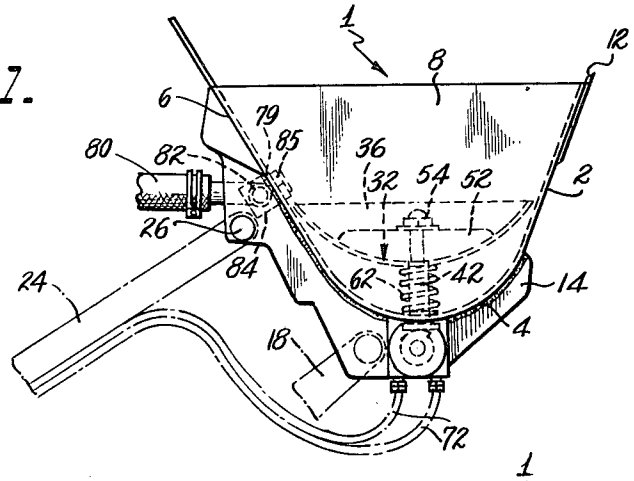
Aug. 6, 1968 W. A. ERICKSON 3,395,798

MATERIALS SEPARATING LOADER BUCKET

Filed Feb. 20, 1968 2 Sheets-Sheet 1

Fig. 1.



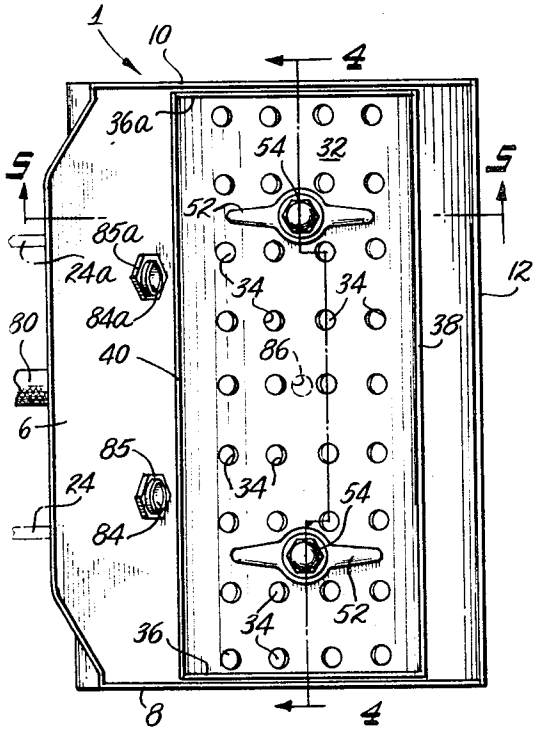


Fig. 2.

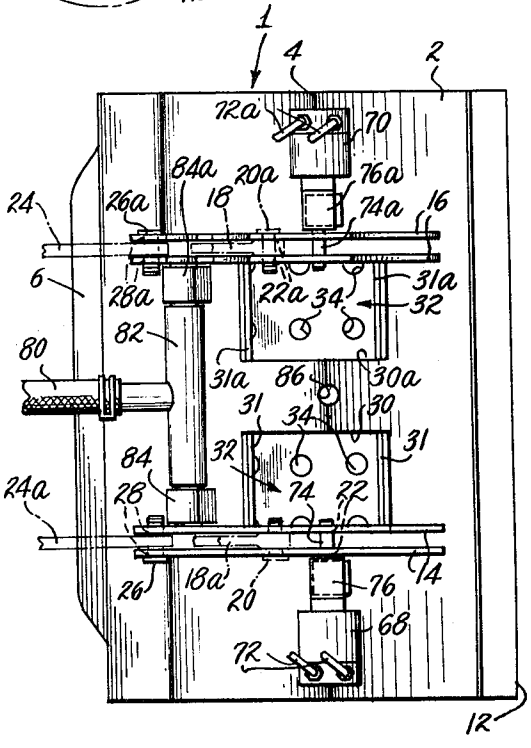


Fig. 3.

