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(54) **Absorbing felt**

Absorbierendes Filz

Feutre absorbant

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(73) Proprietor: **WEAVEXX CORPORATION**  
**Wake Forest, NC 27588 (US)**

(72) Inventors:  
• **Gstrein, Hippolit**  
**A-2640 Gloggnitz (AT)**

• **Jochinger, Johann-Dieter**  
**A-1060 Wien (AT)**

(74) Representative: **Popp, Eugen, Dr. et al**  
**MEISSNER, BOLTE & PARTNER**  
**Widenmayerstrasse 48**  
**80538 München (DE)**

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**FR-A- 2 361 502**                      **US-A- 5 025 839**

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## Description

The invention relates to felts for use in papermaking machines, and has to do more particularly with felts for removing water from a paper sheet while the sheet is supported on and carried by the felt (see US-A-5 025 839).

Various techniques have hitherto been proposed for removing water from a paper sheet, the most common being by the use of a press, wherein the paper sheet and the felt on which it is carried are squeezed between rollers, the felt being formed in such a manner that the water extracted from the paper will pass through the felt for discharge. Desirably, the press felts are woven so as to have relatively large open areas or voids which will enhance their water conveying capabilities so that the water may be removed from the felt upon passage over a suction box. The press felt normally has a conveyer belt-like shape and during the various operations previously mentioned, a large amount of water is built up in the press felt which is removed by suction or various other drainage devices, usually after the paper web and press felt are no longer in direct contact.

The ideal papermaking felt should have at least the following properties. First, it should have a surface that is fine enough to produce a smooth finish and minimize marking of the sheet of paper being produced. Second, it should be open enough to allow water to drain through it without significant impedance. Third, it should be resilient enough to quickly recover from repeated high nip pressures over a long period of time. Fourth, it should be tough and strong enough to provide good stability, wear resistance and felt life.

It has been found that a papermaker's felt having a base fabric with a high vibration absorption capacity compared to the usual dual layer fabrics provides better runnability, fewer maintenance stops and improved paper quality.

Accordingly, is an object of the present invention to provide a fabric for use in papermaking machine having improved vibration absorption capacity.

It is a further object to provide a felt having high elasticity and resilience to assure better runnability, less maintenance stops and improved paper quality.

It is a further object of the invention to provide a papermaker's felt with improved dewatering performance.

It is another object of the present invention to provide a felt having longer lasting resiliency for better wet felt performance on heavily loaded, high-speed positions.

### SUMMARY OF THE INVENTION

These and other objects, as will be apparent to those skilled in the art, may be achieved from practice of the present invention, one embodiment of which is a papermakers felt having a dual layer base fabric woven in a special weave pattern which results in a base fabric

having energy absorbing characteristics. The yarns are woven in a pattern in which the number of machine direction yarns on the top side of the fabric is twice the number of the machine direction yarns on the bottom side of the fabric. The yarns may be spun yarns, multifilaments, monofilaments, core-wrapped yarns or any kind of twists. The bottom fabric is attached to a top fabric by needling. A preferred top fabric is a single layer fabric with long floatings and fine yarn components.

A felt having the absorber base fabric of the present invention having the special weave pattern shows significantly higher vibration absorption capacity compared to usual felts. High elasticity and resilience assure better runnability, fewer maintenance stops and improved paper quality. The concept reduces flow resistance giving better dewatering performance. By using the top fabric together with the absorber fabric, the requirements of the felt are adapted to paper quality (weight, surface) and press conditions (speed, pressure, runnability). In addition to being used as a component of a papermaker's felt, the base fabric may be used as a forming fabric in a papermaking machine.

In a second embodiment, the yarns of the base fabric are treated or extruded with elastic resins or polymeric materials having superior dampening characteristics. Materials include monofilaments or multi/monofilaments twists in machine direction, which can be treated or extruded with elastic resins (polyurethane, latex, polyacrylic, etc). An example of a suitable fiber is thermoplastic polyester elastomer, or TPE. The specially treated yarns are provided in the machine direction to provide a papermaking fabric having improved vibration dampening ability.

