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(54) Device to switch fabrics for napping machines

(57) Device to switch fabrics in napping machines (11), which is suitable to displace laterally in a desired manner a fabric (14) being fed, the axis (29) of feed of which is substantially perpendicular to the axis of the napping drum (12), the device comprising at least a first lengthwise intake bar (20) and a second lengthwise output bar (21) and including at least one powered roll (22) positioned between the first bar (20) and second bar (21), the first bar (20) and the second bar (21) and the powered roll (22) having a first position with their relative axes (26, 28, 27) substantially perpendicular to the axis (29) of feed of the fabric (14) and at least one second position with their relative axes (26, 28, 27) inclined by a relative angle (α, γ, and β) in relation to the line perpendicular to the axis (29) of feed of the fabric (14).

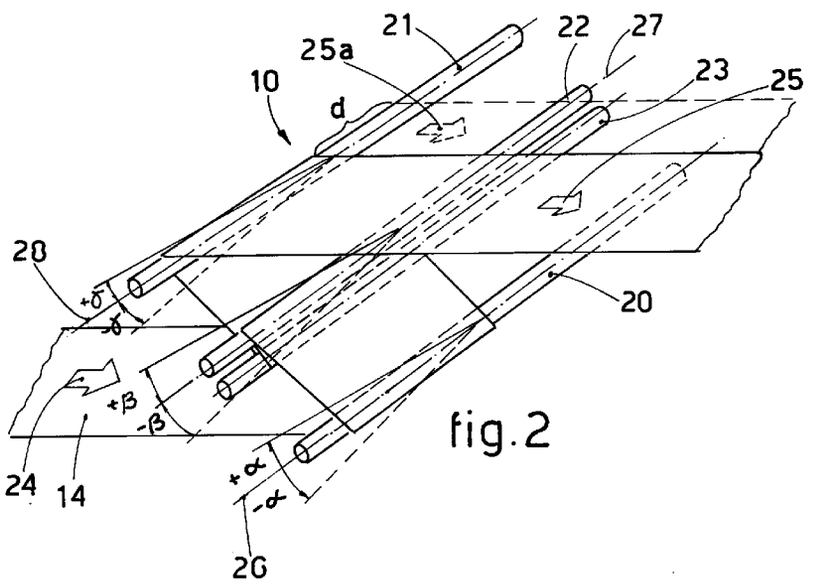

fig.2

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Description

This invention concerns a device to switch fabrics for napping machines, as set forth in the main claim.

To be more exact, the invention concerns a switching device which enables the fabric being fed to a napping machine, or to a machine for textile processes in general, to be displaced laterally in a desired manner.

This lateral displacement is performed so as to direct the fabric to distinct desired lengthwise segments of the napping rollers so as to make the napping action of those rollers uniform as compared to the differentiated wear which is encountered on the relative roller clothing as the napping passes follow one another.

The textile field covers napping machines in which the fabric runs over a napping drum, which bears on its circumference napping rollers provided on their periphery with hooked pins or needles, which come into contact with the fabric so as to form the surface nap.

The lengthwise extent of these napping rollers is always greater than the width of the fabric being processed so as to be able to cover with the same machine a very wide range of widths of fabrics and so as to ensure definitely that the whole width of the fabric undergoes the napping action.

But this situation has the effect that the roller clothing bearing the hooked pins or needles is not wholly affected by the napping action and therefore is worn in a differentiated manner as time goes by.

In particular, this roller clothing becomes more worn at the middle than at the ends since the middle is always affected by the passing of the fabric with any width of the fabric.

Even when the width of the fabric being processed is almost equal to the lengthwise extent of the napping rollers, the lateral shrinkage of the fabric has the effect that the roller clothing is always more worn at the middle than at the ends.

This differentiated wear of the roller clothing entails a different napping action at the middle of the fabric from that at the selvedges or edges of the fabric, and the result in particular is that the nap near the selvedges is greater than that encountered at the middle of the fabric.

This difference becomes very evident when a napping cycle, without any change of the napping rollers, is carried out on a fabric wider than the fabric processed in the preceding cycles.

