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DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION
APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of
Applicant(s)

In support of the application made by Mölnlycke AB

Title

for a patent for an invention entitled A METHOD AND APPARATUS
FOR POSITIONING AT LEAST ONE THREAD, BAND OR THE LIKE IN A
PRE-DETERMINED PATTERN ON A MATERIAL WEB

Name(s) and
address(es)
of person(s)
making
declaration

I/we, STEFAN OLSSON,
S-405 03 Goteborg, Swedden.

do solemnly and sincerely declare as follows:-

1. I am/we are ~~the applicant(s) for the patent, or~~
~~am/are~~ authorised by the abovementioned applicant
to make this declaration on its behalf.
2. The basic application(s) as defined by Section 141
of the Act was/were made in the following country
~~or countries~~ on the following date(s) by the
following applicant(s) namely:-

Country, filing
date and name
of Applicant(s)
for the or
each basic
application

in Sweden on 12 July 1988
by Mölnlycke AB
in _____ on _____ 19____
by _____

3. The said basic application(s) ~~was/were~~ ^{XX} ~~XXXX~~ the first
application(s) made in a Convention country in respect
of the invention the subject of the application.

Name(s) and
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inventor

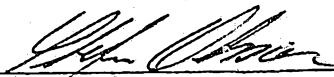
4. The actual inventor(s) of the said invention is/are
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5. The facts upon which the applicant(s) is/are entitled
to make this application are as follows:-
By virtue of an Assignment dated 12 June 1989 between Mr. Persson
and Mr. Johansson and the Assignee; and by virtue of an Assignment
between Mr. Indrebø and the Assignee, dated 30 November 1989.

DECLARED at Göteborg, Sweden this 21st day of January 1991

MÖLNLYCKE AB


Stefan Olsson
House Patent Counsel



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US 4776911
US 4172748
US 4064916
- (57) Claim

1. A method of positioning at least one filament in a predetermined pattern over a web of sheet material carried on a conveyor comprising the steps of:

rotating a first filament outlet of a filament outfeed device in a plane which is substantially parallel to said conveyor;

said rotation of said first filament outlet including simultaneous rotation of said first filament outlet about both a first and a second rotational axis;

outfeeding said filament through said first filament outlet; and

linearly moving said conveyor relative to said first and second rotational axes such that said filament is wrapped around dogging elements on said conveyor to position said filament on said web in said predetermined pattern.

13. An apparatus for positioning a filament in a predetermined pattern over a web carried on a conveyor comprising:

dogging elements disposed on said conveyor and movable with said web; and

first means for wrapping the filament around the dogging elements to provide said predetermined pattern over said web, said wrapping means including at least one filament outlet and means for simultaneously rotating said filament outlet about two rotational axes.

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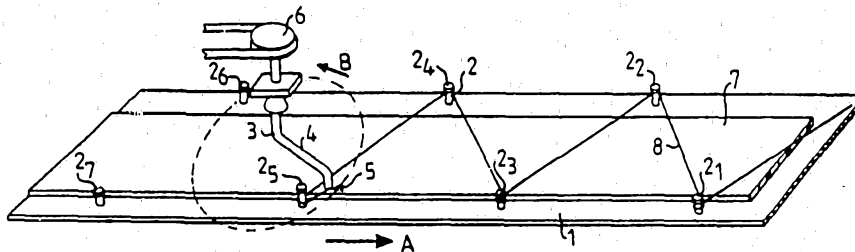
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(21) International Application Number: PCT/SE89/00390 (22) International Filing Date: 6 July 1989 (06.07.89) (30) Priority data: 8802607-5 12 July 1988 (12.07.88) SE (71) Applicant (for all designated States except US): MÖLN- LYCKE AB [SE/SE]; S-405 03 Göteborg (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): PERSSON, Lennart [SE/SE]; Västerbergsvägen 177, S-427 00 Billdal (SE). JO- HANSSON, Dan [SE/SE]; Hallstenshagen 27, S-421 56 V. Frölunda (SE). INDREBØ, Leidulf [NO/NO]; Simle- vejen 28, N-3152 Jersøy (NO). (74) Agents: HJÄRNE, Per-Urban et al.; H. Albiñns Patentbyrå AB, Box 3137, S-103 62 Stockholm (SE).	(81) Designated States: AT (European patent), AU, BE (Euro- pean patent), CH (European patent), DE (European pa- tent), DK, FI, FR (European patent), GB (European pa- tent), HU, IT (European patent), JP, LU (European pa- tent), NL (European patent), NO, SE (European patent), US. Published With international search report.	

(54) Title: A METHOD AND APPARATUS FOR POSITIONING AT LEAST ONE THREAD, BAND OR THE LIKE IN A PRE-DETERMINED PATTERN ON A MATERIAL WEB



(57) Abstract

The present invention relates to a method for positioning at least one thread, band or like element (8) in a pre-determined pattern above a conveyer path (1) with the aid of thread outfeed device (3) having at least one thread outlet device (5). In accordance with the invention, the thread outlet, or each thread outlet, is moved in a simple or a composite rotational path in a plane parallel with the conveyer path, and the path is moved linearly in relation to the rotational axis of the thread outlet. This will cause the thread outlet to move in a spiral-like movement path relative to the conveyer path. The conveyer path has mounted thereon dogging elements (2) which are located within the spiral-like movement path of the thread outlet, such as to enable the thread to be laid out in a pattern determined by the dogging elements. The invention also relates to apparatus for carrying out the method.

1 (amended)

A method and apparatus for positioning at least one thread, band or the like in a pre-determined pattern on a material web

5 The present invention relates to a method and apparatus for positioning at least one elastic thread, band or like element in a pre-determined pattern on a sheet material web for a disposable absorbent article with the aid of a thread outfeed means and a thread outlet. The method and apparatus are particularly intended for laying out elastic threads intended to form the leg and waist elastic of diapers.

10 It is known in the manufacture of so-called disposable diapers to provide the diapers with leg elastic, so that the diaper will fit snugly around the thighs of the wearer. For reasons of manufacture, the elastic threads used to this end in known diapers are placed in mutually parallel relationship. An example of such diapers is found described and illustrated in US 3,860,003. These
15 diapers comprise absorbent pads of hour-glass configuration, the narrow central part of which is located centrally between the wearer's legs in use. The use of elastic threads which extend in straight, mutually parallel lines in the longitudinal direction of the diaper, however, results in chafing against the wearer's skin,
20 on the inward sides of the thighs.

It is also known to position the elastication in a V-shape pattern, in which the elastic intersects the absorbent pad in the vicinity of the crotch part of the diaper. Diapers which are provided with this type
25 of elastication will better conform to the contours of the wearer's body than a diaper manufactured in accordance with the aforesaid US patent specification, besides avoiding unpleasant chafing of the wearer's crotch.



It is also known to arrange elastic threads in a diamond or network configuration and to produce curved leg elastic similar to that used in tailored leg apparel.

5 One method of producing such elastication is described and illustrated in our Swedish Patent Specification 8406071-4.

10 It is also conceivable to lay elastic threads in a curved path on a continuously advancing web of material, for instance by guiding the thread laying devices electrically, in a backward and forward motion across the web. Such a method of manufacture, incorporating rapid transfer movements, will be complicated, however, particularly in the case of high speed manufacturing lines.

15 Our Swedish Patent Application 8801324-8 teaches a method and apparatus for laying out elastic threads or filaments in a curved path, with the aid of one or more rotating rolls which have peripherally arranged thread-guiding grooves or slots.

20 The object of the present invention is to provide a method of the aforesaid kind which will ensure uniform tension in the laid threads; which will enable the threads to be laid with good precision; which can be effected with the aid of only a few moveable components; which will enable the threads to be laid out at high speeds; and which will enable the threads to be laid out in mutually different patterns.