### BRIEF DESCRIPTION OF THE DRAWINGS

An understanding of this invention may be had from the detailed discussion which follows and from an examination of the drawing in which:

FIG. 1 is a weave diagram illustrating the weave pattern of the base fabric;

FIG. 2 is a schematic representation of the path of the cross-machine direction yarns in relation to the machine direction yarns;

FIG. 3 is a schematic representation of the path of the cross-machine direction yarns in relation to the machine direction yarns showing the top fabric and the base fabric.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In a first embodiment, the felt is comprised of a dual layer base fabric 28 woven in a special pattern to improve its dampening characteristics, in combination with a top fabric 27, as shown in FIG. 3. The base fabric 28 can function either as a forming fabric for use in a pa-

permaking machine, or when it is combined with a top fabric 27, as a papermaker's felt. The dual layer base fabric consists of a fabric having sets of either machine direction yarns or cross machine direction yarns in more than one plane. Dual layer fabrics are manufactured in two basic ways to form an endless belt. First, they can be woven by a flat weaving process with their ends joined by any one of a number of well known methods to form the endless belt. Alternatively, they can be woven directly in the form of a continuous belt by means of an endless weaving process. Both methods are well known in the art and the term "endless belt" as used herein refers to belts made by either method. In a flat woven papermakers fabric, the warp yarns extend in the machine direction and the filling yarns extend in the cross machine direction. In a papermakers fabric having been woven in an endless fashion the warp yarns extend in the cross machine direction and the filling yarns extend in the machine direction. As used herein the terms "machine direction" and "cross machine direction" refer respectively to a direction corresponding to the direction of travel of the papermakers fabric on the papermaking machine and a direction transverse this direction of travel.

Reference is made to FIG. 1. This figure is a weave diagram illustrating the weave pattern of the fabric of the present invention on six harnesses. The six horizontal rows of the diagram, numbered 1 through 6, represent six cross-machine direction yarns. The vertical columns of the diagram numbered 7 through 24 represent 18 machine direction yarns. The "X" marks on the diagram represent those points at which the machine direction yarns are woven under the cross-machine direction yarn indicated at that point. The "O" marks in the diagram illustrate those points at which the machine direction yarns are woven above the cross-machine direction yarn indicated in that point.

The pattern repeats on every six cross-machine direction yarns and on every 18 machine direction yarns. In the various figures, one weave repeat is designated as 1 through 6 for the cross-machine direction yarns and 7 through 24 for the machine direction yarns.

FIG. 2 is a schematic cross-sectional representation of the path of the cross-machine direction yarns of the base fabric of the present invention. It illustrates the six cross-machine direction yarns in one weave repeat and shows their relative position with respect to the same machine direction yarns.

Numbers 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22 and 23 refer to the machine direction yarns on the top side 25 of the fabric 28. Numbers 9, 12, 15, 18, 21 and 24 refer to the machine direction yarns on the bottom side 26 of the fabric 28. It is clear that the fabric 28 has twice as many machine direction yarns on the top side 25 as it has on the bottom side 26.

FIG. 3 shows a cross sectional view of the fabric 28 together with a top fabric 27. The top fabric 27 may be any fabric needled to the base fabric 28 in the conven-

tional manner. A preferred top fabric is a single layer fabric with long floatings and fine yarn components (i.e., 0.2 mm x 2 ply or 0.15 mm x 3 ply, etc.). When the weave pattern of the present invention is used, an increase in hysteresis of greater than 25 percent (25%) has resulted. The vibration dampening characteristics are tested by measuring elasticity modulus and loading hysteresis on a load tester. The dampening characteristics depend on the flexibility of the base fabric 28 or the base fabric 28 in combination with the top fabric 27.

The second embodiment includes the use of yarns in the machine direction that are treated or extruded with elastic resins or polymers. Preferred materials include monofilaments or multi/monofilament twists in machine direction which can be treated or extruded with elastic resins such as polyurethane, latex, polyacrylic, etc. The use of such materials provides a further improvement in hysteresis values.

