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(54) A METHOD AND APPARATUS FOR MAKING ROLLS FROM FLEXIBLE MATERIAL, SUCH AS MINERAL WOOL

(57) The present invention relates to a method and apparatus for making rolls (200) by rolling a length of compressed flexible material (201), such as compressed isolation wool, wherein said method comprises

- tapering the end of said length of compressed flexible material (203) between a folding roller (101) comprising grip edges (103) and a roll-up belt (105) providing a support on one side of said length of compressed flexible material to maintain the compression of said compressed flexible material,
- initiating the rolling of said length of compressed flexible material by rotating the folding roller in a direction whereby a tip (203) of the tapered end of said length of compressed flexible material is bent in the rolling direction (207) due to a gripping contact between the grip edges of said folding roller,
- continued rolling of said length of said compressed flexible material (201) while supporting the roll by said roll-up belt (105) until a roll of a specific size has been obtained.

Thereby an automatic rolling of flexible material is obtained solving the above-mentioned problems by letting the folding roller (101) ensure that the initiation of the rolling is in a controlled manner.

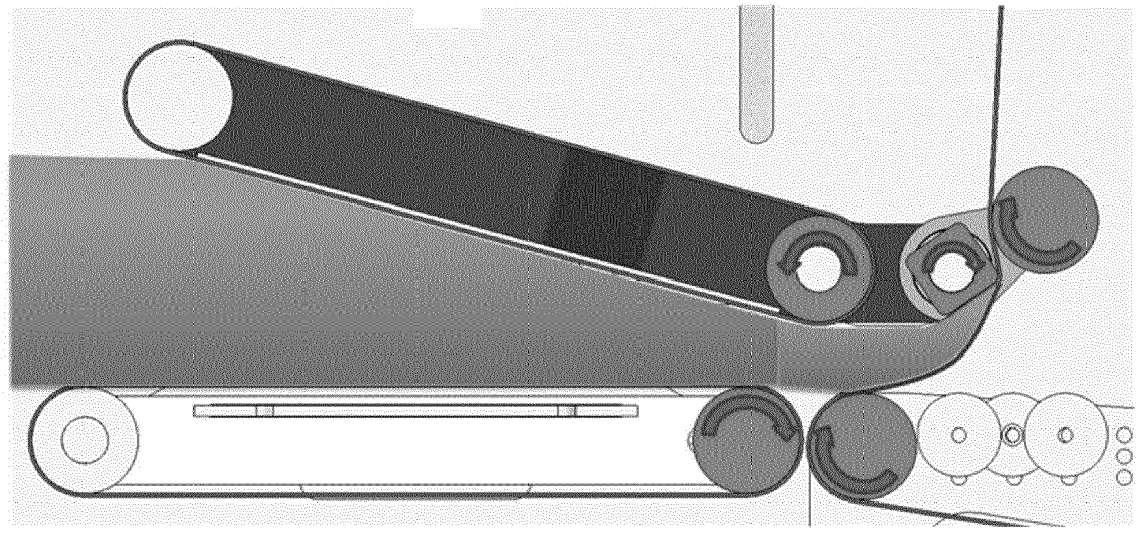

Fig. 2b

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Description

[0001] A method and apparatus for making rolls from flexible material, such as mineral wool.

[0002] The present invention relates to a method of of making rolls by rolling a length of compressed flexible material, such as compressed insulation wool. Further, the invention relates to an apparatus for performing such a method.

Description of related art

[0003] Insulation wool is used for insulating e.g. houses in order to reduce energy loss. Insulation wool is a material comprising a lot of air and in order to save space both when transporting, storing and handling the material, it is an advantage to compress the material before packaging. Obviously, this is not only an advantage when it comes to insulation wool, but also other material comprising air, such as foam used in inter alia furniture, e.g. in mattresses, could be compressed to save space.

[0004] It is known to stack and compress compressible products, such as insulation wool, in the same process. Another method of compressing and packaging wool is to compress and roll the wool in wool rolls. Using rolls can be advantageous in situations where large segments are to be covered by wool which can be done much faster by just rolling out the roll instead of having to position a number of product pieces next to each other.

