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(54) **Title:** DEVICE FOR MAINTENANCE OF A ROLL OF A FIBER WEB MACHINE

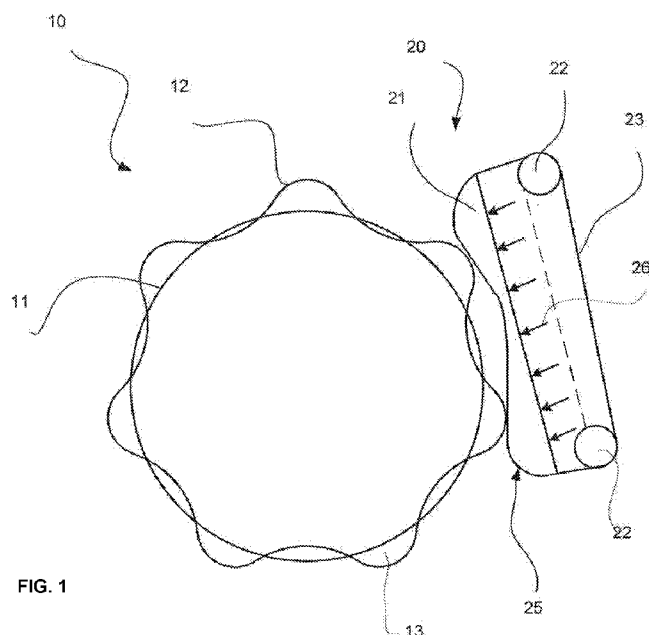


FIG. 1

(57) **Abstract:** The invention relates to a device for the maintenance of a roll of a fiber web machine which comprises a grinding means (20) for the maintenance of a surface/cover of a roll (10). The grinding means (20) of the maintenance device is arranged to grind wave-type deformations (12) in the surface/cover of the roll (10) of the fiber web machine passing in the longitudinal direction of the roll. The grinding means (20) comprises a curved contact area which simultaneously extends at the point of at least two crests (13) of the wave-shaped deformation (12) in the surface/cover of the roll (10) and into connection with the curved contact area is arranged abrasive material (25).



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Device for maintenance of a roll of a fiber web machine

The invention pertains to rolls of fiber web machines and their maintenance. The invention relates to a device for the maintenance of a roll of a fiber web machine according to the preamble of claim 1.

- 5 As known of prior art, rolls employed in fiber web machines and finishing devices of fiber web machines wear, are contaminated and/or damaged, which can induce geometrical distortion in the roll of the fiber web machine or the finishing device of the fiber web machine which, in turn, leads to the weakening of the properties of the fiber web being manufactured and/or makes using the roll for its purpose
10 problematic e.g. due to noise, vibration or some other reason. In some cases, the condition of the roll deteriorates so much that it has to be replaced by a new equivalent roll.

- A particular problem, especially in connection with calender rolls of fiber web machines, is the so-called barring phenomenon which occurs as intensive nip
15 vibration and induces a permanent deformation in the roll surface/cover, which appears in the roll surface/cover as axial whips and/or peripheral waviness, in which the roll surface/cover profile changes from an evenly round line form to a wavy line form. This phenomenon advances gradually such that the wave crests enlarge i.e. the deformation increases. In this specification, such deformations of
20 the roll profile in the roll surface/cover in the axial direction of the roll are referred to as wave-type deformations in the roll surface/cover.

- Such wavy-type deformations of the roll surface/cover as above, in which deformation peaks (wave crests, whips etc.) are created at a distance from each other in the roll surface/cover, also occur in connection with other rolls of the fiber
25 web machine, such as e.g. in the rolls of a press and the counter rolls of coating machines.

- Of prior art, maintenance devices for a roll of a fiber web machine are known which have aimed at correcting the above wave-type deformations of the roll surface/cover. A disadvantage of the prior-art devices is that their effect is local,
30 whereby the correction of the wave-like deformation has required monitor and control systems for the continuous adjusting of the maintenance force effect. Therefore, the arrangements have been complicated and difficult to implement.

Patent specification US6645349 introduces a method and a device for the conditioning of a roll of a paper machine or a finishing device of a paper machine.