25 This object is achieved in accordance with the invention by means of a method having the characteristic features set forth in Claim 1. Because the thread outlet need only be given a rotational movement, the threads can be

laid out at high speeds. This renders the inventive method highly suitable for laying out elastic threads in the manufacture of diapers. Furthermore, the threads can be laid out with great precision, since the precision
5 concerned in the present respect is dependent solely on the accuracy at which the thread dogging elements, thread carriers or like devices are positioned.

The invention also relates to apparatus for carrying out
10 the inventive method, the characteristic features of which apparatus are set forth in the following Claim 8.

So that the invention will be more readily understood, a number of exemplifying embodiments of the invention will
15 now be described in greater detail with reference to the accompanying drawings, in which

Figure 1 is a schematic perspective view of a first embodiment of an inventive apparatus particularly suited for laying out elastic threads on a web of material;

20 Figure 2 illustrated the relative movement path of the thread outlet above the web;

Figure 3 is a schematic illustration of a thread pattern in which threads are laid with the aid of two thread outfeed devices which rotate in mutually opposite directions and which form part of the apparatus illustrated
25 in Figure 1;

Figures 4A and 4B illustrate the thread pattern obtained when using two thread outfeed devices which rotate in mutually the same direction and which form part of the
30 apparatus illustrated in Figure 1, said apparatus also including thread dogging elements of particular configuration, the profiled section of which dogging elements is shown in Figure 4B;

Figure 5 illustrates the configurations of various
35 dogging elements, to the left of the Figure, and a

thread pattern obtained when using said elements, to the right of the Figure;

Figure 6 illustrates a three-thread pattern which can be employed very advantageously for the purpose of laying out diaper leg and waist elastic;

Figure 7 illustrates a second embodiment of inventive apparatus by means of which threads are laid out in a curved pattern;

Figure 8 illustrates the relative movement path of a thread outlet located above the material web and included in the apparatus shown in Figure 7;

Figure 9 illustrates a second embodiment of an inventive thread outfeed device;

Figure 10 illustrates the relative movement path of the thread outlet of Figure 9 above a continuous web;

Figure 11 illustrates an application in which a laid-out thread pattern is utilized to wind a thread around a cylindrical object; and

Figures 12 and 13 illustrates a third embodiment of an inventive thread outfeed device.

Figure 1 illustrates a conveyer path 1, which is driven in the arrowed direction A in some suitable manner, and which may comprise, for instance, a belt-driven endless path. Arranged in the close proximity of the two outer edges of the conveyer path are respective rows of thread dogging elements 2 in the form of pins, studs or like elements, the dogging elements 2 in one row being displaced in relation to the dogging elements in the opposite row, as seen in the direction of path movement. A rotatable thread outfeed device 3 is mounted on a frame, stand or like structure and is positioned such that its rotational axis will intersect the longitudinal symmetry line of the conveyer path. The thread outfeed device includes an outfeed tube 4 having an outlet 5

whose outlet orifice is located at a given distance above the upper surface of the conveyer path and radially outside the rotational axis of the thread outfeed device. The outfeed device is driven for rotation by means of an appropriate mechanism, such as a belt or sprocket wheel 6 and a transmission belt for instance.

The thread outfeed device 3 will also preferably be arranged to co-act with an ejector-type thread infeed device, the ejector effect generated by which is operative in blowing a free end of a thread in through the outfeed tube 4, and also with means for preventing slackening of the threads as they leave the outfeed device 3. When the thread outfeed device is intended for use with elastic threads, as in the case of the Figure 1 embodiment, thread tension is preferably achieved with the aid of an unwinding reel or like device, which is driven such that the length of thread unwound from the reel per unit of time will be shorter than the length of thread fed out from the thread outlet. In the case of non-stretchable threads, the slack-preventing means may have the form of a simple friction brake. When laying out inelastic threads, it can also be appropriate to arrange a supplementary thread tensioning device downstream of the thread outlet, particularly in the case of those pattern formations in which not all of the closed loops formed are wound around dogging elements.

Figure 1 also shows a material web 7 on which thread 8 exiting from the device 3 is intended to be affixed and which is advanced by means of the conveyer path 1.

The manner of operation of the inventive embodiment illustrated in Figure 1 will now be described with

reference to Figures 1 and 2.

Figure 2 illustrates schematically a relative movement path taken by the thread outlet 5 over the conveyer path 1, when the thread outlet is rotated in the direction of the arrow B. The circular motion performed by the outlet is shown by a broken line in Figure 1. Since during a first half of one revolution (in Figure 1 the half revolution nearest the viewer) the outlet will have a movement component acting in the direction of conveyer path movement and during the second half of said revolution will have a movement component which is counter-directional to the linear movement of said path, movement of the conveyer path relative to the outlet will be greater per unit of time during that half revolution in which the outlet moves against the direction of path movement. The movement path described by the outlet will thus have the form of an extended flat spiral, above the conveyer path, as illustrated schematically in Figure 2.

The V-shaped thread pattern shown in Figure 1 is thus obtained by positioning the dogging elements 2 within the spiral-like movement path of the outlet, the dogging elements 2_1 , 2_3 , 2_5 , 2_7 of Figure 1 being placed in the closed loops formed in the spiral-like movement path of the thread outlet. Consequently, when the apparatus of Figure 1 is operating, the thread 8 will be wound one turn around each of the dogging elements 2_1 , 2_3 , 2_5 and 2_7 on that side of the conveyer path on which the outlet has a movement component in the direction of movement of the conveyer path, and is laid around an outer peripheral part of the opposing dogging elements 2_2 , 2_4 and 2_6 .

As beforementioned, the preferred thread outfeed device 3 is constructed so that the length of thread fed out with each revolution is shorter than the length cor-

responded by the sum of the distances between the dogging elements 2_1 , 2_2 and 2_2 , 2_3 respectively. As a result, the elastic thread 8 will be stretched as it is laid out, and will therefore always be brought into abutment with each dogging element that passes the outlet. This will ensure that the thread is unable to jump from a dogging element as a result of being subjected to the influence of external forces generated by vibration, shaking, air-draughts, etc.

It will also be understood that it is necessary for the outlet 5 to move more quickly than the conveyer path 1, in order that the outlet has time to pass a dogging element 2_1 , 2_3 , 2_5 and 2_7 . Thus, if it is assumed that a point moves along the line C in Figure 2, it will be seen to be necessary for the outlet to pass through that arcuate part of its movement path which lies beneath the line C in a faster time than the time taken for the conveyer path to move through the distance a, so that a point which is passed by the outlet on the upstream side will also be passed by the outlet on the downstream side, i.e. said point may not move at a speed which will enable said point to leave the movement path of the outlet.

Furthermore, the outlet 5 is located slightly above the plane of the conveyer path 1, such that the laid thread 8 will lie immediately above the web 7, but not in contact therewith, so as to enable any variations in thread outfeed speed, rotational speed, conveyer speed, and therewith variation in thread tension, to be equalized in the laid-out thread.

The thread laid in the V-shaped pattern shown in Figure 1 is intended to be bonded or likewise affixed to the

web 7. This can be effected readily, by pressing the thread against the web with the aid of a roller or like device arranged downstream of the apparatus shown in Figure 1, and by adhesive bonding the thread to the web. The adhesive required herefor may be applied in conjunction with pressing the thread into contact with the web. It is preferred, however, to apply adhesive in a given pattern on the web 7, prior to passing the web to the conveyer path, at a location upstream of the apparatus shown in Figure 1. Subsequent to bonding the threads to the web 7, the threads are clipped from those sections of the conveyer path which protrude beyond the web.

