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(54) **IMPROVED SPIRAL FABRICS**

VERBESSERTE SPIRALGEWEBE

TOILES A SPIRALES AMELIOREES

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to spiral fabrics. More specifically, the present invention relates to spiral-link fabrics having coils with relatively large widths utilized on a papermaking machine and other industrial applications.

Description of the Related Art

[0002] During the papermaking process, a cellulosic fibrous web is formed by depositing a fibrous slurry, that is, an aqueous dispersion of cellulose fibers, onto a moving forming fabric in a forming section of a paper machine. A large amount of water is drained from the slurry through the forming fabric, leaving the cellulosic fibrous web on the surface of the forming fabric.

[0003] The newly formed cellulosic fibrous web proceeds from the forming section to a press section, which includes a series of press nips. The cellulosic fibrous web passes through the press nips supported by a press fabric, or, as is often the case, between two such press fabrics. In the press nips, the cellulosic fibrous web is subjected to compressive forces which squeeze water therefrom, and which adhere the cellulosic fibers in the web to one another to turn the cellulosic fibrous web into a paper sheet. The water is accepted by the press fabric or fabrics and, ideally, does not return to the paper sheet.

[0004] The paper sheet finally proceeds to a dryer section, which includes at least one series of rotatable dryer drums or cylinders, which are internally heated by steam. The newly formed paper sheet is directed in a serpentine path sequentially around each in the series of drums by a dryer fabric, which holds the paper sheet closely against the surfaces of the drums. The heated drums reduce the water content of the paper sheet to a desirable level through evaporation.

[0005] It should be appreciated that the forming, press and dryer fabrics all take the form of endless loops on the paper machine and function in the manner of conveyors. It should further be appreciated that paper manufacture is a continuous process which proceeds at considerable speeds. That is to say, the fibrous slurry is continuously deposited onto the forming fabric in the forming section, while a newly manufactured paper sheet is continuously wound onto rolls after it exits from the dryer section.

[0006] Fabrics in modern papermaking machines may have a width of from 5 to over 33 feet, a length of from 40 to over 400 feet and weigh from approximately 100 to over 3,000 pounds. These fabrics wear out and require replacement. Replacement of fabrics often involves taking the machine out of service, removing the worn fabric, setting up to install a fabric and installing the new fabric.

[0007] For example, because of the solid support beams for dryer sections, all dryer fabric must have a seam. Installation of the fabric includes pulling the fabric body onto a machine and joining the fabric ends to form an endless belt. The seam region of any workable fabric must behave in use as close to the body of the fabric in order to prevent the periodic marking by the seam region of the paper product being manufactured.

[0008] A fabric may be formed completely of spiral coils (so called "spiral-link fabric") as taught by Gauthier, U.S. Patent 4,567,077. In such a fabric, spiral coils are connected to each other by at least one connecting pin, pintle or the like. In theory, the seam can therefore be at any location in the fabric body where a connecting pin may be removed. Spiral-link fabrics offer a number of advantages over traditional fabric. For example, the seam of a spiral-link fabric is geometrically similar to the fabric body, and thus is less likely to mark the paper sheet. In addition, spiral-link fabrics may withstand flattening, thus imparting constant permeability to fluids (in particular air) which would otherwise pass therethrough. Due to these advantageous features, spiral-link fabrics are used in papermaking machines, particularly for drying sheets of paper wherein water vapor is removed which passes through the spiral-link fabric. Spiral link fabrics have other industrial applications where they act as industrial conveyors and may be coated or otherwise impregnated with a resin depending upon the application.

[0009] Unfortunately, the production of spiral-link fabrics is both labor-intensive and expensive. For example, spiral-link fabrics are constructed of many small spiral elements that must be coiled and assembled. The multiple manufacturing steps of coiling, interdigitating, and interconnecting spiral coils makes the process costly. In addition, it is difficult to interconnect the spiral coils because a pin, pintle or the like is inserted through small channels formed from the interdigitated spiral coils. Production time for such fabric is compounded because the small width of the spiral coils requires a large number of pintles, as fabrics may be formed in a width of from 5 to over 33 feet and a length of from 40 to over 400 feet. Further, the large number of pintles substantially covers the fabric resulting in a fabric that is diagonally stiff during operation.

