Feb. 1, 1966 S. C. WENTA ETAL 3,232,427

SEPARATING DEVICE

Filed Dec. 14, 1962 2 Sheets-Sheet 1

FIG. 1.

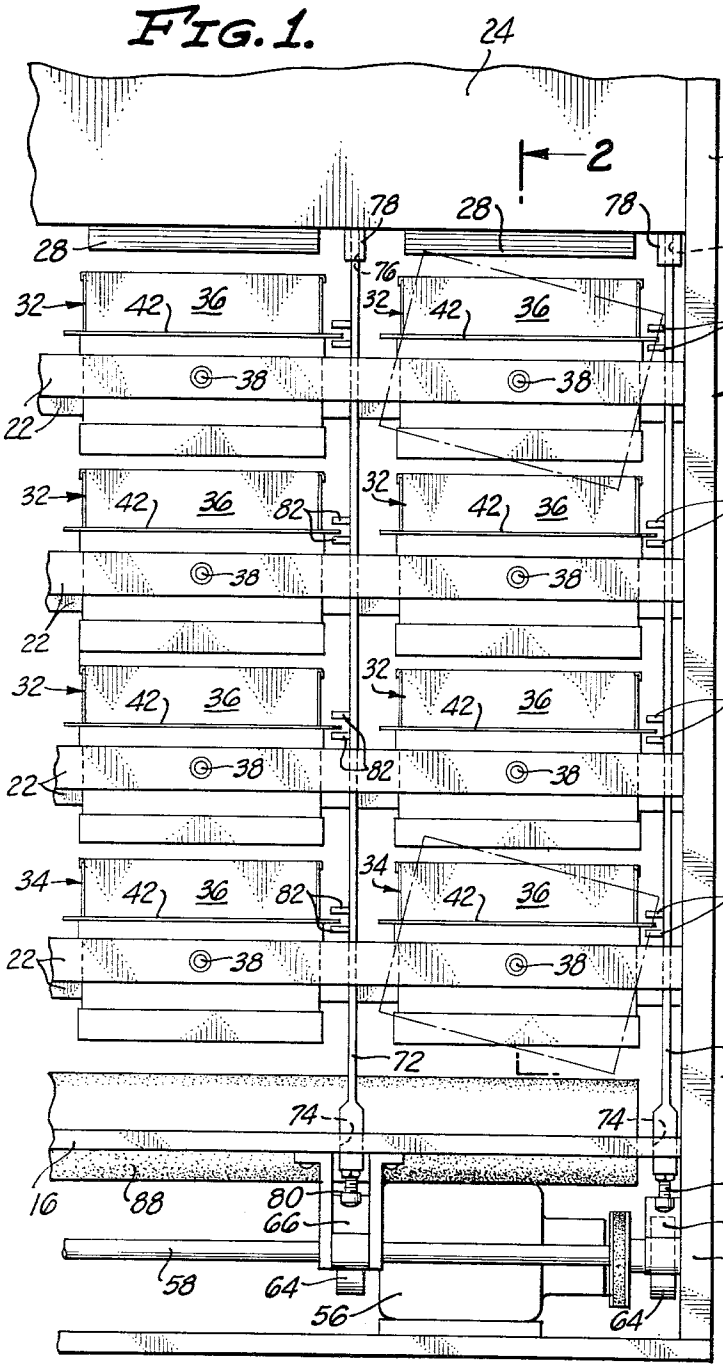
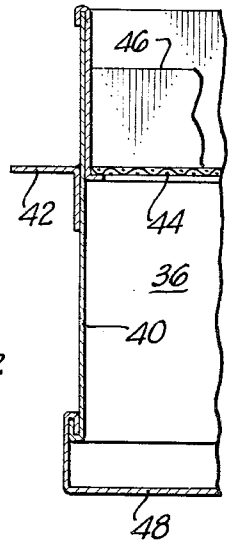


FIG. 3.



