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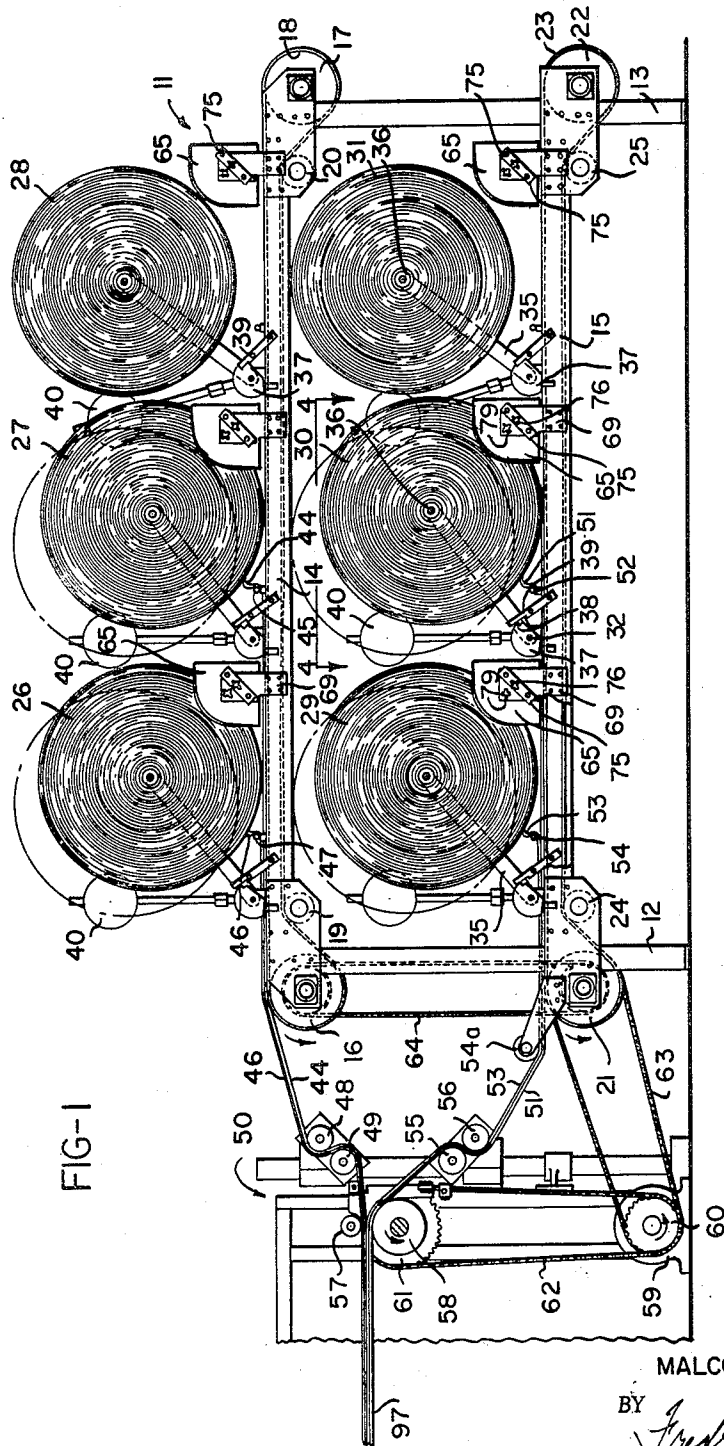
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METHOD OF CORRECTING WEB MISALIGNMENT