An example of a suitable fiber is "thermoplastic polyester elastomer" or TPE. For example, the yarn may be 0.020 inch diameter "Riteflex" made by Hoechst Celanese. Thermoplastic polyester elastomer should be available from the supplier in monofilament diameters between 0.004 inches and 0.060 inches. This material could be used in multifilament form as well. There are other polymers available that also have energy absorbing characteristics.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

## Claims

1. A fabric for use in a papermaking machine comprising a six harness dual layer base fabric (28) having a pattern of woven cross-machine direction yarns (1 - 6) and machine direction yarns (7 - 24), said base fabric (28) having an upper surface (25) and a bottom surface (26), wherein the number of machine direction yarns on the upper surface is twice the number of machine direction yarns on the bottom surface; characterized in that said pattern repeats on every 6 cross-machine direction yarns and on every 18 machine direction yarns, said pattern includes:
  - in a first harness, a cross-machine direction yarn (1) passes beneath a machine direction yarn (7), above two machine direction yarns (8,

9), beneath two machine direction yarns (10, 11), above a machine direction yarn (12), beneath five machine direction yarns (13 - 17), above a machine direction yarn (18), beneath two machine direction yarns (19, 20), above two machine direction yarns (21, 22), beneath a machine direction yarn (23) and above a machine direction yarn (24);

in a second harness, a cross-machine direction yarn (2) passes beneath two machine direction yarns (7, 8), above a machine direction yarn (9), beneath five machine direction yarns (10 - 14), above a machine direction yarn (15), beneath two machine direction yarns (16, 17), above two machine direction yarns (18, 19), beneath a machine direction yarn (20), above a machine direction yarn (21), beneath a machine direction yarn (22) and above two machine direction yarns (23, 24);

in a third harness, a cross-machine direction yarn (3) passes beneath five machine direction yarns (7 - 11), above a machine direction yarn (12), beneath two machine direction yarns (13, 14), above two machine direction yarns (15, 16), beneath a machine direction yarn (17), above a machine direction yarn (18), beneath a machine direction yarn (19), above two machine direction yarns (20, 21), beneath two machine direction yarns (22, 23) and above a machine direction yarn (24);

in a fourth harness, a cross-machine direction yarn (4) passes above a machine direction yarn (7), beneath a machine direction yarn (8), above a machine direction yarn (9), beneath a machine direction yarn (10), above two machine direction yarns (11, 12), beneath two machine direction yarns (13, 14), above a machine direction yarn (15), beneath five machine direction yarns (16 - 20), above a machine direction yarn (21), beneath two machine direction yarns (22, 23), and above a machine direction yarn (24);

in a fifth harness, a cross-machine direction yarn (5) passes beneath two machine direction yarns (7, 8), above two machine direction yarns (9, 10), beneath a machine direction yarn (11), above a machine direction yarn (12), beneath a machine direction yarn (13), above two machine direction yarns (14, 15), beneath two machine direction yarns (16, 17), above a machine direction yarn (18), beneath five machine direction yarns (19 - 23) and above a machine direction yarn (24), and

in a sixth harness, a cross-machine direction yarn (6) passes beneath two machine direction yarns (7, 8), above a machine direction yarn 9, beneath two machine direction yarns (10, 11), above two machine direction yarns (12, 13), beneath a machine direction yarn (14), above a machine direction yarn (15), beneath a machine direction yarn (16), above two machine direction yarns (17, 18), beneath two machine direction yarns (19, 20), above a machine direction yarn (21) and beneath three machine direction yarns (22, 23, 24).

2. The fabric of Claim 1, further comprising an upper fabric (27) needed to said base fabric (28).
3. The fabric of Claim 1 or 2, wherein a portion of said machine direction yarns (7 to 24) are monofilaments made of a polymer having vibration dampening characteristics.
4. The fabric of Claim 3, wherein a portion of said machine direction yarns (7 to 24) are made of thermoplastic polyester elastomer.

