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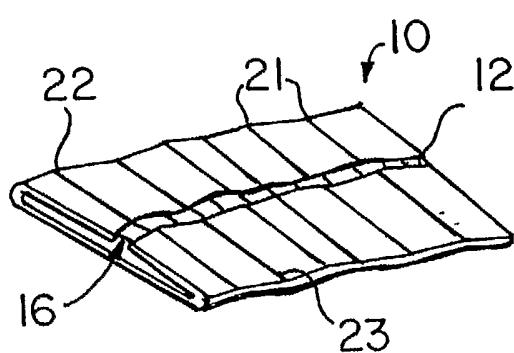
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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(54) Title: ROLL OF PAPERBAND



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portions (41, 42). An adhesive (20, 46, 47) coats the outer surface thereof when the paperband (10, 31, 38) is used for baling.

(57) **Abstract:** Roll of paperband (10, 31, 38) usable in paper web cutting and turn-up systems or in baling includes an elongate multi-ply board (11) having a center portion (14, 45) and side portions (13, 32, 33, 39, 40), each having an inside and outside edge portion and the inside edge portion being defined by a longitudinal first groove (15, 34, 35, 44). Each side portion (13, 32, 33, 39, 40) is folded to dispose same in contact with center portion (14, 45). The paperband (10, 31, 38) includes upper and lower transverse undulations (21) to enable the board to be formed into a roll of paperband (10, 31, 38) without materially affecting its tensile strength. The side edge portions (13, 32, 33, 39, 40) may be located closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness (16, 36, 48, 49) is formed therebetween or may overlap and render weakened edge

ROLL OF PAPERBAND

TECHNICAL FIELD

This invention relates to a roll of paperband wherein the paperband includes longitudinal indentations and transverse undulations to create a corrugated structure to control stiffness and flexibility of the band as desired.

BACKGROUND ART

It is a common practice in the papermaking and packaging industries to employ a paperband or strap that is loaded into a channel of a track assembly and then removed rapidly out of the channel and employed to cut and spool a web of paper onto an empty spool or to be used to wrap around and secure a load, container or a bundle of material. Because the paperband should be stiff enough to be pushed into the channel from one end thereof, the band may twist or otherwise be distorted or separated during upward movement that is accomplished by a "stripping" action during removal from the paperband track assembly. This becomes a very important consideration in those applications where the width of the channel opening is made less than the width of the band or tape and the lower tape-carrying guide way of the channel in order to cover and carry the tape. An improved paperband is disclosed herein that greatly reduces the distortion and crimping common to prior art paperbands, reduces the wear on the guide way channel and its cover, and also reduces the separation of layers in some bands made from multiple layers.

Examples of the prior art include U.S. Patent No. 5,816,526, which discloses multiply folded strip held together by adhesive. U.S. Patent No. 3,126,312 discloses a plurality of elongate members aligned in a plane and held together by adhesive. U.S. Patent No. 4,414,258 discloses a woven ribbon made of flat strips and weft filaments, which are held in place by adhesive.

U.S. Patent Publication No. 2004/0131825 A1 (July 8, 2004) discloses a strap constructed of a double layer of elongated paper elements secured with adhesive on at least a portion of the strap.

None of the above-described paper devices is satisfactory for use in a paperband track assembly beneath wide paper machines for the reason that they do not have the required stiffness for such use.

DISCLOSURE OF THE INVENTION

In one aspect of the present invention there is provided a roll of paperband adaptable for use in paper web cutting and turn-up systems or for use in baling, the paper-

band comprising an elongate multi-ply board having upper and lower surfaces, and a center portion and spaced reduced side portions, each side portion having an inside edge portion and an outside edge portion, each inside edge portion being defined by an elongate longitudinal first groove between the center portion and respective side portion. Each side portion is folded about the respective groove to dispose each side portion in contact with an adjacent portion of the center portion. The side edge portions are located generally medially of the center portion. The paperband includes transverse undulations to enable the multi-ply board to be formed into a roll of paperband without materially affecting its tensile strength. The side edge portions are located closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness is formed therebetween. An adhesive layer is located between each side edge portion and the center portion. An adhesive coating may be located on one surface or both surfaces of the paperband when the paperband is used for baling, depending on the type of adhesive. The undulation parameters are defined by and chosen to increase or decrease stiffness and stretchability. The undulations are provided on the upper and lower surfaces of the paperband. The adhesive layer is water-soluble. The side edge portions are in abutment with each other when said paperband is used for baling.

