

Sept. 1, 1942.

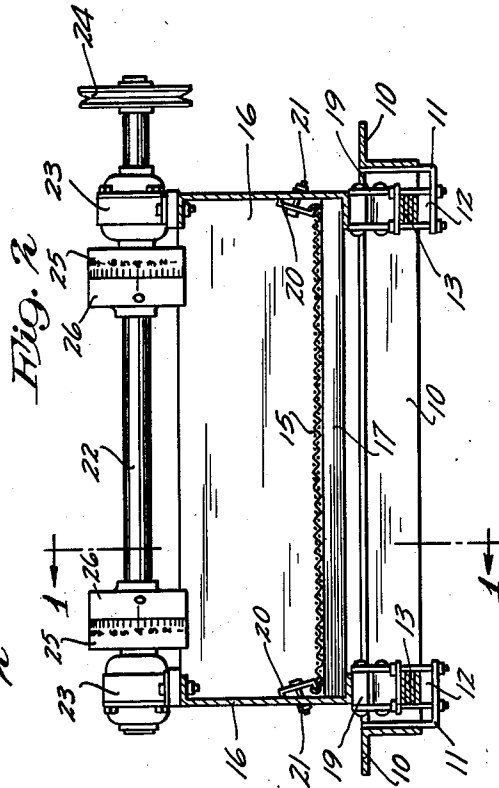
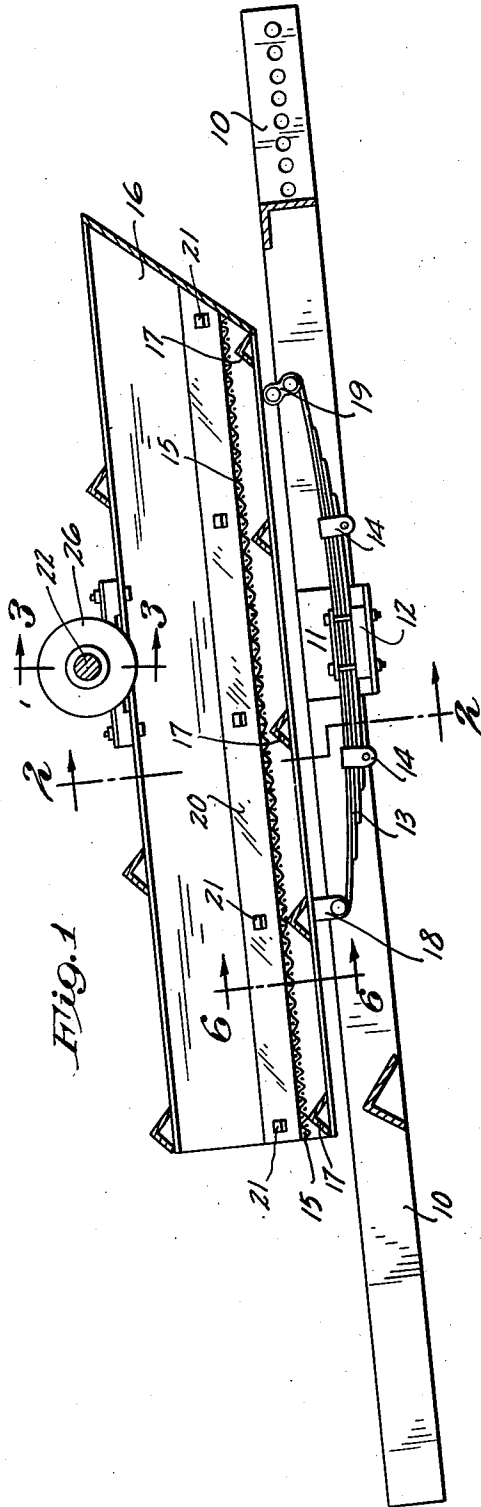
J. A. COYLE ET AL

2,294,448

SCREENING MACHINE

Filed July 17, 1941

2 Sheets-Sheet 1



Inventors
Joseph A. Coyle
Charles H. Roth
By their Attorneys
Merkant Merchant

Sept. 1, 1942.