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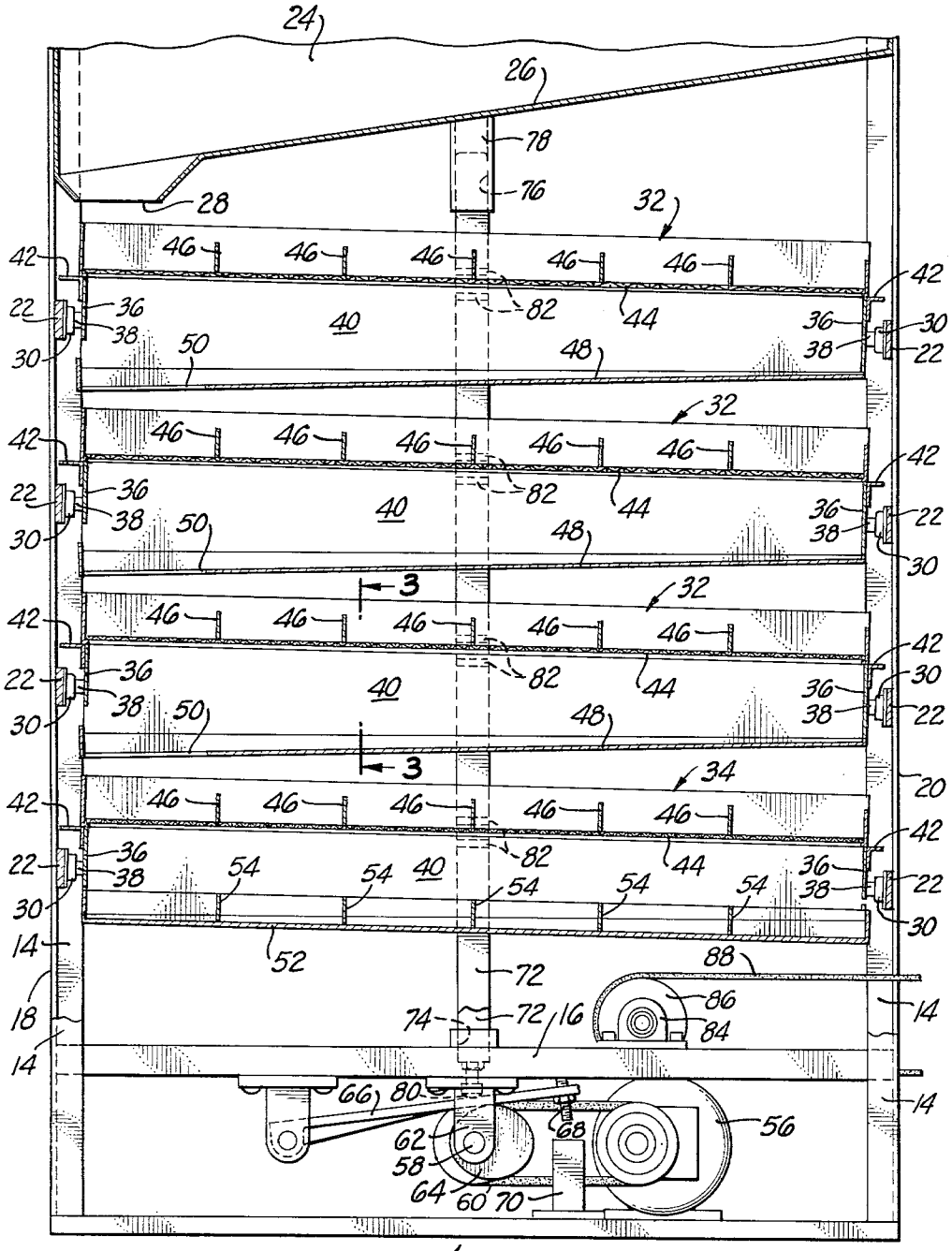

FIG. 2.

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SEPARATING DEVICE

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Filed Dec. 14, 1962, Ser. No. 244,731
3 Claims. (Cl. 209—44)

This invention relates to new and improved separating devices such as are capable of being employed in concentrating various types of ore such as gold ore.

In spite of the fact that a great many different types of classifying and separating devices have been developed and utilized in the past, there remains a very definite need for new and improved devices of this type. To be acceptable a separating device must of course be capable of being used in separating and concentrating various mineral ores with a relatively high degree of efficiency. In addition, however such a device must be capable of being easily and conveniently manufactured at a comparatively nominal cost and must be capable of being inexpensively operated.

An object of the present invention is to provide new and improved separating devices which are designed to meet these needs. Thus, a more specific object of this invention is to provide separating devices which can be manufactured at a comparatively nominal cost, which are capable of being operated at a minimal expense, and which effectively do the job of separating or concentrating mineral ores.

