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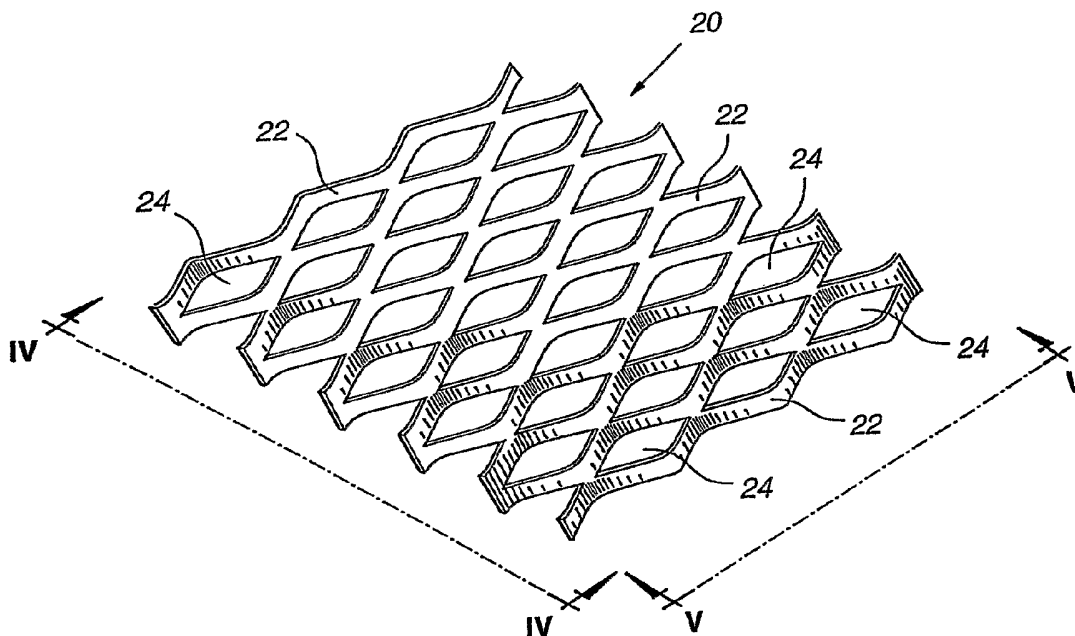
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(54) Title: GROUND STABILIZING CELLULAR WEB



(57) Abstract: A method and a system for preparing a cellular web (20), useful for ground erosion protection, out of a sheet of yieldable material (10). The system comprises a set of rotary knives (30) and a complementary set of discs (32). Each pair of knives and discs is matched to form a cut in the sheet (10) when passed therebetween. Each of the rotary knives (30) comprises a cut-out (30a), the cut-outs (30a) of one knife being angularly shifted with respect to the cut-outs of two adjacent knives, so that a pattern of alternating incisions (12) and non-cut portions (14) along parallel lines are received in a staggered order, whereby the non-cut portions (14) of every second line are aligned with respect to each other, and non-aligned with respect to the incisions (12) of adjacent lines.

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GROUND STABILIZING CELLULAR WEBS

FIELD OF THE INVENTION

The present invention relates to cellular webs for preventing ground
5 erosion.

BACKGROUND OF THE INVENTION

Honeycomb-like, cellular structures are known, used particularly for stabilizing embankments and other sorts of ground slopes.

Conventionally, such cell structures are composed of an array of plastic
10 strips S placed side-by-side, welded (W), seamed or otherwise bonded to each other along equally distanced, staggeredly located lines. When the array is stretched from the compact state (Fig. 1b) it become unfolded into a honeycomb-like blanket (Fig. 1a) which is used to cover the ground that needs protection against erosion.

15 Although widely used, this kind of products (mainly known in the art as GEOWEB®) suffer several disadvantages.

First, the method of manufacture is inherently cumbersome regarding that each individual strip needs to be welded (e.g. by ultrasonic process if made of plastics) over and over again all along its length.

20 Secondly, each cell defines a separate chamber where water becomes trapped. For this reason, many designs include draining perforations (not shown), which again increases the production costs.

Thirdly, in the compact form, the web is of an elongated, beam-like shape, as shown in Fig. 1b, causing waste in storage space and is inconvenient for transportation.

It is thus the prime object of the present invention to provide a more
5 effective and less costly method of producing erosion protective cellular webs.

It is a further object of the invention that the storage and transportation state of the web be in form of a reel.