#### Patentansprüche

1. Gewebe zur Verwendung in einer Papiermaschine, umfassend ein Sechsgeschirr-Doppelschicht-Grundgewebe (28) mit einem Muster gewebter Garne in Quermaschinenrichtung (1-6) und Garne in Maschinenrichtung (7-24), wobei das Grundgewebe (28) eine obere Oberfläche (25) und eine untere Oberfläche (26) aufweist, wobei die Zahl der Garne in Maschinenrichtung auf der oberen Oberfläche zweimal so groß ist wie die Zahl der Garne in Maschinenrichtung auf der unteren Oberfläche; dadurch gekennzeichnet, daß sich das Muster bei jeden 6. Garnen in Quermaschinenrichtung und bei jeden 18. Garnen in Maschinenrichtung wiederholt, und das Muster umfaßt:

in einem ersten Geschirr verläuft ein Garn in Quermaschinenrichtung (1) unterhalb eines Garnes in Maschinenrichtung (7), oberhalb von zwei Garnen in Maschinenrichtung (8,9), unterhalb von zwei Garnen in Maschinenrichtung (10,11), oberhalb eines Garnes in Maschinenrichtung (12), unterhalb von fünf Garnen in Maschinenrichtung (13 bis 17), oberhalb eines Garnes in Maschinenrichtung (18), unterhalb zwei Garnen in Maschinenrichtung (19,20), oberhalb von zwei Garnen in Maschinenrichtung (21,22), unterhalb eines Garnes in Maschinenrichtung (23) und oberhalb eines Garnes in Maschinenrichtung (24);

in einem zweiten Geschirr verläuft ein Garn in Quermaschinenrichtung (2) unterhalb von zwei Garnen in Maschinenrichtung (7,8), oberhalb eines Garnes in Maschinenrichtung (9), unterhalb von fünf Garnen in Maschinenrichtung (10-14), oberhalb eines Garnes in Maschinenrichtung (15), unterhalb von zwei Garnen in Maschinenrichtung (16,17), oberhalb von zwei Garnen in Maschinenrichtung (18,19), unterhalb eines Garnes in Maschinenrichtung (20), oberhalb eines Garnes in Maschinenrichtung (21), unterhalb eines Garnes in Maschinenrichtung (22) und oberhalb von zwei Garnen in Maschinenrichtung (23,24).

in einem dritten Geschirr verläuft ein Garn in Quermaschinenrichtung (3) unterhalb von fünf Garnen in Maschinenrichtung (7-11), oberhalb eines Garnes in Maschinenrichtung (12), unterhalb von zwei Garnen in Maschinenrichtung (13,14), oberhalb von zwei Garnen in Maschinenrichtung (15,16), unterhalb eines Garnes in Maschinenrichtung (17), oberhalb eines Garnes in Maschinenrichtung (18), unterhalb eines Garnes in Maschinenrichtung (19), oberhalb von zwei Garnen in Maschinenrichtung (20,21), unterhalb von zwei Garnen in Maschinenrichtung (22,23) und oberhalb eines Garnes in Maschinenrichtung (24);

in einem vierten Geschirr verläuft ein Garn in Quermaschinenrichtung (4) oberhalb eines Garnes in Maschinenrichtung (7), unterhalb eines Garnes in Maschinenrichtung (8), oberhalb eines Garnes in Maschinenrichtung (9), unterhalb eines Garnes in Maschinenrichtung (10), oberhalb von zwei Garnen in Maschinenrichtung (11,12), unterhalb von zwei Garnen in Maschinenrichtung (13,14), oberhalb eines Garnes in Maschinenrichtung (15), unterhalb von fünf Garnen in Maschinenrichtung (16-20), oberhalb eines Garnes in Maschinenrichtung (21), unterhalb von zwei Garnen in Maschinenrichtung (22,23) und oberhalb eines Garnes in Maschinenrichtung (24);

