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(71) Applicant: **ALBANY INTERNATIONAL CORP.**
1 Sage Road
Menards New York 12201(US)

(72) Inventor: **Dutt, William H.**
Van Winkle Drive R. D. 1
Rensselaer, N.Y.(US)

(74) Representative: **Speidel, Eberhardt**
Postfach 1320 Waldpromenade 26
D-8035 Gauting(DE)

(54) Papermaking felt with a smooth inner surface and a method of making the same.

(57) A belt (16) is disclosed having a base fabric (34) which has been impregnated by or immersed into a polymer material (36) so that it has a smooth inner surface (16'). The belt (16) is used to form an extended press nip (10) for dewatering a paper web (24). The press nip (10) is formed by forcing a stationary shoe (14) against the inner surface of the belt (16).

The belt (16) is preferably made by mounting a base fabric (34) on the inner mandrel (40) of a cylindrical mold - (38) and injecting an appropriate material in the mold. After the material is properly dispersed through the base fabric, it is cured.

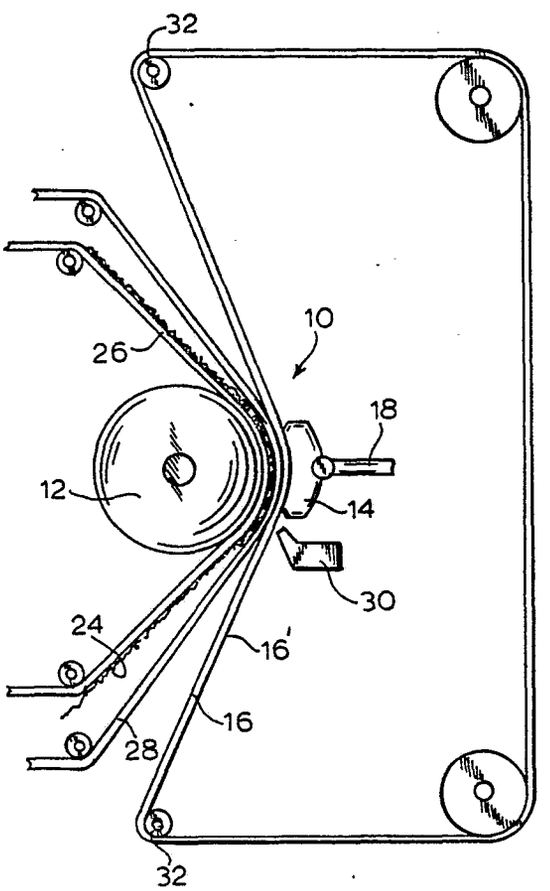


FIG.1

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A PAPERMAKING BELT WITH A SMOOTH INNER SURFACE AND A METHOD OF MAKING THE SAME

BACKGROUND OF THE INVENTION

1. Field of Invention

The field of the invention relates to impermeable belts with smooth inner surfaces and more particularly to a belt used in an extended press nip for dewatering a fibrous web formed in a papermaking machine.

2. Decription of the Prior Art

During the papermaking process, a web is formed by depositing a fibrous slurry on a forming wire. A large amount of water is drained from the slurry during this process, after which the newly-formed web proceeds to a press section. The press section includes a series of press nips. The web finally proceeds to a drying section including heated dryer drums where the water content is reduced to a desirable level.

In view of the high cost of energy, it is desirable to remove as much water as possible from the web prior to its entering the drying section. The dryer drums in this section are often heated by steam and costs can be substantial if a large amount of water needs to be removed.

The use of extended press nips has been found to be advantageous over the use of nips formed by pairs of adjacent rollers. By extending the time the web is subjected to pressure in the nip, a greater amount of water can be removed. This fact has been recognized by those skilled in the art, and several patents have been granted in the area. These patents include Re. 30,268, 4,201,624, 4,229,253 and 4,229,254.

In using extended press nips to dewater a fibrous web, the web has typically been sandwiched between two moisture absorbing felts and a belt. The felts are trained around a cylindrical press roll with the web between them while the belt is arranged for applying pressure to the felts and roll. A pressure shoe exerts pressure on the belt in the press area.

The belt is provided with a very smooth surface for contacting the shoe so that it can transfer pressure to the felts and the fibrous webs without overheating or wearing away. Furthermore the belt must be impermeable to oil used to lubricate its passage over the shoe which could contaminate the felts and the web. Heretofore the belt was made by applying a polymer coating to the outer surface of an endless fabric. Since the belt is arranged so that its inner surface is the shoe-contacting surface, the endless coated fabric is then reversed (i.e. turned inside out). While this procedure was satisfactory for belts having a length of 24 feet or more, it has been found that it is difficult to reverse belts having a length of less than 24 feet. Furthermore it was found that it was difficult to apply the coating to the outer surface of shorter belts.