SUMMARY OF THE INVENTION

Provided according to one aspect of the invention is a method of preparing
10 cellular webs useful for earth erosion protection comprising the steps of processing a sheet of a yieldable material against a set of rotating knives, the knives being circular except for at least one part of their circumference so that a series of parallel incisions are made, separated by a series of non-cut portions, in a staggered order whereby the non-cut portions of every second line of the
15 incisions are aligned with respect to each other in the direction perpendicular to the processing direction of the sheet, and non-aligned with respect to the incisions of the adjacent lines, and unfolding the sheet by stretching it in said perpendicular direction.

According to another aspect of the invention there is provided a system for
20 applying to a sheet of a yieldable material a pattern of alternating incisions and non-cut portions along parallel lines in a staggered order whereby the non-cut portions of every second line are aligned with respect to each other, and non-aligned with respect to the incisions of adjacent lines, the system comprises: a set of rotary knives; means for rotating the rotary knives; a complementary set of

discs whereby each pair of knife and disc are matched to form a cut in the sheet when passed between a rotary knife and the respective disc; and each of the rotary knives comprises a cut-out, the cut-outs of one knife being angularly shifted with respect to the cut-outs of two adjacent knives.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

These and additional constructional features and advantages of the invention will be more readily understood in the light of the ensuing description of two preferred embodiments thereof, given by way of example only, with reference to the accompanying drawings wherein:-

10 Fig. 1a is a perspective view of a conventional ground stabilizing web in the unfolded state;

Fig. 1b shows the web of Fig. 1a in the folded state;

Fig. 2 shows a sheet with the arrangement of incisions divided by non-cut portions;

15 Fig. 3 is a perspective view of a cellular web formed by stretching the sheet of Fig. 2;

Fig. 4 is a view taken along line IV-IV of Fig. 3;

Fig. 5 is a view taken along line V-V of Fig. 3;

Fig. 6 is a schematic perspective view illustrating a first embodiment of
20 rotary cutting knives system;

Fig. 7 is a view taken along line VII- VII of Fig. 6;

Fig. 8 is a section taken along line VIII- VIII of Fig. 7;

Fig. 9 is a schematic perspective view illustrating a second embodiment of rotary cutting system;

Fig. 10 is a view taken along line X- X of Fig. 9;

Fig. 11 is a section taken along line XI- XI of Fig. 10; and

Fig. 12 is a schematic representation of a complete line of production of the sheets shown in Fig. 2.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Sheet 10 of Fig. 2 is preferably made of a flexible plastic material such as PP (Polypropylene) or HDPE (High Density Polyethylene), 1.00mm - 2.00mm thick.

A series of incisions or slices 12, separated by a series of non-cut portions 14 are made in parallel rows, however in a staggered order as shown, namely that
10 the incisions and the non-cut portions of every second line are in transverse alignment with respect to each other.

The length of the incisions 12 are typically 10cm – 40cm and that of the intermediate non-cut portions is 2 cm - 6 cm.

When stretched in the direction perpendicular to the lines, a honeycomb
15 like web 20, comprised of strips 22 and rhomboidal cells 24 is formed as shown in Figs. 3-5, which can be readily used for the same applications as of the GEOWEB products, while possessing superior features. For example, as can be seen in Fig. 4, the bottom of the web 20 is zig-zagged, which helps to prevent the web from sliding down when spread over steep ground surfaces; because of the tilted
20 direction of the cells 24, the problem of water accumulation is solved and rain water can uninterruptedly drain down the slope of ground (compared with GEOWEBs where some times special measures must be taken to ensure drainage, such as perforations made in the walls of the cells).

The most outstanding advantage over the GEOWEB systems resides, however, is that the sheets 10 as herein proposed can be transported in reels or rolls (denoted 260 in Fig. 12), rather than in the form of blocks or slabs as shown in Fig. 1b.

5 Two options of equipment for preparing the sheets 10 are proposed, although others can be used. The rotary cutting system depicted in Figs. 6-8 is based on rotary knives 30 operatively associated with rotary discs 32. The knives 30 have a sharp cutting edge, and are positively driven at the cutting speed recommended for the material of the sheets.

10 The discs 32 may be freely rotatable about axle 34, or driven at the same peripheral speed (e.g. using gear-box placed in housing 36).

The knives 30 are formed with one or more cut-outs or notches 30a. In the present example, two such notches as shown, in exactly diametrically opposite locations namely shifted by 180° . Should it be determined to employ three
15 notches, the angular distance therebetween will be 120° . Moreover, the angular relative position of the notches is displaced by 90° for every pair of adjacent knives.

It will be now readily understood that processing the sheet 10 between the rotary knives 30 and the discs 34 will result in the formation of the pattern
20 described with reference to Fig. 2.