J. A. COYLE ET AL

2,294,448

SCREENING MACHINE

Filed July 17, 1941

2 Sheets-Sheet 2

Fig. 3

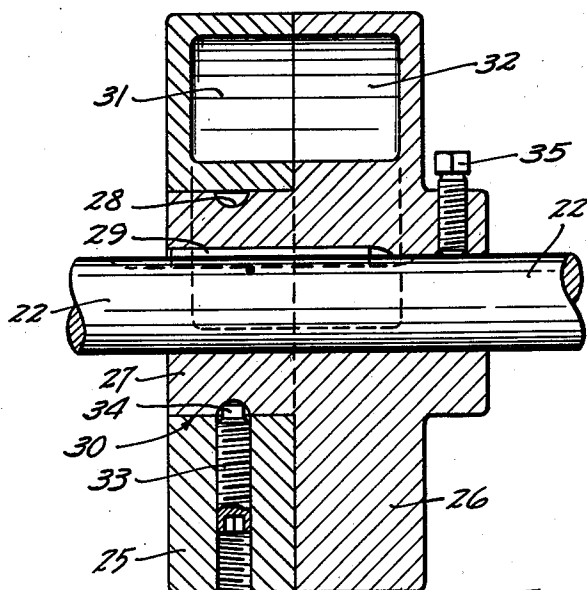


Fig. 6

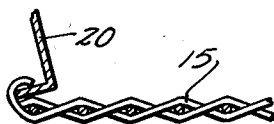


Fig. 5

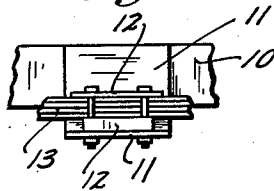
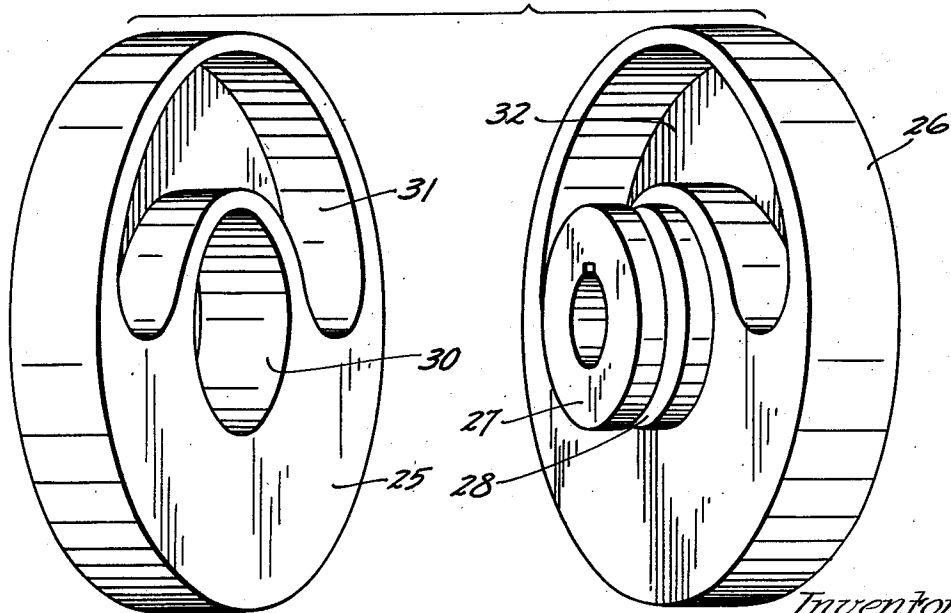


Fig. 4



Inventors
Joseph A. Coyle
Charles H. Roth
By their Attorneys
Mitchell & Mitchell

UNITED STATES PATENT OFFICE

2,294,448

SCREENING MACHINE

Joseph A. Coyle and Charles H. Roth,
Minneapolis, Minn.

Application July 17, 1941, Serial No. 402,754

1 Claim. (Cl. 209—367)

Our invention provides an improved screening machine or device and, generally stated, consists of the novel devices, combinations of devices, and arrangement of parts hereinafter described and defined in the claims.

The screening machine is capable of a large range of uses but we have had particularly in mind and have especially designed the same for the separation of materials such as gravel, crushed stone, coal and the like.

The chief feature of this invention is found in an improved off and on balance vibrator head which will be fully described in connection with the accompanying drawings.

Referring to the drawings, wherein like characters indicate like parts throughout the several views.

Fig. 1 is a vertical longitudinal section taken centrally through a screening machine or device designed in accordance with what is at the present considered the preferred commercial form thereof;

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1;

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is a view in perspective showing the relatively adjustable wheel-like elements of the vibrator head laterally separated and turned, the one away from the other.

Fig. 5 is a fragmentary view showing the central portion of one of the supporting springs; and

Fig. 6 is a fragmentary section taken on the line 6—6 of Fig. 1.