The described device comprises traversing means for cleaning and/or grinding the roll, and the device consists of an assembly of devices which comprises measurement units for measuring and monitoring the roll surface/cover as regards contamination, wear and damage in the cover, a cleaning/grinding unit for cleaning
5 and/or grinding the roll surface/cover based on measurement results, and the device operates continuously and can be operated during the production run of the paper machine and/or the finishing device, and grinding pressure of the cleaning/grinding device is arranged controllable based on the measurement results obtained from the measurement units. This specification, however, does
10 not describe arrangements where wave-type deformations in the roll surface/cover can be eliminated. Furthermore, the device assembly described is complex requiring e.g. measurement units and a control system for controlling the operation of the device based on measurement results obtained. Additionally, the device can only be operated during production run.

15 The object of the invention is to create a device for the maintenance of a roll of a fiber web machine, which enables eliminating particularly wave-type deformations in the roll surface/cover.

An additional nonessential object of the invention is to provide a maintenance device for a roll of a fiber web machine which is simple and versatile of its
20 construction and suitable for various applications.

A further object of the invention is to provide a maintenance device for a roll of a fiber web machine in which the disadvantages of prior art have been eliminated or at least minimised.

To achieve the above objects and those which come out later, the device for the
25 maintenance of a roll of a fiber web machine according to the invention is mainly characterised by what is presented in the characterising part of claim 1.

A grinding means of the roll maintenance device according to the invention comprises a curved contact area which simultaneously extends at the point of at least two crests of wave-shaped deformations in the roll surface/cover such that
30 the bottoms of the wave-shaped deformation are not ground. Advantageously, the length of the curved contact area in the peripheral direction of the roll is 50–500 mm. Thus, the grinding means in the maintenance device for a roll of a fiber web machine according to the invention is arranged such that grinding work is mainly

applied to the peak points of the peripheral profile of the roll i.e. the crest points of the wave-type deformations.

5 According to an advantageous additional characteristic of the invention, a support section of the grinding means has either been manufactured having a desired radius of curvature at the manufacturing stage or the support section is flexible in its longitudinal direction, whereby in the grinding event the support section is pressed towards the roll from its ends, which enables making the curvature of its inner surface to equal the curvature of the roll being ground.

10 According to an advantageous additional characteristic of the invention, the grinding means of the maintenance device is traversing in the axial direction of the roll, whereby substantially constant material removal is provided in the axial direction, thus maintaining a good roll diameter profile. The grinding means is also arrangeable as a grinding means extending substantially for the whole length of the roll.

15 The grinding means of the roll maintenance device according to the invention comprises an abrasive i.e. grinding material, which can be e.g. a grinding band arranged as an endless loop or a grinding band used from a coil. The abrasive material can also be e.g. attached by an adhesive material or some other attaching means on the support section of the grinding means.

20 The grinding means of the maintenance device for a roll of a fiber web machine according to the invention is implementable according to an advantageous characteristic as a band grinding element, whereby the grinding band is pressed against the roll surface on the support section of the grinding element by e.g. a concave presser the radius of curvature of which is greater than or equal to the
25 radius of curvature of the roll being ground. Then, the grinding band contacts most forcibly the peak points of the roll profile thus removing the disadvantageous dimensional error.

The grinding means of the roll maintenance device according to the invention is according to an embodiment a grinding band well tolerant of pulling without the
30 support section, which grinding band is tightenable against the roll surface.

According to an advantageous further characteristic, the abrasive material in the grinding means of the maintenance device for a roll of a fiber web machine is of diamond, hard metal, material comprising some oxide or carbide.

According to an advantageous additional characteristic, the maintenance device comprises means for adjusting the grinding force of the grinding means particularly when starting grinding, e.g. an flexible support and locking. The grinding means comprises according to an advantageous further characteristic a pivoting or an flexible part, e.g. a hinge mechanism, such that the surface of the grinding means having the abrasive material sets on top of the crest points of the wave-shaped deformations in the roll surface/cover.

According to an advantageous additional characteristic, the roll maintenance device comprises means for measuring the shape of the roll to measure the starting and ending point of the grinding work of the grinding means. This measurement can be e.g. optical or based on computer vision.

According to an advantageous further characteristic, the grinding means of the maintenance device comprises a perforation extending through the support section, thus enabling to determine the location and size of deformations in the roll profile by measuring the pressure of the fluid being blown through the perforation.