[0005] When rolling wool rolls, it is of interest to maintain the optimum compression while rolling and further especially when initiating the rolling, the first part of the wool length may be over-compressed reducing the quality of the wool. Another problem is that in the known methods of rolling, the first rounds of rolling cannot be optimally controlled which often results in the first roll rotations being quite random thus bending the material in various directions.

Summary of the invention

[0006] It is an object of the present invention to solve at least some of the above-mentioned problems.

[0007] This is obtained by a method of making rolls by rolling a length of compressed flexible material, such as compressed isolation wool, wherein said method comprises

- tapering the end of said length of compressed flexible material between a folding roller comprising grip edges and a roll-up belt (105) providing a support on one side of said length of compressed flexible material to maintain the compression of said compressed flexible material,

- initiating the rolling of said length of compressed flexible material by rotating the folding roller in a direction, whereby a tip of the tapered end of said length of compressed flexible material is bent in the rolling direction due to a gripping contact between the grip edges of said folding roller,

- continued rolling of said length of said compressed flexible material while supporting the roll by said roll-up belt until a roll of a specific size has been obtained.

[0008] Thereby, an automatic rolling of flexible material is obtained solving the above-mentioned problems by letting the folding roller ensure that the initiation of the rolling is in a controlled manner.

[0009] In an embodiment, the folding roller is square-shaped, and the four corners are the grip edges.

[0010] Tests have shown that such configuration gives good rolling

[0011] In an embodiment, said continued rolling is performed by the roll-up belt supporting the outer roll layer and moving along the outer surface of the outer roll layer.

[0012] Thereby, the outer surface of the roll is under control during rolling, whereby control is optimised and the end result is improved.

[0013] In an embodiment, the roll-up belt is moved between a set of inlet rollers, wherein one of said rollers is a dynamic inlet roller, and wherein said dynamic inlet roller is moved towards said second inlet roller as the roll size increases and a roll-up belt pocket is created next to said inlet rollers.

[0014] Thereby, a belt pocket is generated behind the inlet rollers after the folding roller has ensured the quality of the initial rolling. Then, the belt pocket handles the remaining rolling.

[0015] In an embodiment, said dynamic inlet roller has a first position during initiation of the folding, in which first position the circumference of said dynamic inlet roller is adjacent the circumference of the folding roller.

[0016] Thereby and by having a sufficiently small distance between the circumferences of the dynamic inlet roller and the folding roller, respectively, insulation material is blocked from passing between the rollers and is forced to fold in the direction according to the roll to be made.

[0017] In an embodiment, said dynamic inlet roller is connected to the folding roller rotation axis via a connection arm, and wherein said arm is rotated around the folding roller rotation axis to move the dynamic inlet roller.

[0018] Thereby, the dynamic inlet roller can easily move relative to the folding roller, and if the folding roller is moved in a vertical direction, the dynamic inlet roller moves correspondingly.

[0019] In an embodiment, the tapering of the insulation material is obtained by moving the length of insulation material between an upper compression belt and a lower compression belt, and wherein the compression belts are inclined relative to each other, whereby the distance between their transport surfaces decreases in their transport direction.

[0020] Thereby, the compression of the insulation ma-

terial moving along the surface of the lower compression belt is gradually increased.

[0021] In an embodiment, said upper compression belt is connected to said folding roller via a connecter.

[0022] Thereby, the position of the folding roller and the upper compression belt can be changed simultaneously.

[0023] In an embodiment, said folding roller is moveable in a direction parallel to the moving direction of the insulation material being fed to the rolling process.

[0024] Thereby, the folding roller can maintain rolling contact to the roll as the roll increases.

[0025] Furthermore, it should be noted that the claims as currently on file define one scope of protection, but a separate divisional application, which focusses on the combination of a tablet holding housing and the pivot fitting disclosed in the present specification, could also be filed in the future.

