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TOSHIO MORO

3,526,349

NEEDLE-BLADE ROLLER FOR MANUFACTURING NET-LIKE SPLIT FABRICS

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2 Sheets-Sheet 1

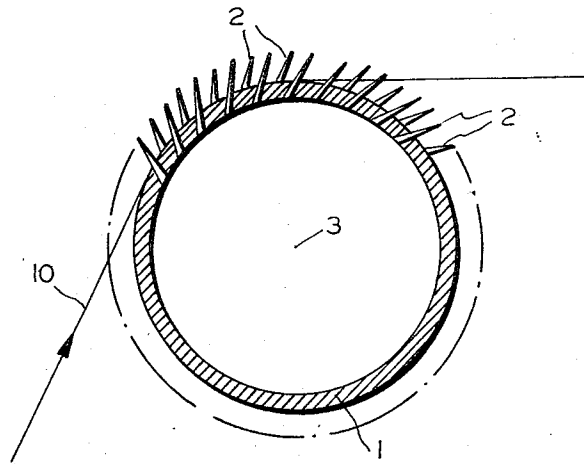


FIG. 1

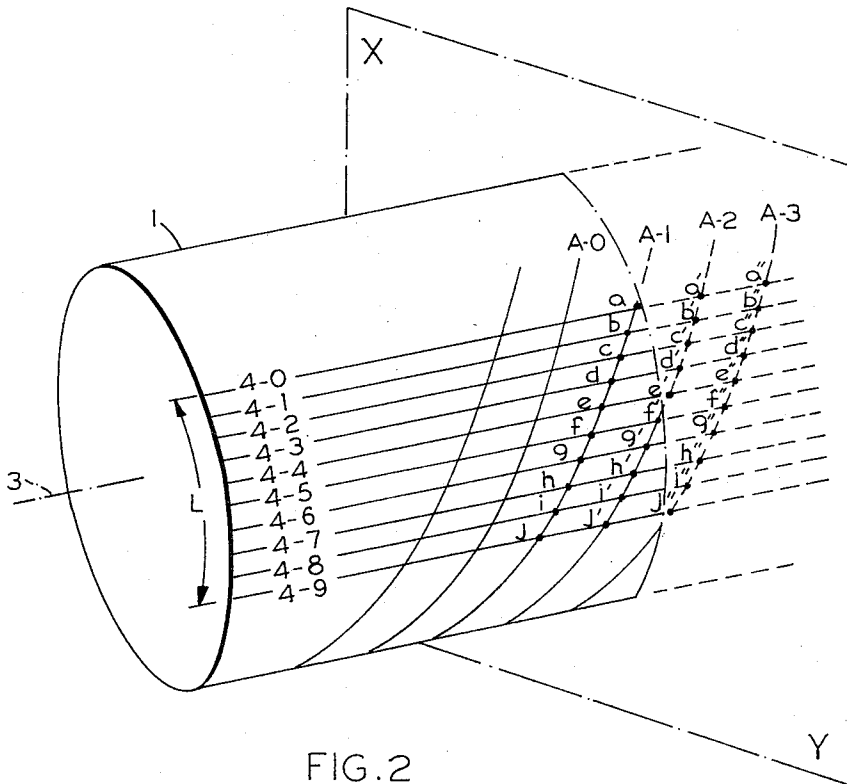


FIG. 2

INVENTOR
TOSHIO MORO

BY

Wendroth, Lund & Torack
ATTORNEYS

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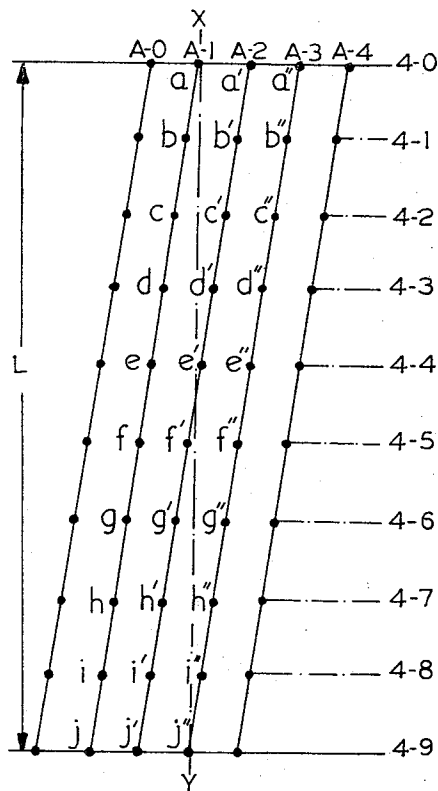
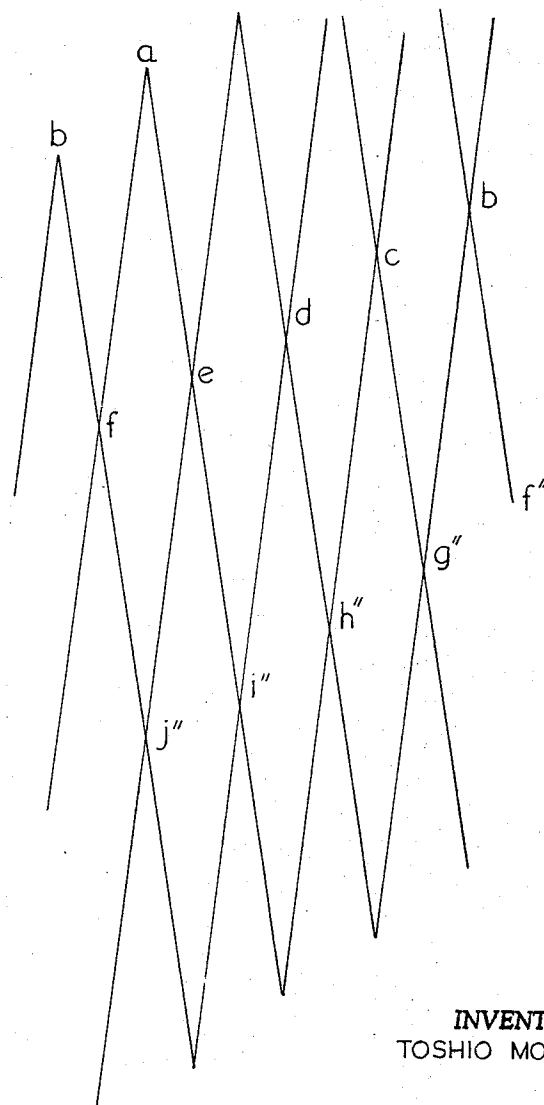


FIG. 3

FIG. 4



INVENTOR
TOSHIO MORO

BY *Wendroth, Lind & Tonack*
ATTORNEYS

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NEEDLE-BLADE ROLLER FOR MANUFACTURING NET-LIKE SPLIT FABRICS

Toshio Moro, Odawara, Japan, assignor, by direct and mesne assignments, of one-half each to Ikegai Tekko Kabushiki Kaisha, and Showa Denko Kabushiki Kaisha, both of Tokyo, Japan

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1 Claim

ABSTRACT OF THE DISCLOSURE

A needle-blade roller for manufacturing a net-like fabric from a synthetic resin film has a plurality of needle-blades secured on its periphery, whereby the needles are arranged on the periphery of the roller at each intersection point of even-numbered multi start spiral lines thereon with lines parallel to the axis of the roller dividing the circumferential length between every other spiral lines into odd-numbered regular intervals.

BACKGROUND OF THE INVENTION

The present invention relates to a needle-blade roller for processing a synthetic resin film by applying longitudinal splits thereon into a net-like split fabric. The heretofore used conventional needle-blade roller for producing split fabrics is constituted of a roller with numerous needle blades planted at regular intervals over the peripheral surface of the roller, which make numerous longitudinal splits on the film by the use of a differentiation between the peripheral speed and the film-moving speed, the film thus split being able to be used as tape, rope, fabric, and the like. However, although such a conventional needle-blade roller may be able to make a numerous number of parallel splits of a certain length on the film, it leaves unsplit portions at certain traverse intervals which inevitably are thicker than the split portions. That is, the conventional roller may split the film comb-like, but not in a net form.