In another aspect of the present invention there is provided a roll of paperband adaptable for use in paper web cutting and turn-up systems or for use in baling, the paperband including an elongate multi-ply board having upper and lower surfaces, and a center portion and spaced reduced side portions, each side portion having an inside edge portion and an outside edge portion, each inside edge portion being defined by an elongate longitudinal first groove between the center portion and respective side portion, each side portion being folded about respective groove to dispose each side portion in contact with an adjacent portion of the center portion. The side edge portions are located generally medially of the center portion to be located closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness is formed therebetween to provide for longitudinal bending of the paperband about the line of weakness when the paperband is pulled from a track assembly. The paperband includes transverse undulations to enable the multi-ply board to be formed into a roll of paperband without materially affecting its tensile strength. There is also a coating of adhesive for securing the folded side portions to the center portion. The board includes several plies formed of cellulose fibers. The side edge portions preferably are in abutment with each other when the paperband is used for baling. The corrugations are formed to shorten the length of the paperband to provide a

shock-absorbing function to minimize tearing of the paperband when tensile force is applied to the paperband.

In a further aspect of the present invention a roll of paperband adaptable for use in paper web cutting and turn-up systems or for use in baling, the paperband being formed of an elongate multi-ply board having upper and lower surfaces, and a center portion and spaced reduced side portions, each side portion having an outside edge portion, each side portion being folded to dispose each side portion in contact with an adjacent portion of the center portion, the outside edge portions being located generally medially of the center portion. The paperband includes transverse undulations to enable the multi-ply board to be formed into a roll of paperband without materially affecting its tensile strength. The outside side edge portions are located closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness is formed therebetween.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an end diagrammatic exploded view of a first embodiment of the paperband in accord with the present invention;

FIG. 2 is a perspective view of the paperband of FIG. 1;

FIG. 3 is an enlarged side diagrammatic view of the paperband of FIG. 1;

FIG. 4 is a cross-sectional view of a prior art track assembly usable with the paperband of the present invention;

FIG. 5 is a side diagrammatic view of a roll of paperband in accord with the present invention;

FIG. 6 is an end diagrammatic view of a second embodiment of a paperband in accord with the present invention;

FIG. 7 is an end diagrammatic view of a third embodiment of a paperband in accord with the present invention illustrating the generally S-shaped folding; and

FIG. 8 is a greatly enlarged view of one end of the paperband of FIG. 7 after being pressed into final form.

BEST MODES FOR CARRYING OUT THE INVENTION

INTRODUCTION

The paperband disclosed herein is formed of a multi-ply board made by a multi-ply board machine with a chemical composition, weight and thickness selected for a particular application. As a general proposition however, the high degree of stiffness of a multi-ply board does not allow of a turn-up paperband cutting tape.

The present paperband includes a series of staggered transverse indentations, undulations or formations that result in a "corrugated" profile and provide the desired flexibility without a significant sacrifice of overall strength.

The lengthwise extent of the transverse indentations or undulations provides for a level of shock-absorbing capability because a slight stretching of the paperband can occur when high tensile forces are applied during rapid removal of the band from a turn-up track assembly or in strapping applications such as baling.

As understood in the papermaking art, paper and paperband can be made in a manner to provide greater strength in the longitudinal direction represented by the direction of the paper through the papermaking machine. The present paperband employs board of 8 to 30 points and is stronger in the machine direction lengthwise than cross-machine direction by about 5:1. Preferably, the board is made of several plies formed of cellulose fibers bonded together and is manufactured on a multi-ply board machine.

The paperband in a first embodiment is formed from a length of board by feeding the board through rollers to provide two spaced longitudinal scores or creases along the length of the board. Adhesive is applied to the upper surface between the scores or creases. The board is then folded by a forming die at the creases so that the side edges are folded inwardly and are closely adjacent each other or even in an abutting relationship over the medial line which may be scored longitudinally at the same time as the creases are formed and pressed to fix the adhesive. Then the board is fed through rollers to corrugate the board transversely. The joint between the outside edges--which may be a small gap--provides for the desired bending medially when the paperband is pulled from a track assembly and such bending may be enhanced by a score line therealong. In a second embodiment, the adhesive may be applied to the entire upper surface (see FIG. 6) or in a third embodiment to opposed surfaces of the foldable edge portions beyond the creases (see FIG. 7).