These and various other objects of this invention will be more apparent from a detailed consideration of the remainder of this specification, the appended claims, and the accompanying drawings in which:

FIG. 1 is an end elevation view showing a part of a separating device of this invention;

FIG. 2 is a cross-sectional view taken at line 2—2 of FIG. 1;

FIG. 3 is a partial cross-sectional view taken at line 3—3 of FIG. 2;

The accompanying drawings are primarily intended so as to clearly illustrate a presently preferred embodiment or form of a separating device of this invention in such a manner that anyone skilled in the art of concentrat-and and separating structures or devices for use with various types of mineral ores will have no difficulty in reproducing the invention. Such individuals will realize from a careful consideration of the remainder of this specification and of the drawings that the principles and features of this invention as are defined or summarized in the appended claims can be embodied within other devices which differ from the preferred device shown as to appearance through the use or exercise of routine engineering skill.

As an aid to understanding this invention it can be stated in essentially summary form that it concerns separating devices, each of which has a vertically extending frame structure which holds a series of separating pans located one above another so that these pans are capable of being oscillated. These pans are formed so that each of them has a screen extending completely across it and a sloping bottom; preferably each of the screens is surmounted by riffles. Further all of the pans except the bottom one of them is provided with an end outlet opening. With this type of structure the materials to be separated or classified are located on the uppermost of the pans and upon oscillation of all the pans moves downwardly from one to another of them so as to achieve a separating action.

The invention is best more fully explained by referring directly to the accompanying drawings. Here there is shown a separating device 10 of the present invention

which includes a framework 12 having vertically extending uprights 14 which extend from a base 16. At first and second ends, 18 and 20 of the framework 12 the uprights 14 are connected by means of horizontally extending support bars 22. At the top of the framework 12 the uprights 14 carry a hopper 24 having a sloping bottom 26 containing and leading to a series of individual discharge openings 28.

The bars 22 carry bearings 30 which are aligned so as to carry various pans 32 and 34. Each of the pans 32 and 34 includes end walls 36 which carries shafts 38 fitting into the bearings 30 in such a manner that the pans 32 and 34 are capable of being oscillated during the use of the device 10. These end walls 36 are joined by means of imperforate side walls 40; these side walls carry outwardly extending angle iron braces 42 which serve to reinforce the pans 32 and 34 and which also serve another function as hereinafter described.

Each of the pans 32 and 34 carries a screen 44 which extends between the end and side walls 36 and 40 of the pan within which it is located. Each of the screens 44 is surmounted by a series of riffles 46, each of which extends completely between the side walls 40 of the pan within which they are located. These riffles 46 may be secured to the screens 44; if they are not secured they preferably fit very tightly or closely against these screens. In each of the pans 32 and 34 the screen 44 employed is located at a slight angle to the horizontal so as to slope gradually from the first end 18 of the framework 12 downwardly towards the second end 20 of this framework.

Each of the pans 32 is provided with an imperforate bottom 48 which extends at a slight angle to the horizontal so as to slope downwardly from the second end 20 of this framework 12 towards the first end 18 of it. In each of the bottoms 48 there is provided an outlet opening 50 which is located immediately above the upper end of a screen 44 in another pan 32 or 34. The pans 34 at the bottom of the device 10 differ from the pans 32 in that they have imperforate bottoms 52 which slope from the first end 18 of the framework 12 towards the second end of this framework. In the pans 34 the bottoms 52 are secured to riffles 54 which extend completely across these bottoms 52 between the sidewalls 40 of these pans.

In the device 10 the pans 32 and 34 are in effect positioned with respect to one another so as to form a series of vertically extending pans, each one of these series being located beneath a discharge opening 28 from the hopper 24, and each one of these series terminating in a lowermost pan 34. The pans 32 and 34 are arranged in this manner so that they can be easily and conveniently oscillated back and forth as a unit with a banging type action if this is desired. In the device 10 the power for such oscillation of the pans 32 and 34 is provided by a conventional motor 56 mounted upon the base 16 of the framework 12.

Power from this motor 56 is transmitted to a drive shaft 58 used to oscillate all the series of the pans 32 and 34 through a conventional drive 60. This shaft 58 is mounted upon bearings 62 so as to extend along the base 16 of the framework 12 generally parallel to the first and second ends 18 and 20 of it. The shaft 58 carries a series of individual cams 64, each of which is used to convey motion to a series of pans 32 and 34 located one above another. This motion is transmitted through the use of a rocker arm 66 which is pivotally mounted in bearings mounted upon the base 16 of the framework 12 in conjunction with each of the cams 64. Each rocker arm 66 normally rests against its corresponding cam 64 and projects beyond it. At the end of each rocker arm 66 there

is provided a bolt **68** capable of being adjusted so as to extend from the arm upon which it is mounted a distance depending upon how it is desired to operate the device **10**. These bolts **68** are adapted to hit against stop anvils **70** secured to the base **16**.

