June 18, 1968 W. H. WESTBROOK 3,388,798

VIBRATING SCREENS WITH UNBALANCED WEIGHT

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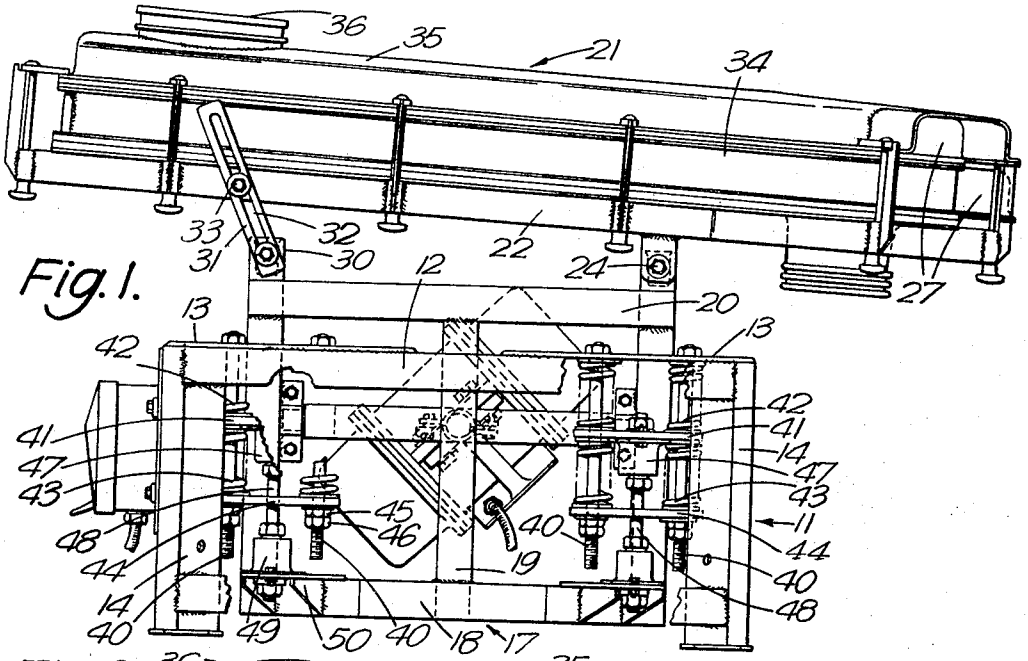

Fig. 1.

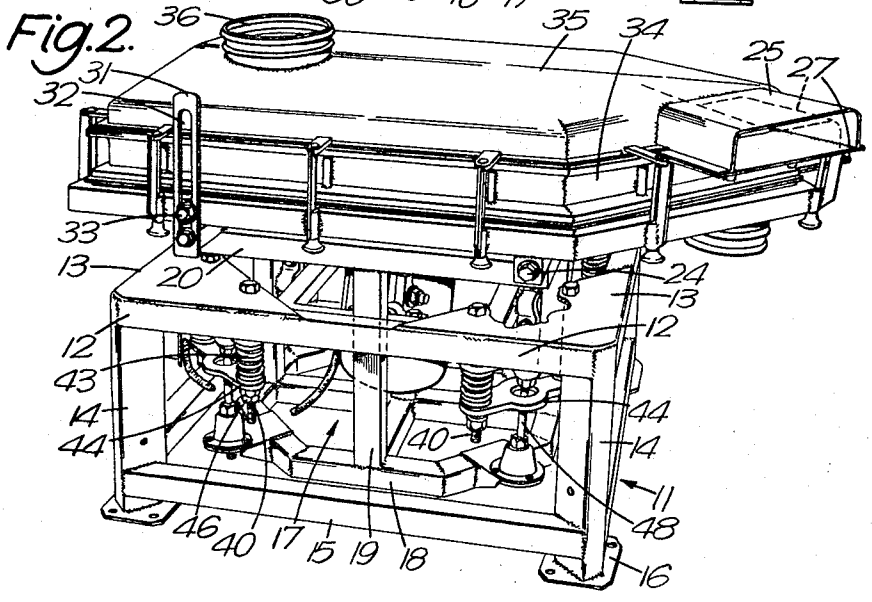

Fig. 2.

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Fig. 3.