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Filed Feb. 20, 1968 2 Sheets-Sheet 2

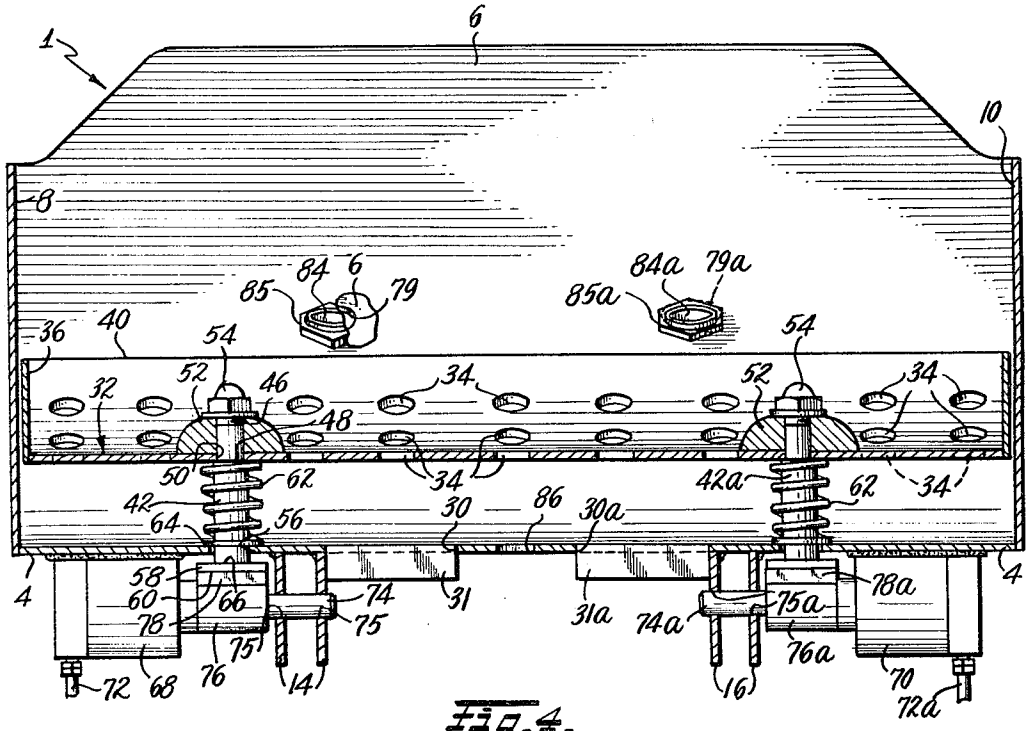


Fig. 4.

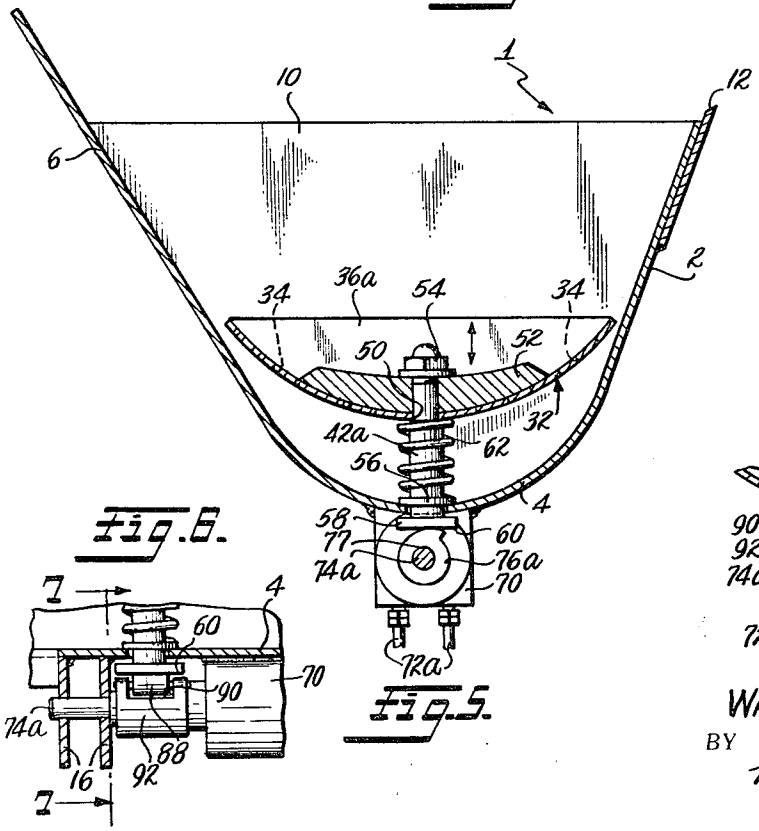


Fig. 5.