Figure 3 illustrates the pattern obtained when a second or further thread outfeed device is mounted in the travel direction, on one side of the first mentioned thread outfeed device 3 illustrated in Figure 1, this second thread outfeed device being arranged to rotate in a direction opposite to the first device. The thread 8_1 laid out by the first device 3 is shown in a full line, whereas the thread 8_2 laid out by the second device 3 is shown in a broken line. Because the second thread outfeed device 3 rotates in a direction opposite to the arrow B, the thread 8_2 will be wound around the dogging elements 2_2 , 2_4 and 2_6 instead of around the dogging elements 2_1 , 2_3 and 2_5 , the thread 8_1 exiting from the first thread outfeed device being wound around these latter dogging elements in the manner aforescribed. Thus, as will be seen from Figure 3, the threads 8_1 and 8_2 extend parallel with one another within the region of the web 7. Consequently, a V-shaped double elastic can be produced very readily with the aid of the inventive apparatus.

Double elastic can also be produced with the aid of two thread outfeed devices which rotate in mutually the same direction, when the dogging elements used have varying height dimensions and when the two threads are caused to exit from respective devices at mutually different heights, i.e. respective thread outlets are positioned at different heights above the conveyer path. Figure 4A illustrates one such thread pattern, and Figure 4B illustrates in side view a dogging element of which the upper part has smaller dimensions than the lower part thereof.

The left-hand side of Figure 5 illustrates in side view other dogging element configurations, while shown to the right in Figure 5, from above, are thread patterns 8_1 , 8_2 obtained with the aid of such elements. The dogging element shown at the top of the figure can replace the type of dogging element illustrated in Figure 3, whereas the dogging element shown to the bottom of the Figure can replace the type of dogging element illustrated in Figures 4A and 4B. When comparing the centre and bottom views shown in Figure 5, these views being taken from above and illustrating part-patterns produced by thread outfeed devices which rotate in mutually different directions and mutually the same directions respectively, that it is possible with such dogging elements to lay the threads at different distances between mutually parallel threads, in dependence on the directions in which the thread outfeed devices rotate.

A study of Figure 5 will also show that the threads can be laid in a trapezoidal configuration, by exchanging the dogging elements 2_2 , 2_4 , 2_6 of the Figure 1 embodiment with two mutually adjacent and mutually spaced dogging elements in the movement direction of the con-

conveyer path, provided that these dogging elements are positioned within the movement path of the outlet.

Of course, it is also possible to produce regular patterns, the recurring parts of which are formed during more than one revolution of the outlet. Thus, if the dogging element 2_3 is removed from the Figure 1 apparatus, the thread 8 will move parallel with the direction of conveyer path movement, between the dogging elements 2_2 and 2_4 when the outlet 5 has reached the position illustrated in Figure 1, and the thread will thus be laid in a U-shape between the dogging elements 2_1 , 2_2 , 2_4 and 2_5 . If the dogging element 2_4 is removed instead of the dogging element 2_3 , the thread 8 will run parallel with the direction of conveyer path movement, between the dogging elements 2_3 and 2_5 , in a manner analogous with the former case.

Figure 6 illustrates a pattern which is formed by three different threads 8_1 , 8_2 , 8_3 , which have a square-wave-like configuration and which are displaced in phase relative to one another, these threads being shown as a full line thread 8_1 , a broken line thread 8_2 and a dotted line thread 8_3 . Also shown in dotted, fainter lines in the Figure, is the configuration of the diapers on which the three threads are intended to form leg and waist elastics. The three threads are fed-out at mutually different heights above the web, so that a dogging element or like thread guide which co-acts with solely one of the threads is unable to disturb the laying out of the other threads. Thus, the inventive apparatus enables longitudinal and transverse elastic to be laid out simultaneously, which considerably increases the production rate in comparison with those cases when the longitudinal and transverse elastics must be laid

out in separate steps. Furthermore, it is possible, of course, to form patterns from more than three threads, and two conveyer paths can be used when laying out the threads, these paths being later brought together.

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Figure 7 illustrates another embodiment of inventive apparatus in which two conveyer paths are used and which differs from the apparatus illustrated in Figure 1 by virtue of the fact that the dogging elements are arranged close together in mutually sequential groups 102, 102', so that the threads will form curved patterns.

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In other respects, the threads are laid out in a manner analogous with that described with reference to Figures 1 and 2, with the principle difference that more than one dogging element is positioned within the closed loops of the outlet movement path, which means that the length and breadth extension of the dogging element groups must be taken into account when deciding the relationship between the speed of movement of the conveyer path 101 and the rotational speed of the thread outfeed device 103.

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In order to ensure that the outlet 105 is able to pass on both sides of the dogging element group 102 during rotational movement of the outlet, it is necessary for the outlet of the Figure 7 embodiment to rotate more quickly in relation to the moving conveyer path than the outlet 5 of the Figure 1 embodiment.

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Figure 8 illustrates schematically the relative movement path of the outlet 105 on the conveyer path 101. As a comparison with Figure 2 will show, the illustrated movement paths of the outlets 5 and 105 have principally

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the same spiral-like configuration, although the spiral shape described by the outlet 5 is more extended than the spiral-shaped movement path of the outlet 105, due to the differences in rotational speed relative to the speed of conveyer path movement.

The dogging element groups 102 have a droplet configuration, with a wider and a narrower part relative to a line which extends parallel with the direction of conveyer movement and which is intersected by the rotational axis of the thread outfeed device 103. The rotational direction of the outlet is preferably chosen so that that part of its revolutionary movement in which the outlet has a movement component in the direction of conveyer movement is located on the same side of the aforesaid line as the broader part of the droplet configuration formed by the dogging element group 102.

The apparatus illustrated in Figure 7 is constructed to lay a pattern of two mutually parallel threads and to apply these threads between two material webs 107 and 107', which are moved past two glue nozzles 111 and 111' respectively, prior to being brought together and placed on two conveyer paths in the form of belt or chain driven endless belts 101 and 101'. The dogging element groups 102 and 102', rigidly mounted on the endless belts, pass through the webs such as to project above the webs to a height which will prevent the laid-out threads from coming into contact with the adhesive earlier applied to the web surfaces. The dogging element groups 102 and 102' will pass successively beneath associated, rotating thread outfeed devices 103 and 103', which are driven synchronously by a common drive shaft 109. The material webs 102 and 102' and the overlying threads 108 and 108' then pass through a press

section 110, in which the material webs and the intermediate threads are pressed together and exit from the press section in the form of a double-layer material structure with intermediate double elastic. It is mentioned that the term "overlying" used in conjunction with the outfeed of threads is related to the side of an endless belt on which the threads are laid, this side constituting in this text the upper side, irrespective of whether said side is in reality the upper or the lower side of the belt.

As will be seen from Figure 7, the conveyer belts 101 and 101' move in a divergent path subsequent to exiting from the press section, such as to withdraw the dogging elements successively from piercing engagement with the material webs 107 and 107'. The rollers mounted in the press section 110 are recessed in the vicinity of the dogging elements, so as not to damage said elements.

In those instances when compression of the parts of the webs lying laterally outside the dogging elements does not induce sufficient compression of intermediate parts such as to achieve positive adhesion of the threads, the rollers may be provided with grooves opposite each pair of dogging elements in the groups 102 and 102' coinciding in the longitudinal direction of the conveyer path. One conceivable variant is to provide a dogging element construction in which the dogging elements can be withdrawn down into the confines of the conveyer path and biased towards their working position by means of a spring.

It should be mentioned that the aforementioned configuration of press rollers or dogging elements can be applied with all pattern configurations in which dogging

elements pierce through the applied material layers, such as in the case of the pattern illustrated in Figure 6 for instance.

5 It should also be mentioned in this respect that the amplitude of the relative movement path of the outlet on the conveyer path can, of course, be varied by changing the radial length of the outfeed tube and by placing the rotational centre of the thread outfeed device to one
10 side of the longitudinal symmetry line of the conveyer path.

