Title: ROLL WITH ADJUSTABLE SHELL, APPARATUS AND METHOD

Abstract: A roll (1) comprising a stationary shaft (2) and a hollow shell (3) rotatably fitted onto the shaft, and longitudinal sealings (8) and end searings (9,10) are arranged between the shaft and the shell for forming a first pressure chamber (6) and a second pressure chamber (7), and the roll (1) is loadable by conveying a pressure medium into the first pressure chamber (6) and/or into the second pressure chamber (7) for adjusting deflection of the shell (3). The amount and the direction of the total load caused to the shell (3) from inside by the pressure medium is defined by the difference of the loads caused by the pressure in the first pressure chamber (6) and the pressure in the second pressure chamber (7), and the pressure medium is steam, and the roll (1) is heatable by conveying that steam into at least one of said pressure chambers (6,7). An apparatus (20,30,1,33) comprising a deflection compensated roll (1) according to any embodiment of the invention. A press section of a fiber web machine. A drying section of a fiber web machine. A method for using a roll (1).
ROLL WITH ADJUSTABLE SHELL, APPARATUS AND METHOD

FIELD OF INVENTION

The invention relates to a roll with an adjustable shell and a belt rotating apparatus used in fiber web machines. The invention relates particularly, though not exclusively, to a deflection compensated roll, which may be applied in a press and a drying section of a paper machine, for transferring heat to a metal belt and/or to paper, and to a method for using a deflection compensated roll.

BACKGROUND ART

In a deflection compensated swimming roll a shell is rotatably arranged on top of a stationary shaft, which shell is loaded by conveying pressure oil into a pressure chamber between the shaft and the shell to correct deflection of the shell of the roll. The oil used to pressurize the roll is used to heat the swimming roll. Deflection compensated swimming rolls are manufactured for example under brands SymRoll, EcoNip and S-Roll. The publication US 5244448 describes one deflection compensated swimming roll. Swimming rolls are typically used in narrow and slow paper machines with driving speed up to 1300 m/min.

Oil loaded swimming rolls have had in some applications a limited rotating speed as a limitation. When the rotating speed increases i.a. the internal friction of the oil loaded swimming roll caused by the oil increases and the roll requires a large amount of driving output.

When the production demands of paper machines expand paper is produced with wider and faster paper machines, in which case it is not desirable to have the rotating speed of swimming deflection compensated rolls used with inter alia the press section and the drying section restricting the process in the fast running range over 1300 meters per minute.
The publication US 5725465 describes an air loaded deflection compensated swimming roll.

The publication WO 03064762 describes a metal belt calender. A deflection compensated roll is used as a roll outside the metal belt circulation and/or as a roll inside the metal belt circulation pressable against the outside roll. Particularly compensating tension and speed differences between the edge and the middle point of the metal belt in a wide metal belt calender and guiding of the metal belt have proven to be challenging. Metal belt calenders have been manufactured under brand ValZone.

It is desired to find a more cost-effective method to heat the metal belt of the press section instead of a traditional thermo roll.

Rolls of the drying section are in their external dimensions large and take a lot of space. Use of the metal belt has been suggested for the drying section as one method of heat transmission. Use of the drying cylinder as a heat transmission means for the metal belt has not been found to be widely applicable.

Costs rise high when using periphery drilled thermo rolls and the periphery drilled thermo rolls are difficult to manufacture.

SUMMARY

According to a first aspect of the invention there is provided a roll, which comprises a stationary shaft and a hollow shell rotatably fitted onto the shaft, and longitudinal sealings and end sealings are arranged between the shaft and the shell for forming a first pressure chamber and a second pressure chamber, and the roll is loadable by conveying a pressure medium into the first pressure chamber and/or into the second pressure chamber for adjusting deflection of the shell, and the amount and the direction of the total load caused to the shell from inside by the pressure medium is defined by the difference of the loads caused by the pressure in the first pressure chamber and the pressure in the second pressure chamber,
and the pressure medium is steam, and the roll is heatable by conveying that steam into at least one of said pressure chambers. Preferably, the steam is superheated steam.