Fig. 6.

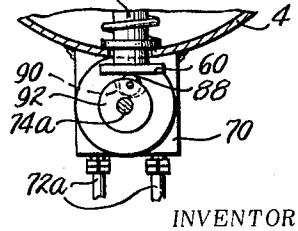


Fig. 7.

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3,395,798

MATERIALS SEPARATING LOADER BUCKET

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Filed Feb. 20, 1968, Ser. No. 706,842
9 Claims. (Cl. 209—260)

ABSTRACT OF THE DISCLOSURE

The bucket, which is adapted to be mounted on a loader-type vehicle lift for raising and lowering and for tilting movement, has a separator screen mounted in the lower portion therefor, A pair of push shafts extend downwardly from the screen and engage cams on the shafts of rotary hydraulic motors for vibrating the screen vertically while water is being discharged onto the materials in the bucket through apertures in the rear wall. The smaller materials and water pass through the vibrated screen and fall through openings in the bottom of the bucket while large aggregate is retained on the screen and discharged from the bucket at a suitable location.

The present invention relates to a bucket which may be advantageously employed for digging earth materials containing mineral values, although not limited to this use. By separating the large undesirable aggregate from that of a desirable size while vibrating the materials and washing all of the mineral values from the large separated aggregate, the load on the values recovering equipment, such as the jigs or sluices used in placer mining, is reduced and accordingly this equipment may be of a much lighter construction and of reduced capacity.

It is an object of this invention to provide a vehicle loader bucket for washing and rapidly separating large sized, undesirable aggregate from earth materials containing mineral values before delivering the materials to values recovering equipment.

Another object is to provide a loader bucket in which mixed aggregate may be separated and washed with the smaller aggregate falling from the bucket through openings in the bottom wall and the large aggregate being retained in the bucket.

A further object of the invention is to provide a loader bucket for rapidly and efficiently separating undesirable large aggregate from aggregate of a desirable size.

An additional object is to provide a loader bucket for reducing the load placed on equipment for recovering mineral values by separating the large sized aggregate before the earth materials are delivered to the values recovering equipment.

Other objects and advantages of the invention will become more apparent from the following specification and claims when taken in conjunction with the drawings in which:

FIG. 1 is a side elevational view of the mining bucket of the present invention;

FIG. 2 is a top paln view of the bucket of FIG. 1;

FIG. 3 is a bottom view of the bucket of FIG. 1;

FIG. 4 is an enlarged vertical sectional view taken on the line 4—4 of FIG. 2;

FIG. 5 is a transverse sectional view taken on the line 5—5 of FIG. 2;

FIG. 6 is a fragmentary, vertical sectional view, similar to FIG. 4, showing a modified form of cam mechanism for vibrating the separator screen of the bucket; and

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6.

The loader bucket includes a front wall 2, a bottom wall 4 and a rear wall 6 smoothly contoured into a continuous surface in order to avoid corners into which materials being handled might lodge. The ends of the bucket are closed by vertical end walls 8 and 10 and the upper edge of the front wall 2 is provided with the customary digging edge 12.

For supporting the bucket on the lift and tilting arms of a loader-type vehicle such as a tractor, a pair of spaced, parallel plates 14, contoured to the outer surface of the bucket, are welded to the outer surface of the bucket approximately midway between the wall 8 and the center of the bucket. In like manner, a similar pair of plates 16 are welded to the outer surface of the bucket midway between the end wall 10 and the center of the bucket. Since neither the vehicle nor the lift mechanism carried thereby form a part of this invention, only the outer ends of the lift arms 18 and 18*a* are shown in phantom lines in FIGS. 1 and 3. The bucket is mounted for pivotal movement on the outer ends of the lift arms 18 and 18*a* by hardened pins 20 and 20*a* passing through suitable openings formed in the outer end of the lift arms and through aligned openings 22 and 22*a* formed in the plates 14 and 16 respectively. In like manner, the outer ends of the tilt arms 24 and 24*a* of the lift mechanism also shown in phantom lines, are connected to the bucket by hardened pins 26 and 26*a* passing through suitable openings formed in the outer ends of the tilt arms and through aligned openings 28 and 28*a* formed in the parallel plates 14 and 16 respectively.

