United States Patent [19]

Riesbeck et al.

[11] **3,794,165**

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[54] **MOTION CONTROL FOR A MATERIAL SEPARATOR**

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[21] Appl. No.: **125,274**

[52] **U.S. Cl.** **209/325,** 209/332, 209/367, 74/87

[51] **Int. Cl.** **B07b 1/36,** B07b 1/42

[58] **Field of Search** 209/331, 332, 366, 366.5, 329, 209/415, 413, 325, 367, 363, 364; 74/86, 87, 89.15, 424.8; 248/17, 23

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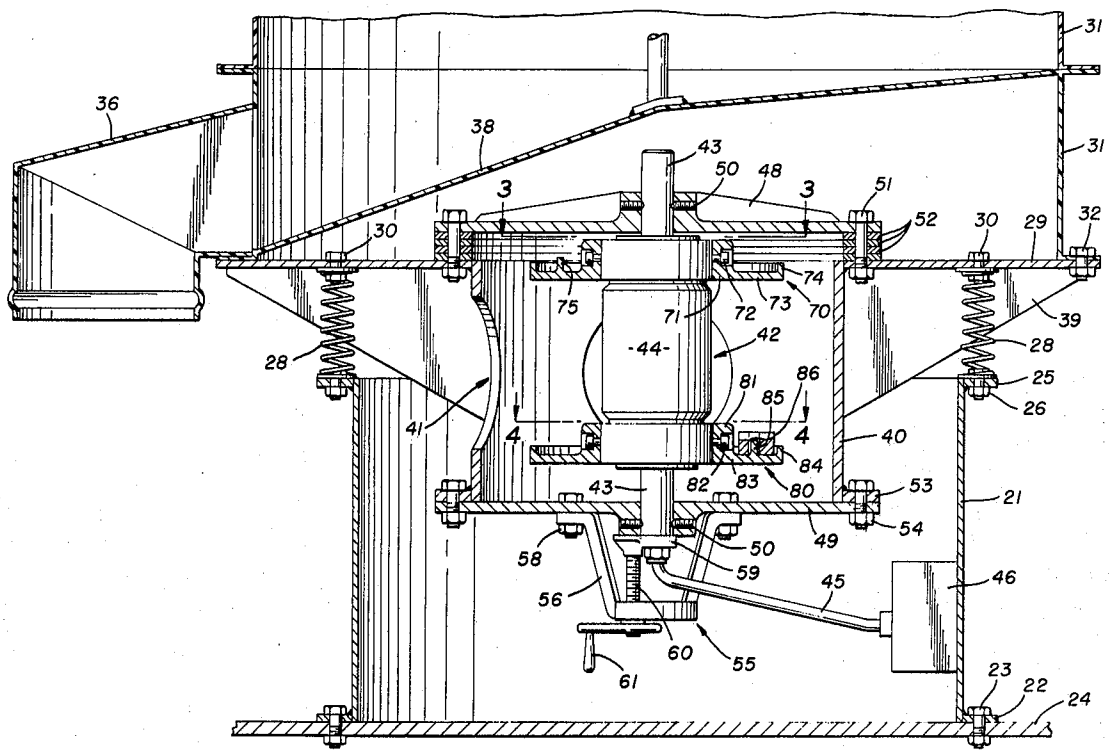
[57] **ABSTRACT**

A device for generating motion to a conventional material separator consists generally of a variable speed rotatable shaft-like member. Attached to the rotatable member are weights, the position of which is adjustable axially along and circumferentially around the rotatable member. Further, the axial position of the rotatable member and the weights affixed thereto is adjustable, thus providing a wide range of motions to the material separator.

11 Claims, 15 Drawing Figures



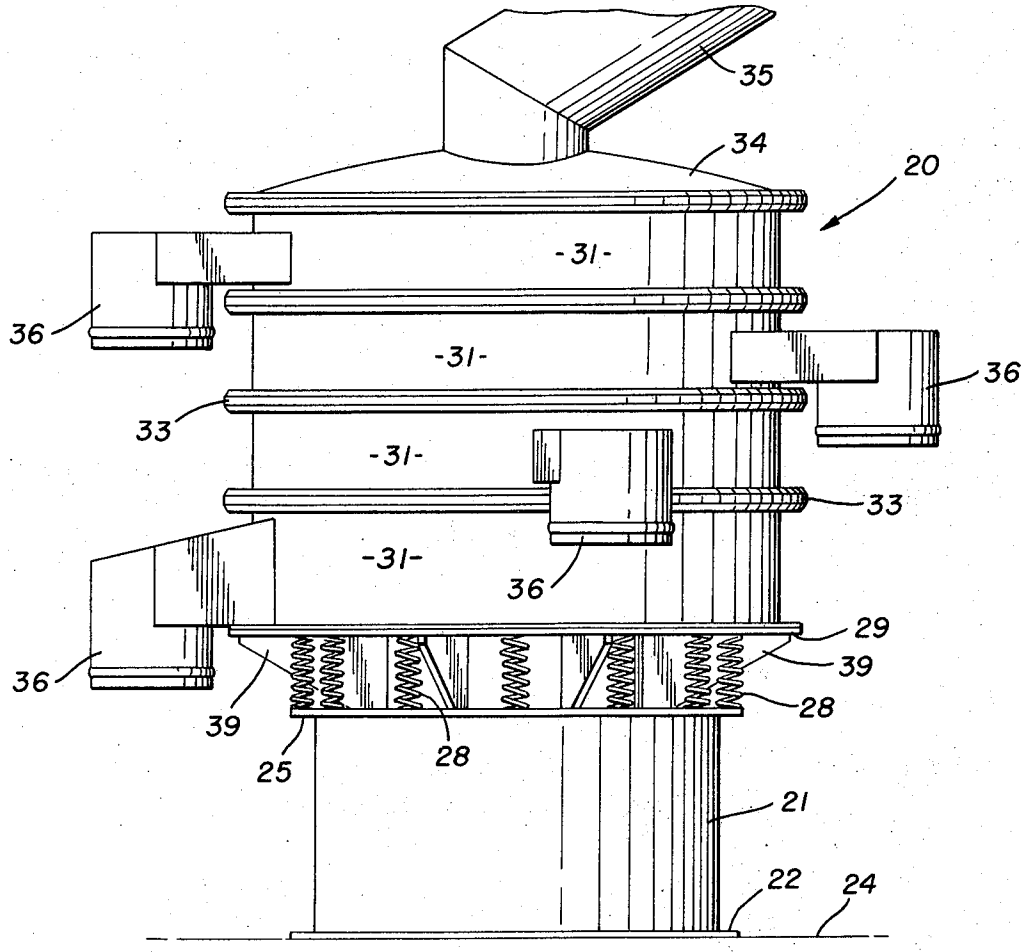


FIG. 1

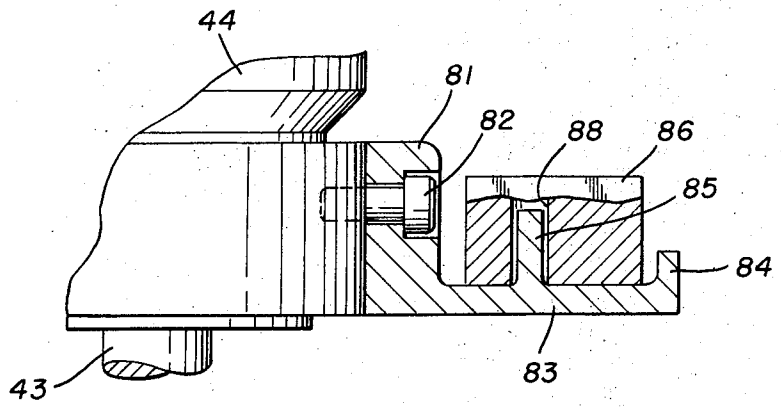


FIG. 5

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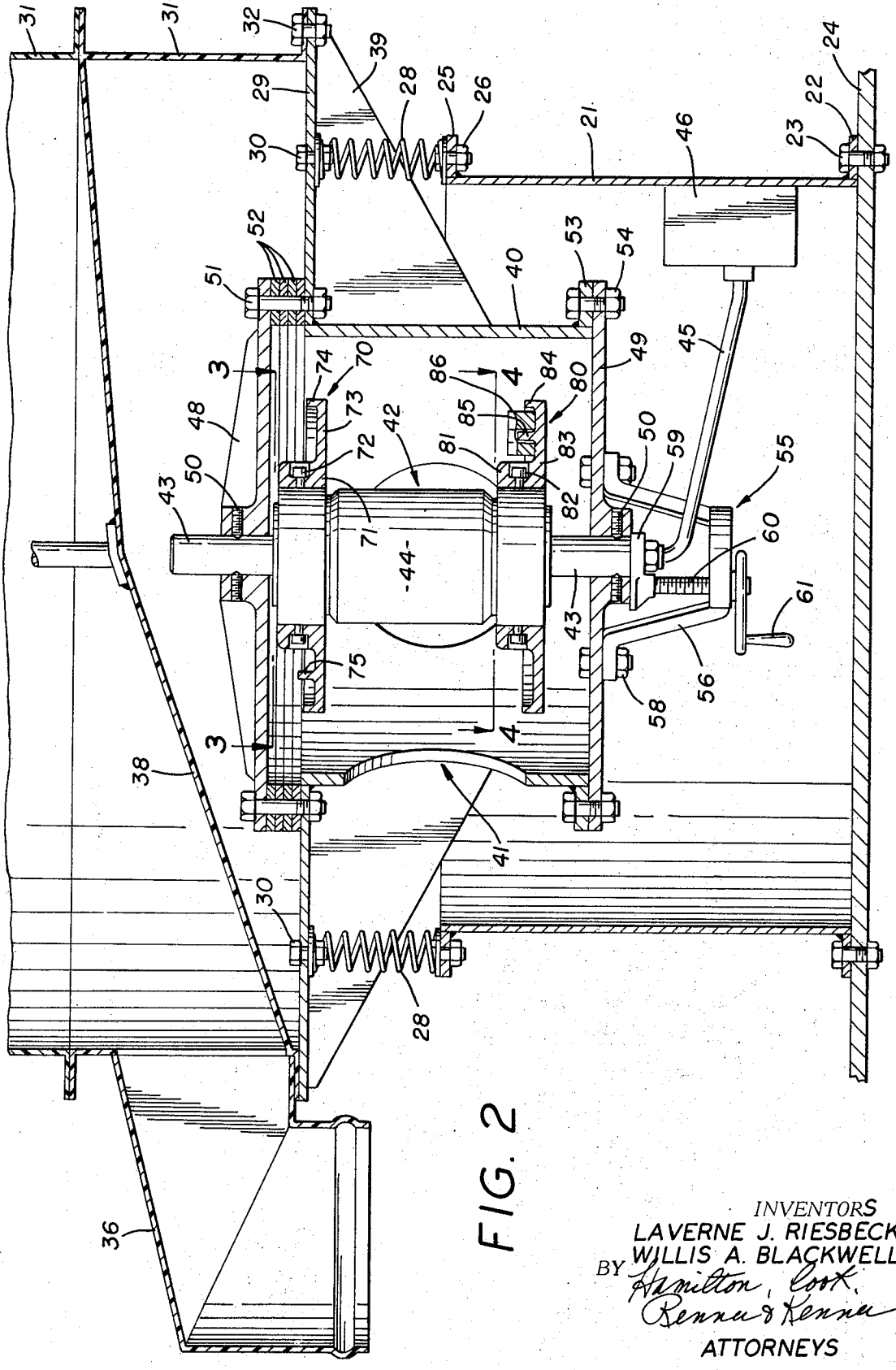

FIG. 2

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FIG. 3

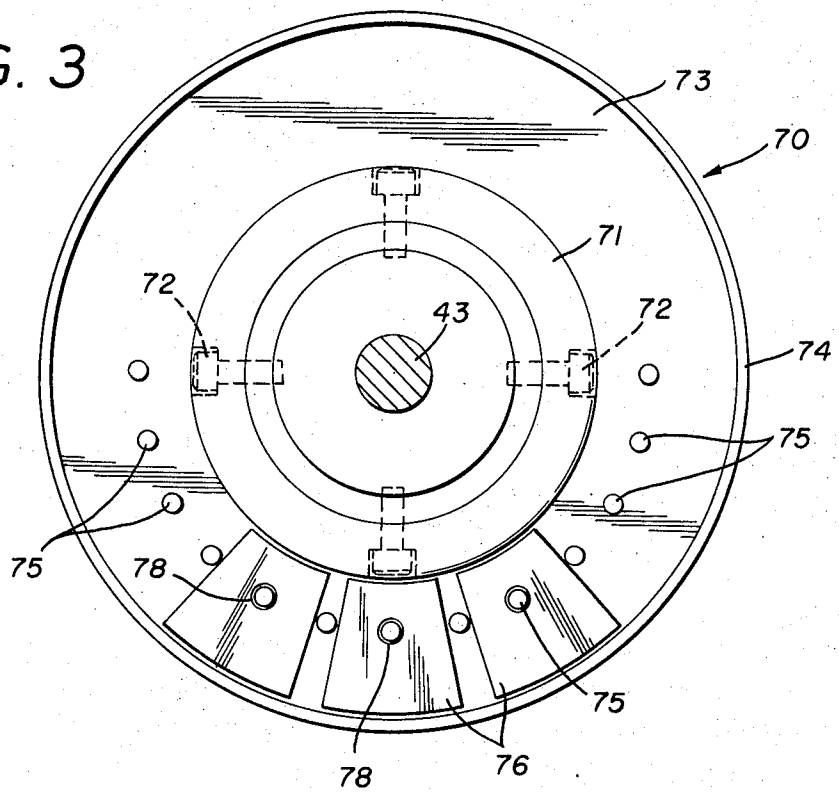
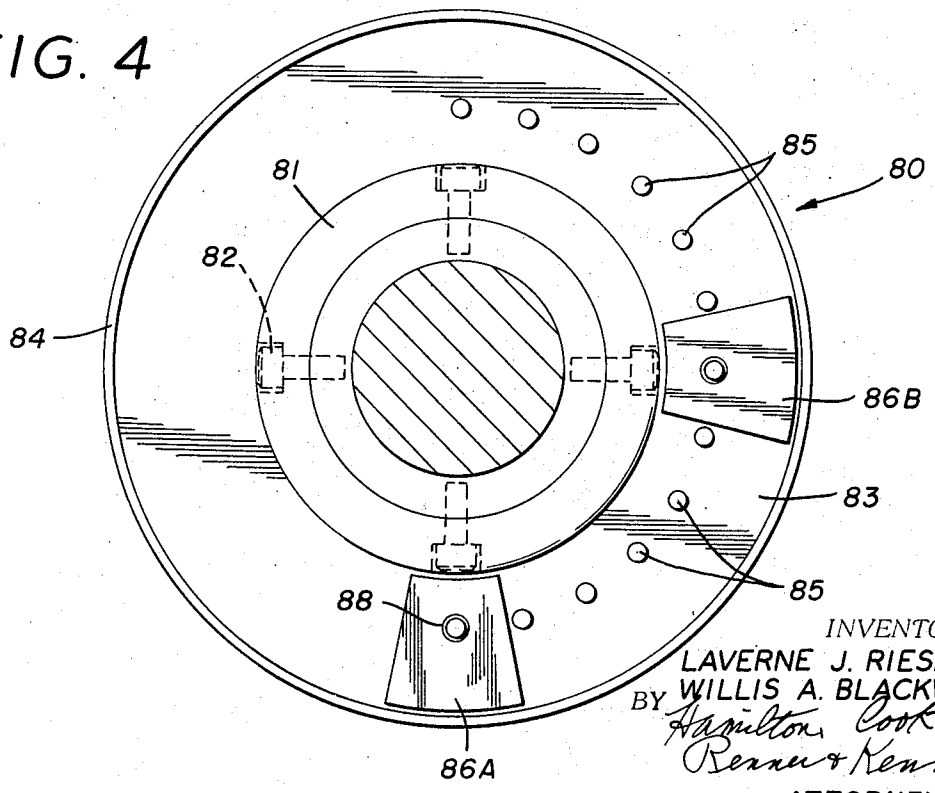


FIG. 4



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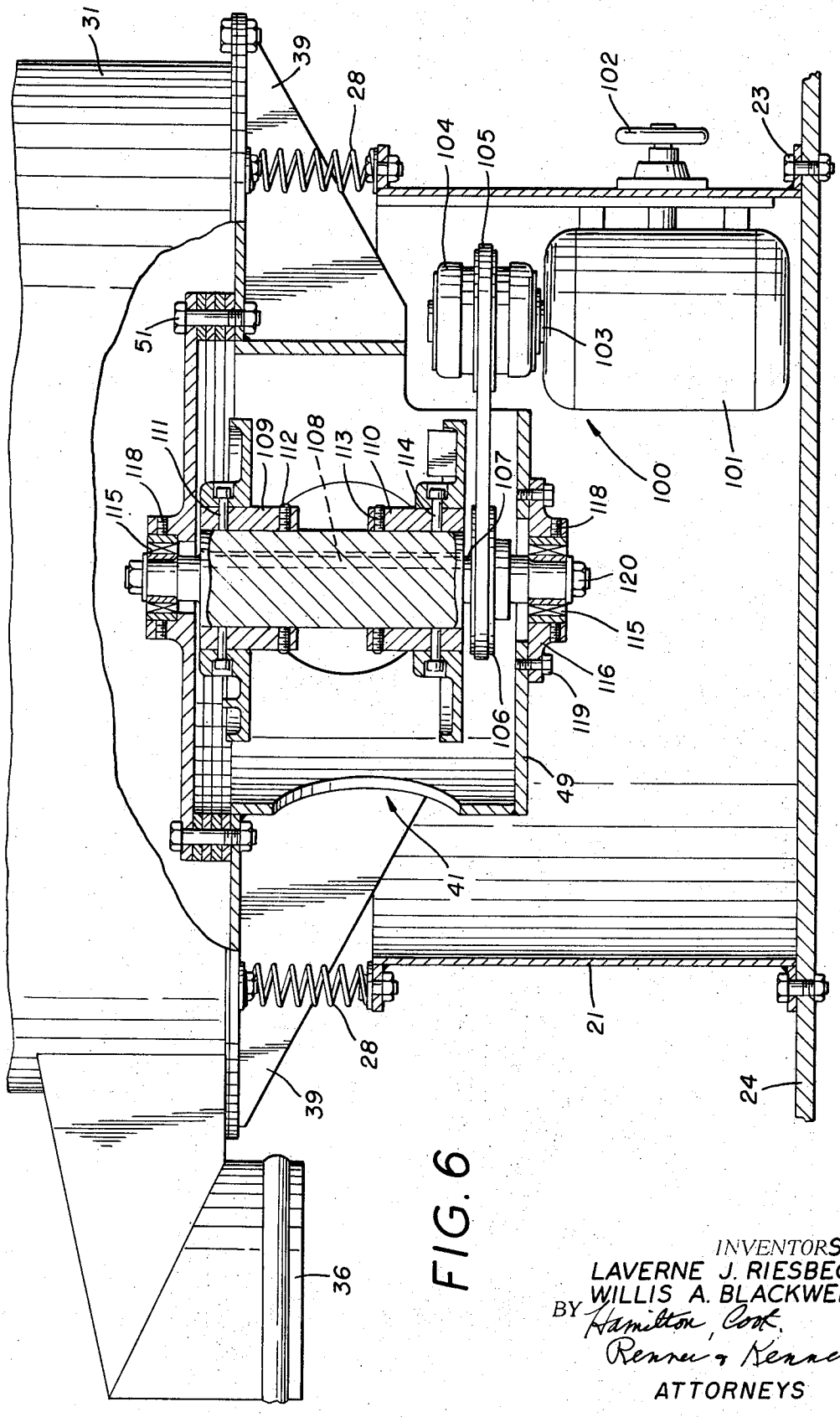

FIG. 6

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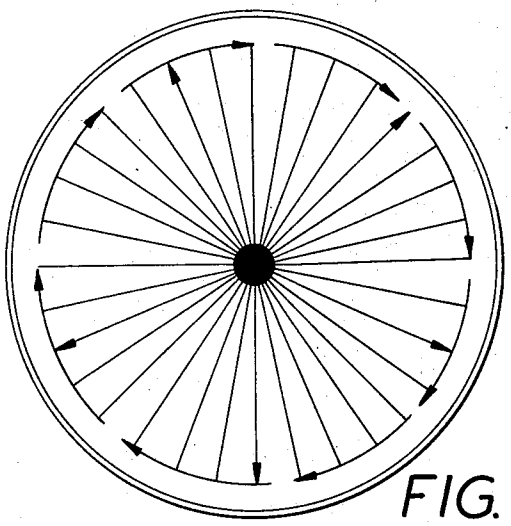

FIG. 7

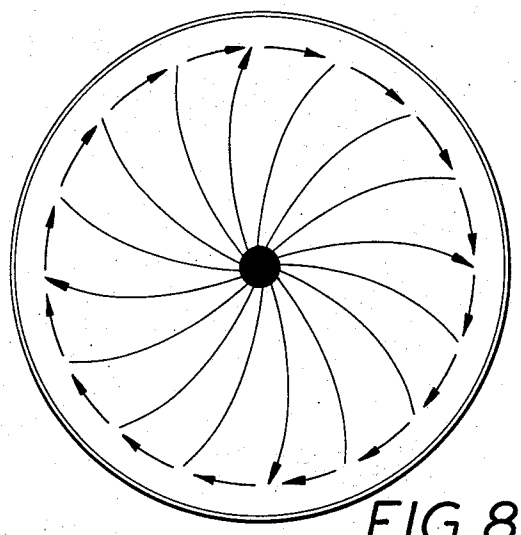

FIG. 8

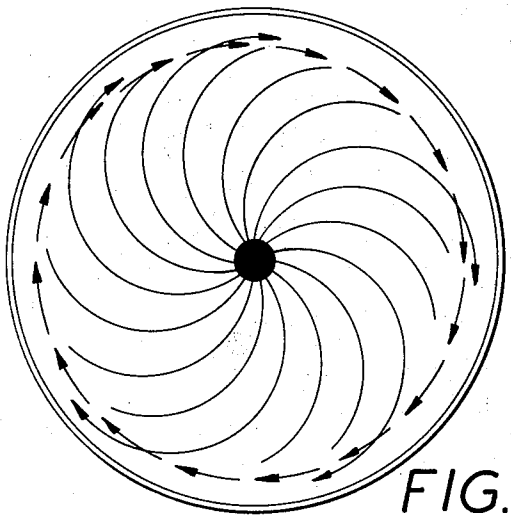

FIG. 9

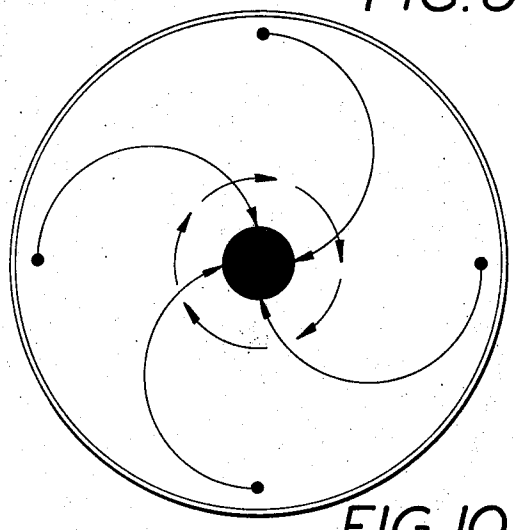

FIG. 10

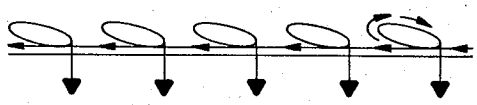

FIG. 11

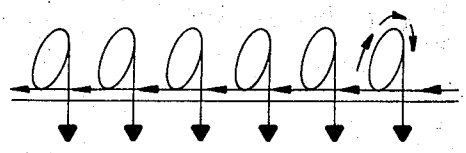

FIG. 14

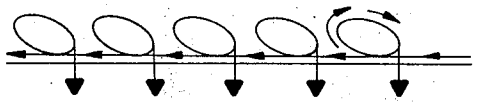

FIG. 12

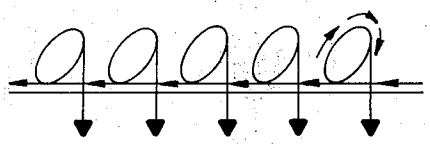

FIG. 15

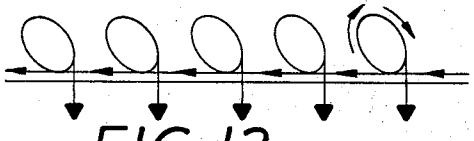

FIG. 13

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MOTION CONTROL FOR A MATERIAL SEPARATOR

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for generating motion in a conventional material separator. More specifically, this invention relates to an apparatus which is capable of producing and controlling a variety of motions so that a material separator can be universally utilized to classify materials having a diversity of specifications.

Many industries utilize material separators to classify certain solid materials by size or to separate solid material from liquid material. In either case, the material is fed to at least one screen surface which retains the oversize particles and allows the smaller particles or the liquid to pass therethrough. A vibrating, shaking or agitating motion is imparted to the screen to effect a more efficient separation and to move the oversize particles on the screen to a discharge area or chute generally located at the periphery of the screen but sometimes located centrally thereof. The type of motion to be imparted to the screen or screens varies dependent on the particular material being separated. Prior to this time, there is no device, of which we are aware, which is capable of providing the necessary range of motions so that a single material separating machine could be universally utilized for all materials.

One prior art device was first described in U.S. Pat. No. 2,284,671 and has since been shown environmentally in a number of patents pertaining to the material separating art. In this design a motor having eccentric weights on its rotating shaft vibrates the material separator which is supported by a plurality of springs. Such design, however, even as improved through the years, has presented certain mechanical as well as control problems. Mechanically, heat buildups in the area of the motor, in addition to a generally complex design, cause a rapid wearing of vital components. Further, no means have ever been provided in these devices to prevent the vibrations from loosening the electrical wires which provide the power to the motor.

In the control sense, the device of U.S. Pat. No. 2,284,671 has not proven acceptable for universal applications, particularly in that the flow pattern of the material cannot be totally adjusted. Initially, any adjusting that can be made requires substantial disassembling of the apparatus and thus cannot be made while the machine is operating. Further, the use of eccentric weights inherently initiates a force which is too vertically oriented such that certain desired flow patterns cannot be obtained. Likewise, undesirable flow patterns or even no flow whatsoever might occur if a "null" point existed at some height above the motor, that is, at the level of one of the stacked screens. Since this device provides no means for readily adjusting the vertical height of the forces, these null points might exist. While some of the above problems could be solved if the rpm of the motor were adjustable, such controllability is not provided in the device of U.S. Pat. No. 2,284,671. Since this machine is not capable of operation at high speeds (basically due to the fact the mechanical problems previously discussed would be compounded), those applications requiring a greater speed are either inefficiently attempted on such a machine or are not accomplished at all.

Another prior art device, designed to solve some of the above noted problems, is that shown in U.S. Pat. No. 3,273,409. This device utilizes two shafts, one stationary connected to the material separator and the other rotatable about the first and being movable laterally of the axis of the first shaft to adjust the eccentricity. Counterweights are necessary to prevent vibratory force transmission to the rotatable shaft, or stated another way, are necessary to overpower the severe unbalance created by the eccentricity. While the facet of adjusting the eccentricity of the shafts does aid in solving some of the control problems present in the prior art device previously described, certain mechanical and control problems nevertheless exist in the device of U.S. Pat. No. 3,273,409. For example, because of the eccentric shafts, severe bearing problems as well as lubrication problems exist in the device. When the bearings or any particular part must be repaired or replaced, the whole generator must be torn down and because the stationary shaft is welded to the lower portion of the material separator, the machine itself must be dismantled and certain parts thereof replaced.

The motion generated by the device of U.S. Pat. No. 3,273,409 is characterized by an excessive horizontal force and deficient vertical force. Thus, the apparatus will adequately separate liquids from solids (which process requires a substantial horizontal force) but does less than an efficient job on the classification of dry materials due to its inability to establish any flow pattern. Further, as is characteristic of other prior art, undesirable null points will tend to exist at certain screen levels despite efforts to eliminate the same.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a device for generating motion to a material separator so that the separator can be universally adapted for all applications.

It is another object of the present invention to provide a device, as above, which controls the pattern of the flow of material on a screen of a material separator.

It is still another object of the present invention to prove a device, as above which is capable of adjusting the vertical height of the forces generated on particles to be separated, controlling the amount and speed of circumferential travel thereof, and eliminating null points which might exist at a particular screen.

It is yet another object of the present invention to provide a device, as above, which can be maintained, controlled and repaired without dismantling.

It is a further object of the present invention to provide a device, as above, which eliminates the problems with bearings, heat build-ups, rapid wearing or parts and lubrication characteristic of the prior art.

It is a still further object of the present invention to provide a device, as above, which is electrically operated but not plagued with the occurrence of broken electrical connections.

These and other objects of the present invention which will become apparent from the following description are accomplished by apparatus hereinafter described and claimed.

In general, a rotatable member carries two balance trays or cages which are axially separated and which hold circumferentially adjustable weights. In one embodiment, the rotatable member is a shaft rotated by a variable speed motor; in another embodiment, the ro-

tatable member is the motor itself. The entire assembly of the rotatable member and upper and lower weights is axially adjustable with respect to the material separator.

The multiple adjustment features, that is, adjustment in height of the motor, adjustment in speed of the motor, adjustment in circumferential position of the weights in the balance cages, and the adjustment in the amount of weights provide an unlimited variety of separator motions so that a single material separator can be utilized for the processing of any material in any given situation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a material separator which forms the environment for the motion generating device according to the concept of the present invention.

FIG. 2 is a sectional view of the motion generating device according to the concept of the present invention.

FIG. 3 is a sectional view taken substantially along line 3—3 of FIG. 2.

FIG. 4 is a sectional view taken substantially along line 4—4 of FIG. 2.

FIG. 5 is an enlarged sectional view of a portion of the lower balance cage shown in FIG. 4.

FIG. 6 is a sectional view substantially similar to FIG. 2 showing an alternate embodiment of the motion generating device according to the concept of the present invention.

FIGS. 7–10 are diagrammatical plan views of a screen showing the flow patterns of a material thereon obtained through an adjustment of the motion generating device according to the concept of the present invention.

FIGS. 11–15 are diagrammatical views of a particle of material as it travels across the screen, the varying patterns being obtainable through an adjustment of the motion generating device according to the concept of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A conventional material separator is indicated generally by the numeral **20** in FIG. 1 and is shown as having a cylindrical base **21** to which is welded, at the lower end, an annular flange **22.** The material separator **20** can then be attached, as by nut and bolt assemblies **23,** to the floor **24** or other desirable supporting subsurface. An upper annular flange **25** is also affixed to base **21** to hold, as by nut and bolt **26,** a plurality of springs **28** or other cushioning devices.

Springs **28** carry a base plate **29,** being attached thereto by nut and bolt assemblies **30.** As best shown in FIG. **1,** plate **29** supports a series of axially adjacent cylindrical sections **31,** the bottom section being affixed to plate **29** as by nut and bolt assembly **32.** Between each section **31** is a screen mounting assembly **33** which supports a screen extending across each section **31** and which is described in detail in our U.S. Pat. No. 3,463,315 to which reference is made for such details as may be necessary to understand the subject invention. A cover **34,** placed on the top section **31,** has an opening for the introduction of the material to be separated through piping **35.** Each section **31** is also provided, at some point along the periphery of the screen, with a chute **36** for the discharge of the classified material. Bottom section **31** can be provided with an angularly oriented base **38** which directs all the material presented thereto to its discharge chute **36.**

Extending downward and radially inward from base plate **29** are a series of reinforcing ribs **39** which support a cylindrical motion generator housing **40.** Openings **41** in housing **40** allow facile access to the motor or motion generating device indicated generally by the numeral **42.**

The motion generator **42** is preferably a variable speed motor and can be called an "inverted" motor, that is, having a fixed shaft **43** around which rotates the body portion **44** on suitable bearing members. Shaft **43** conveniently and safely contains the electrical wires **45** extending from power source **46** (which includes means to vary the speed of the motor) and is fixed to an upper support plate **48** and lower support plate **49** by set screws **50.** Plates **48** and **49** combine with cylindrical housing **40** to enclose motion generator **42** and protect it from any foreign substances.

The vertical position of the motion generator **42** is adjustable in two manners. A "gross" adjustment lies in the connection between the upper support plate **48** and the base plate **29** as well as the connection between the lower support plate **49** and the motor housing **40.** Support plate **48** is connected to base plate **29** as by the nut and bolt assemblies **51.** As shown in FIG. **2,** a plurality of spacers **52** can be provided between plates **29** and **48,** the number dependent on the vertical height desired. If it were desired to lower the generator **42,** the required number of spacers **52** could be removed and placed between the lower support plate **49** and the annular flange **53** welded to housing **40** and attached to plate **49** by nut and bolt assemblies **54.**

A second or "fine" vertical adjustment means is indicated generally by the numeral **55** in FIG. **2** and consists of a spider-like member **56** attached, as at **58,** to the lower plate **49.** A collar member **59** is fixed to the shaft **43** and receives a threaded shaft **60.** Shaft **60** extends through the base of spider **56** and is rotated via handle **61.** After loosening set screws **50,** rotation of handle **61** easily raises or lowers the generator **42** from its uppermost position within housing **40** as shown in FIG. **2** to a fully down position or any precise location therebetween. The effect of the vertical position of the motor on the separating process will be hereinafter discussed.

Indicated generally by the numeral **70** in FIG. **2,** and shown in more detail in FIG. **3,** is an upper weight tray or cage which consists of a body portion **71** which adjustably engages the member **44** at any desired point along the axial length thereof, being fixed thereto by set screws **72;** an annular shelf portion **73** which is substantially perpendicular to the body portion **44** of motion generator **42;** and an annular lip portion **74** defining the outside periphery of tray **70.** A plurality of circumferentially spaced weight positioning pegs **75** can be molded into shelf **73, 13** such pegs being shown in FIG. **3** spaced **15** degrees apart.

A plurality of weights **76,** as shown in FIG. **3** as having a shape which conforms to the sector of an annulus, have a recess **78** for receiving the pegs **75.** The weights **76** may be positioned on alternate pegs **75** in any desired position, the importance of which will be hereinafter discussed.

A lower weight tray or cage is indicated generally by the numeral **80** in FIG. **1** and shown in detail in FIG. **4.** Like tray **70,** it consists of a body portion **81** which engages the member **44** being fixed thereto by set screws **82;** an annular shelf portion **83** which is substantially perpendicular to the body portion **44** of motion generator **42;** and an annular lip portion **84** defining the outside periphery of tray **80.** A plurality of circumferentially spaced weight positioning pegs **85** can be molded into shelf **83, 13** such pegs being shown in FIG. **4** spaced **15** degrees apart.

A desired number of weights **86** interchangeably similar to weights **76** may be positioned as desired on shelf **83.** The recess **88** in weights **86** is provided for engaging the pegs **85.** The significance of the number and position of weights **86,** and their relationship to weights **76** will be hereinafter discussed. It should be evident that these weights are readily accessible and thus the addition, removal or change in position of weights becomes a relatively simple matter. While an open tray has been shown, a more fully enclosed tray or cage could be utilized. This would, of course, detract somewhat from the advantage of accessibility just described.

An alternate embodiment of the present invention, indicated generally by the numeral **100** in FIG. **6,** is substantially similar to that just described. In this instance, however, the inverted motor **42** is not utilized. Rather, a variable speed electric motor **101,** having a means for conveniently adjusting the speed as by handle **102,** drives a shaft **103** which supports, at its outer end, the pulley structure **104.** A belt **105** transfers the rotation of pulley **104** to pulley **106** which is mounted to shaft **107.** Thus, shaft **107** rotates at the speed of motor **101** as set by handle **102.**

Keyed, as at **108,** to shaft **107** are upper and lower mounting collars **109** and **110,** respectively, each having two sets of recesses such as **111** and **112** for the upper collar **109** and recesses **113** and **114** for the lower colar **110.** These recesses provide two locations on each collar for the mounting of upper and lower weight cages substantially similar to cages **70** and **80** previously described.

Since in the motion generator **100** a rotatable shaft extends through upper support plate **48** and lower support plate **49,** suitable bearings **115** must be provided, held within bearing housings **116** by set screws **118.** The bearing housings **116** can be integral with the support plate, as shown with respect to upper support plate **48,** or can be a separate housing and attached to the support plate, as by bolts **119** attaching housing **116** to lower support plate **49.** Shaft **107** is held axially in place by nuts **120.**

In almost all otqher aspects, the motion generating device **100** is similar to motion generator **42.** Both are provided with the cages **70** and **80** and the adjustable weights therein; the axial position of the cages is adjustable; and the speed of revolution of the housing **44** and shaft **107** is adjustable. Further, both embodiments have means to raise or lower the entire motion generating device with respect to the material separator. While the device of FIG. **6** is not shown with the fine adjustment **55** shown in FIG. **2,** it is evident to one skilled in the art that such could be provided.

Combinations of the various weight positions as well as the amount of the weights, speed of the motor, and axial position of the motion generator provide a virtually infinite number of obtainable patterns of material on the screen cloth. Only some of the basic motions obtained from the various adjustments will be described herein, it being evident that the adjustments may be combined to achieve particular screening patterns desirable, dependent on the characteristics of the specific material being screened.

The weights **76** in the upper cage **70** generate a horizontal force on the material separator because of its operation in a plane close to the center of the mass of the machine. By increasing the amount of each weight or the number of weights, more horizontal or radial force will be created causing oversize particles to discharge through chutes **36** at a much faster rate.

The weight **86** in the lower cage **80** provides a vertical component of force or a tilting motion to the material separator due to its operation well below the center of mass of the machine. Increasing the distance between the weight **86** and weights **76** will, of course, lengthen the fulcrum and thereby effect the tilting motion. By increasing the amount of the weight **86** the vertical force is increased, thereby presenting the material to the screen many times prior to its discharge through chutes **36.** Such vertical motion is highly desirable in heavy, coarse, or wet materials.

A tangential force component is introduced to the machine by adjusting the relative angular positions of weight or weights **86** with respect to weights **76.** FIGS. **7–10,** inclusive, show various flow patterns evolved when a weight **86** is set to lead the weights **76** by a certain angular degree. For example, with the weights **76** as shown in FIG. **3** and the weight **86A** as shown in FIG. **4,** that is, at zero degrees (in phase), the expected material travel would be directly radially outward as shown in FIG. **7.** This type of pattern does not allow the material to remain on the screen for any substantial length of time and would therefore be effective only for high tonnage rough screening applications.

FIG. **8** displays a typical flow pattern when the weight **86** is set to lead the weights **76** by about **15** degrees, the weight **86** being positioned on the peg **85** adjacent that which weight **86A** is on in FIG. **4.** A slight spiral effect is achieved by the induced tangential component force. FIG. **9** is the pattern achieved at a **35** degree setting which affords a very efficient screening of average dry materials. As the lead angle increases, the flow patterns created are found continuously better in wet material applications. At the **90** degree setting shown by the weight **86B** in FIG. **4,** oversize material actually is kept from leaving the screening surface as shown in FIG. **10.**

It would be evident that the lead angles are adjustable either by changing the position of the lower weight or weights **86,** or by changing the position of the upper weights **76,** or both. It is the relative lead angle of the lower weights to the upper weights which allows one to obtain the various patterns of FIGS. **7–10,** inclusive.

Whatever the pattern, the rate of travel on the screen can be additionally controlled by regulating the speed of the motor. Thus, if it is desired to achieve the pattern of FIG. **9** but have the particles travel their spiral path quite quickly, the speed of the motor could be increased. Similarly, if it is desired to direct the material slowly but directly radially outward, then a FIG. **7** configuration with a slow motor rpm would be utilized. In short, innumerable combinations of patterns and speed could be accomplished.

The present device is also capable of regulating the particle movement as it moves along the paths shown

in FIGS. 7–10, inclusive. Various particle movements are shown in FIGS. 11–15, inclusive, most of which can be accomplished for any of the patterns shown in FIGS. 7–10. In FIGS. 11–15, it is to be generally understood that the right hand side of each represents the approximate center of a screen with overall particle movement being to the left, representative of moving generally radially outward toward a discharge chute. The elliptical shapes represent the orbit of a plurality of particles on a screen at a single instant in time. Thus, in effect, the particles move across the screen in a wave-like fashion.

The generally flat elliptical pattern shown in FIG. 11 can be obtained by adding more weight in the top cage 70 or, more importantly, raising the entire motion generator through the removal of selective spacers 52 or the rotation of handle 61. This particle orbit would be most advantageously used with weight 86 set at a low lead angle, such as shown in FIGS. 7–9, inclusive.

As the motor would be progressively lowered and/or weight removed from the upper cage 70 and added to the lower cage 80, the orbits of FIGS. 12–15, inclusive, could be obtained. For example, the elliptical path shown in FIG. 13 would find the motor near the center of its permissible range of vertical or axial movement. The orbit of FIG. 14 is highly influenced by vertical forces with the motor being low and possibly with additional weight in cage 80. This would be used in wet applications where the materials being separated are quite cohesive, and with lead angles of weight 86 in the range of 60°.

To achieve the orbit shown in FIG. 15, the motor would be at its lowest extent and most likely additional weight would be added to cage 80. With the motor situated in such a low position, it has been found that the normally radially outward tendency of the particles is actually opposed so that the oversize particles will actually remain on the screen. Thus, these settings are to be utilized with patterns such as that shown in FIG. 10.

The vertical adjustability of the device described herein has other advantageous effects. For example, often the same motion generator is utilized to operate with a varying number of screening sections 31. A machine having two sections 31, for instance, might be properly "tuned" at one particular vertical location of the motion generator. Adding two more sections 31 would further compress springs 28, thereby lowering the center of gravity of the machine and possibly creating a "null" point at some screen level. In this instance then, the motion generator would be lowered until efficient separating was being effected at each screening level.

It should not be evident to one having ordinary skill in the art that the device described herein provides unlimited combinations of motion adjustments, thus substantially improving the material separating art.

We claim:

1. Apparatus for generating combinations of generally horizontal and generally vertical motions to a material separator having a substantially vertical axis comprising a variable speed motor having a rotatable external body portion and a shaft passing centrally therethrough, said body portion having a generally vertical axis and mounted generally of the material separator, said shaft being operatively connected to the material separator, first tray means mounted on said rotatable external body portion and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally horizontal motion, second tray means mounted on said rotatable external body portion beneath said first tray means and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally vertical motion and means to adjust the vertical position of said motor and said first and second tray means to regulate the amount of generally vertical motion.

2. Apparatus according to claim 1 wherein each said tray means has means to hold said weights at desired circumferential positions.

3. Apparatus according to claim 5 wherein said means to hold said weights are peg members, said weights being adapted to fit over said peg members.

4. Apparatus for generating combinations of generally horizontal and generally vertical motions to a material separator having a substantially vertical axis comprising a rotatable member having a generally vertical axis and mounted generally axially of the material separator, means to rotate said rotatable member on the axis thereof, first tray means mounted on said rotatable member and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally horizontal motion, second tray means mounted on said rotatable member beneath said first tray means and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally vertical motion, means to adjust the vertical position of said rotatable member to regulate the amount of generally vertical motion and additional means to adjustably vary the vertical position of each said tray means to said rotatable member to regulate the combinations of generally horizontal and generally vertical motions.

5. Apparatus for generating combinations of generally horizontal and generally vertical motions to a material separator having a substantially vertical axis comprising a rotatable member having a generally vertical axis and mounted generally axially of the material separator, means to rotate said rotatable member on the axis thereof, first tray means mounted on said rotatable member and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally horizontal motion, second tray means mounted on said rotatable member beneath said first tray means and adapted to hold weights thereon in circumferentially adjustable positions to generate the generally vertical motion and means to adjust the vertical position of said rotatable member and said first and second tray means to regulate the amount of generally vertical motion, said means to adjust the vertical position of said rotatable member including gross adjustment means to make large vertical adjustments and fine adjustment means to make smaller vertical adjustment, said gross adjustment means including spacer means positioned between the material separator and the apparatus for generating motion.

6. A material separator including at least one cylindrical section, a screen spanning said cylindrical section, chute means for discharging the material from said screen, a plate carrying said cylindrical section, a base, cushioning means between the base and said plate, a housing depending from said plate, a motion generator within said housing, said motion generator comprising a rotatable member including a variable speed motor having a generally vertical shaft fixed to said housing and a body portion rotatable about said shaft, said motor being mounted generally axially of

said cylindrical section and said screen, first balance tray means mounted on said rotatable member, means on said first balance tray means to carry weight members thereon at circumferentially varying locations, said first balance means thereby acting upon rotation of said rotatable member to direct material generally toward said chute means, second balance tray means mounted on said rotatable member below said first balance tray means, means on said second balance tray means, to carry weight members thereon at circumferentially varyihg locations, said second balance tray means thereby acting upon rotation of said rotatable member to impart a generally vertical movement to the material as it passes over said screen, and means to regulate the amount of generally vertical movement imparted to the material by generally vertically moving said housing axially of said cylindrical section.

7. A material separator according to claim **6,** said housing including a means of access to said rotatable member.

8. A material separator according to claim **6** wherein said means to generally vertically move said housing includes spacer means between said housing and said plate.

9. A material separator according to claim **6** including means to generally vertically move said rotatable member within said housing.

10. A material separator including at least one cylindrical section, a screen scanning said cylindrical section, chute means for discharging the material from said screen, a plate carrying said cylindrical section, a base, cushioning means between said base and said plate, a housing depending from said plate, a motion generator within said housing, said motion generator comprising a rotatable member having a generally vertical axis and mounted generally axially of said cylindrical section and said screen, first balance means mounted on said rotatable member, means on said first balance tray means to carry weight members thereon at circumferentially varying locations, said first balance tray means thereby acting upon rotation of said rotatable member to direct material generally toward said chute means, second balance tray means mounted on said rotatable member below said first balance tray means, means on said second balance tray means to carry weight members thereon at circumferentially varying locations, said second balance tray means thereby acting upon rotation of said rotatable member to impart a generally vertical movement to the material as it passes over said screen, means to regulate the amount of generally vertical movement imparted to the material by generally vertically moving said housing axially of said cylindrical section, a collar fixed to said rotatable member, threaded shaft received by said collar, and spider means mounted on said housing and receiving said threaded shaft so that rotation of said threaded shaft moves said rotatable member within said housing.

11. A material separator according to claim **10** wherein said rotatable member is a generally cylindrical shaft rotatably connected to said housing and driven by a variable speed motor.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,794,165 Dated February 26, 1974

Inventor(s) Laverne J. Riesbeck et al.

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

Column 7, line 63, after "generally" insert -- axially --.

Signed and sealed this 19th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,794,165 Dated February 26, 1974

Inventor(s) Laverne J. Riesbeck and Willis A. Blackwell

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

Column 5, line 53, "otqher" should read --other--.
Column 6, line 50, "would" should read --should--.
Column 7, line 52, "not" should read --now--;

Column 8, line 12, "claim 5" should read --claim 2--; line 31, "to" should read --on--; line 53, "adjustment" should read --adjustments--; line 61, "the base" should read --said base--.

Column 9, line 5, after "balance" insert --tray--; line 10, after "means" delete the comma (,); line 11, "varyihg" should read --varying--; line 29, "scanning" should read --spanning--.

Column 10, line 6, after "balance" insert --tray--; line 23, after "member," insert --a--.

Signed and sealed this 1st day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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