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(12) # EUROPEAN PATENT APPLICATION

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(54) **Press belt or sleeve incorporating a spiral-type base carrier for use in long nip presses.**

(57) A belt for a long nip press is constructed of a nonwoven spiral-type base or carrier which is coated with a solidified urethane coating material. The urethane coating is at least coextensive with the upper and lower surfaces of the spiral-type base, and at least one surface of the coating is preferably spaced above a surface of the base so as to embed the base within the coating. The coating solidifies to form a unitary endless belt with the base embedded therewithin.

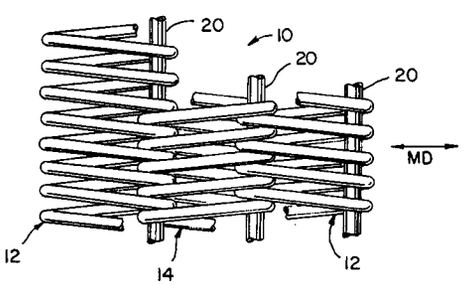

FIG. 1

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BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to an endless belt for use in a long nip press. More particularly, the invention relates to a press jacket used on a sleeve type of long nip press such as the Voith Flexonip press, or to belting used on a Beloit-type long nip press. Hereafter, such a press jacket or belting will be referred to as a belt.

A long nip press is used in a papermaking machine to dewater a fibrous web. The belt is typically used in combination with a felt, which functions to support the web between the belt and a cylindrical press roller. The belt is engaged by an arcuate pressure shoe, which includes a concave surface. The roller and the shoe cooperate to define a long nip through which the belt, felt and web pass to increase the dewatering of the web when compared to conventional nips on a papermaking machine.

Prior art long nip press belts have been constructed of a woven fabric coated and impregnated with a polymeric resin, such as polyurethane. Grooves may be formed in the outer surface of the belt for receiving water from the felt and web. Representative patents of this type include Dutt U.S. Patent 4,946,731; Stigberg U.S. Patent 5,196,092; Cronin et al International Publication No. W087/02080 (International Application No. PCT/US85/01953); Dutt U.S. Patent 5,234,551; and Dutt U.S. Patent 5,238,537.

It is an object of the present invention to advance the state of the art in long nip press belts by forming the belt of a nonwoven base or reinforcing material, which is impregnated and coated with a conventional polymeric resin material, such as polyurethane. It is a further object of the invention to provide a long nip press belt which is relatively simple to construct while providing significant advantages in operation.

The prior art has utilized a synthetic base structure woven on a textile loom using multiple sheds or harnesses. Typically, this structure is stabilized and seamed to form an endless base. The present invention teaches use of a non-woven synthetic base structure incorporating preformed loops joined with connecting rods to form a uniform endless base. Advantages offered by the invention include ease of manufacture in that preparation steps such as weaving and seaming are eliminated. Elimination of these process steps provides significant improvement in manufacturing flexibility. Additional benefits include improved uniformity and coatability of the base structure.

In accordance with the invention, a long nip press belt is formed of a nonwoven spiral-type base or carrier which defines a first surface and a second surface. The base includes a series of axially extending side-by-side spirals, each of which defines an internal space. The spirals are interconnected by a series of substantially parallel connection rods extending through the internal spaces of adjacent spirals. A polymeric resin coating is applied to the spiral base, and fills the internal spaces of the spirals. The polymeric resin coating extends at least coextensively with the first and second surfaces of the base. Preferably, the polymeric resin coating defines a first surface which extends past the first surface of the base. The coating further defines a second surface, which may either be coextensive with the second surface of the base or may extend past the second surface of the base. The base or carrier is thus embedded within the polyurethane material to form a continuous composite belt structure, functioning to reinforce the polyurethane material and to maintain the integrity of the material during use in a long nip press environment.

The invention further contemplates a method of making a long nip press belt, substantially in accordance with the foregoing summary.

