United States Patent [19]

Katter

[11] **3,815,737**

[45] **June 11, 1974**

[54] **GRAVITY ORE CLASSIFIER**

[76] Inventor: **Gene S. Katter,** Box 204, Brownsville, Oreg. 97324

[22] Filed: **Nov. 6, 1972**

[21] Appl. No.: **304,079**

[52] **U.S. Cl.** **209/44,** 209/445, 209/452

[51] **Int. Cl.** **B03b 7/00**

[58] **Field of Search** 209/445, 451, 452, 44

[56] **References Cited**

UNITED STATES PATENTS

189,882	4/1877	Taylor	209/452
450,756	4/1891	Hull et al.	209/452 X
1,319,665	10/1919	Hudson	209/44 X
1,917,300	7/1933	Hardinge	209/452
2,208,092	7/1940	Addis	209/44 X

FOREIGN PATENTS OR APPLICATIONS

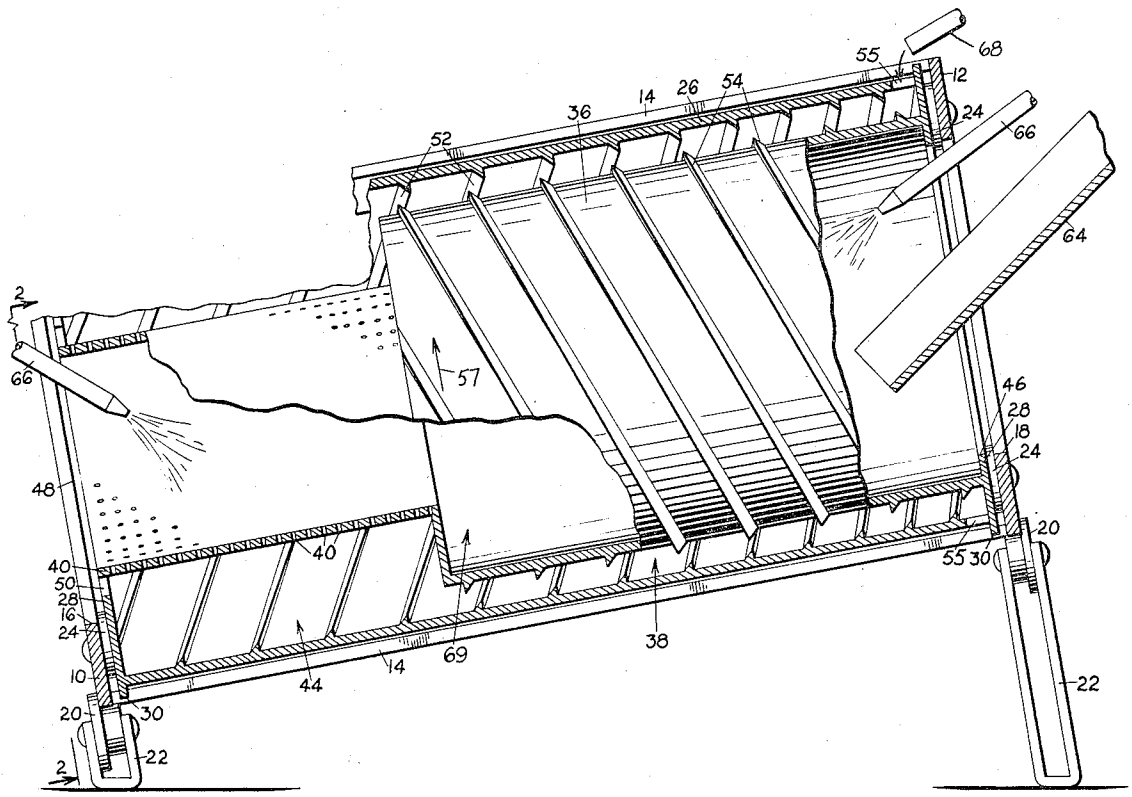
95,198	6/1922	Switzerland	209/451

Primary Examiner—Frank W. Lutter
Assistant Examiner—Ralph J. Hill
Attorney, Agent, or Firm—Eugene M. Eckelman

[57] **ABSTRACT**

A classifier having an outer tubular casing and a scrubber barrel with the casing. The scrubber barrel has an imperforate portion at the inlet end thereof and a perforated portion at the outlet end. The scrubber barrel is of less diameter than the outer casing to provide a space therebetween. The inner surface of the casing has a screw conveyor arranged to urge material toward the inlet end and the outer surface of the scrubber barrel has a screw conveyor arranged to urge material toward the outlet end. The arrangement is such that fines discharged into the area between the outer casing and the scrubber barrel are concentrated and urged back toward the inlet end by the screw conveyor on the casing, the upper or lighter portion of the fines being shaved off and moved toward the outlet end by the conveyor on the scrubber barrel. Means are provided to laterally shake the assembly.

