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Method and apparatus for continuously forming
an airlaid web

Field of the Invention

This invention relates to fibrous absorbent structures and in particular to reinforced airlaid fibrous bodies.

Background of the Invention

Absorbent fibrous structures comprised of low strength absorbent materials such as airlaid wood pulp fibers are well known in the disposable absorbent bandage art. In certain of these prior art fibrous pad structures it has been found desirable to employ one or more internally located plies of tissue paper or other web materials which are substantially impervious to the passage of fluids to act, for example, as a reinforcing agent, as a fluid baffle to distribute absorbed fluids within the absorbent fluff structure, as a partitioning agent or the like. Addition of such internal plies which have a width substantially equal to that of the absorbent fibrous webs located on the uppermost and lowermost surfaces thereof has typically been provided by utilizing a multiplicity of discrete forming zones with a separate fiber supply source for each zone. However, the multiple forming zone approach typically employed by such prior art systems requires considerable converting line space and involves a duplication of disintegrating and air layering equipment for each absorbent fibrous layer employed in the resultant structure. Furthermore, altering the position of the internal ply relative to the uppermost and lowermost surfaces of the finished absorbent pad typically requires a complex adjustment procedure for each fiber deposition zone in the system.

Accordingly, it is an object of the present invention to provide method and apparatus for forming an airlaid fiber impervious fibrous fluff web provided with a substantially planar fiber impervious internal reinforcing ply whose width is substantially coextensive with that of the web.

It is a preferred object of the present invention to provide method and apparatus for easily altering the position of the internal ply relative to the uppermost and lowermost surfaces of the absorbent pad in question.

It is yet another object of the present invention to provide method and apparatus for the continuous formation of an internally reinforced airlaid fibrous fluff web in a single fiber deposition zone, the reinforcement comprising a substantially planar fiber-impervious internal reinforcing ply having substantially the same width as said fibrous web, and the deposition zone having an overall length no greater than that required to form an identical absorbent pad of the comparable basis weight without said center ply.

Summary of the Invention

In one method aspect of the present invention the aforementioned objectives are accomplished by carrying out the steps of:

- 5 (a) continuously feeding said substantially planar reinforcing ply (2) in a first direction in a first plane;
 - (b) introducing said moving reinforcing ply into a single fiber deposition zone in which is disposed a foraminous support surface (11) moving in said first direction while the ply is oriented so that the direction of fiber flow is substantially parallel to the width of said ply, to vacuum form on said support surface, a first portion (21) of said airlaid fibrous fluff web;
 - 10 (c) guiding said moving reinforcing ply into contact with a first equal length leg portion (58) of the trailing surface of a planar isosceles right angled triangle, (52) said first equal length leg portion being oriented perpendicular to said first direction of travel of said ply (20);
 - 15 (d) wrapping said moving reinforcing ply about opposite surfaces of said planar right triangle (52) by passing said ply about the hypotenuse thereof;
 - 20 (e) restoring said moving ply to said first direction of travel by passing said moving ply about the second equal length leg portion (56) of said triangle (52), thereby causing said ply to assume a planar condition in a second plane perpendicular to said first plane, said ply being positioned with its lowermost surface immediately adjacent said first airlaid fibrous fluff web portion (21);
 - 25 (f) exposing the uppermost surface of said moving reinforcing ply to said fiber deposition zone while in a planar condition to vacuum form a second portion (22) of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply (20); and
 - 30 (g) removing said ply and said airlaid web portions from said fiber deposition zone.
- In a second method aspect of the present invention the objectives are accomplished by carrying out the steps of:
- 35 (a) continuously feeding said substantially planar reinforcing ply (20) in a first direction in a first plane;
 - 40 (b) guiding said moving reinforcing ply about a first direction changing means (5) and into contact with the leading surface of a first planar isosceles right angled triangle (2) said triangle having its altitude oriented perpendicular to said first direction of travel of said ply;
 - 45 (c) wrapping said moving reinforcing ply
 - 50
 - 55
 - 60

- about opposite surfaces of said first planar triangle;
- (d) restoring said moving ply to its first direction of travel by directing said ply about the apex of said first triangle while maintaining the lateral edge portions of said moving ply in contact with the leading and trailing surfaces of said first triangle, thereby causing said ply to fold about itself in a second plane perpendicular to said first plane;
- (e) introducing said moving reinforcing ply to a single fiber deposition zone in which is disposed a foraminous support surface (11) moving in said first direction while the ply is in a folded configuration, to vacuum form on said support surface, a first portion (21) of said airlaid fibrous fluff web;
- (f) wrapping said moving reinforcing ply about opposite surfaces of a second isosceles triangle (4) identical to and longitudinally aligned with said first triangle (2) and having its altitude oriented perpendicular to said first direction of travel such that the lateral edges of said moving ply are guided on opposite sides of the apex of said second triangle as said moving ply is directed about the apex thereof, the lateral edges of said moving ply being maintained in contact with the leading and trailing surfaces of said second triangle, thereby restoring said ply to a planar condition;
- (g) directing said moving reinforcing ply about a second direction changing means (6) to restore it to said first direction of travel and to bring the lowermost surface thereof into contact with the first airlaid fibrous fluid portion (21)
- (h) exposing the uppermost surface of said moving reinforcing ply to said fiber deposition zone while in a planar condition to vacuum form a second portion (22) of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply; and
- (i) removing said ply and said airlaid web portions from said fiber deposition zone.

Brief Description of the Drawings

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a simplified cross-sectional illustration of a pad forming mechanism employing a preferred embodiment of the present invention taken along Section Line 1—1 in Figure 2;

Figure 2 is a complete side elevation view of

the pad forming mechanism illustrated in cross-section Figure 1.

Figure 3 is an enlarged cross-sectional illustration taken along Section line 3—3 in Figure 2;

Figure 4 is a simplified perspective view of the pad forming mechanism illustrated in Figures 1—3;

Figure 5 is a simplified schematic illustration of the folding board portion of the mechanism utilized in a preferred embodiment of the present invention;

Figure 6 is a discharge end view of the folding board illustrated in Figure 5;

Figure 7 is a plan view of the folding board illustrated in Figure 5; and

Figure 8 is a simplified perspective view of yet another folding board suitable for use in the present invention.

Detailed Description of the Invention

Figure 1 is a plan view of a preferred embodiment of the present invention wherein a wet strength tissue ply 20 is incorporated intermediate the uppermost and lowermost surfaces of an absorbent pad for a disposable absorbent article to improve its in use integrity. As can be seen more clearly from Figure 2, the wet strength tissue ply 20 is directed about a folding board mechanism 1 prior to entry of the tissue ply into a fiber deposition chute 12 fed by a source of discrete fibrous material from e.g. a fiber disintegration apparatus (not shown). The lower region of the chute 12 defines a chamber wherein a lowermost layer of absorbent airfelt 21 is formed beneath the surface of the tissue ply 20 and an uppermost layer of airfelt 22 is formed adjacent its uppermost surface. In a particularly preferred embodiment of the present invention, a layer of wet strength tissue paper 23 is employed adjacent the lowermost surface of the layer of airfelt 21, and an uppermost layer of tissue paper 24 is employed adjacent the uppermost surface of the layer of airfelt 22.

In the embodiment illustrated in Figures 1 and 2 the folding board 1 comprises a pair of identical planar isosceles triangles 2, 4 having an included angle of approximately 90° at their respective apexes, connected to one another at their altitudes by means of a vertical planar member 3. A layer of reinforcing wet strength tissue paper 20 having a width W substantially equal to that of the airfelt layers 21, 22 is preferably fed in the same direction and at the same velocity V as the foraminous supporting surface 11. The tissue ply 20 is caused to alter its path of travel from a horizontal direction to a vertical direction by virtue of being wrapped about direction changing roller 5 located near the base of the isosceles right triangle 2 forming a portion of the folding board 1. While the centerline of the moving tissue ply 20 is caused to coincide with the altitude of the isosceles right triangle 2 in the illustrated embodiment,

the lateral edge portions of the ply are caused to remain in contact with both the leading and trailing surfaces of the triangle by virtue of angular guides 7, 8 located adjacent the interior corners formed between vertical planar member 3 and the planar triangle 2. When the tissue ply 20 is forced to resume its original direction of travel about the apex of the isosceles right triangle 2, the angular guide members 7, 8 force the tissue ply 20 to assume an inverted U-shape as illustrated in the cross-section of Figure 3. While the vertical planar member 3 does conveniently serve to maintain planar isosceles triangles 2, 4 in longitudinal alignment with one another, its presence is not essential to guide the inverted U-shaped tissue ply 20 intermediate the triangles 2, 4. The inverted U-shaped shroud 28 which connects angles 9, 10 to one another serves to prevent fibers within the deposition chute 12 from collecting on the inverted U-shaped tissue ply 20 prior to passage of the ply through the limited clearance corners formed between angles 9, 10, triangle 4 and vertical planar member 3. Collection of fibers on the inverted U-shaped tissue ply 20 could cause jamming or tearing at these points.

The tissue ply 20 is introduced into the fiber deposition chute 12 while in the inverted U-shape in order to permit formation of a substantially planar lowermost layer of airfelt 21 which lies adjacent the lowermost surface of the tissue ply 20 in the finished absorbent pad embodiment. Internal airflow baffling techniques well known in the art may be employed within the vacuum chamber 26 to minimize any discontinuities in the cross-machine direction uniformity of the airfelt layer 21 which might otherwise occur due to the minor obstruction presented by the thin U-shaped shroud 28. In a particularly preferred embodiment, the lowermost layer of airfelt 21 is formed directly over a layer of envelope tissue 23 similar to that utilized as the reinforcing ply 20 in the forwardmost portion 13 of the fiber deposition chute 12. As can be seen in Figure 2, the vacuum chamber 25 located adjacent the lowermost surface of the moving foraminous support member 11 is preferably divided into two distinct segments 26, 27 by means of an adjustable dividing wall 19 which may be advanced or retarded in the machine direction. The vacuum chamber 25 is preferably segmented as outlined above in order to permit the application of differing vacuum levels between the leading portion 13 of the fiber deposition chute 12 and the trailing portion 14, since the trailing portion encounters more resistance to air flow than the leading portion due to the presence of the fibrous layer 21 and the reinforcing tissue ply 20 during formation of the uppermost layer of airfelt 22.

