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(54) **FELT FOR INDUSTRIAL IRONING SYSTEM**

FILZ FÜR INDUSTRIELLES BÜGELSYSTEM

FEUTRE POUR SYSTÈME DE REPASSAGE INDUSTRIEL

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Description

Related Application

[0001] The present application claims priority from and the benefit of U.S. Provisional Patent Application No. 62/182,970, filed June 22, 2015. The present invention relates to a felt for an industrial ironing system.

Backaround

[0002] A typical industrial system for ironing cloth (for example, bed sheets for hotels, cloth for tailored clothing, tablecloths, or the like) includes an enclosure that includes a base (also referred to as a "chest") that provides support from underneath. Two cylindrical rolls are positioned within semicircular recesses in the chest. The rolls are perforated and are hollow. Each of the rolls is covered with a felt that is wrapped around the circumference of the roll. A steam generation system is operatively associated with the chest, and a suction unit is fluidly connected to the cavities of the rolls.

[0003] In operation, the cloth to be ironed is fed between the chest and the rolls, with the rolls **16** rotating about their longitudinal axes to convey the cloth. Typically the nip between each felt and the underlying recess of the chest is sufficiently narrow that the cloth is pressed between these structures. Steam is generated in the steam generation system and released through the chest into the cloth. The suction unit draws the steam through the cloth and the felt and into the cavities of the rolls through the perforations in the rolls. The heat, steam and pressure help to remove wrinkles in the cloth. The steam exits the rolls **16** and is conveyed to a heat exchanger (not shown) for cooling and/or re-use.

United States Patent No. 3,458,911 to Koester describes a papermakers' felt and method of making the same in which a woven base material is woven with soluble filler yarns formed of calcium alginate and which are removed after battings have been needled into the base material to form a finished felt substantially free of crosswise structure.

United States Patent No. 5,551,176 to Hejhal et al. describes a roll cover for use on a flat work ironer formed of a thermally resistant fabric which is coated or impregnated with a mixture of an acrylic resin and a stiffening agent.

European Patent Application No. EP 1561860 A1 to Tamfelt Ojy Abp describes a press belt made from an elastomer material having an inner surface and an outer surface and three layers of reinforcement yarns arranged inside the elastomer material. The innermost yarn layer is formed by longitudinal and transversely adjacent reinforcement yarns and the middle yarn layer is formed by transverse longitudinally adjacent reinforcement yarns.

German Patent No. DE 10204357 to Heimbach GmbH Thomas Josef describes a papermaking machine having a press felt which promotes the formation and guides the progress of a paper web through a papermaking machine. The press felt has a core sandwiched between layers of parallel main fibers with each layer at right angles or at a diagonal to the adjacent layer.

Summary

[0004] The invention provides a felt for an industrial ironing system according to claim 1. Embodiments of the invention are defined in the dependent claims. As a first aspect, embodiments of the invention are directed to the felt for an industrial ironing system. The felt comprises: first and second batt layers; and a plurality of yarns extending parallel to each other in the machine direction. The yarns are devoid of additional yarns interweaving perpendicular to the plurality of yarns extending in the machine direction. The yarns are aramid yarns included in density of between about 6 and 12 yarns per cm, and having a size of between about 30 and 300 tex.

[0005] As a second aspect, embodiments of the invention are directed to an industrial ironing system, comprising: a base having a chest with at least one recess; a roll mounted at least partially within the recess, the roll defining a longitudinal axis, the longitudinal axis being parallel to a cross-machine direction; and a felt circumferentially surrounding the roll as defined in claim 1.

Brief Description of the Figures

[0006]

FIG. 1 is a schematic side view of an industrial ironing system according to embodiments of the present invention.

FIG. 2 is a schematic perspective view of the felt of the ironing system of **FIG. 1.**

FIG. 3 is a side section view of the felt of **FIG. 2** compared to a felt of a conventional ironing system.

Detailed Description of Embodiments of the Invention

[0007] The present invention will now be described more fully hereinafter, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity.

[0008] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in

commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0009] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein the expression "and/or" includes any and all combinations of one or more of the associated listed items.

[0010] As used herein, the terms machine direction ("MD") and cross machine direction ("CMD") refer, respectively, to a direction normal to the longitudinal axes of the rolls in an industrial ironing system and a direction parallel to the longitudinal axes of the rolls in an industrial ironing system.

[0011] In addition, spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0012] Well-known functions or constructions may not be described in detail for brevity and/or clarity.