OBJECTIVES AND SUMMARY OF THE INVENTION

An objective of the present invention is to provide a relatively short belt with a smooth inner surface, adapted to be used in an extended press nip.

Another objective is to provide a belt which is impermeable to oil.

A further objective is to provide a method of producing the above-mentioned belt.

Other objectives and advantages shall become apparent from the following description of the invention. According to this invention a belt is constructed of an endless base fabric embedded in a polymeric substance formed with a smooth, frictionless inner surface. The belt is made by providing a mandrel with a smooth outer surface, placing the endless base fabric on said mandrel covering with an outer shell, and then impregnating the base fabric with a polymer. As the polymer solidifies the outer surface of the mandrel forms a smooth inner polymer surface.

Brief Description of the Drawings

Figure 1 is a side elevational view of an extended press nip employing the belt constructed according to the invention;

Figure 2 is a partially sectional front view of the press nip shown in Figure 1;

Figure 3 is a sectional side elevational view of the belt employed in the invention; and

Figure 4 is a partial sectional side view of the apparatus used to produce the belt constructed in accordance with the invention.

Detailed Description of the Invention

An extended press nip is provided by the invention for dewatering a travelling web of material. The nip 10 is defined by a cylindrical press roll 12, a pressure shoe 14 having an arcuate surface facing the press roll, and a belt 16 arranged such that it bears against the surface of the press roll. The arcuate surface of the pressure shoe has about the same radius of curvature as the press roll. The distance between the press roll and the pressure shoe may be adjusted by means of conventional hydraulic or mechanical apparatus (not shown) connected to a rod 18 pivotally secured to the shoe 14. The rod may also be actuated to apply the desired pressure to the shoe. It will be appreciated that the pressure shoe and press roll described above as shown in Figures 1-2 are conventional and that other arrangements are also well known in the art.

Paper web 24 is carried to and away from the nip by a first felt 26. A second felt 28 is used to absorb the water expressed from web 24 in the nip.

A lubricating means 30 is used to apply a lubricant such as oil to the inner surface 16' of belt 16 to further reduce friction between said inner surface and shoe 14. The belt is entrained by rollers 32 used to drive the belt in a predetermined path as shown.

The belt 16 employed in accordance with the invention is shown in detail in Figure 3. It has proven to be superior to belts currently known to the art both from an operational standpoint and for manufacturing considerations. The belt 16 comprises a base fabric 34 which is impregnated with a polymeric material 36. Thermosetting resins such as polyurethanes have been found to be suitable impregnating materials. Preferably a 100% polyurethane resin should be used to avoid formation of bubbles during the curing of the belt structure. Thermoplastic polymers such as polypropylene are also acceptable.

The base fabric 34 is sufficiently open to allow total impregnation. This eliminates the possibility of any voids forming in the final fabric which would allow the lubrication used between the belt and shoe to pass through the belt and contaminate the felt and fibrous web. It is endless in final construction and uniform in thickness. The fabric must also be made to have sufficient stability under paper machine conditions. In other words, it must have length stability, width stability, and guideability.

The base fabric may comprise a single or multi-layered flat woven fabric which has been heat stabilized and joined using normal joining techniques. The base fabric may be made of polyester or other polymeric materials having the necessary properties in accordance with the invention. The base may be made endless by endless weaving also.

At least one of the sides or surfaces of the belt, such as side 16', is smooth for contacting the pressure shoe 14.

Belts manufactured in accordance with the invention have been found to have many desirable characteristics. They move easily over the pressure shoe and are capable of transmitting pressure from the shoe to the web and press roll. Sufficient flexibility is obtained, and the belts have proven to be unaffected by lubricant applied prior to entering the press nip.

The belt is manufactured in a cylindrical mold 38 - (Figure 4) with an outer shell 39 and a concentric mandrel 42. The mandrel is provided with a smooth outer surface 40. The spacing between the outer shell 39 of the mold and the inner mandrel determines the thickness or caliper of the belt. The base fabric 32 is first placed on the smooth mandrel surface 40 and then the mold 38 is hermetically sealed with cover 44. Next, the pressure within the mold is reduced by substantially removing the air contained therein via a pipe 46 connected to a vacuum source (not shown). After the pressure within the mold has been reduced, an appropriate polymer is injected into the mold through pipe 48. Because of the low pressure inside the mold, the polymer quickly fills the mold including the interstices of the fabric. Advantageously, a smooth inner polymer surface is formed along the mandrel surface 40. The polymer is cross-linked by applying heat to the mold. After the polymer has cured the fininshed belt may be removed from the mold.

Alternatively a polymer catalyst mixture may be used which is self cross linking if left undisturbed several hours.

The resulting belt is shown in Figure 3, with the fabric 34 being fully impregnated with and impermeable to oil and other substances. The belt has a uniform caliper as a result of the molding operation.

Numerous modifications can be made to the invention without departing from its scope as defined in the appended claims.

Claims

1. An endless belt for use in a papermaking extended press nip comprising:

an endless base; and

impregnating material penetrating said fabric to form a smooth inner surface thereon.

2. The endless belt of claim 1 wherein said base comprises a woven fabric.

3. The endless belt of claim 1 wherein said material is a polymer.

4. The endless belt of claim 3 wherein said material is applied to said base in a continuous fashion to render said belt impermeable.

5. The endless belt of claim 4 wherein said material is applied by disposing said base on a mandrel with a smooth outer surface and causing said material to deposit on said mandrel and base.

6. A method of producing an endless belt with a smooth inner surface comprising:

providing a cylindrical mold with a smooth mandrel and an outer shell;

disposing an endless base within said mold on said mandrel; and

injecting an impregnating material into the mold.

7. The method of claim 6 wherein the mold is evacuated prior to the injection of said material to force said material to penetrate said base.

8. The method of claim 7 wherein said material is a polymer, said base is a woven fabric, further comprising heating said mold to cross-link said material to said base.

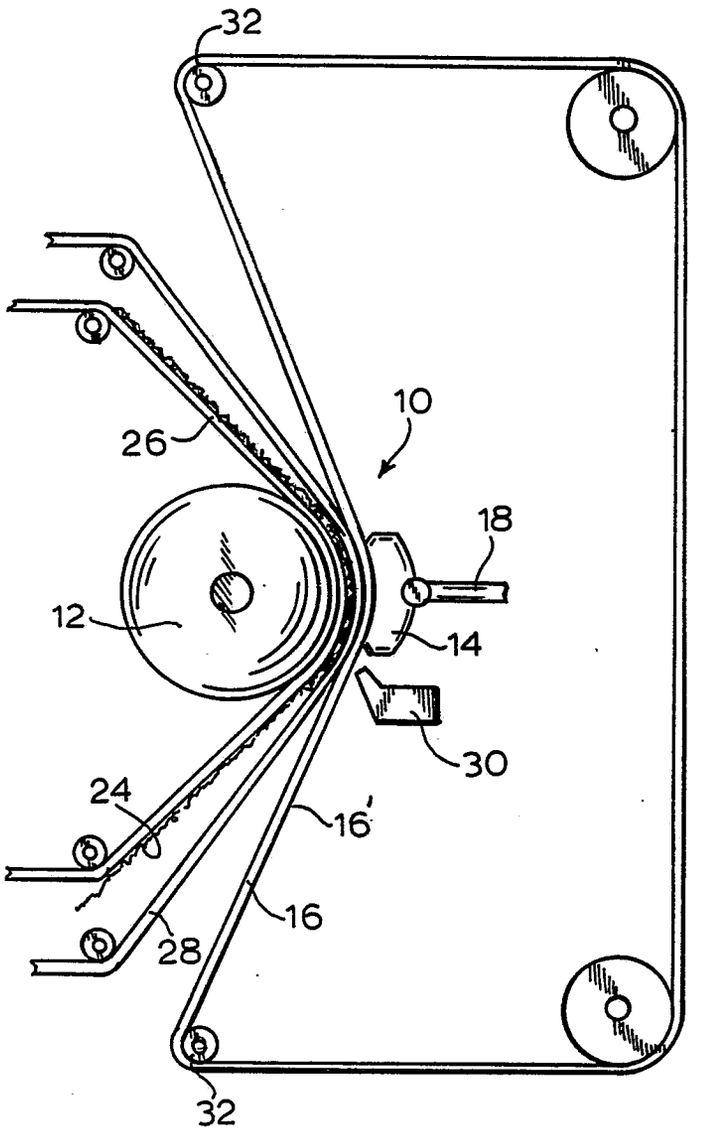


FIG.1

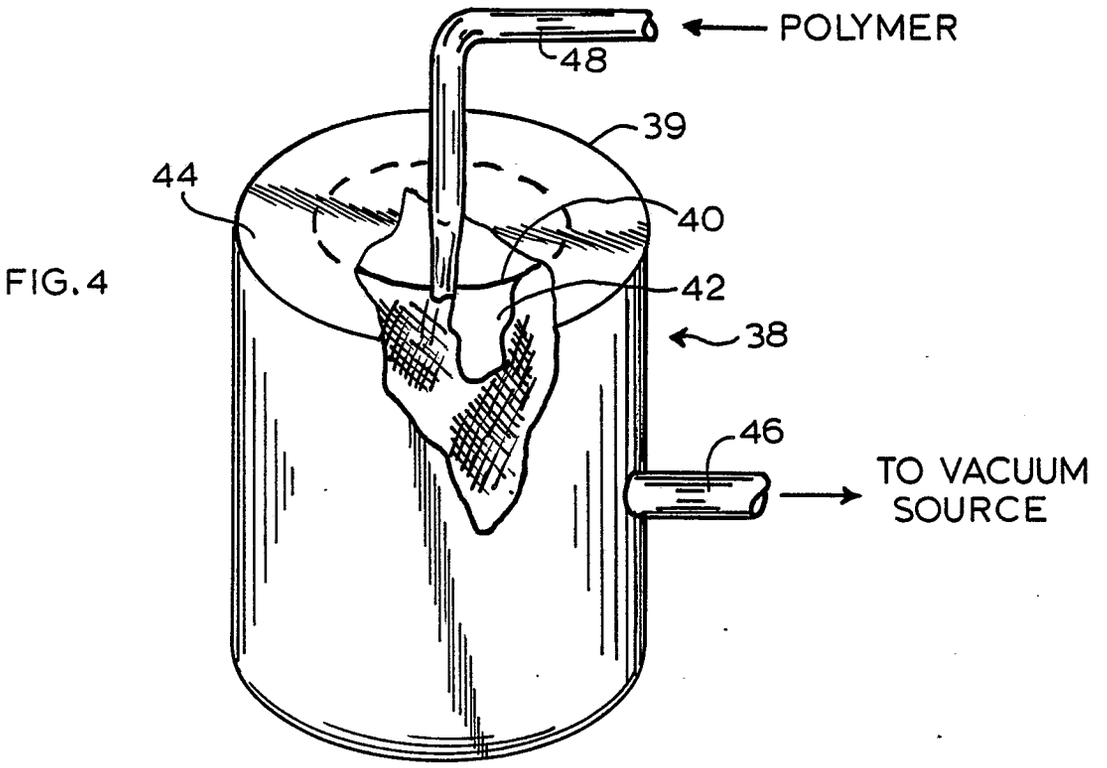


FIG. 4

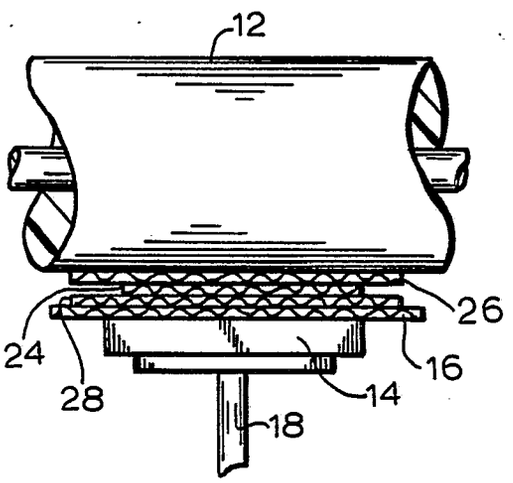
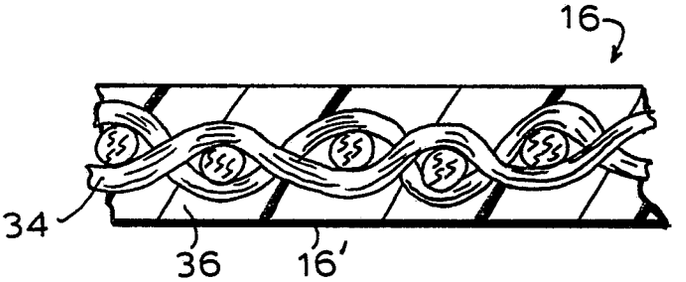


FIG. 2

FIG. 3



European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 10 3042

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.4)
X	DE-A-3 318 984 (OBERDORFER) * Whole document *	1-6,8	D 21 F 3/02
X	GB-A-2 106 557 (ALBANY) * Whole document *	1-4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 21 F
F 26 B
B 30 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-04-1986	DE RIJCK F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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