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Logue

[11] **3,765,490**

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[54] **COMBINED LOADER BUCKET AND FINES SEPARATOR**

[76] Inventor: **George E. Logue,** 321 Winters Ln., Montoursville, Pa. 17754

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[52] **U.S. Cl.** ..... **171/132,** 37/118 R
[51] **Int. Cl.** **A01d 15/02**
[58] **Field of Search** ..... 171/132; 37/118 R, 37/117.5; 209/241

[56] **References Cited**

UNITED STATES PATENTS

3,003,265	10/1961	Lutjens	37/118 R
3,072,257	1/1963	Hockenberry	171/132
3,461,968	8/1969	Longley	171/132

Primary Examiner—Antonio F. Guida
Attorney—Lowe and King

[57] **ABSTRACT**

A loader bucket or scoop is adapted to separate fines after scooping material into the bucket by providing a movable grid to be positioned over the open side. The grid is substantially the same shape as the bucket or scoop and is positionable therein in an out-of-the-way position for loading of the scoop. A power means comprising a hydraulic motor and worm gear and pinion combinations serve to relatively move the grid between the operative position and the inoperative position. The grid is contiguous with the inside surface of the scoop and when the scoop and grid are cylindrical the grid moves in an arc and 360° movement may be accommodated. A scraping edge is provided on the grid for removing stuck material on the inside surface of the scoop and the grid may be formed of steel reinforcing rods; the cross rods also serving as scrapers and agitating the innermost portion of the load prior to dumping.

