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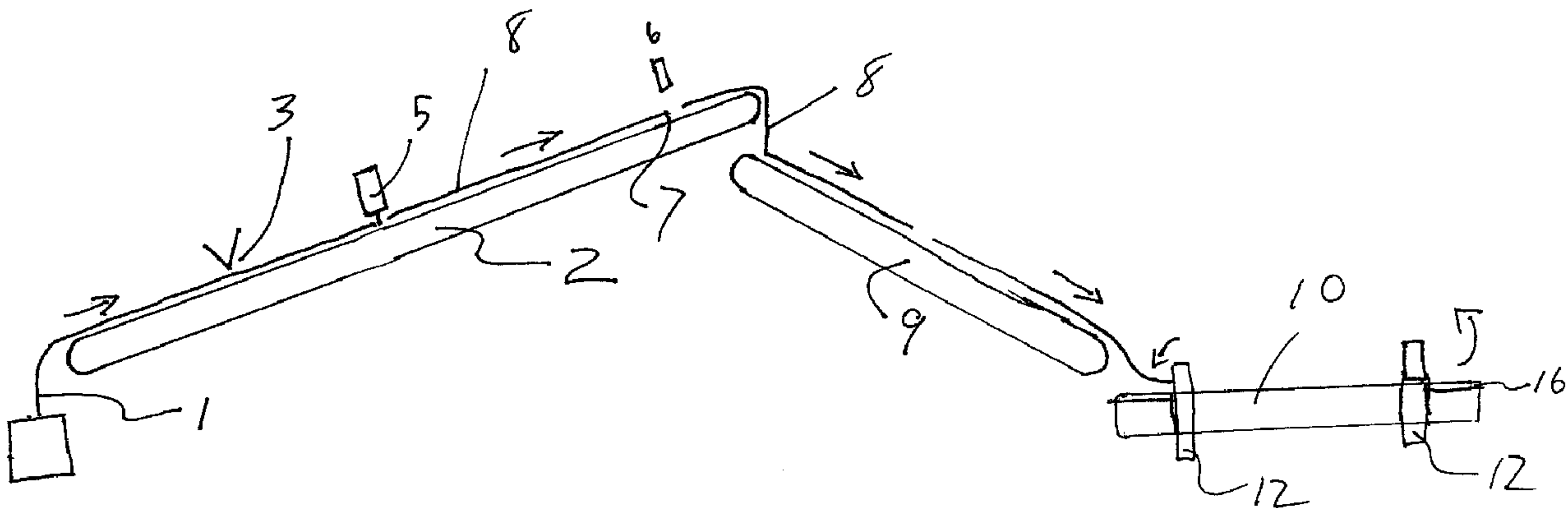
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(54) Titre : METHODE DE PRODUCTION POUR ARTICLES TEXTILES

(54) Title: PRODUCTION METHOD FOR TEXTILE ARTICLES



(57) Abrégé/Abstract:

A method of manufacturing textile articles is disclosed. An elongate tube of knit fabric is provided, having an upper and a lower layer. It is laid flat, onto a first table that has conveyor means for moving the tube of fabric in a lengthwise direction. The tube of fabric is conveyed in a lengthwise direction on the first table. The upper layer of the tube of fabric is then slit at its mid-line in a lengthwise direction which it is being conveyed. The tube of fabric is then cut into desired lengths. The desired lengths of material are conveyed to a sewing table provided with sewing machines, and sewn at an end seam across each end of said length of fabric, to obtain a sheet with unfinished side edges.

Abstract

A method of manufacturing textile articles is disclosed. An elongate tube of knit fabric is provided, having an upper and a lower layer. It is laid flat, onto a first table that has conveyor means for moving the tube of fabric in a lengthwise direction. The tube of fabric is conveyed in a lengthwise direction on the first table. The upper layer of the tube of fabric is then slit at its mid-line in a lengthwise direction which it is being conveyed. The tube of fabric is then cut into desired lengths. The desired lengths of material are conveyed to a sewing table provided with sewing machines, and sewn at an end seam across each end of said length of fabric, to obtain a sheet with unfinished side edges.