According to a second aspect of the invention there is provided an apparatus, which comprises a deflection compensated roll according to any aspect or embodiment of the invention.

The shaft of the roll may be hollow, preferably a tube shaft.

The thickness of the shell of the roll may be 15 to 50 mm, preferably 30 mm.

Preferably, at least one longitudinal sealing comprises a bypass arrangement for the steam.

The apparatus may comprise an endless metal belt, against which there is arranged the deflection adjustable shell of the roll for compensating tension differences in the width direction of the metal belt.

Preferably, in the apparatus the shell of the roll is arranged against the metal belt or a fiber web for leading heat to the metal belt and/or to the fiber web.

The apparatus may comprise an endless metal belt and at least one deflection compensated roll as a belt guide roll, which may be heatable.

The apparatus may belong to a drying section of a fiber web machine, in which drying section at least one drying cylinder may be replaced with at least one roll, respectively, and the diameter of the roll may be substantially smaller than the diameter of the drying cylinder.

According to a third aspect of the invention there is provided a press section of a fiber web machine, which comprises a roll or an apparatus according to any aspect or embodiment of the invention.
According to a fourth aspect of the invention there is provided a drying section of a fiber web machine, which comprises a roll or an apparatus according to any aspect or embodiment of the invention.

According to a fifth aspect of the invention there is provided a method for using a roll, which roll comprises a stationary shaft and a hollow shell rotatably fitted onto the shaft, and longitudinal sealings and end sealings are arranged between the shaft and the shell for forming a first pressure chamber and a second pressure chamber, the method comprising loading the roll by conveying a pressure medium into the first pressure chamber and/or into the second pressure chamber for adjusting deflection of the shell, and the method comprising determining the amount and the direction of the total load caused to the shell from inside by the pressure medium by the difference of the loads caused by the pressure in the first pressure chamber and the pressure in the second pressure chamber, and conveying steam as the pressure medium into at least one of said pressure chambers, and heating the roll with the steam.

Preferably, in the method the shell of the roll is arranged against an endless metal belt for guiding the metal belt and the deflection of the shell of the roll is adjusted for compensating tension differences of the endless metal belt in the width direction.

A pressure difference of 8 bar may be arranged between the first and the second pressure chamber of the roll, whereby a linear load of 350 kN/m may be reached with the roll. A pressure difference of 2 bar may be arranged between the first and the second pressure chamber of the roll, whereby a linear load of 100 kN/m may be reached with the roll.

The roll and/or the apparatus may be used in different sections of fiber web machines such as a paper machine, a board machine and a pulp machine. The roll and/or the apparatus may be used in deflection compensation solutions. The roll may be used especially with a metal belt. The roll suits well for a deflection
compensation solution used with a metal belt, in order to be able to compensate especially tension and speed differences between the edge and the middle point of the wide metal belt, caused for example by deflections of rolls, and to be able to guide the metal belt in a suitable way. Additionally, a good and economic heat transmission to the metal belt or to the fiber web may be obtained with the roll. The roll may be manufactured more cost efficiently than a periphery drilled roll. The roll and/or the apparatus may be used in a press section and in a drying section and preferably in calenders with a low heat demand. The roll may be used instead of a drying cylinder, too. With the deflection compensation the diameter of the shell of the roll may be substantially smaller than the diameters of current drying cylinders. In some cases the roll may be used with higher speeds than current deflection compensated rolls. In that case a speed limitation caused by a deflection compensated roll does not occur in the process of manufacture of fiber web. Other advantages will come up in the following description and claims.

Different embodiments of the present invention will be illustrated or have been illustrated only in connection with one or some aspects of the invention. A person skilled in the art appreciates that any embodiment of an aspect of the invention may be applied in the same aspect of the invention and in other aspects alone or as a combination with other embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described, by way of example, with reference to the accompanying schematical drawings, in which:

Fig. 1 shows a deflection compensated roll, which may be heated with steam;
Fig. 2 shows a cross section A-A of a Fig. 1 type roll in an end region of the roll;
Fig. 3 shows a Fig. 1 type roll, which is located on the outside of a metal belt circulation as a deflection compensated roll;
Figs. 4 - 7 show some cross sections B-B of a Fig. 1 type roll in the middle region of the roll; and
Figs. 8 and 9 show a Fig. 1 type roll as a belt guide roll of the metal belt
circulation.