According to an advantageous additional characteristic, into connection with the maintenance device is arranged means for measuring the roll shape optically from the variation in the surface colour or lightness.

The maintenance device for a roll of a fiber web machine according to the invention can prevent the disadvantageous barring phenomenon from occurring in calendering by the maintenance device grinding the wave-type crest-like deformations i.e. whips from the roll already at their early stage before the barring phenomenon has been able to develop into a disadvantageous stage. The roll maintenance device according to the invention removes very little material when preventing the barring phenomenon from occurring, e.g. only some microns, whereby grinding-time measurement is not required in all applications.

The maintenance device for a roll of a fiber web machine according to the invention is usable advantageously when the roll is in the machine either during a shutdown or production run even more often if required e.g. at specific intervals during run and the roll is rotatable by its own rotation drives. In addition to the maintenance of a roll in the machine, the roll maintenance device according to the invention is also usable outside the machine e.g. in a roll grinding machine.

The roll maintenance device according to the invention also comprises according to an advantageous additional characteristic other means for the maintenance and/or cleaning of the roll surface/cover.

- By means of the roll maintenance device according to the invention, it is also possible to remove deformations in connection with the borings of peripherally-bored rolls caused by the effect of heat during run.

Next, the invention will be described in more detail with reference to the figure of the enclosed drawing, to the details of which the invention is, however, intended by no means to be narrowly limited.

- The figure very schematically shows a grinding means of a maintenance device for a roll of a fiber web machine according to an embodiment of the invention.

- The figure shows as a very schematic illustration of principle a grinding means 20 of a roll maintenance device according to an embodiment of the invention in connection with a roll 10 of a fiber web machine. The roll 10 includes wave-type deformations in the axial direction of the roll, which are depicted by a profile line 12. A desired circular profile of the roll 10 is designated by a profile line 11. As seen from the figure, wave-shaped crests 13 can be formed in the circular profile 11 of the roll. In the figure, seven such crests 13 are shown in the profile line 11 of the roll 10 but, in practice, there are considerably more, dozens, even 80, of these crests 13, and practically their height ratio is not in accordance with the figure but usually their height is 1–3 μm , that is, some microns. During grinding, the rotation of the roll 10 takes place by rotation drives and, if the grinding occurs the roll 10 being in place in the fiber web machine, the rotation drives of the roll 10 are used. If required, drives to rotate the roll can be arranged into connection with the maintenance device.

- The grinding means 20 of the roll maintenance device according to an exemplifying embodiment of the invention is concave of its surface towards the roll 10 i.e. of its contact surface such that its radius of curvature is equal to the radius of curvature of the roll or greater than the radius of curvature of the roll. The grinding means 20 simultaneously extends of its grinding surface i.e. contact surface at the point of at least two deformation crests 13 in the surface/cover of the roll 10. Advantageously, the length of the curved contact area of the grinding means 20 in the peripheral direction of the roll 10 is 50– 500 mm.

In the exemplifying embodiment shown in the figure, the grinding means 20 comprises a support section 21 onto the grinding surface being towards the roll 10 of which is arranged to pass a grinding band 23 comprising abrasive material 25. In the example according to the figure, the grinding band 23 passes as an endless loop controlled by rolls 22. Into connection with the support section of the grinding means 22 is arranged a perforation by which blowings of gaseous material, e.g. air, which are designated with arrows 26, are blown towards the surface of the roll 10, whereby the shape of the deformation profile line 12 is known based on pressure at the point of the grinding means 20.

10 Instead of the loop-like arrangement shown in the figure, the grinding band 23 of the grinding means 20 can be brought into connection with the support section 21 of the grinding means 20 from a coil, an arrangement of this type is described in patent US6645349 mentioned here as reference.

15 Instead of the grinding band 23, the abrasive material can be attached directly onto the surface of the support section 21 whereby, as the abrasive material wears, the support section 21 or a separate section comprising the abrasive material attached to it is replaced. The abrasive material in the grinding means 20 is e.g. of diamond, hard metal, material comprising some oxide or carbide.

20 The maintenance device of the roll 10 comprises means arranged into connection with the grinding means 20 for adjusting the grinding force of the grinding means when starting the grinding, e.g. an flexible support and locking, whereby the flexible support consists of the support section 21 and a locking mechanism (not shown in the figure) arranged into connection with it. Alternatively, the force of the grinding device is kept continuously constant e.g. by means of compressed air loading.