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PRODUCTION METHOD FOR TEXTILE ARTICLES

The present invention relates to the field of fitted sheets. In particular, the present invention provides a method and apparatus for the automated production of fitted sheets from knit material.

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The traditional way of making fitted sheets from knit or woven material is to lay a large number of layers of material on a lay table, trace the outline of a pattern on the top-most layer of material and then cut the layers of material with an electric knife so that a large number of unfinished blanks is obtained. The blanks are then brought in bundles to sewing stations, where operators sew the corners according to a predetermined pattern, and apply binding, with or without an elastic component, around the perimeter of the sheet. This method of production is very labour intensive. Moreover, it is dependent on employing a large number of skilled sewing machine operators.

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Fitted sheets commonly known as envelope sheets, and described in Applicant's Canadian Patent No. 2,195,928 are made by a somewhat faster technique. To make those sheets, it is necessary only to cut a piece of knit fabric to the correct length. The side margins of the fabric piece are then folded over the central portion of the fabric piece, to meet or nearly meet near the centre of the fabric. Then, a transverse seam is sewn across each end of the piece, and binding is applied around the unfinished open portion of the sheet. It will be appreciated that even though manufacture of this sheet is accomplished faster than manufacture of traditional sheets, each sheet must be folded correctly and sewn individually. Accordingly, the applicant has sought to develop a method and apparatus to manufacture fitted bed sheets from knit material, with a minimum of added labour.

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Moreover, the applicant has discovered that by utilizing a continuous production line technique, it is possible to produce variants on the basic design of a fitted bed sheet

with folded-over margins, and a variety of different products including mattress pads, waterproof mattress covers, quilted sheets, flannel sheets with elastic side panels, and sleeping bags.

5 The present invention therefore provides, in one broad aspect, a method of manufacturing textile articles comprising the steps of: providing an elongate tube of knit fabric having an upper and a lower layer, laid flat, onto a first table that has conveyor means for moving said tube of fabric in a lengthwise direction; conveying said tube of fabric in said lengthwise direction on said first table; slitting the upper layer of said tube
10 of fabric at its mid-line in said lengthwise direction which it is being conveyed; cutting said tube of fabric into desired lengths; and conveying said desired lengths of material to a sewing table provided with sewing machines, and sewing an end seam across each end of said length of fabric, to obtain a sheet with unfinished side edges.

15 In another broad aspect, the present invention provides a method of manufacturing textile articles comprising the steps of: assembling a plurality of layers of elongate lengths of material on a conveyor table; conveying said layers past a pair of sewing machines to sew the edges of said plurality of layers together to form a laminate; cutting said laminate into desired lengths; and conveying said desired lengths of laminate
20 to a sewing table provided with sewing machines and sewing an end seam across each end of said laminate to obtain a desired textile article.

In drawings that illustrate the present invention by way of example:

25 FIGURE 1 is a schematic of a manufacturing process according to the present invention.

FIGURE 2 is a schematic, overhead view of the process shown in FIGURE 1.

FIGURE 3 is a schematic view of the manufacturing process of the present invention, with a number of alternate steps illustrated.

FIGURE 4 is a schematic overhead view of the process of Figure 3.

FIGURE 5 is a schematic of an alternate form of sewing table.

Turning now to Figure 1 the basic manufacturing process of the present invention is illustrated. Knit material, typically made from cotton or a polyester/cotton blend is produced at the premises of a knitter. Knit material is produced as a long tube of material. It is then washed, dried, and dyed if necessary. The long tube of material will then present an inside surface and an outside surface. Typically, the more desirable surface of the tube, that is, the surface one would desire to use as the outer surface of a sheet, is the outer surface of the tube of material. However, since the finished seems on a fitted sheet must be located on the inside of the finished sheet, it is necessary at this point to invert the entire tube of material. Accordingly, it must be turned inside out. It is known in the art that the most efficient way to do this is to fasten one end of the tube to the perimeter of a long tunnel, and then to blow the entire tube of material through the tunnel. The material turns itself inside out as it is blown though the tunnel. The fastened end is then released, and the tube of material is withdrawn from the tunnel and flat-folded in a long continuous piece. This is a starting material for the manufacturing method of the present invention.