DETAILED DESCRIPTION

In the following description, like numbers denote like elements. It should be appreciated that the illustrated drawings are not entirely in scale, and that the drawings mainly serve the purpose of illustrating embodiments of the invention.

Fig. 1 shows a partial side cross section of a swimming deflection adjustable roll 1 comprising a stationary shaft 2 and a rotatable shell 3. The shaft 2 is supported at its ends 2.1 to a structure outside the roll 1 in a way allowing bending 5 the shaft 2 and the shell 3. The shell 3 is arranged at its shell ends 3.1 on end bearings 4, which are fitted on shaft ends 2.1. The shell 3 comprises a shell surface 3.2, which may be adjusted to a desired curvature. A deflection compensation motion 3' of the roll 1 may be transferred via shell surface 3.2 to another handling member of the fiber web such as a nip roll 12 or a metal belt 11. The shell 3 bends under the load caused by a roll, a belt or fiber web, for example, but an inner surface 3.3 of the shell is not in contact with an outer surface of the shaft 2.2 due to the distance between said inner and outer surfaces.

The deflection compensated roll 1 may be loaded and heated with superheated steam. Using the roll 1 allows increasing of rotating speed of the heatable swimming roll, as the inner friction of the heating and pressure medium when steam is used does not increase substantially when the rotating speed increases. The roll 1 is competitive with its energy consumption compared to liquid loadable, heatable swimming rolls.

The shaft 2 and the shell 3 are sealed to each other with longitudinal sealings 8, such that the longitudinal sealings 8 define a first pressure chamber 6 and a second pressure chamber 7 between the outer surface 2.2 of the shaft 2 and the inner surface 3.3 of the shell 3. End sealings 8 are attached to the shaft 2 preferably with grooves arranged on opposite sides of the shaft 2. The end sealings 8 allow a rotating motion and a bending motion of the shell 3 and keep the pressure
chambers 6, 7 suitably pressure tight. The first 6 and the second 7 pressure chambers are shown hatch lined. The first and/or the second pressure chambers may be divided into partial chambers, which each form a series of chambers (not shown in figures).

The roll 1 comprises end sealings at the end region 3.1 of the shell 3, with which pressure chambers 6 and 7 are sealed so that rotating and deflecting of the shell 3 is allowed. In the example of Fig. 1, the end seal of the first pressure chamber 6 is made at both ends of the shell 3 with first end sealings 9 fitted to face surfaces of the center part of the shaft 2, and the second pressure chamber 7 comprises second end sealings 10 corresponding to the first end sealings 9 of the first pressure chamber 6. The end sealing 9, 10 may comprise seal parts placed in grooves, which seal parts form a uniform end sealing. The end sealings 9 and 10 have a pressure tight fitting to the longitudinal sealings 8. The end sealings 9, 10 surround shaft ends 2.1 attached to the center part of the shaft 2. Seal flanges 11 are attached on the inner side of the bearings 4 of the shell 3, against which the first and the second end sealings 9, 10 have a pressure tight fitting. The seal flange 11 has a center hole, via which the shaft end 2.1 is adapted to run so that changing the distance between the shaft 2 and the shell 3 is allowed.

In some embodiments the longitudinal sealings 8 are intentionally arranged to leak. If for example the roll 1 is not heating critical, then the minimum flow of pressure steam, which is fed into one pressure chamber, to another pressure chamber, may be arranged as a controlled sealing leakage, in other words, as a bypass of the sealing. In that case, at least one longitudinal sealing 8 comprises a bypass arrangement for steam. The sealing leakage may be arranged from the first pressure chamber 6 to the second pressure chamber 7 or from the second pressure chamber 7 to the first pressure chamber 6.