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4 Sheets-Sheet 1



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FIG-2

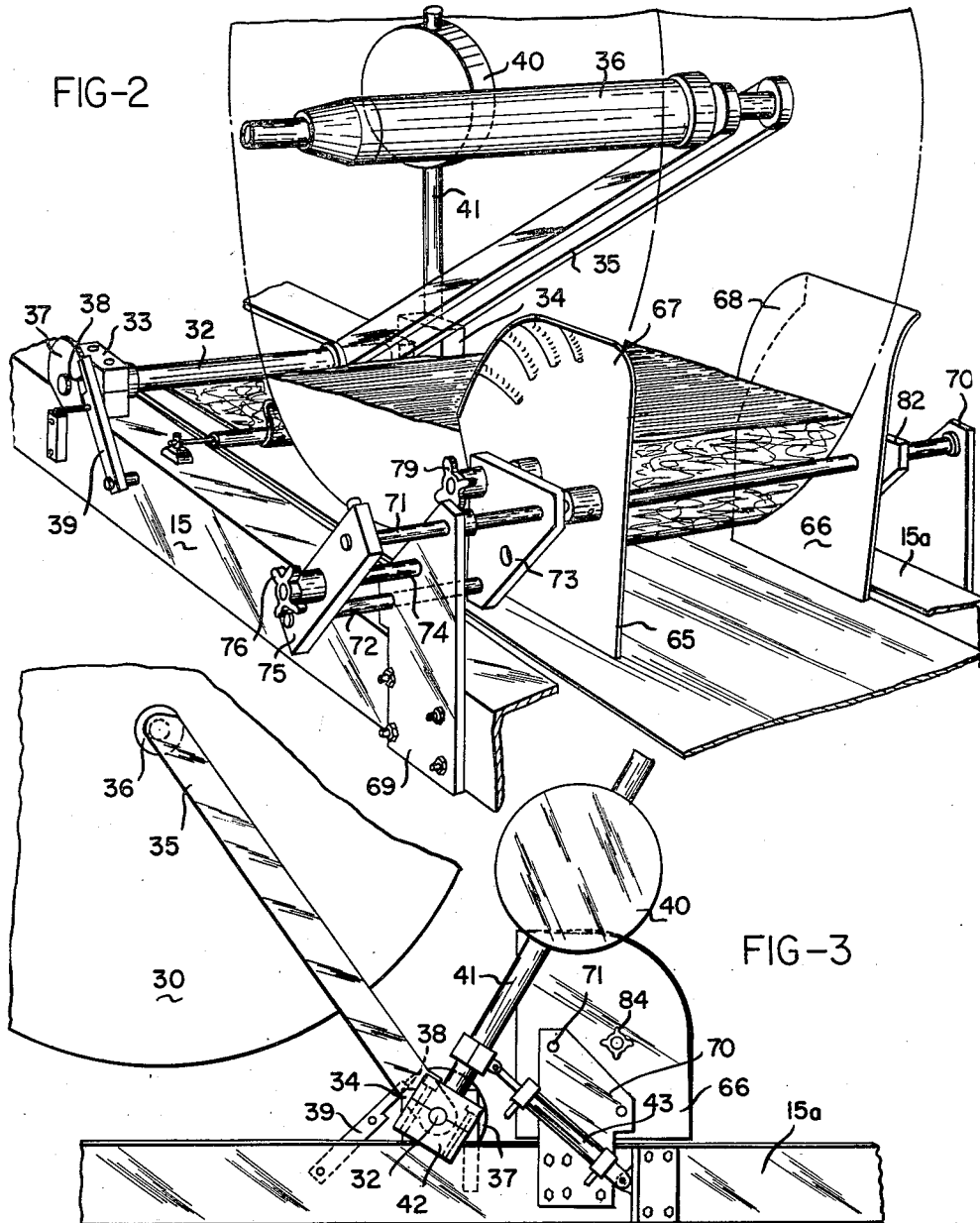


FIG-3

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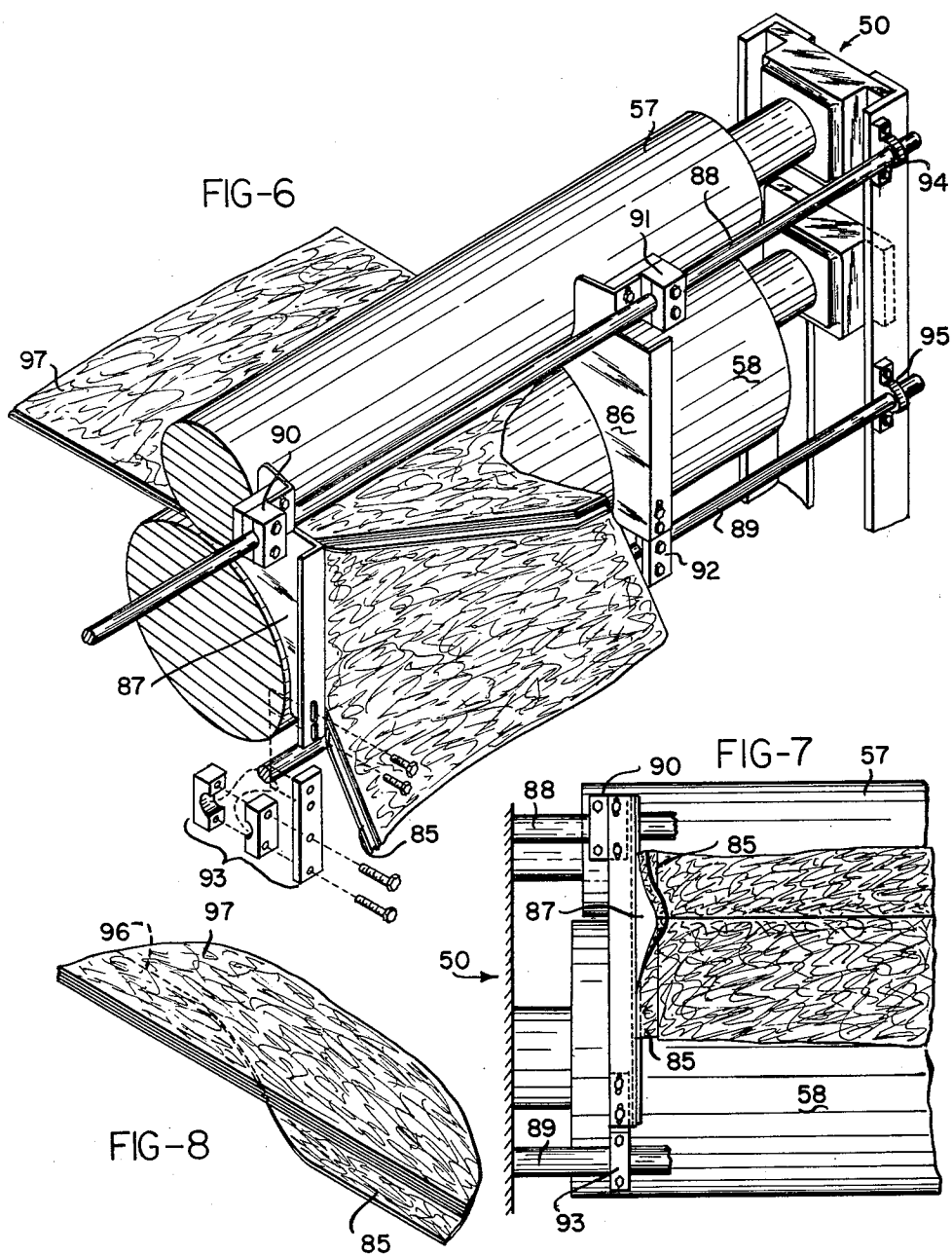
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4 Sheets-Sheet 4



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METHOD OF CORRECTING WEB
MISALIGNMENT

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1 Claim. (Cl. 270-41)

This invention relates to a method for supplying a plurality of layers of superposed sheet material in web form and feeding same to a pair of calendering rolls. More particularly, the method is concerned with the feeding of superposed layers of web material so that they arrive at the calendering rolls with their edges in substantial alignment.

One of the problems encountered in feeding multiple layers of web material to a machine for further processing is in maintaining proper alignment of the edges of the superposed webs. This problem is magnified as the number of webs of material are increased. In the manufacture of disposable diapers of the type described in the application of Robert C. Duncan et al., Serial No. 124,422, filed July 17, 1961, and commonly owned by the assignee of the present invention, a plurality of layers of creped cellulose wadding are superposed to form the absorbent pad necessary for this type of product. In the manufacture of this product on production equipment, it became necessary to provide a plurality of rolls of wadding material which are simultaneously unwound, superposed and fed to a pair of calendering rolls from where the combined layers are processed into an absorbent diaper pad and ultimately a finished disposable diaper. The wadding is generally supplied in large rolls and is usually in extremely soft condition when received from commercial suppliers. Consequently, it is very difficult to unroll wadding material simultaneously from several rolls to form a plurality of superposed webs that are properly aligned edgewise.