An alternative method of preparing the sheet 10 with the pattern of slits shown in Fig. 2 is illustrated in Figs. 9-10. The set of knives 30 is replaced by a set of cylindrical discs 130 provided with depressions 130a and 130a', alternately formed at the two peripheral sides of every disc. Hence, the depressions 130a are

spaced 180° from each other and so are the depressions 130a', and, in addition, are displaced by 90° relative to the depression 130a, in a staggered fashion (see Fig. 11).

The discs 130 and 132 are even width, and interlock at the periphery so that scissors effect is attained for cutting through the plastic sheet when passed therebetween – except during the passage between a disc 132 and either of the depressions 130a or 130a' of a counter disc 130; such passage will not amount to cause a cut, but will leave the sheet intact as requested for attaining the Fig. 2 pattern.

The production process of the sliced sheet, as schematically shown in Fig. 12 differs from the conventional process only in that a cutting system such as illustrated in Figs. 6 or 9 are incorporated. Hence, the blank sheet merges from extruder 240 and undergoes a first cooling and calibration stage between rollers 242, 244, second stage between rollers 246 and 248 and third stage-rollers 250-252 and 256.

Now comes the turn of the cutting system generally designated 258.

The sliced sheet is collected in the form of a reel 260. This manifests the outstanding superiority of the process proposed according to the present invention over the conventional GEOWEB family of products. Obviously, the storage and/or transportation on the one hand, and the deployment of the web sheet at the site on the other hand, is by far more economical and convenient, besides the manufacturing costs saving per a given area of covered ground which can amount up to 50%.

Those skilled in the art to which this invention pertains will readily appreciate that numerous changes, variations and modifications can be effectuated without departing from the true spirit and scope of the invention as defined in and by the appended claims.

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WHAT IS CLAIMED IS:

1. A method of producing a cellular web useful for ground erosion protection comprising the steps of –

(a) processing a sheet of a yieldable material (10)

against a set of rotating knives (30), the knives being circular

except for at least one part of their circumference (30a) so

that a series of parallel incisions (12) are made separated by

a series of non-cut portions (14) in a staggered order

whereby the non-cut portions (14) of every second line of the

incisions are aligned with respect to each other in the

direction perpendicular to the processing direction of the

sheet, and non-aligned with respect to the incisions of

adjacent lines; and

(b) unfolding the sheet (10) over the ground by

stretching it in said perpendicular direction.

2. The method as claimed in Claim 1 wherein the processed sheet is rolled in form of a reel.

3. A system for applying to a sheet of a yieldable material (10) a pattern of alternating incisions (12) and non-cut portions (14) along parallel lines in a staggered order whereby the non-cut portions of every second line are aligned with respect to each other,

and non-aligned with respect to the incisions of adjacent lines, the system comprises:-

- a set of rotary knives (30);
- means for rotating the rotary knives;
- 5 - a complementary set of discs (32) whereby each pair of knives and discs is matched to form a cut in the sheet (10) when passed therebetween;
- each of the rotary knives (30) comprises a cut-out (30a), the cut-outs of one knife being angularly shifted with
- 10 respect to the cut-outs of two adjacent knives.

4. The system as claimed in Claim 3 wherein the rotary knives (30) are sharp-edged.

15 5. The system as claimed in Claim 4 wherein the cut-outs (30a) are angularly distanced from each other by 180°, and by 90° relative to the cut-outs of the two adjacent knives.

20 6. The system as claimed in Claim 3 wherein the rotary knives are cylindrical discs (130) comprising depressions (130a) formed at both peripheral sides thereof.

7. The system as claimed in Claim 6 wherein depressions (130a) of each peripheral side of any cylindrical disc are angularly

distanced from each other by 180° and by 90° relative to the
depressions of the other side of the disc.

