

[54] **AUXILIARY DEVICE FOR CENTERING OF THE CENTRIFUGAL DRUM OF PENDULUM TYPE HYDRO EXTRACTORS DURING CLEARING WITH A HIGH NUMBER OF REVOLUTIONS**

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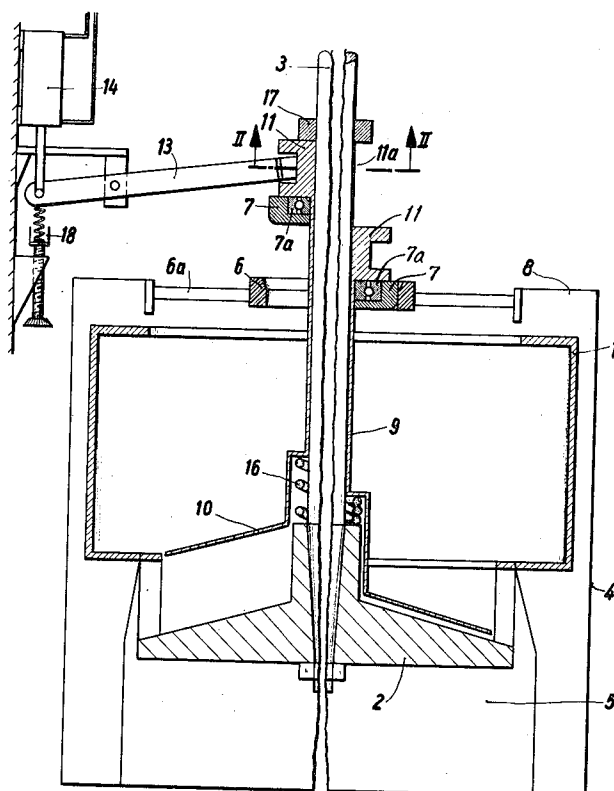
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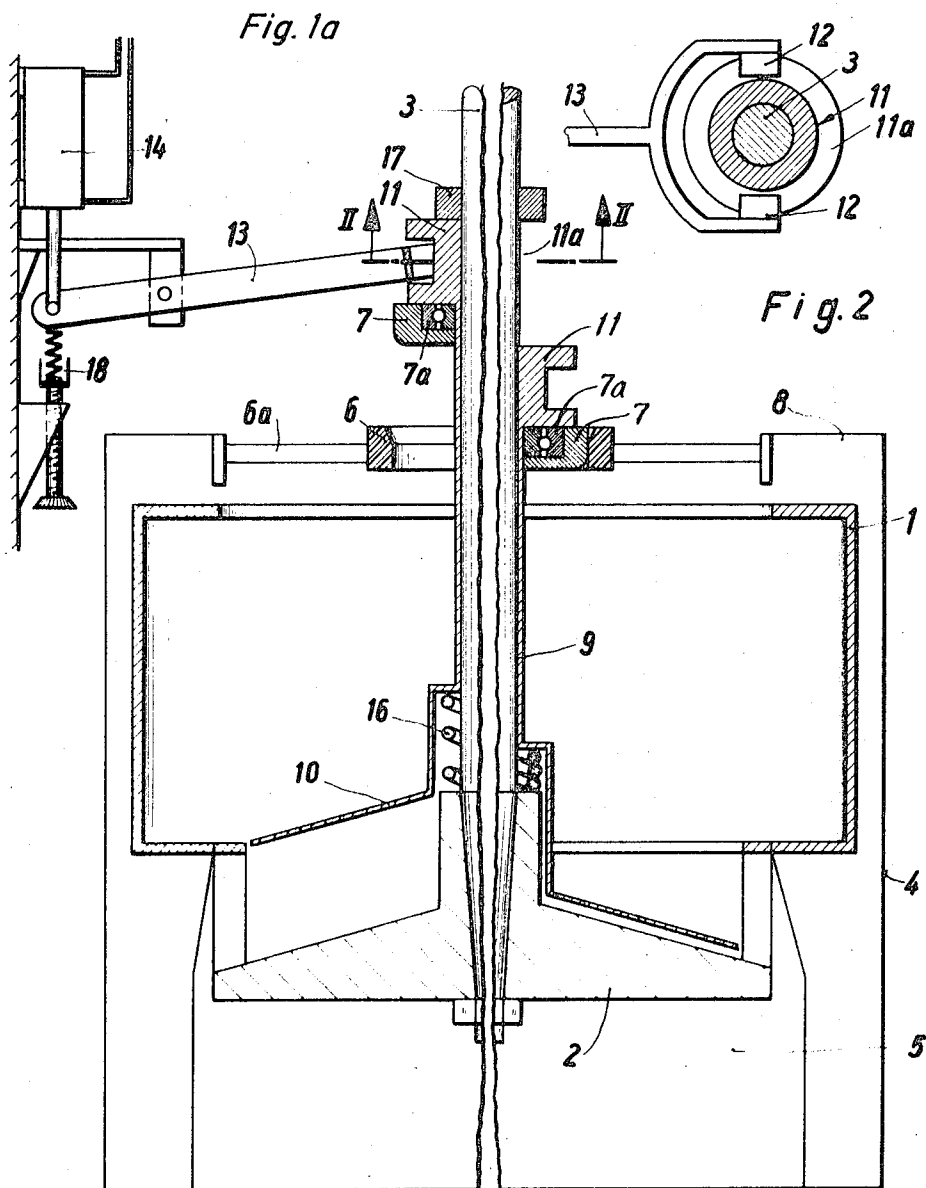
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[57] **ABSTRACT**