As is apparent from Figures 1 and 2, the tissue ply 20 is maintained in an inverted U-configuration until the desired thickness of airfelt layer 21 has been obtained. The relative

and total thickness of the respective airfelt layers 21 and 22 is controllable not only by the rate of fiber deposition within the chute 12, but also by the level of vacuum applied beneath the moving formaminous support member 11 in vacuum chamber segments 26 and 27, the machine direction positioning of the segmenting wall 19 within the vacuum chamber 25, and the machine direction positioning of the planar isosceles right triangle 4 connected to vertical planar member 3. Furthermore, baffle plates 15 and 16 which extend across the entire width of the fiber deposition chute 12, and which may be adjusted about pivot points 17 and 18, may also be employed to direct the flow of fibers toward either the leading portion 13 or the trailing portion 14 of the deposition chute 12, depending upon the desired split between uppermost layer 22 and lowermost layer 21.

Angular guides 9 and 10 force the tissue ply 20 to remain in contact with the leading surface of isosceles right triangle 4 which is identical in size and shape to the isosceles right triangle 2 as the centerline of a tissue ply 20 is directed about the apex of triangle 4. This in turn forces the tissue ply 20 to resume a planar configuration as it passes the base portion of the trailing surface of the triangle 4. Direction changing roll 6 restores the tissue ply 20 to its original direction of travel and exposes the uppermost surface of the ply to the deposition of fibers in the downstream portion 14 of the fiber deposition chute 12. A fibrous airlaid web 22 is thus formed adjacent the uppermost surface of the tissue ply 20 prior to passage of the assemblage from the fiber deposition chute 12. A wet strength tissue ply 24 is preferably thereafter brought into contact with the uppermost surface of the absorbent airfelt layer 22 about direction changing roller 30 as shown in Figure 2 to form a reinforced fibrous structure encapsulated on both sides by wet strength tissue plies 23, 24.

As has been pointed out earlier herein, the relative position of the internally located tissue ply 20 may be adjusted intermediate the uppermost and lowermost surfaces of the resultant absorbent pad structure by advancing or retarding the position of the folding board 1 and the direction changing rollers 5, 6 which are preferably mounted thereto within the fiber deposition chute 12. This of course necessitates a corresponding adjustment of angular guides 7, 8, 9 and 10 and shroud 28 in order to maintain the tissue ply 20 in contact with the surfaces of triangles 2, 4. The U-shaped shroud 28 illustrated in cross-section in Figure 3 is preferably employed in the practice of the present invention to avoid the collection of fibers on the uppermost surfaces of the wet strength tissue ply 20 prior to direction of the ply intermediate angular guides 9 and 10 located at the interior corners formed between isosceles triangle 4 and vertical planar member 3. This is necessary to avoid hangup or jamming

of the ply within the relatively tight clearances provided intermediate the guides 9 and 10 and the interior corners formed by triangle 4 and vertical planar member 3. As will thus be apparent to those skilled in the art, the shroud 28 must also be adjustable such that adjustment of the triangle 4 in the machine direction will not result in exposure of the inverted U-shaped tissue ply 20 to the stream of fibers present in the leading portion 13 of fiber deposition chute 12. In a most preferred embodiment of the present invention, separating wall 19 in vacuum chamber 25 is adjustable so as to vertically coincide with the position ultimately assumed by isosceles triangle 4 within the deposition chute 12.

Figure 4 is a simplified perspective illustration of the embodiment of the present invention illustrated in Figures 1—3. Selected portions of the fiber deposition chute 12 have been broken away to illustrate with maximum clarity the present pad forming operation.

The geometry of the folding board 1 illustrated in Figures 1—4 is more clearly set forth in Figures 5—7. While it is not essential that the folding board 1 be comprised of solid sheet stock as illustrated in Figure 5, the folding board preferably comprises a pair of planar isosceles right triangles 2, 4 connected to one another by means of a vertical planar member 3 corresponding in height to the altitude of each isosceles triangle. In order to minimize the vertical height requirement for a folding board of the present invention, it is preferable that the centerline of the tissue ply 20 be made to coincide with the altitude of both triangles during its passage over the folding board. Thus, in the simple embodiment illustrated in Figure 4 the included right angle α of triangle 2 is surrounded by equal length legs 42, 43 while the included right angle α of identical triangle 4 is surrounded by equal length legs 45, 46. The base 44 of isosceles triangle 2 and the base 47 of isosceles triangle 4 connect the respective equal length leg segments of the triangles. Lines 40 and 41 illustrated in Figure 5 represent the altitudes of right triangles 2 and 4, respectively. Thus, the angle β in each case amounts to 90 degrees, and the included right angle α of each triangle is bisected by its respective altitude. The angle γ between the altitude 40 of right triangle 2 and the base of vertical planar member 3 and the angle δ between the altitude 41 of triangle 4 and the base of vertical planar member 3 in the illustrated embodiment are also equal to 90 degrees.

The principle upon which the folding board 1 illustrated in Figures 1—7 operates is that each point on the incoming ply 20 must travel the same linear distance in traversing the surface of the forming board from entry thereon near the base 44 of isosceles right triangle 2 until its exit therefrom near the base 47 of isosceles right triangle 4. The paths followed by a pair of corresponding points located on opposite sides of the ply centerline is represented by lines 48

and 49 in Figure 5. The principle is further illustrated in Figure 6 which is a discharge end view of the folding board 1 illustrated in Figure 5. The sum of any given pair of lines $A_n + B_n$ must be constant, where A_n is any line parallel to the altitude 41 of the triangle and B_n is the corresponding horizontal distance of the line A_n from the altitude 41.

As should be clear from Figure 7 which is a plan view of the folding board 1 illustrated in Figure 5, the lowermost layer of absorbent fibers 21 is formed while the ply 20 is in the inverted U-configuration intermediate triangles 2, 4. As will be appreciated by those skilled in the art, it is desirable to minimize the width occupied by the ply 20 as it passes through the fiber deposition chute 12 in the inverted U-configuration in order to minimize any cross-machine direction non-uniformity in the lowermost airlaid web 21 formed adjacent its lowermost surface.

While it should be observed that the angle θ formed between triangle 2 and vertical planar member 3 and the angle ϕ formed between triangle 4 and vertical planar member 3 amounts to 90 degrees in the embodiment illustrated in Figures 1—7, it should be noted that the angles θ and ϕ need not equal one another, nor is it required that either angle be a right angle. The angle of infeed and outfeed of the tissue ply 20 may be varied as desired, provided only that the angles employed permit the tissue ply to be maintained in substantial surface contact with the triangles at the inside corners formed between triangles 2, 4 and vertical planar member 3. It should further be noted that vertical planar member 3 is not an essential portion of the present folding board 1, but rather is employed in a preferred embodiment of the present invention as a means of securing the triangles in longitudinal alignment with one another, a feature which is critical to the practice of the present invention.

It is possible to substitute other suitable means of maintaining the tissue ply 20 in contact with the inside corners formed between triangles 2, 4 and vertical planar member 3 for the angular guides 7, 8, 9 and 10 illustrated in Figures 1 and 2. Thus, rods, rolls, or any other suitable mechanism may be employed, provided only that the overall distance traveled by any given point on the tissue ply remain substantially constant across the width of the ply. In this regard, it should be noted that sharp edges are preferably removed from portions of the folding board 1 where stress concentrations are particularly high in order to avoid cutting or tearing of the tissue ply by the tensional forces to which it is subjected as it is drawn through the folding board. In this regard, a slight relief is preferably provided at the leading and trailing surfaces of the triangle 2, 4 at their respective apexes. While this causes a very slight deviation in the theoretical constant length criteria described above, the practical and beneficial

effect is to minimize the tendency of the ply 20 to rip or tear at points of stress concentration.

Figure 8 represents yet another particularly preferred embodiment of a folding board 50 which may be employed in the practice of the present invention in a system similar to that illustrated in Figures 1 and 2. In the embodiment illustrated in Figure 8, a vertical support member 57 is joined to one of the equal length leg segments 58 of an isosceles right triangle 52 having its included right angle ψ located intermediate equal length legs 58, 56. The triangle 52 preferably forms an angle Ω of 90 degrees with vertical planar member 57. In practice, a ply of reinforcing tissue 20' having a width W' is fed in a vertical plane in a direction parallel to the direction of travel of the foraminous support member 11 illustrated in Figures 1 and 2. The incoming ply 20' is wrapped about leg 58 of the isosceles right triangle 52 such that it contacts the trailing surface of the triangle and its borders parallel the equal length leg 56. The ply 20' is thereafter directed about the hypotenuse 54 of the planar triangle 52 and downwardly in a direction parallel to leg 58 while in contact with the leading surface of the triangle. The ply 20' is finally directed about equal length leg 56 of the triangle and thereafter continues in a manner similar to that illustrated in Figures 1 and 2. The particular embodiment illustrated in Figure 8 offers the advantage that the tissue ply 20' does not require the use of any external guides to hold it in intimate contact with the surfaces of the isosceles right triangle 52, but rather is wrapped tightly thereabout by means of the tension employed to draw the ply through the folding board 50. Furthermore, there is no interruption of the fiber forming zone in the leading portion 13 of the fiber deposition chute 12, since the vertical support member 57 may be located adjacent the edge of the fibrous web 21. Accordingly, it is feasible to obtain a uniform cross-machine direction basis weight and profile in the fibrous airfelt web 21 formed adjacent the lowermost surface of the ply 20'. The embodiment illustrated in Figure 8 does, however, require greater overhead clearance at the fiber deposition chute 12 due to the fact that the ply 20' is not folded upon itself, as in the case of the embodiment illustrated in Figures 1—3.

In a particularly preferred embodiment of the present invention, the outermost tissue plies 23 and 24 illustrated in Figures 1 and 2 may be somewhat wider than the tissue ply 20 and the airfelt web portions 21 and 22. In such an embodiment the lateral edge portions of plies 23 and 24 may be secured to one another by folding, by adhesives, or by other means well known in the art to form a continuous encapsulating envelope. If desired, a continuous layer of moisture-pervious topsheet material may be secured in superposed relation to the continuous envelope. Absorbent pad segments

of predetermined length are thereafter cut from the continuous envelope. The absorbent pad segments are preferably rotated 90° prior to securement to a continuous web of moisture-impervious backsheet material about their periphery to form a continuous web of disposable absorbent bandages, such as diapers. Individual diapers are thereafter cut from the continuous web intermediate the absorbent pad segments. U.S. Patent 3,952,745 issued to Duncan on April 27, 1976 and incorporated herein by reference is generally representative of such a construction. Aligning the machine direction of the tissue plies 20, 23 and 24 parallel to the waistband portions of the diaper in this manner is generally desirable since it aligns the tissue's direction of maximum strength with the direction in which the greatest tensile loads are typically applied in use.