12 Claims, 6 Drawing Figures

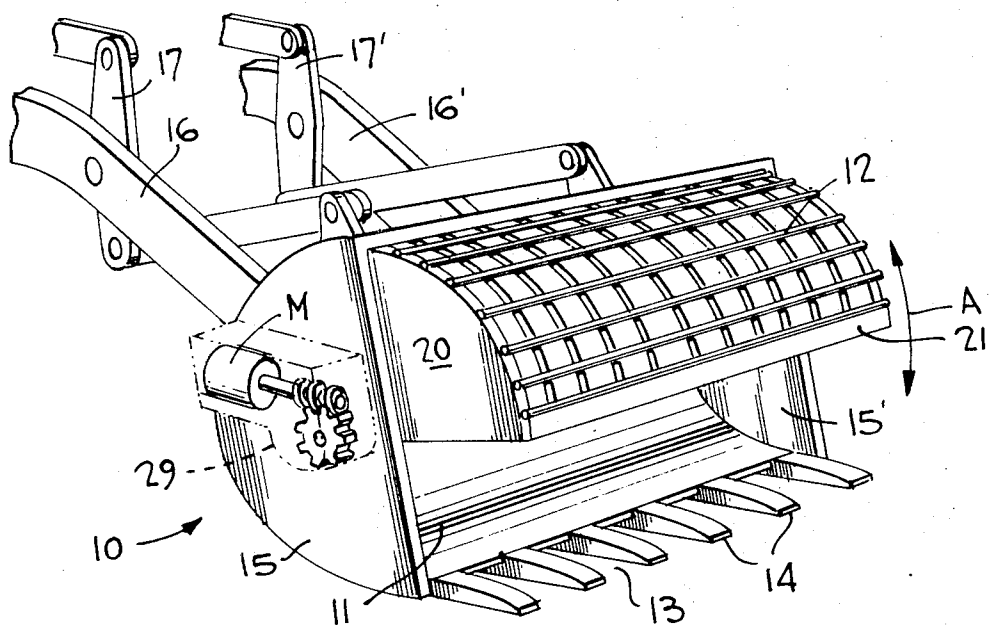


FIG. 1

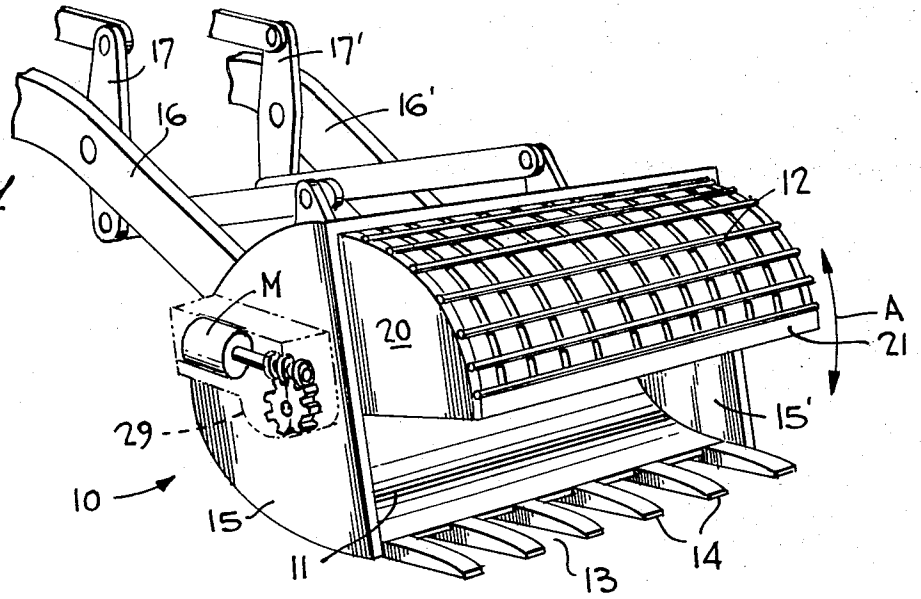

17
17'
16
16'
12
M
20
A
21
15'
29
10
15
11
13
14

FIG. 2

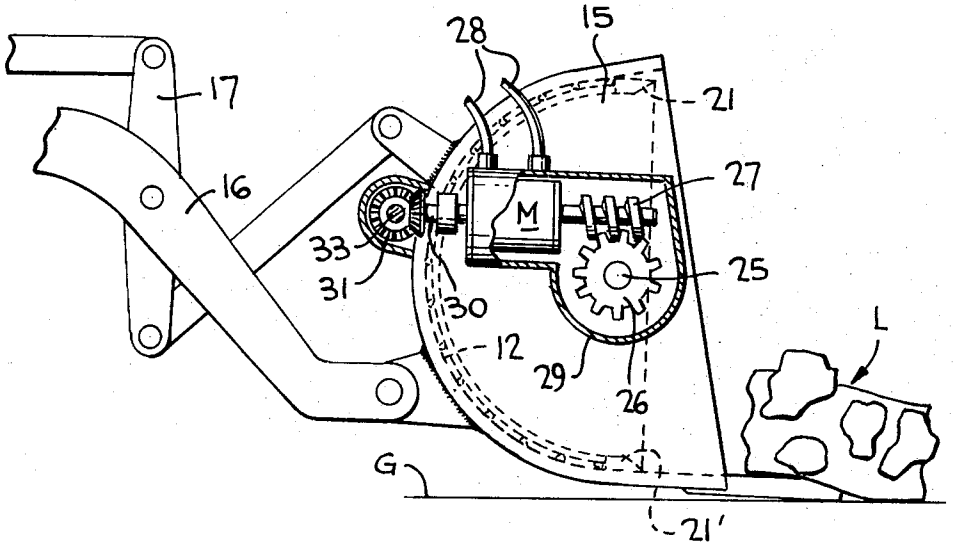

28
15
17
21
16
27
M
33
31
25
30
12
29
26
L
G
21'