One solution disclosed has been to process the fabric by displacing it alternately first wholly to the right and then wholly to the left, but it is evident that the wear of the roller clothing in the central zone is always more accentuated than at the ends of the roller clothing.

This situation entails also a break of the continuity of the cycle, corrective work by the labour force, downtimes, etc.

This problem is even more difficult where a plurality of napping machines positioned in line are employed or where a plurality of passes of the fabric joined in an endless ring are carried out on the same napping machine.

In such cases the fabric always comes into contact with the roller clothing substantially at the same part of that clothing.

Guiding means have been disclosed at the present time which are used to convey the fabric to the desired position and which enable the fabric to be displaced sideways by a few centimetres (about 10 to 15) inasmuch as a greater displacement entails the formation of folds in the fabric itself.

DE-A-27 27 474 discloses a device suitable to cause a lateral displacement of a web being fed, the device consisting of three screw-threaded rolls, of which the intake and output rolls have the same pitch, while the intermediate roll has an opposite pitch.

The threaded rolls are driven by one and the same motor and, in view of their screw-threaded surface configuration, displace the web sideways while drawing it forwards.

When it is desired to change the direction of the lateral displacement, the direction of rotation of the three rolls is inverted simultaneously, so that the rolls rotate at least for a time in a direction opposed to the feed of the fabric, thus entailing problems as regards the tension and at least the surface quality of the fabric itself.

This device makes possible lateral displacements of a very limited value and causes folds and tensions in the fabric being fed.

DE-A-1.574,386 too discloses a device able to displace laterally a web being fed. This device comprises an intake roll and an output roll for the fabric and a pair of transmission bars which can be inclined so as to cause the lateral displacement.

The output roll can be displaced only axially, transversly to the direction of feed of the fabric, in relation to the displacement caused in the fabric by the inclination of the bars.

This situation has the purpose of keeping the output roll aligned with the laterally displaced position taken up by the fabric.

This device too, however, makes possible only limited displacements if it is not desired that the device should cause tensions and folds in the fabric, especially in the case of wetted fabrics of a given strength; such tensions could become too great owing to the angle of winding of the fabric about the lengthwise bars.

The present applicants are not aware of devices which enable the fabric to be displaced laterally between one napping pass and another by a considerable value without causing in the fabric undesired folds and without interrupting the cycle.

The present applicants have designed, tested and embodied this invention so as to provide a device which enables the above drawbacks to be avoided and also enables further advantages to be achieved.

This invention is set forth and characterised in the main claim, while the dependent claims describe variants of the idea of the main embodiment.

The purpose of the invention is to provide a fabric-switching device suitable to displace laterally, even by a

considerable extent, the fabric being fed to a napping machine or to a textile machine in general without causing the formation of folds in the fabric.

In fact, the formation of folds would lead to shortcomings in the downstream processing of the fabric, particularly in the event of napping operations.

The invention is applied in particular to napping operations which include a plurality of successive passes, either with the combination of a plurality of napping machines in line, or with a plurality of passes on the same machine but with the fabric itself joined together as an endless ring.

According to the invention the switching device is associated with a napping drum so as to displace the fabric laterally in a desired manner before the fabric undergoes a napping pass.

According to the invention the device includes two lengthwise bars, namely a first fabric intake bar and a second fabric output bar.

At least one powered roll is positioned between the first fabric intake bar and the second fabric output bar.

According to a variant the powered roll is associated with a transmission roll.

The inclusion of the powered roll discharges the tension of the fabric being fed, and thus prevents the formation of folds, especially where the fabrics are wetted and have a given strength.

The lengthwise bars and the drawing and transmission rolls are associated with relative displacement means which enable the respective lengthwise axes of the bars and rolls to be inclined in relation to the axis of feed of the fabric.

In particular, these lengthwise bars and rolls have a first working position with their lengthwise axes substantially perpendicular to the axis of feed of the fabric; in this position the fabric is drawn forwards without any lateral displacements being imparted to the fabric.