It is noteworthy that the invention disclosed herein may be utilized to provide plies which are perforate or imperforate and which are either continuous or discontinuous in the cross machine direction intermediate a pair of fibrous webs in a single fiber deposition zone. Furthermore, multiple plies may be simultaneously fed utilizing an embodiment of the present invention, or multiple stages of the present invention may be employed to provide multiple reinforcing plies within a single structure, each ply being separated from the next by a fibrous layer. In addition, it should be noted that although in the embodiment illustrated in Figures 1—3 it is preferable to align the centerline of the ply 20 with the altitude of triangles 2, 4 to minimize overall height requirements in the deposition chute 12, the lateral positioning of the ply 20 may be altered as desired relative to the apex of the triangle and will maintain the selected position until manually repositioned. This is due to the fact that the laterally imposed forces introduced on the ply by the illustrated system remain in total balance with one another as the ply is tracked through the folding board. Thus, there is nothing to disturb the equilibrium established once the desired position of the web relative to the apex of the triangle or triangles has been established.

Claims

1. A continuous, in-line method for forming airlaid fibrous fluff web provided with a substantially planar fiber-impervious internal reinforcing ply whose width is substantially coextensive with that of said web *characterised in that* it comprises the steps of:

- (a) continuously feeding said substantially planar reinforcing ply (20) in a first direction in a first plane;
- (b) introducing said moving reinforcing ply into a single fiber deposition zone in which is disposed a foraminous support surface

- (11) moving in said first direction while the ply is oriented so that the direction of fiber flow is substantially parallel to the width of said ply, to vacuum form on said support surface, a first portion (21) of said airlaid fibrous fluff web;
- (c) guiding said moving reinforcing ply into contact with a first equal length leg portion (58) of the trailing surface of a planar isosceles right angled triangle (52), said first equal length leg portion being oriented perpendicular to said first direction of travel of said ply (20);
- (d) wrapping said moving reinforcing ply about opposite surfaces of said planar right angled triangle (52) by passing said ply about the hypotenuse thereof;
- (e) restoring said moving ply to said first direction of travel by passing said moving ply about the second equal length leg portion (56) of said triangle (52), thereby causing said ply to assume a planar condition in a second plane perpendicular to said first plane, said ply being positioned with its lowermost surface immediately adjacent said first airlaid fibrous fluff web portion (21);
- (f) exposing the uppermost surface of said moving reinforcing ply to said fiber deposition zone while in a planar condition to vacuum form a second portion (22) of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply (20); and
- (g) removing said ply and said airlaid web portions from said fiber deposition zone.

2. A method according to Claim 1 *characterised in that* said planar isosceles right angled triangle (52) is located in a plane perpendicular to said first direction of travel of said substantially planar reinforcing ply and said ply is abruptly restored to said first direction of travel prior to its exit from said fiber deposition zone.

3. A method according to either one of Claims 1 and 2 *characterised in that* the relative thickness of the first and second airlaid fibrous fluff web portions is controlled by adjusting the machine direction position of said isosceles right angled triangle within said fiber deposition zone.

4. A method according to any one of Claims 1 to 3 *characterised in that* a greater level of suction is applied to vacuum form the second airlaid fibrous fluff web portion (22), than that applied to vacuum form the first air laid fibrous fluff web portion (21), to offset the added resistance to airflow created by the reinforcing ply (21) and the first fibrous fluff web portion (21).

5. A method according to any one of Claims 1 to 4 *characterised in that* the first air laid fibrous fluff web portion (21) is vacuum formed directly over a second continuously moving tissue ply (23) having a width at least as great

as that of said internal reinforcing ply (21), and in that a third continuously moving tissue ply (24) is applied directly over the uppermost surface of the second airlaid fibrous fluff web portion (22) upon exit thereof from said fiber deposition zone.

6. A method according to Claim 5 *characterised in that* said second and third tissue plies (23, 24) have a width greater than that of said internal reinforcing ply (21) and the lateral edges of said second and third tissue plies are secured together by folding upon one another to form a continuous tissue envelope about the internal reinforcing ply and the first and second airlaid fibrous fluff web portions (21, 22).

7. A method according to Claim 6 *characterised in that* absorbent pad segments of predetermined length are cut from said continuous tissue envelope and thereafter secured intermediate a moisture-impervious backsheet and a moisture-pervious topsheet which are secured in superposed relation to one another, thereby forming a disposable absorbent bandage.

8. An in-line apparatus for the continuous manufacture of an airlaid fibrous fluff web provided with a substantially planar internal fiber impervious reinforcing ply that is substantially coextensive with the width of said web, said apparatus being *characterised in that* it comprises;

- (a) a source of fibrous material in discrete fiber form
- (b) a single fiber deposition chamber (12) into which said fibers are fed continuously from said source;
- (c) a continuously moving foraminous support member (11) passing through said deposition chamber (12) in a plane substantially perpendicular to the direction of fiber flow;
- (d) suction means (25, 26, 27) located adjacent the surface of said foraminous support member (11) opposite said fiber source;
- (e) means (57) for introducing said reinforcing ply (21) to said deposition chamber in a first direction identical to that of said foraminous support member while said ply is oriented in a first plane such that its width is substantially parallel to the direction of fiber flow within said chamber to facilitate vacuum forming the portion of said airlaid fibrous fluff web on said foraminous support member;
- (f) Right-angled isosceles triangular guide means (52), 56, 58) extending perpendicular to said first direction of travel within said fiber deposition chamber (12) for abruptly reorienting said reinforcing ply to a second plane perpendicular to said first plane while restoring said ply to said first direction of travel, thereby to contact the lowermost

surface thereof with said airlaid fibrous fluff web and to facilitate vacuum forming the portion of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply; and

- (g) means for removing said ply and said airlaid web portions from said fiber deposition chamber.

9. The apparatus of Claim 8, *characterised in that* the position of said triangular guide means (52) is adjustable in the machine direction within the fiber deposition chamber to vary the relative thickness of the first and second airlaid fibrous fluff web portions.

10. The apparatus of either one of Claims 8 and 9 *characterised in that* said right angled isosceles triangular guide means (52) is planar, with one of its equal length leg portions (58) oriented perpendicular to said first direction of travel of said reinforcing ply (21) and the other of its equal length leg portions (56) in a second plane perpendicular to said first plane, said second plane being parallel to the plane of said foraminous support member (11).

11. The apparatus of any one of Claims 8 to 10 wherein the suction means (25) located adjacent the surface of said foraminous support member is comprised of a vacuum chamber having a length at least equal to that of said fiber deposition chamber, said vacuum chamber having an internal partition member (19) oriented perpendicular to the direction of travel of said ply, said partition member being adjustable in the machine direction to facilitate alignment thereof with said triangular guide means within said chamber and thereby facilitate the application of a higher level of suction during formation of the second airlaid fibrous fluff web portion.

12. The apparatus of any one of Claims 8 to 11 further including means for feeding a second tissue ply (23) having a width at least as great as said reinforcing ply into superposed relation with said foraminous support member prior to entry thereof into said fiber deposition chamber (12) and means for feeding a third tissue ply (24) having a width at least as great as said reinforcing ply (21) into superposed relation with the uppermost surface of said uppermost airlaid fibrous fluff web portion (22) upon exit thereof from said fiber deposition chamber (12).

13. A continuous, in-line method for forming an airlaid fiber impervious fibrous fluff web provided with a substantially planar internal reinforcing ply that is substantially coextensive with the width of said web *characterised in that* it comprises the steps of:

- (a) continuously feeding said substantially planar reinforcing ply (20) in a first direction in a first plane;
- (b) guiding said moving reinforcing ply about a first direction changing means (5) and into contact with the leading surface of a first planar isosceles right angled triangle (2) said triangle having its altitude (40)

oriented perpendicular to said first direction of travel of said ply;

- (c) wrapping said moving reinforcing ply about opposite surfaces of said first planar triangle;

- (d) restoring said moving ply to its first direction of travel by directing said ply about the apex of said first triangle while maintaining the lateral edge portions of said moving ply in contact with the leading and trailing surfaces of said first triangle, thereby causing said ply to fold about itself in a second plane perpendicular to said first plane;

- (e) introducing said moving reinforcing ply to a single fiber deposition zone in which is disposed a foraminous support surface (11) moving in said first direction while the ply is in a folded configuration, to vacuum form on said support surface, a first portion (21) of said airlaid fibrous fluff web;

- (f) wrapping said moving reinforcing ply about opposite surfaces of a second isosceles triangle (4) identical to and longitudinally aligned with said first triangle (2) and having its altitude (41) oriented perpendicular to said first direction of travel such that the lateral edges of said moving ply are guided on opposite sides of the apex of said second triangle as said moving ply is directed about the apex thereof, the lateral edges of said moving ply being maintained in contact with the leading and trailing surfaces of said second triangle, thereby restoring said ply to a planar condition;

- (g) directing said moving reinforcing ply about a second direction changing means (6) to restore it to said first direction of travel and to bring the lowermost surface thereof into contact with the first airlaid fibrous fluff portion (21);

- (h) exposing the uppermost surface of said moving reinforcing ply to said fiber deposition zone while in a planar condition to vacuum form a second portion (22) of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply; and

- (i) removing said ply and said airlaid fibrous fluff portions from fiber deposition zone.

14. A method according to Claim 13 *characterised in that* the centerline of said moving reinforcing ply (20) is caused to coincide with the altitudes (40, 41) of said first and said second isosceles triangles as said ply is drawn across the surfaces thereof, thereby causing said ply to assume an inverted U-configuration about its centerline as it moves intermediate said first and said second triangles.

15. A method according to either one of Claims 13 and 14 wherein said first and second isosceles triangles are in parallel planes which are perpendicular to said first direction of travel

of said substantially planar reinforcing ply.

16. A method according to any one of Claims 13 to 15 *characterised in that* the relative thickness of the first and second airlaid fibrous fluff web portions (21, 22) is controlled by adjusting the machine direction position of said second isosceles triangle (4) within said fiber deposition zone.

17. A method according to any one of Claims 13 to 16 *characterised in that* a greater level of suction is applied to vacuum form the second airlaid fibrous fluff web portion (22), than is applied to vacuum form the first airlaid fibrous fluff web portion (21) to offset the added resistance to airflow created by said ply (20) and said first airlaid fibrous fluff web portion (21).

18. A method according to any one of Claims 13 to 17 *characterised in that* the first portion (21) of said airlaid fibrous fluff web is formed directly on the surface of a second moving tissue ply (23) having a width at least as great as said reinforcing ply; and after said plies and said first and second airlaid web portions are removed from said fiber deposition zone a third tissue ply (24), having a width at least as great as said reinforcing ply, is superposed upon the second portion of said airlaid web (22).