FIG. 3

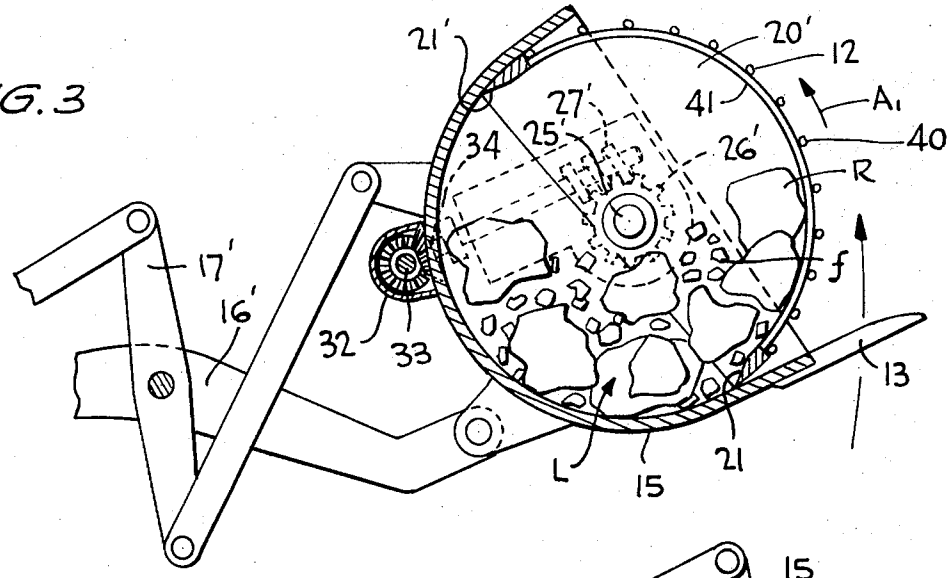


FIG. 4

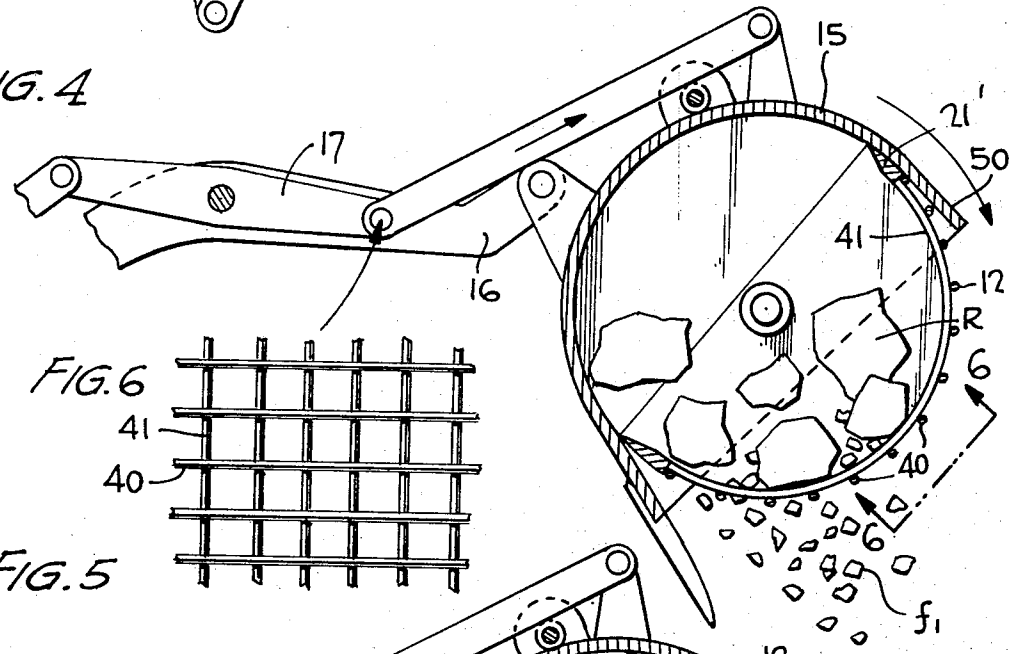
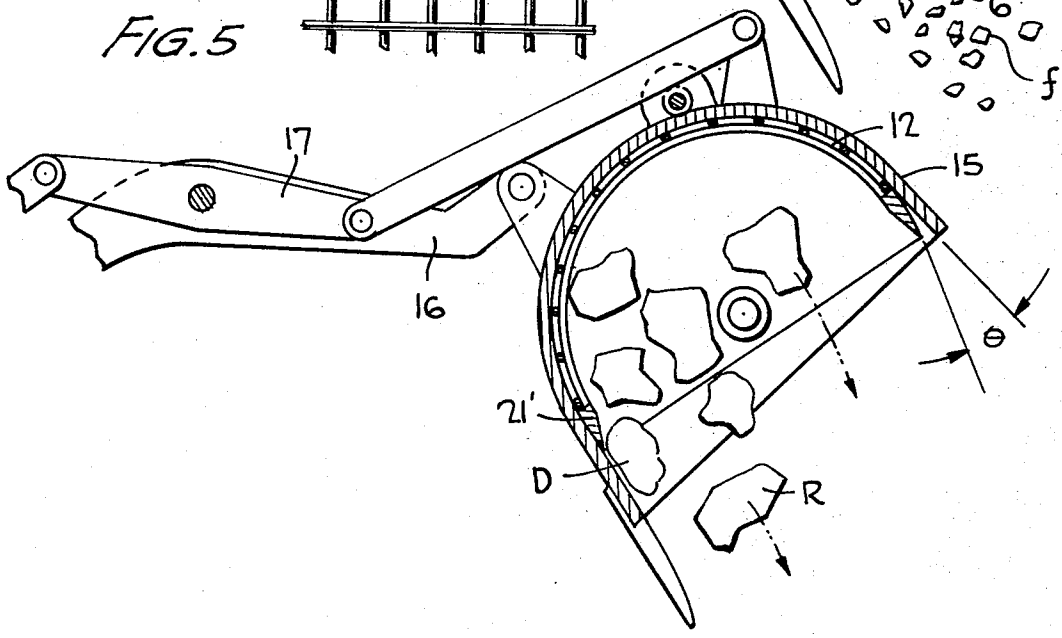


