A press belt for a shoe-press device for dewatering or smoothing a fibrous web, in particular a paper, cardboard, or tissue web. The press belt has a fiber-reinforced plastic matrix. On account of the fiber-reinforced plastic matrix containing at least in a partial region at least one polyurethane material and polydimethyl siloxane and silicon dioxide microparticles as additives, resistance to abrasion, the tendency toward developing fissures and toward fissure growth and/or resistance in relation to media present in a paper-making machine can be improved.
PRESS BELT IN A PAPER-MAKING MACHINE

[0001] The invention relates to a press belt for a shoe-press device, having the features of the preamble of claim 1. The invention furthermore relates to a method for manufacturing a plastic matrix for a press belt of a shoe-press device, having the features of the preamble of claim 12.

[0002] Press belts which may be configured, for example, as a closed sleeve of a shoe-press roller or as a transfer belt which is routed as a continuously revolving belt between the fibrous web and the sleeve of the counter roller, are exposed to high mechanical, thermal and also chemical stresses. Press belts of this type typically are composed of a polyurethane matrix which is fiber-reinforced. The polyurethane matrix here may be configured so as to be single-layered or multilayered, such that the press belt may display a plurality of plies or layers, respectively. The outer surface of the respective press belt may be provided with a structure, such as grooves, blind holes, or similar, in order for dewatering in the press to be optimized. On account of the high mechanical stresses, fissures may develop in the press belts, wherein further growth of the fissures may arise, likewise on account of the high mechanical stress. This occurrence of fissure growth may increasingly arise also in press belts having grooves or blind holes. On account of fissure growth, structural and/or functional failure of the press belt may be incurred. Moreover, the press belts are also exposed to enormous mechanical-cum-dynamic stresses, such that the press belts additionally are subjected to high abrasion. Moreover, on account of the various media present in the paper-making machine, the press belts are exposed to intense chemical stresses in the paper-making machine. In this way, the press belts may be in contact with, for example, water, oil, acids, bases, solvents, or similar, and are at least partially corroded by these media.

[0003] For example, a press sleeve is thus disclosed in DE19702138A1, the hardness and resistance to wear of said press sleeve having been increased by additives from rock flour, ceramic, or carbon. It is proposed in DE4411620A1 to provide only an outer layer of the press sleeve with additives which increase resistance to wear.

[0004] US2005287373 and US20060118261 disclose press belts which display polydimethyl siloxane. The paper-making machine belts of WO2005090429 and of US2008081179 display nanoparticles, in order to improve resilience in relation to fissure growth, hardness or resilience to abrasion, for example. Paper-making machine belts which display silicon dioxide microparticles are described in EP2330249.

[0005] Despite the embodiments which already exist, there is ongoing demand for press belts for a shoe-press device, having improved resilience in relation to mechanical, thermal, and chemical stress.

[0006] The present invention focuses on the object of providing for a press belt of a shoe-press device, and for a method for manufacturing a plastic matrix for a press belt of this type, an improved or at least an alternative embodiment which is distinguished, in particular, by higher resilience to abrasion, a tendency toward fissure formation and toward fissure growth which is lower or at least not worse, and/or by a lower sensitivity in relation to media which are present in a paper-making machine.

[0007] According to the invention, this object is achieved by the subject matter of the independent claims. Advantageous embodiments are the subject matter of the dependent claims.

[0008] In one aspect of the invention, a press belt for a shoe-press device for dewatering or smoothing a fibrous web, in particular a paper, cardboard, or tissue web, is proposed, in which the press belt displays a fiber-reinforced plastic matrix. The fiber-reinforced plastic matrix here may at least in a part-region display a polyurethane material, and polydimethyl siloxane and silicon dioxide microparticles as additives.