Brief description of the drawings

[0026] In the following, the invention will be described in greater detail with reference to embodiments shown by the enclosed figures. It should be emphasised that the embodiments shown are used for example purposes only and should not be used to limit the scope of the invention.

[0027] The following figures are used to describe embodiments of the present invention, wherein

Figs. 1a and 1b illustrate an embodiment of elements in an apparatus performing a rolling according to the present invention,

Figs. 2a-2f illustrate the method of rolling using the embodiment of Fig. 1,

Figs. 3a-c illustrate an alternative embodiment of elements performing an alternative method of rolling according to the present invention.

[0028] Detailed description of the embodiments.

[0029] Figs. 1a and 1b illustrate an embodiment of elements in an apparatus performing a rolling according to the present invention. The elements are part of a machine for rolling and packaging insulation material and only elements of relevance to the method of rolling will be described in the following. It is further to be noted that a number rollers are present where an arrow 115 illustrates their rotating direction during rolling. The elements will initially be described from left (description of Fig. 1 a) to right (description of Fig. 1b) which is also the direction, wherefrom the length of flexible material is to be fed.

[0030] Fig. 1a illustrates an upper compression belt 109 and a lower compression belt 107 positioned above each other to receive the insulation material between the two belts. Each belt is a conventional transporting belt, where a belt rotates around rollers and the rotating direction and also the transport direction are illustrated by the arrows 115. The upper compression belt 109 is mounted in an inclined manner relative to the lower compression belt 107, whereby the distance decreases between the two belts in the transport direction of the transporting belt. This decrease in distance compresses the insulation material between the belt as the insulation is moved along the transport belts. Further, the upper compression belt 109 is connected to further elements 119 (explained later) and together with these further elements, an upper rolling part is formed 123, and this entire upper rolling part is moveable in the direction illustrated with the arrow 117 parallel to the transport surface of the lower compression belt 107.

[0031] In Fig. 1b, the upper compression belt is connected to a folding roller 101 via a connecter 124, and the connecter 124 ensures that the position of the folding roller is fixed relative to the upper compression belt 109. The folding roller 101 rotates as indicated by the arrow and is shaped as a square, wherein each corner of the square forms a grip edge 103.

[0032] In one embodiment, the folding roller could be made of steel, having a steel surface, but other materials could also be used, such as aluminium. Further gripping edges could also be obtained via a star shape (where more edges are present around the surface). Generally, more edges would ensure a more continuous grip with the insulation wool, but also the size of the gripping edges matters when enabling the folding roller to force the tip of the insulation material in the rolling direction. Therefore, a compromise has to be made between number of edges and size of edges.

[0033] The folding roller is further connected to a dynamic inlet roller 111 via a connection arm 125, and the connection arm can move along the arrow 127.

[0034] The dynamic inlet roller 111 rotates as indicated by the arrow, and a roll-up belt is moved (as indicated by the arrow) between the folding roller 101 and the dynamic inlet roller. Another inlet roller 113 ensures that the roll-up belt between inlet roller 113 and the dynamic inlet roller and the folding roller is tightened and has an angle suitable for initiating the rolling.

[0035] Before feeding a length of insulation material to the apparatus to initiate that a rolling up cycle starts, the position of the machine parts are as shown in Figs. 1 a and 1 b.

[0036] In Fig. 2a, the insulation material 201 is fed to the apparatus, and as it moves along the transport surface of the lower and upper compression belt, the material is compressed and becomes tapered. The tip 203 of the length of insulation material is the most compressed part of the insulation material. At this point, rolling has not yet started.

[0037] In Fig. 2b the insulation material enters the rolling process. Due to the angle of the roll-up belt and the pressure between the roll-up belt and the folding roller, the insulation material makes a curvature on the roll-up belt.