An object of the invention is to improve the conventional needle-blade roller to achieve a qualitative improvement of split fabrics.

SUMMARY OF THE INVENTION

This invention forms net-like splits in a synthetic resin film in its longitudinal direction and eliminates such thick portions having no splits in the split fabric transversely to the film as are inevitable with a conventional needle-blade roller.

The split films manufactured by a needle-blade roller according to the present invention have therefore uniform fibers in their thickness and thus they provide products such as tape, yarn or the like of excellent quality.

It is a primary object of the invention to provide a roller having needle-blades which are arranged on the roller so that they can make a series of net-like splits in a synthetic resin film in its longitudinal direction without producing thick portions as in the conventional needle-blade roller and give a net-like structure from the film which comprises fibers having uniform thickness.

To achieve this object, the needle-blade roller according to the present invention has a plurality of needle-blades secured on its periphery, whereby the needles are arranged on the periphery of the roller at each intersection point of even-numbered multi start spiral lines parallel to the longitudinal axis of the roller dividing the circum-

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ferential length between every other spiral line into odd-numbered regular intervals.

With the above and other objects in view which will be apparent from the detailed description below, a preferred modification of the invention is shown in the drawings in which:

FIG. 1 is a vertical side sectional view of a cutter roller with needle-blades according to the present invention and also shows the state of the splitting of a synthetic resin film by way of the cutter roller;

FIG. 2 is a schematic perspective view of the cutter roller showing the arrangement of the needle blades;

FIG. 3 is a schematically developed plan view of one eighth of the outer peripheral surface of the cutter roller shown in FIGS. 1 and 2 in order to show the arrangement of needle blades secured on the outer peripheral surface of the cutter roller; and

FIG. 4 is a schematic plan view of the net-like split synthetic resin film manufactured by the cutter roller shown in FIGS. 1, 2 and 3.