A length of flat folded knit tube material (1) is positioned behind a first table (2) set at an upward incline, and provided with means, such as a conveyor belt on its surface to pull the tube of material up at a steady rate. The upward incline in the table is provided in order that a steady tension be provided in the tube of material, to prevent it from wrinkling or bunching up.

As the tube of material (1) is drawn up the table (2), the material in the upper layer of the tube is drawn through a knife (3) or other means to slit the tube open at its centre-line (4). If desired, the slit may be intermittent, that is, somewhat shorter than the length of a finished sheet. As the slit tube of material continues to travel up the table, the length of

material is continuously gauged, and at desired intervals, the progress of the tube is halted, and the material is cut in lengths corresponding to the length of the desired finished sheet. If an intermittent slit has been made, the material is cut to length mid-way between adjacent slits.

5 The transverse cuts to cut the tube of material into lengths can be made by a cutter (5) that travels across the material. The length of material to be cut can be gauged in any manner that will be apparent to one skilled in the art. For instance, as each length of material is cut, a new leading edge of material is formed. An "electric eye" or other optical sensor (6) can be positioned downstream of the cutter a length equal to the desired sheet
10 length, with the leading edge (7) being sensed by the optical sensor (6) and causing progression of the tube of material to stop, and the transverse cutter (5) to cut the material. Alternately, the conveyor belt may be used to measure material as it moves the material, stopping and triggering the cutter when a desired length of material has progressed up the table.

15 Another means to measure the length of material is to provide a roller over the material rotatable by the passage of the material as it is drawn up the table. Other measurement means will be apparent to one skilled in the art.

20 As the slit lengths (8) of material (1) reach the top of the inclined first table (2), they are picked up by a second table (9) also equipped with a conveyor belt, and drawn down an incline to a third table (10) aligned with the second table (9). Conveyor means on the third table draw the length of material along the length of the third table, and then stop. At this point, a length (8) of tubular knit material slit along its upper layer will be
25 positioned on the third table, with its end edges (11) slightly over-hanging the ends of the third table.

The ends (13) of the third table are preferably arcuate, as can be seen in Figure 2. Two sewing machines (12) are positioned at diagonally opposed corners (14) of the third table, and the corners of the length of material are positioned at the infeed of the sewing machines. The third table is provided with means to permit it to be rotated through an arc sufficient to bring the entire width of the tube of material through a respective sewing
 5 machine to turn the respective edge in an arc and sew it closed, from side to side.

The curvature of the arc will depend on the length of the third table (10). That is, if it is desired to produce a sheet with ends having pronounced arcs, the third table should be quite short. If only a gentle arc is required, the table should be longer. In any event, once
 10 the desired radius of the arc is determined, a single third table (10) can be used to make sheets of various lengths by providing two conveyor belts in association with the third table. The first belt receives the tubular material from the second table, and draws it part way across the third table. At that point, a second belt takes over, and draws the leading edge of the material to the edge (15) of the table, at which point it stops. The first belt
 15 does not stop, however, until the trailing edge of the material is aligned with the edge of the table. This may cause the material to bunch up in the middle of the table, but this is not of concern, since after the sewing operation, the material is removed from the table.

In order to ensure that the ends of the material are guided smoothly though the
 20 diagonally opposed sewing machine, short lips (16) are provided just below the edges of the table, to support the edge of the fabric, and prevent it from simply drooping over the arcuate edge of table, a situation that may make it difficult for the material to be guided into the sewing machine.

25 After the ends of the material have been sewn in a separate operation, binding is sewn to the edges of the slit, in a continuous loop, which also serves to reinforce the end seams of the sheet, which at that point is finished.

Numerous variations in the production method of the present invention are possible.

Binding may be applied to the slit edges of the material before the ends are sewn. This can be accomplished in two different ways. In a first method, a sewing machine (17) equipped with two heads facing in opposite directions and equipped with continuous rolls of binding material may be positioned immediately downstream of the slitting means, so that as the upper layer of the tube is slit, the slit edges are each immediately guided into a sewing machine, where a binding strip is sewn to the edge. The remainder of the process is substantially unchanged, but the ends of the sheet, where the bound edges are sewn with the end seam, should be tacked for reinforcement. Alternately, the end seam may be bound as well, as part of the sewing thereof. This will add material cost, but cut labour costs, so it may be appropriate in some market conditions.