10 Claims, 3 Drawing Figures



PATENTED JUN 11 1974

3,815,737

FIG. 1

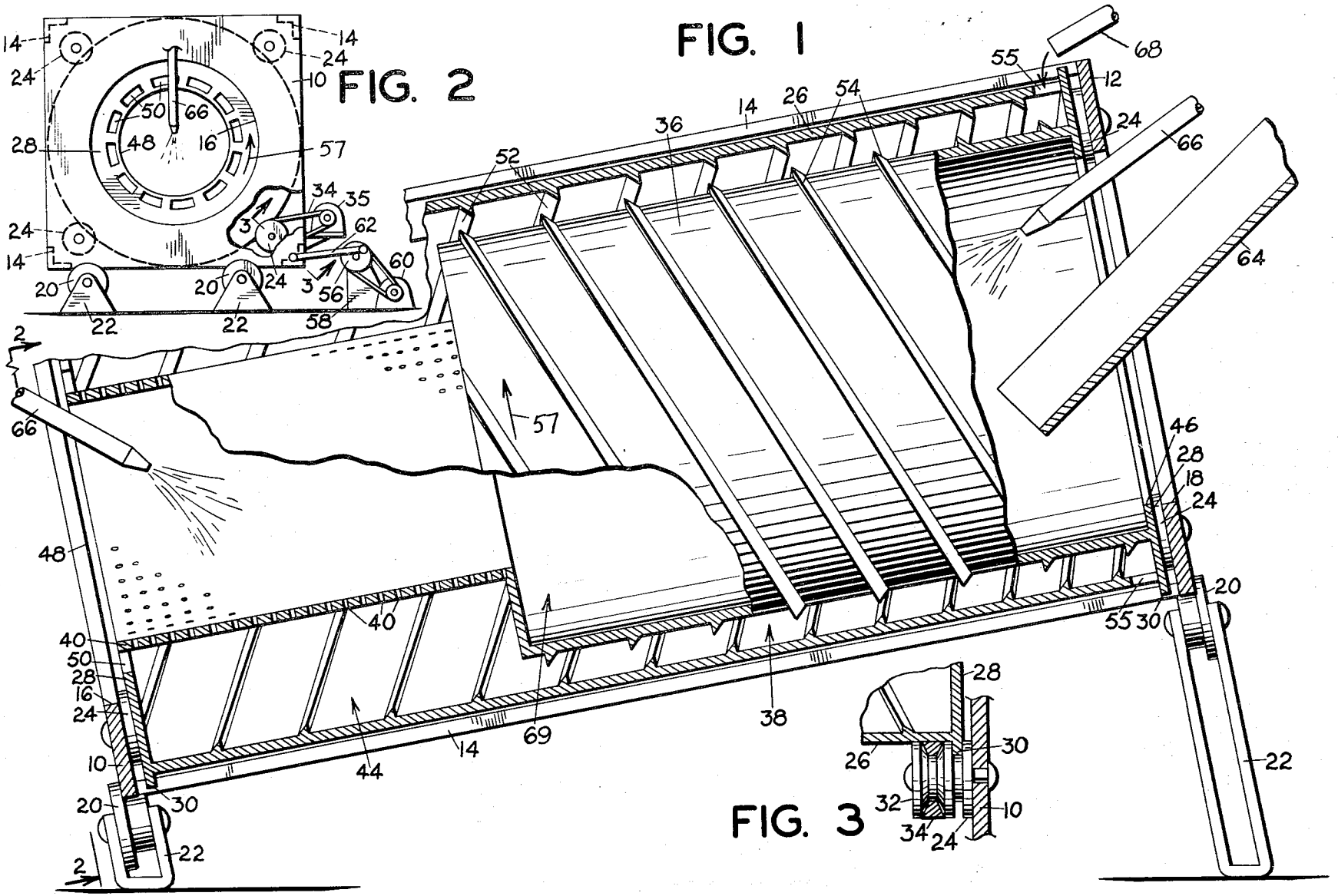


FIG. 2

FIG. 3

GRAVITY ORE CLASSIFIER

This invention relates to new and useful improvements in gravity separators.

A primary objective is to provide a gravity classifier which is capable of separating a concentrate from aggregate material with greater efficiency than devices heretofore employed.

A more particular object of the present invention is to provide a gravity classifier having means to separate fines from an aggregate and arranged to concentrate the heavy fines by shaving off lighter upper portions of the fines.