Preferably, leaking of the end sealings 9, 10 is blocked, so that condensing water and steam do not enter oil lubrication of the bearings 4.
Condensing water condensating from steam acts as lubricant of the sealings 8, 9, 10 when rotating the shell 3.

Main types for possible structures of the sealings 8, 9, 10 of the present swimming deflection adjustable roll 1 are frictional (doctoring) strips and filmy sealings. A stationary sealing strip 8 or 9 or 10 optionally fitted to the roll 1 is preferably provided with load to confirm tightness of the sealing. The stationary sealing strip 8 or 9 or 10 optionally fitted to the roll 1 is preferably provided with an adjustment to confirm tightness of the sealing. A stationary protruding sealing strip 8 or 9 or 10 optionally fitted to the roll 1 and supported by the pressure difference may be sufficiently adaptable to confirm the tightness of the sealing, as well as a filmy sealing structure optionally fitted to the roll 1.

Preferably, longitudinal sealings 8 and end sealings 9, 10 comprise water resistant material, in order to keep the properties of the sealings good despite the high temperature and presence of water, and harmful water absorption may be avoided. Absorption of water into the sealings may lead to boiling of water in the sealings and to breakage of the structure of the sealings.

In some embodiments the longitudinal seal between the first pressure chamber 6 and the second pressure chamber 7 may comprise at least one longitudinal sealing 8, for example, two parallel sealings. In some embodiments one longitudinal sealing 8 is arranged between the first pressure chamber 6 and the second pressure chamber 7, which may comprise sealing forms directed in the direction of both pressure chambers 6, 7 towards the inner surface 3.3 of the shell 3, for example sealing lips.

A pressure difference between the first pressure chamber 6 and the second pressure chamber 7 defines a direction, in which the deflection of the shell 3 is adjusted with the pressure of the pressure medium. If the pressure of the steam fed into the first pressure chamber 6 is adjusted sufficiently higher than the steam pressure in the second pressure chamber 7, the distance of the shell 3 from the shaft 2 increases in the center region of the roll 1 or the shell 3 bends upwards.
when the roll 1 is in the position shown in Fig. 1. The difference of pressures in the
pressure chambers 6 and 7 suitably affects a counter force for the friction forces
between the shell 3 and the sealings 8, for the movable mass of the shell 3 and for
possible forces caused in contact with the shell 3 by the roll and/or the fiber web
and/or the belt.

Steam may be fed into the roll 1, for example, through the first shaft end and
removed, for example, through the second shaft end. Means for circulating steam,
which acts as heatable pressure medium, into the roll 1 and out from the roll 1 are
arranged in the roll 1. When feeding the steam into the pressure chambers 6, 7
inside the shell 3 of the roll 1, the steam forms condensing water when transferring
heat to the shell 3. Liquid condensing water may be collected from inner walls 3.3
of the shell 3, from which inner walls the longitudinal sealings 8 scrape the
condensing water. The condensing water may be removed with any known
method from inside the pressure chamber. The condensing water may be, for
example, sucked or blown with pressure outside the roll 1. The condensing water
may be brought outside the roll 1 along the same or another route as steam flows
out of the pressure chamber of the roll.

Preferably, internal pressure in the first pressure chamber 6 and in the second
pressure chamber 7 of the roll 1 is at most 10 bar, which corresponds to a usual
maximum pressure of an industrial air pressure system. Pressure of pressurized
steam may be in some cases replaced with air pressure of an air pressure system,
for example when pressure testing a pressure chamber.

In some cases, a pressure difference between the first pressure chamber 6 and
the second pressure chamber 7 is 8 bar, whereby a linear load of for example 350
kN/m may be reached with the roll 1. In some dimensioning cases a linear load of
100 kN/m may be reached with a pressure difference of 2 bar between the first
pressure chamber 6 and the second pressure chamber 7, which linear load
corresponds to a linear load reached with some soft calenders. The roll 1 may be
applied very advantageously in deflection compensation solutions of a metal belt
circulation. As an example let there be said, that the belt tension of one metal belt calender is approximately 100 kN/m.