Alternately, the slit tube of material may be opened up after it is slit, and binding applied to the edges by sewing machines (18) positioned at the side edges of the table, through which the side edges of the material may be guided. In such a case, it is then necessary to fold the side edges back over the central position of the material, either before or after it is transversely cut into sheet-sized lengths of material.

The production method of the present invention may also be modified as shown in Figs. 3 and 4, utilized to produce mattress pads such as those described in Applicant's co-pending Canadian Patent Application No. 2,499,155. To do so, a tube of knit material is not used. Rather, a series of layers of material are used. These layers are assembled from rolls of material, on a table preceding the first table noted above, and may comprise:

- 1) a water-proof layer, laid down as the base layer, on the conveyor,
- 2) a layer of quilted material or a layer of fibrous batting, over the water-proof layer,

3) a top layer of a flannelette, or other material selected for its comfort and appearance,

4) over the top layer are layed sided panels with outer edges, aligned with the edges of the other three layers.

5 Three layers (19, 20, 21) are shown in the drawings, for clarity of illustration.

10 The side edges are then sewn by guiding the multi-layer construction through a pair of sewing machines (22) aligned the side edges of multi-layer construction, to provide a laminate, and the laminate is then guided onto the first table (2), where it is cut to length, and moved via the second table (9) to the third table (10), where it is sewn in the manner described above. This variation of the method of the present invention can also be utilized to construct a sleeping bag, by laying down layers of nylon, fibre fill batting, and flannel; sewing the side edges; cutting the length without slitting, and then sewing the ends closed at a shallow arc. A zipper is then applied around the side and bottom edges any binding
15 applied to the top edge for a finished product.

As a variant of the present invention, the third table may be designed as shown in Fig. 5 to shuttle from side to side, instead of rotate about its centre. If designed this way, both sewing machines (12) for the third table (10) will be at one side, so that top and
20 bottom edges will be sewn in a single side to side shuttle of the table. This configuration of the third table is especially advantageous for sewing articles requiring a straight edge, such as a comforter or a sleeping bag.

25 In summary, then, it will be seen that the present invention provides an efficient method for the automated production of fitted bed sheets. The method of the present invention is adaptable to produce a wide variety of other textile articles efficiently, and at sustainable high production levels.

CLAIMS

1. A method of manufacturing textile articles comprising the steps of:
 - 1- providing an elongate tube of knit fabric having an upper and a lower layer,
5 laid flat, onto a first table that has conveyor means for moving said tube of fabric in a lengthwise direction;
 - 2- conveying said tube of fabric in said lengthwise direction on said first table;
 - 3- slitting the upper layer of said tube of fabric at its mid-line in said lengthwise direction which it is being conveyed;
 - 10 4- cutting said tube of fabric into desired lengths; and
 - 5- conveying said desired lengths of material to a sewing table provided with sewing machines, and sewing an end seam across each end of said length of fabric, to obtain a sheet with unfinished side edges.
- 15 2. The method of claim 1, including the further step, just prior to cutting said tube of fabric in desired lengths, of measuring said desired lengths.
3. The method of claim 2, wherein said desired lengths of fabric are measured by sensing a leading edge of said tube of fabric at a detection point as it is being conveyed.
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4. The method of claim 3, wherein said tube of fabric is cut upstream of said detection point a distance equal to said desired length.
5. The method of claim 4, wherein conveying of said tube of fabric is halted briefly
25 during said cutting steps.
6. The method of claim 5, wherein said sewing table is rotatable about a central axis orthogonal to said length of material, and said table has ends which are arcuate.
- 30 7. The method of claim 6, wherein an end of said sewing table has a lip projecting therefrom below the upper surface of said sewing table.