In Figs. 1 and 2 of the drawings the numeral 10 indicates a firmly supported relatively stationary rectangular main frame or base support which, in practice, will be mounted for adjustments into different positions of inclination and will be firmly supported in position in which it may be set by well-known or any suitable means for accomplishing such support and adjustment. At its intermediate portion and approximately at the point where it would usually be pivotally supported, the side bars of said frame 10 is provided with hanger brackets 11 to which, by means of bolt-equipped clamping devices 12, the intermediate portions of leaf springs 13 are rigidly connected. These springs 13 may be and preferably are of the semi-elliptical type made up of a plurality of leaves bound together by clips 14 or the like.

The screen or sieve 15 is preferably a woven wire structure of the proper mesh for the particular kind of separation to be made and it is

mounted in a hopper-like frame or shoe 16, the bottom of which is open but, as shown, is provided with transverse cross bars 17 preferably V-shaped in cross section with their upper edges engaging and supporting the screen 15.

Either by tilting the frame 10 or otherwise, the shoe 16 will be set with its screen 15 inclining toward the open end of the shoe; and in practice, the said shoe and screen will usually be set at a greater inclination than shown in Fig. 1.

To support the shoe and screen for up and down vibratory movements perpendicular to the plane of the screen while holding the same against endwise vibrations or vibrations in the direction of the flow of the coarser materials over the screen, the springs 13, at their front ends, are pivoted to lugs or brackets 18 that are rigidly secured to the bottom of the sides of the shoe 16; and at their other or rear ends, the springs 13 are connected by links 19 to the rear portion of the sides of said shoe 16. This arrangement is highly important for reasons that will be more fully described later on; but it is desirable at this point to call attention to the fact that under the inclination of the shoe and screen just noted, the weight of the load carried by the springs will tend to and will nearly or quite straighten said springs, and will put the forwardly projecting portions, to wit: the portions at the left of the hanger brackets 11, under tension.

The screen 15 can be attached or anchored to the shoe by any suitable means but in the drawings it is shown as attached at its edges to the sides of the shoe by means of clamping strips 20 and co-operating nut-equipped bolts 21.

As already indicated, vibratory movement of the shoe and screen will be produced by so-called vibrator heads made up of co-operating elements that are adjustable to vary the vibratory action from zero to a certain maximum. Preferably, and as shown in the drawings, there are two of these vibrator heads mounted on a transverse shaft 22 journaled in suitable bearings, preferably roller or ball bearing devices 23, applied on the upper side portions of the shoe 16. This shaft 22 is shown as provided with a pulley 24 over which a power-driven belt, not shown, is adapted to run to impart rotary movement to said shaft 22. Of course, said shaft 22 can be power-driven by any other suitable means.

The vibrator heads involve novel and important features; and each involves two wheel-like elements 25 and 26. Wheel 26 has a concentrically located hub 27 that is formed with a quite deep

annular or endless groove 28. Hub 27, by a key 29 or the like, is keyed to shaft 22, all as best shown in Figs. 3 and 4. Wheel 25 has a concentric hole or bore 30 that snugly fits and is adapted to be telescoped onto the hub 27 of wheel 26. Wheel 25 has a segmental cavity 31 and wheel 26 has a similar segmental cavity 32. The cavities 31 and 32 are preferably of the same extent and give each member of the head the same preponderance of weight on one side of diameters thereof, so that when the two wheels are assembled, as shown in Fig. 3, the vibrator heads will be adapted for any desired degree of off balance action. When the two wheels 25 and 26 are adjusted so that their cavities 32 are diametrically opposite, the heavier portions of the said wheels will also be at diametrically opposite points and the head, when revolved, will, therefore, be balanced and will run at high speed or at any speed without tending to produce vibration of the screen or shoe.

It is also important that the perimeter of the vibrator head made up of the two assembled wheels will not only be concentric to the axis of rotation but smooth and free from projections which will not tend to throw or project rocks, lumps of coal and the like that may accidentally come in contact therewith. In actual practice it has been found that devices rotating at high speeds that have irregular or projecting portions, which would catch and project objects, are liable to project such articles at high speeds and injure attendants or do other damage.

The wheel 25 is adapted to be easily telescoped onto the hub 27 provided the periphery of said hub has not been upset, distorted or in any way made irregular. Hence, as the means for securing the wheel 25 on said hub and while permitting infinitesimal fine adjustment of the balance offsetting action of the two members, wheel 25 is provided with a diametrically adjustable screw 33 and the hub 27 is provided with the above noted deep annular groove or channel 28. The reduced end 34 of screw 33 is projected into the channel 28 and engages only with the bottom of said groove or channel and under no condition can mar or upset the smooth exterior of the hub 27. When the screw 33 is thus applied, it is evident that wheel 25 can not move axially on the hub 27 but that said wheel 25 is free for rotary adjustments in respect to the wheel 26. Here it may be noted that wheel 26 is further secured to shaft 22 by a set-screw 35.

