(57) Abrégé/Abstract:
A device for aligning the refining disc of a refining apparatus, in which refining apparatus lignocellulose-containing material is disintegrated and refined, which device is intended to be arranged in a support (701) for the axle package of the refining apparatus, the supporting (701) resting on a ground surface, which axle package comprises the rotary refining disc of the refining apparatus, a rotation axle to which the rotary refining disc is attached, and a bearing housing (702) in which the axle is journaled by means of bearings arranged in the bearing housing (704). The device comprises a first wedge-shaped member (703), which is slid able in a direction along said ground surface, and a second wedge-shaped member (704) provided between the first member (703) and the bearing housing (702) of the axle package, which second member (704) is slide able in a direction transverse to the sliding direction of the first member (703), and the first member (703) when displaced in its sliding direction is arranged to displace the second member (704). The device comprises a control device for displacing the first member (703) and a support means (706), on which the bearing housing (702) rests, which is provided between the second member (704) and the bearing housing (702) and arranged to engage with a to the support means (705) complementary recess (707) of the bearing housing (702). The support means (706) has a convex contact surface (708) against the recess (707) of the bearing housing (702), and the convex contact surface (708) of the support means (706) is displaceable in relation to the surface of the complementary recess (707) of the bearing housing (702). Support and refining apparatus comprising said device.
Title: A DEVICE FOR ALIGNING THE REFINING DISC OF A REFINING APPARATUS

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A DEVICE FOR ALIGNING THE REFINING DISC OF A REFINING APPARATUS

Technical Field

The present invention relates to a device for aligning the refining disc of a refining apparatus in which lignocellulose-containing material is disintegrated and refined, which device for aligning is intended to be arranged in a support for supporting the axle package of the refining apparatus, which axle package comprises the rotary refining disc of the refining apparatus, a rotary axle to which the rotary refining disc is attached, and a bearing housing in which the axle is journalled by means of bearings arranged in the bearing housing, where the support is intended to rest on a ground surface. The device comprises a first wedge-shaped member, which is slidable in a direction along said ground surface, and a second wedge-shaped member provided between the first wedge-shaped member and the bearing housing of the axle package, which second wedge-shaped member is slidable in a direction transverse to the sliding direction of the first wedge-shaped member, and the first wedge-shaped member when displaced in its sliding direction is arranged to displace the second wedge-shaped member in its sliding direction. The device furthermore comprises a control device for displacing the first wedge-shaped member. The present invention relates furthermore to a support for supporting the axle package of a refining apparatus comprising such a device, and to a refining apparatus comprising such a support.

Background of the Invention

For highly concentrated refining, CTMP, TMP, fluffing and highly concentrated grinding of sack paper and other lignocellulose-containing material, refining apparatus or disc refiners are used. Examples of refining apparatus are described in US 6 957 758 and EP 0 386 031. Refining apparatus usually comprise two opposite refining discs rotatable in relation to each other, where usually one refining disc is rotatable, a so called rotor, and one refining disc is non-rotatable, a so called stator, but in some refining apparatus both refining discs are rotatably arranged. The refining discs in this type of refining apparatus are provided with replaceable refining segments which form the refining surfaces of the refining apparatus. The refining segments comprise bars and intermediate grooves. Refining occurs between the two refining surfaces which are held at a certain distance from
each other, whereby is a space, known as a refining gap, is provided between the refining surfaces.

If the refining surfaces would come in contact with each other during operation, this will result in a risk of a breakdown or at least result in wear of the refining surfaces and therewith a shortened operating performance. Furthermore the degree of alignment between the refining surfaces has a crucial importance for the quality of the ground material. When the degree of alignment between the refining surfaces decreases, the quality of the refined material is deteriorated. A correct alignment between the refining surfaces is therefore of great importance.

To obtain a correct alignment between the refining surfaces of the refining discs it is a prerequisite that the rotation axle, to which the rotor is arranged, obtains correct alignment. To angle the axle in relation to the horizontal plane and the vertical plane, two alignment devices are used, which align the whole axle package, to which the axle and the rotor belongs. Such an alignment device according to known technology is described in more detail in the detailed description in connection with the figures 1 to 6. The alignment of the axle package, and thereby of the axle and the rotor, is performed with approximately one-month intervals for a refining apparatus in operation. The adjustment of the axle along its own longitudinal axis is performed by means of another adjustment device which displaces the whole axle package in relation to the support in the direction of the longitudinal axis of the axle. This lengthwise adjustment of the axle package, and thereby of the size of the refining gap, is performed several times per second, as the refining gap often must be reduced or increased because of the constant change in the quality of the material intended for refining, such as the amount of material per time unit. To obtain a correct alignment between the refining surfaces of the refining discs, additionally an alignment of the refining surfaces themselves in relation to the refining discs take place. An example of alignment of the refining surfaces themselves is given in GB 1 468 649.