in einem fünften Geschirr verläuft ein Garn in Quermaschinenrichtung (5) unterhalb von zwei Garnen in Maschinenrichtung (7,8), oberhalb von zwei Garnen in Maschinenrichtung (9,10), unterhalb eines Garnes in Maschinenrichtung (11), oberhalb eines Garnes in Maschinenrichtung (12), unterhalb eines Garnes in Maschinenrichtung (13), oberhalb von zwei Garnen in Maschinenrichtung (14,15), unterhalb von zwei Garnen in Maschinenrichtung (16,17), oberhalb eines Garnes in Maschinenrichtung (18), unterhalb von fünf Garnen in Maschinenrichtung (19-23) und oberhalb eines Garnes in Maschinenrichtung (24); und

in einem sechsten Geschirr verläuft ein Garn in

Quermaschinenrichtung (6) unterhalb von zwei Garnen in Maschinenrichtung (7,8), oberhalb eines Garnes in Maschinenrichtung (9), unterhalb von zwei Garnen in Maschinenrichtung (10,11), oberhalb von zwei Garnen in Maschinenrichtung (12,13), unterhalb eines Garnes in Maschinenrichtung (14), oberhalb eines Garnes in Maschinenrichtung (15), unterhalb eines Garnes in Maschinenrichtung (16), oberhalb von zwei Garnen in Maschinenrichtung (17,18), unterhalb von zwei Garnen in Maschinenrichtung (19,20), oberhalb eines Garnes in Maschinenrichtung (21) und unterhalb von drei Garnen in Maschinenrichtung (22,23,24).

2. Gewebe nach Anspruch 1, dadurch gekennzeichnet, daß es außerdem ein auf das Grundgewebe (28) genadeltes oberes Gewebe (27) umfaßt.

3. Gewebe nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein Teil der Garne in Maschinenrichtung (7-24) Monofilamente aus einem Polymer mit vibrationsdämpfenden Eigenschaften sind.

4. Gewebe nach Anspruch 3, dadurch gekennzeichnet, daß ein Teil der Garne in Maschinenrichtung (7-24) aus einem thermoplastischen Polyesterelastomer sind.

## Revendications

1. Tissu pour une utilisation dans une machine à papier comprenant un tissu de base à deux couches et six harnais (28) ayant un dessin de fils tissés dans la direction transversale à la machine (1-6) et de fils dans la direction de la machine (7-24), ledit tissu de base (28) ayant une surface supérieure (25) et une surface inférieure (26) dans lequel le nombre de fils dans la direction de la machine sur la surface supérieure est le double du nombre de fils dans la direction de la machine sur la surface inférieure, caractérisé en ce que ledit dessin se répète tous les six fils dans la direction transversale et tous les dix-huit fils dans la direction de la machine, ledit dessin comprend :

dans un premier harnais, un fil dans la direction transversale (1) passe sous un fil dans la direction de la machine (7) au-dessus de deux fils dans la direction de la machine (8, 9), en dessous de deux fils dans la direction de la machine (10, 11), au-dessus d'un fil dans la direction de la machine (12), en dessous de cinq fils dans la direction de la machine (13-17), au-dessus d'un fil dans la direction de la machine (18), en

dessous de deux fils dans la direction de la machine (19, 20), au-dessus de deux fils dans la direction de la machine (21, 22), en dessous d'un fil dans la direction de la machine (23) et au-dessus d'un fil dans la direction de la machine (24) ;

dans un deuxième harnais, un fil dans la direction transversale (2) passe en dessous de deux fils dans la direction de la machine (7, 8), au-dessus d'un fil dans la direction de la machine (9), en dessous de cinq fils dans la direction de la machine (10-14), au-dessus d'un fil dans la direction de la machine (15), en dessous de deux fils dans la direction de la machine (16, 17), au-dessus de deux fils dans la direction de la machine (18, 19), en dessous d'un fil dans la direction de la machine (20), au-dessus d'un fil dans la direction de la machine (21), en dessous d'un fil dans la direction de la machine (22) et au-dessus de deux fils dans la direction de la machine (22, 24) ;