An auxiliary device for centering of the centrifuge drum of pendulum centrifuges during clearing at a high number of revolutions which comprises a bearing guiding a centrifuge drum during clearing and rigidly supported at least timely temporary against radial deviation. The drum shaft has an axially displaceable sleeve within the range of the upper edge of the drum. The bearing comprises a friction-free designed rotary bearing carried by the sleeve. A protecting jacket surrounding the rotary bearing. A centrifuge housing, and a centering ring is disposed coaxially rigidly secured to the drum shaft on the centrifuge housing within the range of the upper edge of the drum shaft, and the sleeve is rollable-in and -out with the bearing and the protecting jacket.

3 Claims, 3 Drawing Figures





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AUXILIARY DEVICE FOR CENTERING OF THE CENTRIFUGAL DRUM OF PENDULUM TYPE HYDRO EXTRACTORS DURING CLEARING WITH A HIGH NUMBER OF REVOLUTIONS

The present invention relates to an auxiliary device for centering of the centrifugal drum of pendulum-centrifuges during clearing with a high number of revolutions, in which the drum shaft is guided during the clearing in a bearing which is at least timely temporary rigidly supported against radial deviations.

The clearing of pendulum-centrifuges can be performed without particular measures only at a relatively low number of revolutions of the order of about 50 r/min, because the deviations of the centrifuge drum, possibly due to the pendulum suspension, can lead to the point, that the clearing knife and clearing tube, respectively, destroys the sieve jacket of the centrifuge drum. The clearing at a low number of revolutions of the drum is, in addition to other drawbacks, first of all, connected with an appreciable extension of the timely duration of the individual working plays of a centrifuge. The centrifuge drum must namely be braked from a high number of revolutions of the centrifuge down to a low number of revolutions of 50 r/min, before the clearing process can start. The braking requires of course time. Also the clearing can be performed at the low number of revolutions of the drum with only a slight advance of the clearing knife and of the clearing tube, respectively. Prior to filling after the clearing, the centrifuge drum must be accelerated again to the number of revolutions of the order of 200 - 300 r/min. For the low clearing number of revolutions, the driving motors of the centrifuge must be equipped upon designing as pole-switchable asynchronous machines with an additional pole-step, which can be realized in most instances merely by application of the tandem structure, that means also addition of a supplementary motor, increasing the axial structure length. By this arrangement, not only high manufacturing costs arise, but also undesirably great structural heights of the centrifuges.

In order to avoid the described drawbacks, it is of advantage, if the clearing at the comparatively high number of revolutions for filling could be performed at the order of 200 - 300 r/min. It is, however, required to center and to mount, respectively, the centrifuge drum such, that deviations are impossible.

In known embodiments of the first-named auxiliary device, bearings are provided below the centrifuge drum within the range of the outlet space, which bearings are supported by means of radially extended arms with the centrifuge housing, or by other suitable means. The bearings are, depending upon the structure of the auxiliary device, either permanently connected with the lower end of the drum shaft, or also rolled-in at the start of the clearing process from below into a recess of the drum shaft. In bearings which are rolled-in in axial direction from below, the supporting arms are formed rigidly, while in connection with bearings which remain connected below as sleeves or rings with the drum shaft, are formed either in form of rigid spring arrangements or as hydraulic or pneumatic working members, which permit during the normal centrifuge operation radial deviations of the centrifuge drum, however during clearing exert a strong resistance against such deviations.

