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SIEVE CENTRIFUGE

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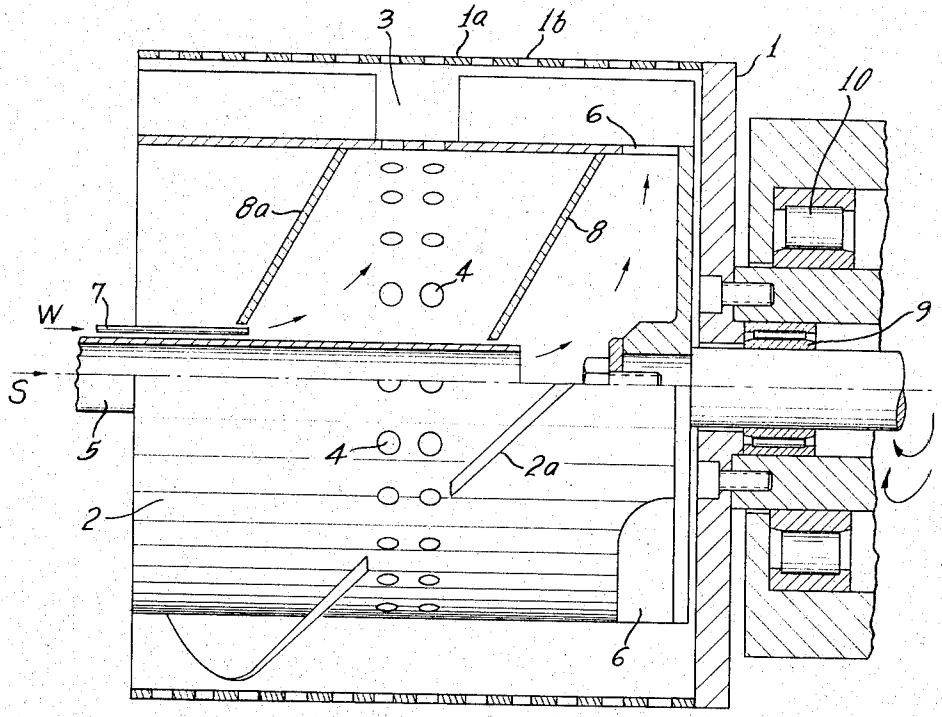

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ABSTRACT OF THE DISCLOSURE

The present invention relates to a sieve centrifuge, for washing solid flowable material, including a rotatable cylindrical drum having sieve apertures in the curved periphery thereof and a relatively rotatable generally cylindrical feed screw mounted coaxially within the drum, the thread or threads of the feed screw being interrupted to provide at least one free annular space between the circumference of the feed screw and the drum, the feed screw having peripheral apertures through which wash liquid can be supplied from a passage within the screw to the annular space, and the arrangement being such that by relative rotation of the feed screw and the drum during operation of the centrifuge, material supplied at one end of the drum can be fed between the feed screw and the drum in a direction parallel to their common rotational axis, passing across the annular space and out of the the other end of the drum.

It is known to remove solid material from liquid in which the material is suspended, or by which it is wetted, by the use of sieve centrifuges. It is further known to provide inside such a sieve centrifuge a feed screw which continuously transports the solid material to be separated along the inner face of a sieve drum from one end to the other so as to provide a continuous supply of the material to be centrifuged and a continuous discharge of the centrifuged material. To enable the feed screw type of sieve centrifuge to be used not only for the removal of liquid but also for washing the solid material, the feed screw is interrupted to provide at least one free annular space between the feed screw and the drum, and openings are provided in the periphery of the feed screw so that, from a passage within the same, washing liquid can be supplied to the annular space. To ensure the transport of material across the annular space, the sieve drum is of conical shape in order, during operation of the centrifuge, to produce a thrust on the solid material in a direction from the narrower to the wider end of the sieve drum. The axis of rotation of such a centrifuge is generally vertical, the narrow end of the drum, at which material is introduced, being uppermost.

Centrifuges of the foregoing type have the disadvantage that the washing liquid may be unevenly distributed so that the centrifuged material is not uniformly washed. These centrifuges have, therefore, been modified in numerous ways to remedy this shortcoming. For example, the washing liquor is introduced through nozzles located within the annular space, or baffles are provided to confine the washing liquid within such space. While these expedients improve the uniformity of the washing process, they have the disadvantage that the nozzles or baffles must have an accurately determined shape and must be mounted in a particular location on the feed screw to ensure that the washing liquor acts evenly on the material to be centrifuged.

The present invention provides a sieve centrifuge for washing solid flowable material, including a rotatable cylindrical drum having sieve apertures in the curved

periphery thereof and a relatively rotatable generally cylindrical feed screw mounted coaxially within the drum, the thread or threads of the feed screw being interrupted to provide at least one free annular space between the circumference of the feed screw and the drum, the feed screw having peripheral apertures through which wash liquid can be supplied from a passage within the screw to the annular space, and the arrangement being such that by relative rotation of the feed screw and the drum during operation of the centrifuge, material supplied at one end of the drum can be fed between the feed screw and the drum in a direction parallel to their common rotational axis, passing across the annular space and out of the other end of the drum. The centrifuge of the invention is of a simpler design than those heretofore known but still enables the centrifuged material to be washed completely evenly.

