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(54) BELT FOR A SET OF BELT DRUMS IN A TWO-DRUM WINDER, AND A TWO DRUM WINDER

GURT FÜR EINEN BANDTROMMELSATZ IN EINEM ZWEITROMMELWICKLER UND DOPPELTROMMELWICKLER

CEINTURE POUR UN JEU DE TAMBOURS DE CEINTURE DANS UN ENROULEUR À DEUX TAMBOURS ET ENROULEUR À DEUX TAMBOURS

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Description

[0001] The invention relates to a belt for a set of belt drums in a two-drum winder according to the preamble of claim 1.

[0002] The invention also relates to a two-drum winder according to the preamble of claim 3.

[0003] On slitter-winders, a full-width web is slit in a longitudinal direction into component webs in a slitter section and the component webs are wound into customer rolls in a windup section. In winders, the component webs are wound around cores into fibrous web rolls and longitudinal successive cores are locked in place to form a core line by means of a core chuck placed at both ends. In a slitter-winder, two-drum winders are often used as a winder, in which components webs are wound into component web rolls on support of two supporting drums through a nip between one supporting drum and a fibrous web roll that is being formed. As a supporting drum it is also possible to use a set of belt drums in which a belt loop is placed around two lead rolls. The present invention relates to belts used in sets of belt drums in winders of the two-drum-type, and to two-drum winders in which at least one supporting drum is a set of belt drums.

[0004] As known in the state of the art, the structure of belts in sets of belt drums of two-drum winders is generally formed such that when the belt is new, the distance between a support layer/fabric of the belt and the outer surface of the belt loop, i.e. the surface lying against a fibrous web roll, is great, so that the thus formed outer layer is thick and it is most commonly made of rubber. The support layer usually comprises tension yarns or similar structures, the purpose of which is to carry the tensile stress in the longitudinal direction of the belt, i.e. in the rotating direction of the loop. In the belt used today, the support layer is composed of yarns extending in the direction of the belt, above which yarns and possibly also under which yarns there is a transverse stiffening layer composed of crosswise yarns, the function of this stiffening layer being to stabilize the width of the belt.

[0005] When a fibrous web, for example, a paper or board web is wound into a web roll in sets of belt drums of two-drum winders known from the prior art, the belt of the set of belt drums bends back and forth during the winding process, with the result that the radius of deflection of the belt changes in the area of contact between the belt and the fibrous web roll, so that there occurs slippage between the roll and the outer surface of the belt. The bending causes a stretch in the outer layer of the belt, which stretch is proportional to the distance of the outer surface of the belt from the neutral axis of deflection situated at or close to the support layer of the belt. When the stretch of the surface changes in the portion lying against the fibrous web, slippage occurs between the web and the surface of the belt. This slippage in turn causes wear of the belt surface and, possibly, winding problems. The greater the distance between the surface and the support layer of the belt, the greater are the slippage, wear and belt surface stretch. Great wear may lead to uneven belt thicknesses, which may further cause problems in the winding process. The closest prior art is represented in US 5,875,273A.

[0006] An object of the invention is to provide a belt for sets of belt drums in two-drum winders, and a two-drum winder, in which belt and winder the bending of the belt of the set of belt drums during the winding process does not lead to the above-noted problems and in which the problems of the state-of-the-art belt and two-drum winder are eliminated or at least minimized.

[0007] With a view to achieving the objects described above as well as those coming out later, the belt according to the invention is mainly characterized in what is stated in the characterizing part of claim 1.

[0008] The two-drum winder according to the invention is in turn mainly characterized in what is stated in the characterizing part of claim 3.

[0009] In accordance with the invention, the outer layer of the belt is manufactured of a highly wear-resistant material, preferably of rubber or polyurethane elastomer, and the thickness of the outer layer, i.e. the distance of the outer surface of the belt to the support surface, is small, also when the belt is new, preferably smaller than 3.5 mm. Therefore, the outer layer of the belt in accordance with the invention wears very slowly, thereby allowing a long service life to be achieved in spite of the thinness of the outer layer, which thus forms the wearing surface of the belt. Also, when wear is slow, great thickness differences are not produced in the belt or, on the other hand, between the belts used in the same winder.