[0009] Advantageously, chemical resistance in relation to the media present in the paper-making machine can be increased on account of the combination of the additives polydimethyl siloxane and silicon microparticles. Moreover, on account of the listed additives, resilience to abrasion can be improved, and the tendency toward fissure formation and toward fissure growth can be held low. Advantageously, by way of adding the combination of additives, the swelling behavior of the press belt is not or only slightly modified.

[0010] In comparison with employing polydimethyl siloxane alone, the combination of additives leads to improved resilience to abrasion and to increased chemical resistance. In contrast, employing silicon dioxide microparticles alone leads to worsened dispersibility of the reactant of the plastic matrix and, on account thereof, optionally to an increased tendency toward fissure formation in the finished press belt. Moreover, it was determinable that press belts having only silicon dioxide microparticles as an additive displayed significantly worsened resilience to abrasion.

[0011] It may thus be established that a balanced stress profile can be created only by way of the combination of additives, such that both resilience to chemicals and the tendency toward fissure formation and toward fissure growth, and resilience to abrasion, are improved in a mutually balanced ratio, without any deterioration of one of these properties or in the further required properties, such as the swelling behavior, for example, occurring.

[0012] A press belt is to be understood a belt or a sleeve which, together with a fibrous web, is routed through a shoe-press nip which is formed between a static press element, the so-called press shoe, and a cylindrical counter roller. The press shoe is supported on a fixed yoke and is hydraulically pressed against the counter roller. In addition to the fibrous web and the press belt, one or a plurality of continuously revolving felts and/or further continuously revolving press belts may be routed through the press nip.

[0013] The press belt may be implemented as a press sleeve of the shoe-press roller, i.e. as a closed sleeve said press belt is held by two lateral tension disks and rotates about the fixed press shoe. In order to reduce the friction of the press belt on the press shoe, oil for lubricating is applied to the inner side of the press belt. Instead of being guided by the two lateral tension disks, the press belt may be routed over the press shoe and a plurality of guide rollers, as is the case in open shoe presses. The surface of press sleeves may be provided with grooves and/or blind holes.

[0014] The press belt may also be implemented as a transfer belt which, in order to convey the fibrous web through the shoe-press nip, is routed as a continuously revolving belt between the fibrous web and the sleeve of the counter roller. After the shoe-press nip, the fibrous web is then taken off the press belt with the aid of a suction roller, transferred to another clothing, and supplied to the downstream machine.
group. It is thus advantageous for the surface of the transfer belt to have adequate adhesion in relation to the fibrous web in order to reliably guide the latter, and for the surface of the transfer belt to have good smoothness and a low tendency toward marking. On the other hand, it is likewise advantageous for the fibrous web to be capable of being easily taken off again.

[0015] A fiber-reinforced plastic matrix is to be understood as a plastic matrix in which one-, two-, or three-dimensional fiber structures are embedded. The term one-dimensional fiber structure here comprises fibers, endless fibers, yarns, fiber bundles, fiber strands, filaments, filament bundles, rovings, or hybrid forms. The term two-dimensional fiber structure comprises woven fabrics, knitted fabrics, warp-knitted fabrics, non-woven fabrics, cross-laid structures, unidirectionally deposited fiber layers, multiaxial cross-laid structures, mats, knitted goods, woven spacer fabrics, braided hoses, emboideries, sewn goods, peel plies, or hybrid forms. The term three-dimensional fiber structure is to be understood as being substantially a plurality of two-dimensional fiber structures which are layered so as to be on top of one another. The two-dimensional fiber structures here may be configured in different manners. In this way it is conceivable, for example, that a unidirectional fiber layer is followed by another non-woven fabric as the next layer, while a woven fabric may complete the three-dimensional fiber structure. However, unidirectional two-dimensional fiber structures may also be exclusively used for constructing a three-dimensional fiber structure. The unidirectional two-dimensional fiber structures here may be identically oriented or be variably oriented with respect to their direction. In the event of the latter, a multiaxial cross-laid structure is present.