[0010] In addition, "stuffers" in the form of yarns or the like are typically inserted within the inner space of each spiral coil to lower the permeability of the fabric. Currently, stuffers are pushed or stuffed into the inner space of each spiral coil one portion at a time. As is to be appreciated, such stuffing method limits the material which may be used as stuffers because the stuffer must be sufficiently stiff or rigid to facilitate insertion into the small coil opening and across the full width of the fabric. Further, because the stuffers are pushed into the fabric, the process of inserting the stuffers may be slow and labor-intensive. The document US-A-5,115,582 discloses a spiral fabric wherein stuffers are inserted into the fabric by being pulled.

[0011] The present invention overcomes these shortcomings by providing a spiral-link fabric with wide spiral coils.

SUMMARY OF THE INVENTION

[0012] The inventors of the present invention have recognized that a spiral-link fabric having wide spiral coils may overcome the shortcomings of the prior art.

[0013] Accordingly, a spiral-link fabric for use in a papermaking machine or other industrial application is provided which may include a plurality of side-by-side spiral coils. The spiral coils may be interdigitated and interconnected by a series of parallel pintles extending through channels formed from the interdigitated spiral coils. Each spiral coil has a width of approximately 12 mm or larger. The ratio of the coil width to the coil thickness can be about 0.5 or less. These larger spiral coils allow for versatility in selecting stuffers not heretofore realized, such that they may go beyond their traditional role involving permeability.

[0014] The present invention will now be described in more complete detail with preference being made to the figures wherein like reference numerals denote like elements and parts, which are identified below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] For a more complete understanding of the invention, reference is made to the following description and accompanying drawings, in which:

FIGs. 1a and 1b are views of a spiral-link fabric in accordance with an embodiment of the present invention;

FIG. 2 is a diagram of a pintle usable in the present spiral-link fabric; and

FIG. 3 is a photograph of present spiral-link fabrics with stuffer inserts.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] A preferred embodiment of the present invention will be described in the context of a papermaking dryer fabric. However, it should be noted that the present invention may be used in other sections of a papermachine, as well as in other industrial settings where spiral-link fabrics have heretofor found application as industrial fabrics. Accordingly, the invention should be.

[0017] FIGs. 1a and 1b are views of a spiral-link fabric 10 in accordance with an embodiment of the present invention. Spiral-link fabric 10 may include a plurality of side-by-side spiral coils, such as coils 12 and 14, with each coil having a coil thickness and a coil width 18. Spiral coils 12 and 14 are substantially disposed in a direction transverse relative to the longitudinal axis of the fabric (which is along the running or machine direction of the fabric). The turn of spirals 12 and 14 may be inclined in a predetermined manner. Spirals 12 and 14 are interdigitated and interconnected by a series of parallel or substantially parallel pintles or pins 24, or the like, extending through channels 26 formed from the interdigitated spiral coils 12 and 14. Further, stuffer inserts 28 may be inserted or otherwise disposed within openings 20 and 22 of spirals 12 or 14.

[0018] The present invention provides spiral coils 12 and 14 that are significantly wider than prior art designs. For example, coil width 18 may be from about 12 mm to 150 mm or about 0.5 to 6 inches. Further, spiral coils 12 and 14 may have a ratio of coil thickness 16 to coil width 18 of approximately 0.5 or less.

[0019] As a general example of the present invention, spiral coils 12 and 14 may be round in cross section having a coil thickness 16 of 3.3 mm and a coil width 18 of 28.5 mm. Spiral coils 12 and 14 would then have a ratio of coil thickness 16 to coil width 18 of about 0.11.

[0020] Further, spiral coils 12 and 14 may be formed of a polymer (such as polyester), metal or other material suitable for this purpose known to those so skilled in the art. As is appreciated, the starting yarn or material, e.g., a monofilament, used to make the spiral coils 12 and 14 may be in various shapes. It may be, for example, round, rectangular, oval, or may be flattened, which shape may be determined by one of skill in the art on the basis of the ultimate use of the spiral-link fabric and the performance specifications required therefore. Further, spiral coils 12 and 14 may be formed from a monofilament or multifilament material, which, if they are multifilament, may be treated or coated if necessary to ensure that the coils retain the ability to maintain their shape. The spiral coils 12 and 14 themselves may take on various shapes from, for example, round or helical to oval, as shown in the figures.

