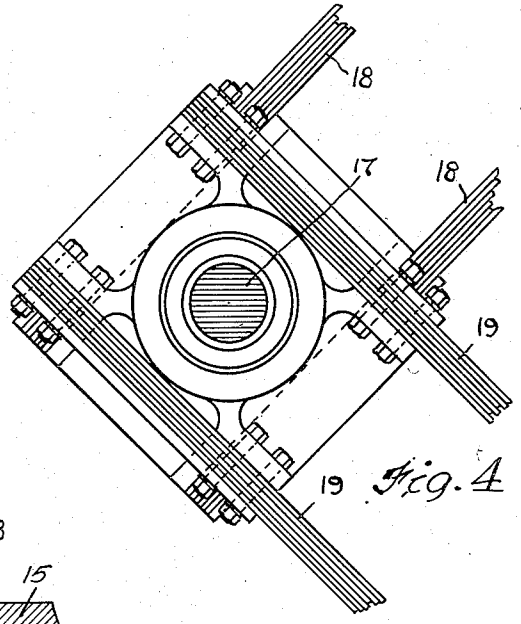

Fig. 4

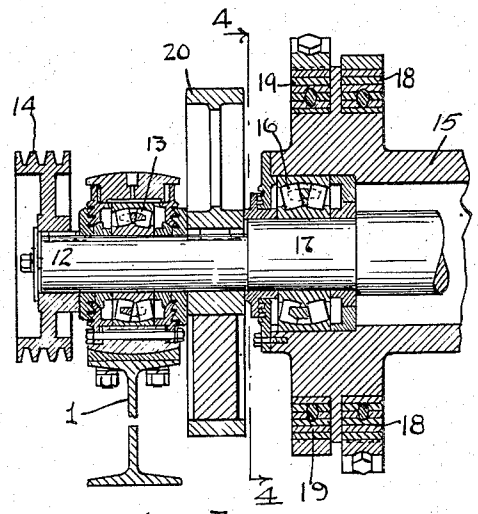

Fig 3

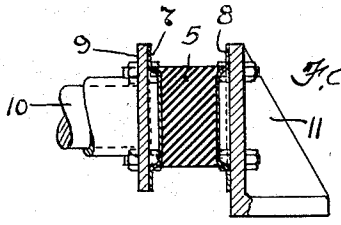

Fig. 5

INVENTOR.
Walter J. Parks
BY Jay Oberlin & Jay
ATTORNEYS.