There exists however certain problems with today's alignment devices for aligning the refining disc of a refining apparatus, of which an example is described in detail in figures 4 to 6.

The requirement that the contact surface of the upper wedge-shaped member against the bearing housing must form different angles with the horizontal plane so as to, at different settings of the axle package, fully bear against the exte-
rior surface of the bearing housing, results in that the upper wedge-shaped member must rotate in relation to the horizontal plane. This 'tilting' of the upper wedge-shaped member results in that there must be a relatively large sideway play between the upper wedge-shaped member and the space in the support in which the upper wedge-shaped member is provided. This play leads however to that the upper wedge-shaped member easily jams in its installation space in the support. Furthermore, the flat contact surface of upper wedge-shaped member against the bearing housing and the flat contact surface of bearing housing against the upper wedge-shaped member have a very even surface as these repeatedly shall slide in relation to each other, which even surface as the repeatedly shall slide in relation to each other, which poses high requirements on the machining of said flat surfaces.

The requirement that the actuator of the alignment device must be placed on the side of the support which is facing away from the refining housing, so that the operator is able to control these, has led to a complicated construction of the alignment device, where the alignment by means of the alignment device includes many steps. This also results in a long distance between the securing point of the alignment device in the support and the lower wedge-shaped member, which leads to that the respective alignment device is sensitive to temperature influence and the construction is not resilient enough.

The above-mentioned problems will appear more clearly from the detailed description, where prior art is described in more detail.

The Object of the invention

The object of the present invention is accordingly to provide an alignment of the refining disc of a refining apparatus, which is reliable in service and straightforward to perform.

Summary of the invention

The above-mentioned object is achieved by providing a device as defined in claim 1.

With this device, the second wedge-shaped member, which is situated above the first wedge-shaped member, does not need to be rotatable in relation to the horizontal plane, whereby the problematic 'tilting' of the second wedge-shaped member does not occur, and said member can be installed in its installation
space/its guide without lateral play, whereby the risk that said wedge-shaped member jams in its installation space in the support is eliminated. The requirement that the flat surfaces must be very even in surface does not exist any more, as the main displacement occurs between said convex and concave surface.

As the bearing housing, via the surface of the complementary recess, rests on the convex contact surface, these are in contact with each other, and the displaceability of convex contact surface the support means in relation to the surface of the complementary recess of the bearing housing comprises that the convex contact surface is displaceable along the surface of the complementary recess while there is surface contact between them. The convex contact surface can advantageously move in all directions along with and in contact with the surface of the complementary recess.

According to an advantageous embodiment of the device according to the present invention, the device comprises a plate in a polymer material which is provided between the support means and the second wedge-shaped member, whereby a sliding surface without the need for lubricating oil is obtained, and advantageously said plate in polymer material has an extent corresponding to basis of the support means which is facing the second member. Hereby, there is no longer a need for the complicated feed of lubricating oil to the contact surface of the upper wedge-shaped member against the bearing housing in prior art.

According to a further advantageous embodiment of the device according to the present invention, the support means is secured to the bearing housing. This facilitates when mounting the bearing housing in the support. This securing does however not fixate the support means but allows the displacement of the support means in relation to the bearing housing.

According to another advantageous embodiment of the device according to the present invention, the control device comprises an actuator, which is provided at one side of the support, the control device comprising a control axle which extends from the actuator to the first member, where the control axle is rotatable around its longitudinal axis and rotatably secured to the first member, that the first member is arranged to be displaced upon rotation of the control axle, and the actuator is arranged to control the rotation of the control axle.

In this way, an alignment is provided which comprises a minimum number of steps. In principle, only a rotation of the actuator in one direction is needed for
the alignment. By means of this device the distance between the fastening point of the device in the support and the first wedge-shaped member is radically reduced. In this way, a control is also achieved which is uncomplicated in its construction and needs a considerably less twisting moment upon alignment compared to prior art alignment devices.