In the case of the embodiments described hitherto, the thread outlet performs a simple rotating movement.
15 However, those variations in the outlet movement path afforded by varying the relationship between the speed at which the outlet rotates and the speed at which the conveyer path moves, or by changing the radial length of the outfeed tube, will not always suffice in achieving
20 the desired thread lay-out pattern. The possibilities of varying the thread lay-out pattern can be improved, by configuring the thread outfeed device in accordance with the device illustrated schematically from above in Figure 9. In the case of this embodiment, the rotation
25 axle of the outfeed tube 204 is firmly connected to a gear or toothed wheel 209 and axially rigid but rotatably connected to the free end of a rotatable arm 210. The teeth of the toothed wheel 209 co-act with the radially inner teeth of a gear-ring or toothed ring 211,
30 which in the case of the preferred embodiment is stationary. Thus, rotation of the arm 210 in the direction indicated by the arrow D will cause the toothed wheel to rotate about its own axis, by virtue of co-action with the toothed ring, which means, in turn, that the thread
35 outlet will rotate in the direction of the arrow E. When

the transmission ratio between toothed ring and toothed wheel is 1:3, the outlet will rotate three times about its own rotational axis for each revolution of the arm 210.

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Figure 10 illustrates schematically the relative movement path of the thread outlet on a conveyer path moving in the direction of the arrow A. This movement path enables the number of possible pattern configurations to be increased considerably. For example, a thread outfeed device according to Figure 9 can be used with great advantage to form square-wave patterns, such patterns being difficult to achieve with thread outlets which are solely capable of performing simple rotational movements.

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By varying the transmission ratio between the toothed ring and the toothed wheel and the length of the outfeed tube of the thread outfeed device, the thread outfeed device illustrated in Figure 9 can be used to produce a large number of different thread lay-out patterns. Furthermore, it is also possible in this respect to change the transmission ratio, by rotating the toothed wheel at the same time as the arm 210.

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As will be understood, the threads laid out by means of the aforescribed embodiments of the inventive apparatus are not restricted in use to the leg and waist elastic of diapers, and neither need they necessarily be bonded to a flat material layer.

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Accordingly, an application of the inventive concept in which a thread laid out in a square wave pattern is wound one revolution around a cylindrical object will now be described with reference to Figure 11.

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In Figure 11 there is shown a conveyer path 301 on which a thread 308 is laid out in a square wave pattern with the aid of a thread outfeed device (not shown) of the kind illustrated in Figure 9. Positioned on the conveyer path above the thread pattern are cylindrical bodies 310, as shown in Figure 11. It will be understood that the cylindrical bodies are illustrated by way of example and that said bodies may have any cross-sectional shape whatsoever. The apparatus illustrated in Figure 1 also includes a gripping device 311 which is intended to co-act with each alternate dogging element 302₁, 302₅ etc. nearest the viewer of Figure 11, in a manner described in more detail hereinafter.

The gripping device 311 can be swung through 180°, between a first and a second terminal position, about an axis which lies in the extension of an imaginary line passing through the dogging elements 302₃ and 302₂, and thus has an angle of 45° to the direction of conveyer path movement. The gripping device comprises an arm 312 which in the terminal position shown in Figure 11 extends transversely across the conveyer path and includes two gripping fingers 313, which in the illustrated position lie opposite the dogging element 302₁. In the other terminal position of the gripping device, the arm 312 extends parallel with the direction of conveyer path movement.

The conveyer path moves in the direction of the arrow A and the dogging element 302₁ will thus be moved in between the fingers 313. This will cause the arm 312 to be rotated through 180°, from the terminal position shown in Figure 11 to the other terminal position, and the dogging element 302₁, which is constructed so as to

be liftable from the conveyer path, will accompany movement of the arm. The dogging element 302₁ will therefore be moved around a semicircular path, as indicated in chain lines in Figure 11, to the position occupied by the dogging element 302₄ in the Figure. At the same time, the dogging element 302₄ is moved together with the conveyer path, and the dogging element 302₁ will thus be located immediately behind the dogging element 302₄ when the arm 312 has reached its other terminal position. The arm 312 is then rotated back to its first terminal position, wherewith the thread 308 can be withdrawn from the dogging element 302₁, by virtue of the fact that at this time point the thread is located beneath the short leg of an L-shaped thread stripper 314. During reverse pivotal movement of the arm 312, the gripping device 311 is moved forwards, parallel with the conveyer path, so that the dogging element 302₁ can be moved back to the same location on the conveyer path. Subsequent hereto, the gripping device is again moved forwards, so that the gripping fingers leave the dogging element 302₁ and the arm 312 is then again rotated to its second terminal position and moved backwards, through the same distance as it was earlier moved forwards. When the whole of the cylinder body has passed the axle connection of the gripping device 311, the arm 312 is again rotated to the position shown in Figure 11, so as to be able to co-act with the dogging element 302₅. When the aforescribed operation is completed, the thread 308 will thus have been wound through one turn around the cylinder 310.

Figures 12 and 13 illustrate schematically an embodiment of a thread outfeed device which is particularly suitable for laying out threads in triangular patterns.

In the case of this embodiment, an outfeed tube 404 is carried for rotation by a carrier 410 which can be rotated about a shaft 411 in some suitable manner, for instance by means of a belt transmission. A toothed wheel 412 is rigidly connected to the shaft 411 and engages a toothed wheel 413 which is rigidly connected to a further shaft 414, which in turn is carried for rotation by the carrier arm 410. Mounted on the lower end of the shaft 414 is a toothed wheel 415 which, similar to the toothed wheel 413, is rigidly connected to the shaft 414. This toothed wheel 415 is in engagement with a toothed wheel 416, which is rigidly connected to the outfeed tube 404, such as to rotate said tube relative to the carrier arm 410.

The composite movement of the outfeed tube 404 resulting from rotation of the carrier arm 410 in the direction of the arrow E will now be explained with reference to Figure 13, in which the toothed wheels 412, 415 and 416 have been symbolized with circles for the sake of simplicity.

Figure 13 shows the outfeed tube 404 and the toothed wheels 412, 415 and 416 in four mutually different, equally spaced positions I-IV during a revolution of the carrier arm 410. The position I is shown in full lines and corresponds to the position of the outfeed tube 404 shown in Figure 12. Rotation of the carrier arm 410 in the direction E will cause the toothed wheel 413 to be rotated by the fixed toothed wheel 412 in an anti-clockwise direction in Figures 12 and 13, which in turn means that the toothed wheel 415 will also rotate anti-clockwise and therewith cause the toothed wheel 416 and the outfeed tube 404 to rotate clockwise. The gear transmission is therewith so constructed that when the

carrier arm 410 is rotated through one quarter of a revolution and has reached the position II in Figure 13, the toothed wheel 416 will also have rotated through one quarter turn. As will best be seen from Figure 13, the outfeed tube 404 has a length such that in the position II the end of the tube will exactly reach the centre of the toothed wheel 412.

Subsequent to a further quarter turn of the carrier arm 410, and therewith also of the toothed wheel 416, the outfeed tube is again perpendicular to the longitudinal axis of the path 1 and the end of the tube will extend slightly beyond the movement path of the dogging elements 2. In position III, the outfeed tube, similar to the position II, extends parallel with the longitudinal direction of the web 1.

Because of the configuration of the thread outfeed device, the end of the outfeed tube 404 will move in a rectilinear, reciprocating movement path transversely across the conveyer path 1. As will be seen from Figure 12, when laying out threads with the aid of such a device, the thread 8 will not be crossed at any of the dogging elements, as distinct from the case when using the aforescribed thread outfeed devices, see Figure 1 and Figure 11. The obtainment of uniform thread tension is facilitated by this device.

Thus, the invention provides apparatus which enable threads to be laid out at high speeds without the need of complicated thread guides, while still enabling various thread patterns to be readily achieved. Although the method and apparatus according to the invention are primarily intended for laying out threads intended for use as leg and waist elastic in diapers, it will be

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understood that the invention is not restricted to such use. The invention shall therefore only be limited by the disclosures made in the following claims.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of positioning at least one filament in a predetermined pattern over a web of sheet material carried on a conveyor comprising the steps of:

rotating a first filament outlet of a filament outfeed device in a plane which is substantially parallel to said conveyor;

said rotation of said first filament outlet including simultaneous rotation of said first filament outlet about both a first and a second rotational axis;

outfeeding said filament through said first filament outlet; and

linearly moving said conveyor relative to said first and second rotational axes such that said filament is wrapped around dogging elements on said conveyor to position said filament on said web in said predetermined pattern.