25 The support section 21 of the grinding means and possible additional parts attached to it, such as rolls 22 controlling the grinding band, gas blowing means 26, means producing grinding force and adjusting it, are attached into connection with frame structures of the maintenance device and, according to an advantageous additional characteristic, the attachment is implemented by a pivoting or an flexible part, e.g. by a hinge mechanism, such that the contact surface having the abrasive material 25 of the grinding means 20 sets on top of the crest points 13 of the wave-shaped deformations in the surface/cover of the roll 10.

The maintenance device for a roll of a fiber web machine according to the invention is usable advantageously when the roll is in the machine either during production run or a shutdown, and the roll is rotatable by its own rotation drives.

5 The grinding means 20 of the maintenance device is advantageously traversing in the axial direction of the roll 10, whereby into connection with the maintenance device is arranged means for transferring the grinding means 20 in the axial direction of the roll 10. The grinding means 10 is also arrangeable as a grinding means extending substantially for the whole length of the roll 10.

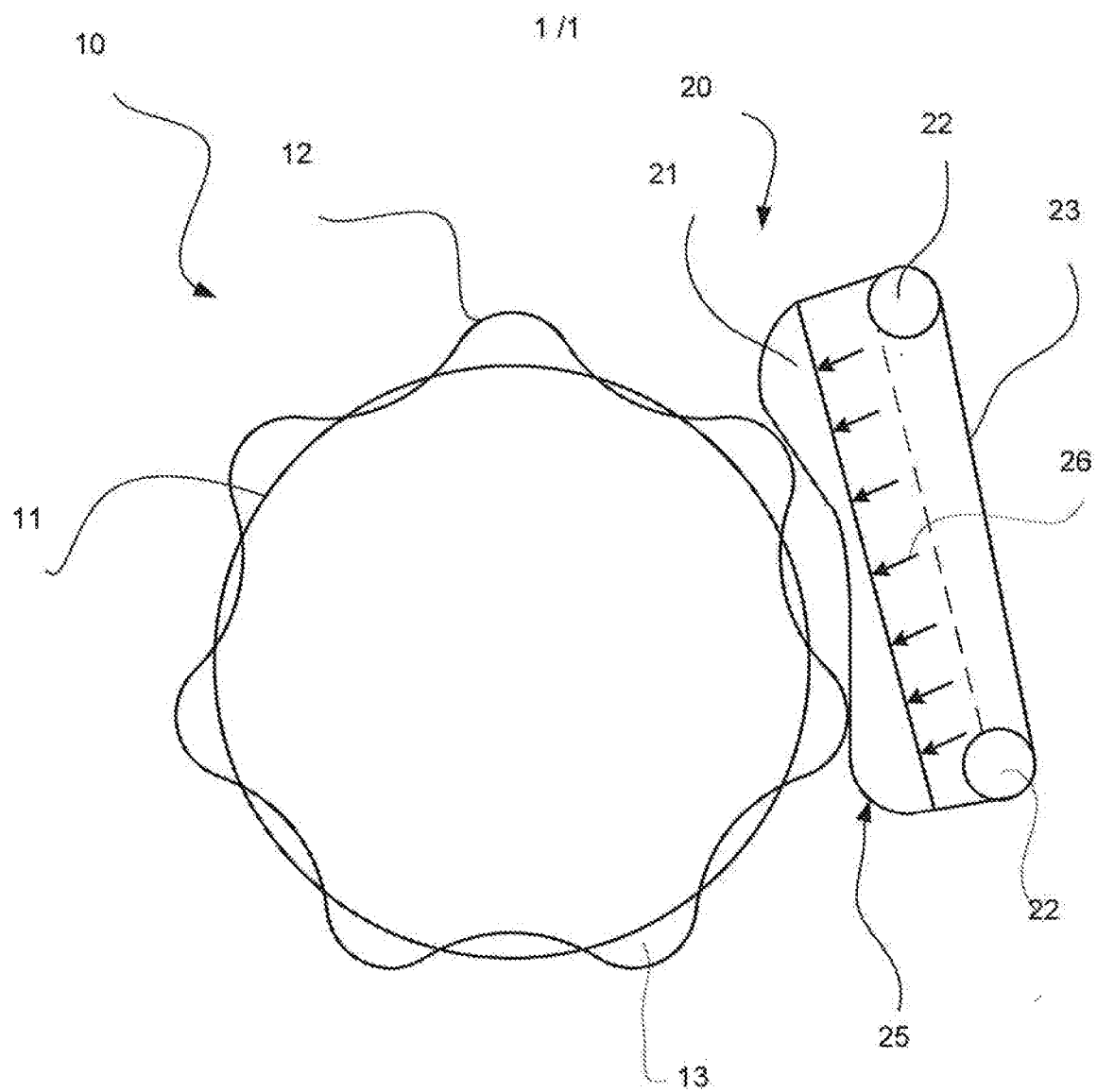
10 In addition to the grinding means 20 according to the invention, the maintenance device of the roll 10 can also comprise other means for the maintenance and/or cleaning of the surface/cover of the roll 10. These means can be replaceable or attachable into connection with the maintenance device by a turret-type arrangement.