[0021] The wider spiral coils of the present invention provide advantages over current spiral-link fabric designs. For example, coil width 18 determines the number of coils per length of fabric. A wider coil means less coils or assembles per length of fabric which may result in faster production of the fabric. Because the wider coils of the present invention may require fewer pintles to interconnect per length of fabric, the spiral fabrics may be easier to form and may require less labor and cost. Further, the wider spiral coils of the present invention may allow easy and quick installation of pintles 24 through channels 26. Accordingly, the present invention may effectively reduce the time and cost for manufacturing fabric 10.

[0022] Pintle 24 may be pre-crimped or may have a stepped diameter. That is, the diameter of pintle may not be the same throughout its length. As shown in FIG. 2, first portion 25 has a first diameter and second portion 27 has a second diameter different than the first diameter. In this way, pintles 24 may provide wider coil spacing and use less material. It is also contemplated by the present invention that the pintles may alternatively have a non-

round shape, or may be deformable under pressure. Further, the pintles 24 may be flexible and may reduce diagonal stress/strain of the fabric during operation.

[0023] In addition, the spiral coils of the present invention, while functioning as the primary structural members of the fabric in all directions, also serve as carriers for stuffer inserts 28. For example, spiral coils 12 and 14 provide the fabric's MD strength and continuum as well as providing the "seam" or basis for becoming an endless belt. However, as the spiral coils of the present invention are wider than those of the prior art, and accordingly may accommodate larger stuffers than are possible in the prior art, it is also a facet of the present invention that the stuffers may also impart structural characteristics to the spiral-link fabric. For example, the composition of the stuffer inserts may alter the CD stiffness and the diagonal stress/strain of the spiral-link fabric. Accordingly, stuffer insert 28 may be designed to optimize fabric properties and characteristics, for example, permeability.

[0024] FIG. 3 is a photograph of side-by-side view of portions of spiral-link fabrics 30 and 32 in accordance with an embodiment of the present invention. As shown, fabric 30 and 32 have relatively wide spiral coils 34 and 36 which provide inner spaces for insertion of stuffer inserts 40 and 42. Stuffer inserts 40 and 42 may be formed from one or more different materials, which may be rigid or flexible.

[0025] The stuffer inserts of the present invention may be formed from a material which is woven, knitted, or molded, or may be formed from extruded sheets of polymeric material or films, and may be continuous or formed from a number of discontinuous portions. In addition, the stuffer insert may be simply disposed within a spiral coil, or attached or fixed to the spiral coils. If fixed, the stuffer inserts may be fixed to spiral coils at its edges, center or at multiple points along the coils. The stuffer insert may include edges having grooves, ridges or so forth to facilitate the fixing of the stuffer insert to the coils. In addition, the stuffer insert may be stretched or relaxed to obtain a desired permeability or permeability profile for the fabric.

[0026] Further, the present invention includes stuffer inserts that are non-uniform in at least one dimension throughout the length of each individual stuffer. In many dryer sections, the sheet moisture profile is such that the sheet edges are drier than the center. A fabric that is more permeable in the center would contribute to flattening this unwanted non-uniform profile. For instance, in a spiral link fabric of the present invention, a stuffer insert may have one effective diameter along its length at the ends or edges of the fabric and a second effective diameter at the fabric center. Effective diameter is a relative term to define the ability of both round and nonround cross section stuffers to affect the fabric characteristic desired. The effective diameter of the stuffer near the fabric edges can be greater than that at the center of the fabric. This results in the spiral link fabric to have edge areas with a lower permeability than the fabric center, so as to correct the sheet moisture profile. Of course, if the sheet profile is such that the edges are wet and the center is dry, a spiral link fabric with stuffer inserts so designed as to make the center area less permeable than the fabric edges can also be constructed. Alternatively, various mechanical alterations of the stuffer, including but not limited to crimps, folds, perforations and the like may be distributed throughout the stuffer in a non-uniform manner. Such a stuffer of the present invention may include a stuffer that has been crimped" or "folded" in such a manner that the number of "crimps" or "folds" dispersed throughtout the length of the stuffer. For example, a stuffer may have a larger number of "crimps" or "folds" dispersed throughout the ends of the stuffer than are present in the center of the stuffer.