2. A method as claimed in claim 1 wherein said filament is selected from the group consisting of elastic thread and elastic band.

3. A method as claimed in claim 1 further comprising the step of maintaining the filament in a tensioned state.

4. A method as claimed in claim 1 further comprising the step of rotating a second filament outlet of a filament outfeed device in a direction opposite to a direction of rotation of said first filament outlet such that said predetermined pattern includes double parallel filaments, said second filament outlet being positioned downstream from said first filament outlet.

5. A method as claimed in claim 1 wherein said predetermined pattern is a square-wave-like pattern.

6. A method as claimed in claim 5 further comprising the step of rotating at least a second and a third filament outlet such that said predetermined pattern is a multiple square-wave-like pattern having a sequence of pattern segments comprising a trapezoid and a triangle over said web.

7. A method as claimed in claim 6 wherein the dimensions of said pattern segments are chosen to have a size suitable for a leg and waist elastic of a diaper.



8. A method as claimed in claim 6 wherein each of said filaments is laid out in a different plane over said web.

9. A method of positioning at least one filament in a predetermined pattern between two webs, each web carried on a different conveyor, said conveyors positioned to converge and then diverge along a direction of movement of said conveyors, said method comprising the steps of:

rotating two filament outlets, one filament outlet being positioned in a plane of rotation over one conveyor, the other filament outlet being positioned in a plane of rotation over the other conveyor, each plane of rotation being substantially parallel to a portion of its corresponding conveyor;

said rotation including simultaneous rotation of at least one of said filament outlets about both a first and second rotational axis;

outfeeding said filament through each of said two filament outlets;

linearly moving both of the conveyors relative to said two filament outlets such that the filament from each filament outlet wraps around dogging elements disposed on its corresponding conveyor and such that each filament outlet positions each filament in a predetermined pattern on its corresponding conveyor; and

pressing said two webs together at an apex region of said two conveyors, said filaments being positioned between the two webs.

10. A method as claimed in claim 9 wherein said filaments are selected from the group consisting of elastic threads or bands.

11. A method as claimed in claim 9 further comprising the step of bonding said webs together.

12. A method as claimed in claim 11 wherein said bonding step is performed with glue.

13. An apparatus for positioning a filament in a predetermined pattern over a web carried on a conveyor comprising:

dogging elements disposed on said conveyor and movable with said web; and

first means for wrapping the filament around the dogging elements to provide said predetermined pattern over said web, said wrapping means including at least one



filament outlet and means for simultaneously rotating said filament outlet about two rotational axes.

14. An apparatus as claimed in claim 13 wherein said filament is selected from the group consisting of elastic thread or elastic band.

15. An apparatus as claimed in claim 13 further comprising means for maintaining tension in said filament.

16. An apparatus as claimed in claim 13 further comprising second means for wrapping a second filament around said dogging elements over said web, said second means for wrapping a second filament being disposed downstream from said first means for wrapping a filament, said second means for wrapping including means for synchronously driving said second means for wrapping in a different rotational direction from said first means for wrapping.

17. An apparatus as claimed in claim 13 wherein said means for wrapping the filament includes:

a carrier arm, rotatable in a first direction, said at least one filament outlet being disposed on said carrier arm; and

means for rotating said filament outlet in a second direction which is opposite to said first direction of said carrier arm.

18. An apparatus as claimed in claim 13 wherein said dogging elements are arranged in a row along each outer edge of the conveyor with a space between each dogging element.

19. An apparatus as claimed in claim 13 wherein said means for simultaneously rotating said filament outlet about two rotational axes includes:

a rotatable arm having a free end and a rotatably fixed end;

a stationary toothed ring having teeth on its inside circumference;

a rotatable toothed wheel having teeth which engage the teeth on the toothed ring, said toothed wheel being rotatably attached at its center on one side to the free end of the rotatable arm and fixedly connected at its center on the other side to said at least one filament outlet.



20. An apparatus for positioning at least one filament in a predetermined pattern between two webs comprising:

a first conveyor for carrying a first web;

a second conveyor for carrying a second web;

said first and second conveyors positioned to converge toward each other upstream of an apex region, said first and second conveyors positioned to diverge from each other downstream of said apex region;

a plurality of dogging elements disposed on each conveyor and movable with said web;

first means for wrapping at least one filament around dogging elements of said first conveyor such that said predetermined pattern is formed over said first conveyor, said first wrapping means including a filament outlet and means for simultaneously rotating said filament outlet about two rotational axes;

second means for wrapping at least one filament around dogging elements of said second conveyor such that said predetermined pattern is formed over said second conveyor; and

means for pressing the webs together near said apex region, said filaments being positioned between said webs.

21. An apparatus as claimed in claim 20 wherein said filament is selected from the group consisting of elastic thread and elastic band.

22. An apparatus as claimed in claim 20 further comprising means for bonding said webs together.

23. An apparatus as claimed in claim 22 wherein said bonding means includes glue.

24. An apparatus as claimed in claim 20 wherein said predetermined pattern is a multiple square-wave-like pattern which includes a sequence of pattern segments comprising a trapezoid and a triangle.

25. An apparatus as claimed in claim 24 wherein one of said webs comprises a series of absorbent pads arranged inside the triangle pattern segment of said multiple square-wave-like pattern.



26. An apparatus as claimed in claim 25 wherein a side of said triangle forms leg elastic on two opposing sides of mutually sequential diapers.
27. An apparatus as claimed in claim 20 wherein at least one of said dogging elements has a cross-sectional dimension which varies along an axis that extends away from a web.
28. An apparatus as claimed in claim 27 wherein said cross-sectional dimension near the web is greater than another cross-sectional dimension further away from the web.
29. An apparatus as claimed in claim 28 wherein said dogging elements comprise superposed cylindrical parts having different diameters.
30. An apparatus as claimed in claim 27 wherein said at least one dogging element comprises a filament receiving groove provided peripherally thereon.
31. An apparatus as claimed in claim 20 wherein at least one of said dogging elements comprises two cylindrical parts arranged side by side.
32. An apparatus as claimed in claim 31 wherein said at least one of said dogging elements comprises a third cylindrical part, arranged between said two cylindrical parts, which extends above said two cylindrical parts.
33. An apparatus as claimed in claim 13 wherein at least one of said dogging elements has a cross-sectional dimension which varies along an axis that extends away from a web.
34. An apparatus as claimed in claim 33 wherein said cross-sectional dimension near the web is greater than another cross-sectional dimension further away from the web.
35. An apparatus as claimed in claim 34 wherein said dogging elements comprise superposed cylindrical parts having different diameters.
36. An apparatus as claimed in claim 33 wherein said at least one dogging element comprises a filament receiving groove provided peripherally thereon.



37. An apparatus as claimed in claim 13 wherein at least one of said dogging elements comprises two cylindrical parts arranged side by side.

38. An apparatus as claimed in claim 37 wherein said at least one of said dogging elements comprises a third cylindrical part, arranged between said two cylindrical parts, which extends above said two cylindrical parts.