According to yet another advantageous embodiment of a device according to the present invention, the control device comprises at least one bearing housing with bearings by which the control axle is journalled, said bearing housing being fastened in the support between the first member and the actuator. In this way a short distance is obtained between the fastening point of the device in the support, which is the same as the fastening point of the bearing housing of the device in the support, and the first member.

According to a further advantageous embodiment of the device according to the present invention, the control axle comprises two sub-axles which are coupled together by means of an shaft coupling which is part of the control device, where the bearing housing of the control device is fastened in the support between the shaft coupling and the first member, and the sub-axle which is secured to the first member is journalled by the bearing of said bearing housing. The shaft coupling allows the longitudinal axes of the sub-axles to be angled in relation to each other without having the sub-axles rotating around their longitudinal axis in relation to each other, i.e. they do not rotate in relation to each other in rotation direction.

According to another advantageous embodiment of the device according to the present invention, the control axle is secured to the first member by a threaded section provided on the control axle, which is in engagement with a means provided with an inner thread, which is fixedly secured in the first member, the first member being displaceable in relation to the control axle. Advantageously, the axle comprising said threaded section and the means are integral parts of a ball screw. By the means of the ball screw, also called roll screw, a securing free from play of the control axle in the first member is achieved.

Further advantageous embodiments of the device according to the present invention appear in the dependent claims.

The present invention also relates to a support as defined in claim 10 and to a refining apparatus as defined in claim 11.
An operator can control the actuator manually. The control device of respective device according to the present invention can advantageously also be connected to a control apparatus for controlling the alignment between the refining surfaces for the two opposite refining discs rotatable in relation to each other and included in a refining apparatus, where the material is disintegrated and refined in the refining gap between the refining surfaces, and the device of the invention is advantageously arranged to automatically align the rotatable refining disc of the refining apparatus based on said control until a correct alignment is obtained between the refining surfaces, which can for example be achieved by the fact that the actuator of the control device is connected to the control apparatus, for example connected via a control unit arranged to control the actuator based on the results of the control by the control apparatus. The alignment between the refining surfaces is correct when the width of the refining gap is kept constant for every diameter for a complete revolution.

**Brief Description of the Drawings**

The present invention will now be described, for exemplary purposes, in more detail in by means of embodiments and with reference to the accompanying drawings in which:

- **Fig. 1** is a schematic side view of a refining apparatus, equipped with alignment devices according to prior art, in cross-section,
- **Fig. 2** is a schematic frontal view of the refining apparatus in Fig. 1, in cross-section,
- **Fig. 3** is a schematic side view of a support for supporting the axle package, equipped with alignment devices according to prior art, in cross-section,
- **Fig. 4** is a schematic side view of an alignment device according to prior art, in cross-section,
- **Fig. 5** is a view of a detail in Fig. 4
- **Fig. 6** shows the section A-A in Fig. 4, and
- **Fig. 7** is a schematic side view of an embodiment of the device for aligning the refining disc of a refining apparatus according to the present invention, in cross-section.
Detailed Description of a Preferred Embodiment

Fig. 1 shows in outline a refining apparatus, in the form of a so called CD-refiner (Conical Disc), in a cross-section seen from the side, for disintegration and refining of lignocellulose-containing material in a refining gap 101 between refining surfaces on two opposite refining discs 102, 103 rotatable in relation to each other, in the form of a rotatable rotor 102 and a non-rotatable stator 103. The refining discs 102, 103 are provided in a refining housing 104 and the material for refining is fed to the refining gap 101 through an inlet 105. The rotor 102 is a part of what is called an axle package 106 and this axle package 106 comprises a rotatable axle 107, the rotor 102 being attached to one of the ends of the axle 107. The axle 107 is brought into rotation by a suitable drive (not shown). The axle 107 is supported by a rear bearing 108, an intermediate bearing 109 and a front bearing 110. All the bearings are arranged in a bearing housing 111 through which the axle 107 extends. The bearing housing 111 is in its turn arranged in a support 112. To obtain a correct alignment between the refining surfaces of the refining discs 102, 103, it is a prerequisite that the axle 107, and thereby the rotor 102, first obtains a correct alignment. To adjust the alignment of the bearing housing and the axle 107, two alignment devices are used, of which only one alignment device 113 may be seen in Fig. 1. This alignment device 113 is described more in detail in connection with the figures 4 to 6.