It is an object of this invention to provide a method of feeding a plurality of webs of sheet material of the type described above in superposed relationship in such a manner that at least one of the edges of the several webs are in substantial alignment.

Another object of this invention is the provision of a method of correcting the misalignment of multiple webs of sheet material of a nature difficult to re-align by the usual techniques of the art by infolding the protruding margin of a misaligned web prior to passing the webs into a pair of calendering rolls.

In general, the nature of the present method can be summarized as comprising the following steps:

- (1) A plurality of webs of soft, absorbent, tissue-like sheet material having a relatively irregular surface, so as to tend, when once misaligned, to remain so, are fed at substantially the same linear speed;
- (2) The webs so fed are guided into a pair of calendering rolls with at least one edge of all of them normally in substantial edgewise alignment; and
- (3) As misalignment occurs, the protruding edge of the misaligned web is infolded prior to entry with the calendering rolls.

In this manner, a multi-ply assembly of pre-determined, substantially uniform width is produced. Preferably, the correction of misalignment is applied to both edges of the plurality of webs.

While the specification concludes with a claim particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention it is believed the invention will be better understood from the

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following description taken in connection with the accompanying drawings in which:

FIGURE 1 is an elevation view of an illustrative embodiment of an apparatus for carrying out the method of this invention.

FIGURE 2 is an isometric view of a typical spindle used in the apparatus of FIG. 1 to support the web material rolls including the alignment plates.

FIGURE 3 is a fragmentary elevation of the supporting spindle taken on the side opposite that shown in FIGURE 1.

FIGURE 4 is a plan view of a roll of web material and its supporting spindle and associated structure taken on the line 4-4 of FIGURE 1.

FIGURE 5 is a fragmentary elevation partially in cross section taken on the line 5-5 of FIGURE 4.

FIGURE 6 is a fragmentary isometric view showing the calendering rolls and the folder mechanism for receiving the superposed layers of web material in the apparatus of FIG. 1.

FIGURE 7 is a fragmentary elevation looking toward the calendering rolls and showing the folder blades.

FIGURE 8 is a fragmentary isometric view of the superposed layers of web material showing the manner in which a misaligned edge of one layer is in-folded by the folder members associated with the calendering rolls.

Referring now to the drawings and particularly FIGURE 1, the illustrative apparatus includes a frame 11 composed of vertical legs 12 and 13, an upper horizontal cross member 14 and a lower horizontal cross member 15. A similar structural support is provided on the far side of the frame 11 and is attached to the members shown by short transverse members although none of these appear in the view of FIGURE 1.

The belt pulleys 16 and 17 are appropriately mounted for rotation on the frame 11 and support an endless conveyor belt 18. Idler pulleys 19 and 20 are provided to economize on space and to give the belt 18 a greater angle of contact with the pulleys 16 and 17. Similarly, a pair of lower pulleys 21 and 22 are mounted for rotation in the frame 11 and have an endless conveyor belt 23 running thereover. Idler pulleys 24 and 25 are mounted for free rotation and perform the same function as the pulleys 19 and 20.

A plurality of rolls of wadding material 26, 27, 28, 29, 30 and 31 are supported for rotation on the frame 11. While the invention has been developed particularly for handling rolls of creped cellulose wadding, it nevertheless has broad application to the handling of rolls of any web material having a generally soft, absorbent, tissue-like nature and a relatively irregular surface so as to present peculiar problems of re-alignment.

For convenience, the supporting and alignment means for the roll 30 will be described in detail. It will be understood that each of the other rolls are provided with substantially similar or equivalent supporting structure. Referring then to FIGURES 2, 3 and 4, a support shaft 32 is mounted for pivotal movement in the bearing blocks 33 and 34 which are attached, respectively, to the cross members 15 and 15a. An arm member 35 is secured to the shaft 32. A freely rotatable spindle 36 extends from the upper end of the arm 35. The core of each roll of webbing material fits loosely over the spindle 36 so that the roll may be moved axially by the alignment means to be hereinafter described. A lock element 37 having a notch 38 is secured to one end of the shaft 32. A detent 39 is freely rotatable on the cross member 15 and normally lies on the lock element 37.