The bottom wall 4 of the bucket is formed with a pair of large rectangular shaped discharge openings 30 and 30*a* positioned between the pairs of parallel plates 14 and 16 and separated by a portion 30*b* of the bottom wall 4. In forming the openings 30 and 30*a*, a narrow portion of the bottom wall at the front and rear edge thereof is bent downwardly to form the vertical walls 31 and 31*a* respectively.

A separator screen 32, having openings 34 of a suitable size formed therein, is positioned adjacent the bottom portion of the bucket. In the form shown herein for the purpose of illustration, the screen 32 is of trough-like shape, as viewed in transverse cross-section. However, it will be obvious that the screen may be flat or of any suitable shape and provided with openings of suitable size to separate aggregate larger than a predetermined size. The ends of the trough-like screen 32 are closed by end walls 36 and 36*a* which are positioned closely adjacent to but spaced from the bucket end walls 8 and 10 respectively while the front edge 38 and the rear edge 40 of the screen 32 are spaced a short distance from the corresponding front and rear walls 2 and 6 of the bucket. Thus, the screen 32 forms a barrier in the lower portion of the bucket through which materials falling through the openings 30 and 30*a* must first pass.

The screen 32 is mounted in the lower portion of the bucket for vertical vibrating or reciprocating movement on the push shafts 42 and 42*a*. Since both push shafts are structurally alike and the manner in which they are connected with the screen 32 is the same, only the arrangement of push shaft 42 will be described. At the upper end, the push shaft 42 is formed with a portion of reduced diameter 44 terminating at its upper extremity in a threaded portion 46, the junction between the body of the push shaft and the portion 44 providing a radially extending shoulder 48. The portion of reduced diameter 44 passes through a suitable opening 50 formed in the screen 32 near the end 36 of the screen and midway between the front and rear edges 38 and 40. An elongated dished washer 52, having a configuration to conform to the upper surface of the screen 32, is positioned on the reduced portion 44 in engagement with the upper surface of the screen 32. A cap nut 54 tightly screws onto the threads 46 and clamps the screen 32 between the shoulder 48 of the push shaft 42 and the washer 52. The cap nuts

54 protect the threads 46 from damage by hard aggregate and may be easily removed from the push shafts 42 and 42*a* for replacing one screen with another should the screen become damaged. Also screens having openings of different size may be employed so as to pass therethrough only aggregate up to a maximum size.

The lower end of the push shaft 42 passes through an opening 56 formed in the bottom wall of the bucket in alignment therewith and extends downwardly for a short distance below the lower surface of the bottom wall 4 of the bucket. At its lower extremity, the push shaft 42 is provided with an enlarged head 58 having a hard outer surface 60. The body portion of the push shaft 42 disposed within the bucket is surrounded by a coiled compression spring 62 which is seated at its lower end on a packing member 64 resting on the bottom wall 4, thus providing a seal between the push shaft and the opening 56. The other end of the spring 62 engages the lower surface of the screen 32. The length of the push shaft 42 and the length of the coiled compression spring 62 are so related that the screen 32, when no materials are disposed thereon, is resiliently supported the desirable distance above the bottom wall 4 of the bucket while, at the same time, the upper surface 66 of the head 58 is spaced a sufficient distance below the lower surface of the bottom wall 4 of the bucket so that the push rod 42 may be moved vertically in order to vibrate or reciprocate the screen 32 in a manner presently to be described.