The lengthwise bars have also a plurality of second working positions in which the relative lengthwise axes of the bars are inclined by one and the same desired angle, depending on the extent of the lateral displacement required, in relation to the axis of feed of the fabric.

The powered and transmission rolls are in turn inclined according to the inclination of the lengthwise bars so that the relative lengthwise axes of the rolls always remain perpendicular to the axis of feed of the fabric.

The winding of the fabric onto the first fabric intake bar, as is known, causes an inclination of the axis of feed of the fabric, this inclination being twice the inclination of the intake bar.

Since the axes of the rolls have to be kept perpendicular to the axis of feed of the fabric, the rolls are inclined in turn by an angle twice the angle of inclination of the first intake bar.

Thus, the rolls cause the fabric to be fed according to a direction inclined in relation to the normal direction of feed without causing further displacements of the fabric.

The second output bar in turn is inclined by an angle equal to the angle of inclination of the first intake bar and in the same direction of inclination.

The pass of the fabric over the second output bar causes a second displacement of the fabric, which at the outlet of the switching device thus lies in a position parallel to the direction of intake but displaced laterally in relation to the direction of intake.

The extent of the lateral displacement can be determined precisely during working inasmuch as it depends on the angle of inclination imparted to the intake and output bars and on the distance between those bars.

According to a first embodiment of the invention the angle of inclination is kept unchanged during the whole cycle of napping of a fabric.

At the beginning of the cycle the fabric is fed onto the napping drum at one position and at the end of the cycle lies in a determined position displaced laterally on the napping drum.

According to a variant the angle of inclination of the intake and output bars and therefore of the drawing rolls is changed during the pass of the fabric.

In this case the fabric is displaced laterally on the napping drum while it is being fed and takes up a position at the end of the cycle which may even coincide with the position at the beginning of the cycle.

The attached figures are given as a non-restrictive example and show some preferred embodiments of the invention as follows:-

Fig.1	is a diagram of a napping machine associated with a switching device according to the invention;
Fig.2	is a three-dimensional diagram of a possible switching device according to the invention;
Fig.3	is a diagram of the working step of a napping machine without using a switching device;
Figs.4a, 4b and 4c	show three separate napping cycles of a napping machine employing a switching device according to the invention.

Fig.1 is a diagram of a napping machine 11 which includes a napping drum 12 bearing a plurality of napping rollers 13 provided with hooked pins or needles along their periphery.

The napping method employing the napping machine 11 includes a plurality of passes of a fabric 14 on the napping drum 12 by connection of the two ends of the fabric 14 to form an endless ring, a vessel 15 being included on which the fabric 14 can slide; the case (not shown here) is analogous in which the fabric 14 is fed to a plurality of napping machines 11 positioned in line.

According to the invention a switching device 10 is included in cooperation with the napping drum 12 and is suitable to displace laterally the fabric 14 while the latter is being fed.

This lateral displacement has the purpose of directing the fabric 14, during and after each napping pass, onto a desired lengthwise segment of the napping rollers 13 so as to prevent the formation of pre-ordained zones of wear on the clothing of the napping rollers 13, particularly in the central zone of the napping rollers 13.

This enables the napping action of the napping rollers 13 on the fabric 14 to be made uniform and also the formation of the superficial nap to be made uniform.

In fact, the continuing pass of the fabric 14 fed, for instance, on the centre of the napping rollers 13 causes a more accentuated wear of the central zone 16 of the clothing of the napping rollers 13 as compared to the ends 17 of that clothing.

This becomes very evident in particular when fabrics 14 are processed in one napping cycle which are wider than those processed in the preceding cycles.

Fig.3 shows as an example a situation which is created when a napping of a fabric 14 having a width "**l**" is followed by the napping of a fabric 14 having a width "**L**" greater than "**l**".

In this case the first napping cycle causes a more accentuated wear of a central zone 16 having a width "**l**".

In the successive napping cycle a higher nap 18 is formed at the non-worn ends 17 of the napping rollers 13, whereas at the more worn central zone 16 the nap 19 is lower over a segment of width "**l**".