[0016] Materials which may be employed for fiber structures are glass fibers, carbon fibers, plastic fibers, aramid fibers, PBO fibers, polyethylene fibers, polyester fibers, polyamide fibers, natural fibers, basalt fibers, quartz fibers, aluminum oxide fibers, silicon carbide fibers, or hybrid forms.

[0017] Additives are to be understood as materials which are added to the plastic matrix in order to modify the properties of the latter in the desired way and manner. In this way, additives are added to the plastic matrix in order to, for example, influence a targeted manner resilience to abraision, a low tendency toward fissure formation, a low fissure growth, high resilience in relation to media present in the paper-making machine, such as, for example, water, oil, acids, bases, solvents, or similar, desired surface properties, such as, for example the adhesive capability in relation to a fibrous web, hardness, or similar. Here, likewise properties which are achieved by way of the fiber reinforcement may be influenced by the additives. In this way, for example, pigments, microfibers, such as, for example, carbon fibers, glass fibers, or similar, powdered glass, carbon black, clay, montmorillonite, soapstone, Hectorite, Mica, vermiculite, bentonite, nontronite, beidellite, volkonskoite, manadellite, kenyaite, smectite, bederite, silicon carbide, silicon acid salt, metal oxides, or arbitrary mixtures of the aforementioned compounds can be used as further additives.

[0018] A fibrous web is to be understood as a cross-laid structure or a random structure of fibers, respectively, comprising wood fibers, plastic fibers, glass fibers, carbon fibers, additives, auxiliaries, or similar. In this way, the fibrous web may be configured as a paper, cardboard, or tissue web, for example, which is substantially composed of wood fibers, with small amounts of other fibers or also additives and auxiliaries being present.

[0019] Furthermore, at least one further part-region of the fiber-reinforced plastic matrix may be configured as foam. On account of configuring a further part-region of the fiber-reinforced plastic matrix as foam, higher elasticity and softness of the press belt may advantageously be established. On account of the press belt displaying less hardness, the compressive force may be adjusted in a more exact manner. Moreover, in the case of unevenness in the fibrous web or other components of the paper-making machine, the compressive force fluctuates less intensely. Foam here is to be understood as bubbles which are separated by walls. If the foam has open pores, the walls are at least in part breached, while in a closed foam the individual bubbles are closed off by the walls.

[0020] The part-region which displays at least polyurethane, and polydimethylsiloxane and silicon dioxide microparticles as additives, or the further part-region which is configured as foam, may comprise a layer of the press belt, a surface layer of the press belt, a peripheral region of the press belt, or an inner layer of the press belt, for example.

[0021] If the part-region comprises a surface layer of the press belt, the press belt may thus be equipped with the desired surface property but, on account of layers of the press belt which lie on the inside and which are configured in various manners, may be equipped with further advantageous properties. By way of a surface layer which is designed in such a manner, abrasion resistance, an advantageous fissure behavior, and high resilience in relation to the media present in the paper-making machine may be achieved, for example, while sufficiently high elasticity and tear strength can be established by way of inner layers. In an analogous manner, this also applies to the peripheral regions of the press belt. An inner layer, for example configured from a foam, may positively influence elastic behavior and softness of the press belt, without the demanded high resilience of the surface of the press belt deteriorating.

[0022] A layer or a ply, respectively, of the press belt here is understood to be a region which is delimitable in the direction of thickness in relation to other layers or plies. Delimiting may be performed, for example, by the fiber reinforcement, by the construction of the plastic matrix, by the additive proportions and/or by mechanical properties.

[0023] Furthermore, the employed polydimethylsiloxane may display a viscosity of 100 to 100,000 mPas. Polydimethylsiloxane having a viscosity of 500 to 50,000 mPas, optionally of 1000 to 10,000 mPas, in particular of 1500 to 5000 mPas, and of 2000 to 3000 mPas, for example, may also be employed. This relates to a temperature of 25°C.