A counterweight 40 is attached to an arm 41 which is secured to the shaft 32 by means of the clamp 42. A hydraulic damping element 43 is secured at one end to

the arm 41, the other end being attached to the frame as illustrated in FIGURE 3.

When the apparatus is put in operation, the arm member 35 is manually turned counter-clockwise as viewed in FIGURE 1, thereby permitting the detent 39 to enter the notch 38. The position of the arm 35 when so raised is illustrated in connection with the rolls 28 and 31 of FIGURE 1. The spindle 36 is initially empty so that the counterweight tends to cause sudden movement of the arm 35 when it is pivoted to the loading position. The damping element 43 is provided as a cushion to avoid sudden impacts and possible damage to the mechanism. The damping element 43 also limits the travel of the arm 35 when it is moved into the loading position (see FIGURE 3). When the roll of web material is mounted on the spindle, it substantially counterbalances the weight 40. The roll can then be manually lowered into its operating position after the detent 39 is disengaged from the notch 38. The rolls 26, 27, 29 and 30 of FIGURE 1 are shown in their operating position.

When in the operating position, the rolls are in contact with their respective conveyor belts 18 and 23. Movement of the conveyor belts 18 and 23 drives each roll of wadding material that has been lowered into the operating position so that the rate of unwinding from the rolls is controlled by the speed of belt movement. The mass of each counterweight 40 and its moment arm are selected so that each of the webbing rolls 26 . . . 31 exert a substantially constant pressure on the belts 18 and 23 as webbing material is removed from each of the rolls. This is accomplished because the sum of the vertical moments around the shaft 32 of any roll 26 . . . 31 and its counterweight 40 remains substantially constant as the arm 35 slowly pivots because of the gradual decrease in roll diameter.

Any number of rolls can be operated at any one time. Four rolls are illustrated in the operating position in FIGURE 1 merely for convenience. It will be understood that five rolls or six rolls can be placed in operation on the frame 11. The frame 11 can be extended to accommodate additional rolls if necessary. The number of rolls in operation depends entirely upon the number of plies of web material that are to be superposed.

Referring again to FIGURE 1, the web 44 is separated from the roll 27 by the peel-off roller 45 and is carried forward by the belt 18. Similarly, the web 46 from the roll 26 is separated by the peel-off roller 47 and superposed with the web 44. The superposed webs 44 and 46 are led around the tracking rollers 48 and 49 mounted on the frame 50 of the calendering apparatus. Similarly, the web 51 from the roll 30 is separated by the peel-off roller 52 and carried forward by the belt 23. The web 53 is removed from the roll 29 by the peel-off roller 54 and superposed with the web 51. The superposed webs 51 and 53 move under the roller 54a and are threaded through the tracking rollers 55 and 56 mounted on the frame 50. The webs 44, 46, 51 and 53 are then superposed as they are fed through the calendering rolls 57 and 58. The tracking rollers 48, 49 and 55, 56 align the separate superposed webs 44, 46 and 51, 53, respectively, as received from the upper and lower rows of rolls so they are fed to the calendering rolls in substantial alignment.

The use of peel-off rollers 45, 47, 52 and 54 is only necessary when the webbing material is of such character that it tends to remain adhered to the roll as in the case of the wadding material described heretofore. When the webbing material has proper characteristics so that it will separate as the rolls are turned by the belt, the peel-off rollers are not needed.

The drive means for the apparatus are also illustrated in FIGURE 1. A motor 59 is provided to drive the calendering roll 58 by means of the sprockets 60 and 61 and the chain 62. The pulley 21 is also driven from the motor 59 by means of a chain drive 63 from the shaft of

the pulley 21. Similarly, the pulley 16 is driven by the chain drive 64 from the shaft of the pulley 21. The calendering rolls are driven so that the material moving therebetween is moving at a slightly greater speed than the speed of the belts 18 and 23 in order to maintain a slight tension in the web material.