[0038] In Fig. 2c, the rolling is initiated. The insulation material has reached the rotating folding roller 101, where the edges of the square-shaped folding roller force the tip of the material downwards against its own upper surface. The roll-up belt moves in the direction of the arrow, and as the amount of insulation material between inlet rollers increases, also more of the roll-up belt is present to support the rolled part and maintain the compression of the rolled part. Further, the moving of the roll-up belt in the direction of the arrow enables the roll-up belt to assist in the rolling. The distance between the circumference of the folding roller and the dynamic inlet roller is small, whereby insulation materiel cannot pass between them and is forced into contact with the edges of the squared folding roller and to bent to initiate the rolling.

[0039] In Fig. 2d, the initiation of the rolling is almost finished, and insulation roll has almost started to roll up solely due to the support and movement of the roll-up belt. The initiation is however still in process, and the folding roller still ensures that the tip of the material gets down towards its own upper surface. The insulation material is still compressed partly due to the tension of the roll-up belt moving along the surface and supporting the roll.

[0040] In Fig. 2e, the diameter of the insulation roll has increased its size, and the upper compression belt has been moved to the left in the horizontal direction (illustrated by the arrow). At this point, the dynamic inlet roller is about to move downwards.

[0041] In Fig. 2f, the dynamic inlet roller has moved downwards and is positioned above the other inlet roller, whereby a roll-up belt pocket is generated on the side for supporting the roll to maintain its compression and for guiding the rolling of the insulation material.

[0042] This can then be continued until sufficient material has been rolled and thereafter, the roll is foil-wrapped (e.g. by feeding foil to the system), and the insulation roll can be released from the apparatus.

[0043] Figs. 3a-c show an alternative embodiment of elements performing an alternative method of rolling compressed insulation material according to the present invention. Arrows are shown to illustrate the rotation direction of the rollers and or movements of elements. In this apparatus, the insulation material 303 is already partly compressed before entering the apparatus.

[0044] The apparatus comprises a roller belt 301. The roller belt 301 has two rollers around which a belt is mounted. Above the roller belt 301, a moveable upper surface 311 is positioned, and the distance between the roller belt 301 and the moveable upper surface 311 ensures that a compression of the compressed insulation material being fed to the apparatus is maintained. The moveable upper surface is further connected to a folding roller 305. Further, roll-up belt 303 is positioned along surfaces of the folding roller 305, and two inlet rollers 307, 309. The inlet rollers are positioned to maintain a stretched rolling belt 305 between the inlet rollers 307, 309 and the folding roller 305, whereby the insulation material 303 will be pushed towards the roll-up belt 303 and forced between the roll-up belt 303 and the folding roller 305.

[0045] In Fig. 3a, a further compression of the compressible material has begun, and the end of the insulation material is tapered being moved and compressed between the moveable upper surface 311 and the roll-up belt 303.

[0046] In Fig. 3B, the insulation material continues between the folding roller 305 and the roll-up belt 303, where it is further compressed, and a tip 313 of the insulation material is positioned between the folding roller and the roll-up belt.

[0047] In Fig. 3c, the folding roller changes its rotating direction and due to the contact between the tip of the insulation material as well as the surface of the folding roller, the tip is folded in the rolling direction. Further, by continuing this process, the rolling will continue and as the roll grows larger, the folding roller is moved gradually away (indicated by arrow) from the roll to make space for the increasing roll size. The gradual movement is to ensure that the folding roller maintains the contact with the roll to ensure pressure is maintained and to maintain contact between the roll of material and the roll-up belt.

[0048] This can then be continued until sufficient material has been rolled and thereafter, the roll is foil-wrapped (e.g. by feeding foil to the system), and the insulation roll can be released from the apparatus.

Claims

1. A method of making rolls (200) by rolling a length of compressed flexible material (201), such as compressed isolation wool, wherein said method comprises

   - tapering the end of said length of compressed flexible material (203) between a folding roller (101) comprising grip edges (103) and a roll-up belt (105) providing a support on one side of said length of compressed flexible material to maintain the compression of said compressed flexible material,
   - initiating the rolling of said length of compressed flexible material by rotating the folding roller in a direction, whereby a tip (203) of the tapered end of said length of compressed flexible material is bent in the rolling direction (207) due to a gripping contact between the grip edges of said folding roller,
   - continued rolling of said length of said compressed flexible material while supporting the roll by said roll-up belt until a roll of a specific size has been obtained.