The feed screw sieve centrifuge of the invention has proved its value for centrifuging and washing both crystalline and fibrous materials. It is preferably adapted for use with its axis substantially horizontal which is of advantage since with such a device it is easier to observe and control the throughput of material centrifuged and the progress of the washing thereof. The efficiency of the feed screw sieve centrifuge of the invention could not have been expected for a number of reasons. In the first place, the centrifuge disproves the previously held view that feed screw sieve centrifuges, in which grooves are machined into the screw flights, must be of a conical shape to ensure the transport of the centrifuged material. In the second place, it could not have been expected that the cylindrical shape of the sieve drum and of the feed screw would ensure the even action of the washing liquid without using any of the previously adopted measures.

Compared with the previously known feed screw sieve centrifuges, the sieve centrifuge of the invention has the further advantage that it requires less washing liquor to achieve an equivalent washing effect. This constitutes a further and particularly valuable advance in the art.

Also, the solid material discharged from the centrifuge contains less liquid than material obtained with known centrifuges, under comparable operating conditions.

The feed screw sieve centrifuge of the invention is easy to manufacture. For example, the openings for the washing liquor may merely be bores in the periphery of the feed screw, the openings advantageously being regularly distributed.

The invention is further illustrated in the accompanying drawing, in which the single figure is a diagrammatic representation of a cylindrical feed screw sieve centrifuge, the upper portion of the drawing being a section taken on a radius of the centrifuge, and the lower portion of the drawing being a view in elevation, partly in section, showing the exterior of the feed screw.

Referring to the drawing, the feed screw sieve centrifuge comprises a rotatable drum **1** having a cylindrical wall **1***a* with sieve apertures **1***b*. Inside the drum **1** there is provided a hollow cylindrical feed screw **2**, rotatable relative to the drum **1**, having a screw flight **2***a*, which flight may be formed from pieces of sheet metal attached to the core of the screw. The screw flight is interrupted to provide the annular space **3**, and adjacent the space **3** the openings **4** are provided in the feed screw **2**. The openings **4** connect a passage inside the feed screw with the space **3**. The spindle **5** of the feed screw is hollow and borne in the axle bearing **9**. Said hollow spindle is used to convey the material to be centrifuged, in the direction of the arrow S, to the right-hand end of the feed screw whence it is deflected by means of a funnel-shaped baffle **8**, attached to the interior wall of the feed screw, through the outlet openings **6**, and is directed against the interior of the wall **1***a*. The washing liquid is transported, in the direc-

tion of the arrow W, through an inlet 7 into the inside of the feed screw 2 and deflected by the funnel-shaped baffle 8*a*, which is attached to the interior wall of the feed screw, through the openings 4 and into the space 3. The washing liquid is forced outwardly through the material which has collected in the space 3 so that it elutriates this material and is then discharged through the wall 1*a* of the sieve drum.

As indicated by the arrow at the right-hand end of the spindle, the feed screw rotates clockwise, viewed from the right-hand end thereof (as shown in the drawing). The sieve drum 1, borne in the roller bearing 10, rotates in the same direction but at a slightly higher speed so that the relative movement between the feed screw 2 and the sieve drum 1 causes the material to travel from the right to the left.

Since the cylindrical sieve drum 1 produces a uniform centrifugal force from one end of the drum to the other, the transport of the centrifuged material along the filter surface depends only upon the action of the feed screw and can be measured from the pitch of the feed screw flights and the difference between the rotational speeds of the screw flights and the sieve drum, respectively. The dwell time of the centrifuged material in the separating zone 3 is generally only a fraction of a second. As a result of the interruptions in the screw flights, the dwell time in this zone is increased, in known manner. Inside the groove 3 a ring of centrifuged material builds up and the dwell time thereof can be increased depending upon the depth and width of the space 3, the pitch and number of flights of the feed screw, and the difference in speed between the drum 1 and the feed screw 2. The type of product centrifuged also has a certain influence on the dwell time. The dwell time in the machine may be, for example, up to about one minute.

Generally, it suffices to provide only one annular space 3 between the feed screw and the sieve drum. Only when the centrifuge is to be used to treat material which is difficult to wash is it necessary to provide a plurality of such spaces.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

What is claimed is:

1. A sieve centrifuge comprising a rotatable, horizontally mounted cylindrical drum having sieve apertures in the curved periphery thereof, a relatively rotatable feed screw coaxially mounted in the drum, the feed screw having a cylindrical core and at least one screw flight thereon, the flight being interrupted to provide one free annular space between the feed screw and the drum, an aperture at one end of the core for passing material to be washed from the interior of the core to the interior of the drum, a plurality of apertures in the core for passing washing fluid from the interior of the core to the free annular space, and baffle means in the core for separating a portion of the interior of the core in communication with the aperture for passing material to be washed from a portion of the interior of the drum in communication with the apertures for passing washing fluid.

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