Fig. 2 shows a schematic frontal view of the refining apparatus in Fig. 1, in cross-section, where the bearing housing 111 is installed in the support 112. Here, both alignment devices 113, 213 are shown and how they are placed in the support 112. The bearing housing 111 is cylindrical with a substantially circular cross-section. Where the bearing housing 111 abuts against the alignment devices 113, 213, the bearing housing 111 has flat surfaces which have been provided by milling.

Returning to Fig. 1, the front part 114 of the bearing housing 111, which is adjacent to the refining housing 104, is supported by respective alignment device 113 while the rear part 115 of the bearing housing 111 is supported directly by the support 112. The alignment devices 113 adjust the alignment of the axle 107 by raising respectively lowering the front part 114 of the bearing housing 111 and/or displacing the front part 114 of the bearing housing 111 sideways, while the position of the rear part 115 is kept unchanged.
Fig. 3 shows a support 201, without the axle package mounted, and shows one of the alignment devices 202 installed in the lower part of the support 201, and the front part of the bearing housing is supported by a support means 204, which is a part of the alignment device 202, and the rear part of the bearing housing rests on a lower rear portion 205 of the support 201, and the bearing housing is supported at the top in principle by two retaining means 206, 207 arranged in the upper part of the support. The bearing housing is supported in the corresponding manner on the other side of its symmetry line by the second alignment device (not shown). The support 201 rests on a ground surface 208.

Fig. 4 shows an alignment device according to prior art, which is arranged in a support 301 in which the bearing housing is mounted and by which support the axle package is supported. The bearing housing is supported at the base by a support means 302, which is a part of the alignment device, and by a lower part 303 of the support 301. The first support means 302 is vertically slidable, while the second support means 303 is stationary. The first support means 302 is in the form of an upper wedge-shaped member 302 and this member 302 is movably arranged in a space 304 in the support 301. In the same space 304 a pad 305, in the form of a lower wedge-shaped member 305, is arranged and rests on the bottom of said space 304. The lower member 305 is horizontally slidable. A bearing housing washer 306, which is ring-shaped when seen from above, rests on the upper surface of the lower member 305. On this bearing housing washer 306 a bearing washer 307 rests, which when seen from above also is ring-shaped. The bearing housing washer 306 and the bearing washer 307 are displaceable in relation to each other, and the bearing housing washer 306 is usually made of a hard material, such as stainless steel, while the bearing washer 307 is made from a softer material, such as bronze. The upper member 302 rests on the bearing washer 307. The inner walls of said space 304 prevent the lateral displacement of the upper wedge-shaped member 302. The contact surface of the upper member 302 against the bearing housing must however be able to form different angles with the horizontal plane to fully lie against the outer surface of the bearing housing at different adjustments of the axle package. The rotation of the upper member 302 in relation to the horizontal plane is achieved by said bearing housing washer 306 and bearing washer 307. This 'tilting' of the upper member 302 entails that there must be a relatively large sideways play between the side edges of the upper
member 302 ant the inner walls of the space 304. However, this play entails that the upper member 302 easily can jam in said space 304 when an alignment of the axle package is to be performed. Further, the flat contact surface of the upper wedge-shaped member 302 against the bearing housing and the flat contact surface of the bearing housing against the upper wedge-shaped member 302 must be very even as these repeatedly slide in relation to each other.

In Fig. 5 it can be seen that the bearing housing washer 306 and the bearing washer 307 are spherical in their design, and the contact surface of the bearing housing washer 306 against the bearing washer 307 is concave while the contact surface of the bearing washer 30 against the bearing housing washer 306 is convex in cross-section.