19. A method according to Claim 18 wherein said second and third tissue plies have a width greater than that of said internal reinforcing ply and the lateral edges of said second and third plies are secured together by folding upon one another to form a continuous tissue envelope about the internal reinforcing ply and the first and second airlaid fibrous fluff web portions.

20. A method according to Claim 19 wherein absorbent pad segments of predetermined length are cut from said continuous tissue envelope and thereafter secured intermediate a moisture-impervious backsheet and a moisture-pervious topsheet which are secured in superposed relation to one another, thereby forming a disposable absorbent bandage.

21. An in-line apparatus for the continuous manufacture of an airlaid fibrous fluff web provided with a substantially planar internal fiber-impervious reinforcing ply that is substantially co-extensive with the width of said web, said apparatus being *characterised in that* it comprises:

- (a) a source of fibrous material in discrete fiber form;
- (b) a single fiber deposition chamber (12) into which said fibers are fed continuously from said source;
- (c) a continuously moving foraminous support member (11) passing through said deposition chamber in a plane substantially perpendicular to the direction of fiber flow;
- (d) suction means (25) located adjacent the surface of said foraminous support member (11) opposite said fiber source;

- (e) means for continuously feeding said reinforcing ply in the same direction as said foraminous support member while oriented in a first plane parallel to that of said foraminous support member;
- (f) first right-angled isosceles triangular guide means (2, 5), extending in a direction perpendicular to said direction of travel for abruptly causing said reinforcing ply to fold about itself in a second plane perpendicular to said first plane;
- (g) means (3, 7, 8) for introducing said reinforcing ply to said fiber deposition chamber while in a folded configuration to facilitate vacuum forming a first airlaid fibrous fluff web portion adjacent the foraminous support member;
- (h) second right-angled isosceles triangular guide means extending perpendicular to the direction of travel (4, 6) of said reinforcing ply within said fiber deposition chamber (12) for abruptly reorienting said ply from a folded configuration to a planar configuration in said first plane while restoring said ply to said first direction of travel to bring the lowermost surface of said ply into contact with said first airlaid fibrous fluff web portion and to facilitate vacuum forming a second portion of said airlaid fibrous fluff web adjacent the uppermost surface of said reinforcing ply; and
- (i) means for removing said ply and said airlaid web portions from said fiber deposition chamber.

22. The apparatus of Claim 21, *characterised in that* said first and second guide means (2, 4) comprise identical planar triangular bodies, (42, 43, 44, 45, 46, 47) maintained in longitudinally aligned parallel relationship by a planar member (3) connecting their respective attitudes (40, 41).

23. The apparatus of Claims 22 *characterised in that* the planar isosceles triangles (2, 4) and said connecting planar member (3) are adjustable as a unit (1) in the machine direction to vary the relative thickness of the first and second air laid fibrous fluff web portions.

24. The apparatus of any one of Claims 21—23 wherein the suction means (25) located adjacent the surface of said foraminous support member is comprised of a vacuum chamber having a length at least equal to that of said fiber deposition chamber, said vacuum chamber having an internal partition member (19) oriented perpendicular to the direction of travel of said ply, said partition member being adjustable in the machine direction to facilitate alignment thereof with said second triangular guide means (4) within said chamber and thereby facilitate the application of a higher level of suction during formation of the second airlaid fibrous fluff web portion.

Patentansprüche

1. Kontinuierliches Durchlaufverfahren zur Bildung einer luftabgelegten Faserflaubbahn, die mit einer praktisch planaren, faserundurchlässigen inneren Verstärkungslage versehen ist, deren Breite praktisch gleich derjenigen der Bahn ist, dadurch gekennzeichnet, dass es die Schritte umfasst:

- (a) kontinuierliches Einführen der praktisch planaren Verstärkungslage (20) in einer ersten Richtung in eine erste Ebene;
- (b) Einführen der laufenden Verstärkungslage in eine Einzelfaserablagezone, in welcher eine perforierte Trägerfläche (11) angeordnet ist, die sich in der ersten Richtung bewegt, während die Lage so orientiert ist, dass der Faserstrom praktisch parallel zur Breite der Lage gerichtet ist, um auf der Trägerfläche durch Saugformung einen ersten Teil (21) der luftabgelegten Faserflaubbahn zu bilden;
- (c) Führen der laufenden Verstärkungslage in Kontakt mit einem ersten gleichlängigen Schenkelteil (58) der hinteren Oberfläche eines planaren gleichschenkligen rechtwinkligen Dreiecks (52), wobei der erste gleichlängige Schenkelteil senkrecht zur ersten Laufrichtung der Lage (20) orientiert ist;
- (d) Umlegen der laufenden Verstärkungslage um einander gegenüberliegende Oberflächen des planaren rechtwinkligen Dreiecks (52) durch Führen der Lage um die Hypotenuse des Dreiecks;
- (e) Rückführen der laufenden Lage in die erste Bewegungsrichtung durch Führung der laufenden Lage um den zweiten gleichlängigen Schenkelteil (56) des Dreiecks (52), um dadurch zu bewirken, dass die Lage einen planen Zustand in einer zweiten Ebene senkrecht zur ersten Ebene annimmt, wobei die Lage mit ihrer unteren Fläche unmittelbar auf dem ersten luftabgelegten Faserflaubbahn (21) liegt;
- (f) Exponieren der oberen Fläche der laufenden Verstärkungslage in planarem Zustand in der Faserablagezone, um einen zweiten Teil (22) der luftabgelegten Faserflaubbahn auf der oberen Fläche der Verstärkungslage (20) durch Saugformung zu bilden, und
- (g) Abführen der Lage und der luftabgelegten Bahnteile aus der Faserablagezone.

2. Verfahren nach Patentanspruch 1, dadurch gekennzeichnet, dass das planare gleichschenklige rechtwinklige Dreieck (52) in einer Ebene senkrecht zur ersten Laufrichtung der praktisch planaren Verstärkungslage angeordnet ist und dass die Lage vor ihrer Abführung aus der Faserablagezone jäh in die erste Laufrichtung zurückgeführt wird.

3. Verfahren nach einem der Patentansprüche 1 oder 2, dadurch gekennzeichnet, dass die relativen Dicken der ersten und zweiten

luftabgelegten Faserflaubbahnteile durch Einstellen der Maschinenrichtungsstellung des gleichschenkligen rechtwinkligen Dreiecks in der Faserablagezone geregelt werden.

4. Verfahren nach einem der Patentansprüche 1—3, dadurch gekennzeichnet, dass zur Saugformung des zweiten luftabgelegten Faserflaubbahnteils (22) ein stärkerer Sog angewendet wird, als zur Saugformung des ersten luftabgelegten Faserflaubteils (21), um den zusätzlichen Luftströmungswiderstand auszugleichen, der durch die Verstärkungslage (21) und den ersten Faserflaubbahn (21) verursacht wird.

5. Verfahren nach einem der Patentansprüche 1—4, dadurch gekennzeichnet, dass der erste luftabgelegte Faserflaubbahn (21) durch Saugformung direkt auf einer zweiten kontinuierlich laufenden Papiertuchlage (23) gebildet wird, die eine mindestens ebenso grosse Breite wie die innere Verstärkungslage (21) hat, und dass eine dritte kontinuierlich laufende Papiertuchlage (24) direkt auf die obere Fläche des zweiten luftabgelegten Faserflaubbahnteils (22) bei dessen Abführung aus der Faserablagezone aufgebracht wird.

6. Verfahren nach Patentanspruch 5, dadurch gekennzeichnet, dass die zweite und dritte Papiertuchlage (23, 24) grössere Breiten haben, als die innere Verstärkungslage (21), und dass die Seitenkanten der zweiten und dritten Papiertuchlage durch Aufeinanderfaltung miteinander verbunden werden, um eine fortlaufende Papiertuchhülle um die Innenverstärkungslage und den ersten und den zweiten luftabgelegten Faserflaubbahn (21, 22) zu bilden.

7. Verfahren nach Patentanspruch 6, dadurch gekennzeichnet, dass aus der fortlaufenden Papiertuchhülle saugfähige Polstersegmente vorbestimmter Länge geschnitten und dann zur Erzeugung einer saugfähigen Wegwerfbandage zwischen einem feuchtigkeitsundurchlässigen Rückblatt und einem feuchtigkeitsdurchlässigen Vorderblatt übereinanderliegend befestigt werden.

8. Durchlaufvorrichtung zur kontinuierlichen Herstellung einer luftabgelegten Faserflaubbahn, die mit einer praktisch planaren inneren faserundurchlässigen Verstärkungslage versehen ist, die praktisch gleich breit wie die Bahn ist, welche Vorrichtung gekennzeichnet ist durch

- (a) eine Quelle für Fasermaterial in Form von Einzelfasern,
- (b) eine Einzelfaserablagekammer (12), in welche die Fasern von der Quelle kontinuierlich eingespeist werden;
- (c) einen kontinuierlich laufenden perforierten Träger (11), der durch die Ablagekammer (12) in einer Ebene praktisch senkrecht zur Richtung des Faserstroms läuft;
- (d) eine Saugeinrichtung (25, 26, 27), die benachbart zur Oberfläche des per-

- forierten Trägers (11) entgegengesetzt zur Faserquelle angeordnet ist;
- (e) eine Einrichtung (57) zur Einführung der Verstärkungslage (21) in die Ablagekammer in einer ersten Richtung gleich derjenigen des perforierten Trägers, während die Lage in einer ersten Ebene derart orientiert ist, dass ihre Breite praktisch parallel zur Richtung des Faserstroms in der Kammer liegt, um die Saugformung des Teils der luftabgelegten Faserflaubahn auf dem perforierten Träger zu erleichtern,
- (f) rechteckig - gleichschenkelig - dreieckige Führungen (52, 56, 58), welche sich senkrecht zur ersten Laufrichtung in der Faserablagekammer (12) erstrecken, um die Verstärkungslage jäh in eine zweite Ebene umzulenken, welche senkrecht zur ersten Ebene liegt, während die Lage in die erste Laufrichtung zurückgeführt wird, um dadurch ihre untere Fläche mit der luftabgelegten Faserflaubahn in Kontakt zu bringen und die Saugformung des Teils der luftabgelegten Faserflaubahn auf der oberen Fläche der Verstärkungslage zu erleichtern, und
- (g) eine Einrichtung zum Abführen der Lage und der luftabgelegten Bahnteile aus der Faserablagekammer.

9. Vorrichtung nach Patentanspruch 8, dadurch gekennzeichnet, dass die Stellung der dreieckigen Führung (52) in der Faserablagekammer in Maschinenrichtung einstellbar ist, um die relativen Dicken der ersten und der zweiten luftabgelegten Faserflaubahnteile zu verändern.