FIG. 6

FIG. 5



COMBINED LOADER BUCKET AND FINES SEPARATOR

The present invention relates to loader buckets or scoops for material handling, and more particularly, to a scoop having a movable grid for fines separation.

BACKGROUND OF THE INVENTION

A front end loader is a valuable piece of equipment when it is put to use by a contractor moving dirt or other material. The bucket or scoop of a loader is designed to accommodate relatively large loads, and the loader may be driven over short distances and then deposit the load in a dump truck or other selected location.

In the past, there have been several attempts to accommodate a movable screen that may be selectively placed over the opening of the scoop after the load has been picked up so that the coarse material and fines may be selectively deposited at two different locations. Representative showings of a loader scoop with a fines separator are the U.S. Pats. to Hockenberry, No. 3,072,257 and Lutjens, No. 3,003,265, issued Jan. 8, 1963, and Oct. 10, 1961, respectively. These prior art devices have been characterized by mounting of the screen so that it is difficult to bring the same into operative position. Also, the screen is positioned so as to be in the way of efficient operation of the scoop when loading and during periods when the screen is not in use.

OBJECTIVES OF THE INVENTION

Accordingly, it is one object of the present invention to overcome the above-cited objections and to provide a combined loader bucket and fines separator of an improved design.

It is another object of the present invention to provide a loader bucket and separator wherein a grid for separating the large objects of the material, such as rocks, from the fines, such as the dirt, may be positioned totally within the scoop in an out-of-the-way position.

It is still another object of the present invention to provide a loader bucket and fines separator wherein the separator conforms to the internal surface of the bucket in the stowed position and is made to conform or reconform more completely during each loading cycle.

It is still another object of the present invention to provide a combined loader bucket or scoop and fines separator with integral scraping means for loosening and agitating material on the inside of the bucket.

BRIEF DESCRIPTION OF THE DISCLOSURE

A bucket or scoop for a loader or similar apparatus is provided having an open side to receive and dump the load and with a movable grid that may be positioned over the open side in an operative position to allow passage of fines while retaining the large material in the bucket for separate discharge. One application of the apparatus that is most widely used is the separating of rocks or boulders from the fine dirt during an excavation type operation. The dirt may be placed in a pile next to an excavation, such as a sewer line trench, for redepositing or backfilling in the trench after laying of the line. The rocks, on the other hand, are separated from the fill dirt and deposited in a dump truck and disposed of. By so separating the rocks, breaking of the pipe in the trench cannot occur during the back-filling operation. However, it is to be understood that the invention is useful in other, but similar environments, wherein it is desired to separate a coarse material from the fines in a scooping or loading operation.

The grid is in accordance with the present invention substantially the same shape as the scoop and positionable in what can be described as a nested position within the scoop. The grid is contiguous with and conforms to the internal surface of the bucket. With the introduction of each load, the grid is pressed against the bucket to make the grid more completely conform thereto. Power means is provided for relatively moving the grid and the scoop so that the grid may be brought to the operative position outside of said scoop and positioned over the open side to allow passage of fines during the initial dumping of the load that has been picked up. In accordance with features of the invention, the grid is thus stowed in an out-of-the-way position so that the bucket can be operated without deleterious interference from the grid. The load within the bucket or scoop is agitated or broken up along the innermost portion thereof by relative movement of the grid and bucket just prior to dumping. Any material stuck on the bucket is removed by scrapers and the cross members of the grid during each cycle.