Returning to Fig. 4, the alignment device further includes a control device 300 arranged to push the lower member 305 to the left and right in Fig. 3. The control device 300 comprises a spacing screw 308 and a spacing tube 309 in which the spacing screw is provided, and the first end of the spacing screw 308 is fixedly secured in the in the lower member 305. The spacing screw 308 is hollow along its whole length and in its second end there is an inlet 310 arranged, through which inlet 310 lubricating oil is introduced to the longitudinal channel of the spacing screw 308, whereupon the lubricating oil is led to the first end of the spacing screw 308 and thereby to a first vertical channel 311 in the lower member 305. The lubricating oil is then led from the first vertical channel 311 to a second vertical channel 312 arranged in the upper member 302 through a lead-through device 313, which is described more in detail in connection with Fig. 6. From the second vertical channel 312 the lubricating oil is then led out onto the contact surface of the upper member 302 against the bearing housing. A lubrication of the contact surface between the upper member 302 and the bearing housing has been necessary to maintain a low friction between them, because the upper member 302 and the bearing housing slide in relation to each other when the axle package, as has been described in the introduction, is displaced in relation to the support in a direction along the longitudinal axis of the axle during the frequently occurring adjustment of the size of the refining gap. The control device 300 also comprises a console 314 which is fixedly arranged in the support 301 and a nut locking 315 fixedly arranged in the console 314. Further, the control device 300 comprises actuators 316, 317, 318 which are those means operated by the operator in order to
align the axle package. The actuators 316, 317, 318 comprise an adjustment screw 316 with an exterior thread which is set against the spacing tube and is in threaded engagement with the nut locking 315. There are furthermore two jamb nuts 317, 318, belonging to the actuators 316, 317, 318, which are in threaded engagement with the spacing screw 308. These jamb nuts 317, 318 are used for bracing the lower member 305 at the desired position, to eliminate play. The actuators 316, 317, 318 are as can be seen arranged in the rear part of the support 301. This is the case since it is not practically possible to arrange the actuators 316, 317, 318 in the front part of the support 301, i.e. the part which is adjacent to the refining housing, to the right of the lower member 305, as an operator then would not be able to operate the actuators due to the narrow space between the front part of the support 301 and the refining housing. The consequence is a long distance between the fixing point of the alignment device in the support, which is at the nut locking 315, and the lower member 305, which entails that the alignment device is sensible for temperature influence and the construction is not rigid enough.

To lower the upper member 302 in a vertical direction, the operator starts by loosening the jamb nuts 317, 318, whereupon the operator turns the adjusting screw 316 so that it is displaced to the right in Fig. 3, or in a direction towards the refining housing, in relation to the support 301. The adjustment nut 316 then pushes the spacing tube 309 so it also is displaced to the right in relation to the support 301, and thereby pushes the lower member 305 to the right in the figure. The lower member 305 then also pulls the spacing screw 308 with it so that this also is displaced to the right. By the displacement of the lower member 305 to the right, the bearing housing washer 306 and the bearing washer 307 are also displaced to the right, whereby the upper member 302 is lowered in a vertical direction. Finally the jamb nuts 317, 318 are turned so that they are displaced in a direction towards the adjustment screw 316, so that the lower member 305 is tightened against the spacing tube 309 by the displacement of the spacing screw 308 to the left in relation to the spacing tube 309, and play is eliminated.

To raise the upper member 302 in a vertical direction the operator also in this case starts by loosening the jamb nuts 317, 318, whereupon the operator turns the adjusting screw 316 so that it is displaced to the left in Fig. 3, or in a direction away from the refining housing, in relation to the support 301. A space
arises between the adjustment screw and the spacing tube 309. Thereafter the jamb nuts 317, 318 are turned so they are displaced in a direction towards the adjustment screw 316, whereby the spacing screw 308 is pulled to the left and thereby pulls the lower member 305 to the left, and the lower member 305 pushes the spacing tube to the left. Due to that the lower member 305 is displaced to the left, the bearing housing washer 306 and the bearing washer 307 are also displaced to the left, whereby the upper member 302 is raised in a vertical direction. To raise the upper member 302 in a vertical direction, more operations than when lowering the same are thus required.

Due to that two such alignment devices are arranged in the support, as seen in Fig. 2, the front part of the axle, which is fastened to the rotor, can be laterally and/or vertically displaced.

Fig. 6 shows a detail view of the lead-through device 313 provided between the upper member 302 and the lower member 305. The lead-through device 313 includes a channel 501, which connects to the first vertical channel 311 in the lower member 305 and to the second vertical channel 312 in the upper member 302. The lead-through device 313 is fastened in the upper member 302 with a screw 502 but is displaceable in relation to the lower member 305. The lead-through device 313 further comprises a first O-ring seal 503 for the sealing between the lead-through device 313 and the lower member 305 and a second O-ring seal 504 for the sealing between the lead-through device 313 and the upper member 302, so that the lubricating oil cannot leak on its way to the upper member's 302 contact surface against the bearing housing. However, this need of lubricating oil implies a complicated construction comprising said lead-through device 313 and all the channels, as described above, and also a lubricating oil source must be connected to the inlet 310 of the spacing screw 308, and this lubricating oil source must be controlled and maintained.