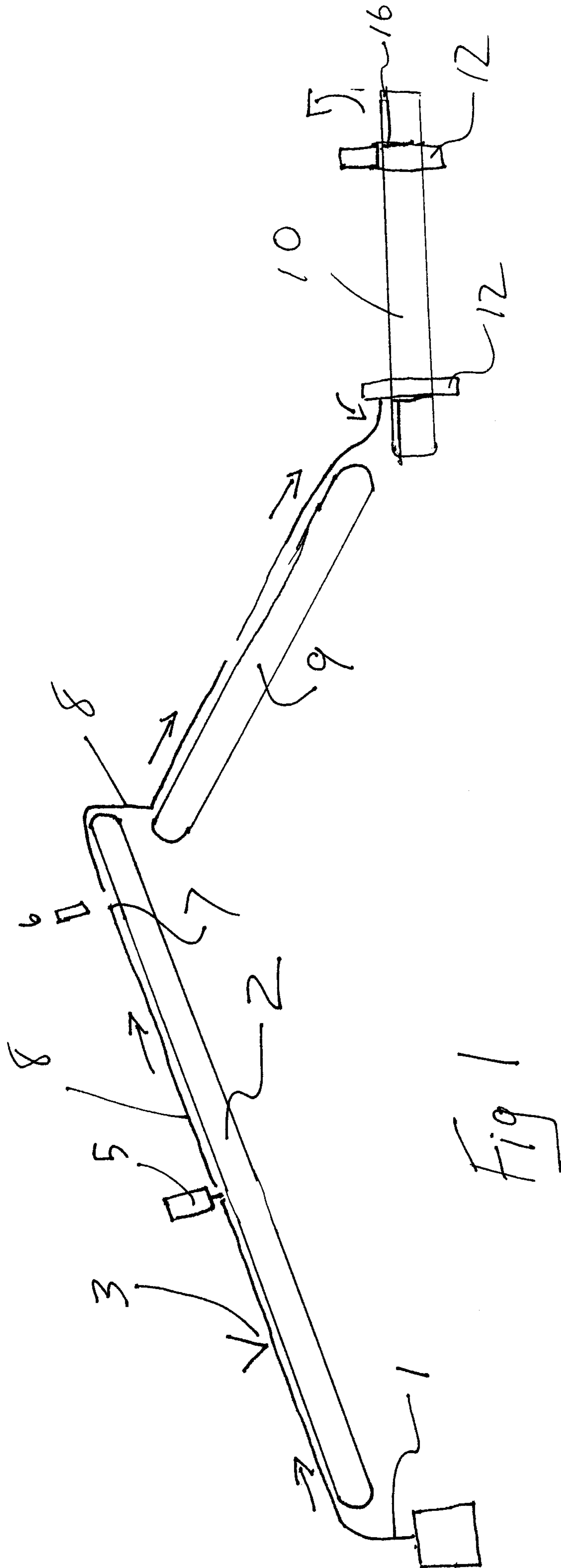
8. The method of claim 7, wherein said sewing machines are situated at diagonally opposed corners of said sewing table, whereby rotation of said sewing table will guide the end of said length of material by said sewing machine for sewing.