It is obvious that this leads to an unacceptable finished result.

Figs.4a, 4b and 4c instead show three different napping cycles in which a switching device 10 is employed.

In Fig.4a the switching device 10 is represented for the sake of simplicity merely by the lengthwise bar 20 and is inclined by a fixed angle "α" to the axis 29 of feed of the fabric 14 during the whole napping cycle; this fixed inclination causes a lateral displacement of the fabric 14 on the napping rollers 13 according to the arrow 30 from a position "**A**" at the beginning of the cycle to a position "**A'**" at the end of the cycle.

In the example of Fig.4b the inclination of the lengthwise bar 20 is varied, possibly several times during the cycle, in relation to the axis 29 of feed between an inclination of an angle "+α" and an inclination of an angle "-α".

According to the arrow 31 this variation causes a lateral displacement of the fabric 14 on the napping rollers 13 and a return substantially to the position "**A**" of the beginning of the cycle.

Lastly, in the example of Fig.4c the lengthwise bar 20 is initially kept substantially perpendicular to the axis 29 of feed of the fabric 14, thus providing a substantially central positioning of the fabric 14 at the position "**A**" on the napping rollers 13.

The bar 20 is then inclined alternately first by an angle "+α" and then by an angle "-**a**" so as to displace the fabric 14 laterally firstly to position "**A1**" and then to position "**A2**" and then to take up again the position "**A**" at the end of the cycle, these lateral displacements being shown with the arrow 32.

The lateral displacement of the fabric 14 on the napping roller 13 enables the formation of the nap 18 to be kept uniform over the whole width of the fabric and also enables the wear of the clothing of the napping rollers 13 to be kept substantially uniform.

The switching device 10 is positioned in cooperation with the napping drum 12 and includes, in the preferred embodiment shown in Figs.1 and 2, a first fabric intake lengthwise bar 20 and a second fabric output lengthwise bar 21.

In this example a powered roll 22 and a transmission roll 23 are positioned between the lengthwise bars 20 and 21 and have the purpose of reducing the tension on the fabric 14 caused by the angle of winding of the fabric 14 on those bars 20-21 and of preventing the formation of folds on the fabric 14.

The first and second lengthwise bars 20-21 and the rolls 22-23 are associated with displacement means (not shown here) which are suitable to cause in those bars and rolls an inclination in relation to the axis 29 of feed of the fabric 14.

The purpose of this is to position the bars 20-21 according to a direction more or less inclined in relation to a line perpendicular to the direction of intake 24 of the fabric 14 in relation to the lateral displacement to be imparted to the fabric 14, and to keep the rolls 22-23 perpendicular to that direction of intake 24.

The lengthwise bars 20-21 have a first position with their relative lengthwise axes 26-28 substantially perpendicular to the direction of intake 24 of the fabric 14.

This first position entails a direction of output 25 of the fabric 14 coinciding substantially with the direction of intake 24 since no lateral displacement has been imparted.

When it is desired to impart a lateral displacement to the fabric 14 being fed, the first intake bar 20 is inclined and its relative lengthwise axis 26 is caused to take up a position inclined in one direction or the other in relation to the line perpendicular to the direction of intake 24 of the fabric 14.

The angle of inclination "α" imparted to the first intake bar 20 causes downstream of the intake bar 20 a displacement of the axis 29 of feed of the fabric 14 by an angle "**2**α" in relation to the direction upstream.

As the lengthwise axes of the powered roll 22 and of the transmission roll 23 have to be kept perpendicular to the axis 29 of feed of the fabric 14, so as to ensure correct drawing of the fabric 14, the lengthwise axis 27 of the powered roll 22 is inclined by an angle "$\beta = 2\alpha$".

For the sake of simplicity of the description, the displacement of the transmission roll 23 has not been indicated in Fig.2 but coincides with the displacement of the powered roll 22.

Between the two intake 20 and output 21 lengthwise bars the fabric 14 is fed according to this direction inclined in relation to the direction of intake 24 of the fabric 14.