[0027] As is to be appreciated, current stuffer designs must be sufficiently stiff and rigid so as to be able to be pushed into the small coil openings and across the full width of the spiral-link fabric. This typically involved the use of yarns. In contrast, the wide spiral coils of the present invention enable the stuffer inserts to be pulled through the spiral coils. The stuffer insert may be pulled by a rapier, gripper, or the like. In this way, the process to make the spiral-link fabric may be formed faster and may be less labor-intensive. Accordingly, the present invention may effectively reduce the time and cost for manufacturing a fabric. As is appreciated, there may be other ways of pulling the stuffer insert within the spiral coils of the present invention as known to those so skilled in the art.

[0028] - Further, the stutter inserts of the present invention may be formed of softer, more flexible and less expensive materials than prior art stuffers because the stuffer insert may now be pulled though the fabric instead of pushed through. As a result,
the present fabric may be more flexible and less diagonally stiff than prior art spiral-link fabrics, improving the guiding and tracking of the fabric.

[0029] Thus, the present invention's advantages are realized, and although preferred embodiments have been disclosed and described in detail herein, its scope and objects should not be limited thereby; rather its scope should be determined by that of the appended claims.

Claims

1. A spiral-link fabric for use in a papermaking machine comprising:

   a plurality of spiral coils arranged in a predetermined manner such that adjacent ones of side-by-side spiral coils are interdigitated with each other so as to form a channel and interconnected by a pintle extending through the channel, wherein at least some of the plurality of spiral coils have a coil width of approximately 12 mm or larger as measured in machine direction of

the spiral-link fabric, and
a flexible stuffer insert disposed within one or more spiral coils, wherein the flexible stuffer insert is capable of being pulled through the one or more spiral coils.

2. The spiral-link fabric of claim 1, wherein each spiral coil has a coil thickness associated therewith, and wherein a ratio of the coil thickness to coil width as measured in machine direction of the spiral-link fabric is approximately 0.5 or less.

3. The spiral-link fabric of claim 1, wherein the spiral coils are formed from monofilaments or multifilaments which are coated.

4. The spiral-link fabric of claim 3, wherein the monofilaments are round, rectangular, oval, flattened or other noncircular shape.

5. The spiral-link fabric of claim 1, wherein the pintle is selected from the group consisting of: round pintles, non-round pintles, pre-crimped pintles, and stepped diameter pintles.

6. The spiral-link fabric of claim 1, wherein the flexible stuffer insert comprises a material which is woven, knitted, or molded, or formed from extruded sheets of polymeric material or films.

7. The spiral-link fabric of claim 1, wherein the flexible stuffer insert is non-uniform in at least one dimension along its length.

8. The spiral-link fabric of claim 7, wherein the flexible stuffer insert has a varying effective diameter along its length.

9. The spiral-link fabric of claim 7, wherein the flexible stuffer insert has crimps, folds, and/or perforations distributed in a non-uniform manner throughout the length and/or diameter thereof.

10. The spiral-link fabric of claim 1, wherein the fabric has a variable permeability along its width.

11. The spiral-link fabric of claim 1, wherein the spiral coils have a circular, oval or other noncircular shape.

12. The spiral-link fabric of claim 1, wherein the plurality of spiral coils have a coil width as measured in machine direction of the spiral-link fabric in the range of approximately 12 mm to 150 mm.

13. The spiral-link fabric of claim 1, wherein the flexible stuffer insert includes edges having grooves or ridges.

14. The spiral-link fabric of claim 1, wherein the flexible stuffer insert is attached or fixed to the respective spiral coil.