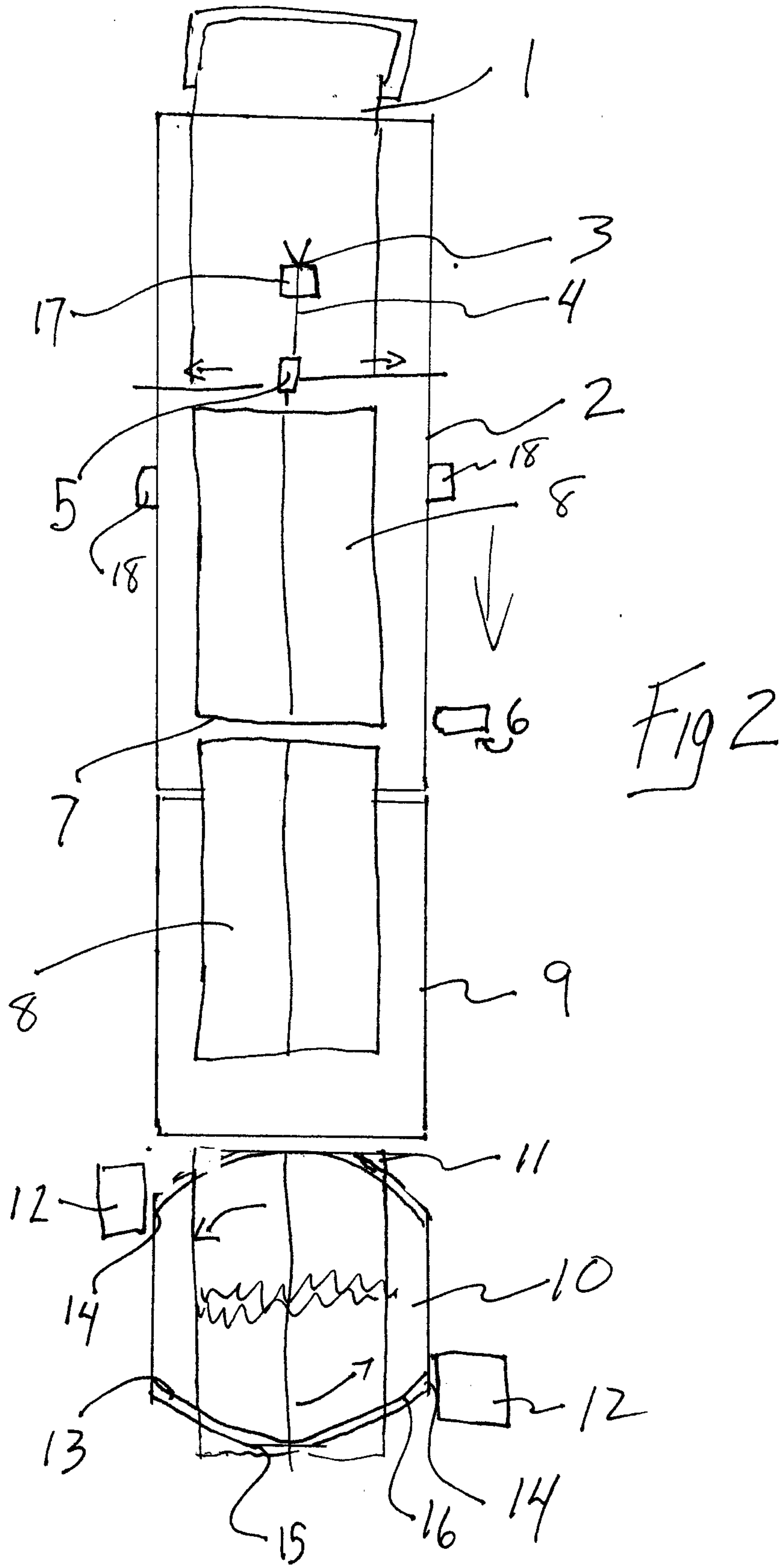
5 9. The method of claim 5, wherein said sewing table shuttles from side to side, and has straight ends, with at least one lip projecting from below the upper surface of an end of said sewing table.

10 10. The method of claim 9, wherein said sewing machines are situated at the corners of one side of said table, whereby shuttling said table from side will guide the ends of said length of material by said sewing machines to sew an end seam.

11. A method as claimed in any one of claims 1-10, including the further step of binding the unfinished edges of said sheet.

15 12. A method as claimed in any one of claims 1-11, including the steps, after slitting, of binding the edges of said slit tube fabric, whereby after claim 5, a sheet with finished edges is obtained.