10. Vorrichtung nach Patentanspruch 8 oder 9, dadurch gekennzeichnet, dass die rechtwinklig-gleichschenkelig-dreieckige Führung (52) planar ist, wobei einer ihrer gleichlängigen Schenkelteile (58) senkrecht zur ersten Laufrichtung der Verstärkungslage (21) und der anderer ihrer gleichlängigen Schenkelteile (56) in einer zweiten Ebene senkrecht zur ersten Ebene orientiert ist, wobei die zweite Ebenenparallel zur Ebene des perforierten Trägerteils (11) liegt.

11. Vorrichtung nach einem der Patentansprüche 8—10, bei welcher die Saugeinrichtung (25), die angrenzend an die Oberfläche des mit Durchbrechungen versehenen Trägers angeordnet ist, eine Vakuumkammer besitzt, deren Länge mindestens gleich derjenigen der Faserablagekammer ist, wobei die Vakuumkammer eine innere Trennwand (19) besitzt, die senkrecht zur Laufrichtung der Lage orientiert und in Maschinenrichtung einstellbar ist, um ihre Ausrichtung mit der dreieckigen Führung in der Kammer zu erleichtern und dadurch die Anwendung eines stärkeren Soges während der Bildung des zweiten luftabgelegten Faserflaubahnteils zu erleichtern.

12. Vorrichtung nach einem der Patentansprüche 8—11 mit einer Einrichtung zur Einführung einer zweiten Lage (23) aus Papiertuch, die

eine mindestens ebenso grosse Breite wie die Verstärkungslage hat aufliegend auf dem perforierten Träger vor dessen Eintritt in die Faserablagekammer (12), und mit einer Einrichtung zur Einführung einer dritten Lage (24) aus Papiertuch, die eine mindestens ebensogrosse Breite wie die Verstärkungslage (21) hat, aufliegend auf der oberen Fläche des oberen luftabgelegten Faserflaubahnteils (22) bei dessen Auführung aus der Faserablagekammer (12).

13. Kontinuierliches Durchlaufverfahren zur Bildung einer luftabgelegten faserundurchlässigen Faserflaubahn, die mit einer praktisch planaren inneren Verstärkungslage versehen ist, die praktisch die gleiche Breite wie die Bahn hat, dadurch gekennzeichnet, dass das Verfahren folgende Schritte umfasst:

- (a) kontinuierliches Einführen der praktisch planaren Verstärkungslage (20) in einer ersten Richtung in eine erste Ebene;
- (b) Führen der laufenden Verstärkungslage um ein erstes Richtungsänderungsmittel (5) und in Kontakt mit der vorderen Oberfläche eines ersten planaren gleichschenkligen rechtwinkligen Dreiecks (2), dessen Höhe (40) senkrecht zur ersten Laufrichtung der Lage orientiert ist;
- (c) Umlenken der laufenden Verstärkungslage um einander entgegengesetzte Oberflächen des ersten planaren Dreiecks;
- (d) Rückführung der laufenden Lage in deren erste Laufrichtung durch Führen der Lage um die Spitze des ersten Dreiecks, während die Seitenkantenteile der laufenden Lage in Kontakt mit den vorderen und hinteren Oberflächen der ersten Dreiecks gehalten werden, wodurch bewirkt wird, dass die Lage in einer zweiten Ebene senkrecht zur ersten Ebene um sich selbst gefaltet wird;
- (e) Einführen der laufenden Verstärkungslage in eine Einzelfaserablagezone, in welcher eine perforierte Trägerfläche (11) angeordnet ist, die sich in der ersten Richtung bewegt, während die Lage sich in einem gefalteten Zustand befindet, um auf der Trägerfläche einen ersten Teil (21) der luftabgelegten Faserflaubahn durch Saugformung zu bilden;
- (f) Umlegen der laufenden Verstärkungslage um einander entgegengesetzte Oberflächen eines zweiten gleichschenkligen Dreiecks (4), das identisch mit dem ersten Dreieck (2) und in Längsrichtung mit diesem ausgerichtet ist, und dessen Höhe (41) senkrecht zur ersten Laufrichtung orientiert ist, so dass die Seitenkanten der laufenden Lage an einander gegenüberliegenden Seiten der Spitze des zweiten Dreiecks geführt werden, wenn die laufende Lage um dessen Spitze geführt wird, wobei die Seitenkanten der laufenden Bahn in Kontakt mit den vorderen und hinteren Oberflächen des zweiten Dreiecks gehalten werden, wo-

durch die Lage wieder in einen planaren Zustand zurückgeführt wird;

- (g) Führen der laufenden Verstärkungslage um ein zweites Richtungsänderungsmittel (6), um sie in die erste Laufrichtung zurückzuführen und um ihre untere Fläche mit dem ersten luftabgelegten Faserflaumbahnenteil (21) in Kontakt zu bringen;
- (h) Exponieren der oberen Fläche der laufenden Verstärkungslage in planarem Zustand in der Faserablagezone zur Saugformung eines zweiten Teils (22) der luftabgelegten Faserflaumbahn auf der oberen Fläche der Verstärkungslage, und
- (i) Abführen der Lage und der luftabgelegten Faserflaumbahnenteile aus der Faserablagezone.

14. Verfahren nach Patentanspruch 13, dadurch gekennzeichnet, dass die Mittellinie der laufenden Verstärkungslage (20) übereinstimmend mit den Höhen (40), 41) des ersten und des zweiten gleichschenkligen Dreiecks geführt wird, wenn die Lage über deren Oberflächen gezogen wird, wodurch bewirkt wird, dass die Lage bei ihrer Bewegung zwischen dem ersten und dem zweiten Dreieck eine umgekehrte U-Form um ihre Mittellinie annimmt.

15. Verfahren nach einem der Patentansprüche 13 oder 14, worin das erste und das zweite gleichschenklige Dreieck in parallelen Ebenen senkrecht zur ersten Laufrichtung der praktisch planaren Verstärkungslage liegen.

16. Verfahren nach einem der Patentansprüche 13—15, dadurch gekennzeichnet, dass die relativen Dicken des ersten und des zweiten luftabgelegten Faserflaumbahnenteils (21, 22) durch Einstellen der Maschinenrichtungstellung des zweiten gleichschenkligen Dreiecks (4) in der Faserablagezone gesteuert werden.

17. Verfahren nach einem der Patentansprüche 13—16, dadurch gekennzeichnet, dass zum Saugformen des zweiten luftabgelegten Faserflaumbahnenteils (22) ein stärkerer Sog als beim Saugformen des ersten luftabgelegten Faserflaumbahnenteils (21) angewendet wird, um den zusätzlichen Luftströmungswiderstand auszugleichen, der durch die Lage (20) und den ersten luftabgelegten Faserflaumbahnenteil (21) erzeugt wird.

18. Verfahren nach einem der Patentansprüche 13—17, dadurch gekennzeichnet, dass der erste Teil (21) der luftabgelegten Faserflaumbahn direkt auf der Oberfläche einer zweiten laufenden Papiertuchlage (23) gebildet wird, die eine mindestens ebensogrosse Breite wie die Verstärkungslage hat; und wobei nach dem Abführen der Lagen und der ersten und zweiten luftabgelegten Bahnenteile aus der Faserablagezone eine dritte Papiertuchlage (24) mit einer mindestens ebensogrossen Breite wie die Verstärkungslage auf den zweiten Teil der luftabgelegten Bahn (22) aufgelegt wird.

19. Verfahren nach Patentanspruch 18, dadurch gekennzeichnet, dass die zweiten und dritten Papiertuchlagen grössere Breiten haben als die

innere Verstärkungslage, und dass die Seitenkanten der zweiten und dritten Lagen durch Aufeinanderfalten miteinander verbunden werden, um eine kontinuierliche Papiertuchhülle um die innere Verstärkungslage und die ersten und zweiten luftabgelegten Faserflaumbahnenteile zu bilden.

20. Verfahren nach Patentanspruch 19, bei welchem aus der kontinuierlichen Papiertuchhülle saugfähige Polstersegmente vorbestimmter Länge geschnitten und danach zwischen einem feuchtigkeitsundurchlässigen Rückblatt und einem feuchtigkeitsdurchlässigen Vorderblatt übereinanderliegend befestigt werden, um eine saugfähige Wegwerfbandage herzustellen.

21. Durchlaufvorrichtung zur kontinuierlichen Herstellung einer luftabgelegten Faserflaumbahn, die mit einer praktisch planaren inneren faserundurchlässigen Verstärkungslage versehen ist, die praktisch gleich breit wie die Bahn ist, welche Vorrichtung gekennzeichnet ist durch:

- (a) eine Quelle für faseriges Material in Form von Einzelfasern;
- (b) eine Einzelfaserablagekammer (12), in welche die Fasern kontinuierlich von der Quelle eingespeist werden;
- (c) einen kontinuierlich bewegten perforierten Träger (11), der in einer Ebene praktisch senkrecht zur Richtung des Faserstroms durch die Ablagekammer läuft;
- (d) eine Saugeinrichtung (25), die benachbart zur Oberfläche des perforierten Trägers (11) und gegenüberliegend zur Faserquelle angeordnet ist;
- (e) eine Einrichtung zur kontinuierlichen Einführung der Verstärkungslage in gleicher Richtung wie der perforierte Träger unter Orientierung in einer ersten Ebene parallel zu derjenigen des perforierten Trägers;
- (f) eine erste rechtwinklig-gleichschenkligdreieckige Führung (2, 5), die sich senkrecht zur Laufrichtung erstreckt, um eine jähe Umfaltung der Verstärkungslage um sich selbst und in eine zweite Ebene senkrecht zur ersten Ebene zu bewirken;
- (g) eine Einrichtung (3, 7, 8) zur Einführung der Verstärkungslage in die Faserablagekammer in gefalteter Form zur Erleichterung der Saugformung eines ersten luftabgelegten Faserflaumbahnenteils auf dem perforierten Träger;
- (h) eine zweite rechtwinklig-gleichschenkligdreieckige Führung, die sich senkrecht zur Laufrichtung (4, 6) der Verstärkungslage in der Faserablagekammer (12) erstreckt, um die Lage jäh aus einer umgefalteten Form in eine planare Form in der ersten Ebene umzuorientieren und die Lage wieder in die erste Laufrichtung zu führen, so dass die untere Fläche der Lage mit

dem ersten luftabgelegten Faserflaumbahnteil in Kontakt kommt und die Saugformung eines zweiten Teils der luftabgelegten Faserflaumbahn auf der oberen Fläche der Verstärkungslage erleichtert wird, und

- (i) eine Einrichtung zum Abführen der Lage und der luftabgelegten Faserflaumbahnteile aus der Faserablagekammer.