Fig. 2 shows the roll 1 from the end direction, especially a cross section A-A of Fig. 1, which shows the longitudinal sealing 9, 10 of the pressure chambers 6 and 7, which longitudinal sealing is located at the end region of the shell 3 of the roll 1. In Fig. 2 it may be seen, that a center section of the shaft 2 between the shaft ends 2.2 may be formed of a tube, the inner surface 2.3 of which defines a hollow space. With a tube structure one may save in material costs of the shaft 2 and the shaft 2 may be formed light. It is also possible to use the hollow inner space 2.3 of a tube 2 in in- and outflow arrangements of steam.

The shell 3 may be formed of steel such as a stainless or corrosion resistant material. The shell 3 may be formed of Duplex-material or Duplex LDX-material.

The shell 3 may be formed very thin, for example, approximately 30 mm thick, so that the shell 3 holds out against a load of a steam pressure and loads of the application such as loads of a nip or a belt circulation. The thickness of a shell of swimming deflection adjustable rolls has traditionally been 50-100 mm, to which it is not desired to be restricted in the invention, but the thickness of the shell 3 may be much smaller, for example 15-50 mm, preferably 30 mm.

Fig. 3 shows a Fig. 1 type deflection compensated and heatable roll 1, which is placed outside a first metal belt apparatus 30. The metal belt apparatus 30 comprises an endless metal belt 11, which is adapted to circulate via belt guide rolls 13, in a simple case outside the belt guide rolls 13. The metal belt 11 may be adapted to run inside and outside the belt guide rolls 13. The deflection compensated roll 1 is arranged to form a thermal treatment nip N1 for a fiber web W, which is brought into the metal belt apparatus 30, onto the surface of the metal belt 11, which runs via the belt guide roll 13, before the deflection compensated roll 1 and which fiber web W leaves the metal belt 11 at the guide roll 13 located after the nip N1. A nip roll 12 shown with a dash-dotted line may be arranged to bring a linear load against the roll 1 at the long nip region N1 inside the metal belt
A curvature of the shell 3 of the deflection compensated roll 1 may be adjusted as desired. By adjusting the curvature of the shell 3 a tension and a speed difference between an edge and a center section of the metal belt may be compensated and the metal belt may be guided in a suitable way. By adjusting the curvature of the shell 3 an irregularity of the linear load caused by deflections of the rolls 1, 12 may be compensated and the deflection line may be adjusted to a desired form. A good and economical heat transfer to the fiber web may be achieved with the roll 1. The roll may be manufactured more cost efficiently than a periphery drilled roll. The roll may be used in a press and a drying section and, preferably in calenders with a low heat demand.

Figs. 4 - 7 show some cross sections B-B of deflection compensated rolls 1 in the center region of the roll 1.

A metal belt 11 is arranged on an outer surface 3.2 of a shell 3 of a roll 1 shown in Fig. 4. The roll 1 and the metal belt 11 form a section of an apparatus 20 for treating a fiber web W. With the roll 1 one may achieve a good and economical heat transfer to the metal belt 11 and/or the fiber web W, which is guided to a treatment nip formed by the shell 3 and the metal belt 11 therebetween. The roll 1 may be manufactured more cost efficiently than a periphery drilled roll for heat transfer applications. The roll 1 may be used in a press and a drying section and preferably in calenders with a low heat demand. The roll 1 may be used instead of a drying cylinder, too. With the deflection compensation a diameter of the shell 3 of the roll 1 may be substantionally smaller than diameters of current drying cylinders. The deflection of drying cylinders is prevented with a large diameter of a drying cylinder. With deflection compensation the shell 3 of the roll 1 may be adjusted into linear form or to a desired curvature. In Fig. 4, a shaft 2 is formed of solid material, for example by molding and machining into the shaft steam flow channels (not shown in figure) and attaching points for sealings 8.