Advantageously, the grid is contiguous with and substantially conforms to the internal surface of the scoop when positioned therein. Preferably, the scoop and the grid are substantially semicylindrical with the grid being pivotally mounted on the ends of the scoop. The scoop and grid are coaxial whereby relative movement of the two may take place through a full 360°. The cylindrical portion of the scoop terminates in tangentially extending edges to permit the guiding of the grid when the same moves into the scoop from the operative position over the open side or face.

The scraping edges of the grid are formed by sharpened cross members spanning between end segments that together form a frame for the grid. The cross elements of the grid and the intersecting circumferential elements are fabricated of steel rods of the concrete reinforcing type to add strength and rigidity to the grid. The relative movement between the scoop and the grid is generated by a hydraulic motor/worm gear and pinion driving system.

Still other objects and advantages of the present invention will become readily apparent to those skilled in this art from the following detailed description, wherein I have shown and described only the preferred embodiment of the invention, simply by way of illustration of the best mode contemplated by me of carrying out my invention. As will be realized, the invention is capable of other and different embodiments, and its several details are capable of modification in various obvious respects, all without departing from the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a perspective view of a preferred embodiment of a bucket or scoop with combined fines separator attached thereto in accordance with the invention;

FIG. 2 is a side view of the scoop with the grid rotated to the inoperative position within the confines of said scoop;

FIG. 3 is a cross-sectional view showing the grid rotated to the operative position covering the open side of the scoop for confining the load therein;

FIG. 4 is a view similar to FIG. 3, but with the scoop tilted forwardly to allow the fines of the load to be discharged through the grid;

FIG. 5 is a view also similar to FIG. 3, but with the grid rotated to the stowed position nested inside the scoop;

FIG. 6 is an enlarged view showing the formation of the grid from intersecting steel rods.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The overall perspective view of FIG. 1 shows a combined loader bucket and fines separator **10** that can be considered to be a preferred embodiment of the invention. The apparatus of the invention comprises a bucket or scoop **11** and a retractable grid **12**, that is shown in a position halfway between the operative (extended) and inoperative (retracted) positions. The scoop **11** is preferably of cylindrical shape and has an open side through which the load is taken up and discharged. Along the lower edge of the open side is provided a cutting edge **13**, which may include individual cutting teeth **14** for engaging the material to be loaded and assisting in dislodging of the material for easier and more efficient operation. The scoop **11** has closed ends **15, 15'**, and the scoop **11** may be provided with conventional support arms **16, 16'** and actuating linkage **17, 17'**.

The grid **12** is supported by a frame including end segments **20** and cross members **21, 21'**. The cross members **21, 21'** define the open side of the grid **12** (note the dotted-line showing of FIG. 2) to allow introduction of the load into the bucket. The cross members **21** have sharpened edges as can be seen in this FIG. to allow ease of introduction of the load as the bucket or scoop **15** is pushed to cut away and pick up the material. Also, these edges serve as scrapers for the inside surface of the scoop **11** to dislodge any material that is stuck to the surface when the grid **12** is rotated relative to said inside surface.

As best shown in FIGS. **1–3**, the end segments **20, 20'** are mounted on stub shafts **25, 25'** so that the grid **12** is mounted for rotary action into and out of the scoop **15**. Each stub shaft **25, 25'** is provided with a pinion **26, 26'** (see FIGS. 2 and 3) that is rotated by a worm gear **27, 27'**. The worm gear **27** may be directly driven by a hydraulic motor M that is fed pressurized fluid through feed lines **28**. A housing **29** is provided on the end plate **15** to protect the drive mechanism from outside forces. A drive shaft **30** extends through the rear of the housing **29** from the motor M for driving a rotary motion transfer system. The system may include bevel gear combinations **31, 32** (see FIGS. 2 and 3) cross connecting shaft **33**, and a drive shaft **34** driving the worm **27'**.