The mechanism for vibrating or vertically reciprocating the screen 32 includes a rotary motor 68 welded or otherwise secured to the lower surface of the bottom wall 4 of the bucket adjacent the head 58 of the push shaft 42 and a similar rotary motor 70 is in like manner attached to the bottom wall 4 adjacent the head of the push shaft 42*a*. Preferably, the rotary motors 68 and 70 are of the hydraulic type and are adapted to be driven by the hydraulic fluid of the hydraulic system of the loader which is supplied to the motors 68 and 70 through the flexible hoses 72 and 72*a* respectively. Hydraulic fluid control valving, not shown, is connected with the hoses 72 and 72*a* and positioned for convenient actuation by the operator of the loading vehicle for controlling the operation of the motors 68 and 70. If desired, electric motors could be employed instead of the hydraulic ones.

The rotary shafts 74 and 74*a* of the motors 68 and 70 are supported for rotation at their outer ends in suitable aligned openings 75 and 75*a* which form outboard bearings in the respective plates 14 and 16. Cam members 76 and 76*a* are fixedly secured to the shafts 74 and 74*a* between the respective motors and the outboard bearings 75 and 75*a* provided in the plates 14 and 16, by keys 77. The eccentric portion 78 and 78*a* of these cams are arranged for operative engagement with the outer hard surface 60 of the push shafts 42 and 42*a* for vibrating or reciprocating the screen 32 vertically within the bucket. The screen may be vibrated or reciprocated vertically a distance of up to an inch or more depending on the configuration of the cams employed and the rate of vibration or reciprocation may be varied by controlling the speed of rotation of the motors 68 and 70.

In order to wash mineral values from the large aggregate which does not pass through the openings in the screen 32 and to promote the rapid screening of materials and aggregate which do pass through the openings 34, apertures 79 are formed in the rear wall 6 of the bucket, at a level above the upper edge of the screen 32, and through which water under pressure is sprayed into the bucket and onto the materials resting on the screen 32. Water under pressure is supplied to the apertures from a suitable source through the hose 80 connected to the T fitting 82 which is connected at either end to the threaded fittings 84 and 84*a* secured in the apertures 79 by the lock nuts 85 and 85*a*. The T fitting 82 may be rigidly secured to the rear wall 6 of the bucket or it may be pivotally secured thereto.

It is believed that the operation and method of employing the loader bucket is obvious. After the bucket is suitably filled by digging into earth materials having mineral values, the bucket is raised to an elevated position as shown in FIG. 1 by the lift arms 18, 18*a* and is transported to the values recovering equipment. When the bucket is loaded or partially loaded, the springs 62 are compressed and the outer hard surface 60 of the heads 58 of the push shafts 42 and 42*a* are in contact with the periphery of the cams 76 and 76*a*. With the bucket disposed over the materials receiving portin of the values recovering equipment, the hydraulic motors 68 and 70 are rotated by the hydraulic fluid furnished through the hoses 72 and 72*a* to vibrate the screen 32 vertically. At the same time, valve means, not shown, suitably connected with the hose 80, permits water under pressure to discharge into the bucket through the apertures of the threaded fittings 84 and 84*a* and onto the materials disposed in the bucket and resting on the screen 32. The small aggregate and fine earth materials will readily pass through the openings 34 in the screen 32 due to the washing action of the water and the vibrating movement of the screen and will fall from the bucket through the openings 30 and 30*a* onto the values recovering equipment. The larger undesirable aggregate which will not pass through the openings 34 will remain on the screen 32 and will have all of the mineral values removed therefrom by the wash water. After all of the materials which will pass through the screen openings 34 have been discharged from the bucket, the large aggregate remaining on the screen 32 may be transported to a suitable location and discharged from the bucket by tilting it about the pins 20 and 20*a*.

It is obvious that many modifications, alterations or changes in the present apparatus will occur to those skilled in the art. For example, the screen may be flat or of some other configuration rather than trough shaped as disclosed herein. Further, the specific arrangement for supporting the screen and for vibrating it could readily be arranged in a manner different than that disclosed herein. For example, the screen could be vibrated by a single motor disposed adjacent the center of the bucket with a push shaft extending through the opening 86 formed in the center of the bottom wall 4 of the bucket. Obviously, the screen could be vibrated horizontally or in some other manner rather than vertically in order to promote the screening process.