[0013] Referring now to the figures, a system for ironing cloth, designated broadly at **10,** is shown in **FIG. 1.** The system **10** includes an enclosure **12** that includes a base **14** (also referred to as a "chest") that provides support from underneath. Two cylindrical rolls **16** are positioned within semicircular recesses **18** in the chest **14.** The rolls **16** are perforated and are hollow. Each of the rolls **16** is covered with a felt **22** that is wrapped around the circumference of the roll **16,** with an overlapping section **38** present at one end of the felt **22.** A steam generation system **20** is operatively associated with the chest **14.** A suction unit **24** is fluidly connected to the cavities of the rolls **16.**

[0014] In operation, a cloth **30** to be ironed (for example, a bed sheet, cloth for tailored clothing, tablecloths, or the like) is fed between the chest **14** and the rolls **16,** with the rolls **16** rotating about their longitudinal axes A to convey the cloth **30.** Typically the nip between each felt **22** and the underlying recess **18** of the chest **14** is sufficiently narrow that the cloth **30** is pressed between these structures. Steam is generated in the steam generation system **20** and released through the chest **14** into the cloth **30.** The suction unit **24** draws the steam through the cloth **30** and the felt **22** and into the cavities of the rolls **16** through the perforations in the rolls **16.** The heat, steam and pressure help to remove wrinkles in the cloth **30.** The steam exits the rolls **16** and is conveyed to a heat exchanger (not shown) for cooling and/or re-use.

[0015] Referring now to **FIG. 2,** the felt **22** is multi-layered and comprises at its core a base layer comprising a plurality of yarns **32.** The yarns **32** extend parallel to each other in the machine direction as defined above. As illustrated in **FIG. 2,** the felt **22** has no yarns extending in the cross-machine direction that weave with the yarns **32.** In **FIGS. 2** and **3,** the yarns **32** are shown as being arranged in a single layer, but in other embodiments the yarns **32** may be arranged in multiple layers, typically with a scrim or batt layer present between the layers of yarns.

[0016] The yarns **32** may be formed of a variety of forms, including monofilaments, multifilaments, spunbond yarns, staple yarns, and twisted combinations thereof, and with a variety of materials, such as aramid, polyester, polyamide, polyphenylene sulfide (PPS), and the like. The yarn sizes may also vary; typically the yarns are between about 30 and 300 tex. Yarn spacing may also vary; in a typical felt, the spacing between the yarns **32** creates a yarn density of between about 6 and 12 yarns per cm. In particular, the yarn material, size and spacing should be selected so that the overall felt **22** has a tensile strength in the machine direction of at least 300N/cm, and/or has an elongation resistance of less than 0.26 percent in operation, and an overall elongation of 25 percent to failure.

[0017] The felt **22** also includes batt layers **34, 36** that overlie and underlie the yarns **32.** The batt layers **34, 36** are typically formed of a variety of materials, such as aramid, polyester, polyamide, PPS, and the like, and combinations thereof, although other materials may also be employed. Although the batt layers **34, 36** are shown as single layers, either or both of the batt layers **34, 36** may include multiple layers, which may be formed of the same or different materials. Ordinarily, the batt layers **34, 36** are applied to the yarns **32** by a needling process.

[0018] **FIG. 3** shows a comparison of the felt **22** with a conventional felt **22'.** As can be seen in **FIG. 3,** the conventional felt **22'** includes batt layers **34', 36'** and a woven fabric **32'** serving as a base layer that comprises MD yarns **32M** interwoven with CMD yarns **32C.** As shown in **FIG. 3,** the MD yarns **32M** follow a sinuous or crimped path in interweaving with the CMD yarns **32C.** The crimping of the MD yarns **32M** effectively creates some slack in the MD yarns **32M,** such that, when the conventional felt **22'** is placed under tension in the machine direction

(which occurs during operation as the rolls **16** rotate relative to the chest **14**), the conventional felt **22'** tends to elongate in the machine direction.

[0019] In contrast, the yarns **32** of the felt **22** have no crimping because they do not interweave with other yarns. As such, when placed under tension in the machine direction during operation, the yarns **32** have little to no slack, and thus resist lengthening (i.e., have low elongation) considerably more than the MD yarns **32M** of the conventional felt **22'.** If a felt stretches too much, it may become necessary to cut back the overlapping section **38** with some frequency, during which operations cease. The felt **22** may provide sufficient elongation resistance to prevent elongation during operation that would require cutting of the overlapping section **38.** Also, because the felt **22** has no CMD yarns, the overall weight of a felt with similar or improved elongation resistance can be lower. Further, the absence of CMD yarns within a woven fabric (i.e., the use of only MD yarns) can reduce the cost of the felt significantly, as the weaving process can be omitted.