Various other features, objects and advantages of the invention will be made apparent from the following description taken together with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

Fig. 1 is a plan view of a section of the spiral-type material which forms the base or carrier for the long nip press belt of the invention;

Fig. 2 is a schematic side elevation view showing the manner in which the long nip press belt of the invention is constructed;

Fig. 3 is a partial longitudinal section view through a portion of the long nip press belt of the invention constructed as in Fig. 2;

Fig. 4 is a view similar to Fig. 2, showing an alternative system for constructing a long nip press belt according to the invention;

Fig. 5 is a partial longitudinal section view through a portion of the long nip press belt of the invention constructed as in Fig. 4;

Fig. 6 is a schematic side elevation view of a long nip press in which the belt of the invention is employed; and

Fig. 7 is a schematic side elevation view of an alternative form of a long nip press in which the belt of the invention is employed.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 illustrates a section of a spiral-type base or carrier 10 which forms a part of the long nip press belt of the invention. The construction of base 10 is representatively illustrated in Gauthier U.S. Patent 4,567,077, the disclosure of which is incorporated by reference. This patent discloses use of the spiral-type material as a papermaking fabric which directly supports the web.

Base 10 is constructed of oppositely oriented axially extending spirals, shown at 12, 14. Spirals 12 are oriented in one direction, e.g. with their upper portions being inclined leftwardly, and spirals 14 are oriented oppositely, e.g. with their upper portions inclined to the right between spirals 12.

Spirals 12 and 14 extend along parallel longitudinal axes. Referring to Figs. 3 and 5, spirals 12 and 14 define longitudinally extending internal passages 16, 18, respectively. Spirals 12 and 14 are arranged to overlap each other, so that the end portions of internal spaces 16, 18 overlap. Connector rods 20 extend through the overlapping portions of spiral internal spaces 16, 18, to connect spirals 12 and 14 into a continuous mat.

Construction of a spiral structure as shown in Fig. 1 and described above is known in the art.

Referring to Fig. 2, base 10 is constructed into an endless belt according to conventional technology, and is positioned about a pair of rolls 22, 24. One of rolls 22, 24 is driven so as to provide movement of the top run of base 10 in a left-to-right direction.

A urethane coating apparatus, schematically shown at 26, is positioned over the upper run of base 10, and includes a nozzle 28 which deposits a coating of urethane, shown at 30, onto base 10. A stationary box 32, defining a planar upper surface, is located below nozzle 28, and the upper run of base 10 extends through a space between the upper surface of box 32 and nozzle 28, with the lower surface of base 10 engaging the upper surface of box 32.

Urethane coating 30 is applied to base 10 by nozzle 28 in a substantially uniform thickness throughout the width of base 10. When applied to base 10, the urethane material is in a substantially liquid state, and functions to flow into and completely fill passages 16, 18 of spirals 12, 14, respectively, to a depth such that the lower extent of urethane coating 30 is coextensive with the lower surface of base 10. Rolls 22, 24 are operated at a speed such that urethane coating 30 has set and hardened sufficiently when discharged from the upper surface of box 32 to form an integral, self-supporting sheet or mass with base 10 embedded therein. This process of applying urethane coating 30 to base 10 is continued while base 10 is moved by rolls 22, 24 until the entire extent of base 10 is coated with coating 30 to thereby form an integral, endless urethane belt 33 reinforced by base 10 embedded therewithin.

As noted previously, urethane coating 30 defines a lower surface, shown at 34, which is coextensive with the lower surface of base 10. Coating 30 further defines an upper surface 36 spaced above the upper surface of base 10. Representatively, base 10 has a thickness of approximately 0.08 inches, and coating 30 has a thickness of approximately 0.13 inches, leaving upper surface 36 of coating 30 approximately 0.05 inches above the upper surface of base 10. This thickness of coating 30 has been found to provide sufficient flexibility and strength to belt 33 to withstand use in a long nip press environment.