8. The system as claimed in Claim 3 wherein the knives and
the discs are motor driven.

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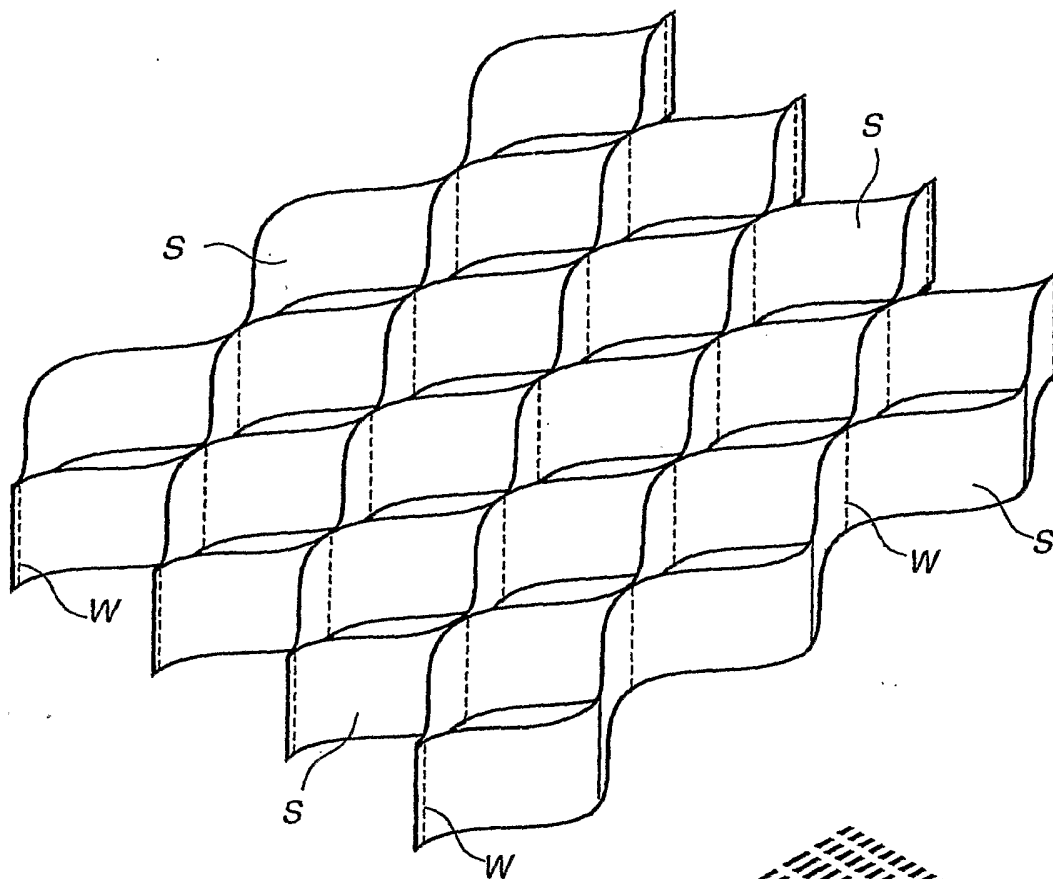


FIG. 1a
(PRIOR ART)