[0010] With respect to its structure, the belt in accordance with the invention is most advantageously such that it has a thin support layer that carries most of the longitudinal tension, and an outer layer at least on that side of the belt which is in contact with the roll, which outer layer is composed of an elastic, resilient wear-resistant material, such as rubber, polyurethane elastomer or another elastomer. The above-mentioned outer layer can be incompressible or porous and thus compressible.

[0011] In the belt in accordance with the invention, the support layer mainly carrying the longitudinal tension is preferably thin, so that variations in the radius of deflection do not cause too great stress variations in it. The support layer is formed of a fabric comprising yarns extending substantially in the longitudinal direction of the belt or yarns extending substantially in the longitudinal and cross direction of the belt.

[0012] In the belt in accordance with the invention, the support layer is close to the outer surface of the belt that is in contact with the roll, so that the stretch of the outer layer changes less when the belt is bending than if the distance between the support layer and the outer surface were larger. In the prior art arrangements, the minimum of the above-mentioned distance has been limited, when the belt is new, by the required thickness of the wearing surface and by the thickness of the transverse stiffening layer. Since, on the one hand, a separate layer compris-

ing transverse stiffening above the support layer mainly carrying the tension is not used in the belt in accordance with the invention, and, on the other hand, the outer layer is made of a wear-resistant material, the distance between the surface and the support layer can be reduced, with the result that the change in the stretch of the surface is smaller and the thickness of the wearing surface required by the service life of the belt is smaller.

[0013] In the belt in accordance with the invention, transverse stiffening is provided such that the support layer comprises substantially crosswise yarns and/or a transverse stiffening layer is only under the support layer (in an inner layer of the belt).

[0014] The belt in accordance with the invention provides many benefits. The rate of change of the thickness of the belt is lower during the period of use and the thickness differences between the belts arising from uneven wear are smaller. The fatigue durability of the wearing surface is better because of smaller stretch changes when the belt bends.

[0015] With respect to its structure, the belt in accordance with the invention can be continuous, i.e. endless, or it may include a splice which is used for forming the belt into a loop, and which splice does not cause disturbances in the process, for example, marking of the wound paper. The belt can be a full-width continuous belt or a set of belts composed of several belts.

[0016] In the following, the invention will be described in more detail with reference to the figures of the appended drawing, to the details of which the invention is, however, by no means meant to be narrowly limited.

Figure 1 is a schematic view of a prior-art two-drum winder, in which a set of belt drums is used as a front supporting drum.

Figure 2A schematically shows the effect of the bending of a belt in a set of belt drums on the length of the belt element in a prior-art belt.

Figure 2B schematically shows the effect of the bending of a belt in a set of belt drums on the length of the belt element in a belt in accordance with the invention.

Figure 3 is a schematic cross-sectional view of a belt in accordance with the invention, when viewed in the longitudinal direction of a belt loop.

[0017] In the following figures, the same reference signs are used of parts that correspond to one another, and the parts according to the prior art are denoted with an apostrophe.

[0018] As shown in Fig. 1, as known in itself from the prior art, a two-drum winder comprises supporting drums 11', 15', a rear supporting drum 11' and a front supporting drum 15', of which in the application illustrated in the figure the front supporting drum 15' is formed of a set of belt drums comprising two lead rolls 12', 13' and a belt loop 20' arranged around them. On the two-drum winder, a fibrous web roll, such as a paper or board roll, is wound on support of the rear supporting drum 11' and the set of belt drums 15'.

[0019] As shown in Fig. 2A, when the belt 20' bends while winding the fibrous web, the length of a belt element a' in an outer layer 22' of the belt 20' changes as a result of the bending occurring during the winding process in the area of contact of the belt 20' and a fibrous web roll 10', so that there occurs slippage between the roll 10' and the outer surface 22' of the belt 20', causing wear of the surface 23' of the outer layer 22' of the belt 20'. Slippage, wear and the stretch of the surface of the belt are great because the distance between the outer surface 23' of the belt 20' and a support layer 21' is great, i.e. the thickness of the outer layer 22' is great.