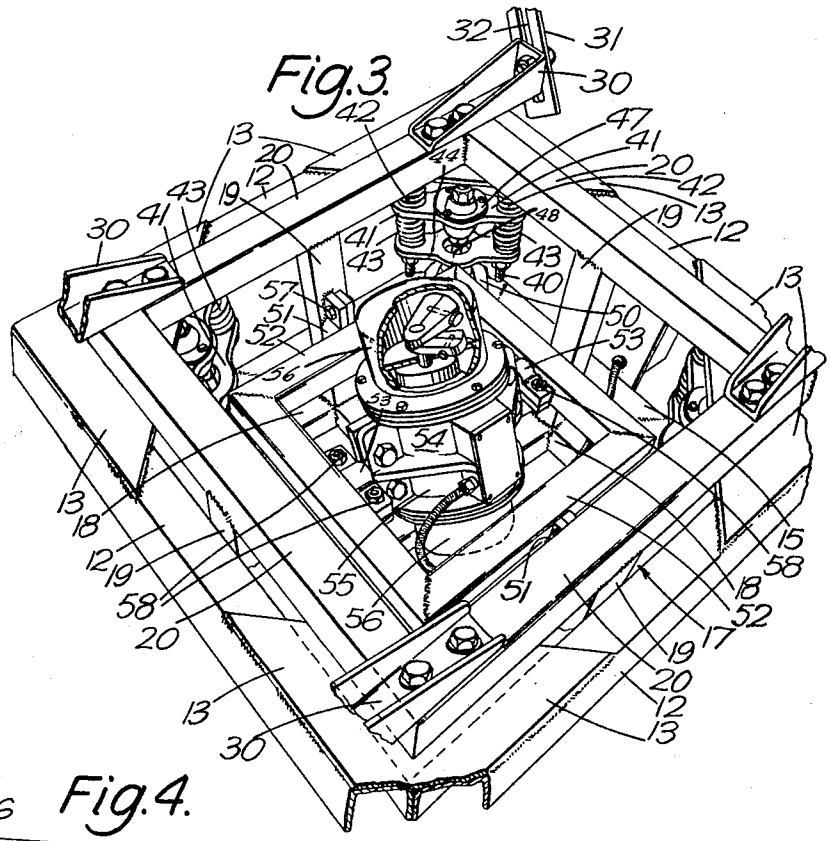
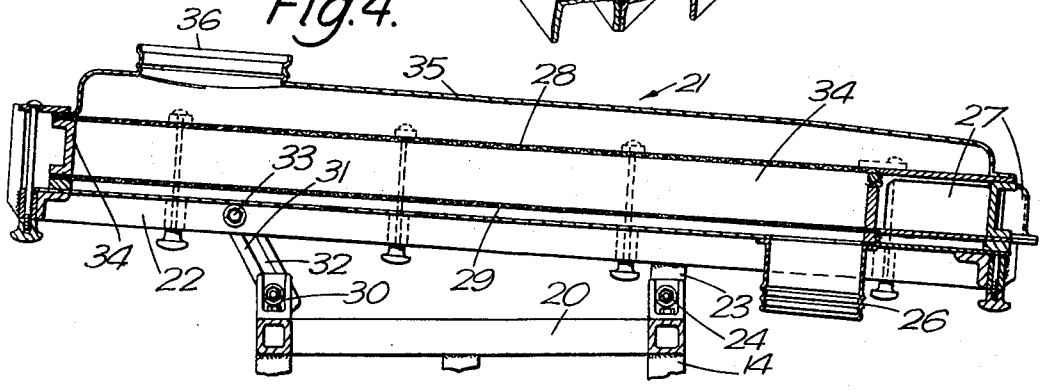


Fig. 4.



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VIBRATING SCREENS WITH UNBALANCED WEIGHT

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ABSTRACT OF THE DISCLOSURE

A machine for sifting or straining purposes which includes a stationary frame, and a vibratory frame elastically supported from the stationary frame by means which permits up and down motion and lateral motion in any direction.

This invention comprises improvements in or relating to vibrating screens for sifting or straining purposes.

It is known to manufacture screens which are vibrated by means of an out-of-balance weight rotated by an electric motor and mounted on a frame which carries the screen, the out-of-balance weight rotating about an axis which is vertical or nearly so, so that the screen is caused to vibrate with a circular orbital movement in a horizontal plane. It has also been proposed to mount the out-of-balance weight so that it rotates on a horizontal axis and causes the screen to move with an orbital or elliptical movement in a vertical plane.

According to the present invention a machine for sifting or straining purposes comprises in combination a stationary frame, a vibratory frame elastically supported from the stationary frame by means permitting relative movement in all dimensions, that is to say both up and down and laterally in any direction, a sifting or straining assembly secured to the vibratory frame and a motor-driven out-of-balance assembly secured to the vibratory frame by means permitting its angular adjustmetn about two axes at right angles to one another and to the axis of the out-of-balance weight. By this means it becomes possible to cause the frame to vibrate at will in any plane which may be chosen by the operator in accordance with the position to which the out-of-balance assembly has been adjusted relatively to the vibratory frame.

In a preferred construction the means permitting angular adjustment of the out-of-balance assembly comprise a gimbal mounting which supports the assembly in the vibrating frame.