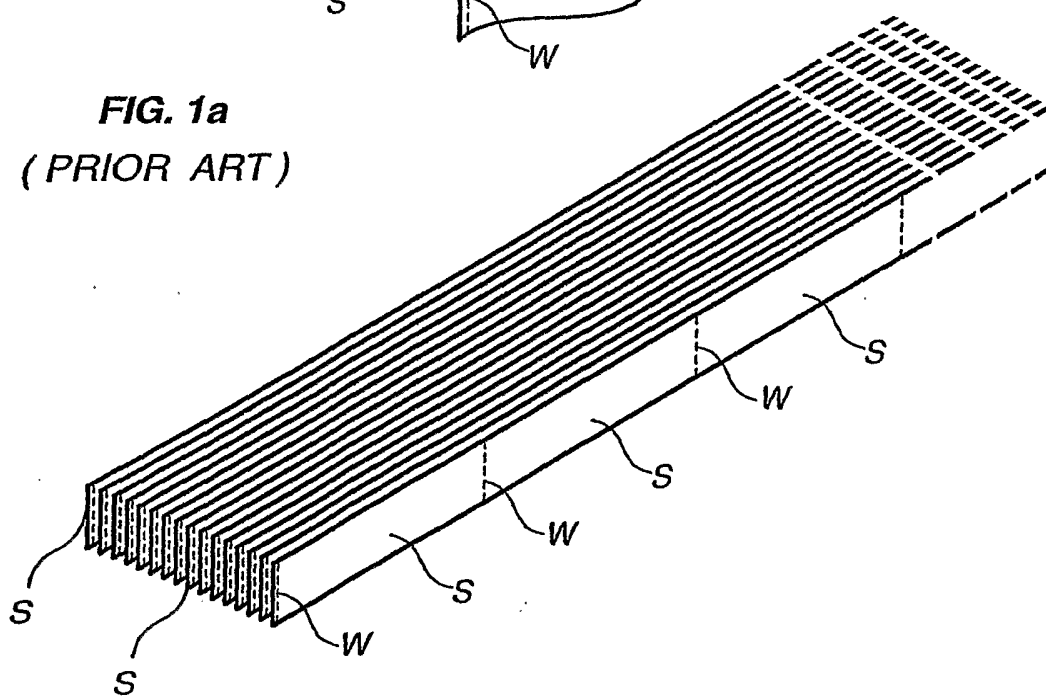
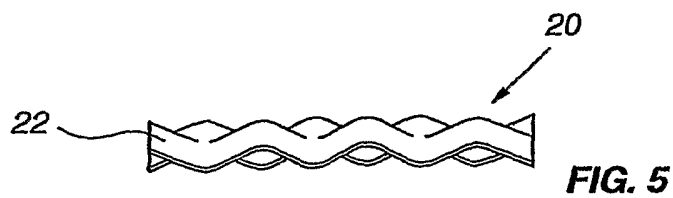
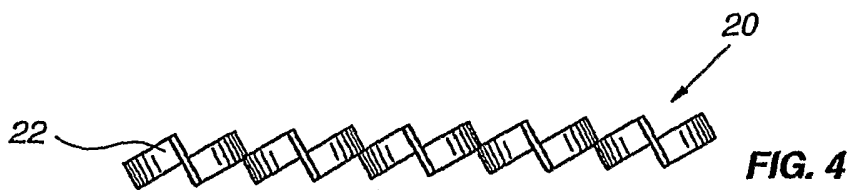
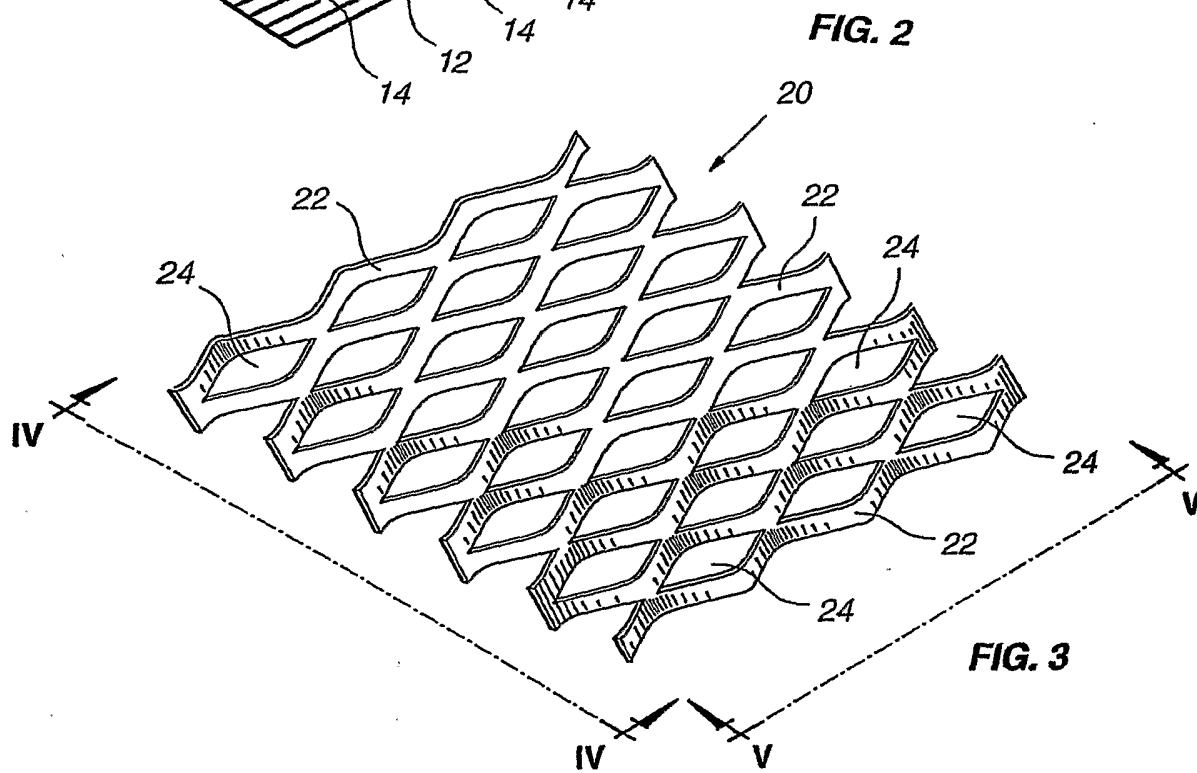
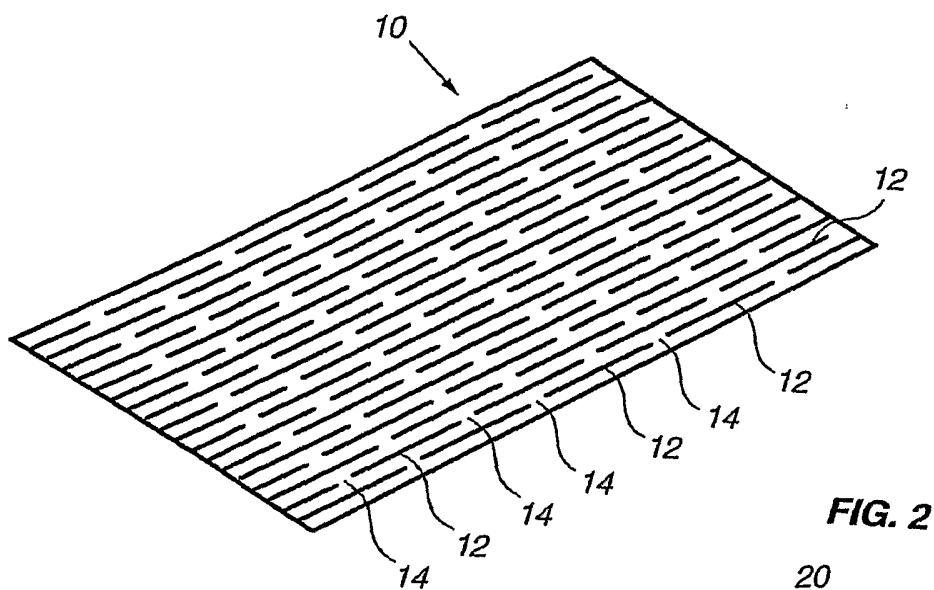