In the device **10** each of the series of vertically extending pans **32** and **34** is located next to a rocker bar **72** which extends vertically upwardly from immediately above one of the arms **66**. These bars **72** extend through openings **72** in the base **16** of the framework **12** and into other openings **76** in brackets **78** secured to the bottom **26** of the hopper **24**. Thus, with this construction the bars **72** are capable of being reciprocated back and forth as bolts **80** mounted upon the lowermost ends ride against the upper surfaces of the arms **68** when the motor **56** is operating. Such motion is transmitted to the individual pans **32** and **34** so as to oscillate them by means of small flanges **82** which are secured to the bars **72** and which straddle the braces **42** on the individual pans **32** and **34**.

The base **16** of the framework **12** carries other bearings **84** which in turn carry an elongated roller **86** in such a manner that such roller extends parallel to the second end **22** of the framework **12**. The roller **86** carries a conventional conveyor belt **88**, the portions of which are not shown in the drawing are supported in an established manner.

During the use of the device **10** material to be processed within this device is placed within the hopper **24** at the same time the motor **56** is operating. Normally such material will move downward by gravity into the uppermost end of the screen **44** on the uppermost of the pans **32**. As the material moves in this manner all of the pans **32** and **34** will be oscillating through the use of the structure previously described. This will cause the material to move towards the second end **20** of the framework **12** over the riffles **46** in this pan along the screen **44**. As this happens certain material will, of course accumulate behind these riffles **46** and other material will pass through the screen **44** in the uppermost of the pans **32** and will hit against the bottom **48** of it and will move downwardly through the outlet opening **50** to the next pan **32** of the series. The material accummulated behind the riffles **46** will build up until it is higher than the riffles. Since the riffles **46** have their top edges progressively stepped downwardly to the right, as seen in FIG. 2, the larger, lighter material moves to the right over the tops of the riffles. It is restrained by the sides which extend above the tops of the riffles **46**. The larger, lighter material ultimately passes out of the right hand end of pans **32**, as seen in FIG. 2, and falls upon the conveyor **88** to be carried away. The larger, heavier material remains behind the riffles and is slowly ground until the particles ground therefrom pass through the supporting screen **44**.

This action will of course continue until such time as the material reaches the lowermost pan **34** of any series. Here the heaviest material will accumulate behind the riffles **54** in the bottoms **52** of the pans **34**. As this action continues comparatively large and/or comparatively lightweight particles of the material initially deposited within the hopper **24** will pass over the right end walls **36** of the pans **32** and **34**, as seen in FIG. 2, adjacent to the second end **20** of the framework **12**. This material will land upon the conveyor belt **88** and be conveyed away from the device **10**.

Preferably the various individual screens **44** employed in the pans **32** and **34** are graduated as to size so that in any series of these pans **32** and **34** the screen dimensions are the greatest at the top of the series and the smallest at the bottom of the series. This enables a size separation to be achieved so that small comparatively heavy particles accumulate in the bottom pan **34**. If desired the areas back of the riffles **54** in the bottom pans **34** may be initially filled with mercury so as to aid in separating and accumulating gold when the device **10** is used with gold ore.

From a careful consideration of the preceding and of the accompanying drawings it will be realized that the device **10** is a comparatively simple, effective structure for use in separating comparatively heavy or dense small particles of material from different ores. It will also be realized that devices such as the device **10** may be manufactured so as to include only a single series of vertically extending pans such as the pans **32** and **34** located one above another, or that any numbers of series of pans can be employed in a single device corresponding to device **10**. By virtue of this it is possible to obtain a structure in which a plurality of series of pans are used so as to achieve virtually any desired degree of movement of the pans **32** and **34** required for use with any specific ore can be achieved by adjusting the bolts **68** and **80**.

Because of the nature of this invention and the fact that various changes of routine engineering variety may be made in the structure shown it is to be considered as being limited solely by the appended claims forming a part of this disclosure.