After coating 30 has been applied to base 10, upper surface 36 of coating 30 may be ground and polished in accordance with conventional technology.

Fig. 4 illustrates another arrangement for forming a long nip press belt according to the invention. In this arrangement, box 32 is positioned below the upper run of a pouring belt 38, which extends the entire width of base 10. Pouring belt 38 is trained about a series of rolls 40, one of which is driven to provide movement of pouring belt 38 below base 10 at the same rate of speed at which base 10 travels between rollers 22, 24. Base 10 and pouring belt 38 are arranged such that a space, shown at 42, is disposed between the lower surface of base 10 and the upper surface of belt 38.

A urethane coating 44 is applied to base 10 from nozzle 28. Coating 44 again functions to completely fill spaces 16, 18 in spirals 12, 14, respectively of base 10, and to pass through base 10 and space 42 into engagement with the upper surface of pouring belt 38. This results in a long nip press belt 45, as illustrated in Fig. 5. Belt 45 is constructed substantially identically to belt 33 of Fig. 3 in which base 10 is embedded within and reinforces urethane coating 44. In this embodiment, however, urethane coating 44 defines a lower surface 46 which is spaced below the lower surface of base 10. As in the embodiment of Fig. 3, the upper surface 48 of belt 45 is disposed above the upper surface of base 10. Representatively, coating 44 has a thickness of approximately 0.17 inches, and base 10 again has a thickness of approximately 0.08 inches. Upper surface 48 of belt 45 is disposed approximately 0.05 inches above the upper surface of base 10, and lower surface 48 of coating 44 is disposed approximately 0.04 inches below the lower surface of base 10. This thickness of coating 44 is sufficient to provide adequate strength and flexibility to belt 45 for use in a long

nip press environment.

Rollers 40 are configured and arranged relative to nozzle 28 to provide support for coating 44 while it sets and hardens after application from nozzle 28 so that, when coating 44 and base 10 are discharged from the rightwardmost roller 40, coating 44 forms a self-supporting sheet or mass with base 10 embedded therewithin. The process of applying coating 44 to base 10 is continued while base 10 is moved by rolls 22, 24 until the entire extent of base 10 is coated with coating 44.

Coatings 30, 44 may be any satisfactory elastomer such as conventional urethane as is available from Uniroyal Chemical Corp. under its designation Adiprene Ribbon Flow. Alternatively, any satisfactory elastomer such as is known to those of ordinary skill in the art could be employed to form coatings 30, 44. Coatings 30, 44 are impervious and flexible, and have a sufficient hardness to withstand use in a long nip press environment. Representatively, coatings 30, 44 have a hardness of approximately 95 (shore A).

Referring to Fig. 6, belts 33, 45 are adapted for use in a long nip press, shown generally at 50. The press nip includes a cylindrical press roll 52, an arcuate pressure shoe 54, and belts 33, 45 constructed as described above disposed against pressure shoe 54 between shoe 54 and roll 52. A rod 56 is pivotably mounted to pressure shoe 54 for applying the desired pressure to shoe 54.

A papermaker's wet press fabric 58 supports a fibrous web 60, being processed into a paper sheet. Fabric 58 and web 60 pass through long nip press 50 between roll 52 and the belt, such as 33, 45, for extracting water from web 60. The construction and arrangement of the elements of press 50 are conventional in the art.

Belt 33 is arranged in press 50 such that its upper surface 36 is disposed against pressure shoe 54, in order to provide maximum wear resistance to belt 33. In this construction, the lower surface of base 10 bears against fabric 58. Belt 45 is preferably oriented with its upper surface 48 bearing against supporting fabric 58 and its lower surface 46 bearing against pressure shoe 54. The presence of urethane material between lower surface 46 and the lower surface of base 10 provides resistance to wear imparted to belt 45 from pressure shoe 54. Belt 45 may have its upper surface 48 grooved, drilled or otherwise patterned, as is known in the art, to provide additional void volume for water removal during processing.

Fig. 7 illustrates an alternative construction of a long nip press 62 in which belts 33, 45 constructed according to the invention are employed. As in press 50 of Fig. 6, press 62 includes a cylindrical press roll 64, an arcuate pressure shoe 66, and belts 33, 45 constructed as described above disposed against pressure shoe 66 between shoe 66 and roll 64. A rod 68 is pivotably mounted to pressure shoe 66 for applying the desired pressure to shoe 66.

A fibrous web 70, being processed into a paper sheet, is disposed between a pair of papermaker's wet press fabrics 72, 74. Fabrics 72, 74, web 70 and the belt, such as 33, 45, move upwardly through the nip between roll 64 and pressure shoe 66, for extracting water from web 70. The construction and arrangement of the elements of press 62 are conventional in the art.

Belts 33, 45 are arranged in press 62 in the same manner as described above with respect to press 50.

Base 10 is oriented within belts 33, 45 such that connector rods 20, and the longitudinal axes of spirals 12, 14, extend perpendicularly to the machine direction of presses 50, 62, as illustrated in Fig. 1. With this arrangement, the segmental construction of base 10 provides flexing of base 10 as belts 33, 45 are trained about the roll of long nip presses 50, 62 and about the upper surface of pressure shoes 54, 66.

Various alternatives and embodiments are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter regarded as the invention.

Claims

1. An endless, impervious belt for a long nip press, comprising:

a nonwoven spiral-type base defining a first surface and a second surface and including a series of axially extending side-by-side spirals, each spiral defining an internal space, wherein the spirals are interconnected by a series of substantially parallel connector rods extending through the internal spaces of adjacent spirals; and

a polymeric resin coating applied to the spiral base, the polymeric resin coating filling the internal spaces of the spirals and extending at least coextensively with the first and second surfaces of the base.

2. The belt of claim 1, wherein the polymeric resin coating extends past at least one of the first and second surfaces of the base.

3. The belt of claim 2, wherein the polymeric resin coating extends past both the first and second surfaces of the base.

4. The belt of claim 1, wherein the spiral-type base is oriented such that the longitudinal axes

of the spirals and of the rods extends substantially perpendicular to the machine direction of the belt.

5. An endless, impervious belt for a long nip press, comprising:

an endless polymeric resin belt defining a first surface and a second surface; and

a nonwoven spiral-type carrier embedded within the belt, the carrier including a series of axially extending side-by-side spirals, each of which defines an internal space, wherein the spirals are interconnected by a series of substantially parallel connector rods extending through the internal spaces of adjacent spirals, the carrier defining a first surface and a second surface, and wherein the first and second surfaces of the belt are at least coextensive with the first and second surfaces, respectively, of the carrier.

6. The belt of claim 5, wherein the first surface of the carrier is disposed inwardly of the first surface of the belt.

7. The belt of claim 6, wherein both the first and second surfaces of the carrier are disposed inwardly of the first and second surfaces, respectively, of the belt.

8. A method of making an endless, impervious belt for a long nip press, comprising applying a polymeric resin coating to a nonwoven spiral-type base, the base comprising a series of axially extending side-by-side spirals, each of which defines an internal space, wherein the spirals are interconnected by a series of substantially parallel connector rods extending through the internal spaces of adjacent spirals, wherein the polymeric resin coating fills the internal spaces of the spirals and extends at least coextensively with the first and second surfaces of the base.

9. The method of claim 8, wherein the step of applying the polymeric resin coating comprises applying the coating such that the coating extends past at least one of the first and second surfaces of the base.

10. The method of claim 9, wherein the step of applying the polymeric resin coating comprises applying the coating such that the coating extends past both the first and second surfaces of the base.

11. An endless, impervious belt for a long nip press, comprising a spiral-type carrier embedded within a polymeric resin base, wherein the carrier comprises a series of axially extending side-by-side spirals, each of which defines an internal space, wherein the spirals are interconnected by a series of substantially parallel connector rods extending through the internal spaces of adjacent spirals, and wherein the belt is formed by applying the polymeric resin coating to the base such that the coating substantially fills the internal spaces of the spirals and extends at least coextensively with the first and second surfaces of the base.

12. The belt of claim 11, wherein the polymeric resin coating is applied to the base such that the coating extends past at least one of the first and second surfaces of the base.

13. The method of claim 12, wherein the polymeric resin coating is applied to the base such that the coating extends past both the first and second surfaces of the base.

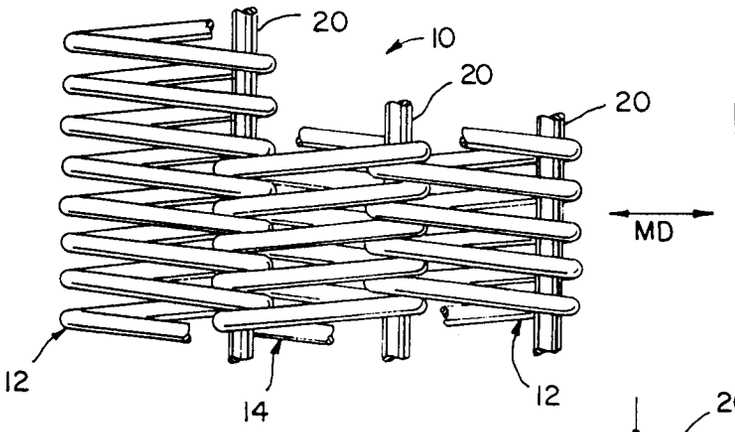


FIG. 1

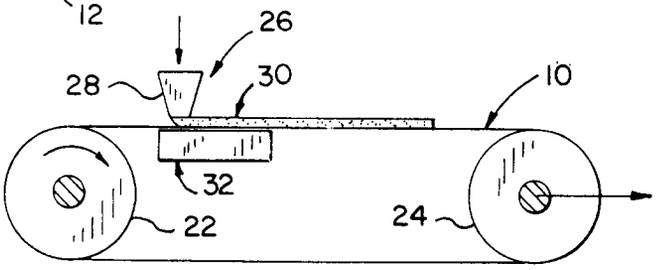


FIG. 2

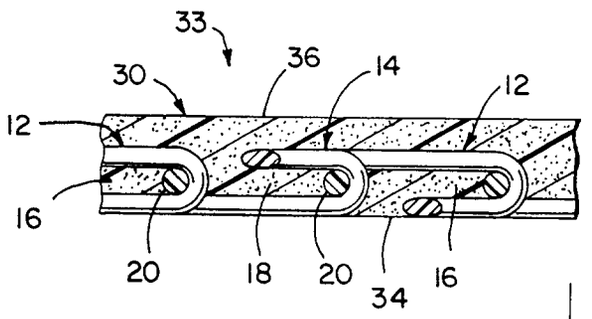


FIG. 3

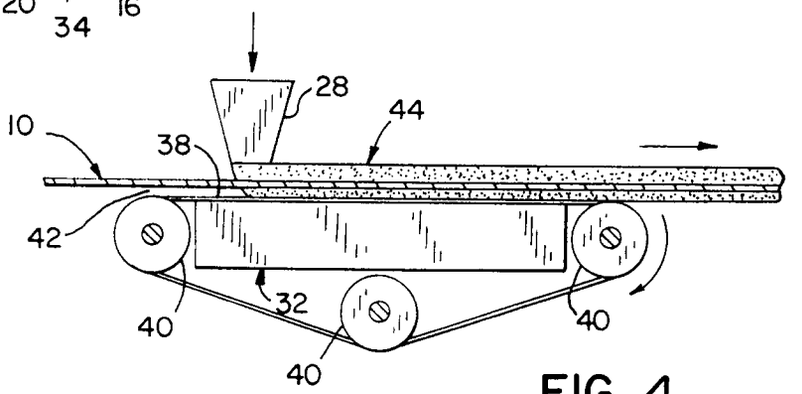


FIG. 4

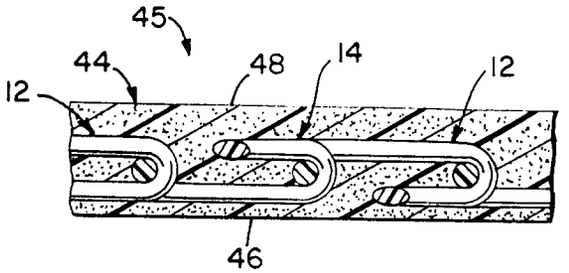
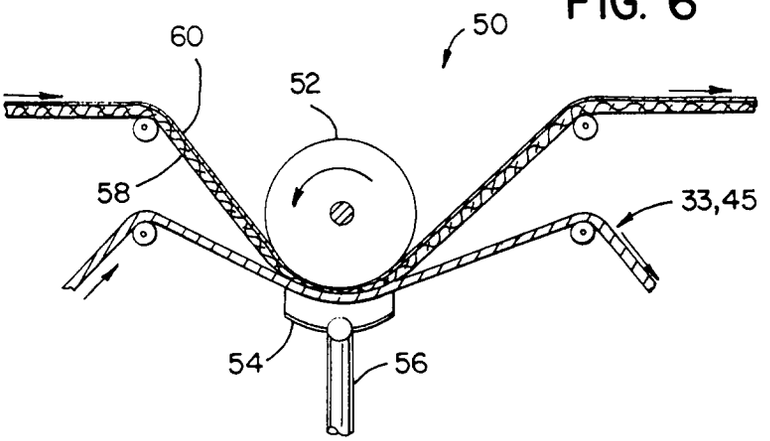


FIG. 5

FIG. 6



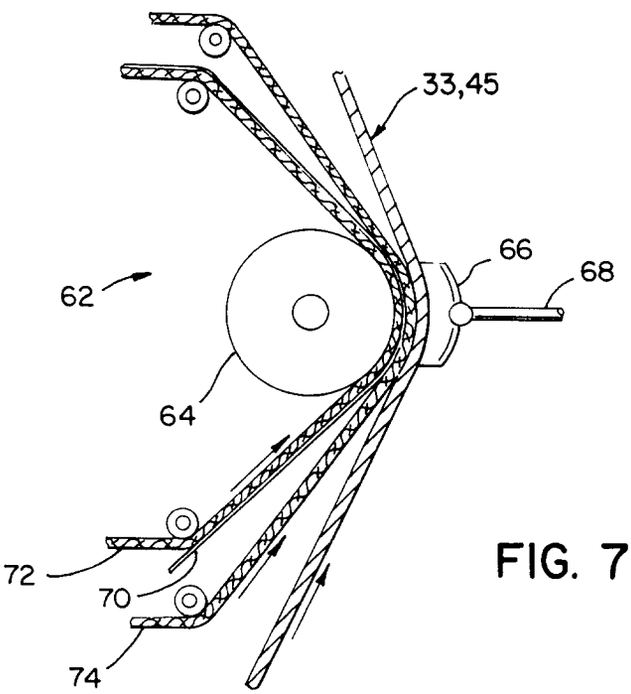


FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 10 2947

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP-A-0 396 036 (HEIMBACH) * the whole document *	1,2,4-6, 8,9,11, 12	D21F3/02 D21F1/00
A	US-A-4 675 229 (WESTHEAD) * the whole document *	1,2,4-6, 8,9,11, 12	
A	EP-A-0 414 629 (BELOIT)		
A	EP-A-0 325 134 (OBERDORFER)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D21F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 December 1994	De Rijck, F

CATEGORY OF CITED DOCUMENTS

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