A fiber web W, such as a paper web, is arranged onto an outer surface 3.2 of a
shell 3 of a roll 1 shown in Fig. 5. The roll 1 forms a section of an apparatus 20 for treating fiber web W. With the roll 1 one may achieve good and economical heat transfer to the fiber web W, which is guided to run on the outer surface 3.2 of the rotating shell 3. Additionally, a belt for intensification of heat transfer (not shown in figure) may be placed on the fiber web W, which belt may be a metal belt or a belt of another material. The roll 1 may be manufactured more cost efficiently than a periphery drilled roll for heat transfer applications. The roll 1 may be used in a press and a drying section and preferably in calenders with a low heat demand. The roll 1 may be used instead of a drying cylinder, too. With the deflection compensation a diameter of the shell 3 of the roll 1 may be substantially smaller than diameters of current drying cylinders. The shaft 2 is formed in Fig. 5 in a way corresponding to Fig. 2.

Figs. 6 and 7 illustrate operating directions of a deflection compensated roll 1. In some cases the roll 1 may be also used in angle positions differing from the directions shown in figures, for example under constant load. For example a belt guide roll of a belt circulation 11 may be seen as a constant load on the roll 1. In Fig. 6, a shell 3 of the roll 1 is loaded with a pressure difference between the first pressure chamber 6 and the second pressure chamber 7 in upright direction upwards so that pressure in the first pressure chamber 6 is higher than in the second pressure chamber 7. In Fig. 7, the shell 3 of the roll 1 is loaded with a pressure difference between the first pressure chamber 6 and the second pressure chamber 7 in upright direction downwards so that pressure in the second pressure chamber 7 is higher than in the first pressure chamber 6, when the tension of the metal belt 11 pressing fiber web W against the shell 3 is 100 kN/m.

Fig. 8 shows an application of a Fig. 1 type deflection adjustable and heatable roll 1, in which application rolls 1 are located inside a second metal belt apparatus 31 as belt guide rolls 1. The metal belt apparatus 31 comprises an endless metal belt 11, which is adapted to circulate via belt guide rolls 13 and deflection adjustable and heatable belt guide rolls. The metal belt 11 may be adapted to run in- and outside the said belt guide rolls 13, 1. A suitable number of deflection compensated rolls may be arranged to compensate a tension and a speed
difference between the edge and the center point of the metal belt 11 and to guide and heat the metal belt 11. Deflection compensated rolls 1 may be arranged as every second belt guide roll of the metal belt circulation 11, for example in a way shown in the figure. The metal belt apparatus 31 comprises a nip roll 32, which forms with the metal belt 11 a thermal treatment and/or a press nip N1 for the fiber web W. The fiber web W is brought into the metal belt apparatus 31, onto the surface of the metal belt 11, which runs via the deflection adjustable and heatable belt guide roll 1, before the thermal treatment and/or the press nip N1 and the fiber web W leaves the metal belt 11 at the guide roll 13 located after the nip N1. The deflection adjustable and heatable roll 1, shown with a dash-dotted line, may be arranged against the nip roll 32 at the long nip region N1 inside the metal belt 11.

Fig. 9 shows an application of a Fig. 8 type deflection adjustable and heatable roll 1, in which application rolls 1 are placed inside a third metal belt apparatus 33 as belt guide rolls 1. Deflection compensated rolls 1 are arranged in a metal belt circulation 11 as the deflection compensated and heatable belt guide rolls 1 before a nip roll 32. A nip roll, shown with a dash-dotted line, may be arranged to bring linear load against the nip roll 32 at the long nip region N1 inside the metal belt 11. The nip roll 32 shown in Figs. 8 and 9 may be a thermo roll.

The foregoing description provides non-limiting examples of some embodiments of the invention. It is clear to a person skilled in the art that the invention is not restricted to details presented, but that the invention can be implemented in other equivalent means.