[0024] On account of employing polydimethylsiloxane having a viscosity of this type a reduction of the surface interferences in the press belt may advantageously be performed. Moreover, dispersibility of the reactants of the plastic matrix may be improved on account of a viscosity of the polydimethylsiloxane of this type.

[0025] The at least one part-region furthermore may display 0.1 to 10% by weight polydimethylsiloxane. It is also conceivable that the at least one part-region displays 0.1 to 8% by weight, in particular 0.1 to 5% by weight, optionally 0.1 to 3% by weight, and 0.2 to 1.5% by weight polydimethylsiloxane, for example.
On account of a proportion of polydimethyl siloxane of this type the aforementioned advantages may be advantageously achieved.

Furthermore, the silicon dioxide microparticles may display a mean particle size of 2 to 800 µm. It is also conceivable for the silicon dioxide microparticles which display a mean particle size of 5 to 500 µm, in particular of 5 to 50 µm, for example of 10 to 30 µm, and optionally of 10 to 20 µm, to be employed.

On account of a proportion of silicon dioxide microparticles of this type, dispersibility of the reactants of the plastic matrix may be advantageously improved.

Furthermore, the at least one part-region may display 0.01 to 10% by weight silicon dioxide microparticles. It is also conceivable for the at least one part-region to display 0.01 to 5% by weight, in particular 0.05 to 3% by weight, optionally 0.05 to 5% by weight, and for example 0.05 to 2% by weight silicon dioxide microparticles.

On account of a proportion of silicon dioxide microparticles of this type, the aforementioned advantages may be advantageously achieved.

Furthermore, silicon dioxide nanoparticles having a mean particle size of 10 to 80 nm may be employed in the at least one part-region. It is also conceivable for silicon dioxide nanoparticles which have a mean particle size of 12 to 60 nm, in particular of 14 to 40 nm, for example of 16 to 30 nm, and optionally of 18 to 25 nm, to be employed.

On account of employing silicon dioxide nanoparticles, the tendency toward fissure formation may be advantageously reduced. Possibly, the tendency toward fissure growth likewise may be reduced. Employing silicon dioxide nanoparticles alone does in turn improve the tendency toward fissure formation, but leads to a deterioration in the resilience to abrasion. By combining the additives, resilience to abrasion of the at least one part-region is increased.

By means of a proportion of silicon dioxide nanoparticles of this type in the at least one part-region, the aforementioned advantages may be achieved.

Furthermore, the at least one polyurethane material may be manufactured from a polyurethane polymer and a cross-linking agent. The polyurethane polymer here may be configured as an MDI prepolymer and/or as a PPDI prepolymer having polyether and/or polycarbonates and polyca-proteins as a polyol component. On account of a configuration of the polyurethane component of the plastic matrix of this type, the desired durability and resilience in relation to the wear of the press belt may be advantageously established. Moreover, a plastic matrix of this type is distinguished by high resilience in relation to media present in the paper-making machine.

Furthermore, the cross-linking agent may contain at least one polyester polyol. It is also conceivable for linear polyether polyol, and also linear polypropylene etherpolyol, for example, to be employed.

On account of cross-linking agents of this type, the properties of the plastic matrix with respect to elasticity, hardness, and resilience to media present in the paper-making machine may be advantageously influenced.

In a further aspect of the invention, a method for manufacturing a plastic matrix for a press belt of a shoe-press device for dewatering or smoothing a fibrous web, in particular a paper, cardboard, or tissue web as described above, is proposed. Here, the plastic matrix is manufactured from at least one polyurethane prepolymer, at least one cross-linking agent, polydimethyl siloxane, and silicon dioxide microparticles.

On account of a method of this type, press belts which display the abovementioned advantages may be advantageously manufactured.