CONSTRUCTION

With respect now to the drawings, the paperband includes multi-ply board 11 folded to form gap 12. Spaced pair of side grooves or creases 15 and a medial longitudinal line or narrow area of weakness 16 is formed by spaced side portions 13 and parallel medial portions 14 forming gap 12. An interior surface 17 has an interior adhesive coating 19 thereon which holds the paperband together. An exterior surface 18 may have a heat or water-activated adhesive coating 20 if the paperband 10 is used for baling. If PVA is used

for sealing the band, then the entire exterior surface 18 is preferably coated with adhesive coating 20 (as shown by dotted line 20A in FIG. 1). See, for example U.S. Patent No. 6,363,689. The dimensions of the paperband 10 are exaggerated for purposes of illustration.

Transverse undulations or corrugations 21 are created to provide the desired flexibility and may be a wave-like or "sine wave" or any other form that may be appropriate depending upon the use to be made of the paperband 10. Preferably, the roll 29 (FIG. 5) is carried in a closed "loop box" (not shown) and may stow a large quantity of paperband 10 or 31, each of which have transverse corrugations. The confined space of the box would severely limit the amount of paperband that can be carried if the paperband did not have the flexibility that results from the transverse corrugations 21 that are created.

Preferably, corrugations 21 are created as shown in FIG. 2 after the band 10 has been folded as shown in FIG. 1. The corrugations 21 allow for a slight elongation of the band 10 when under tension and provide a "shock absorber" function. Transverse score lines likely would weaken the tensile strength of the band 10 and thus is not encompassed by this invention.

FIGS. 2 and 3 are views of the paperband having transverse undulations or corrugations 21 to create respective ridges or hills 22 and grooves or valleys 23 to create a corrugated structure of the band 10.

FIG. 4 illustrates a prior art track assembly 24 having a paperband carrier 25 formed with a channel 28, two side guide shoulders 27 in grooves 26.

FIG. 5 is a side diagrammatic view of paperband 10, 31 or 38 wound in a roll 29 around center core 30.

FIG. 6 illustrates a second embodiment of the paperband 31 having partially overlapping side portions 32, 33 defined by longitudinal score lines 34, 35 and edges 37. The section of the paperband 31 between the side portions 32A, 33A do not overlap, form longitudinal lines or narrow areas of weakness 36 since the edge portions are two layers of the multi-ply material which the center portion has three layers of the material and permit bending along 36 of the paperband 31 during turn-up or other uses.

In FIG. 7, a third embodiment of a paperband 38 includes side portions 39 and 40 and a medial or center portion 45 folded to form a generally S-shape. The side portion 39 is folded about longitudinal score line 43 forming a "soft bend" 41. The other side portion 40 is similarly folded about longitudinal score line 44 to form a "soft bend" 42. Areas of weakness or flexible joints 48 and 49 are created during the transition from three layers to

two layers. Adhesive layers 46 and 47 are shown on opposed surfaces of the paperband 38, i.e., an upper surface of side portion 39 and a lower surface of side portion 40. Alternately, the adhesive 46, 47 may be applied simultaneously to both surfaces of center portion 45. This method may be accomplished by feeding the unfolded paperband board vertically to permit the adhesive 46, 47 to be sprayed on or otherwise applied to center portion 45 by any appropriate technology.

The performance of paperband 38 is similar to that of paperbands 10, 31 in track pullout by way of flexing at joints 48 and 49. After pressing to fix the adhesive 46, 47, the desired transverse undulations are formed as in the other embodiments previously described. The soft bends 41 and 42 are formed in the manner described to provide the paperband 38 with substantially planar outer surfaces as the ends 50, 51 transition more smoothly with adjacent portions of soft bends 41, 42 to create relatively flat sides for the paperband 38 (FIG. 8). In other words, the three-layer center portion of the multi-ply board are compressed by uniformly spaced apart rollers and the two-layer edge portions are compressed at the same time but only to the thickness determined by the three-layer center portion. In addition, the soft bends 41, 42 also increase tear resistance in the transverse or crosswise direction of the paperband.

The preferred paperbands 31 and 38 provide for the use of thinner multi-ply board (for the same bulk) than other embodiments. This derives from the higher strength/density of the thinner board. The horizontal and vertical symmetry of the completed band is also preferred. The folded edge portions provide for the "flexing" or bending during turn-up and also provide for high resistance to cross-wise tearing of the band and reduced fiber damage during compression-forming of the band. The thinner board also allows for more footage at the same diameter thus providing for fewer splices of the band.

The undulating or wave-like formations of the paperbands are defined in terms of parameters including height, width and number per unit elongate length and are the result of the use of rollers or any other appropriate apparatus. The creation of the corrugations or undulations 21 causes a selectable shortening of the paperband 10 that provides a shock absorbing capability when tensile force is applied to the paperband 10 when it is stripped out of track assembly 24 during turn-up or when being pulled tightly during a baling operation.

In baling pulp it is common for the bale to "grow" or become enlarged as it absorbs moisture from its surroundings. An additional benefit of the corrugations of the band is that it allows for growing of the bale without considerably affecting the overall strength of the

band under the circumstances. The size, shape and number of the corrugations can be varied to adjust the stretchability and/or stiffness of the band as desired in a specific application.

The preferred methodology of forming the paperband 10 is as follows:

- A. The score or crease lines 15 are formed.
- B. Adhesive is applied to the center portion 14 between the scores 15 (not preferred adhesive applied to side portions 13).
- C. The side portions 13 are folded over by a forming die.
- D. The side portions 13 are then pressed onto the medial portions 14 to fix the adhesive.
- E. Transverse corrugations 21 are formed in the paperband.

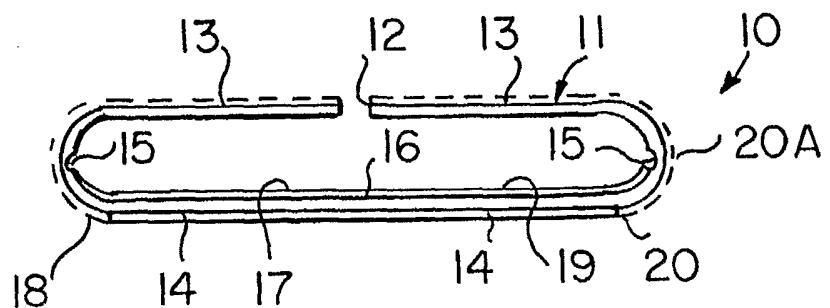
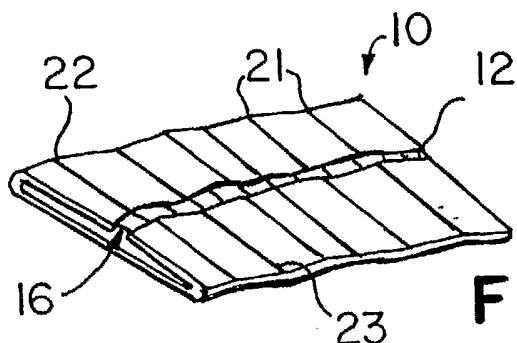
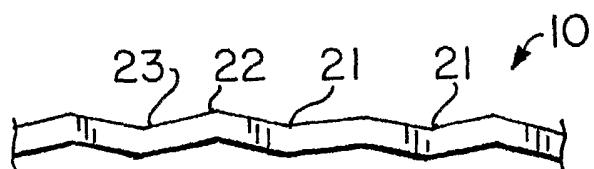
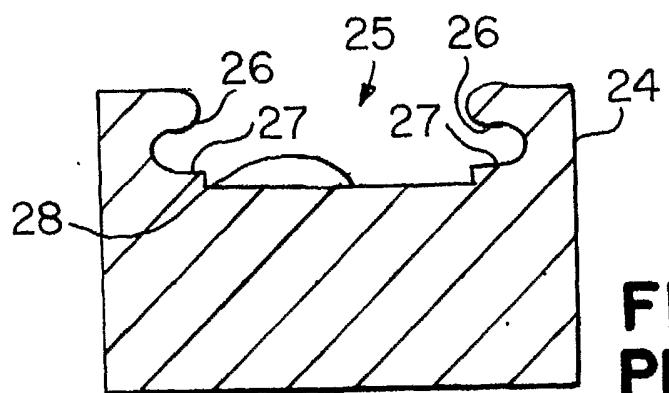
The specific type of formations 22, 23 and how they are formed varies in the circumstances. It is important, however, to avoid scores or cuts or similar formations that result in a reduction of the tensile strength of the paperband as such result would be counterproductive. Transverse indentations which do not materially affect the strength of the paperbands in accord with the present invention may be employed to create undulations where dictated by the specific application.

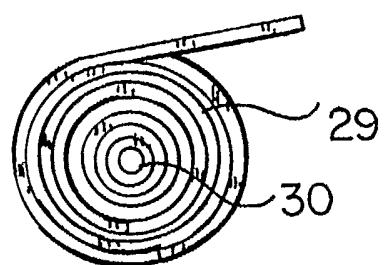
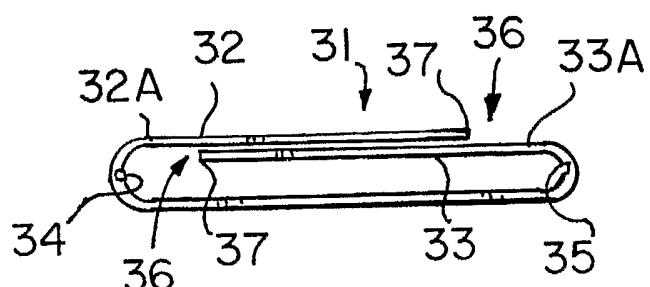
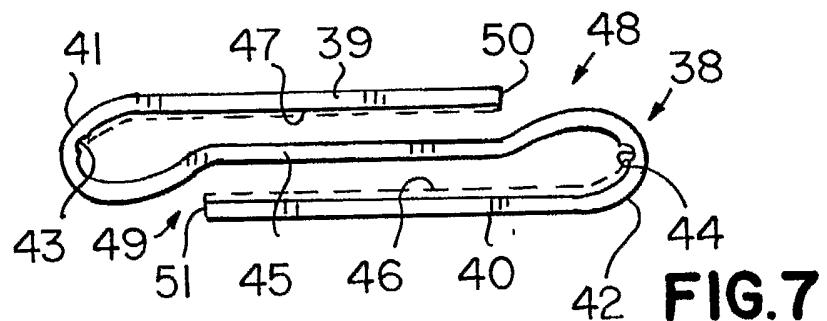
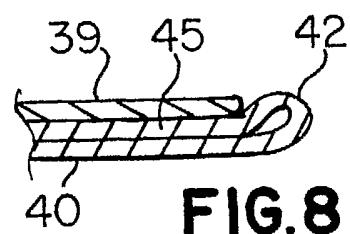
As the undulations are more pronounced by pressure of the rollers, the height of the undulations are increased and/or may be less pronounced by decrease in roller pressure. Alternately, the width of undulations and/or the number per lineal distance may be varied to increase or decrease the stiffness and/or stretchability of the paperband. In addition, the folded edges of the paperbands 10, 31, 38 minimize cross tearing of the paperbands 10, 31, 38. Preferably, all plies are made of cellulose fibers although other material may be used if necessary. Also, all adhesive, which may include PVA, is water-soluble to aid in repulping of the paperband particularly in baling applications. Preferably, if PVA is used, the adhesive is applied to both sides of the paperband because the adhesive sticks best to itself. The use of PVA on only one side results in inadequate adhesion in many circumstances.

1. A roll of paperband adaptable for use in paper web cutting and turn-up systems or for use in baling, said paperband comprising:
an elongate multi-ply board having upper and lower surfaces, and a center portion and spaced reduced side portions, each said side portion having upper and lower surfaces and an outside edge portion, each said side portion being foldable to dispose each said side portion in contact with an adjacent portion of said center portion, said paperband including transverse undulations to enable said multi-ply board to be formed into a roll of paperband without materially affecting its tensile strength and to allow for lengthening of said paperband when tensile force is applied to said paperband.
2. The roll of paperband as defined in Claim 1 wherein one said side portion is folded to place said upper surface of said one side portion onto said central portion, another said side portion is folded to place said lower surface of said another side portion onto said center portion, said side portions being folded so that a pair of spaced generally parallel longitudinal lines of weakness are formed closely adjacent respective said outside edge portion of each said side portion.
3. The roll of paperband as defined in Claim 1 wherein said side portions are foldable to overlap so that a pair of spaced generally parallel longitudinal lines of weakness are formed closely adjacent respective said outside edge portion of said side portion.
4. The roll of paperband as defined in Claim 1 further including a first longitudinal groove formed in said upper surface of said board closely adjacent one said side portion and a second longitudinal groove formed in said lower surface of said board, closely adjacent another said side portion.
5. The roll of paperband as defined in Claim 4 wherein said one side portion is foldable about said first groove to place said upper surface of said one side portion onto a portion of said upper surface of said center portion, said another said side portion is foldable about said second groove to place said lower surface of said another side portion onto a portion of said lower surface of said center portion.

6. The roll of paperband as defined in Claim 4 wherein said side portions are foldable over said center portion to provide a three-layer portion of said paperband located medially thereof and a two-layer portion of said paperband laterally of said three-layer portion of said paperband to provide a pair of spaced longitudinal lines of weakness where said three-layer portion is adjacent respective two-layer portion.
7. The roll of paperband as defined in Claim 6 wherein said side portions are folded in a manner to provide substantially planar upper and lower surfaces for said paperband.
8. A roll of paperband as defined in Claim 1 wherein each said side portion has an inside edge portion and an outside edge portion, each said inside edge portion being defined by an elongate longitudinal first groove between said center portion and respective said side portion, each said side portion being folded about respective said groove to dispose each said side portion in contact with an adjacent portion of said center portion.
9. The roll of paperband as defined in Claim 8 wherein said side edge portions are located closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness is formed therebetween.
10. The roll of paperband as defined in Claim 8 further including an adhesive layer between each said side edge portion and said center portion.
11. The roll of paperband as defined in Claim 10 wherein each said ply of said board is formed of cellulose fibers and said adhesive is water-soluble.
12. The roll of paperband as defined in Claim 8 further including an adhesive coating on at least one said surface of said paperband when said paperband is used for baling.
13. The roll of paperband as defined in Claim 8 wherein said undulations are provided on said upper and lower surfaces of said paperband.
14. The roll of paperband as defined in Claim 8 wherein said undulations are defined by parameters that are selected to increase or decrease stiffness and stretchability of said paperband.

15. The roll of paperband as defined in Claim 8 wherein said paperband includes an outer surface, further including an adhesive coating on said outer surface of said paperband.
16. The roll of paperband as defined in Claim 8 wherein said side edge portions are in abutment with each other when said paperband is used for baling.
17. The roll of paperband as defined in Claim 8 wherein said board is formed on a multiply board manufacturing machine.
18. A roll of paperband as defined in Claim 1 wherein said undulations are formed to shorten the length of said paperband to provide a shock-absorbing function to minimize tearing of said paperband when tensile force is applied to said paperband.
19. The roll of paperband as defined in Claim 1 wherein said side edge portions are located generally medially of said center portion closely adjacent each other without any overlap therebetween so that a longitudinal line of weakness is formed therebetween to provide for longitudinal bending of said paperband about said line when said paperband is pulled from a track assembly.
20. A roll of paperband as defined in Claim 19 wherein said undulations are formed to shorten the length of said paperband to provide a shock-absorbing function to minimize tearing of said paperband when tensile force is applied to said paperband.

**FIG.1****FIG.2****FIG.3****FIG.4**
PRIOR ART

**FIG.5****FIG.6****FIG.7****FIG.8**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/16782

A. CLASSIFICATION OF SUBJECT MATTER

IPC: B32B 3/28(2006.01)

USPC: 428/121

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 428/121, 126, 157, 167, 182

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,816,526 A (BARTELMUSS et al) 06 October 1998 (06.10.1998), column 2, lines 33-41 and the Figures.	1-20

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

27 July 2006 (27.07.2006)

Date of mailing of the international search report

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