The following is a description, by way of example, of one construction in accordance with the invention:

Referring to the accompanying drawings,

FIGURE 1 is a side elevation of a vibratory sieve mounting, with a sieve frame upon it containing a sieve;

FIGURE 2 is a perspective view of the parts shown in FIGURE 1;

FIGURE 3 is a perspective view of part of the machine to a larger scale, showing the gimbal mounting for the out-of-balance weights; and

FIGURE 4 is a longitudinal section through the sieve frame.

The machine comprises an outer stationary frame, represented generally by the numeral **11**, which is built up from rectangular tube and consists of an upper square frame **12** having diagonal plates **13** welded across its corners, which upper frame is supported at each corner on an upstanding post **14** from a lower square frame **15** also of tubular material having feet **16** at each corner to rest upon the ground.

Within the outer stationary frame there is supported an inner square vibrating frame, represented generally by numeral **17**. The inner frame, like the outer one, is built up from square tubular material. It comprises a lower horizontal square **18** (having the corners cut off) which is somewhat smaller than the lower square **15** of the outer frame and is hung within the outer frame by a spring suspension from the diagonal corner plates **13** of the top portion **12** of the outer frame. The spring suspension is more fully described later in this specification. In the centre of each side of the inner frame is an upstanding tubular post **19** which is long enough to support an upper square tubular frame **20** at a level a little above the top of the stationary frame. On this upper square there is mounted a sieve assembly, represented generally by numeral **21**. The sieve assembly **21** may be of any desired kind, that is to say, it may be circular and with or without a spiral guide over the sifting surface, or it may be rectangular.

In the case of a rectangular assembly (which is shown in the drawings), one suitable construction comprises a rectangular sheet-metal open-topped framework **22**, a bracket **23** on which it is pivoted at **24** on the upper square of the vibrating frame near one edge thereof, so that one end of the sheet-metal sifting or straining assembly projects beyond the vibrating and stationary frames and carries a discharge chute **25** for the oversize treated product of the apparatus and another discharge chute **26** for the fines. As shown, there are two sifting septa **28**, **29**, and there is another discharge **27** for intermediate material. The other end of the assembly is supported on brackets **30** which stand up from the sides of the vibrating frame and carry slotted pivoted arms **31**. In the arms **31** are slots **32** through which set-screws **33** pass into frame **22**, so that the sifting or straining assembly **21** can be raised or lowered to vary its inclination to the horizontal. Within the sifting assembly the screens **28**, **29** are of a different size of mesh, the upper screen **28** being the coarser. The upper screen **28** leads at its lower end which overhangs the side of the machine, to the discharge **25** for oversize material. Below the upper screen the lower screen **29** leads to the discharge **27** shown in the far side of the surrounding wall **34** which separates the two screens. In the bottom of the assembly below the screen **29** is a downwardly projecting mouth **26** forming the discharge for material of intermediate size. A cover **35** overlies the screens and contains a feed-opening **36** for material to be treated.

The means of elastic suspension of the vibrating frame **17** from the stationary frame **11** is as follows: Within the corners of the stationary frame the diagonal plates **13**, or corner brackets as they may be called, each support two downwardly projecting screwed rods **40** which are large enough to be rigid, that is they are about an inch in diameter each, and they extend downwardly for the greater part of the distance between the upper and lower squares of the outer frame. On each pair of rods there is threaded an elongated plate **41** with apertures near its ends of sufficient size to pass the fixed rods **40** freely. Around each rod above the elongated plate there is a helical spring **42** and below the elongated plate there is a second helical spring **43**. Below the two lower helical springs **43**, is a second elongated plate **44** slidably mounted on the rods and held up against the springs by nuts **45** and lock-nuts **46** on the rods **40** below it. By these nuts the springs can be compressed to any suitable extent and therefore the first-mentioned elongated plate **41** which is supported between the springs **42**, **43** is capable of moving up and down to an extent permitted by the elasticity of the springs. This elongated plate **41** supports in its centre between the two pairs of springs, a mounting **47** for a rubber bush which is bonded

to a downwardly depending suspension rod **48**. The suspension rod passes downwardly through a large hole in the lower elongated plate **44** and carries at its lower end a second rubber bush in a metallic mounting **49**. The lower mountings **49** of the four suspension rods **48**, one at each corner of the frame, are secured to brackets **50** carried on the corners of the inner or vibrating frame. The rubber bushes within the mountings **47**, **49** of the suspension rods **48** permit the frame **17** to vibrate in any direction in a horizontal plane and the springs **42**, **43** permit the suspension rods **40**, and with them the inner frame **17**, to vibrate in a vertical direction. The inner frame **17** is therefore free to vibrate in any dimension.

It will be seen that the whole system comprises four flexible assemblies at the four corners of the machine, each of four helical springs (**42**, **42**; **43**, **43**) arranged in pairs, two above and two below the plate **41** carrying the suspension rod **40**.