[0020] As shown in Fig. 2B, in a belt 20 in accordance with the invention, the length of a belt element b in an outer layer 22 of the belt 20 is substantially unchanged and independent of the bending of the belt 20, whereby it has been possible to minimize wear, slippage and the stretch of the outer layer 22 of the belt 20 because the thickness of the outer layer 22 of the belt 20 is small.

[0021] As shown in Fig. 3, the belt 20 comprises an outer layer 22, a support layer 21, and an inner layer 25. The support layer 21 comprises a structure that mainly carries the longitudinal tension of the belt 20. The outer layer 22 is a layer between the support layer 21 and an outer surface 23 of the belt 20 placed against the fibrous web roll 10 building up, and the inner layer 25 is, in a corresponding manner, a layer between the support layer 21 and an inner surface 24 of the belt 20 placed against lead rolls 12, 13 in a set of drums 15. In accordance with the invention, the outer layer is as thin as possible, preferably less than 3.5 mm, i.e. the ratio of the distance L22 of the centre axis of the support layer 21 from the outer surface 23 of the belt 20 to the thickness L20 of the belt 20 is 0.25 ... 0.50, most appropriately 0.35. The belt is manufactured of a wear-resistant material, preferably of rubber or elastomer. The support layer 21 comprises lengthwise elements, for example, tension yarns, which extend substantially in the rotating direction of the belt loop and carry the longitudinal stress/tension of the belt 20. The support layer 21 can also be formed, for example, into a netlike structure or into a continuous layer - it is essential that it shall form a layer that carries the longitudinal stresses of the belt 20. The transverse stiffness of the belt for stabilizing the width of the belt is provided such that the support layer also comprises substantially crosswise yarns and/or a transverse stiffening layer is only under the support layer in the inner layer of the belt. The inner layer 25 can be manufactured in many different ways in themselves known by a person skilled in the art and to have a structure in itself known by a person skilled in the art.

[0022] Above, the invention has been described only with reference to some of its advantageous applications,

to the details of which the invention is, however, not by any means meant to be narrowly limited.

Claims

1. A belt for a set of belt drums in a two-drum winder, which belt (20) comprises a support layer (21) that maintains the longitudinal tension of the belt (20), an outer layer (22) between the support layer (21) and an outer surface (23) of the belt (20) placed against a fibrous web roll (10) that is being wound on the two-drum winder, and an inner layer (25) between the support layer (21) and a surface placed against lead rolls (12, 13) of the set of belt drums (15) in the two-drum winder the outer layer of the belt (20) being manufactured of a wear-resistant material, such as rubber or elastomer, **characterized in that** the outer layer (22) of the belt (20) is thin, i.e. has a thickness of less than 3.5 mm when the belt is new and unused, and that the transverse stiffness of the belt (20) for stabilizing the width of the belt is provided such that the support layer also comprises substantially crosswise yarns and/or a transverse stiffening layer is only under the support layer in the inner layer of the belt.

2. A belt as claimed in claim 1, **characterized in that** the support layer (21) is formed of a fabric comprising lengthwise and crosswise yarns.

3. A two-drum winder comprising two supporting drums (11, 15), on support of which a fibre web roll (10) to be wound on the two-drum winder is arranged to be wound, of which supporting drums at least one is a set of belt drums (15) comprising two lead rolls (12, 13) and a belt (20) disposed around them, which belt (20) comprises a support layer (21) that maintains the longitudinal tension of the belt (20), an outer layer (22) between the support layer (21) and an outer surface (23) of the belt (20) placed against a fibrous web roll (10) that is being wound on the two-drum winder, and an inner layer (25) between the support layer (21) and a surface placed against the lead rolls (12, 13) of the set of belt drums (15) in the two-drum winder, the outer layer of the belt (20) being manufactured of a wear-resistant material, such as rubber or elastomer, **characterized in that** the outer layer (22) of the belt (20) in the set of belt drums (15) of the two-drum winder is thin, i.e. has a thickness of less than 3.5 mm when the belt is new and unused, and that the transverse stiffness of the belt (20) of the set of belt drums (15) in the two-drum winder for stabilizing the width of the belt is provided such that the support layer also comprises substantially crosswise yarns and/or a transverse stiffening layer is only under the support layer in the inner layer of the belt.