The lengthwise axis 28 of the second output bar 21 is inclined in turn by an angle "$\gamma = \alpha$" so as to bring the

direction of output 25a of the fabric 14 parallel to the original direction of output 25, a final lateral displacement equal to "**d**" having been imparted.

This lateral displacement "**d**" is a function of the angle of inclination " $\alpha = \gamma$ " imparted to the intake and output bars 20-21 and is a function of the distance between the bars 20-21.

Claims

1. Device to switch fabrics in napping machines (11), which is suitable to displace laterally in a desired manner a fabric (14) being fed, the axis (29) of feed of which is substantially perpendicular to the axis of the napping drum (12), the device comprising at least a first lengthwise intake bar (20) and a second lengthwise output bar (21), the device being characterised in that it includes at least one powered roll (22) positioned between the first bar (20) and second bar (21), the first bar (20) and the second bar (21) and the powered roll (22) having a first position with their relative axes (26, 28, 27) substantially perpendicular to the axis (29) of feed of the fabric (14) and at least one second position with their relative axes (26, 28, 27) inclined by a relative angle (α, γ, and β) in relation to the line perpendicular to the axis (29) of feed of the fabric (14).

2. Switching device (10) as in Claim 1, whereby the first lengthwise intake bar (20), the second lengthwise output bar (21) and the powered roll (22) have at least one third position with their relative axes (26, 28, 27) inclined by a relative value ($-\alpha$, $-\gamma$ and $-\beta$) in relation to the line perpendicular to the axis (29) of feed of the fabric (14).

3. Switching device (10) as in Claim 1 or 2, whereby the relative angle of inclination (α, γ, β) is kept unchanged during the whole cycle of napping of the fabric (14).

4. Switching device (10) as in Claim 1 or 2, whereby the relative angle of inclination (α, γ, β) is varied during the cycle of napping of the fabric (14).

5. Switching device (10) as in any claim hereinbefore, whereby in each step of the cycle of napping of the fabric (14) the relative angles (α, γ) of the respective first (20) and second (21) bars are equal.

6. Switching device (10) as in any claim hereinbefore, whereby in each step of the cycle of napping of the fabric (14) the angle of inclination (β) of the powered roll (22) is twice the angle of inclination (α, γ) of the first (20) and second (21) lengthwise bars, ($\beta = 2\alpha = 2\gamma$).

7. Switching device (10) as in any claim hereinbefore, whereby an inclinable transmission roll (23) is included at least between the powered roll (22) and the second lengthwise output bar (21).