22. Vorrichtung nach Patentanspruch 21, dadurch gekennzeichnet, dass die erste und zweite Führung (2, 4) identische planare dreieckige Körper (42, 43, 44, 45, 46, 47) besitzen, die in Längsrichtung parallel ausgerichtet und durch einen planaren Teil (3) an den jeweiligen Höhen (40, 41) miteinander verbunden sind.

23. Vorrichtung nach Patentanspruch 22, dadurch gekennzeichnet, dass die planaren gleichschenkligen Dreiecke (2, 4) und der planare Verbindungsteil (3) als eine Einheit (1) in der Maschinenrichtung einstellbar sind, um die relativen Dicken der ersten und zweiten luftabgelegten Faserflaumbahnteile zu verändern.

24. Vorrichtung nach einem der Patentansprüche 21—23, wobei die Saugeinrichtung (25), die benachbart zur Oberfläche des perforierten Trägers angeordnet ist, eine Vakuumkammer besitzt, die eine mindestens ebenso-grosse Länge wie die Faserablagekammer hat, wobei die Vakuumkammer eine innere Trennwand (19) besitzt, die senkrecht zur Laufrichtung der Lage steht und in Maschinenrichtung einstellbar ist, um ihre Ausrichtung mit der zweiten dreieckigen Führung (4) in der Kammer zu erleichtern und dadurch das Anlegen eines stärkeren Soges während der Bildung des zweiten luftabgelegten Faserflaumbahnteils zu erleichtern.

Revendications

1. Procédé continu en ligne pour la formation d'une nappe de duvet fibreux déposée pneumatiquement, munie d'une couche intérieure de renforcement pratiquement plane, imperméable aux fibres, dont la largeur est pratiquement égale à celle de la nappe, caractérisé par les étapes suivantes:

- (a) faire avancer en continu la couche de renforcement pratiquement plane (20) dans une première direction dans un premier plan,
- (b) introduire la couche de renforcement en mouvement dans une seule zone de dépôt de fibres dans laquelle est disposée une surface de support perforée (11) se déplaçant dans la première direction, tandis que la couche est orientée de telle sorte que la direction d'écoulement des fibres soit pratiquement parallèle à la largeur de la couche, pour former par dépression sur la surface de support une première partie (21) de la nappe de duvet fibreux déposée pneumatiquement,
- (c) guider la couche de renforcement en

mouvement pour l'amener en contact avec un premier des côtés égaux (58) de la surface postérieure d'un triangle rectangle isocèle plan (52), ce premier côté étant orienté perpendiculairement à la première direction de mouvement de la couche (20),

- (d) enrouler la couche de renforcement en mouvement autour de surfaces opposées du triangle rectangle plan (52) en faisant passer la couche autour de l'hypoténuse de celui-ci,
- (e) ramener la couche en mouvement dans la première direction de déplacement en faisant passer la couche en mouvement autour du deuxième côtés égaux (56) du triangle (52) de façon que la couche prenne une position plane dans un deuxième plan perpendiculaire au premier plan, la couche étant dans une position où sa surface inférieure est immédiatement adjacent à la pre première partie de nappe de duvet fibreux (21) déposée pneumatiquement,
- (f) exposer la surface supérieure de la couche de renforcement en mouvement à la zone de dépôt de fibres pendant qu'elle est dans une position plane, pour former par dépression une deuxième partie (22) de la nappe de duvet fibreux déposée pneumatiquement, au voisinage de la surface supérieure de la couche de renforcement (20), et
- (g) retirer de la zone de la zone de dépôt de fibres la couche et les parties de nappe déposée pneumatiquement.

2. Procédé selon la revendication 1, caractérisé en ce que le triangle rectangle isocèle plan (52) est situé dans un plan perpendiculaire à la première direction de mouvement de la couche de renforcement pratiquement plane et en ce que cette couche est ramenée brusquement à la première direction de mouvement avant de sortir de la zone de dépôt de fibres.

3. Procédé selon l'une des revendications 1 ou 2, caractérisé en ce que pour régler l'épaisseur relative des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement, on règle la position de direction de fabrication du triangle rectangle isocèle au sein de la zone de dépôt de fibres.

4. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé en ce que l'on applique un niveau d'aspiration plus élevé pour former par dépression la deuxième partie de nappe de duvet fibreux déposée pneumatiquement (22) que pour former par dépression la première partie de nappe de duvet fibreux déposée pneumatiquement (21), afin de compenser la résistance supplémentaire opposée à l'écoulement d'air par la couche de renforcement (20) et la première partie de nappe de duvet fibreux (21).

5. Procédé selon l'une quelconque des

revendications 1 à 4, caractérise en ce que l'on forme directement par dépression la première partie de nappe de duvet fibreux déposée pneumatiquement (21) par dessus une deuxième couche de papier mousseline (23) en mouvement continu, ayant une largeur au moins aussi grande que la couche de renforcement intérieure (20) et en ce que l'on applique directement une troisième couche de papier mousseline (24) en mouvement continu par dessus la surface supérieure de la deuxième partie de nappe de duvet fibreux déposée pneumatiquement (22) lorsque celle-ci sort de zone de dépôt de fibres.

6. Procédé selon la revendication 5, caractérisé en ce que les deuxième et troisième couches de papier mousseline (23, 24) ont une largeur supérieure à celle de la couche intérieure de renforcement (20) et que l'on fixe ensemble les bords latéraux des deuxième et troisième couches de papier mousseline en les pliant l'un sur l'autre pour former une enveloppe continue de papier mousseline autour de la couche de renforcement intérieure et des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement (21, 22).

7. Procédé selon la revendication 6, caractérisé en ce que l'on coupe dans l'enveloppe continue de papier mousseline des segments de tampon absorbant de longueur prédéterminée et qu'ensuite on les place entre une feuille de soutien imperméable à l'humidité et une feuille supérieure perméable à l'humidité que l'on fixe en les superposant de manière à former un bandage absorbant jetable.

8. Appareil en ligne pour la fabrication continue d'une nappe de duvet fibreux déposée pneumatiquement, munie d'une couche intérieure de renforcement pratiquement plane, imperméable aux fibres, dont la largeur est pratiquement égale à celle de la nappe, appareil caractérisé en ce qu'il comprend:

- (a) une source de matière fibreuse sous forme de fibres distinctes,
- (b) une seule chambre de dépôt de fibres (12) à laquelle les fibres sont amenées continuellement de la source,
- (c) un élément support perforé (11) en mouvement continu passant à travers la chambre de dépôt (12), dans un plan pratiquement perpendiculaire à la direction d'écoulement des fibres,
- (d) des moyens d'aspiration (25, 26, 27) situés au voisinage de la surface de l'élément support perforé (11), à l'opposé de la source de fibres,
- (e) des moyens (57) permettant d'introduire la couche de renforcement (20) dans la chambre de dépôt dans une première direction identique à celle de l'élément support perforé, tandis que la couche est orientée dans un premier plan de telle sorte que sa largeur soit pratiquement parallèle à la direction d'écoulement des fibres à l'intérieur de la chambre, pour

faciliter la formation par dépression de la partie de la nappe de duvet fibreux déposée pneumatiquement sur l'élément support perforé,

- (f) des moyens de guidage en forme de triangle rectangle isocèle (52, 56, 58) placés perpendiculairement à la première direction de mouvement à l'intérieur de la chambre de dépôt de fibres (12) de manière à réorienter brusquement la couche de renforcement dans un deuxième plan perpendiculaire au premier plan, tout en ramenant la couche dans la première direction de mouvement de manière à mettre en contact sa surface inférieure avec la nappe de duvet fibreux déposée pneumatiquement et à faciliter la formation par dépression de la partie de la nappe de duvet fibreux déposée pneumatiquement qui est adjacente à la surface supérieure de la couche de renforcement, et
- (g) des moyens permettant de retirer de la chambre de dépôt de fibres la couche et les parties de nappe déposée pneumatiquement.

9. Appareil selon la revendication 8, caractérisé en ce que la position des moyens de guidage triangulaires (52) est réglable dans la direction de fabrication, à l'intérieur de la chambre de dépôt de fibres, pour faire varier l'épaisseur relative des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement.

10. Appareil selon l'une des revendications 8 ou 9, caractérisé en ce que les moyens de guidage (52) en forme de triangle rectangle isocèle sont plans, l'un des côtés égaux (58) étant orienté perpendiculairement à la première direction de mouvement de la couche de renforcement (20) et l'autre des côtés égaux (56) dans un deuxième plan perpendiculaire au premier plan, le deuxième plan étant parallèle au plan de l'élément support perforé (11).

11. Appareil selon l'une quelconque des revendications 8 à 10, caractérisé en ce que les moyens d'aspiration (25) situés auprès de la surface de l'élément support perforé sont formés d'une chambre à vide ayant une longueur au moins égale à celle de la chambre de dépôt de fibres et présentant une cloison intérieure (19) orientée perpendiculairement à la direction de mouvement de la couche, cette cloison étant réglable dans la direction de fabrication de manière à faciliter son alignement sur les moyens de guidage triangulaires à l'intérieur de la chambre et à faciliter ainsi l'application d'un niveau d'aspiration plus élevé pendant la formation de la deuxième partie de nappe de duvet fibreux déposée pneumatiquement.

12. Appareil selon l'une quelconque des revendications 8 à 11, caractérisé en ce qu'il comprend en outre des moyens permettant de faire avancer une deuxième couche de papier

mousseline (23) ayant une largeur au moins égale à celle de la couche de renforcement, en la superposant au support perforé avant son entrée dans la chambre de dépôt de fibres (12) et des moyens permettant de faire avancer une troisième couche de papier mousseline (24) ayant une largeur au moins égale à celle de la couche de renforcement (20) en la superposant à la surface supérieure de la partie supérieure de nappe de duvet fibreux déposée pneumatiquement (22) à sa sortie de la chambre de dépôt de fibres (12).