[0020] In one embodiment, a felt **22** includes yarns **32** formed of aramid included in a density of 200g/m^2, and batt layers **34, 36** formed of aramid and having a thickness of 4.7 mm, thereby providing a felt having an overall density of 800g/m^2.

[0021] The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. The invention is defined by the following claims.

Claims

1. A felt (22) for an industrial ironing system (10), comprising:

   first and second batt layers (34, 36) overlying and underlying, respectively,
   a plurality of yarns (32) extending parallel to each other in the machine direction, the felt (22) being devoid of additional yarns interweaving perpendicular to the plurality of yarns (32) extending in the machine direction,
   wherein the plurality of yarns (32) have a size of between 30 and 300 tex and spacing between the plurality of yarns (32) creates a yarn density of between about 6 and 12 yarns per cm, and wherein the plurality of yarns are aramid yarns.

2. The felt (22) defined in Claim 1, wherein the first and second batt layers (34, 36) have thickness of between about 4 and 15 mm.

3. The felt (22) defined in Claim 1, wherein the felt (22) has an elongation resistance of less than 0.26 percent.

4. The felt (22) defined in Claim 1, wherein the felt (22) has an elongation at failure of less than 25 percent.

5. The felt (22) defined in Claim 1, wherein the felt (22) is for being in combination with a roll (16) of an industrial ironing system (10) wherein the felt (22) is further for circumferentially surrounding the roll (16).

6. An industrial ironing system (10), comprising:

   a base (14) having a chest (14) with at least one recess (18);
   a roll (16) mounted at least partially within the recess (18), the roll (16) defining a longitudinal axis, the longitudinal axis being parallel to a cross-machine direction; and
   a felt (22) circumferentially surrounding the roll (16) as defined in Claim 1.

7. The system (10) defined in Claim 6, wherein the first and second batt layers (34, 36) have thickness of between about 4 and 15 mm.

8. The system (10) defined in Claim 6, wherein the felt (22) has an elongation resistance of less than 0.26 percent.

9. The system (10) defined in Claim 6, wherein the felt (22) has an elongation at failure of less than 25 percent.

10. The system (10) defined in Claim 6, further comprising a steam generation source (20) operatively associated with the chest (14), and a suction unit (24) fluidly connected with the roll (16).

Patentansprüche

1. Filz (22) für ein industrielles Bügelsystem (10), umfassend:

   erste und zweite Vliesschichten (34, 36), die darüber bzw. darunter liegen,
   eine Vielzahl von Garnen (32), die sich parallel zueinander in der Maschinenrichtung erstrecken, wobei der Filz (22) frei von zusätzlichen Garnen ist, die senkrecht zu der Vielzahl von Garnen (32), die sich in der Maschinenrichtung erstrecken, verweben,
   wobei die Vielzahl von Garnen (32) eine Größe zwischen 30 und 300 Tex haben und der Ab-

stand zwischen der Vielzahl von Garnen (32) eine Garndichte zwischen etwa 6 und 12 Garnen pro cm erzeugt, und wobei die Vielzahl von Garnen Aramidgarne sind.

2. Filz (22) definiert in Anspruch 1, wobei die erste und die zweite Vliesschicht (34, 36) eine Dicke zwischen etwa 4 und 15 mm aufweisen.

3. Filz (22) definiert in Anspruch 1, wobei der Filz (22) einen Dehnungswiderstand von weniger als 0,26 % aufweist.

4. Filz (22) definiert in Anspruch 1, wobei der Filz (22) eine Versagungsdehnung von weniger als 25 % aufweist.

5. Filz (22) definiert in Anspruch 1, wobei der Filz (22) dazu dient, mit einer Rolle (16) eines industriellen Bügelsystems (10) kombiniert zu werden, wobei der Filz (22) ferner dazu dient, die Rolle (16) in Umfangsrichtung zu umgeben.

6. Industrielles Bügelsystem (10), umfassend:

eine Basis (14), mit einer mindestens eine Aussparung (18) aufweisenden Auflage (14);
eine Rolle (16), die zumindest teilweise innerhalb der Aussparung (18) angebracht ist, wobei die Rolle (16) eine Längsachse definiert, die parallel zu einer Querrichtung der Maschine verläuft; und
einen Filz (22), der die Rolle (16) in Umfangsrichtung umgibt, wie in Anspruch 1 definiert.