Satisfactory results could not be obtained, however, with the known supplementary devices. The radial arms are arranged within the path of the centrifuged goods during the emergence from the drum into the delivery space. In connection with sugar centrifuges, a relatively rapid incrustation of the arms takes place and the exit cross-section of the sugar is appreciably reduced. The arms as well as the bearings held by these arms are difficulty accessible due to the arrangement of the output chamber. Devices below the drum shaft lead mostly also to a known desirable increase of the structural height of centrifuges.

An appreciable further drawback resides in supplementary devices with bearings or pins therein rollable from below into the drum shaft, that these bearings or pins during entrance

into the drum shaft are subjected to a high wear and, therefore, have only a limited life. This high load results from the fact that the lower end of the drum shaft runs only in exceptional cases so quite and symmetrically to the rotary axis of the centrifuge drum, that the rolling-in process of the bearing can be performed jolt-free.

It is one object of the present invention to provide an auxiliary device for centering of the centrifuge drum of pendulum centrifuges during clearing with a high number of revolutions, wherein the above-stated drawbacks of known structures are avoided.

It is another object of the present invention, to provide an auxiliary device for centering of the centrifuge drum of pendulum centrifuges during clearing with a high number of revolutions, wherein the drum shaft is equipped within the range of the upper drum edge with an axially displaceable sleeve, which carries a rotary bearing formed friction-poor and surrounded by an outer protecting jacket, and wherein within the range of the upper drum edge at the centrifuge housing a centering ring is rigidly secured co-axially to the drum shaft, into which the sleeve with the bearing and the protective jacket can be rolled-in and-out from above.

The new structure of the auxiliary device avoids structural parts within the non-accessible output chamber and within the range of the emerging centrifuged goods. The sleeve, axially displaceable on the drum shaft, carries in addition a friction-poor formed rotary bearing with a protecting jacket, so that the rolling-in of this bearing into the centering ring takes place extensively wear-free by the cooperation or the rotary bearing. Furthermore, the sleeve with the rotary bearing is easily accessible by the arrangement above the upper drum edge. By such arrangement, not only the servicing, rather under circumstances, also the exchange of worn parts is essentially simplified.

Within the range between the hub-star at the lower drum edge, is disposed in most centrifuges a bottom closing hood liftable and lowerable in axial direction, which hood is in the closing position during filling and is lowered downward during clearing, in order to free an annular exit opening for the centrifuged goods. The fact, that this bottom closing hood, as well as the sleeve of the auxiliary device can be lifted and lowered in axial direction, is exploited in a further advantageous embodiment of this auxiliary device such, that the sleeve is rigidly connected with the bottom closing hood of the drum for a joint operation, whereby the bearing of the sleeve in case of the closing position of the bottom closing hood is disposed outside of the centering ring, however, during opening and lowering, respectively, of the hood enters into the centering ring.

In a suitable further development of the auxiliary device, the sleeve has a peripheral groove, into which enters a fork with axial play, the fork being connected with a driving device for the axial displacement of the sleeve, and the end position of the groove upon upwardly moved sleeve is adjustable relative to the end position of the fork, in order to hold the fork by exploitation of the axial play engagement-free relative to the groove.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is disclosed by example only, will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1a is an axial half-section of the centrifuge drum with a pendulum centrifuge equipped with the auxiliary device, designed in accordance with the present invention;

FIG. 1b is an axial half-section of the device of FIG. 1a in another end position; and

FIG. 2 is a section along the lines II—II of FIG. 1a and FIG. 1b.

Referring now to the drawing, and in particular to FIG. 1a and FIG. 1b, a centrifuge drum 1 of a pendulum-centrifuge is disclosed, which by means of a hub-star 2 is secured to a drum shaft 3. The latter is rotatably mounted for a pendulum move-

ment at its upper end (not shown). The centrifuge drum 1 is arranged within a centrifuge housing 4, which surrounds below the centrifuge drum 1 an output chamber 5.

Within the range of the upper edge of the centrifuge drum 1, is disposed a centering ring 6 co-axially to the drum shaft 3. This centering ring serves the purpose to receive a protecting jacket 7 and a rotary bearing 7a surrounded by the latter for the centering of the centrifuge drum 1. In order to avoid radial deviations of the centering ring 6, the latter is connected by means of rigid arms 6a with an upper edge 8 of the centrifuge housing 4. The rotary bearing 7a formed as a roller bearing is secured to a sleeve 11, which is slidable in axial direction of the drum shaft 3. Two end positions are possible. The one end position is shown in FIG. 1b, and the other in FIG. 1a. It is to be recognized that the protecting jacket 7 with the bearing 7a in the position shown in FIG. 1a has been rolled out from the centering ring 6, however, in the position shown in FIG. 1b it has been rolled-in into the centering ring 6. In order to simplify the rolling-in, the centering ring 6 is upwardly conically widened, while the protecting jacket 7 is inclined downwardly or rounded up.