FIG. 1b
(PRIOR ART)

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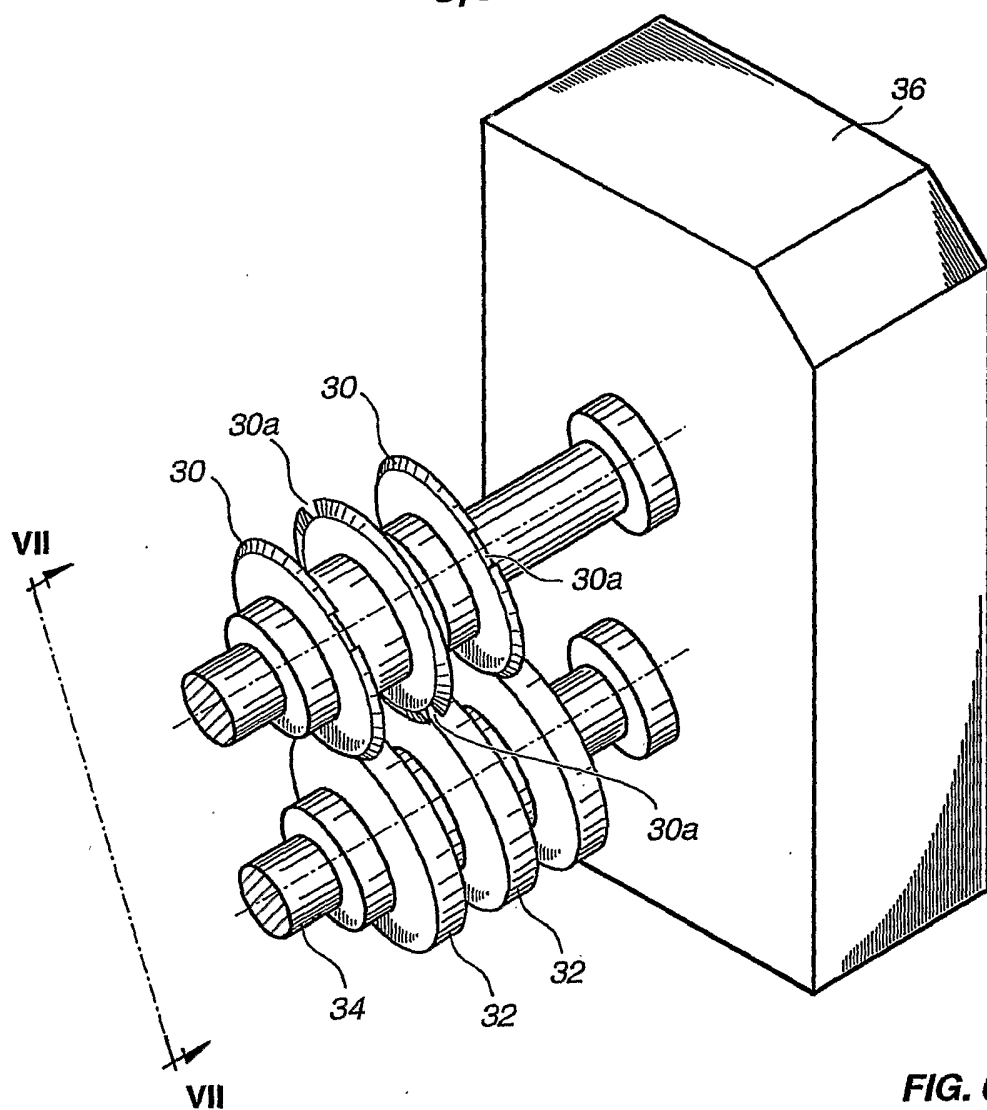