7. System (10) definiert in Anspruch 6, wobei die ersten und zweiten Vliesschichten (34, 36) eine Dicke zwischen etwa 4 und 15 mm aufweisen.

8. System (10) definiert in Anspruch 6, wobei der Filz (22) einen Dehnungswiderstand von weniger als 0,26 % aufweist.

9. System (10) definiert in Anspruch 6, wobei der Filz (22) eine Versagungsdehnung von weniger als 25 % aufweist.

10. System (10) definiert in Anspruch 6 ferner umfassend eine Dampferzeugungsquelle (20), die funktionell mit der Auflage (14) verbunden ist, und eine Saugeinheit (24), die fluidisch mit der Rolle (16) verbunden ist.

Revendications

1. Feutre (22) pour un système de repassage industriel (10), comprenant :

une première et une deuxième couche de nappe (34, 36) recouvrant et sous-tendant respectivement une pluralité de fils (32) s'étendant parallèlement les uns aux autres dans la direction de la machine, le feutre (22) étant dépourvu de fils supplémentaires s'entrelaçant perpendiculairement à la pluralité de fils (32) s'étendant dans la direction de la machine,
dans lequel la pluralité de fils (32) ont une taille comprise entre 30 et 300 tex et l'espacement entre la pluralité de fils (32) crée une densité de fils comprise entre environ 6 et 12 fils par cm, et dans lequel la pluralité de fils sont des fils d'aramide.

2. Feutre (22) selon la revendication 1, dans lequel la première et la deuxième couche de nappe (34, 36) ont une épaisseur comprise entre environ 4 et 15 mm.

3. Feutre (22) selon la revendication 1, dans lequel le feutre (22) a une résistance à l'allongement inférieure à 0,26 pour cent.

4. Feutre (22) selon la revendication 1, dans lequel le feutre (22) a un allongement à la rupture inférieur à 25 pour cent.

5. Feutre (22) selon la revendication 1, dans lequel le feutre (22) est destiné à être combiné à un rouleau (16) d'un système de repassage industriel (10), dans lequel le feutre (22) est en outre destiné à entourer circonférentiellement le rouleau (16).

6. Système de repassage industriel (10), comprenant :

une base (14) comportant un coffre (14) avec au moins un renfoncement (18) ;
un rouleau (16) monté au moins partiellement à l'intérieur du renfoncement (18), le rouleau (16) définissant un axe longitudinal, l'axe longitudinal étant parallèle à une direction transversale de la machine ; et
un feutre (22) entourant circonférentiellement le rouleau (16) selon la revendication 1.

7. Système (10) selon la revendication 6, dans lequel la première et la deuxième couche de nappe (34, 36) ont une épaisseur comprise entre environ 4 et 15 mm.

8. Système (10) selon la revendication 6, dans lequel le feutre (22) a une résistance à l'allongement inférieure à 0,26 pour cent.

9. Système (10) selon la revendication 6, dans lequel le feutre (22) a un allongement à la rupture inférieur à 25 pour cent.

10. Système (10) selon la revendication 6, comprenant en outre une source de génération de vapeur (20) associée fonctionnellement au coffre (14), et une unité d'aspiration (24) reliée fluidiquement au rouleau (16).