13. Procédé continu en ligne pour la formation d'une nappe de duvet fibreux déposée pneumatiquement, munie d'une couche intérieure de renforcement pratiquement plane, imperméable aux fibres, dont la largeur est pratiquement égale à celle de la nappe, caractérisé par les étapes suivantes:

- (a) faire avancer en continu la couche de renforcement pratiquement plane (20) dans une première direction dans un premier plan,
- (b) guider la couche de renforcement en mouvement autour d'un premier moyen de changement de direction (5) pour l'amener en contact avec la surface antérieure d'un premier triangle rectangle isocèle plan (2) dont la hauteur (40) est orientée perpendiculairement à la première direction de mouvement de la couche,
- (c) enrouler la couche de renforcement en mouvement autour de surfaces opposées du premier triangle plan,
- (d) ramener la couche en mouvement dans sa première direction de mouvement en dirigeant la couche autour du sommet du premier triangle tout en maintenant les parties marginales latérales de la couche en mouvement en contact avec les surfaces antérieure et postérieure du premier triangle, de sorte que la couche se plie sur elle-même dans un deuxième plan perpendiculaire au premier plan,
- (e) introduire la couche de renforcement en mouvement dans une seule zone de dépôt de fibres dans laquelle est disposée une surface de support perforée (11) se déplaçant dans la première direction, tandis que la couche est dans une configuration pliée, de manière à former par dépression sur la surface de support une première partie (21) de la nappe de duvet fibreux déposée pneumatiquement,
- (f) enrouler la couche de renforcement en mouvement autour de surfaces opposées d'un deuxième triangle isocèle (4) identique au premier triangle (2), aligné longitudinalement sur celui-ci et dont la hauteur (41) est orientée perpendiculairement à la première direction de mouvement de sorte que les bords latéraux de la couche en mouvement soient guidés sur des côtés opposés du sommet du

deuxième triangle à mesure que la couche en mouvement est dirigée autour du sommet de celui-ci, les bords latéraux de la couche en mouvement étant maintenus en contact avec les surfaces antérieure et postérieure du deuxième triangle de manière à ramener la couche à une position plane,

- (g) diriger la couche de renforcement en mouvement autour d'un deuxième moyen de changement de direction (6) pour la ramener dans la première direction de mouvement et pour amener sa surface inférieure en contact avec la première partie (21) de duvet fibreux déposée pneumatiquement;
- (h) exposer la surface supérieure de la couche de renforcement en mouvement à la zone de dépôt de fibres pendant qu'elle est dans une condition plane de manière à former par dépression une deuxième partie (22) de la nappe de duvet fibreux déposée pneumatiquement au voisinage de la surface supérieure de la couche de renforcement, et
- (i) retirer de la zone de dépôt de fibres la couche et les parties de duvet fibreux déposée pneumatiquement.

14. Procédé selon la revendication 13, caractérisé en ce que l'on fait coïncider la ligne médiane de la couche de renforcement en mouvement (20) avec les hauteurs (40, 41) des premier et deuxième triangles isocèles à mesure que l'on tire la couche en travers des surfaces de ceux-ci, ce qui fait que la couche prend une configuration en U renversé autour de sa ligne médiane à mesure qu'elle se déplace entre les premier et deuxième triangles.

15. Procédé selon l'une des revendications 13 ou 14, caractérisé en ce que les premier et deuxième triangles isocèles sont dans des plans parallèles qui sont perpendiculaires à la première direction de mouvement de la couche de renforcement pratiquement plane.

16. Procédé selon l'une quelconque des revendications 13 à 15, caractérisé en ce que pour régler l'épaisseur relative des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement (21, 22), on règle la position de direction de fabrication du deuxième triangle rectangle isocèle (4) à l'intérieur de la zone de dépôt de fibres.

17. Procédé selon l'une quelconque des revendications 13 à 16, caractérisé en ce que l'on applique un niveau d'aspiration plus élevé pour former par dépression la deuxième partie de nappe de duvet fibreux déposée pneumatiquement (22) que pour former par dépression la première partie de nappe de duvet fibreux déposée pneumatiquement (21) afin de compenser la résistance accrue opposée à l'écoulement de l'air par la couche (20) et la première partie de nappe de duvet fibreux déposée pneumatiquement (21).

18. Procédé selon l'une quelconque des

revendications 13 à 17 caractérisé en ce que l'on forme directement la première partie (21) de la nappe de duvet fibreux déposée pneumatiquement sur la surface d'une deuxième couche de papier mousseline en mouvement (23) ayant une largeur au moins aussi grande que la couche de renforcement et qu'une fois que les couches et les première et deuxième parties de nappe déposée pneumatiquement ont été retirées de la zone de dépôt de fibres, on superpose à la deuxième partie de la nappe déposée pneumatiquement (22) une troisième couche de papier mousseline (24) ayant une largeur au moins aussi grande que la couche de renforcement.

19. Procédé selon la revendication 18, caractérisé en ce que les deuxième et troisième couches de papier mousseline ont une largeur supérieure à celle de la couche de renforcement intérieure et que l'on fixe ensemble les bords latéraux des deuxième et troisième couches en les pliant l'un sur l'autre pour former une enveloppe continue de papier mousseline autour de la couche de renforcement intérieure et des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement.

20. Procédé selon la revendication 19, caractérisé en ce que l'on coupe dans l'enveloppe continue de papier mousseline des segments de tampon absorbant de longueur prédéterminée et qu'ensuite on les fixe entre une feuille de soutien imperméable à l'humidité et une feuille supérieure perméable à l'humidité que l'on fixe en les superposant de manière à former un bandage absorbant jetable.

21. Appareil en ligne pour la fabrication continue d'une nappe de duvet fibreux déposé pneumatiquement, munie d'une couche intérieure de renforcement pratiquement plane, imperméable aux fibres dont la largeur est pratiquement égale à celle de la nappe, appareil caractérisé en ce qu'il comprend:

- (a) une source de matière fibreuse sous forme de fibres distinctes,
- (b) une seule chambre de dépôt de fibres (12) à laquelle les fibres sont amenées continuellement de la source,
- (c) un élément support perforé (11) en mouvement continu passant à travers la chambre de dépôt dans un plan pratiquement perpendiculaire à la direction d'écoulement des fibres,
- (d) des moyens d'aspiration (25) situés au voisinage de la surface de l'élément support perforé (11), à l'opposé de la source de fibres,
- (e) des moyens permettant de faire avancer en continu la couche de renforcement dans la même direction que l'élément support perforé pendant qu'elle est orientée dans un premier plan parallèle à celui de l'élément support perforé,
- (f) un premier moyen de guidage en forme de triangle rectangle isocèle (2, 5) situé dans une direction perpendiculaire à la direction

de mouvement mentionnée de manière à amener brusquement la couche de renforcement à se plier sur elle-même dans un deuxième plan perpendiculaire au premier plan,

- (g) des moyens (3, 7, 8) permettant d'introduire la couche de renforcement dans la chambre de dépôt de fibres pendant qu'elle est dans une configuration pliée pour faciliter la formation par dépression d'une première partie de nappe de duvet fibreux déposée pneumatiquement au voisinage de l'élément support perforé,
- (h) un deuxième moyen de guidage en forme de triangle rectangle isocèle placé perpendiculaire à la direction de mouvement (4, 6) de la couche de renforcement à l'intérieur de la chambre de dépôt de fibres (12) de manière à réorienter brusquement la couche d'une configuration pliée à une configuration plane dans la premier plan mentionné tout en ramenant la couche dans la première direction de mouvement pour amener la surface inférieure de la couche en contact avec la première partie de nappe de duvet fibreux déposée pneumatiquement et pour faciliter la formation par dépression d'une deuxième partie de la nappe de duvet fibreux déposée pneumatiquement, auprès de la surface supérieure de la couche de renforcement, et
- (i) des moyens permettant de retirer de la chambre de dépôt de fibres la couche et les parties de nappe déposées pneumatiquement.

22. Appareil selon la revendication 21, caractérisé en ce que les premier et deuxième moyens de guidage (2, 4) comprennent des corps triangulaires plans identiques (42, 43, 44, 45, 46, 47) maintenus dans une position parallèle et alignée longitudinalement par un élément plan (3) reliant leurs hauteurs respectives (40, 41).

23. Appareil selon la revendication 22, caractérisé en ce que les triangles isocèles plans (2, 4) et l'élément de liaison plan (3) sont réglables d'un bloc (1) dans la direction de fabrication, de manière à faire varier l'épaisseur relative des première et deuxième parties de nappe de duvet fibreux déposée pneumatiquement.

24. Appareil selon l'une quelconque des revendications 21 à 23, caractérisé en ce que les moyens d'aspiration (25) situés auprès de la surface de l'élément support perforé sont formés d'une chambre à dépression ayant une longueur au moins égale à celle de la chambre de dépôt de fibres, la chambre à dépression présentant une cloison intérieure (19) orientée perpendiculairement à la direction de mouvement de la couche, la cloison étant réglable dans la direction de fabrication pour faciliter son alignement sur le deuxième moyen

de guidage triangulaire (4) à l'intérieur de la chambre et faciliter ainsi l'application d'un niveau plus élevé d'aspiration pendant la

formation de la deuxième partie de nappe de duvet fibreux déposée pneumatiquement.