4. A two-drum winder as claimed in claim 3, **characterized in that** the support layer (21) of the belt (20) of the set of belt drums (15) in the two-drum winder is formed of a fabric comprising lengthwise and crosswise yarns.

Patentansprüche

1. Gurt für einen Satz Gurttrommeln in einem Doppeltragwalzenaufwickler, wobei der Gurt (20) eine Stützschicht (21), die die Längsspannung des Gurtes (20) aufrechterhält, eine Außenschicht (22) zwischen der Stützschicht (21) und einer Außenoberfläche (23) des Gurtes (20), die an einer Faserbahnrolle (10) anliegt, die auf dem Doppeltragwalzenaufwickler aufgewickelt wird, und eine Innenschicht (25) zwischen der Stützschicht (21) und einer an den Führungsrollen (12, 13) des Satzes Gurttrommeln (15) in dem Doppeltragwalzenaufwickler anliegenden Oberfläche hat, wobei die Außenschicht des Gurtes (20) aus einem verschleißfesten Material wie Gummi oder Elastomer hergestellt ist, **dadurch gekennzeichnet, dass** die Außenschicht (22) des Gurtes (20) dünn ist, d.h. eine Dicke von weniger als 3,5mm hat, wenn der Gurt neu und ungebraucht ist, und dass die Quersteifigkeit des Gurtes (20) zum Stabilisieren der Breite des Gurtes so bereitgestellt ist, dass die Stützschicht zudem im Wesentlichen querverlaufende Fäden aufweist und/oder dass eine Quersteifungsschicht sich nur unter der Stützschicht in der Innenschicht des Gurtes befindet.

2. Gurt nach Anspruch 1, **dadurch gekennzeichnet, dass** die Stützschicht (21) aus einem Gewebe gebildet ist, das längsverlaufende und querverlaufende Fäden hat.

3. Doppeltragwalzenaufwickler mit zwei Stütztrommeln (11, 15), durch deren Stützwirkung eine auf den Doppeltragwalzenaufwickler aufzuwickelnde Faserbahnrolle (10) aufwickelbar angeordnet ist, wobei von den Stütztrommeln mindestens eine ein Satz Gurttrommeln (15) mit zwei Führungsrollen (12, 13) und einem um sie herum angeordneten Gurt (20) ist, wobei der Gurt (20) eine Stützschicht (21), die die Längsspannung des Gurtes (20) aufrechterhält, eine Außenschicht (22) zwischen der Stützschicht (21) und einer Außenoberfläche (23) des Gurtes (20), die an einer Faserbahnrolle (10) anliegt, die auf dem Doppeltragwalzenaufwickler aufgewickelt wird, und eine Innenschicht (25) zwischen der Stützschicht (21) und einer an den Führungsrollen (12, 13) des Satzes Gurttrommeln (15) in dem Doppeltragwalzenaufwickler anliegenden Oberfläche hat, wobei die Außenschicht des Gurtes (20) aus einem verschleißfesten Material wie Gummi oder Elastomer hergestellt ist, **dadurch gekennzeichnet, dass** die Außenschicht (22) des Gurtes (20) in

dem Satz Gurttrommeln (15) des Doppeltragwalzenaufwicklers dünn ist, d.h. eine Dicke von weniger als 3,5mm hat, wenn der Gurt neu und ungebraucht ist, und dass die Quersteifigkeit des Gurtes (20) des Satzes Gurttrommeln (15) in dem Doppeltragwalzenaufwickler zum Stabilisieren der Breite des Gurtes so bereitgestellt ist, dass die Stützschicht zudem im Wesentlichen querverlaufende Fäden aufweist und/oder dass eine Querversteifungsschicht sich nur unter der Stützschicht in der Innenschicht des Gurtes befindet.

4. Doppeltragwalzenaufwickler nach Anspruch 3, **dadurch gekennzeichnet, dass** die Stützschicht (21) des Gurtes (20) des Satzes Gurttrommeln (15) in dem Doppeltragwalzenaufwickler aus einem Gewebe gebildet ist, das längsverlaufende und querverlaufende Fäden hat.