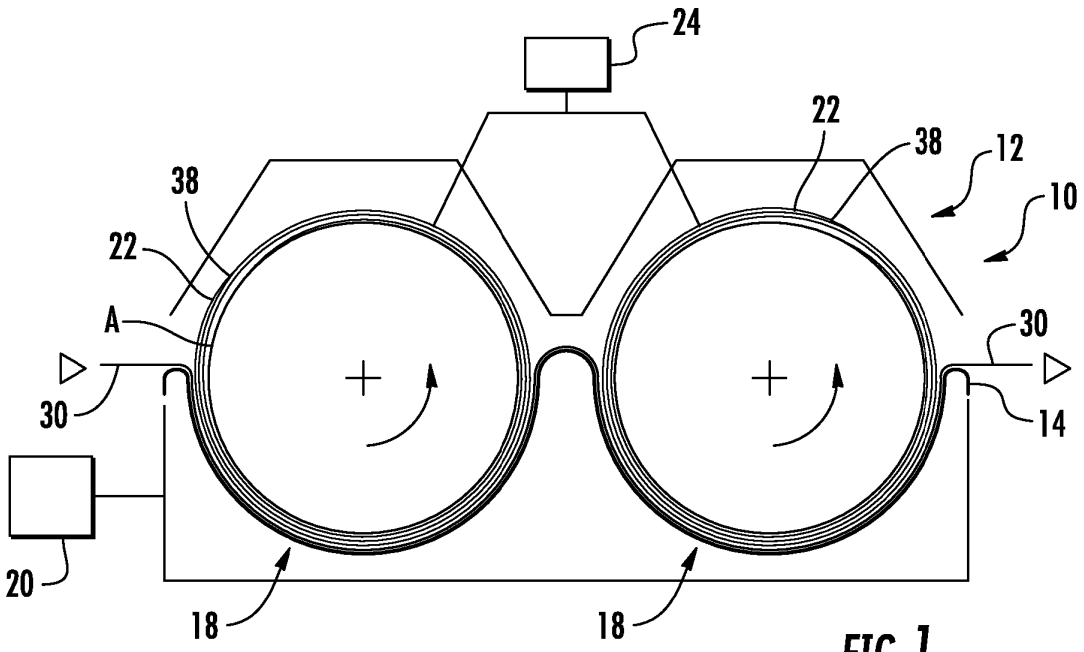

FIG. 1

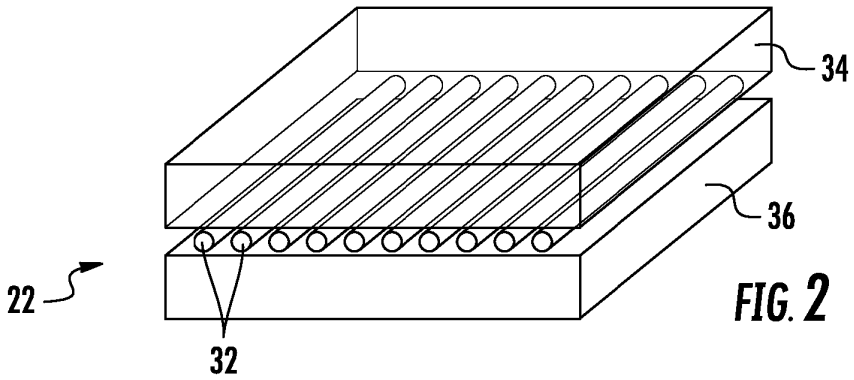

FIG. 2

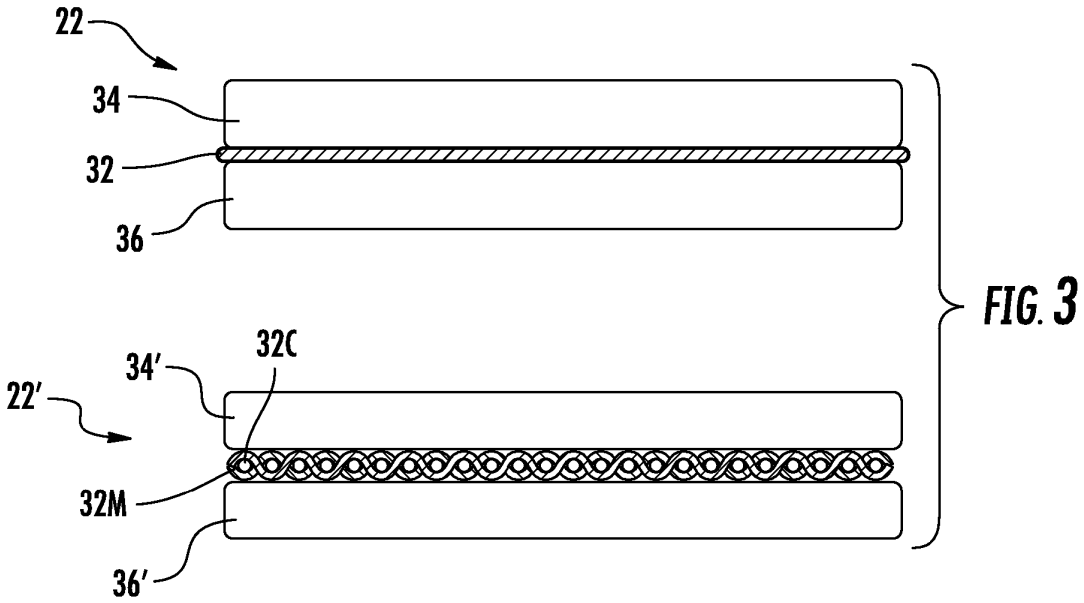

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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