Fig. 7 shows an embodiment of the device for aligning the refining disc of a refining apparatus according to present invention, arranged in a support 701 intended to rest on a ground surface, where the bearing housing 702 of the axle package and the support 701 are only partially shown. In the same way as shown in Fig. 2, two such devices for aligning the refining disc are used, and the device according to the invention is intended to be mounted on the corresponding places shown in figures 1 to 3. The device comprises a first wedge-shaped member 703,
which is slidable, in relation to the support, in a direction along said ground surface, and a second wedge-shaped member 704 provided between the first wedge-shaped member 703 and the bearing housing 702 of the axle package, which second member 704 is slidable, in relation to the support, in a direction transverse to the sliding direction of the first member. When displaced in its sliding direction, the first member 703 is arranged to displace the second member 704 in its sliding direction. The first member has a contact surface 705 against the second member 704, and the second member 704 has a contact surface 722 against the first member 703, which contact surfaces 705, 722 form an angle with said ground surface.

During the displacement of the first member 703 to the right in the figure, i.e. towards the refining housing, the second member 704 sinks downwards in a vertical direction by influence of gravity, and during displacement of the first member 703 to the left in the figure, i.e. away from the refining housing, the second member 704 is raised in a vertical direction, whereby the desired alignment can be achieved.

The device comprises a control device for displacing the first member 703, which control device comprises an actuator 711 arranged at the side of the support 701, which is opposite the side of the support 701 adjacent to the refining housing. The control device comprises a control axle 712, 713 which extends from the actuator 711 to the first member 703. The control axle 712, 713 is rotatable around its longitudinal axis and comprises two sub-axes 712, 713 which are coupled together by means of a shaft coupling 715. The control axle 712, 713 is via its first sub-axe 713 rotatably secured to the first member 703 by a threaded section provided on the first sub-axe 713, which section is in engagement with a means 716 with an inner thread which in its turn is fixedly secured to the first member 703 by means of an fastening flange 717. The first sub-axe 713 including said threaded section and the means 716 with the inner thread are parts of a ball screw/roll screw. The first member 703 is arranged to be displaced upon rotation of the control axle 712, 713 and is slidable in its sliding direction in relation to the control axle 712, 713. To allow this relative displacement the first member 703 comprises a space 718 for the first sub-axe 713, which has a sufficient extent in the sliding direction of the first member 703. The rotation of the control axle 712, 713 is operated by the actuator 711 which is fixated in the control axle 712, 713. The only operation which is required for displacement of the first member 703 is
thus a rotation of the actuator 711 which causes a rotation of the control axle 712, 713 and thereby a displacement of the first member 703. The control device comprises a bearing housing 714 with bearings by which the control axle 712, 713 is journalled via its first sub-axle 713. The bearing housing 714 of the control device is fastened to the support 701 between the shaft coupling 715 and the first member 703. At the actuator 711 there is arranged a nut locking 719 for locking the actuator 711, and a deep groove ball bearing 720 arranged for journaling the outer end of the control axle 712, 713.

Further, the device comprises a support means 706 on which the bearing housing 702 is intended to rest. The support means 706 is provided between the second member 704 and the bearing housing 702 and is arranged to engage with a to the support means 706 complementary recess 707 of the bearing housing. The support means 706 has a convex contact surface 708 against the recess 707 of the bearing housing 702, and the convex contact surface 708 of the support means 706 is displaceable in relation to the surface of the complementary recess 707 of the bearing housing 702. The device comprises a plate 709 in a polymer material, in this embodiment a web-reinforced, polyester based thermoset plastic material, which plate 709 is provided between the support means 706 and the second wedge-shaped member 704, whereby a sliding surface is achieved, so that the axle package, as described in the beginning, can be displaced in relation to the support 701 in a direction along the longitudinal axis of the axle, during the frequently occurring adjustment of the size of the refining gap, without the need of lubrication oil. Said plate 709 has an extent which corresponds to the basis 710 of the support means 706, which bases is facing the second member 704. To facilitate during the mounting of the bearing housing 702 in the support 701, the support means 706 is secured to the bearing housing 702 by means of a fastening means 721. This fastening means 721 is fastened to the support means 706 by means of spring means 722 to allow the displacement of the support means 706 in relation to the bearing housing 702.
CLAIMS