July 23, 1940. W. J. PARKS 2,208,596

RECIPROCATING SCREEN

Filed Sept. 1, 1937 2 Sheets-Sheet 2

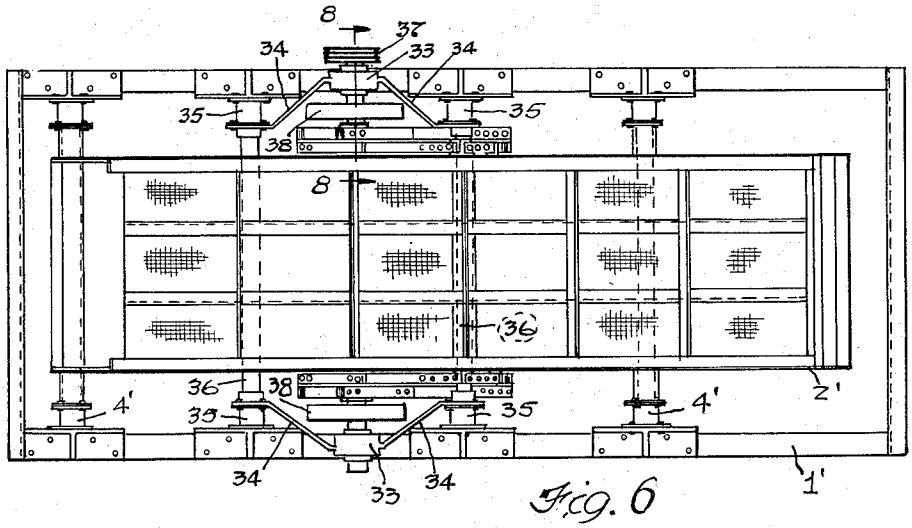

Fig. 6

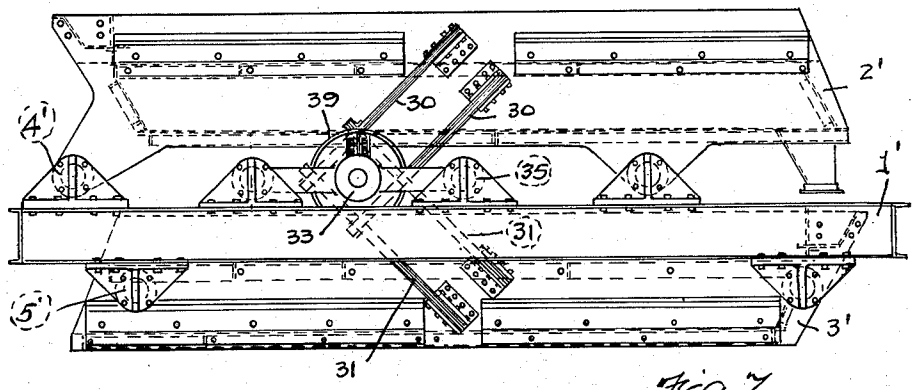

Fig. 7

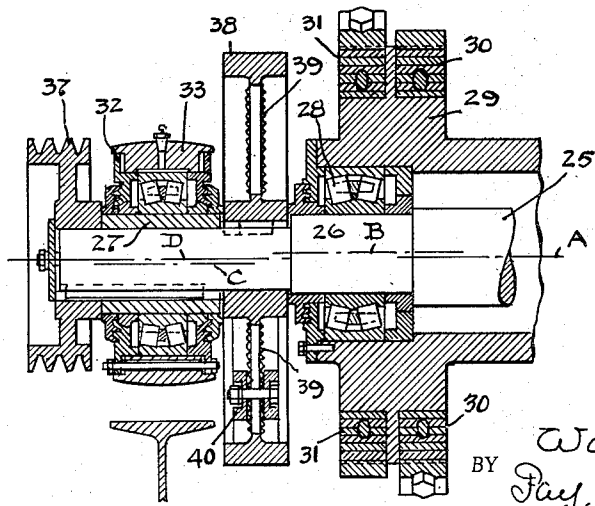

Fig. 8

INVENTOR.
Walter. J. Parks
BY Fay, Oberlin & Fay
ATTORNEYS.

Patented July 23, 1940 2,208,596

UNITED STATES PATENT OFFICE

2,208,596

RECIPROCATING SCREEN

Walter J. Parks, Shaker Heights, Ohio

Application September 1, 1937, Serial No. 161,987

8 Claims. (Cl. 209—365)

The present invention relates to a reciprocating screen construction and has for its particular object the elimination of vibration from the supporting structure of the mechanism. My invention relates to a multiple screen frame type of construction wherein two or more screen frames are mounted upon a common base and reciprocated by the operation of a common actuating mechanism. The construction embodying the principle of my invention is particularly adapted for "flat angle operation" or reciprocating screens disposed in a horizontal plane.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a side elevational view of an apparatus embodying the principle of my invention;

Fig. 2 is an end elevation of the apparatus shown in Fig. 1;

Fig. 3 is an enlarged, detailed sectional view taken substantially along line 3—3 of Fig. 1;

Fig. 4 is an enlarged, detailed sectional view taken substantially along line 4—4 of Fig. 3, and in the direction of the arrows;

Fig. 5 is an enlarged, detailed sectional view taken substantially along line 5—5 of Fig. 1;

Fig. 6 is a top plan view of the apparatus showing a modified form of construction;

Fig. 7 is a side elevational view of the apparatus shown in Fig. 6, and

Fig. 8 is an enlarged, detailed sectional view taken substantially along the line 8—8 of Fig. 6.

Now referring more particularly to the drawings, there is shown therein a supporting structure or base 1 above and below which are mounted the screen frames 2 and 3 by means of the resilient rubber mounting blocks 4 and 5 respectively. As will be seen from Fig. 5, the rubber blocks 5 are cured, vulcanized, or otherwise attached to the metal plates 7 and 8. The metal plate 7 is bolted to the flange 9 on the cross shaft 10, and the metal plate 8 is bolted to the vehicle bracket 11 on the base 1.