dans un troisième harnais, un fil dans la direction transversale (3) passe en dessous de cinq fils dans la direction de la machine (7-11), au-dessus d'un fil dans la direction de la machine (12), en dessous de deux fils dans la direction de la machine (13, 14), au-dessus de deux fils dans la direction de la machine (15, 16), en dessous d'un fil dans la direction de la machine (17), au-dessus d'un fil dans la direction de la machine (18), en dessous d'un fil dans la direction de la machine (19), au-dessus de deux fils dans la direction de la machine (20, 21), en dessous de deux fils dans la direction de la machine (22, 23) et au-dessus d'un fil dans la direction de la machine (24) ; dans un quatrième harnais, un fil dans la direction transversale (4) passe au-dessus d'un fil dans la direction de la machine (7), en dessous d'un fil dans la direction de la machine (8), au-dessus d'un fil dans la direction de la machine (9), en dessous d'un fil dans la direction de la machine (10), au-dessus de deux fils dans la direction de la machine (11, 12), en dessous de deux fils dans la direction de la machine (13, 14), au-dessus d'un fil dans la direction de la machine (15), en dessous de cinq fils dans la direction de la machine (16-20), au-dessus d'un fil dans la direction de la machine (21), en dessous de deux fils dans la direction de la machine (22, 23), et au-dessus d'un fil dans la direction de la machine (24) ;

dans un cinquième harnais, un fil dans la direction transversale (5) passe en dessous de deux fils dans la direction de la machine (7, 8), au-dessus de deux fils dans la direction de la machine (9, 10), en dessous d'un fil dans la direction de la machine (11), au-dessus d'un fil dans la direction de la machine (12), en dessous d'un

fil dans la direction de la machine (13), au-dessus de deux fils dans la direction de la machine (14, 15), en dessous de deux fils dans la direction de la machine (16, 17), au-dessus d'un fil dans la direction de la machine (18), en dessous de cinq fils dans la direction de la machine (19-23) et au-dessus d'un fil dans la direction de la machine (24) ; et

dans un sixième harnais, un fil dans la direction transversale (6) passe en dessous de deux fils dans la direction de la machine (7, 8) au-dessus d'un fil dans la direction de la machine (9), en dessous de deux fils dans la direction de la machine (10, 11), au-dessus de deux fils dans la direction de la machine (12, 13), en dessous d'un fil dans la direction de la machine (14), au-dessus d'un fil dans la direction de la machine (15), en dessous d'un fil dans la direction de la machine (16), au-dessus de deux fils dans la direction de la machine (17, 18), en dessous de deux fils dans la direction de la machine (19, 20), au-dessus d'un fil dans la direction de la machine (21) et en dessous de trois fils dans la direction de la machine (22, 23, 24).

2. Tissu selon la revendication 1, comprenant en outre un tissu supérieur (27) aiguilleté sur ledit tissu de base (28).
3. Tissu selon la revendication 1 ou la revendication 2, dans lequel une partie desdits fils dans la direction de la machine (7 à 24) sont des mono-filaments faits d'un polymère ayant des caractéristiques d'amortissement des vibrations.
4. Tissu selon la revendication 3, dans lequel une partie desdits fils dans la direction de la machine (7 à 24) sont faits d'un élastomère polyester thermo-plastique.