Additional objects of the invention are to provide a classifier of the type described which employs an outer imperforate casing and a scrubber barrel therein, the scrubber barrel being smaller in dimension than the casing to form a working space therebetween wherein fines discharged from the scrubber barrel are manipulated by a screw conveyor on the inner surface of the outer casing and directed toward the infeed end of the device for concentration of the heavy fines at a lower portion of the conveyor, and also including a screw conveyor on the outer surface of the scrubber barrel which operates in the opposite direction from the conveyor on the casing to shave off the lighter fines as they move toward the infeed end; to provide a scrubber barrel having an imperforate portion to form a working space for the cooperation of the two conveyors in the shaving operation and also having a perforated portion of lesser diameter at the end opposite from the infeed end so as to form an enlarged working area for initial separation of fines into the heavier concentrates; and to provide such a classifier which is tilted up at the infeed end so that the aggregate fed thereto works toward the end opposite from the infeed end by gravity.

Another object is to provide a gravity ore classifier of the type described employing lateral shaking means therefor to provide greater efficiency in separation.

Still another object of the present invention is to provide a gravity ore classifier of the type described which may be operated either wet or dry.

Yet another object of the present invention is to provide a classifier which is highly efficient in separating fines from aggregate and which at the same time is simplified in construction and inexpensive to manufacture.

The invention will be better understood and additional objects and advantages will become apparent from the following description which illustrates a preferred form of the device. In the drawings:

FIG. 1 is a longitudinal vertical sectional view of a gravity ore classifier of the instant invention, portions of this view being broken away;

FIG. 2 is a front elevational view of the classifier, taken on the line 2—2 of FIG. 1; and

FIG. 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIG. 2.

With particular reference to the drawings, the present classifier includes a pair of end frames 10 and 12 which as best seen in FIG. 2 are rectangular in shape. These end frames are connected integrally together by longitudinal frame members 14. Frame member 10 has an opening 16 therein and frame member 12 has an opening 18 therein.

The end frame members are supported on four single flanged rollers 20 mounted in brackets 22. As best seen in FIG. 1, the brackets 22 at one end have a greater height than the brackets at the other end whereby the frame assembly is tilted. Frame end 12 comprises the infeed end and the frame end 10 comprises the discharge end.

Each of the frame members 10 and 12 has four double flanged rollers 24 supported thereon. These rollers confine and support for rotation an outer imperforate tubular casing 26. This casing includes end walls 28 which have a diameter slightly greater than the casing 26 to provide flange extensions 30 engageable in the double flanged rollers 24. Such engagement between the extensions 30 and the rollers 24 provides the confining but rotatable support, best seen in FIG. 3.

With particular reference to FIG. 2, one of the rollers 24 has a pulley 32 integral therewith, and this pulley is engaged by a belt 34 from a drive motor 35 secured to the end frame 10. This roller when driven by the motor causes the casing 26 to rotate.

Integral with the outer casing is an inner scrubber barrel 36. This scrubber barrel is of less diameter than the outer casing 26 so as to form a working space 38 therebetween. The scrubber barrel is located at the infeed end of the apparatus and is imperforate. It has an extension 40 at the discharge end of the apparatus which includes a plurality of perforations or apertures 42. Extension 40 is of lesser diameter than the scrubber barrel portion 36 and provides an enlarged working space 44 between it and the outer casing 26.

An inlet end 46 is provided at the infeed end in the wall 28 for supplying aggregate to the scrubber barrel. The perforated extension 40 is open at the discharge end of the apparatus to form an outlet 48 for tailings. The end wall 28 of the casing at the discharge end of the apparatus has a plurality of apertures 50 located just at the outer periphery of the extension 40, and as will be more apparent hereinafter, apertures 50 provide for the discharge of lighter fines.

The outer casing 26 has a screw conveyor 52 on its inner surface and the scrubber barrel 36 has a screw conveyor 54 on its outer surface. Upon rotation of the casing and scrubber barrel in the direction of the arrow 57, the screw conveyor 52 is arranged to move material toward the infeed end of the apparatus and the conveyor 54 is arranged to move material toward the discharge end. In a preferred construction, the lead of the screw conveyor 52 lessens toward the infeed end. A plurality of discharge apertures 55 are provided in the outer casing 26 adjacent to the infeed end of the apparatus.

The apparatus, in addition to be rotated, may be shaken or vibrated laterally. Such is accomplished by a disc 56 rotatably secured on a base 58 and driven by a motor 60. The action is produced by a link 62 connected at one of its ends to the end frame 10 and at its other end to an off-center point on the disc 56.

The infeed end of the apparatus is associated with a trough or chute 64 for the introduction of aggregate. If desired, the infeed end, as well as the outfeed end, may be associated with water feed means 66. Also, water feed means 68 may be employed to feed water into apertures 55 so that in a wet process, water can be caused to flow down over the scrubber barrel and screw conveyor 54 to help clear the aggregate in the area 38.