Furthermore, prior to cross-linking of the at least one polyurethane prepolymer, silicon dioxide nanoparticles having at least part of the cross-linking agent are mixed to form a nanoparticles mixture which contains 20 to 60% by weight silicon dioxide nanoparticles. It is also conceivable for the nanoparticles mixture to contain 25 to 55% by weight, for example 30 to 50% by weight, in particular 35 to 45% by weight, and optionally 38 to 42% by weight silicon dioxide nanoparticles.

On account of process management of this type good dispersibility may be advantageously achieved. If silicon dioxide nanoparticles which have been created by a sol-gel process, wherein the OH groups on the surface of the particles may be blocked by means of silanization, are employed, dispersibility of the reactants of the plastic matrix may be further improved.

Furthermore, the nanoparticles mixture in the downstream method steps may replace the cross-linking agent entirely or by 5 to 40%. Furthermore, it is also conceivable for the nanoparticles mixture to replace the cross-linking agent by 6 to 35%, in particular by 7 to 30%, for example by 9 to 30%, and optionally by 10 to 25%.

On account of process management of this type, dispersibility of the reactants of the plastic matrix likewise may be further enhanced. Furthermore, better mixing of the individual reactants of the plastic matrix is also possible on account thereof.

Furthermore, prior to cross-linking of the at least one polyurethane prepolymer, the silicon dioxide microparticles can be mixed with the polydimethyl siloxane and, if applicable, with further additives, to form an additive mixture. The latter may subsequently be mixed with at least part of the cross-linking agent. It is conceivable here for silicon dioxide nanoparticles to have already been previously mixed into the cross-linking agent.

On account of process management of this type, a homogeneous mixture of the reactants of the plastic matrix may advantageously be achieved and both dispersibility and the mixing behavior may be improved.

The mean particle size may be determined, for example, by way of laser scattered light methods or by means of dynamic image analysis. By means of dynamic image analysis, particle sizes from 1 µm to 30 mm may be determined. The laser scattered light methods allow an analysis of particle sizes from 0.3 mm to 1 µm. Here, the mean particle size is defined according to the measuring method employed according to the respective size range.

Further important features and advantages of the invention are derived from the dependent claims, from the drawings, and from the associated description of the figures by means of the drawings and the example. Preferred exemplary embodiments of the invention are illustrated in the drawings and are explained in more detail in the following description, wherein identical reference signs relate to identical or similar or functionally identical components.

In the drawings, in each case in a schematic manner:

FIG. 1 shows a view of a shoe press having a press sleeve according to one exemplary embodiment of the present invention, and
FIG. 2 shows a view of a press section of a paper-making machine, comprising a shoe press and a conveyor belt, according to one exemplary embodiment of the present invention.

In FIG. 1 a shoe press 10 which comprises a shoe roller 12 and a counter roller 14 is illustrated. While the counter roller 14 is composed of a rotating roller which is designed in a cylindrical manner, the shoe roller 12 is assembled from a shoe 16, a static yoke 18 carrying said shoe 16, and a press sleeve 20. The shoe 16 here is supported by the yoke 18 and by way of hydraulic press elements (not illustrated) pressed onto the press sleeve 20 revolving around said shoe 16. On account of the concave design of the shoe 16 on that side which is opposite the counter roller 14, a comparatively long press nip 22 results. The shoe press 10 is particularly suitable for dewatering fibrous webs 24. During operation of the shoe press a fibrous web 24 having one or two press films 26, 26' is routed through the press nip 22, wherein the fluid which, on account of the pressure exerted in the press nip 22 on the fibrous web 24, leaks from the fibrous web 24 and which, apart from water, contains dissolved and undisolved compounds, such as, for example, fibers, fiber fragments, additives and/or auxiliaries, is temporarily removed by the press felt or felts 26, 26', respectively, and by depressions (not illustrated) which are provided in the press sleeve surface. After leaving the press nip 22 the fluid which has been received by the press sleeve 20 is thrown off from the press sleeve 20, before the press sleeve 20 again enters into the press nip 22. Moreover, water received by the press felt 26, 26' is removed by way of suction elements, after having left the press nip 22.