In order to maintain the several plies of web material in proper alignment, each roll is provided with a pair of alignment plates 65 and 66 as illustrated in FIGURES 2 and 4. The alignment plates are in light contact with the sides of each roll. Each pair of alignment plates 65 and 66 has a curved upper edge 67 and 68, respectively (FIGURE 2), in order to guide the roll of web material into place as it is lowered from the loading position of the arm 35 to the operating position as previously described.

A pair of brackets 69 and 70 are secured on the sides of the cross members 15 and 15a (see also FIGURE 5). Adjusting bars 71 and 72 are mounted for sliding movement through the brackets 69 and 70. The alignment plates 65 and 66 are movable on the adjusting bars 71 and 72. Intermediate plates 73 and 82 are secured to the bars 71 and 72. Adjusting screws 78 and 81 hold the alignment plates 65 and 66 to the intermediate plates 73 and 82, respectively, by means to be hereinafter more fully described. An adjusting screw 74 is threaded in the bracket 69 and is rotatable in the member 75 which is secured to the bars 71 and 72. The knob 76 and collar 77 retain the adjusting screw 74 in fixed position with respect to the member 75. Thus, it will be seen that upon turning the knob 76 the alignment plates 65 and 66 will simultaneously be moved in one direction or the other.

Individual adjusting means for the alignment plates 65 and 66 are also provided. With regard to the plate 65, the adjusting screw 78 is threaded thereinto and is rotatable in the plate 73. A knob 79 and a collar 80 are secured to the adjusting screw 78 to prevent relative movement with respect to the plate 73. The alignment plate 65 can be adjusted individually by turning the knob 79. A similar adjusting mechanism is provided for the alignment plate 66 composed of the adjusting screw 81, the intermediate plate 82, the collar 83 and the knob 84.

Each of the rolls 26 . . . 31 is provided with the alignment plates and adjusting mechanism just described in connection with FIGURES 4 and 5. Referring again now to FIGURE 1, it will be seen that the alignment plates 65, 66 provided for each of the rolls can be moved in unison or individually adjusted by the knobs 76, 79 and 84 until all of the alignment plates on one side of the several rolls are in substantial alignment and all of the alignment plates on the other side of the rolls are similarly aligned. This provides a positive control for alignment of the edges of the several rolls of web material being deposited on the belts 18 and 23. As a result, when the superposed webs arrive at the calendering rolls 57 and 58 the edges thereof are in substantial alignment and the several plies are in proper relative position for further processing.

FIGURES 6 and 7 illustrate the several superposed plies from the roll frame moving between the calendering rolls 57 and 58. Normally, the edges are in alignment as illustrated and previously described. On occasion, however, an edge of one web might become misaligned, e.g. the edge 85 as illustrated in FIGURE 8. A pair of folder members 86 and 87 are provided to guide the superposed webs into the calendering rolls. As illustrated, the folder members 86 and 87 are each contoured so that the span between them decreases toward the nip of the calendering rolls 57 and 58. The folder members are mounted on the support bars 88 and 89 by the brackets 90, 91 and 92, 93 illustrated in FIGURE 6. The support bars 88 and 89 are attached to the frame 50 of the calendering apparatus, for example, by brackets 94 and 95. The folder members 86 and 87 plow under or over, as the case may be, any loose edges such as the edge 85 shown in FIGURES 6, 7 and 8. These are turned over as at 96 in

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FIGURE 8 as the superposed webs enter the calendering rolls so that the multiple plies leaving as at 97 are in perfect edgewise alignment.

While a particular embodiment of apparatus for carrying out the method of the invention has been illustrated and described it will be obvious to those skilled in the art that various changes and modifications can be made without departure from the spirit and scope of the invention and it is intended to cover in the appended claim all such changes and modifications that are within the scope of this invention.

What is claimed as new is:

A method for aligning at least one edge of a plurality of webs of soft, absorbent, tissue like sheet material having a relatively irregular surface, whereby adjacent webs, when misaligned, tend to remain so, which method com-

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prises the steps of feeding a plurality of webs of said sheet material at substantially matched linear speed, guiding said webs of material into a pair of calendering rolls to form a multi-ply assembly with at least one edge of all of said webs normally in substantial edgewise alignment, infolding any protruding edge of any web which is misaligned before it passes through the calendering rolls to produce said multi-ply assembly of a predetermined substantially uniform width.

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