FIG. 6

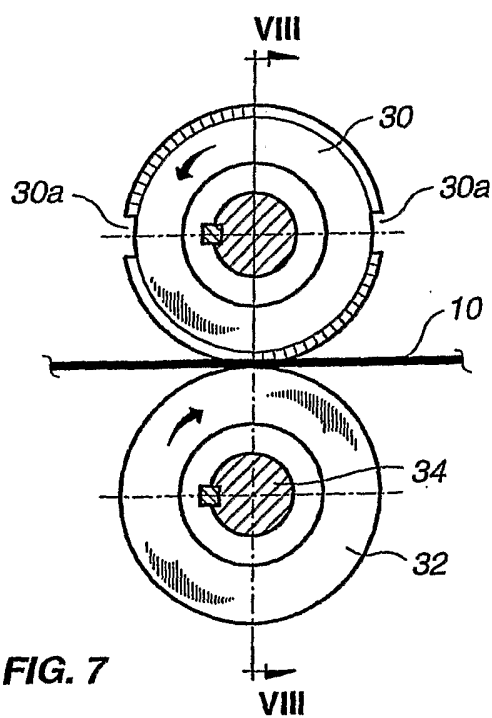


FIG. 7

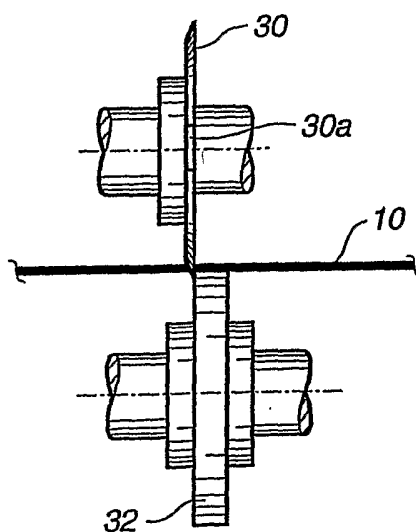


FIG. 8

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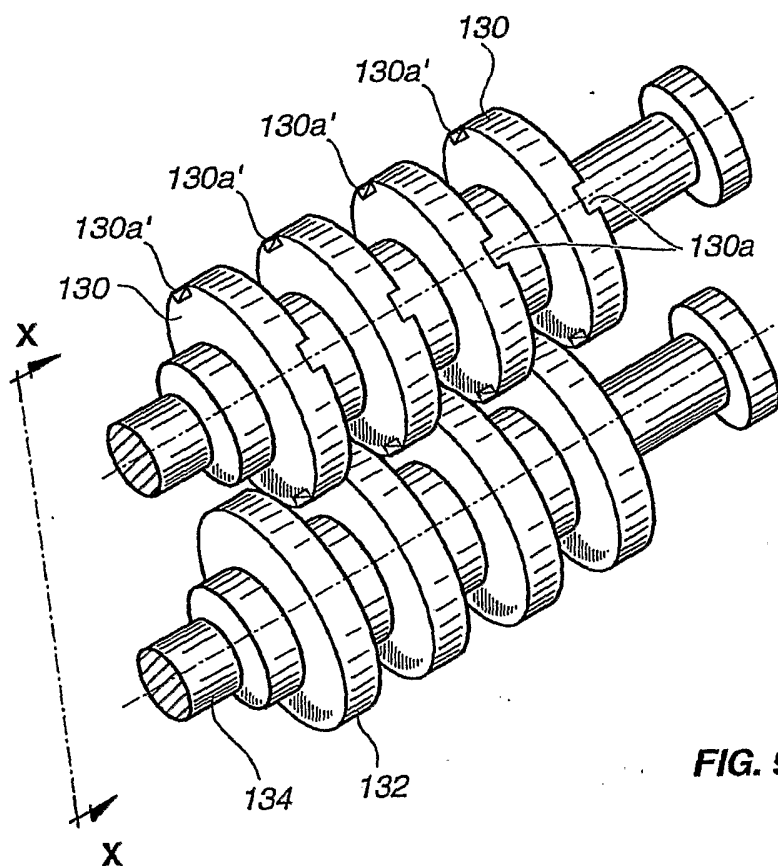