With the preferred arrangement shown, the motor M drives both pinions **26, 26'** with the same force and to the same extent and the end segments **20, 20'** thus in synchronism, and the grid **12** is not subject to skewing action. With this arrangement, the grid **12** may be easily operated into and out of the scoop **11**, as shown by the motion arrow A in FIG. **1**.

In operation, the scoop **15** is positioned adjacent the ground G or other surface on which it is to operate to pick up the desired material. The grid **12** is positioned inside the scoop **15**, as shown in FIG. **2**, contiguous with and conforming to the inside surface. The load is picked up in a conventional manner by moving the scoop **15** forward to gather desired amount of material load L, as shown in FIG. **2**. The bucket **15** is raised and tilted rearwardly, as shown in FIG. **3**, in order to confine the load within the bucket. The grid **12** is then rotated by the motor M in the direction of the motion arrow A_1.

As the grid **12** moves in the direction of the arrow A_1, the load L is conveniently trapped in the scoop **15** as the bottom cross member **21'** rotates up and under said load. The load L may include coarse material, or rocks R, and fine material, or dirt *f*. Once the grid **12** has been moved to the closed or covered position over the open face of the scoop **15**, the scoop **15** and said grid **12** together now form a complete cylinder, as shown in FIG. **3**.

The actuating mechanism **17** may then be utilized to tilt the scoop **15** forwardly (as shown in FIG. **4**) to shift the load L down into the screening or sifting region formed by the grid **12**. When this is done, the rocks R are held within the cylinder, and the fines f_1 sift out through the grid **12** for depositing in a desired location. In order to encourage sifting of the fines f_1 through the grid **12**, the actuating linkage **17** may be jogged back and forth rapidly in order to shift and loosen the material.

After all of the fines f_1 have been deposited in the desired location, the bucket **15** is moved by relocation of the vehicle to which it is attached. A separate area of discharge is then reached; and further rotation of the grid **12**, preferably in the same direction A_1, is carried out to allow discharge of the large material or rocks R (see FIG. **5**).

In accordance with an important feature of this invention, as the cross member **21** is moved along the inside surface of the scoop **15**, any excess material or mud stuck to that inside surface is scraped free and may be dumped with the rocks R, such as is represented by the deposit of mud D, shown in FIG. **5**. The scoop is thereby left completely clean of substantially all material for greatest capacity on the next excavating cycle.

The grid **12** is preferably formed of a plurality of cross elements **40** as can best be seen in the enlarged view of FIG. **6** taken in the direction of the line **6—6** of FIG. **4**. With the cross elements **40** on the outside of the grid **12**, these elements are mounted contiguous with and in guiding relationship with the inside surface of the scoop **15** when the grid **12** is rotated to the inoperative position in the scoop **15** (see FIG. **5**). These cross elements **40** thus also scrape across the inside surface during the relative movement between the grid **12** and the scoop **15** so that additional cleaning of the bucket is accomplished.

Furthermore, as the grid **12** is rotated from the position of FIG. **2** to the closed or operative position of FIG. **3**, the innermost portion of the load is agitated prior to dumping to assure loosening of the material and a good separating process. This agitation is in the form of sliding and tumbling action as the grid **12**

moves under the load L that is held in position by gravity (see FIG. 3).

The circumferentially extending members **41** also serve to form the grid through which the fines f_1 pass. The elements **40, 41** may be made of steel rods, such as concrete reinforcing rods. These are preferred since such reinforcing rods are available in a wide range of gages, are readily available, and are exceptionally strong. Also, the rods may be easily welded together at the crossing points thereby reinforcing the grid **12** in a highly advantageous manner. If desired, other grid material, such as expanded metal of a heavy gage, may be utilized.

The lower edge **13** and the upper or opposed edge **50,** preferably extends tangentially and at an acute angle to the wall of the cylinder delineated by the scoop **15** and the grid **12.** This angle θ is shown in FIGS. **4** and **5** of the drawings. This is important so that the grid **12** may be rotated in either direction and through the full 360° into and out of the scoop **15** without any chance of binding or catching on the edges **13, 50.** The cross elements **40** are in effect led into and pressed back into position should they have been bent temporarily out-of-line by the previous separating action.