A drive shaft 12 is mounted in the bearings 13 on the base 1 and carries the drive pulley 14 on its outer end. A hollow cylindrical member or tube 15 is journalled by means of the bearing 16 on the eccentric portion 17 of the drive shaft 12. Connecting rods 18 and 19 lead from the tube 15 to the screen frames 2 and 3 respectively. The connecting rods as shown in the accompanying drawings are in the form of laminated or leaf springs so that they will be longitudinally rigid but capable of lateral deflection. Equivalent connecting means such as solid connecting rods pivotally connected at each end can equally well be employed in place of the leaf spring rods 18 and 19.

The screen frames 2 and 3 can carry one or more screen decks, but due to the fact that the relative motions are such that the material to be screened travels in opposite directions on the screen frames, it is preferable that a solid plate 21 be mounted on the bottom of the top screen 2 in order to convey screen material down through the delivery chute 22 to the right hand or feed end of the lower screen frame 3.

It will be noted that the connecting rods 18 and 19 are disposed at 90° to each other, and at 54° to the horizontal. This means that the direction of travel of each of the screen frames 2 and 3 will be at 45° to the horizontal, but one of the frames will be moving forwardly and upwardly while the other is moving forwardly and upwardly in the opposite direction, and the resultant motion of each of the screens is a complementary simple harmonic motion at right angles to each other. Thus when one of the screen frames or reciprocating bodies is at the end of its stroke and has a zero velocity, the other screen frame will be at the center of its stroke with a maximum velocity. Similarly, the accelerations and consequently the reciprocating forces exerted upon and by each of the screen frames will be so related that the vector sum of these forces, transmitted through the connecting rods 18 and 19 will always have an instantaneous constant value directed away from the center of the drive shaft 12 and revolving in synchronism with it, and accordingly they can be balanced by means of a set of rotating eccentric weights or balance wheels 20 mounted upon the shaft 12, thus eliminating the transmission of any reciprocating forces or vibration to the base 1.

It will be noted that the total weight or mass of the screen frames 2 and 3 are substantially equal in weight, and that the connecting rods 18 and 19 are connected so that their lines of action are substantially through the center of gravity of each one of them.

In the modified form of construction shown in Figs. 6, 7 and 8, the actuating shaft instead

of being supported directly by the base frame is supported by a set of resiliently mounted opposed eccentric bearings. Referring more particularly to Figs. 6, 7 and 8, the drive shaft 25, whose center line is denoted by the line A, has an eccentric portion 26. The center line of the eccentric portion 26 is denoted by the line B. An eccentric bushing 27 is mounted on the end of the shaft 25 adjacent the eccentric portion 26, and the center line of the eccentric bushing 27 is denoted by the line C. The eccentricities of the portion 26 and of the bushing 27 are thus opposed. The eccentric portion 26 is journalled in the bearing 28 which in turn is mounted in the housing 29. Laminated spring connecting rods 30 lead from the housing 29 to the upper screen frame 2' and similar connecting rods 31 lead from the housing 29 to the lower screen frame 3'.

The eccentric bushing 27 on the drive shaft 25 is journalled by means of the bearing 32 in the housing 33. Rigid connecting arms 34 extend from the housing 33 to the rubber mountings 35 which in turn are mounted upon the supporting frame 1'. Tie bars 36 connect the rubber mountings or the ends of the connecting arms 34 on opposite sides of the screen frame 1'.

A drive sheave pulley 37 and a fly wheel 38 are mounted upon the drive shaft 25. The center line of the pulley 37 and of the fly wheel 38 is indicated by the line D, which substantially coincides with the center line A of the drive shaft 25. Serrated webs 39 are provided on the fly wheel 38 for the adjustable location of balance weights such as indicated at 40.