FIG. 9

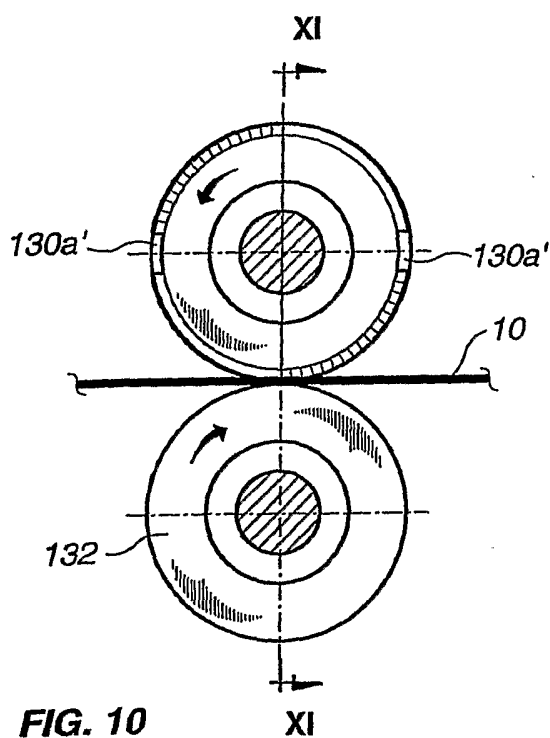


FIG. 10

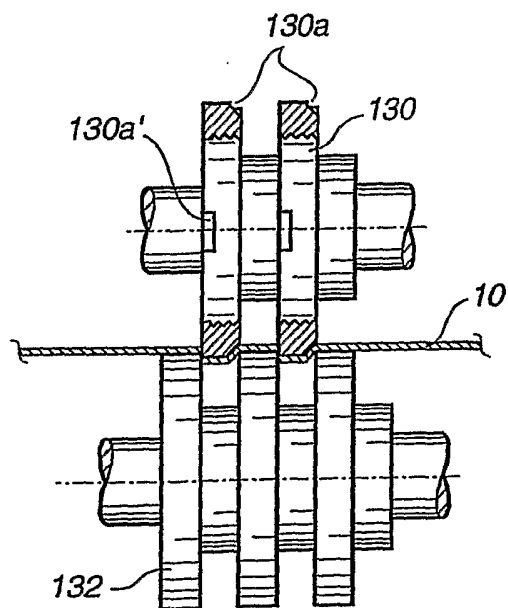


FIG. 11

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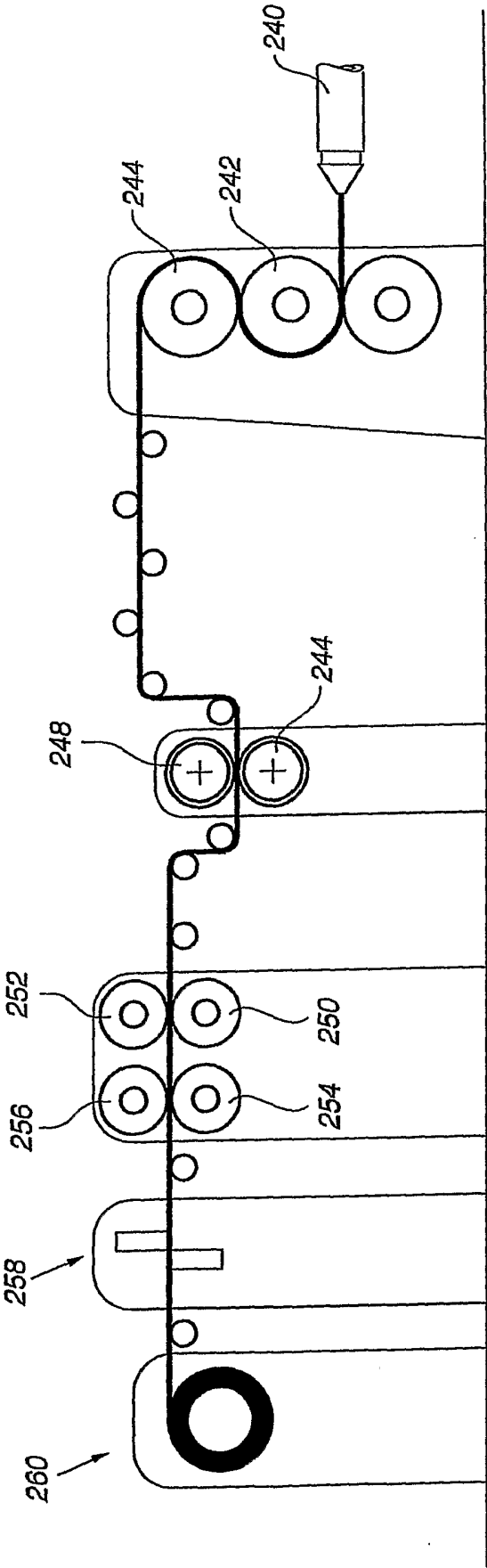


FIG. 12