

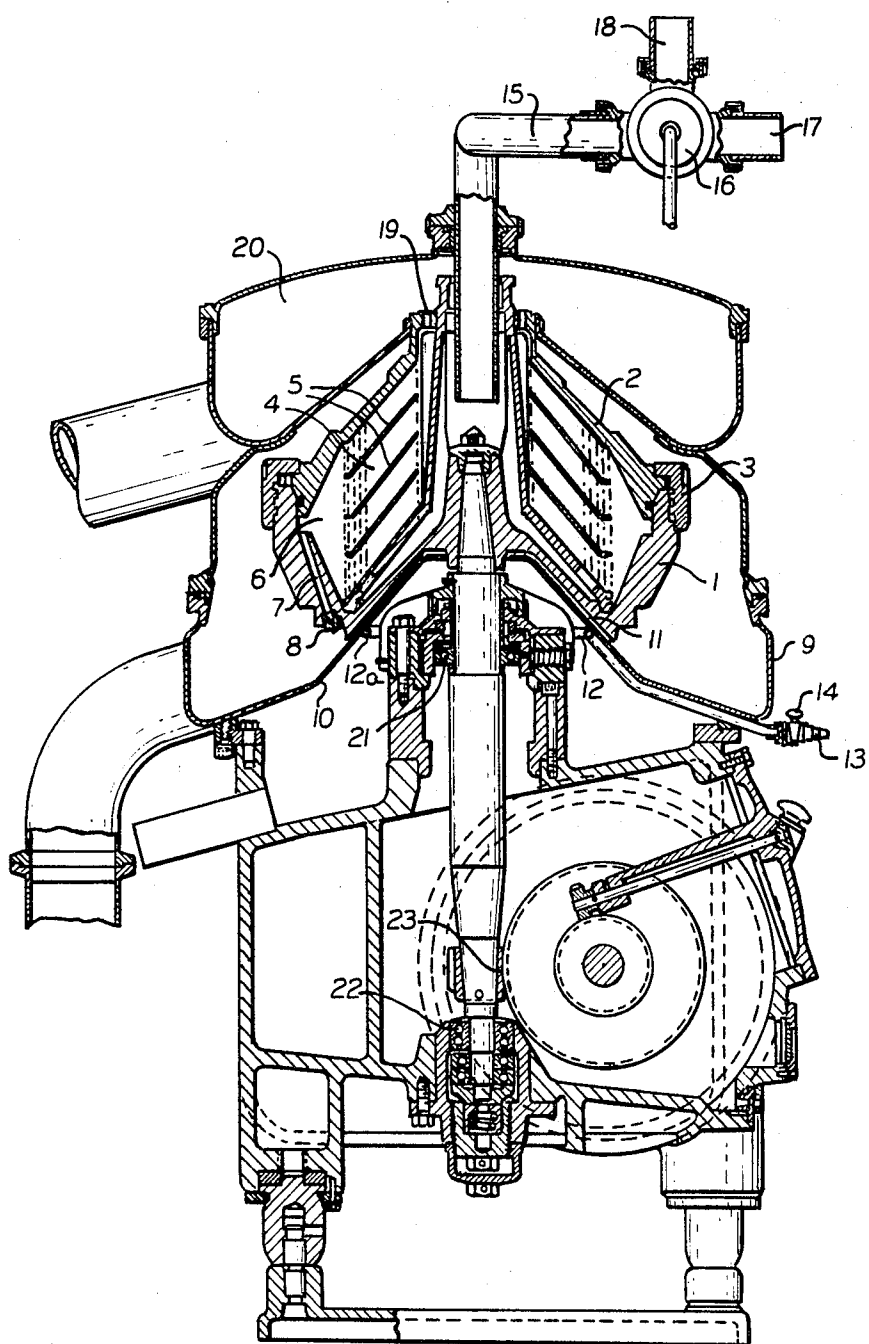
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SEALING OF MOUNTING OF CENTRIFUGAL SEPARATOR

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SEALING OF MOUNTING OF CENTRIFUGAL SEPARATOR

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4 Claims

ABSTRACT OF THE DISCLOSURE

In a centrifugal separator of the nozzle type or self-cleaning type, wherein the bowl is mounted on a driving shaft for rotation therewith, the bowl being surrounded by a catcher for the solids discharged from the bowl, a gap is formed between the bottom of the bowl and the bottom of the catcher, so that vapors and steam may pass through the gap from the catcher into the frame and precipitate in the ball bearings and the driving mechanism when hot water or steam is fed into the bowl for cleaning during rotation and discharged through the openings for solids ejection into the catcher. To prevent such entrance of vapors or steam into the frame a cooling liquid is fed into the gap to condensate the vapors or steam, the condensate of which is thrown outward into the catcher by the rotating bowl together with the cooling liquid.