Some of the features of the above-disclosed embodiments may be used to advantage without the use of other features. As such, the foregoing description shall be considered as merely illustrative of the principles of the invention, and not in limitation thereof. Hence, the scope of the invention is only restricted by the appended patent claims.
PATENT CLAIMS

1. A roll (1) comprising a stationary shaft (2) and a hollow shell (3) rotatably fitted onto the shaft, and longitudinal sealings (8) and end sealings (9, 10) are arranged between the shaft and the shell for forming a first pressure chamber (6) and a second pressure chamber (7), and the roll (1) is loadable by conveying a pressure medium into the first pressure chamber (6) and/or into the second pressure chamber (7) for adjusting deflection of the shell (3), characterized in that the amount and the direction of the total load caused to the shell (3) from inside by the pressure medium is defined by the difference of the loads caused by the pressure in the first pressure chamber (6) and the pressure in the second pressure chamber (7), and the pressure medium is steam, and the roll (1) is heatable by conveying that steam into at least one of said pressure chambers (6, 7).

2. A roll according to claim 1, characterized in that the steam is superheated steam.

3. A roll according to claim 1 or 2, characterized in that the shaft (2) is hollow, preferably a tube shaft.

4. A roll according to any of claims 1 to 3, characterized in that the thickness of the shell (3) is 15 to 50 mm, preferably 30 mm.

5. A roll according to any of claims 1 to 4, characterized in that at least one longitudinal sealing (8) comprises a bypass arrangement for steam.

6. An apparatus (20, 30, 31, 33) comprising a deflection compensated roll (1) according to any of claims 1 to 5.

7. An apparatus according to claim 6, characterized in that the apparatus (20, 30, 31, 33) comprises an endless metal belt (11), against which there is arranged the deflection adjustable shell (3) of the roll (1) for compensating tension differences in the width direction of the metal belt (11).
8. An apparatus according to claim 6 or 7, characterized in that in the apparatus (20,30,31,33) the shell (3) of the roll (1) is arranged against the metal belt (11) or a fiber web (W) for leading heat in the metal belt (11) and/or in the fiber web (W).

9. An apparatus according to any of claims 6 to 8, characterized in that the apparatus (31,33) comprises an endless metal belt (11) and at least one deflection compensated roll (1) as a belt guide roll, which is heatable.

10. An apparatus according to any of claims 6 to 9, characterized in that the apparatus (20) belongs to a drying section of a fiber web machine, in which drying section at least one drying cylinder is replaced with at least one roll (1), respectively, and the diameter of the roll (1) is substantially smaller than the diameter of the drying cylinder.

11. A press section of a fiber web machine comprising a roll (1) according to any of claims 1 to 5 or an apparatus (20,30) according to any of claims 5 to 10.

12. A drying section of a fiber web machine comprising a roll (1) according to any of claims 1 to 5 or an apparatus (20,30) according to any of claims 5 to 10.

13. A method for using a roll (1), which roll (1) comprises a stationary shaft (2) and a hollow shell (3) rotatably fitted onto the shaft, and longitudinal sealings (8) and end sealings (9,10) are arranged between the shaft and the shell for forming a first pressure chamber (6) and a second pressure chamber (7), the method comprising loading the roll (1) by conveying a pressure medium into the first pressure chamber (6) and/or into the second pressure chamber (7) for adjusting deflection of the shell (3), characterized by defining the amount and the direction of the total load caused to the shell (3) from inside by the pressure medium by the difference of the loads caused by the pressure in the first pressure chamber (6) and the pressure in the second pressure chamber (7), and conveying steam as the pressure medium into at least one of said pressure chambers (6,7), and by heating the roll (1) with the steam.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. D21G1/02 D21G1/00

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)

D21G

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<td>Y</td>
<td>WO 03/064762 AI (METSO PAPER INC [FI]; LIPPONEN JUHA [FI]; NISSINEIM VILHO [FI]; K0IVUKU) 7 August 2003 (2003-08-07) cited in the application page 21, line 14 - page 22, line 21 figures</td>
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X Further documents are listed in the continuation of Box C. ID See patent family annex.

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Date of the actual completion of the international search

1 December 2010

Date of mailing of the international search report

17/12/2010

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Pregetter, Marco

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