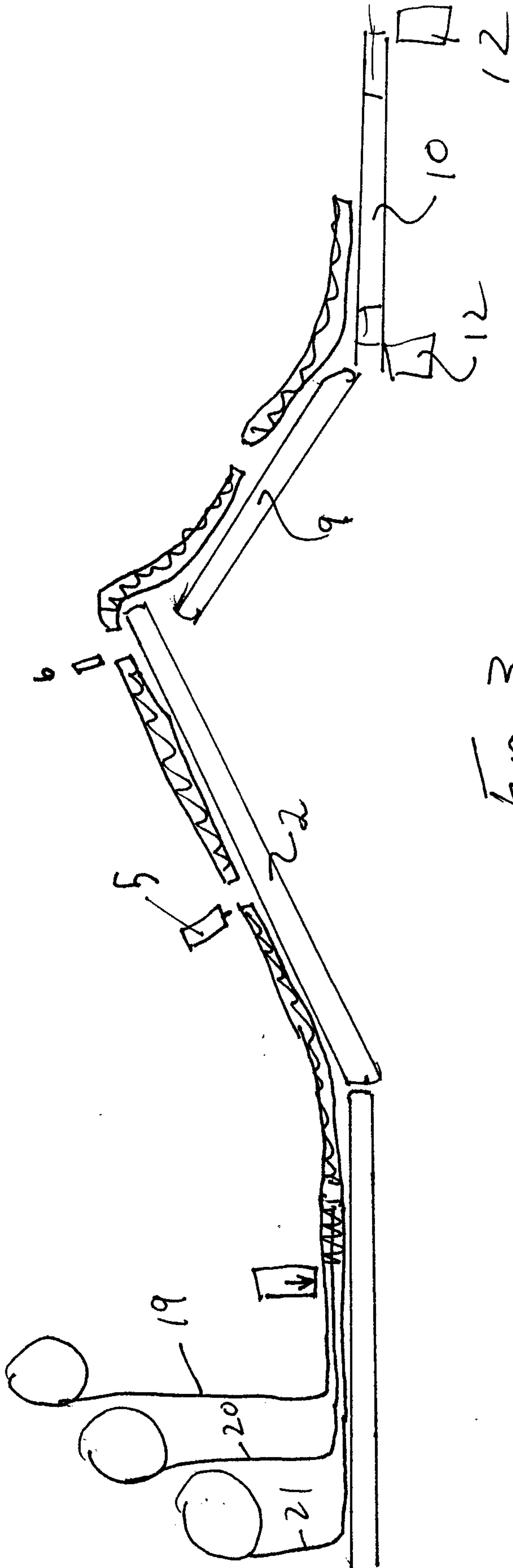


Fig 3

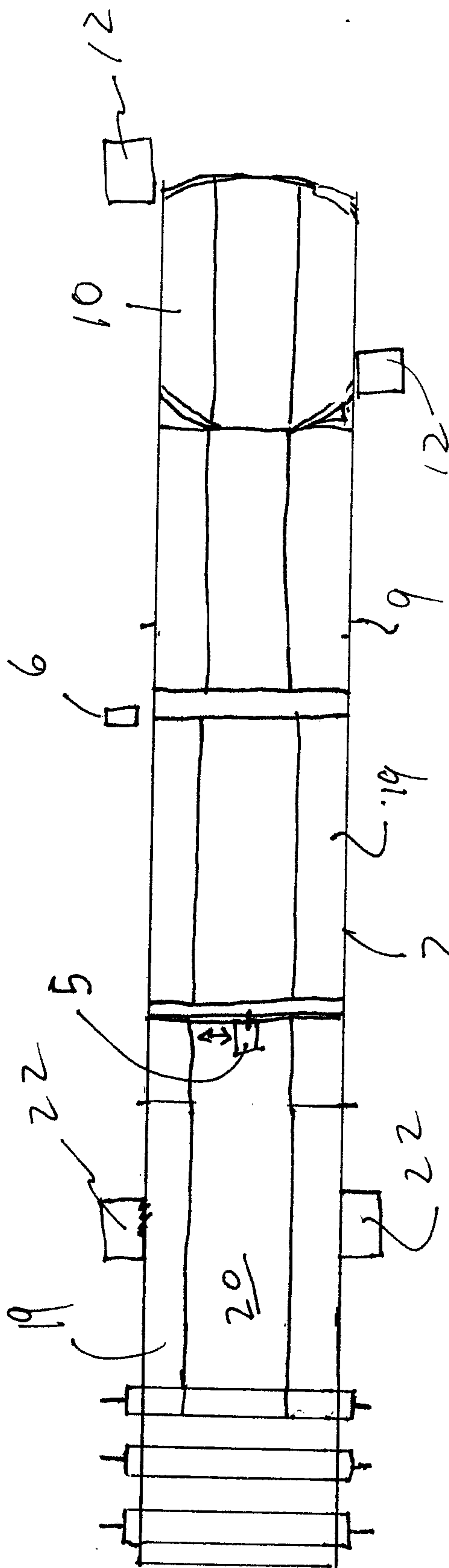