In the last described form of construction it will be seen that the center of rotation of the drive shaft 25 is midway between the center lines of eccentric portion 26 and of the bushing 27, so that under high-speed rotation the resiliently supported housing 33 will gyrate in a circular or approximately circular path, and the reactions in its resilient supports, viz., the rubber mountings 35, will at all times balance the reactions in the complementary resilient supports 4' and 5' of the screen frames 2' and 3' respectively, thus eliminating any tendency of these resilient reactions to be transmitted to the supporting frame 1' and cause vibration in the latter. Accordingly, the resiliency of the rubber mountings 35 and of the rubber mountings 4' and 5' should be substantially equal, or alternatively, the relative eccentricities of the eccentric portion 26 and of the bushing 27 should be made proportional thereto.

Therefore, in the last described form of construction, there is provided a gyratory body, consisting of the drive shaft 25 and its attached parts which generates forces in its resilient supports to balance the complementary reciprocating forces generated in the resilient supports of a plurality of screen frames or bodies having substantially straight line motions.

It should be obvious to those skilled in the art that more than two screen frames could be assembled in an apparatus embodying the principle of my invention, as long as the angular displacement of each of the reciprocating bodies or screen frames with reference to the others is properly determined. For example, three screen bodies could be assembled and operated from a common drive shaft if the connecting rods were spaced 120° apart.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, a member journalled on said eccentric portion of the drive shaft, a set of connecting rods rigidly secured to said member and rigidly connected to one of said screen bodies, a second set of connecting rods rigidly secured to said member and rigidly connected to the other of said screen bodies, said second set being disposed at an angle of 90° to the first set, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

2. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, sets of connecting rods disposed at an angle of 90° to each other, one set of said rods rigidly secured to one of said screen bodies and the other set rigidly secured to the other screen body, means for operatively connecting said rods to said eccentric portions of said shaft, the connection between said rods and said means being rigid, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

3. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, a member journalled on said eccentric portion of the drive shaft, a set of resilient connecting rods rigidly secured to said member and rigidly connected to one of said screen bodies, a second set of resilient connecting rods rigidly secured to said member and rigidly connected to the other of said screen bodies, said second set being disposed at an angle of 90° to the first set, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

4. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, a member journalled on said eccentric portion of the drive shaft, a set of connecting rods rigidly secured to said member and rigidly connected to one of said screen bodies, a second set of connecting rods rigidly secured to said member and rigidly connected to the other of said screen bodies, said second set being disposed at an angle of 90° to the first set, each set of connecting rods comprising spaced resilient arms mounted on opposite sides of the shaft, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum

of the forces transmitted through said connecting rods.

5. In a reciprocating screen mechanism, the combination of a pair of spaced screen bodies, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having journal portions operatively eccentric to the center of revolution of said shaft, sets of connecting rods disposed at an angle of 90° to each other, one set of said rods rigidly secured to one of said screen bodies and the other set rigidly secured to the other screen body, means for operatively connecting said rods to said eccentric portions of said shaft, the connection between said rods and said means being rigid, and counterweight means carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

6. In a reciprocating screen mechanism, the combination of a pair of spaced screen bodies, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having journal portions operatively eccentric to the center of revolution of said shaft, sets of connecting rods disposed at an angle of 90° to each other, one set of said rods connected to one of said screen bodies and to a journal portion of said shaft and the other set of rods connected to the other of said screen bodies and to said journal portion of said shaft, said connections permitting oscillatory motion of said connecting rods, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

7. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, sets of connecting rods disposed at an angle of 90° to each other, one set of said rods connected to one of said screen bodies and to said eccentric portions of said shaft and the other set of rods connected to the other of said screen bodies and to said eccentric portions of the shaft, said connections permitting oscillatory motion of said connecting rods, and a counterweight carried on said shaft and of sufficient mass and so positioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

8. In a reciprocating screen mechanism, the combination of a pair of symmetrically disposed screen bodies of substantially equal mass, a supporting member, said screen bodies being resiliently mounted on said supporting member, a drive shaft having eccentric portions, a member journaled on said eccentric portions of the drive shaft, a set of connecting rods secured to said member and connected to one of said screen bodies, a second set of connecting rods secured to said member and to the other of said screen bodies, said second set being disposed at an angle of 90° to the first set, and a counterweight carried on said shaft and of sufficient mass and so proportioned as to balance the resultant vector sum of the forces transmitted through said connecting rods.

WALTER J. PARKS.