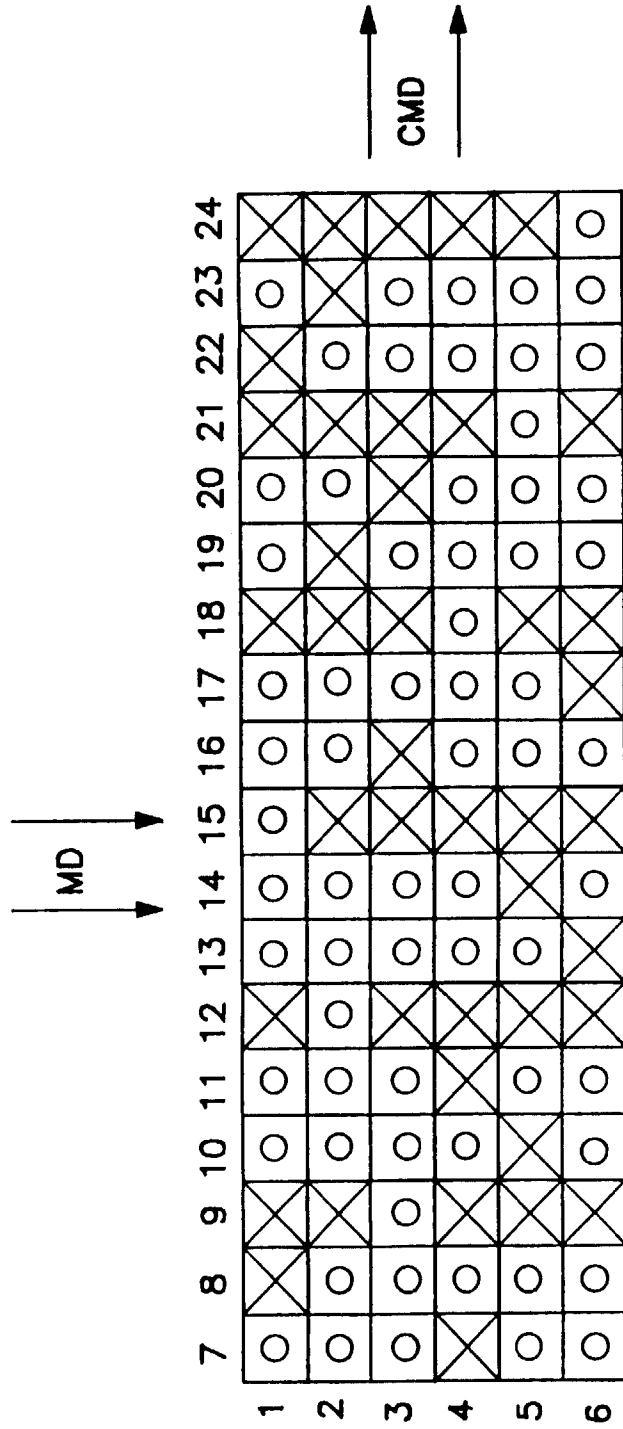


FIG. 1

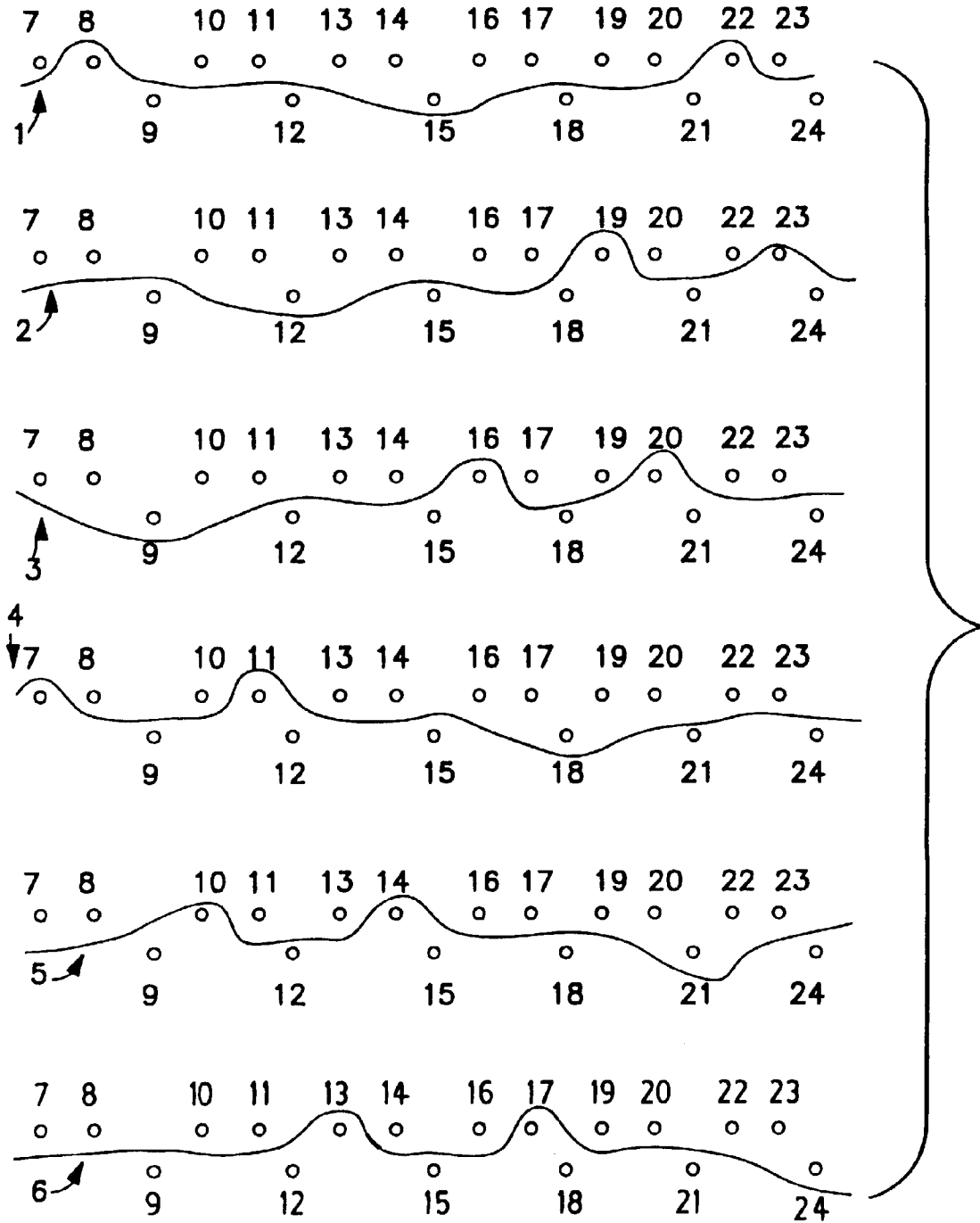