There is shown in FIGS. 6 and 7 a modified form of cam for reciprocating the push shafts 42 and 42*a*. These cams each include an anti-friction roller bearing 88 mounted in a depression 90 formed on the peripheral surface of a sleeve 92 fixedly secured to the shaft of the motor. The roller bearing 88 extends above the surface of the sleeve 92 and engages the outer surface 60 of the head of the push shafts for vibrating the screen 32 in the manner already described.

While I have shown a particular embodiment of my invention, it will be understood that the invention is not limited thereto but is intended to cover such modifications as fall within the true spirit and scope of the foregoing disclosure as encompassed within the appended claims.

What I claim is:

1. A materials separating loader bucket mountable on a loader-type vehicle lift for vertical movement and for tilting movement about a horizontal axis, said bucket comprising: a bottom, front and rear walls, and end walls, screen means disposed within the bucket adjacent to but spaced above said bottom wall for separating materials; means for mounting said screen in the lower portion of said bucket for vibrating movement, said bottom wall having at least one opening formed therein for discharging therethrough separated materials which have passed through said screen; means for conducting water into said

bucket for discharge against materials resting on said screen; means operably connected with said screen for vibrating it within the bucket, and means on said bucket to mount it for said movement on the vehicle lift.

2. A materials separating loader bucket according to claim 1 wherein said screen means is of trough-like configuration, as viewed in transverse cross section, and the opposite ends of the trough-like screen are closed by end walls.

3. A materials separating loader bucket according to claim 1 wherein said screen mounting means includes a push shaft rigid with each end portion of said screen and depending therefrom substantially normal thereto through guide openings formed in said bottom wall in alignment with said push shafts, and a coiled compression spring surrounds each of said push shafts with the opposite ends of said springs in engagement with said bottom wall and with said screen for resiliently supporting said screen and resiliently opposing the weight of any materials resting thereon.

4. A materials separating loader bucket according to claim 1 wherein said vibrating means includes rotary motor means fixedly connected with the bucket and cam means operably connected with the shaft of the motor, and said screen mounting means includes push shaft means having one end thereof rigid with said screen, the other end thereof, being in operative engagement with said cam means whereby rotation of said motor and cam means results in vibration of said screen.

5. A materials separating loader bucket according to claim 1 wherein said rear wall is formed with apertures which are disposed above the upper edge of said screen, and said water conducting means includes a water pipe fixedly secured to the bucket and having discharge openings connected with said apertures.

6. A materials separating loader bucket according to claim 1 wherein said screen mounting means includes a push shaft rigid with each end portion of said screen and depending therefrom substantially normal thereto with the free end thereof projecting through guide openings formed in said bottom wall in alignment with said push shafts and a coiled compression spring surrounds each of said push shafts with the opposite ends of said springs in engagement with said bottom wall and with said screen for resiliently supporting said screen; and said vibrating means includes a rotary motor fixedly connected with the bucket adjacent the free end of said push shafts and cam means operably connected with the shaft of each of said motors, the free end of each push shaft being in operative engagement with the cam means of the adjacent motor, whereby rotation of said motors and cam means results in vertical vibration of said screen.

7. A materials separating loader bucket according to claim 6 in which said screen means is of trough-like configuration, as viewed in transverse cross section, and the opposite ends of the trough-like screen are closed by end walls.

8. A materials separating loader bucket according to claim 7 wherein said rear wall is formed with apertures which are disposed above the upper edge of said screen, and said water conducting means includes a water pipe rigid with the outer surface of said rear wall and having discharge openings connected with said apertures.

9. A materials separating loader bucket according to claim 1 in which said screen means is of trough-like configuration, as viewed in transverse cross section, and the opposite ends of the trough-like screen are closed by end walls, and wherein said screen mounting means includes a push shaft rigid with each end portion of said screen and depending therefrom substantially normal thereto through guide openings formed in said bottom wall in alignment with said push shafts and a coiled compression spring surrounds each of said push shafts with the opposite ends of said springs in engagement with said bottom wall and with said screen for resiliently supporting said screen and resiliently opposing the weight of any materials resting thereon.

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