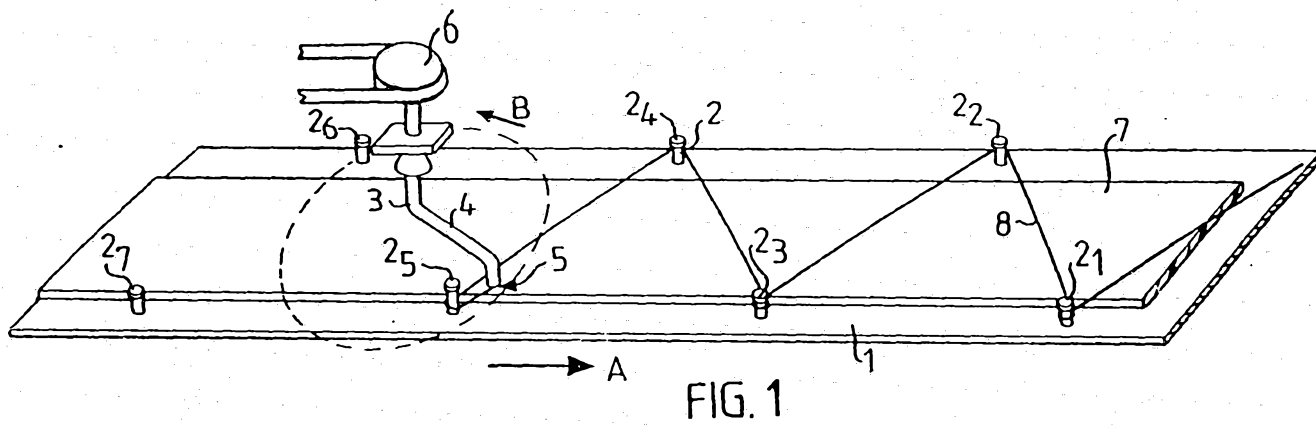
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MOLNLYCKE AB

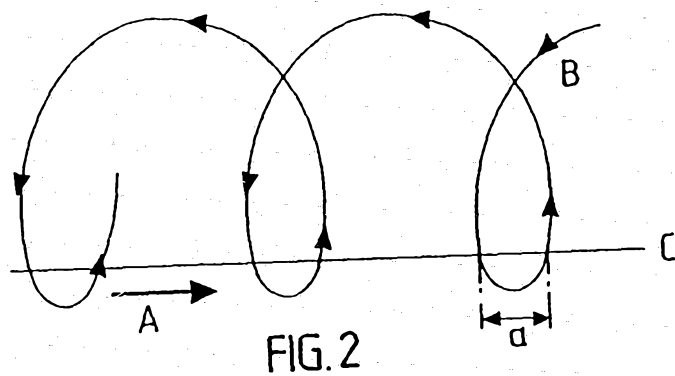
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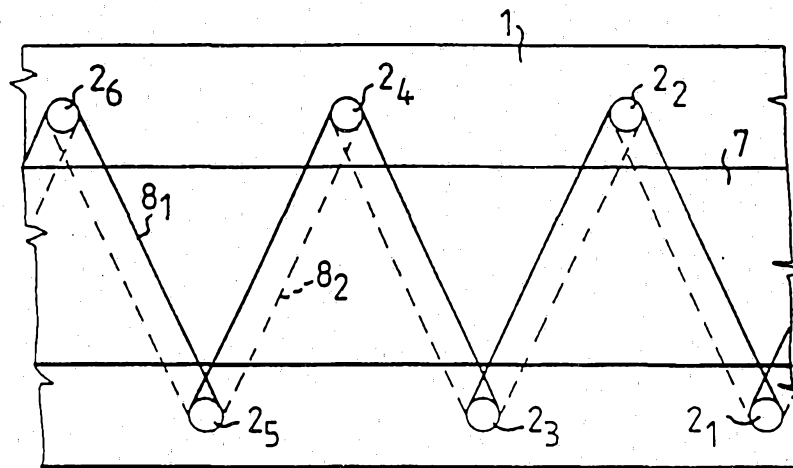


FIG. 3

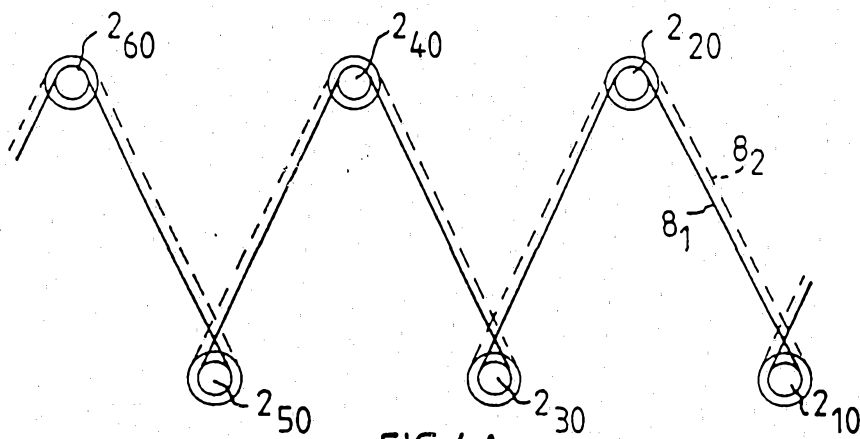


FIG. 4A



FIG. 4B

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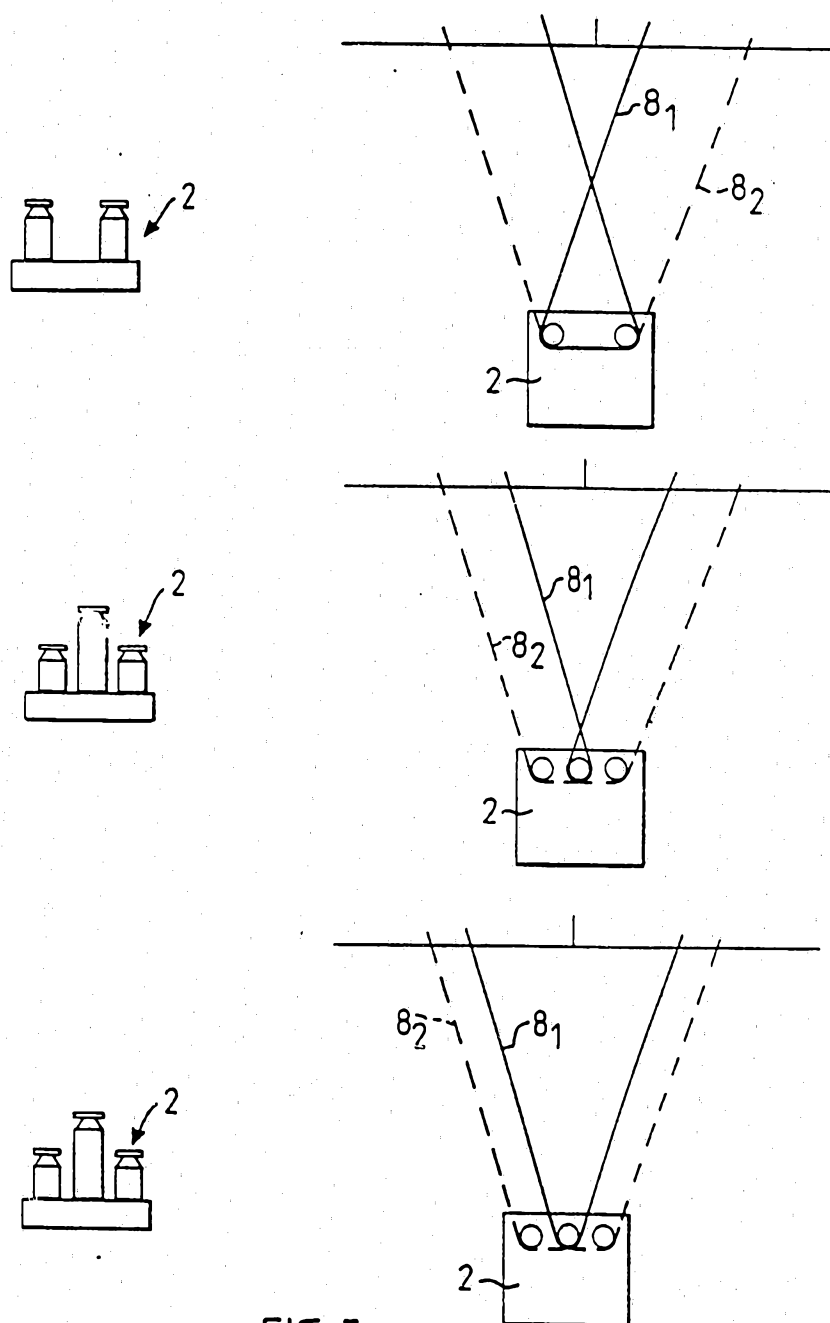