The invention relates to nozzle separators and separators of the self-opening type which, while remaining in operation, continuously or periodically eject from the drum the solids separated from the liquid in which they are carried.

The drum in such separators envelops a separating chamber located in the center part and usually equipped with a plate insert, and a concentrating chamber or sludge chamber located outside of the plate insert.

In the plate interstices the solids are separated from the liquid and forced outward on account of their greater specific weight. The solid-free liquid flows inward, and emerges from the drum through an outlet located in the vicinity of the drum axis.

Nozzle separators continually throw the solids and some of the liquid in pulp form through calibrated openings in the form of interchangeable nozzles which are disposed at a greater distance from the axis of rotation than the outlet for the liquid. These nozzles can be located in the plane of maximum drum diameter. They connect the concentrating chamber directly with the outer chamber. However, they may also be disposed in the bottom or in the cover of the drum, closer to the drum axis, and be connected by means of tubes with the radially external portion of the concentrating chamber. Nozzle separators of the last-named kind are disclosed, for example, in German Patents 559,138 and 869,029.

In the case of self-opening separators, the solids separated from the liquid are first collected in the sludge chamber and are periodically ejected through openings in the periphery of the drum. These openings are opened and closed by an axially displaceable piston slide valve which is externally controlled hydraulically or pneumatically. A centrifugal separator of this kind has been described, for example, in German Patent 1,000,292.

The cleaning of a centrifugal separator by hand requires much time and labor. After the driving motor has been shut off, one must first wait for the drum to stop. Then the coupling to the infeed line must be opened, along with

one or more discharge lines, depending on the design. Then the bonnet must be removed and the drum must be lifted out of the frame, usually as a whole, by means of a hoist, and then must be taken apart. Only then can the cleaning be started.

British Patent 778,503 has disclosed a method of flushing out solid-jacket separators whose stationary discharges are hermetically sealed in relation to the rotating drum, without taking them apart, by introducing flushing liquid through the outlet for the specifically lighter component, which then comes back out through the outlet for the specifically heavier component. Due to the fact that this outlet is in the vicinity of the drum axis, it is not possible while the drum is in rotation to flush out of the drum the specifically heavier solids deposited on the periphery of the drum.

On the other hand, the flushing liquid, in nozzle separators and separators of the self-opening type, is driven out through the openings provided for the ejection of the solids, these openings being arranged at a much greater distance from the drum axis or even in the periphery of the drum. So the flushing liquid follows the same path as the solids do during the centrifuging operation, so that the solids are reliably entrained by the flushing liquid.

Nozzle separators, which are used in the yeast industry, have to meet stringent requirements with regard to their sterility, because infections of the yeast wort can have very unfavorable consequences. The same applies to self-opening separator drums which are used in the pharmaceutical industry and in the food industry. In order to achieve the necessary degree of purity, it is necessary to use a very hot liquid or hot steam for the cleaning.

In that case, it is a great disadvantage that, in these separators, the solids are thrown into a stationary catcher which is located outside of the drum and which is disposed at some distance from the drum to avoid interference between these parts during operation. When hot cleaning liquid or steam is fed into the drum, vapors pass through this annular gap into the frame and precipitate in the ball bearings of the spindle and in the transmission gears. This gives rise to corrosion which impairs the running characteristics of the rotating parts and shortens the life of the affected parts.

The invention is aimed at preventing these disadvantages.

The process of the invention is characterized in that, while hot water or hot steam is fed into the drum, the gap between the bottom of the drum and the bottom of the solid catcher, which is made at least approximately parallel thereto, is continuously supplied with cooling liquid. In this manner, the vapors penetrating into the gap are precipitated and the rotating drum flings them outward into the solid catcher together with the cooling liquid.