Two of the posts **19** which connect the lower square of the vibrating frame to the upper square, on opposite sides of the frame, carry bearings **51** (FIGURE 3) for a square tubular gimbal ring **52**, which is mounted on the bearings at the centre of two of its opposed sides. The other two sides of the gimbal ring carry bearings **53** for an out-of-balance assembly **54**.

The out-of-balance assembly **54** consists of an electric motor **55** having flanges at both ends of its casing and to each flange there is bolted a casing **56** for an out-of-balance flywheel. The two out-of-balance flywheels are in themselves of standard construction, such as is used on the out-of-balance drives for sieves which perform an orbital movement in their own plane and the two flywheels are arranged to be out-of-balance in the same direction and to the same extent. The motor **55** with its out-of-balance flywheels is mounted in the gimbal bearings **53** on the gimbal ring so that its axis is at right angles to the bearings and therefore the out-of-balance assembly of motor and flywheels can be adjusted to any angle relatively to the ring.

The gimbal bearings **53** of the out-of-balance assembly are arranged so that after adjustment they can be bolted up tight by bolts **58** and the gimbal bearings **51** on which the gimbal ring is mounted can also be bolted up tight by bolts **57**. Thus, the ring **52** can be adjusted into any plane about a horizontal axis on the vibrating frame **17** and the out-of-balance assembly **54** can be adjusted to any position about an axis passing through bearings **53** at right angles to the axis of adjustment of the gimbal ring **52**. The axis of bearings **53** is at right angles to the axis of rotation of the motor **55** and thus the direction of the out-of-balance pull can be adjusted so as to be in any direction desired relatively to the screen assembly **21**.

As a result of this construction the direction of the orbital movement of the screen surface can be caused to take place in any desired plane in accordance with what may be found most suitable for the material under treatment, whether for screening dry powders or for straining liquids. It is also possible to arrange that the out-of-balance weights on the flywheels in the assembly **54** are adjustable so that the force producing the orbital movement is also capable of being varied. As such an adjustment of the weight is well known per se, it has not been shown in the drawings.

I claim:

1. A machine for sifting or straining purposes consisting of in combination an outer stationary frame, mounting means, first suspension means to attach the mounting means to the frame for vertical movement only, an inner vibratory frame, second suspension means to attach the vibratory frame to the mounting means for relative movement only in any direction in a horizontal plane at right angles to the said vertical movement; a sifting or straining assembly including a screen secured to the vibratory frame and a motor driven out-of-balance assembly means for securing said assembly to the vibratory frame including means for permitting the angular adjustment of said assembly about two axes at right angles to one another.

2. A machine as claimed in claim **1** wherein the means permitting angular adjustment of the out-of-balance assembly comprise a gimbal mounting which supports the assembly in the vibrating frame.

3. A machine as claimed in claim **1** wherein the mounting means comprise vertically movable plates, the first suspension means comprises vertical guide rods attached to the stationary frame and upper and lower springs on the rods, the plates are mounted for vertical up and down movement on the rods and are held between upper and lower springs and the second suspension means.

4. A machine as claimed in claim **2** wherein the mounting means comprise vertically movable plates, the first suspension means comprises vertical guide rods attached to the stationary frame and upper and lower springs on the rods, the plates are mounted for vertical up and down movement on the rods and are held between upper and lower springs and the second suspension means.

5. A machine as claimed in claim **3** in which the second suspension means comprises vertical suspension rods and elastic mountings between the rods and the movable plates and between the rods and the vibratory frame.

6. A machine as claimed in claim **4** in which the second suspension means comprises vertical suspension rods and elastic mountings between the rods and the movable plates and between the rods and the vibratory frame.

7. A machine as claimed in claim **4** wherein the vibratory frame takes the form of a horizontal lower tubular frame supported on the suspension rods, an upper frame above the top of the stationary frame and united to the lower frame by interconnecting members, the screen is carried on the upper frame and the out-of-balance assembly is mounted on a gimbal mounting between the upper and lower frame.

8. A machine as claimed in claim **7** wherein the gimbal mounting comprises a rectangular frame to constitute a gimbal ring, bearings at the centre of two opposed sides thereof for attachment of the ring to the vibratory frame and bearings in the sides which lie at right-angles to the said two opposed sides to support the out-of-balance assembly on said gimbal ring.

9. A machine as claimed in claim **7** wherein the out-of-balance assembly comprises an electric motor having a shaft protruding from it at both ends and enclosed in a casing, an out-of-balance flywheel on each protruding end of the shaft and bearing means to engage the gimbal ring which surrounds the electric motor casing at right angles to said shaft.

10. A machine as claimed in claim **8** wherein said out-of-balance assembly includes weights and there is means to adjust said weights.

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