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Fig. 1

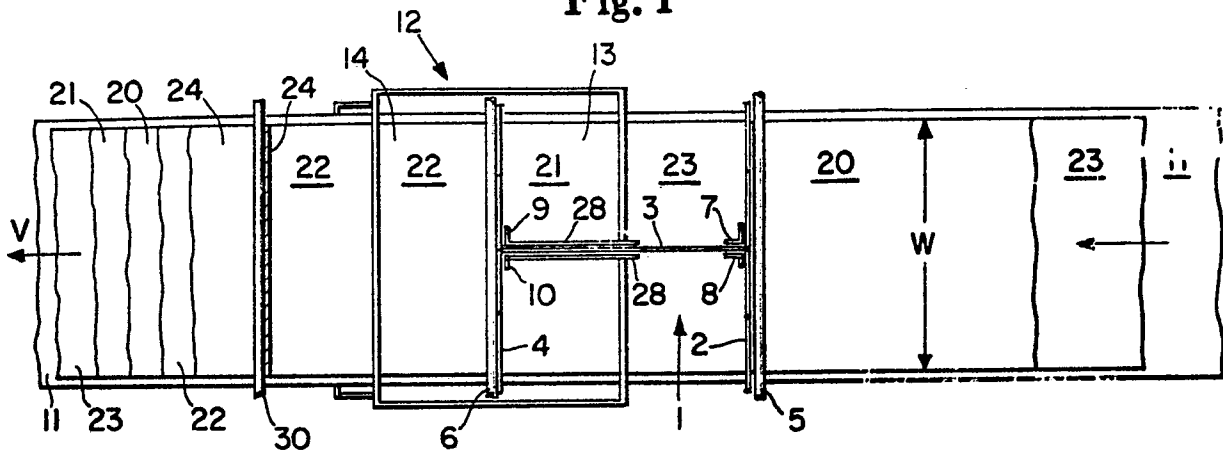


Fig. 2

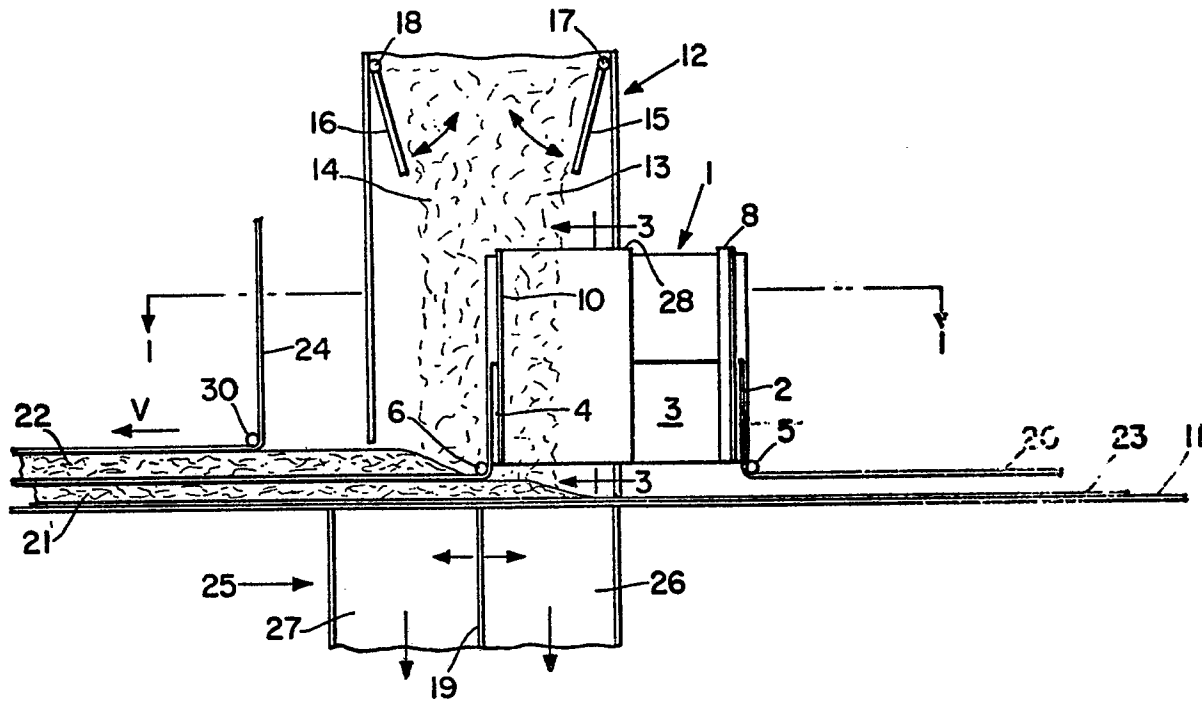


Fig. 3

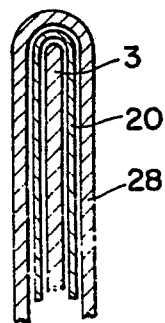


Fig. 4

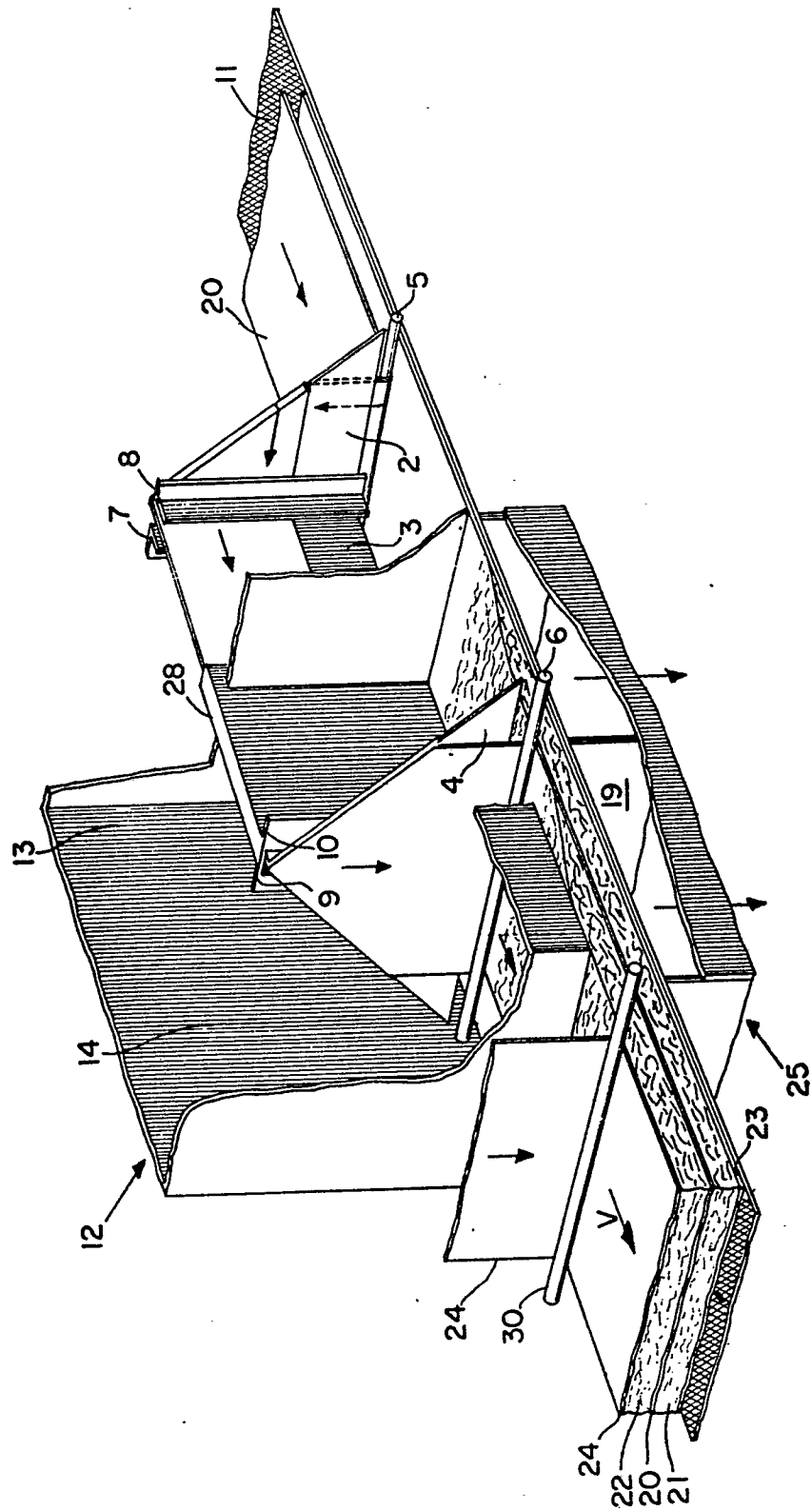


Fig. 5

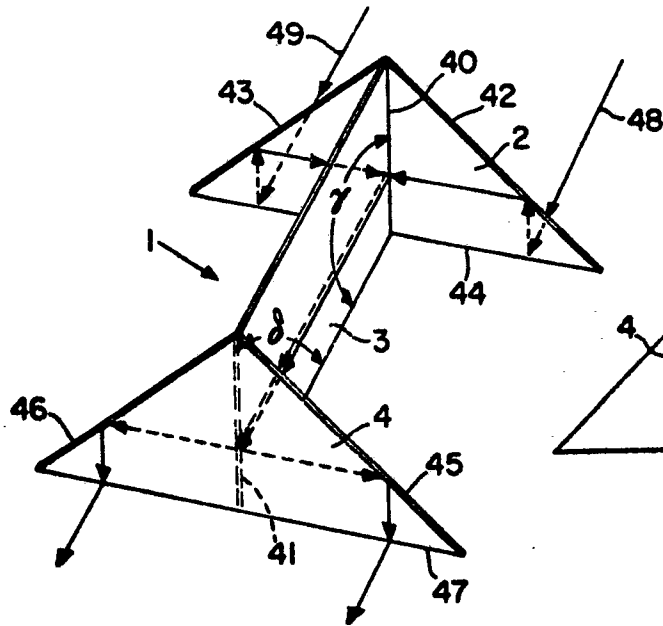


Fig. 6

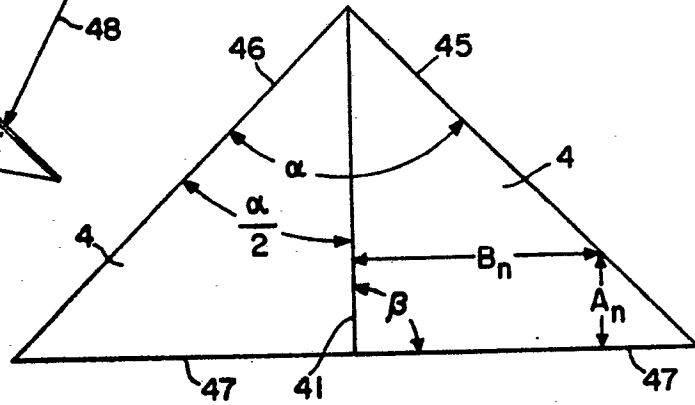


Fig. 7

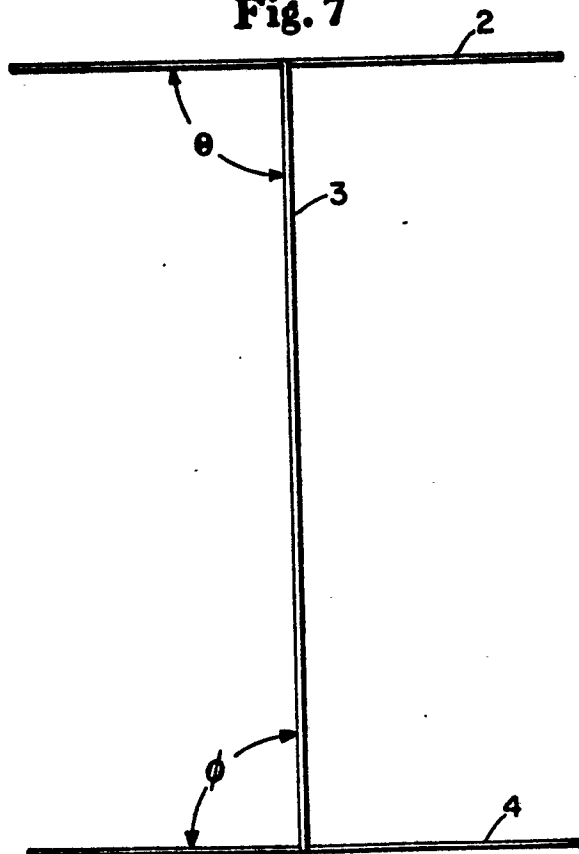


Fig. 8