Revendications

1. Courroie pour un ensemble de tambours à courroie dans une rebobineuse à deux tambours, dont la courroie (20) comprend une couche de support (21) qui maintient la tension longitudinale de la courroie (20), une couche extérieure (22) entre la couche de support (21) et une surface extérieure (23) de la courroie (20) placée contre un rouleau (10) de bande fibreuse qui est enroulé sur la rebobineuse à deux tambours, et une couche intérieure (25) entre la couche de support (21) et une surface placée contre des rouleaux guide (12, 13) de l'ensemble de tambours à courroie (15) dans la rebobineuse à deux tambours, la couche extérieure de la courroie (20) étant fabriquée en un matériau résistant à l'usure, tel que du caoutchouc ou un élastomère, **caractérisée en ce que** la couche extérieure (22) de la courroie (20) est mince, c'est à dire qu'elle présente une épaisseur inférieure à 3,5 mm lorsque la courroie est neuve et non utilisée, et que la rigidité transversale de la courroie (20) permettant de stabiliser la largeur de la courroie est telle que la couche de support comprend également des fils sensiblement transversaux et/ou une couche de raidissement transversale se trouve uniquement sous la couche de support dans la couche intérieure de la courroie.

2. Courroie telle que revendiquée dans la revendication 1, **caractérisée en ce que** la couche de support (21) est formée d'un tissu comprenant des fils longitudinaux et transversaux.

3. Rebobineuse à deux tambours comprenant deux tambours (11, 15) de support, à l'aide desquels une bobine de bande fibreuse (10) à enrouler sur la rebobineuse à deux tambours est agencée pour être enroulée, au moins l'un des tambours de support est un ensemble de tambours à courroie (15) comprenant deux rouleaux guide (12, 13) et une courroie (20) disposée autour d'eux, dont la courroie (20) comprend une couche de support (21) qui maintient la tension longitudinale de la courroie (20), une couche extérieure (22) entre la couche de support (21) et une surface extérieure (23) de la courroie (20) placée contre un rouleau de bande fibreuse (10) qui est enroulé sur la rebobineuse à deux tambours, et une couche intérieure (25) entre la couche de support (21) et une surface placée contre les rouleaux guide (12, 13) de l'ensemble des tambours à courroie (15) dans la rebobineuse à deux tambours, la couche extérieure de la courroie (20) étant fabriquée en matériau résistant à l'usure, tel que le caoutchouc ou l'élastomère, **caractérisée en ce que** la couche extérieure (22) de la courroie (20) dans l'ensemble de tambours à courroie (15) de la rebobineuse à deux tambours est mince, c'est à dire qu'elle présente une épaisseur inférieure à 3,5 mm lorsque la courroie est neuve et non utilisée, et que la raideur transversale de la courroie (20) de l'ensemble des tambours à courroie (15) dans la rebobineuse à deux tambours permettant de stabiliser la largeur de la courroie est telle que la couche de support comprend également des fils sensiblement transversaux et/ou une couche de raidissement transversale se trouve uniquement sous la couche de support dans la couche intérieure de la courroie.

4. Rebobineuse à deux tambours selon la revendication 3, **caractérisée en ce que** la couche de support (21) de la courroie (20) de l'ensemble de tambours à courroie (15) dans la rebobineuse à deux tambours est formée d'un tissu comprenant des fils longitudinaux et transversaux.