The apparatus for the practice of this method is characterized in that the bottom of the solid catcher extends inward at a slight distance from the drum bottom and is joined on its underside with an annular distributor tube for cooling liquid, the latter tube being provided with a connection for the admission of cooling liquid and with holes distributed about its periphery which empty through corresponding holes or openings in the bottom of the solid catcher into the annular gap between the drum bottom and the catcher bottom.

Thus, the invention provides an improvement in centrifugal separators. Such separators include a rotatable drive shaft on which a bowl is mounted for rotation with the shaft, and a catcher disposed about said bowl for receiving the solids and the flushing liquid respectively discharged from the bowl. The catcher is mounted around the bowl, which may oscillate because the spindle is flexi-

bly mounted in the frame. In such a conception, the bowl and catcher define a passageway communicating the catcher with the inner room of the frame. Through this passageway vapors or steam may pass from the catcher to the inner room of the frame. According to the invention, means are provided for introducing a cooling liquid into said passageway for precipitating of the vapors or steam, the condensate of which is thrown outward into the catcher by the rotating bowl together with the cooling liquid. Desirably, the passageway extends radially outwardly and downwardly from adjacent the drum axis, and the means for introducing the cooling liquid communicates with the passageway the condensate and the cooling liquid are thrown outward into the catcher by the rotating drum.

The figure illustrates an example of a nozzle separator according to the invention.

The drum bottom 1 and the drum cover 2 are held together by a ring 3. 4 designates the separating chamber which can be equipped with a set of conical insert plates. Tubes 7 lead from the concentration chamber 6 outside of the plate insert to the nozzles 8 for the ejection of the concentrated solids.

The bottom 10 of catcher 9 for the ejected solids extends inward, according to the invention, at a slight distance from the drum bottom, so that an annular gap 11 is formed between the two parts.

The bottom 10 of catcher 9 is joined on its bottom side to an annular distributor tube 12. The connector 13 serves for connection to a source of coolant. Distributor tube 12 is provided with holes 12a distributed along its periphery which align with matching holes or openings in the bottom 10 of catcher 9 and empty into gap 11.

The cleaning is performed in the following manner. After the centrifuging operation is ended, the cock 14 is to be opened and the infeed 15 is to be changed over by means of three-way valve 16 from the crude mixture supply 17 to the flushing liquid supply 18. The flushing liquid enters the drum by the same route as the crude mixture and some of it is driven through tubes 7 and nozzles 8 into the solids catcher 9 and some through the liquid outlet 19 into the liquid catcher 20. Vapors which might pass through gap 11 into the ball bearings 21 and 22 and the transmission 23 are condensed by the cooling liquid and are flung together with the latter by the rotating drum into catcher 9.

While the invention has been described with respect to

particular embodiments thereof, these embodiments are merely representative and do not serve to define the limits of the invention.

What is claimed is:

1. In a centrifugal separator comprising:

- (a) drive means including a rotatable drive shaft;
- (b) a bowl mounted on said shaft for rotation therewith;
- (c) a catcher disposed about said bowl for receiving the solids and the flushing liquid respectively discharged from the bowl, the catcher being mounted around the bowl;
- (d) the bowl and catcher defining a passageway communicating the catcher with the inner room of the frame, said passageway imposing a threat of passing of vapors or steam from the catcher into the inner room of the frame;
- (e) means for introducing a cooling liquid into said passageway for precipitating the vapors or steam the condensates of which are thrown outward into the catcher by the rotating bowl together with the cooling liquid.

2. Apparatus according to claim 1, wherein said passageway extends radially outwardly and downwardly from adjacent the drum axis, and said means for introducing the cooler liquid communicates with the passageway from which the precipitated vapors or steam are thrown outward by the rotating bowl together with the cooling liquid.

3. The method of operating a centrifuge as is defined in claim 1, which comprises passing flushing liquid from the bowl to the catcher and passing a cooling liquid through said passageway into the catcher to prevent entrance of vapors or steam through said passageway to the inner room of the frame.

4. Method of claim 3, wherein the fluid passed from the bowl to the catcher is steam and the fluid passed through the passageway to the catcher is cooling water.

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