Fig 4

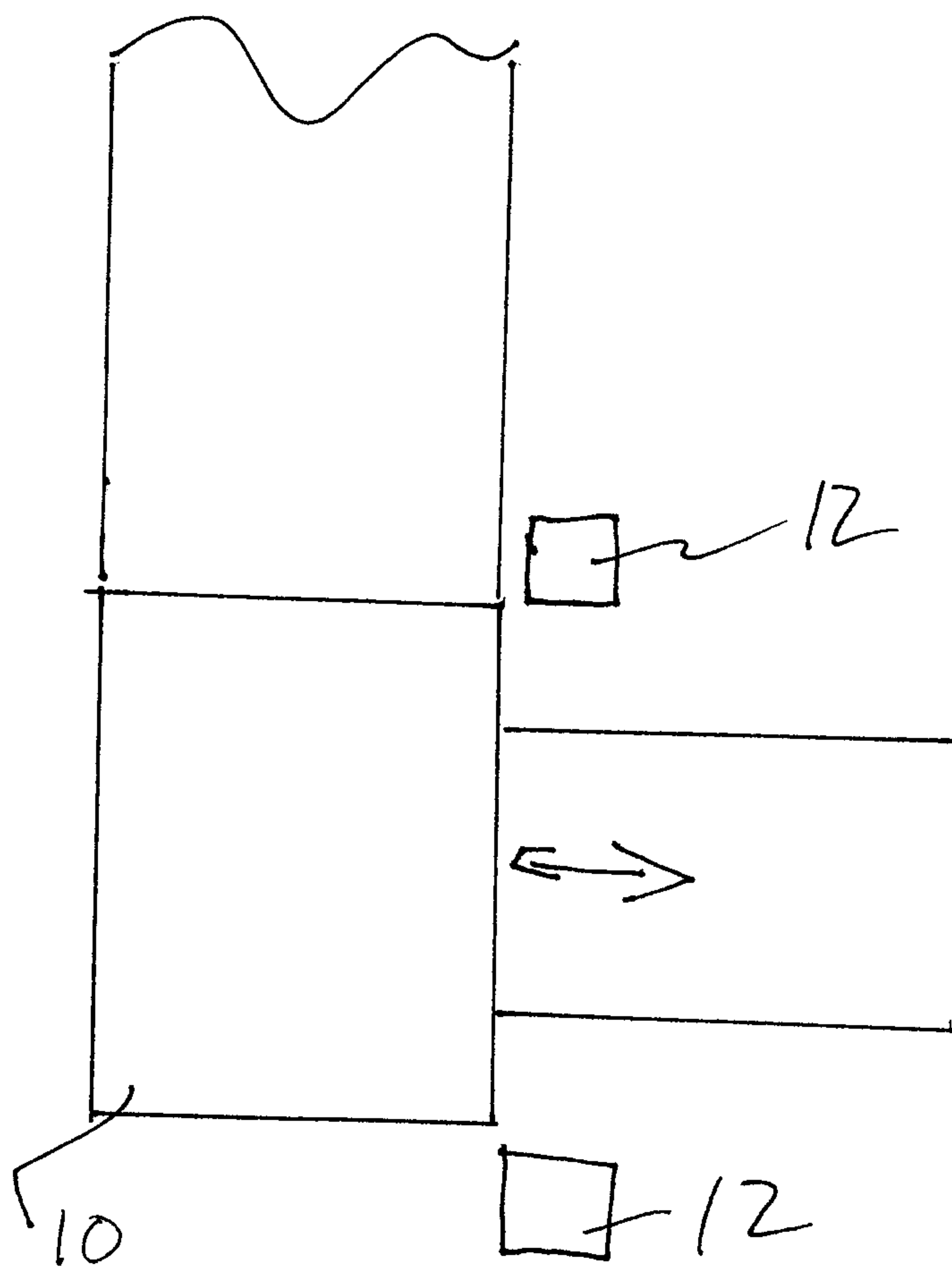


Fig 5