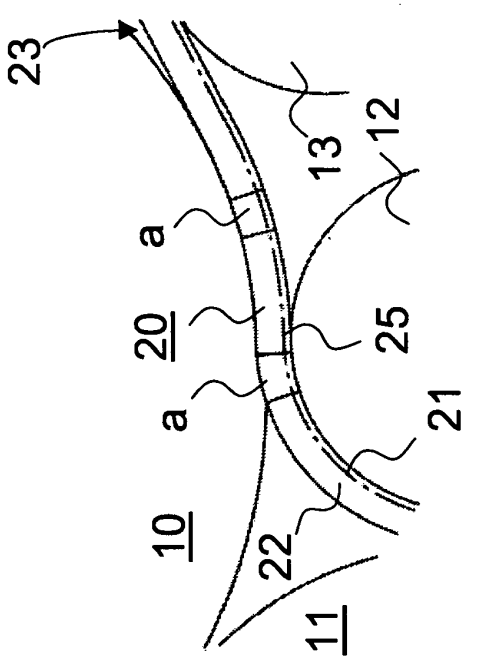


FIG. 2A
PRIOR ART

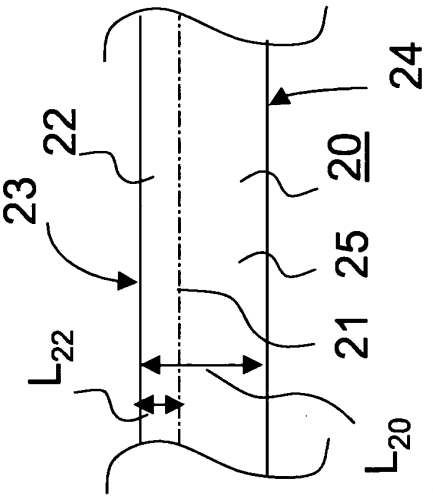


FIG. 3

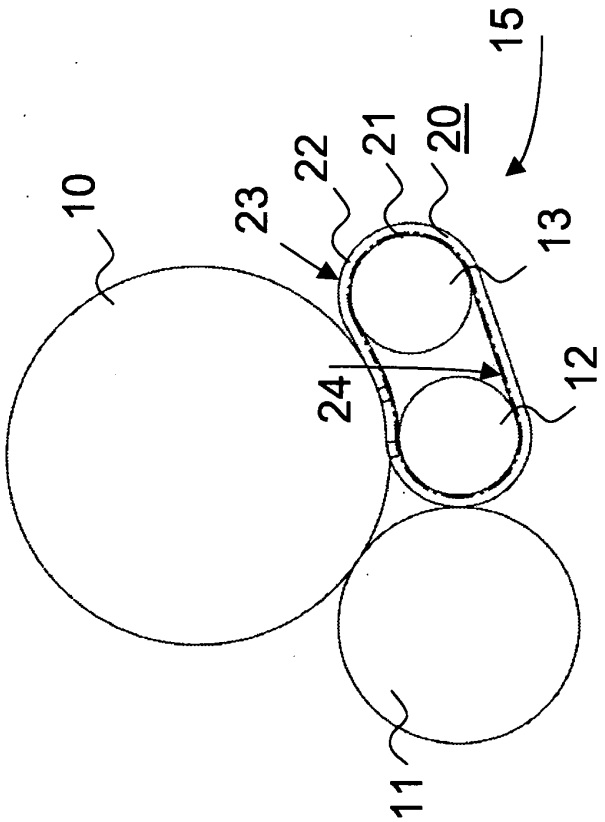


FIG. 1
PRIOR ART

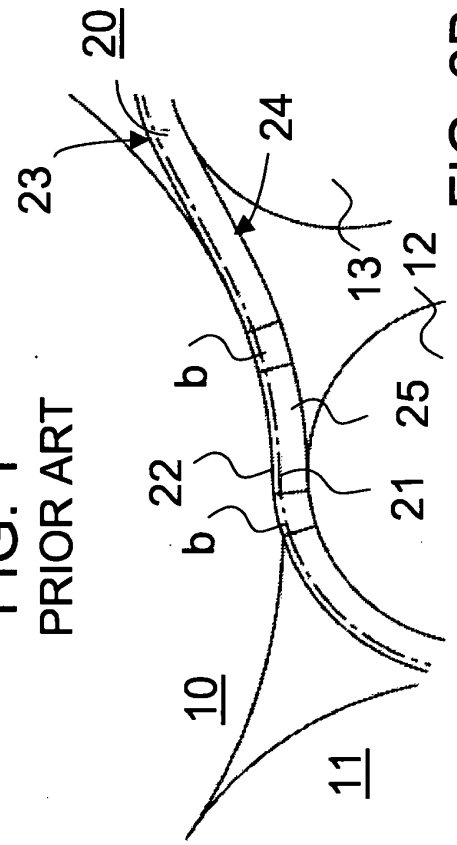


FIG. 2B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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