On account of the comparatively long press nip 22, which is due to the concave design of the shoe 16 on that side which is opposite the counter roller 14, considerably better dewatering of the fibrous web 24 is achieved by such a shoe press as compared with a press composed of two rotating rollers, such that subsequent thermal drying may be correspondingly curtailed. In this way, particularly gentle dewatering of the fibrous web 24 is achieved.

In FIG. 2 a detail of a press section of a paper-making machine 30 which comprises a shoe press 10 is shown. As is also the case in the embodiment illustrated in FIG. 1, the shoe press 10 here comprises a shoe roller 12 which comprises a press sleeve 20 and a press element or shoe 16, respectively, and a counter roller 14, wherein a press nip is configured between the shoe 16 and the counter roller 14. Moreover, this part of the paper-making machine comprises two suction rollers 28, 28' and two deflection rollers 30, 30'. During operation of the paper-making machine a felt 26, which is guided by the suction rollers 28, 28' and which receives the fibrous web 24 on the suction roller 28, is routed through the press nip. Moreover, a route conveyor belt or transfer belt 32, respectively, is routed through the press nip by the deflection rollers 30, 30' below the felt 26 which guides the fibrous web 24, wherein the transfer belt 32 in the press nip takes over the fibrous web 24 from the felt 26 and conveys away said fibrous web 24 from the press nip via the deflection roller 30'. On account of the pressure exerted on the fibrous web 24 in the press nip, fluid leaks from the fibrous web 24, which fluid apart from water contains dissolved and undisolved compounds, for example fibers, fiber fragments, additives and/or auxiliaries, and is temporarily removed by the felt 26 and by depressions which are provided in the press sleeve surface. After having left the press nip, the fluid which has been received by the press sleeve is thrown off by the press sleeve 20, before the press sleeve 20 again enters into the press nip. Moreover, water which has been received by the felt 26 is removed after leaving the press nip by suction elements which are provided on the suction roller 28'. On account of the comparatively long press nip due to the concave design of the shoe 16, significantly better dewatering of the fibrous web 24 is achieved by such a shoe press as compared with a press composed of two rotating rollers, such that subsequent thermal drying can be correspondingly curtailed. In this way, particularly gentle dewatering of the fibrous web 24 is achieved.

EXAMPLE

<table>
<thead>
<tr>
<th>Mixture</th>
<th>O</th>
<th>HV</th>
<th>AV</th>
<th>AN</th>
<th>VAV</th>
<th>VAN</th>
<th>RB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% by weight polydimethylsiloxane</td>
<td>smooth</td>
<td>93.0</td>
<td>29</td>
<td>26</td>
<td>26</td>
<td>47</td>
<td>0.40</td>
</tr>
<tr>
<td>SiO2 microparticles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparative plate without additives</td>
<td>92.3</td>
<td>39</td>
<td>49</td>
<td></td>
<td></td>
<td>0.35</td>
<td></td>
</tr>
</tbody>
</table>

Caption:
HV hardness prior to water storage [ShA]
AV abrasion prior to water storage [mm]
AN abrasion post water storage 150 h at 95°C [mm]
VAV improvement of resilience to abrasion prior to water storage [%]
VAN improvement of resilience to abrasion post water storage [%]
RB mean value of flexural fatigue [mm]

In comparison with a comparative plate without additives, resilience to abrasion is significantly improved, in particular post water storage, on account of adding polydimethylsiloxane—silicon dioxide microparticles. The tendency toward fissure formation here is substantially unchanged. Thus, by way of adding polydimethylsiloxane—silicon dioxide microparticles, resilience to abrasion can be improved while the tendency toward fissure growth remains almost unchanged.