1. A device for aligning the refining disc of a refining apparatus, in which refining apparatus lignocellulose-containing material is disintegrated and refined, which device is intended to be arranged in a support (701) for supporting the axle package of the refining apparatus, which axle package comprises the rotary refining disc of the refining apparatus, a rotation axle to which the rotary refining disc is attached, and a bearing housing (702) in which the axle is journalled by means of bearings arranged in the bearing housing (704), where the support (701) is intended to rest on a ground surface, and the device comprises a first wedge-shaped member (703), which is slidable in a direction along said ground surface, and a second wedge-shaped member (704) provided between the first member (703) and the bearing housing (702) of the axle package, which second member (704) is slidable in a direction transverse to the sliding direction of the first member (703), and the first member (703) when displaced in its sliding direction is arranged to displace the second member (704) in its sliding direction, and the device furthermore comprises a control device for displacing the first member (703) and a support means (706) on which the bearing housing (702) is intended to rest, characterised in that the support means (706) is provided between the second member (704) and the bearing housing (702) and arranged to engage with a to the support means (706) complementary recess (707) of the bearing housing (702), that the support means (706) has a convex contact surface (708) against the recess (707) of the bearing housing (702), and that the convex contact surface (708) of the support means (706) is displaceable in relation to the surface of the complementary recess (707) of the bearing housing (702).

2. A device according to claim 1, characterised in that the device comprises a plate (709) in a polymer material which is provided between the support means (706) and the second member (704), whereby a sliding surface without the need for lubricating oil is obtained.

3. A device according to claim 2, characterised in that said plate (709) in polymer material has an extent corresponding to the basis (710) of the support means (706), which basis (710) is facing the second member (704).
4. A device according to any of the claims 1 to 3, characterized in that the support means (706) is secured to the bearing housing (702).

5. A device according to any of the claims 1 to 4, characterized in that the control device comprises an actuator (711) which is arranged at one side of the support (701), that the control device comprises a control axle (712, 713) which extends from the actuator (711) to the first member (703), that the control axle (712, 713) is rotatable around its longitudinal axis and rotatably secured to the first member (703), that the first member (703) is arranged to be displaced upon rotation of the control axle (712, 713), and that the actuator (711) is arranged to operate the rotation of the control axle (712, 713).

6. A device according to claim 5, characterized in that the control device comprises a bearing housing (714) with bearings by means of which the control axle (712, 713) is journalled, and that said bearing housing (714) is fastened in the support (701) between the first member (703) and the actuator (711).

7. A device according to claim 6, characterized in that the control axle (712, 713) comprises two sub-axles (712, 713) which are coupled together by means of a shaft coupling (715) included in the control device, that the bearing housing (714) of the control device is fastened in the support (701) between the shaft coupling (715) and the first wedge-shaped member (703), and that the sub-axle (713), which is secured to the first member (703), is journalled by the bearing of said bearing housing (714).

8. A device according to any of the claims 5 to 7, characterized in that the control axle (712, 713) is secured to the first member (703) by a threaded section provided on the control axle (712, 713), which section is in engagement with a means (716), provided with an inner thread, which is fixedly secured in the first member (703), and that the first wedge-shaped member (703) is displaceable in relation to the control axle (712, 713).
9. A device according to claim 8, characterized in that the axle (713) comprising said threaded section and the means (716) provided with an inner thread are parts of a ball screw.

10. A support for supporting the axle package of a refining apparatus for disintegrating and refining lignocellulose-containing material, which axle package comprises the rotary refining disc of the refining apparatus, a rotary axle to which the rotary refining disc is attached, and a bearing housing (702) in which the axle is journalled by bearings arranged in the bearing housing (702), and the support (701) comprises at least two devices for aligning the refining disc of the refining apparatus, characterized in that at least one of said devices comprises the features which are mentioned in any of the claims 1 to 9.

11. A refining apparatus for disintegrating and refining lignocellulose-containing material, with an axle package comprising the rotary refining disc of the refining apparatus, a rotary axle to which the rotary refining disc is attached, and a bearing housing (702) in which the axle is journalled by bearings arranged in the bearing housing (702), and the refining apparatus comprises a support (701) for supporting said axle package, characterized in that the support (701) comprises the features which are mentioned in claim 10.