The elements **40,** and indeed the whole grid **12,** is made to conform to the inside surface of the scoop **15** during each cycle by an opposite or pushing-in action. As a load is picked up and is pushed back into the rear of the scoop **15,** there is a pressing of the grid **12** outwardly into a more intimate engagement with the scoop thereby enhancing the conforming relationship of the grid **12** to the inside surface during each loading cycle.

In summary, the combined loader bucket and fines separator **10** of the present invention is characterized by a semicylindrical grid **12** that is rotatably movable between an operative position over the mouth of the bucket or scoop **11,** and an inoperative position within and conformed to the shape of the scoop **11.** The grid **12** includes supporting end segments **20, 20'** and sharpened cross members **21** that serve as a frame; the latter also serving as integral scrapers. The grid is fabricated of steel rods; and the grid being guided by engagement with lead-in edges **50, 13** at the top and bottom of the scoop **15,** respectively, as shown in FIG. **4.** A hydraulic motor M drives through a direct drive system the supporting stub shafts **25, 25'** for the grid **12.**

In this disclosure, there is shown and described only the preferred embodiment of the invention, but as aforementioned, it is to be understood that the invention is capable of use in various other combinations and environment and is capable of changes or modifications within the scope of the invention concept as expressed herein.

I claim:

1. A combined loader bucket and fines separator comprising a scoop having an open side to receive and dump the load, a cutting edge along said side to engage the material for loading, a movable grid for positioning over said open side in an operative position to allow passage of fines during dumping of the load, said grid being substantially the same shape as said scoop and positionable therein in an inoperative position, and power means for relatively moving said grid between the operative position outside the scoop and the inoperative position within said scoop, whereby said grid is stowed out of the way in the inoperative position and the innermost portion of the load is agitated by movement of said grid prior to dumping.

2. The combined bucket and fines separator of claim **1** wherein said grid is contiguous with and substantially conforms to the internal surface of said scoop when positioned therein whereby the load presses the grid against said surface for enhancing the conforming relationship during each loading cycle.

3. The combined bucket and fines separator of claim **1** wherein said scoop is substantially cylindrical with a portion of the curved wall being removed to form said open side.

4. The combined bucket and fines separator of claim **3** wherein said grid is also substantially cylindrical with a portion removed and is contiguous with and substantially conforms to the internal surface of said scoop when positioned therein, pivot mounting means for said grid on the ends of scoop, whereby said grid moves in an arc and the load presses the grid against said surface for enhancing the conforming relationship during each loading cycle to form a more perfect cylinder of the grid.

5. The combined bucket and fines separator of claim **4** wherein said scoop and said grid are coaxial whereby movement of said grid through 360° may be accommodated.

6. The combined bucket and fines separator of claim **2** wherein said grid includes a scraping edge along the open side thereof to remove any material stuck to the inside surface during the relative movement.

7. The combined bucket and fines separator of claim **1** wherein is provided a frame for said grid including closed end segments and cross members spanning between said segments and defining said open side.

8. The combined bucket and fines separator of claim **7** wherein said cross members include a scraping edge directed in the direction of movement to scrape material stuck to the internal surface of said scoop.

9. The combined bucket and fines separator of claim **1** wherein said scoop and grid are substantially cylindrical with corresponding open sides, said grid including cross elements and circumferential elements, said cross elements being contiguous with and substantially conforming to the internal surface of said scoop when positioned therein, whereby the load presses the grid against said surface for enhancing the conforming relationship during each loading cycle, and said cross elements serving as scrapers to remove any material stuck to the inside surface during the relative movement.

10. The combined bucket and fines separator of claim **9** wherein said elements are steel reinforcing rods to add strength and rigidity to said grid.

11. The combined bucket and fines separator of claim **9** wherein the open side of said scoop is formed with the cutting edge and the opposed edge at the top of said scoop at an acute angle to the cylinder of said scoop and said grid whereby said grid is guided in its movement into said scoop.

12. The combined bucket and fines separator of claim **9** wherein said grid is mounted on pivot stub shafts on the ends of said scoop and said power means includes a drive pinion on each shaft, a worm mated with each pinion and hydraulic motor means for driving said worms, whereby said grid is power driven from both ends.

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