FIG. 5

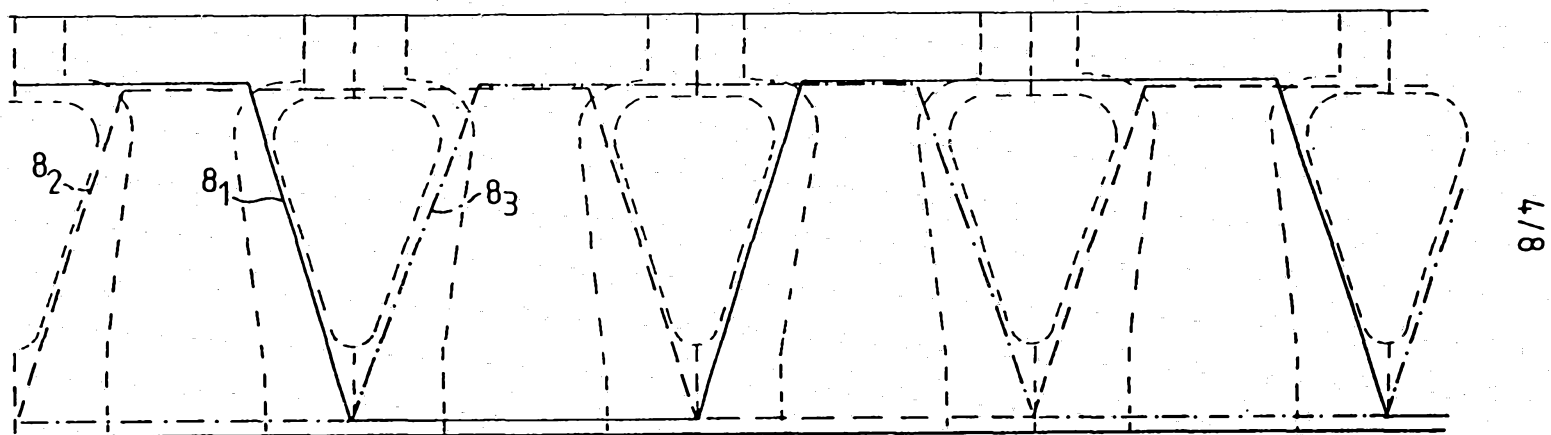
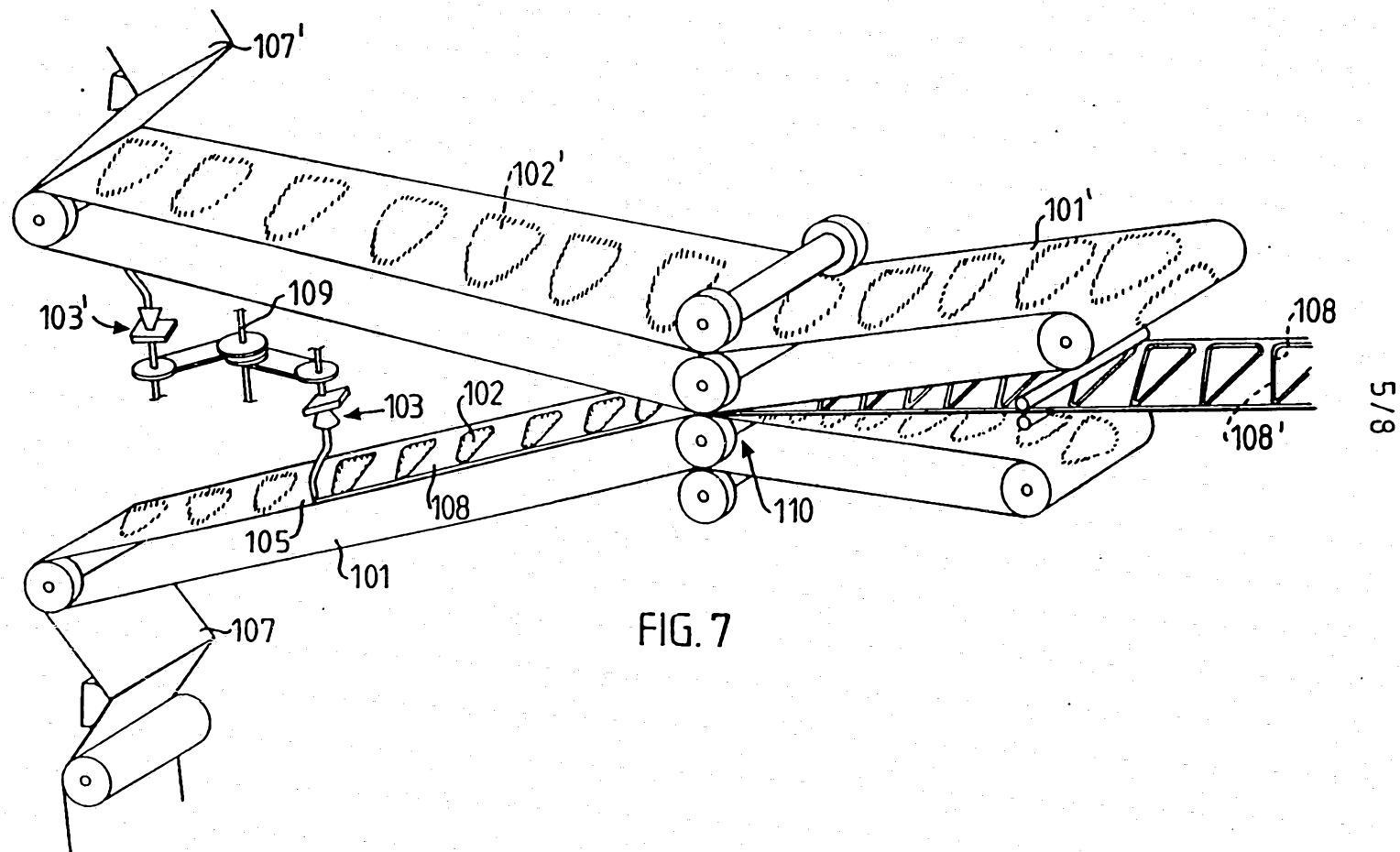


FIG.6



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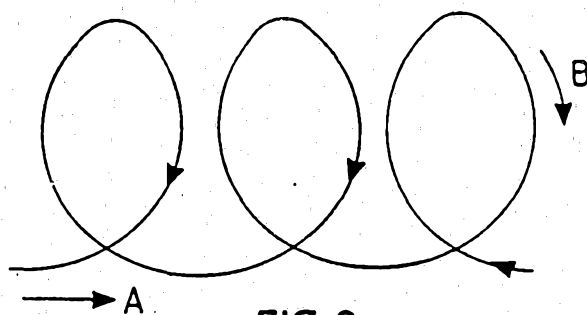