FIG. 1a permits also the recognition, that the sleeve 11 is connected with a bottom closing hood 10, by means of an axially displaceable tube 9 surrounding the drum shaft 3, which bottom closing hood 10 is mounted at the lower end of the centrifuge drum 1 for sliding to different heights. In FIG. 1a the bottom closing hood 10 assumes the closing position, while in FIG. 1b, the open position is shown, which the bottom closing hood 10 assumes during the clearing process.

The sleeve 11, which is axially displaceable on the drum shaft 3, has a groove 11a, into which pins 12 of a fork 13 engage, which is connected with a driving device 14. By means of these driving devices effecting the sleeve 11 by means of the fork 13, the sleeve 11 with the protecting jacket 7 and the bearing 7a, as well as the tube 9 connected with the sleeve 11, can be transferred with the bottom closing hood 10 into the tube end positions shown in FIG. 1a and FIG. 1b. The driving device 14 can, as indicated in FIG. 1a, be formed as a hydraulic or pneumatic working member.

FIG. 1a permits recognition, that the upper end position of the sleeve 11 is defined by an abutment ring 17, which is rigidly secured to the drum shaft 3. The sleeve 11 together with the tube 9 and the bottom closing hood 10 are pressed by means of a spring 16 against this abutment ring 17, which spring 16 supports itself within the range of the lower end of the drum shaft 3 on the hub-star 2. The fork is received in the groove 11a with axial play and can be set in the upper end position, for example, by a spring 18 such, that an engagement-free cooperation is assured in the upper end position. Which engagement-free cooperation is advantageous in view of the great number of revolutions of the drum shaft 3 during the centrifuging for avoidance of unnecessary wear. Wear can be avoided, however, also by other means, for example, by the use of roller bearings or the like.

In operation, when it is desired to open the centrifuge drum the driving means is activated to raise the left-hand end of the fork 13, whereby the right-hand end of the fork 13 pushes the

sleeve 11 downwardly, which sleeve 11, being connected with the axially displaceable tube 9, lowers the bottom closing hood, against the force of spring 16, away from the lower end of the centrifuge drum 1, into the opening for clearing position, freeing an annular exit opening in the bottom of the drum for the centrifuged goods. During this lowering movement, the bearing 7a and the protecting jacket enter complementarily into the centering ring 6. To raise the hood 10 back into the closing position for the filling, the driving device 14 is made inoperative, or reverses its movement, and the spring 16 may effect the raising of the tube 9, and hood 10, secured to the latter, as well as the raising of the protecting jacket 7 and bearing 7a out of the centering ring 6, and the sleeve 11 up to a position against the abutment ring 17.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense.

I claim:

1. An auxiliary device for centering of the centrifuge drum of pendulum-centrifuges during clearing at a high number of revolutions, comprising

a bearing guiding a centrifuge drum during clearing and rigidly supported at least temporarily against radial deviation,

a drum shaft having an axially displaceable sleeve thereon within the range of the upper edge of said centrifuge drum,

said bearing comprising a substantially friction-free rotary bearing carried by said sleeve,

a protecting jacket surrounding said rotary bearing, a centrifuge housing,

a centering ring coaxially secured to said drum shaft within the range of the upper edge of said drum shaft, and

said sleeve with said bearing and said protecting jacket being operatively insertable in and removable from said centering ring.

2. The auxiliary device as set forth in claim 1, which includes

a bottom closing hood of said centrifuge drum,

said sleeve is rigidly connected with said bottom closing hood for a joint operation thereof, and

said bearing of said sleeve is disposed outside of said centering ring in the closing position of said bottom closing hood, and enters said centering ring upon opening and lowering, respectively, of said hood.

3. The auxiliary device as set forth in claim 2, further comprising

a driving device,

said sleeve has a peripheral groove,

a fork member entering with axial play said peripheral groove and connected with said driving device for axial displacement of said sleeve, and

means for setting the end position of said peripheral groove in case said sleeve is in raised position relative to the end position of said fork, in order to maintain said fork free from engagement by exploitation of said axial play relative to said peripheral groove.

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