Manufacturing of the Specimens:

MDI-polyether-prepolymer having an NCO content of approx. 6% is employed. MCDEA and PFTHF200 are used as a cross-linking agent, and cross-linking is performed at a temperature of 90°C.

The prepolymer, the MCDEA and the PFTHF200 are separately degassed, using a vacuum evaporator. Polydimethylsiloxane-SiO2 microparticles are added to the cross-linking agent. Then all components are mixed in a vortex mixer. The mixture is poured into steel molds and tempered.

Determination of Resilience to Abrasion:

Resilience to abrasion determination was performed according to DIN 5316 and ISO 4649. To this end, a specimen piece having a diameter of 16 mm was impinged with a testing force of 10 N. The grinding length was 40 m at an angular speed of 40 revolutions per min.

Determination of the Mean Value of Fissure Growth:

Fissure growth determination is performed in a flexural fatigue machine. To this end, the specimen is flexed 1,000,000 times at a frequency of 7.5 Hz, at an angle of +/−40°. A section in the specimen displays a width of 6 mm and a depth of 2.5 mm. 1-15. (canceled)

A press belt for a shoe-press device for dewatering or smoothing a fibrous web, the press belt comprising: a fiber-reinforced plastic matrix forming the press belt, said fiber-reinforced plastic matrix, at least in a part-region
thereof, containing at least one polyurethane material and additives of polydimethyl siloxane and silicon dioxide microparticles.

17. The press belt according to claim 16, wherein at least one further part-region of said fiber-reinforced plastic matrix is configured as foam.

18. The press belt according to claim 16, wherein at least one part-region is selected from the group consisting of a layer of the press belt, a surface layer of the press belt, a peripheral region of the press belt, and an inner layer of the press belt.

19. The press belt according to claim 16, wherein said polydimethyl siloxane has a viscosity of between 100 and 100,000 mPa*s.

20. The press belt according to claim 16, wherein said at least one part-region contains a proportion of said polydimethyl siloxane of 1 to 10% by weight.

21. The press belt according to claim 16, wherein said silicon dioxide microparticles have a mean particle size of between 10 and 800 µm.

22. The press belt according to claim 16, wherein said at least one part-region contains a proportion of said silicon dioxide microparticles of 1 to 10% by weight.

23. The press belt according to claim 16, wherein said at least one part-region contains silicon dioxide nanoparticles having a mean particle size of between 10 and 80 nm.

24. The press belt according to claim 23, wherein said at least one part-region contains a proportion of said silicon dioxide nanoparticles of 1 to 10% by weight.

25. The press belt according to claim 16, wherein said at least one polyurethane material is made from at least from a polyurethane prepolymer and a cross-linking agent, and said polyurethane prepolymer is an MDI prepolymer and/or a PPDI prepolymer having a polyol component selected from the group consisting of polyether and polycarbonates.

26. The press belt according to claim 25, wherein said cross-linking agent contains at least one polyether polyol material or is composed thereof.

27. The press belt according to claim 16, configured for processing paper web, cardboard web, or tissue web.

28. A method of manufacturing a plastic matrix for a press belt, the method comprising forming the plastic matrix from at least one polyurethane prepolymer, at least one cross-linking agent, polydimethyl siloxane, and silicon dioxide microparticles.

29. The method according to claim 28, which comprises, prior to cross-linking the at least one polyurethane prepolymer, mixing silicon dioxide nanoparticles containing at least part of the cross-linking agent to form a nanoparticle mixture containing between 20% and 60% by weight of silicon dioxide nanoparticles.

30. The method according to claim 28, which comprises, in downstream method steps, replacing the cross-linking agent with the nanoparticles mixture entirely or by 5 to 40%.

31. The method according to claim 28, which comprises, prior to cross-linking the at least one polyurethane prepolymer, mixing the silicon dioxide microparticles with the polydimethyl siloxane and, optionally, with further additives, to form an additive mixture that is subsequently mixed with at least part of the cross-linking agent.

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