FIG. 8

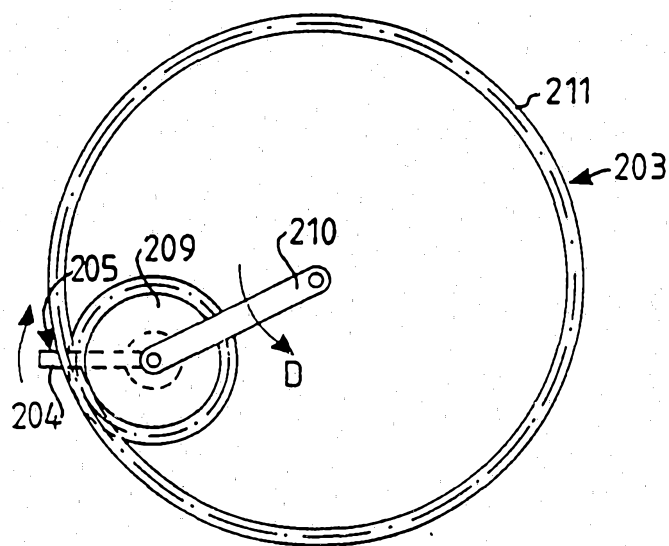


FIG. 9

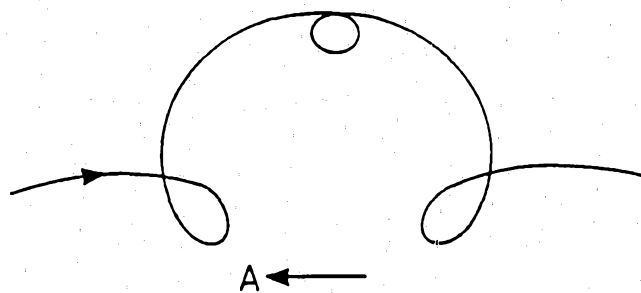


FIG. 10

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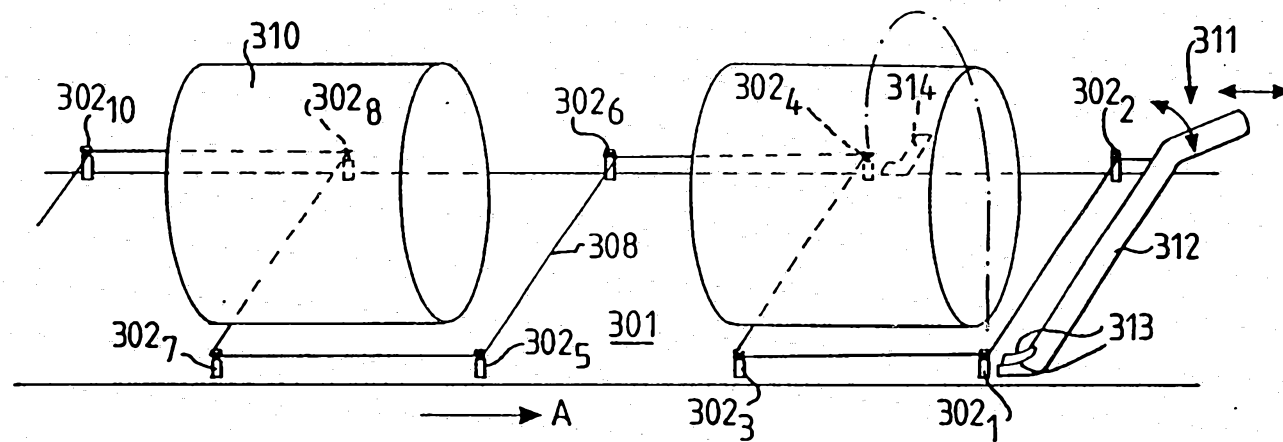


FIG. 11

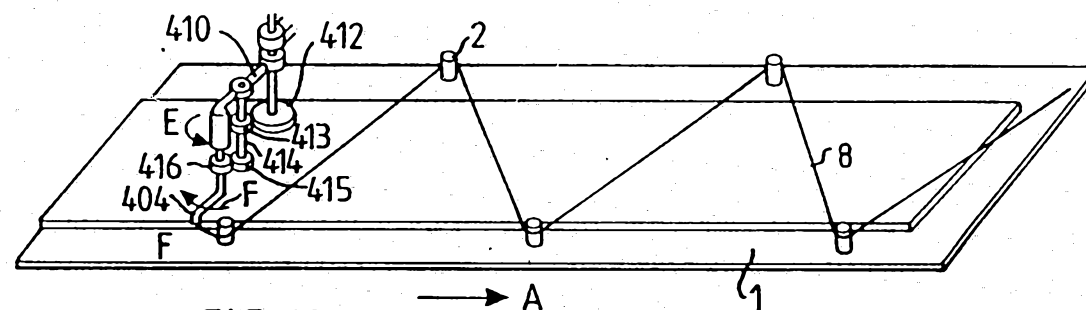


FIG. 12

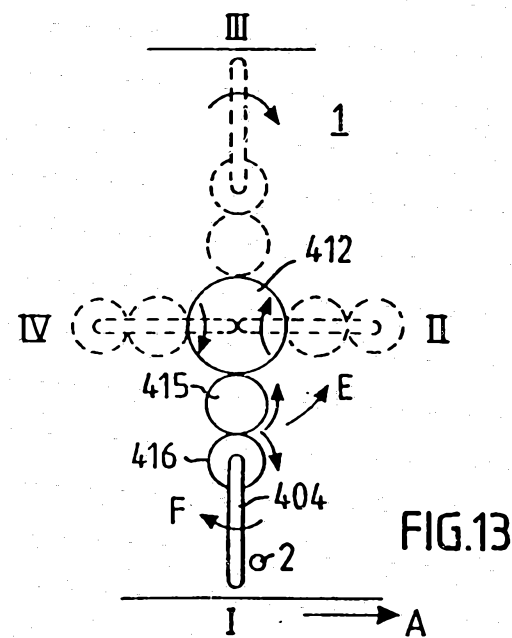


FIG. 13

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE89/00390

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC 4		
B 65 H 57/28, A 41 B 13/02		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC 4	B 65 H; A 41 B; D 04 H	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched *		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
Y	US, A, 4 064 916 (DAHMEN) 27 December 1977 Fig. 3, column 3-4 & DE, 2424281 FR, 2271159 CH, 584645 GB, 1510863	1,8
Y	US, A, 3 321 348 (R.O. RUPP) 23 May 1967 Fig. 1, 2, column 2, line 37 - column 5, line 40	1,2,8,11, (17)
Y	US, A, 4 172 748 (PERZETAKIS) 30 October 1979 Fig. 2, column 2, line 54 - column 4, line 40 & BE, 861752 NL, 7713749 FR, 2373627 DE, 2755516 JP, 53074177 GB, 1573714	1,2,8,11, (17)
.../...		
* Special categories of cited documents: ** "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1989-09-02	1989-10-11	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	Kjell Lundahl / Hans Peterson	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	EP, A2, 0 251 251 (TOYO EIZAI KABUSHIKI KAISHA) 7 January 1988 Fig. 11-14, pages 6-8 & JP, 63099302 US, 4776911 JP, 63243309	1,2,8,10,11
A	US, A, 2 548 468 (G.W. CRISE) 10 April 1951 Fig. 1, column 3, lines 10-55	6
A	US, A, 3 828 367 (BOURGEOIS) 13 April 1974	
Y	US, A, 3 829 339 (L.A. PINETTE) 13 August 1974 Abstract, column 4, line 10 - column 5, line 50	6,11
A	US, A, 3 902 644 (BOUS) 2 September 1975 Fig. 2B-2E, 1B, 9, column 8 -10, 24	17-21
A	US, A, 3 905 067 (KEIB ET AL) 16 September 1975 Fig. 3-4, column 5	3,12
A	US, A, 4 052 239 (CHEN) 4 October 1977 Fig. 1, abstract	
A	US, A, 4 293 367 (KLASEK ET AL) 6 October 1981	
A	US, A, 4 726 873 (ALES ET AL) Fig. 1, 2, 5, 16, abstract, column 2, lines 45-68, column 3, lines 1-27	16
A	NO, B, 158 240 (STANDARD TELEFON OG KABELFABRIK A/S) 25 April 1988	
A	EP, A1, 0 048 010 (BOUSSAC SAINT FRERES B.S.T) 24 March 1982	