8. Switching device (10) as in Claim 7, whereby the transmission roll (23) is always parallel to the powered roll (22).

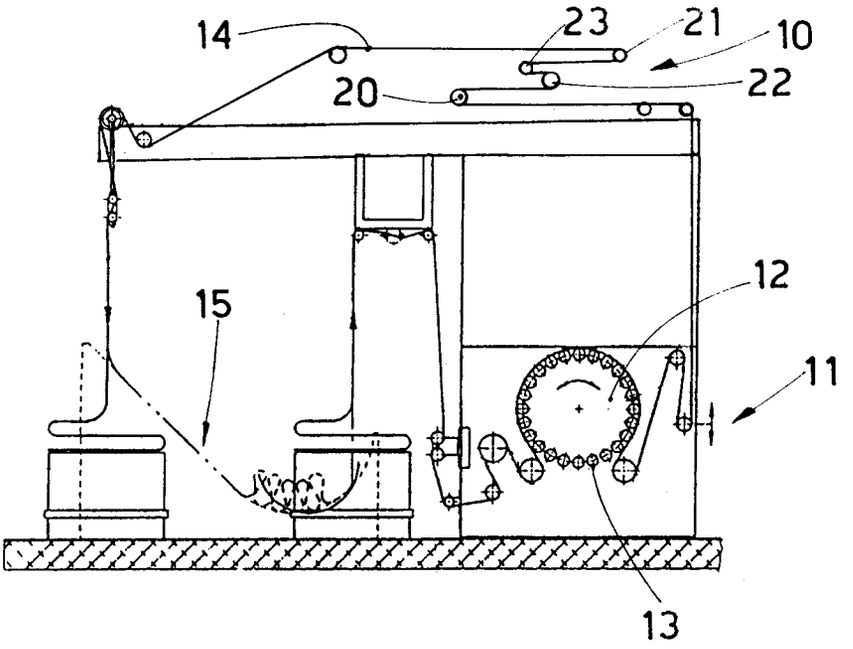

fig.1

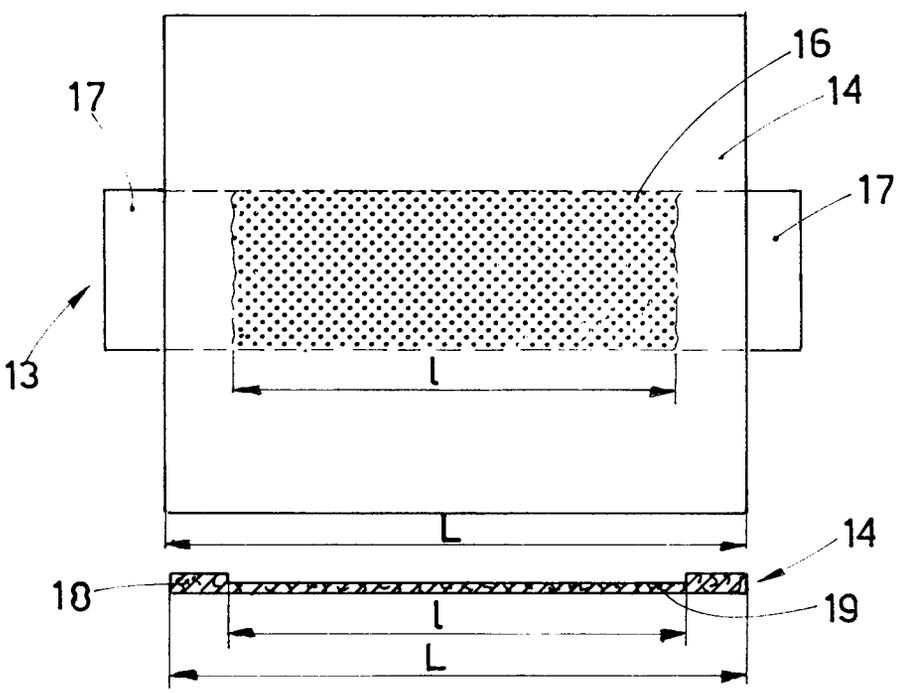

fig.3

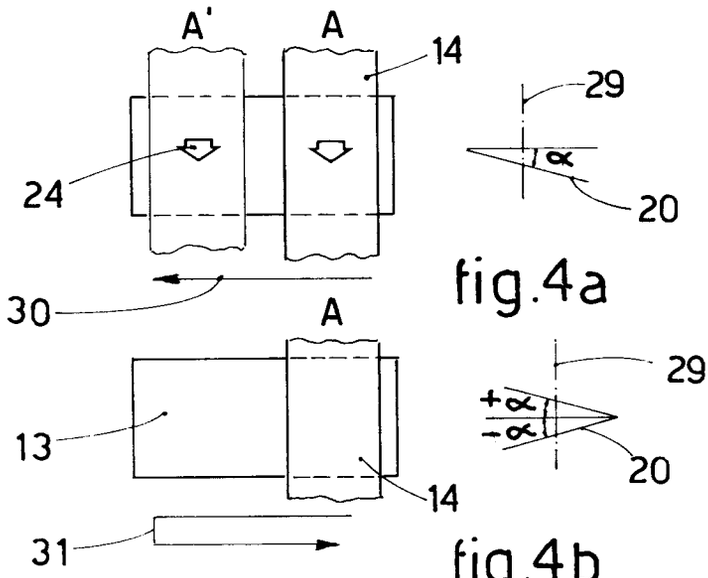

fig.4a

fig.4b

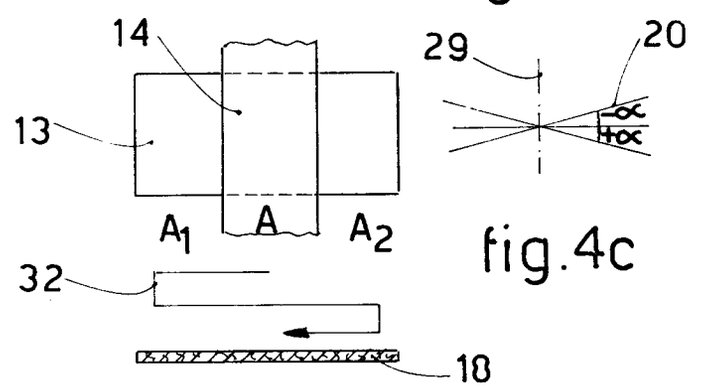

fig.4c

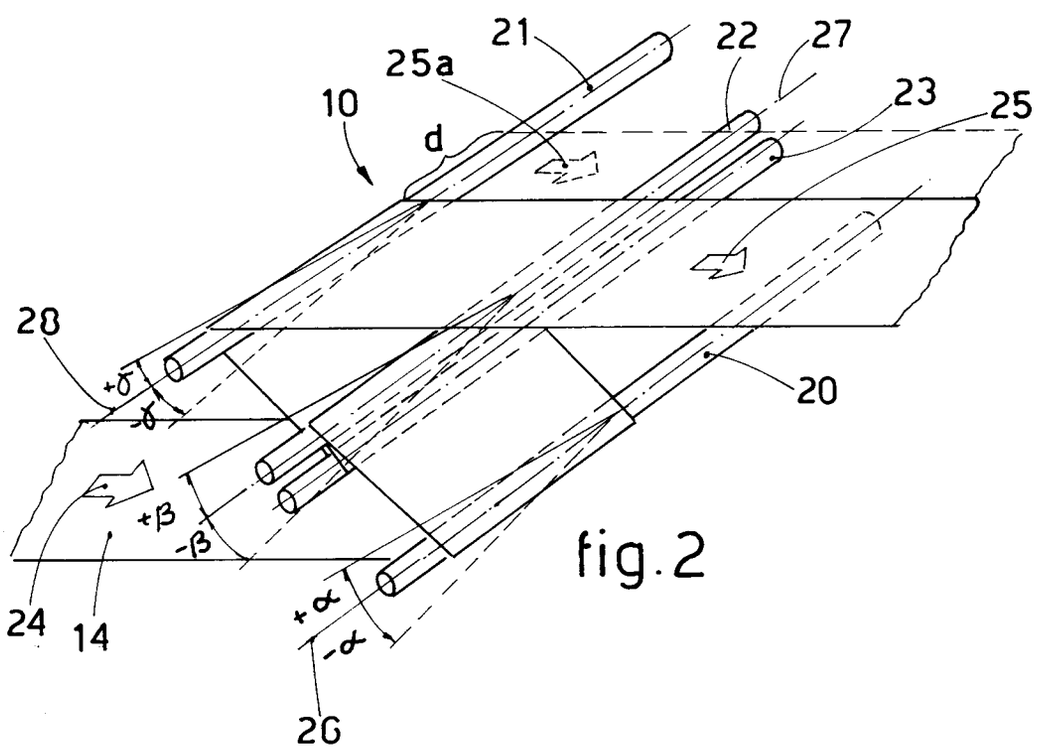

fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 6257

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-A-27 27 474 (VEB TEXTILMASCHINENBAU) * the whole document *	1	D06C11/00 B65H23/038
A	DE-B-15 74 386 (VITS- MASCHINENBAU GMBH) * figures *	1	
A	US-A-3 235 934 (J.H. MILLER) * claim 1; figures *	1	
A	GB-A-348 276 (C.A. DICKHAUT)		
A	US-A-3 095 131 (J. D. ROBERTSON ET AL)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
D06C B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 November 1995	D Hulster, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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