15. The spiral-link fabric of claim 1, wherein the flexible stuffer insert is continuous or discontinuous.

16. A method of forming a spiral-link fabric for use in a papermaking machine comprising the steps of:

arranging a plurality of spiral coils in a predetermined manner such that adjacent ones of side-by-side spiral coils are interdigitated with each other so as to form a channel;
extending a pintle through each said channel formed from the interdigitated spiral coils; wherein at least some of the plurality of spiral coils have a coil width of approximately 12 mm or larger as measured in machine direction of the spiral-link fabric, and
inserting a flexible stuffer insert through at least one spiral coil, wherein the flexible stuffer insert is capable of being pulled through the one or more spiral coils.

17. The method of claim 16, wherein each spiral coil has a coil thickness associated therewith, and wherein a ratio of the coil thickness to coil width as measured in machine direction of the spiral-link fabric is approximately 0.5 or less.

18. The method of claim 16, wherein the spiral coils are formed from monofilaments or multifilaments which are coated.

19. The method of claim 18, wherein the monofilaments are round, rectangular, oval, flattened or other noncircular shape.

Patentansprüche

1. Papiermaschinenbespannung aus miteinander verbundenen Wendeln zur Verwendung auf einer Papiermaschine, enthaltend:

eine Vielzahl von Wendeln, die nach einem vorbestimmten Muster derart angeordnet sind, dass benachbarte, Seite an Seite liegende Wendeln ineinander eingreifen und dabei einen Kanal bilden, und dass sie mittels eines Stiftes miteinander verbunden sind, der sich durch diesen Kanal erstreckt, wobei mindestens einige Wendeln der erwähnten Vielzahl eine Windungsbreite von etwa 12 mm oder darüber aufweisen, gemessen in der Maschinenrichtung der aus Wendeln bestehenden Bespannung, und
einen nachgiebigen Fülleinsatz, der im Inneren

von einer oder mehreren Wendeln angeordnet ist, wobei der nachgiebige Fülleinsatz zum Ziehen durch die eine oder mehrere Wendeln befähigt ist.

2. Bespannung aus Wendeln nach Anspruch 1, bei der jede Wendel eine Wendeldicke aufweist und bei der ein Verhältnis von Wendeldicke zu Wendelbreite, in der Maschinenrichtung der Bespannung gemessen, etwa 0,5 oder weniger beträgt.

3. Bespannung aus Wendeln nach Anspruch 1, bei der die Wendeln aus Monofilamenten oder Multifilamenten erzeugt sind und die beschichtet sind.

4. Bespannung aus Wendeln nach Anspruch 3, bei der die Monofilamente eine runde, rechteckige, ovale, abgeflachte oder eine andere nicht kreisförmige Querschnittsform aufweisen.

5. Bespannung aus Wendeln nach Anspruch 1, bei der der Stift aus der Gruppe ausgewählt ist, die runde Stifte, unrunde Stifte, vorgeriffelte Stifte und Stifte mit abgesetztem Durchmesser umfasst.

6. Bespannung aus Wendeln nach Anspruch 1, bei der der nachgiebige Fülleinsatz aus einem Material besteht, das gewebt, gestrickt oder formgegossen ist oder aus extrudierten Bögen oder Folien eines polymeren Materials erzeugt ist.

7. Bespannung aus Wendeln nach Anspruch 1, bei der der nachgiebige Fülleinsatz in mindestens einer Dimension seiner Länge ungleichförmig ausgebildet ist.

8. Bespannung aus Wendeln nach Anspruch 7, bei der der nachgiebige Fülleinsatz über seine Länge einen veränderlichen effektiven Durchmesser aufweist.

9. Bespannung aus Wendeln nach Anspruch 7, bei der der nachgiebige Fülleinsatz Riffelungen, Knicke und/oder Durchbrechungen aufweist, die ungleichförmig über die Länge und/oder den Durchmesser des Einsatzes verteilt sind.

10. Bespannung aus Wendeln nach Anspruch 1, bei der die Bespannung über ihre Breite eine veränderliche Durchlässigkeit aufweist.

11. Bespannung aus Wendeln nach Anspruch 1, bei der die Wendeln eine kreisförmige, ovale oder eine andere nicht kreisförmige Form aufweisen.

12. Bespannung aus Wendeln nach Anspruch 1, bei der die Vielzahl von Wendeln eine Wendelbreite aufweist, die im Bereich von etwa 12 mm bis 150 mm liegt, in der Maschinenrichtung der Bespannung aus Wendeln gemessen.