As a means for determining when the vibrator heads are set for a predetermined desired vibratory action, the peripheries of the wheels 25 and 26 are graduated. When the graduation marks are set at zero the vibrator heads will be balanced and there will be no tendency to produce vibration in the rotation thereof; and, of course, these graduations will indicate, by the amount they are set from zero, the amount of vibratory action there will be produced up to the point of maximum action.

Summary of operation

The manner in which vibrations of screen or sieve structures of the general character above described is produced is well understood. Of course, the off balance vibrator heads or devices should be mounted on the screen structure or assembly and, under rotation of the vibrator device or devices, when set away from zero or neutral, force will be produced that would tend to impart a gyratory or rotary movement in a

vertical plane. However, with the spring suspension of the arrangement described, the supporting springs 13 hold a screen structure against movements in a horizontal direction or in the general direction of the plane of the screen, but resiliently support the screen for up and down movements in a direction perpendicular to the screen surface. In the described structure, both ends of the springs act to support the screen structure, but only those ends of the springs that are directly pivoted to the screen structure or rigid projections thereof, resist horizontal or approximately horizontal vibratory movements of the screen. The links 19, at the other ends of the springs, simply act as horizontal yielding supporting connections between the springs and screen structure.

It is now important to note the importance of connecting those portions of the springs that are normally under tension directly or pivotally to the screen structure or assembly. As already stated, due to the inclination of the screen structure, it is only those forwardly projecting half portions of the springs that project, for example, from right to left from the supporting brackets or hangers 11 that are thus put under normal tension, and that the oppositely projecting or rear portions of said springs are not at any time put under compression.

It is of the utmost importance that the springs be pivotally or directly connected to the screen structure or assembly only at one end. Moreover, it has, in practice, been found highly important that only those portions of the springs that are under tension be arranged to resist horizontal vibrations and used to hold the sieve structure for up and down movements perpendicular to the screen surface. With a reverse arrangement, to wit: with a direct pivotal connection between the screen structure and the rear end or ends of the springs that are tensioned, it was found that the vertically produced major vibrations transmitted through the tensioned portions of the springs, would set up harmonic or minor vibrations in said tensioned spring portions which would interfere with, and in many instances, especially under high speeds, neutralize or substantially destroy the major and intended vertical vibratory movements of the screen. Such defects in the operation have, in practice, been entirely overcome by the arrangement wherein, as above described, the control of the major screen vibrations is taken through the tensioned portions of the springs.

It is well understood that the desired vibrations are those that will impart the vertical vibrations only to the screen in an up and down direction as nearly as possible perpendicular to the screen surface thereby, in the most direct possible way, causing the fine particles to pass directly downward through the screen while relying for travel of the coarser materials over the screen under the action of gravity.

As already stated, the so-called "semi-elliptical spring" will be nearly or quite straight or flat under load, so that the pivoted ends of the tensioned portions of the springs will be caused to move on straight lines or in slight deviation from perfectly true lines perpendicular to the axis of the screen will be negligible.

In the preferred arrangement the off balance vibratory means involves a pair of the heads described located one near each side of the screen assembly and also in the preferred arrangement, the resilient supporting means in-

volves two of the said springs located one at each side of the machine.

The claim of this application is directed to a modification in the nature of an improvement on the vibrator head for screening devices disclosed and claimed in our prior application filed of date January 27, 1940, under Serial No. 315,984.

What we claim is:

The combination with a deck mounted for vibratory movements, of a power-driven shaft 10 mounted on said deck, a two-section vibrator head mounted on said shaft for rotation therewith, one of said sections having an axially projecting hub and the other section being of annular form and mounted on said hub, said sec- 15

tions having in their opposed inner faces segmental cavities and counter-balancing solid portions, said hub having a peripheral groove and said annular member having a radial set-screw, the inner end of which works in said peripheral groove, the peripheral surfaces of said sections and of said hub being concentric to the axis of said shaft, the section having the hub being rigidly secured to said shaft and said annular member being capable of infinitesimally small rotary adjustments without removal of said set-screw from the groove of said hub.

JOSEPH A. COYLE.
CHARLES H. ROTH.