FIG. 2



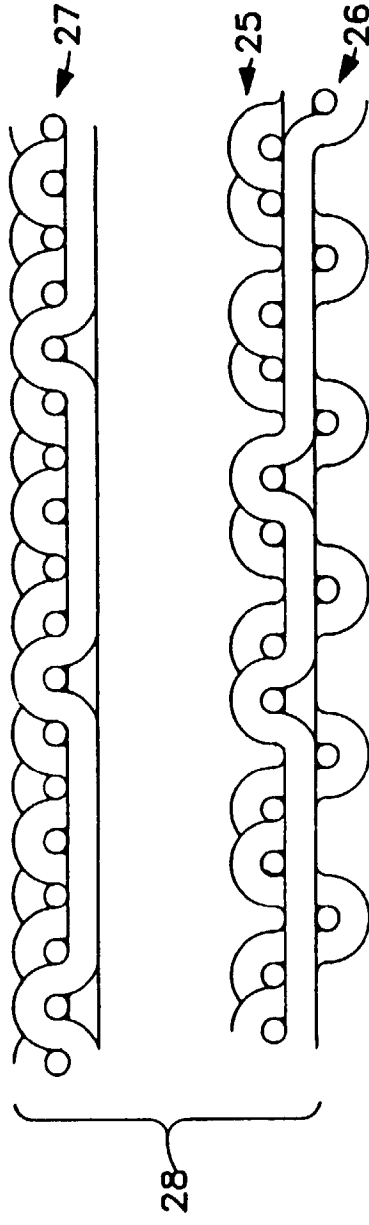


FIG. 3