13. Bespannung aus Wendeln nach Anspruch 1, bei der der nachgiebige Fülleinsatz Ränder besitzt, die mit Nuten oder Furchen versehen sind.

14. Bespannung aus Wendeln nach Anspruch 1, bei der der nachgiebige Fülleinsatz an der zugehörigen Wendel angehängt oder anderweitig befestigt ist.

15. Bespannung aus Wendeln nach Anspruch 1, bei der der nachgiebige Fülleinsatz entweder kontinuierlich oder diskontinuierlich ausgebildet ist.

16. Verfahren zur Herstellung einer Bespannung aus Wendeln zur Verwendung auf einer Papiermaschine, welches die folgenden Schritte umfasst:

Anordnung einer Vielzahl von Wendeln auf eine vorbestimmte Art, derart, dass benachbarte, Seite an Seite liegende Wendeln ineinander eingreifen und dabei einen Kanal bilden;
Einsetzen eines Stiftes in jeden der genannten Kanäle, die von den ineinander eingreifenden Wendeln gebildet werden, wobei mindestens einige aus der Vielzahl der Wendeln eine Breite von etwa 12 mm oder mehr aufweisen, gemessen in der Maschinenrichtung der Bespannung aus Wendeln, und
Einbringen eines nachgiebigen Fülleinsatzes in mindestens eine Wendel, wobei der nachgiebige Fülleinsatz in der Lage ist, durch die eine oder mehrere Wendeln eingezogen zu werden.

17. Verfahren nach Anspruch 16, bei dem jede Wendel eine Wendeldicke aufweist, und bei dem ein Verhältnis der Wendeldicke zur Wendelbreite vorliegt, gemessen in der Maschinenrichtung der Bespannung aus Wendeln, das etwa 0,5 oder weniger beträgt.

18. Verfahren nach Anspruch 16, bei dem die Wendeln aus Monofilamenten oder Multifilamenten hergestellt werden, die beschichtet sind.

19. Verfahren nach Anspruch 18, bei dem die Monofilamente einen runden, rechteckigen, ovalen, abgeflachten oder einen anderen nicht kreisförmigen Querschnitt aufweisen.

Revendications

1. Toile en spirales jointes pour une utilisation dans une machine à papier, comprenant :

une pluralité de bobines hélicoïdales arrangées d'une manière prédéterminée de façon à ce que les bobines adjacentes de la pluralité de bobines

hélicoïdales disposées côte à côte s'engrènent les unes dans les autres afin de former un canal, et elles sont interconnectées par une broche s'étendant à travers le canal, au moins quelques-unes de la pluralité de bobines hélicoïdales présentant une largeur de bobine d'environ 12 mm ou davantage, mesurée dans le sens machine de la toile en spirales jointes, et
un insert de remplissage flexible disposé à l'intérieur d'une ou plusieurs bobines hélicoïdales, cet insert de remplissage flexible étant capable d'être tiré à travers une ou plusieurs bobines hélicoïdales.

2. Toile en spirales jointes selon la revendication 1, dans laquelle à chaque bobine hélicoïdale est associée une épaisseur de bobine, et dans laquelle un rapport de l'épaisseur de la bobine à la largeur de la bobine, mesurée dans le sens machine de la toile en spirales jointes, est d'environ 0,5 ou moins.

3. Toile en spirales jointes selon la revendication 1, dans laquelle les bobines hélicoïdales sont formées à partir de monofilaments ou de multifilaments qui portent un revêtement.

4. Toile en spirales jointes selon la revendication 3, dans laquelle les monofilaments sont circulaires, rectangulaires, ovales, aplatis ou présentent une autre forme non circulaire.

5. Toile en spirales jointes selon la revendication 1, dans laquelle la broche est choisie dans le groupe formé par les broches circulaires, les broches non circulaires, les broches préalablement moulurées et les broches à diamètre étagé.

6. Toile en spirales jointes selon la revendication 1, dans laquelle l'insert de remplissage flexible comprend une matière qui est tissée, tricotée ou moulée, ou est formé à partir de feuilles ou de films extrudés en matière polymère.

7. Toile en spirales jointes selon la revendication 1, dans laquelle l'insert de remplissage flexible est non uniforme selon au moins une dimension le long de sa longueur.

8. Toile en spirales jointes selon la revendication 7, dans laquelle l'insert de remplissage flexible présente un diamètre effectif qui varie le long de sa longueur.

9. Toile en spirales jointes selon la revendication 7, dans laquelle l'insert de remplissage flexible présente des moulures, des plis et/ou des perforations distribués de façon non uniforme selon toute la longueur et/ou le diamètre de l'insert.

10. Toile en spirales jointes selon la revendication 1, dans laquelle la toile présente une perméabilité variable le long de sa largeur.

11. Toile en spirales jointes selon la revendication 1, dans laquelle les bobines hélicoïdales présentent une forme circulaire, ovale ou une autre forme non circulaire.

12. Toile en spirales jointes selon la revendication 1, dans laquelle la pluralité de bobines hélicoïdales présentent une largeur de bobine, mesurée en sens machine de la toile en spirales jointes, comprise entre environ 12 mm et 150 mm.

13. Toile en spirales jointes selon la revendication 1, dans laquelle l'insert de remplissage flexible comprend des bords présentant des rainures ou des sillons.

14. Toile en spirales jointes selon la revendication 1, dans laquelle l'insert de remplissage flexible est attaché ou fixé à la bobine hélicoïdale respective.

15. Toile en spirales jointes selon la revendication 1, dans laquelle l'insert de remplissage flexible a une forme continue ou discontinue.

16. Procédé pour fabriquer une toile en spirales jointes pour l'utilisation dans une machine à papier, comprenant les étapes suivantes :

d'arranger une pluralité de bobines hélicoïdales d'une façon prédéterminée de façon à ce que les bobines adjacentes et disposées côte à côte s'engrènent les unes dans les autres afin de former un canal ;
d'enfiler une broche dans chacun desdits canaux formés par les bobines hélicoïdales engrenées ;
procédé dans lequel au moins quelques-unes de la pluralité de bobines hélicoïdales présentent une largeur de bobine d'environ 12 mm ou davantage, mesurée en sens machine de la toile en spirales jointes, et
d'introduire un insert de remplissage flexible dans au moins une bobine hélicoïdale, l'insert de remplissage flexible étant capable d'être tiré à travers les une ou plusieurs bobines hélicoïdales.

17. Procédé selon la revendication 16, dans lequel chaque bobine hélicoïdale a une épaisseur de bobine associée, et dans lequel un rapport de l'épaisseur de la bobine à la largeur de la bobine, mesurée en sens machine de la toile en spirales jointes, est d'environ 0,5 ou moins.

18. Procédé selon la revendication 16, dans lequel les bobines hélicoïdales sont formées à partir de monofilaments ou de multifilaments qui présentent un revêtement.

19. Procédé selon la revendication 18, dans lequel les monofilaments sont circulaires, rectangulaires, ovales, aplatis ou présentent une autre forme non circulaire.

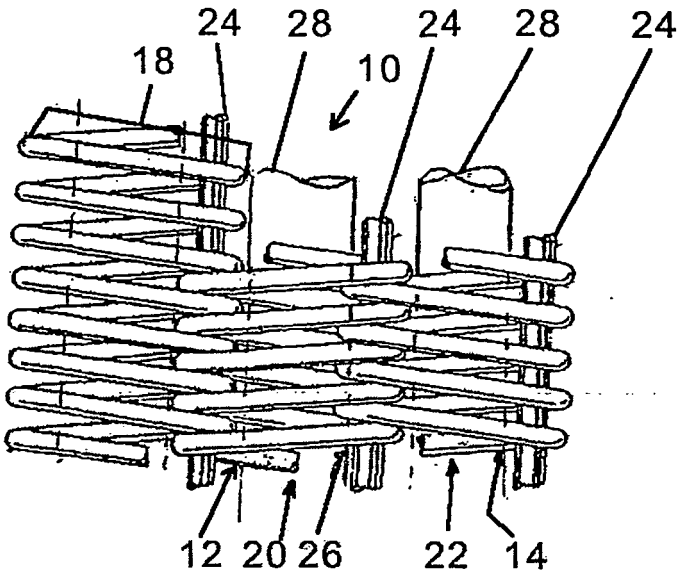

FIG. 1A

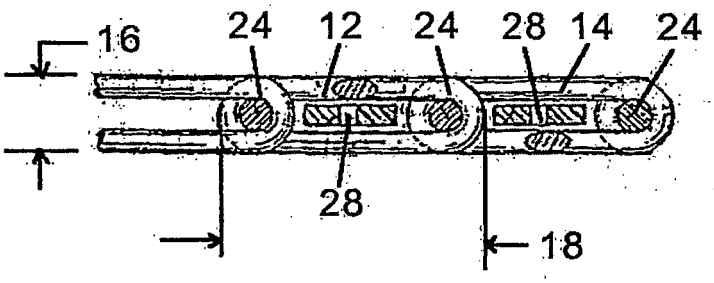

FIG. 1B

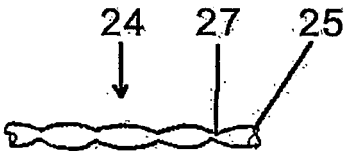

FIG. 2

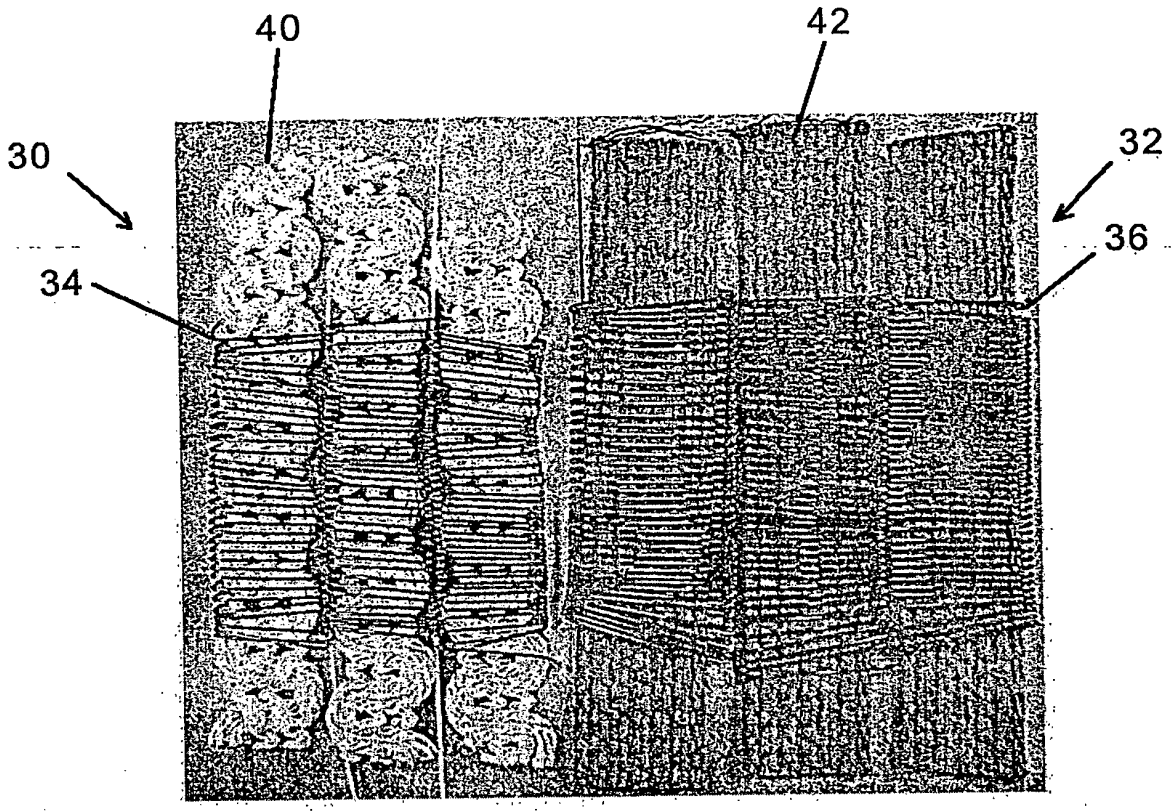

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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