Referring to FIG. 1 of the drawing, a cylindrical roller 1 having any desired thickness and made of suitable material has a plurality of needle-blades 2 each having a pointed end and made of a material such as tool steel planted on its outer periphery and adapted to rotate about its longitudinal axis 3. When film 10 made of synthetic resin such as polyethylene is pressed against roller 1 and moved at a velocity somewhat faster than the peripheral velocity of the roller 1 by drafting rollers (not shown) in the direction shown by the arrow the film 10 is split by the needle-blades 2 into fine fibers.

The needle-blades 2 are secured on the outer periphery of the roller 1 at each intersecting point of multi start helix lines A-1, A-2, etc. with the lines 4-0, 4-1, etc. parallel to the axis 3 of roller 1 as shown in FIGS. 2 and 3, whereby the numbers of multi start helix lines A-1, A-2, etc. are selected so as to have even numbers and parallel lines 4-0, 4-1, etc. are selected so as to divide the circumferential length L between every other spiral line A-1 and A-3 into odd regular intervals.

For instance, in FIGS. 2 and 3, the numbers of multi start helix lines are sixteen, L is one eighth of the circumferential length and it is divided into nine regular intervals.

Accordingly, the spiral lines A-0, A-1, A-2, etc. intersect each the parallel lines 4-0, 4-1, 4-2, etc. at points a, b, c, etc.; a', b', c', etc.; a'', b'', c'' etc. respectively. Thus, when the plane X-Y orthogonal to the central axis 3 of roller 1 is supported so as to be placed to pass through intersecting point a of line 4-0 with helix line A-1, it passes through the intersecting point j'' of line 4-9 with helix line A-3, and it intersects spiral line A-2 midway between points e' and f' which are formed by the intersection of parallel lines 4-4 and 4-5 with helix line A-2 respectively. Because intersection points a', b', etc. j' lie on helix line A-2 at points which divide length L between every other spiral line A-1 and A-3 into nine, that is, odd-numbered regular intervals.

Therefore, for instance, the split made by needle-blade 2 at point a starts from point a and ends in the neighborhood of point a starts from point a and ends in the neighborhood of point j'. It will be appreciated that though the split made with needle-blade 2 at point a intersects spiral line A-2 during its course to point j', since the positions a', b', c', etc. of needle-blades 2 on helix line A-2 lie on positions dividing length L into nine regular intervals as stated above plane XY intersects spiral line A-2 at the middle point of e'f'. Accordingly, the split in film 10 made by needle blade 2 at point a does not join together the splits formed by needle blades 2, 2 at points 3', f', but rather passes between them.

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Therefore, each needle-blade 2, 2, etc. located at each intersection point *a*, *b*, etc.; *a'*, *b'*, *c'*, etc.; *a''*, *b''*, *c''*, etc. crosses helix lines A-1, A-2, etc. lying adjacent thereto and yet the splits formed by such needle blades do not join together other splits formed by other needle blades, so they form net-like splits in the longitudinal direction of film 10 as shown in FIG. 4. FIG. 4 shows the split film made by the cutter roller shown in FIGS. 2 and 3 in the developed state and fibers are shown in straight lines.

On the contrary, supposing that the junctions of the helix lines and parallel lines drawn from such points as the length *L* is divided into even numbers are sought for, a needle blade comes to the midpoint of *a'j''* on helix line A-2, that is, the point of intersection of plane XY with helix line A-2. This means that the net-like splits mentioned above can hardly be obtainable.

Further, in order to make the net-like fabrics, e.g. fabrics formed by splitting, be slender, it is only necessary to decrease the leading angle of the helix lines A-1, A-2, etc. and simultaneously to shorten the intervals between each needle-blade on a helix line.

While I have described and illustrated herein a preferred embodiment of my invention it will be understood that modifications may be made without departing from the spirit of my invention. It should be understood therefore

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that I intend to cover by the appended claim all modifications falling within the spirit and scope thereof.

I claim:

1. A needle-blade roller for processing a synthetic resin film by applying longitudinal splits thereon into a net-like split fabric, comprising a plurality of needle-blades planted on the peripheral surface of said roller, said needle-blades being arranged on the outer periphery of said roller at each intersecting point of even-numbered multi-start spiral lines thereon with lines parallel to the axis of said roller dividing the circumferential length between every other spiral line into odd-numbered regular intervals.

References Cited

UNITED STATES PATENTS

3,273,771	9/1966	Beaumont	-----	225—3
3,369,435	2/1968	Boultinghouse	-----	83—660 X
3,460,416	8/1969	Gilbert	-----	225—97 X

JAMES M. MEISTER, Primary Examiner

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225—3; 83—660; 28—1