In the operation of the present classifier, the casing 26 is placed in operation and aggregate is fed in through the trough 64. The casing may be vibrated laterally by the eccentric 56 if necessary. Water may or

may not be admitted into the infeed and/or discharge ends as determined by the type of material being treated and other conditions, as well understood. For the purpose of illustration, the aggregate will be considered to comprise a sand or a sand and rock combination and it is intended to separate out heavy fines which contain metal such as gold.

With the rotation of the apparatus, the aggregate is agitated in the scrubber barrel portion and thoroughly loosened and mixed. Such aggregate moves by gravity while still being agitated into the perforated extension **40.** Any heavy ore pieces, such as gold nuggets, collect in the bottom front portion **69** of the imperforate barrel **36.** The fines sift through the perforations **42** and the tailings empty out the discharge opening **48.**

The fines thus are deposited in the enlarged working space **44** between the extension **40** and the outer casing **36.** They are then engaged by the outer conveyor **52** which moves them toward the infeed end of the apparatus. In such movement, the fines are agitated so that the heavy concentrates thereof work to the bottom of the casing. The lighter fines are of course forced up to the top of the heavy fines, and as this assortment of fines is carried toward the infeed end, the screw conveyor **54,** operating in the opposite direction, will shave off the top or lighter fines. The fines thus deposited through the forward discharge opening **55** comprise heavy concentrates.

The present apparatus not only operates efficiently to separate fines from the aggregates, but it also separates the heavy or metal containing fines from the other fines, thus eliminating the necessity of transporting a massive bulk of material to distant processing plants. Such feature is accomplished by the two screw conveyors wherein the one conveyor works in one direction to concentrate the fines at the bottom thereof and the other conveyor works in the opposite direction to shave off the lighter, less valuable fines. The apparatus is extremely simplified in construction and thus economical to manufacture.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A gravity ore classifier comprising

a. a tubular imperforate casing,

b. means for rotating said casing,

c. a scrubber barrel mounted integrally within said casing having an outer diameter of less dimension than the inner diameter of said casing to provide a space therebetween,

d. inlet means in said scrubber barrel for admitting aggregate thereto,

e. said scrubber barrel having a perforated extension portion allowing fines to fall by gravity into the space between said casing and the scrubber barrel,

f. means defining an outlet in the end of said extension which is opposite from the feed end,

g. a first conveyor screw on the inner surface of said casing arranged to direct fines which fall into the space between the casing and the scrubber barrel toward the feed end,

h. a second conveyor screw on the outer surface of said scrubber barrel arranged to direct the said fines away from the inlet end whereby as the fines move with said first conveyor toward the inlet end the concentrates thereof compact in the first conveyor for movement therewith and the lighter fines are shaved off by the opposite inter-action between the two conveyors,

i. and outlet means in said casing for discharging the concentrates from said first conveyor.

2. The gravity ore classifier of claim **1** wherein

a. said inlet means in said scrubber barrel is at one end thereof,

b. said scrubber barrel including an imperforate portion adjacent to the inlet end thereof,

c. said perforate portion being disposed adjacent to the other end,

d. and outlet means in said scrubber barrel at the end opposite from said inlet means.

3. The gravity ore classifier of claim **1** wherein

a. said inlet means in said scrubber barrel is at one end thereof,

b. said scrubber barrel including an imperforate portion adjacent to the inlet end thereof,

c. said perforate portion being disposed adjacent to the other end.

4. The gravity ore classifier of claim **3** wherein said casing is tilted down from the inlet to the outlet end.

5. The gravity ore classifier of claim **3** wherein the perforate portion of said scrubber barrel is smaller in diameter than its imperforate portion to provide an enlarged separating space between such imperforate portion and the casing.

6. The gravity ore classifier of claim **5** including an outlet in said casing communicating with said enlarged separating space to discharge lighter ones of the fines.

7. The gravity ore classifier of claim **1** including shaker means engageable with said casing to shake the latter.

8. The gravity ore classifier of claim **1** including shaker means engageable with said casing to shake the latter laterally.

9. The gravity ore classifier of claim **1** including means for introducing water to one of said inlet and outlet ends.

10. The gravity ore classifier of claim **1** including means for introducing water to said inlet means of the scrubber barrel and to the upper outer portion of said scrubber barrel adjacent said inlet means.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,815,737
DATED : June 11, 1974
INVENTOR(S) : GENE S. KATTER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The reference numeral 40 with multiple lead lines applied to the perforations in Figure 1 should be 42.

Signed and Sealed this

Third Day of August 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3, 815, 737
DATED : June 11, 1974
INVENTOR(S) : GENE S. KATTER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The reference numeral 40 with multiple lead lines applied to the perforations in Figure 1 should be 42.

Signed and Sealed this

first Day of June 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks