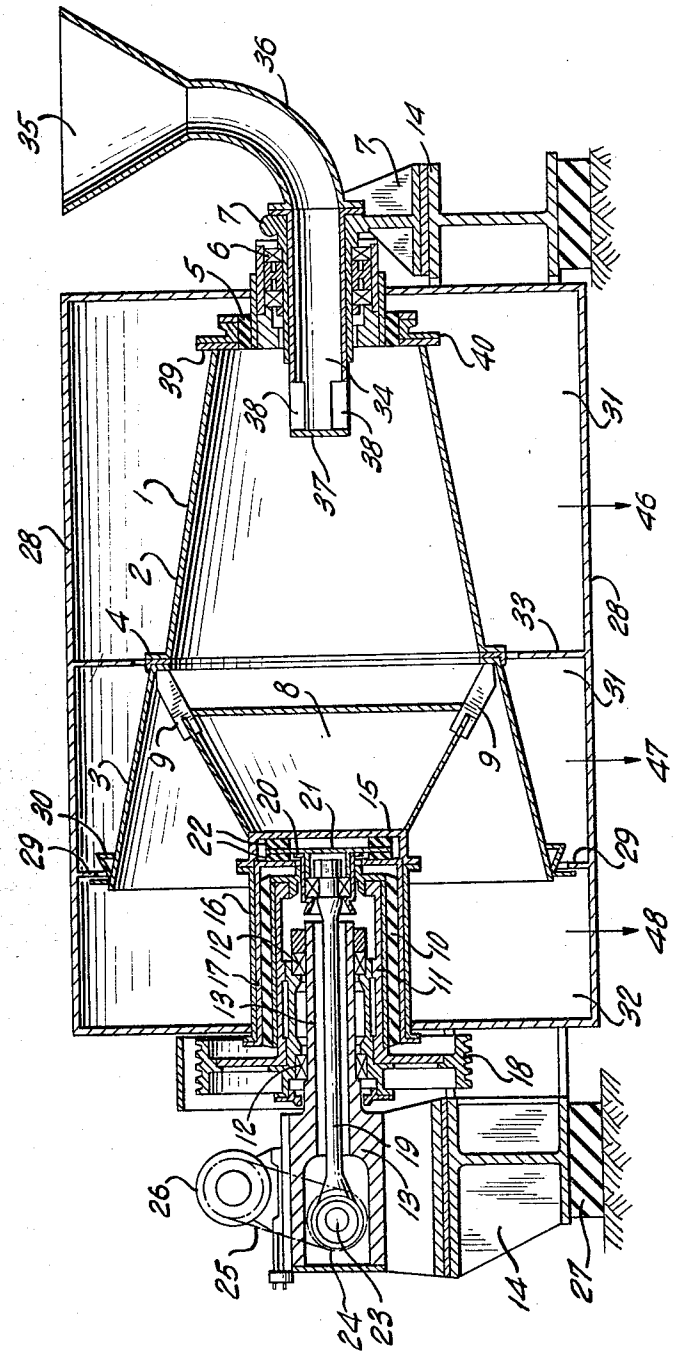
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AXIALLY OSCILLATING HORIZONTAL CENTRIFUGE

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AXIALLY OSCILLATING HORIZONTAL CENTRIFUGE

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The invention relates to an oscillating centrifuge for desiccating fine-grain, wet materials. More particularly, it is concerned with a centrifuge of the kind described which has a screen drum supported at two locations, the wet substance to be centrifuged being continuously introduced through a stationary supply conduit.

In vibrating centrifuges of the prior art a perforated drum or basket is journaled on a shaft which extends through the entire structure. Such a shaft has an axial bore and apertures therein through which the material to be desiccated is fed to the drum. In prior art of this type a stationary feed conduit is employed for introducing the material.

It is the object of the present invention to obviate the necessity of such a shaft which is subject to relatively high wear.

It is another object of the invention to provide an improved mounting for a centrifuge drum on a trunnion, whereby the centrifuge is better adapted for operation under varying load conditions.

Another object is to provide a resilient drum support adapted for positive transmission of rotary and independent vibratory motion thereto.

A further object of th invention is to provide for a centrifuge with an improved material feed means.

A still further object is to provide a screen drum or basket which facilitates passage therethrough of the wet materials to be treated, without impediment or damming therein.

The above and other objects are attained by supporting the drum at the end having the smaller diameter, where the wet material is introduced, over a trunnion. In addition the other or material outlet end is connected with a cylindrical member through the intermediary of a frustoconical member having ribs or brackets attached thereto. The cylindrical member is utilized to provide for rotational power transmission to the drum. It is a particular advantage of this arrangement that the material to be desiccated or dried can be directly introduced into the drum, rather than through a feed pipe to the drum.

It is a further feature of the invention that concentric, annular resilient connecting members are employed to journal the centrifuge drum both on the trunnion and on the cylindrical member. This provides for resilient support of the drum on said members, making it practically insensitive to out-of-balance forces.

Preferably, the ribs are secured to the drum at a location spaced apart from the material outlet end. Such an arrangement provides for the power to be transmitted to the drum for its rotation and also for its axial vibration over a part only of the drum length, that is, over part of the drum envelope. The latter can, therefore, be made relatively thin and light.

Other objects and many of the attendant advantages of the invention will be readily appreciated as the same becomes better understood, by reference to the following detailed description, when considered with the accompanying drawing, the sole figure of which shows a somewhat schematic sectional side view of a centrifuge according to the invention.

The centrifuge comprises a conical, perforated drum or basket **1**, the outer envelope of which consists of two adjoining sections **2** and **3**. As viewed in the drawing, the material is introduced at the right-hand inlet end of the drum from where it advances, owing to the drum rotation and vibration, to the left-hand discharge end. The inlet-end envelope section **2** is releasably linked to the outlet-end section **3** by means of an annular member **4**.

The generatrix of section **2** is flatter with respect to the horizontal than that of section **3**. The respective angles between the horizontal and said sections **2**, **3** may, for example be 5° and 10°, respectively. However these angles may be changed to accommodate various operating conditions.

The drum **1** is supported at the end having the smaller diameter by a stationary, hollow trunnion **7** through the intermediary of a resilient annular member **5** and a bearing **6** to allow both rotation and axial reciprocation of the drum. This is the end through which the material is introduced into the centrifuge. The drum **1** has an inner truncated cone **8** connected thereto, proximate its other end through the utilization of ribs or brackets **9** and the annular member **4**.

The attachment of ribs **9** to the member **4**, which is preferably provided intermediate the envelope sections **2**, **3**, that is, in a spaced-apart relationship from the outlet end of drum **1**, enables the power required for rotating and vibrating the same to be transmitted over a portion of the envelope rather than over the entire length. The envelope may be made relatively thin, therefore, since less stress is required for application to said envelope. Ribs **9** and cone **8** as employed to journal drum **1** on another hollow trunnion **13** by the intermediary of cylindrical resilient connecting members **10**, a cylindrical member **11** and another bearing **12**. These elements, too, allow rotation and axial vibration of the system. The trunnions **7**, **13** are rigidly secured to a foundation or base frame **14** to which further reference will be made hereinbelow.

The truncated cone **8** is connected to a cover **15** which, in turn, is linked to adapter sockets **16**, **17**. The connecting members **10** are firmly clamped between sockets **16**, **17**, and the hollow cylindrical member **11**. The latter carries a pulley **18** adapted to be driven by a V-belt from a conventional motor (neither the V-belt nor the motor are shown), providing rotational movement for the member **11** and the drum **1**.

A crank **19** passes through the hollow trunnion **13** and is eccentrically secured, at one end, to shaft **23** while the other end is rotatably attached to a housing **20**. A disc **21** is secured to said housing and is held between two annular, resilient connecting members **22** serving as a loose coupling between the spaced-apart portions of cover **15** and socket **17** for which members **22** function as braces. The shaft **23** has a pulley **24** thereon which is connected to a motor **26** by means of a V-belt **25**. This provides for axial reciprocation of the drum or basket structure **1**.

The base frame **14** is supported by resilient cushions or blocks **27**, two of which are being shown. The base frame also carries a centrifuge enclosure **28** which is preferably open at its bottom but otherwise enclosed to thereby surround the drum **1** in spaced-apart concentric relationship. The enclosure **28** includes a separator plate or wall **29** therein which engages, with a slight play, a ring member **30** secured to the outlet end of the drum **1**. The wall **29** divides the enclosures **28** into chambers **31**, **32**; the former is reinforced by a partition wall **33**.

As shown in the illustration, the material to be processed is introduced into the drum through a supply conduit **34** which passes axially through the stationary trunnion **7**. An elbow **36** and a funnel **35** are connected to the outer end of conduit **34** to facilitate passage of the material thereto. A disc **37** closes the inner end of conduit **34** inside the drum **1** and limits regularly spaced-apart lateral apertures **38** of the conduit, through which the wet granular substance to be centrifuged is uniformly distributed inside the rotating and oscillating drum.

An annular wall **39** limits the inlet end of the drum **1** around the conduit **34**; the wall is preferably welded to section **2** of the drum **1** and is also fastened, e.g. by means of screws, to a flange **40** surrounding the resilient member **5**. This structure provides means for enclosing the inlet end of the drum and support with respect to trunnion **7**.

The rotational torque derived from the pulley **18** and introduced into the cylindrical member **11** is resiliently transmitted through connecting members **10**, thence through adapter sockets **16, 17** and cover **15** to the conical member **8**. The torque is finally transmitted to the drum through ribs **9**. The drum will then rotate substantially in unison with the member **11**. The resilient members **5, 10** are connected to the centrifuge drum **1** and the frame **14** to form a "two-mass system." Thus, the frame **14** will be subjected to substantially oppositely directed vibrations when the drum **1** is set into axial vibration by means of the eccentric drive **23–26**. The members **5, 10** are subjected to tangential stress so that inertial forces are properly balanced and compensated for. Thus members **5, 10** are connected to allow the transmission of both oscillatory and rotational motion to the drum.

It has been found most advantageous to rotate the drum at about 400 revolutions per minute. The drum periphery or envelope thus presents a centrifugal force averaging about 70 times the gravitational force. Simultaneously the drum is subjected to axial vibrations with a frequency of, say, 30 cycles per second and an amplitude of approximately 3 millimeters.

The wet substance to be desiccated or dehydrated, e.g. coarse mineral-coal slurry having a coal particle size in the range of 0 to 2 millimeters, and a moisture content of approximately 50% by weight, is fed continuously through the elements **34–36**. Materials can be supplied to the centrifuge without preliminary desiccation or concentration, and efficiently processed therein in a single pass and without any subsequent processing steps.

The major portion of the water contained in the slurry is expelled through the perforations of the drum section **2** owing to centrifugal forces while the centrifuge is in operation. The oscillating motion simultaneously imparted to the drum through the eccentric drive impels the residual slurry progressively forward toward section **3** of the drum while being continuously desiccated. The residue reaching presents greater frictional resistance to section **3**, due to its higher density, than it did to section **2**. Although the former section has a steeper inclination, the slurry movement will be considerably lower, due to the higher resistance, as it approaches the discharge end of the drum.

Desiccation, therefore, is provided continuously during this process. The relatively dry coal particles eventually leave the open end of the drum section **3** and are discharged from chamber **32**, in the direction illustrated by

arrow **48**, into a suitable receptacle (not shown). The water which passes through drum section **2** reaches the right-hand portion of chamber **31** from which it may pass, in the direction of arrow **46**, toward a drain or the like (not illustrated). The left-hand portion of chamber **31** beyond the partition wall **33** may have a separate discharge, denoted by arrow **47**.

The annular member is designed to allow both the envelope sections **2, 3** and the ribs **9** to be easily attached thereto. During the operation of the unit the member **4** forms a step over which the material passing from section **2** to section **3** is intermixed thereby allowing the layers of slurry formed in section **2** to be shifted with respect to each other. The graded transition between said sections efficiently aids in desiccating the wet granular materials fed into the centrifuge drum.

The ribs **9** have a narrow cross section thereby presenting no consequential impediment to the processed materials. These ribs, preferably resembling wedge-shaped elements, do not obstruct the passage of the slurry and, in particular, do not cause any damming up at those points.

It should be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example described which do not constitute departures from the spirit and scope of the invention as set forth in the appended claims.

We claim:

1. A centrifuge comprising a pair of coaxial mutually spaced stationary trunnions, said trunnions having a common horizontal axis, an elongated rotary perforated tapered drum extending between said trunnions and having an axis coinciding with the common axis of said trunnions, a pair of bearing means respectively surrounding and freely rotatable with respect to said trunnions and operatively connected to said drum to support the latter for rotation about its axis, said drum having in its interior an elongated completely unobstructed portion extending along its axis, and drive means for rotating said drum and for axially reciprocating the same, said drive means being connected to said drum through one of said bearing means.

2. A centrifuge as recited in claim **1** and wherein the trunnion surrounded by said one bearing means is hollow and wherein said drive means includes structure extending through said hollow trunnion for axially reciprocating said drum.

3. A centrifuge as recited in claim **2** and wherein the other of said trunnions is also hollow and has a pair of opposed open ends, and a supply tube extending through the latter trunnion for supplying to the interior of said drum material to be treated therein.

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