We claim:

1. A separating device which includes:

frame means having first and second ends;

a plurality of separate pans, said pans being pivotally mounted on a pivoted axis on said frame means so as to extend between said ends of said frame means, each of said pans having first and second sides, and each of said pans having first and second ends adjacent said first and second ends of said frame means, said pivotal mounting being on said first and second ends of said pans so that said pivotal axis extends parallel to said sides, said pans being located one above the other and each having a screen extending across its interior between said first and second ends and said first and second sides of said pans, said screens sloping downwardly from said first end of said frame means toward the second end of said frame means, each of said pans above the lowermost of said pans having imperforate bottoms positioned below said screens and secured to said sides sloping downwardly from said second end of said frame means towards the first end of said frame means and an outlet opening in each of said bottoms above the lowermost located above the upper end of a screen of the next lower of said pans, the lowermost of said pans having an imperforate bottom for collecting material separated by said separating device;

means for oscillating said pans above the pivotal mounting of said pans, said means for oscillating comprising:

motor means mounted on said frame means;

cam means connected to said motor means so as to be rotated thereby;

rocker bar means mounted on said frame means so as to be capable of reciprocal motion in a vertical direction;

means for engaging each of said pans so as to oscillate said pans located on said rocker bar means;

means for transmitting motion from said cam means to said rocker bar means so as to cause movement of said bar;

a plurality of riffles mounted in each of said pans above the lowermost of said pans above the screens therein, said riffles being substantially parallel to the end of said pans and at substantially right angles with respect to the pivot hole mounting of said pans so that rocking of said pans is adapted to cause material movement parallel to said riffles.

2. A separating device which includes:

frame means having first and second ends and a top and a bottom;

a hopper mounted on the top of said frame means, said

hopper having a discharge opening located adjacent to said first end of said frame means;

a plurality of separate pans having first and second ends adjacent said first and second ends of said frame means and having first and second sides extending between the ends thereof, first and second end walls at said first and second ends, respectively, first and second side walls at said first and second sides, respectively, each of said plurality of separate pans being pivotally mounted on said frame means one above the other so that each of said pans extends between the first and second ends of said frame means and slopes downwardly towards said second end of said frame means, each of said pans having a screen extending across its interior, said screen being positioned below the tops of said side walls and said end walls of said pans, each of said screens sloping downwardly towards said second end of said frame means from said first end of said frame means, each of said pans including a plurality of riffles extending from one side wall to the other thereof across the screen located therein in contact with the upper surface of said screen, each of said pans above the lowermost of said pans having an imperforate bottom carried by said side walls sloping from said second end of said frame means towards said first end of said frame means and an outlet opening above the uppermost extremity of the screen means in the next lower of said pans, the lowermost of said pans having an imperforate bottom sloping from said first end of said frame means towards said second end of said frame means and a plurality of riffles extending in contact with said imperforate bottom parallel to said ends of said frame means;

conveyor means extending into said frame means beneath the ends of said pans adjacent to said second end of said frame means, said conveyor means being capable of conveying material away from said frame means; and

means for oscillating said pans mounted on said means for oscillating said pans mounted on said frame means so as to be capable of engaging said pans.

3. A separating device which includes:

frame means having first and second ends;

a plurality of separate pans, said pans being pivotally mounted on a pivoted axis on said frame means so as to extend between said ends of said frame means, each of said pans having first and second sides, and each of said pans having first and second ends adjacent said first and second ends of said frame means,

said pivotal mounting being on said first and second ends of said pans so that said pivotal axis extends parallel to said sides, said pans being located one above the other and each having a screen extending across its interior between said first and second ends and said first and second sides of said pans, said screens sloping downwardly from said first end of said frame means toward the second end of said frame means, each of said pans above the lowermost of said pans having imperforate bottoms positioned below said screens and secured to said sides sloping downwardly from said second end of said frame means towards the first end of said frame means and an outlet opening in each of said bottoms above the lowermost located above the upper end of a screen of the next lower of said pans, the lowermost of said pans having an imperforate bottom for collecting material separated by said separating device, said bottom of the lowermost of said pans sloping from said first end of said frame means toward said second end of said frame means, said lowermost of said pans having a plurality of riffles extending parallel to said ends of said frame means across the bottom of said lowermost of said pans; and

means for oscillating said pans about the pivotal mounting of said pans; and a plurality of riffles mounted in each of said pans above the lowermost of said pans above the screens therein, said riffles being substantially parallel to the ends of said pans and at substantially right angles with respect to the pivotal mounting of said pans so that rocking of said pans is adapted to cause material movement parallel to said riffles.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,232,427 February 1, 1960

Steven C. Wenta et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 41, strike out "means for oscillating said pans mounted on said".

Signed and sealed this 17th day of January 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents