(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 182 597**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85308249.3**

(22) Date of filing: **13.11.85**

(51) Int. Cl.⁴: **D 03 D 3/04**, D 21 F 7/10

(30) Priority: **19.11.84 US 673146**

(43) Date of publication of application: **28.05.86**
Bulletin 86/22

(84) Designated Contracting States: **AT CH DE FR GB IT LI NL SE**

(71) Applicant: **APPLETON MILLS, 2100 North Ballard Road, Appleton Wisconsin 54911 (US)**

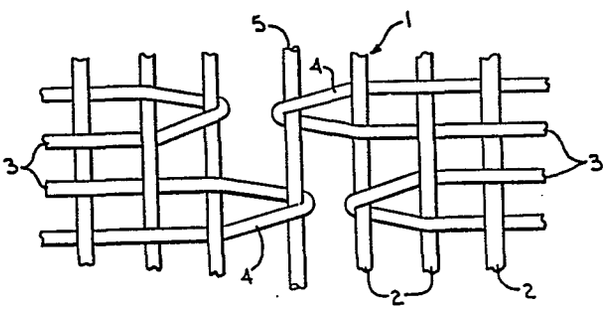
(72) Inventor: **Nowak, Frank C., 530 East Hoover Avenue, Appleton Wisconsin 54915 (DE)**
Inventor: **Gulya, Thomas G., 1003 East Northwood Drive, Appleton Wisconsin 54911 (DE)**

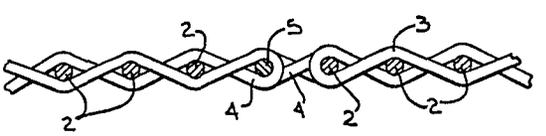
(74) Representative: **Carpenter, David et al, Marks & Clerk Alpha Tower Suffolk Street Queensway, Birmingham B1 1TT (GB)**

(54) Pin seamed fabric.

(57) A method of producing an endless pin seamed fabric having particular use as a fabric on a paper making machine. The fabric is a woven warp and weft system formed by weaving a single continuous warp yarn (3) with an array of parallel weft yarns (2) in a series of forward and reverse picks. During the weaving operation, the warp yarn (3) is selectively looped around a pin (5) disposed parallel to an end yarn in the array of weft yarns in a series of loops (4) to form an endless pin seamed fabric. After weaving, by removal of the pin (5), the endless fabric can be opened and readily installed on a papermaking machine. The region of the fabric adjacent the pin seam has a uniform porosity and a constant thickness.

The terms «warp yarn» and «weft yarn» are considered according to the definition in the description.





EP 0 182 597 A1

PIN SEAMED FABRIC

Background of the Invention

In the past fabrics for papermaking machines, such as forming fabrics, dryer fabrics and felts, have been supplied as open-ended flat fabrics, and after installation on the papermaking machine the ends of the fabric were joined or rewoven into endless form. Reweaving is an extremely tedious manual operation which results in substantial down time for the papermaking machine.

To overcome the need for reweaving the fabric on the papermaking machine, pin seamed fabrics have been utilized. With the pin seamed fabric, loops are attached to the ends of the fabric and a pin is inserted through the interdigitated loops to provide a connection. The pin seamed fabric has the advantage that it can be opened and installed on the papermaking machine and the pin then inserted through the interdigitated loops to provide the endless configuration.

In one common form of pin seamed fabric, metal loops are connected by clips to the end of the fabric. Due to the thickness of the metal clips, it is necessary to add weft yarns adjacent the clips in order to taper the thickness from the metal clips to the body of the fabric. Increasing the number of weft yarns in the region of the pin seam decreases the permeability in this region and also increases the thickness. The increased thickness makes the fabric unsuitable for use as a papermaker's felt due to the fact that the felt, in operation, is passed through a nip between pressure rolls to extract water from the paper web.

In the past, the pin seamed fabrics have also been formed through use of spiral plastic members which were woven into the ends of the fabric. As in the case of the metal loops, the plastic spiral loops produce an

increase in thickness in the seam area and a decrease in permeability.

In an attempt to provide more uniformity in porosity and thickness in the pin seamed area, woven back structures have been utilized. In a woven back structure, the weft yarns in the end of the fabric are removed and the projecting warp yarns are then folded back to form loops and interwoven with the fabric. United States Patents Nos. 2,325,900, 3,436,041, 4,026,330, 4,095,622, 4,182,381 and 4,401,137 show various types of woven back fabrics.

However, in the woven back fabric, problems have been encountered in retaining the integrity of the loops formed by the woven back warp yarns because the woven back yarns tend to slip or loosen. Furthermore, severing the warped yarns in the woven back structure seriously impairs the strength of the fabric, as opposed to a fabric using continuous non-broken yarns.

As a further disadvantage, additional weft yarns are required in the area of the pin seam in order to adequately hold the woven back warp yarns in position, so that the loops do not elongate. The addition of the added weft yarns decreases the porosity of the fabric in the area of the pin seam, as well as providing an increase in thickness.

Papermaking fabrics have also been woven in endless form without a seam and an endless fabric has the inherent advantage of uniform porosity and thickness throughout its length. Endless fabrics, however, present certain problems in installation on the papermaking machine. To install the endless fabric, it is necesssary to shift the roll mountings and slip the fabric over the rolls. Recently, due to the advent of stiffer, bulkier fabrics the problem of installation of an endless felt has been accentuated. The installation

of an endless fabric on a papermaking machine is a time-consuming operation which requires substantial down time for the machine.

Summary of the Invention

The invention is directed to a method of producing an endless pin seamed fabric having particular use as a forming fabric, a dryer fabric, or a felt on a papermaking machine.

In accordance with the invention, the fabric is a woven warp and weft system formed by interweaving a single warp yarn with an array of parallel weft yarns in a series of forward and reverse picks. During the weaving operation, the warp yarn is selectively looped around a pin disposed parallel to an end yarn in the array of weft yarns to form a series of loops around the pin.

After the weaving operation has been completed, the pin can be removed so that the fabric can be opened up and readily installed on the papermaking machine. After installation, the pin can be reinserted through the interdigitated loops on the ends of the fabric.

The fabric of the invention has a uniform porosity in the area of the pin seam and a constant thickness. Thus, the fabric has the inherent advantages of an endless fabric, and due to the pin seam, can be readily opened up and installed on the papermaking machine.

As a further advantage, the fabric includes a single continuous warp yarn which is unbroken and this not only increases the strength of the fabric, but also prevents the loops from elongating in service, as can occur with the woven back type of loop construction.

While the fabric of the invention can be used as a forming fabric, or dryer fabric, it has particular

use as a papermaker's felt due to the fact that the thickness in the area of the pin seam is not increased and the porosity in this area is uniform.

Other objects and advantages will appear in the course of the following description.

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 the pin seam area of a fabric in accordance with one example of the invention,

Fig. 2 is a section taken along line 2-2 of Fig. 1; and

Figs. 3A-3H are schematic representations illustrating showing the picks of the warp yarn in the weaving operation.

Description of the Illustrated Embodiment

Fig. 1 shows a pin seamed fabric 1 that has particular use as a fabric for a papermaking machine. More particularly, the fabric can be used as a papermaker's felt or as a forming fabric or dryer fabric.

Fabric 1 includes an array or plurality of parallel weft yarns 2, and a single, continuous warp yarn 3 is interwoven with the weft yarns. Certain picks or passes of the warp yarn 3 form projecting loops 4 and a pin 5, formed of plastic or metal, is inserted through the aligned interdigitated loops 4 to connect the ends of the fabric together.

As set forth in the specification and claims, the term "warp yarn" is used as in papermaker's terminology in which the warp yarns extend longitudinally of the fabric or in the machine direction.

The term "yarn" as used in the specification and claims is intended to include stands of monofilament, multifilament, fiber materials, or mixtures of

these materials in either twisted, untwisted, intertwined, or plied form.

The yarns can be formed of any desired materials, such as wool or synthetic materials, but it is preferred that the warp yarn 3 be formed of a material which will tend to retain the integrity of the loops 4 when the pin 5 is removed.

Figs. 3A-3H illustrate the endless weaving pattern for forming a two-layer fabric. While Figs. 3A-3H for purposes of illustration, merely show five vertical rows of weft yarns 2, in practice there may be hundreds or thousands of rows of weft yarns depending upon the length of the endless fabric to be produced.

As shown in Fig. 3A, the pin 5 is positioned parallel to an end yarn in the array of weft yarns 2, and in the first pick, the warp yarn 3 is interwoven with the weft yarns of the upper layer. Fig. 3A shows the warp yarn 3 going over and under adjacent weft yarns 2, but it is contemplated that any desired weaving pattern can be employed.

While Fig. 3A-3H shows the warp yarn 3 moving in a sinusoidal path, in practice the weft yarns 2 would be raised and lowered by harnesses to the desired position, and the warp yarn would be moved horizontally by a shuttle in a straight path to provide the interweaving.

As shown in Fig. 3B, warp yarn 3 is looped around pin 5 to form a loop 4 and is then interwoven in the upper layer of weft yarns 2 in a return or second pick.

Following this, the warp yarn 3 is interwoven in a third forward pick with the weft yarns of the lower layer (Fig. 3C), and the warp yarn is then looped around the end weft yarns in the lower layer and interwoven with the weft yarns of the lower layer in a return pick, as shown in Fig. 3D.

Following the return pick, the warp yarn 3 is again interwoven with the weft yarns 2 of the upper layer, as illustrated in Fig. 3E and is then interwoven in a return pick as illustrated in Fig. 3F.

Warp yarn 3 then is interwoven with the weft yarns of the lower layer in a forward pick (Fig. 3G) and is looped around the pin 6 to form a second loop 4 and interwoven with the weft yarns in the lower layer in a return pick, as illustrated in Fig. 3H. This pattern is repeated throughout the width of the fabric.

While Figs. 3A-3H show the weft yarns 2 arranged in four vertical rows (indicted by 2a-2d in Fig. 3A) to form a double layer fabric, it is contemplated that the weft yarns can also be arranged in only two rows in which case a single layer fabric can be produced.

The resulting woven structure is an endless fabric in which certain picks or passes of the single continuous warp yarn 2 are looped around the pin 5. By removal of pin 5, the fabric can be opened up and conveniently installed on the papermaking machine. After installation, the pin can be reinserted within the aligned interdigitated loops 5.

The woven fabric of the invention has particular use as a base fabric for a papermaker's felt. In this situation, one or more layers of fibrous batt can be needled into one or both surfaces of the base fabric. The needling operation may tend to damage the pin 5, so that after needling, the damaged pin can be removed and when the felt is installed on the papermaking machine, a new pin can be replaced.

The fabric of the invention has a constant thickness and permeability adjacent the pin seam. As the warp yarn is continuous, the fabric has improved strength over woven back types of fabric in which the warp yarns are severed.

The fabric can be readily woven on a standard weaving loom and no special equipment is required. Furthermore, the loop construction is made during the regular weaving process, so that the pin seamed fabric can be produced in a substantially shorter period of time than other pin seamed fabrics utilizing metal clips, plastic spirals, or woven back warp yarns.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particulary pointing out and distinctly claiming the subject matter which is regarded as the invention.

Claims:

1. A method of producing a pin seamed fabric, comprising the steps of weaving an endless fabric having a warp and weft system by interweaving a single continuous warp yarn in a plurality of forward and reverse picks with an array of parallel weft yarns, and selectively looping said warp yarn during said weaving around a pin disposed parallel to the side of said array in a series of loops to thereby form a pin seamed endless fabric, said pin being removable to enable the fabric to be opened and installed on a machine.

2. A method of producing an endless pin seamed fabric, comprising the steps of arranging a plurality of weft yarns in a parallel pattern, said pattern having a first weft yarn at one end of said pattern and a second weft yarn at the opposite end of said pattern, positioning a pin parallel to the second yarn in said pattern, interweaving a warp yarn with the weft yarns in a forward pick, looping the warp yarn around the pin and interweaving the warp yarn with the weft yarns in a return pick, looping the warp yarn around said first weft yarn and interweaving the warp yarn with the weft yarns in a second forward pick, looping the warp yarn around the second weft yarn and interweaving the warp yarn with the weft yarns in a second return pick, looping the warp yarn around the first weft yarn and interweaving the warp yarn with the weft yarns in a third forward pick, looping the warp yarn around the second weft yarn and interweaving the

warp yarn with the weft yarns in a third return pick, looping the warp yarn around said first weft yarn and interweaving the warp yarns with the weft yarns in a fourth forward pick, and looping the warp yarn around said pin and interweaving the warp yarn with said weft yarns in a fourth return pick.

3. The method of claim 1, and including the step of needling a fibrous batt to at least one surface of said fabric.

4. A method of producing an endless pin seamed fabric, comprising the steps of arranging a first group of weft yarns in a parallel pattern in a first plane, arranging a second group of weft yarns in a parallel pattern in a second plane parallel to said first plane, alternately interweaving a single continuous warp yarn with said first and second groups of weft yarns, and selectively looping said warp yarns during said weaving around a pin disposed parallel to the corresponding sides of said first and second groups of weft yarns to form a pin seamed endless fabric, said pin being removable to enable the fabric to be opened and installed on a machine.

5. An endless pin seamed fabric, comprising a woven fabric including a plurality of weft yarns and a single continuous warp yarn interwoven with said weft yarns, the ends of said fabric being disposed in opposed relation, portions of said single warp yarn projecting from said opposed ends of the fabric in a plurality of interdigitated loops, and a pin disposed in said interdigitated loops to maintain the fabric in an endless form.

6. The fabric of claim 5, and including a layer of fibrous batt needled to at least one surface of said fabric.

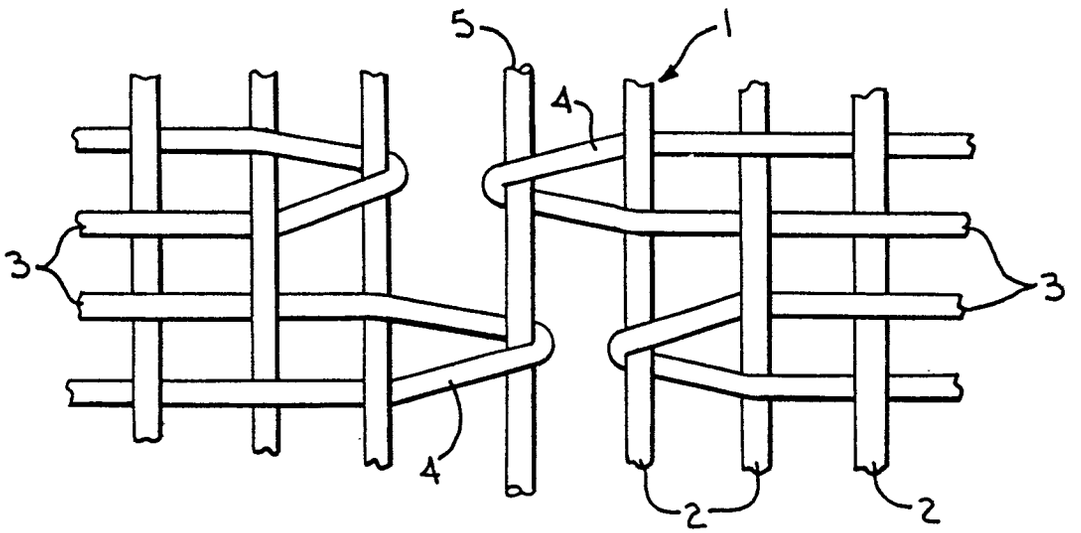


FIG. 1

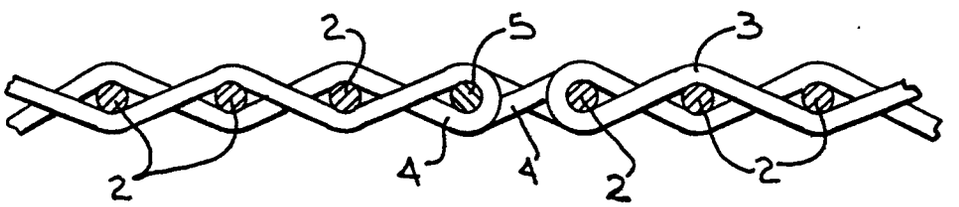


FIG. 2

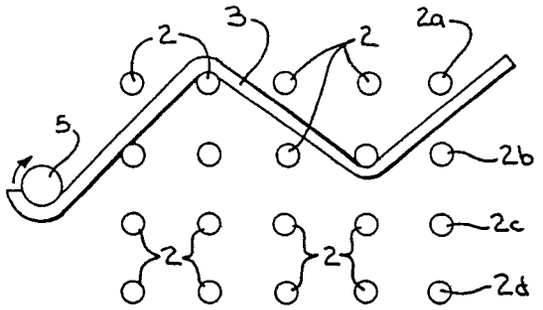


FIG. 3A

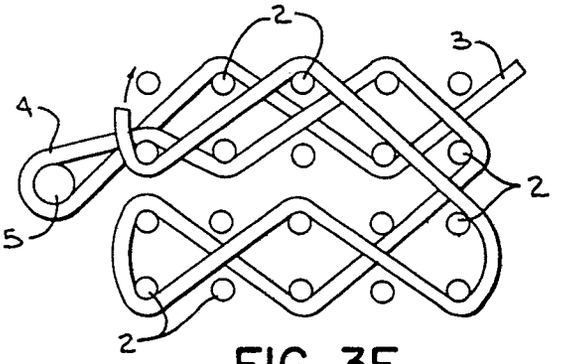


FIG. 3E

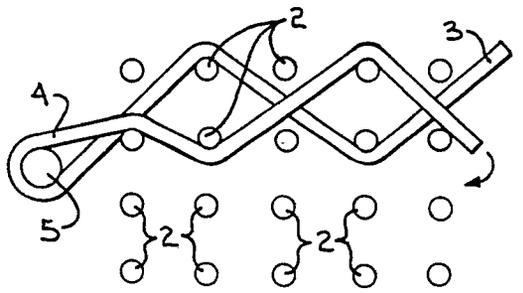


FIG. 3B

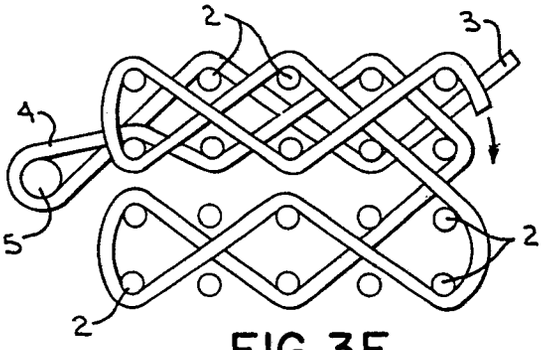


FIG. 3F

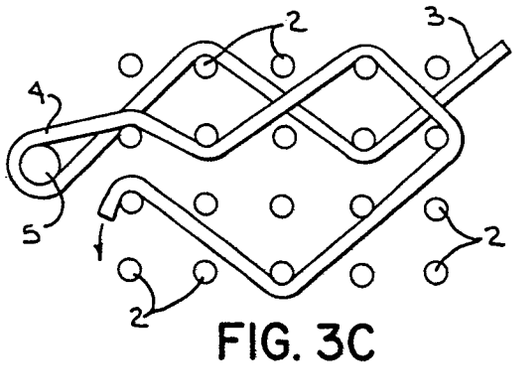


FIG. 3C

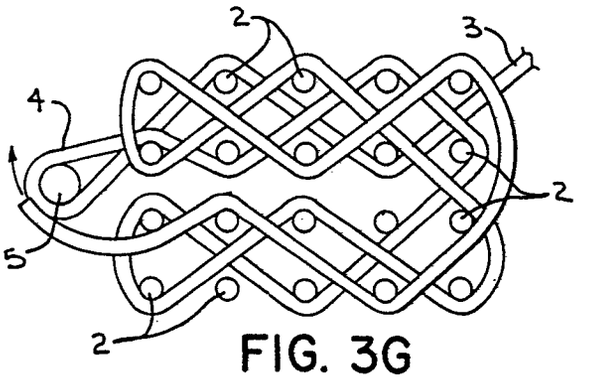


FIG. 3G

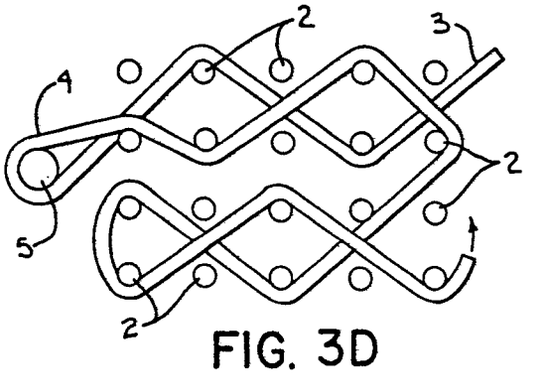


FIG. 3D

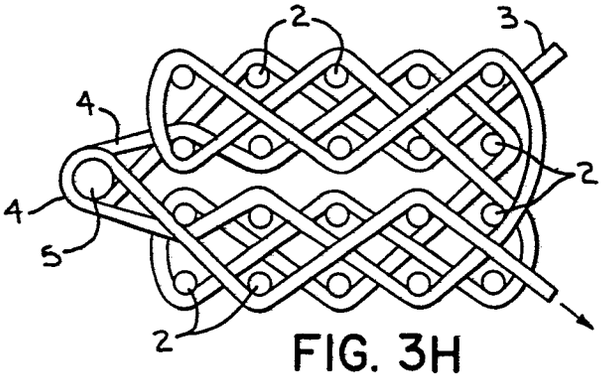


FIG. 3H

0182597

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 85 30 8249

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-2 164 700 (NORDISKA) * Page 7, line 9 - page 8, line 10; figures 4,5 *	1,2,4, 5	D 03 D 3/04 D 21 F 7/10
A	DE-A-2 437 303 (MARX) * Claim 1 *	3,6	
A	US-A-2 883 734 (DRAPER)		
A,D	US-A-4 095 622 (MacBEAN)		
A,D	EP-A-0 011 977 (ALBANY) & US - A - 4 401 137		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
D 03 D D 21 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13-02-1986	BOUTELEGIER C.H.H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family corresponding document

PO Form 1503 03 82