15 The invention was described above referring to only one of its advantageous exemplifying embodiments, to the details of which the invention is not intended to be narrowly limited but many modifications and variations are possible within the scope of the idea according to the invention.

Claims

1. A device for the maintenance of a roll of a fiber web machine, which comprises a grinding means (20) for the maintenance of a surface/cover of a roll (10), which grinding means (20) comprises a curved contact area and into
5 connection with which curved contact area is arranged abrasive material (25), which grinding means (20) of the maintenance device comprises a support section (21), **characterised** in that the grinding means (20) of the maintenance device is arranged for grinding wave-type deformations (12) in the surface/cover of the roll (10) of the fiber web machine passing in the
10 longitudinal direction of the roll, that the curved contact area of the grinding means (20) simultaneously extends at the point of at least two crests (13) of the wave-shaped deformation (12) in the surface/cover of the roll (10), and that the support section (21) has been either manufactured having a desired radius of curvature at the manufacturing stage or the support section (21) is
15 flexible in its longitudinal direction, whereby the curvature of the inner surface of the support section (21) can be made to equal the curvature of the roll being ground by pressing the support section from its ends towards the roll (10).
2. A maintenance device according to claim 1, **characterised** in that the length
20 of the curved contact area of the grinding means (20) of the maintenance device in the peripheral direction of the roll (10) is 50–500 mm.
3. A maintenance device according to claim 1 or 2, **characterised** in that the grinding means (20) of the maintenance device is traversing in the axial direction of the roll (10).
- 25 4. A maintenance device according to claim 1 or 2, **characterised** in that the grinding means (20) of the maintenance device extends substantially for the whole length of the roll (10) in the axial direction.
5. A maintenance device according to claim 1, **characterised** in that the radius
30 of curvature of the curved contact area is greater than or equal to the radius of curvature of the roll (10).
6. A maintenance device according to claim 1, **characterised** in that the abrasive material in the grinding means (20) of the maintenance device is in a grinding band (23) which is arranged to pass over the contact area of the grinding means.

7. A maintenance device according to claim 1, **characterised** in that the abrasive material in the grinding means (20) of the maintenance device is attached by adhesive material or some other attaching means on the support section (21) of the grinding means (20).
- 5 8. A maintenance device according to claim 1, **characterised** in that the maintenance device comprises means for adjusting the grinding force of the grinding means particularly when starting the grinding.
9. A maintenance device according to claim 1, **characterised** in that the grinding means (20) of the maintenance device comprises a perforation
10 extending through the support section (21), whereby the location and size of the deformations in the profile of the roll (10) are determinable by measuring the pressure of fluid being blown through the perforation.
10. A maintenance device according to claim 1, **characterised** in that into
15 connection with the maintenance device is arranged means for measuring the shape of the roll (10) optically from the variation in the surface colour or lightness.



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. B24B5/37 B24B5/36 B24B49/08 B24B49/12
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B24B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	DE 102 39 402 A1 (VOITH PAPER PATENT GMBH [DE] VOITH PATENT GMBH [DE]) 15 April 2004 (2004-04-15) figures 1-3	1-8
Y	paragraphs [0001], [0008] - [0012], [0015], [0017], [0036], [0037], [0040] ----- -/--	10



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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