2. A method according to claim 1, wherein the folding

roller is square-shaped, and the four corners are the grip edges.

3. A method according to claims 1-2, wherein said continued rolling is performed by the roll-up belt supporting the outer roll layer and moving along the outer surface of the outer roll layer.

4. A method according to claims 1-3, wherein the roll-up belt is moved between a set of inlet rollers (111, 113), wherein one of said rollers is a dynamic inlet roller (111), and wherein said dynamic inlet roller (111) is moved towards (127) said second inlet roller (113) as the roll size increases and a roll-up belt pocket is created next to said inlet rollers.

5. A method according to claim 4, wherein said dynamic inlet roller has a first position during initiation of the folding, in which first position the circumference of said dynamic inlet roller is adjacent the circumference of the folding roller.

6. A method according to claims 4-5, wherein said dynamic inlet roller is connected to the folding roller rotation axis via a connection arm (115), and wherein said arm is rotated around the folding roller rotation axis to move the dynamic inlet roller.

7. A method according to claims 1-6, wherein the tapering of the insulation material is obtained by moving the length of insulation material (201) between an upper compression belt (109) and a lower compression belt (107), and wherein the compression belts are inclined relative to each other, whereby the distance between their transport surfaces decreases in their transport direction.

8. A method according to claim 7, wherein said upper compression belt is connected to said folding roller via a connecter (124).

9. A method according to claims 1-8, wherein said folding roller is moveable in a direction parallel to the moving direction of the insulation material being fed to the rolling process.

10. An apparatus for performing the method according to claims 1-9.

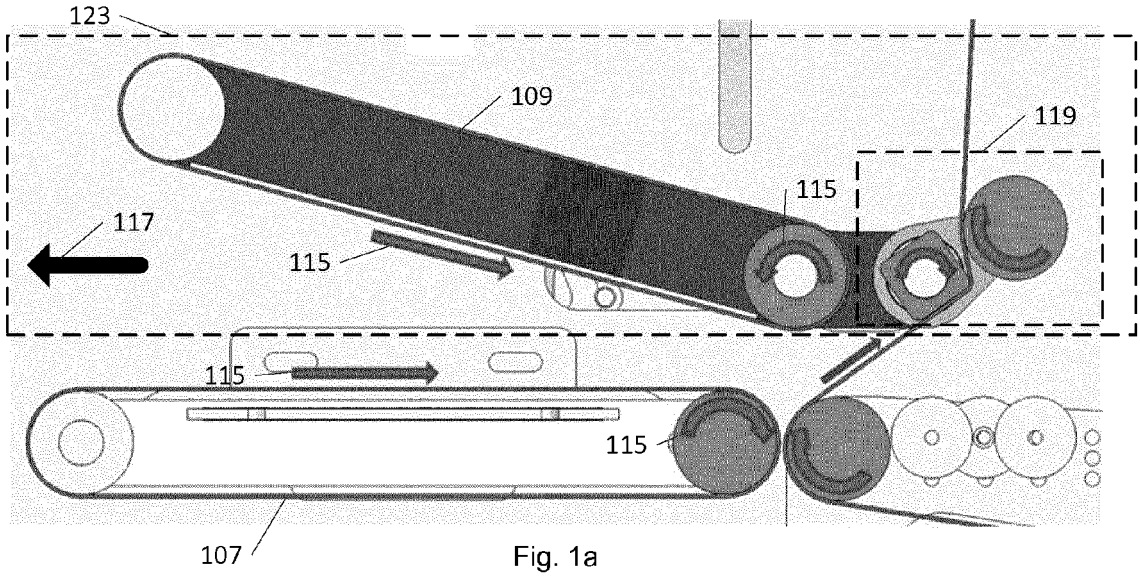
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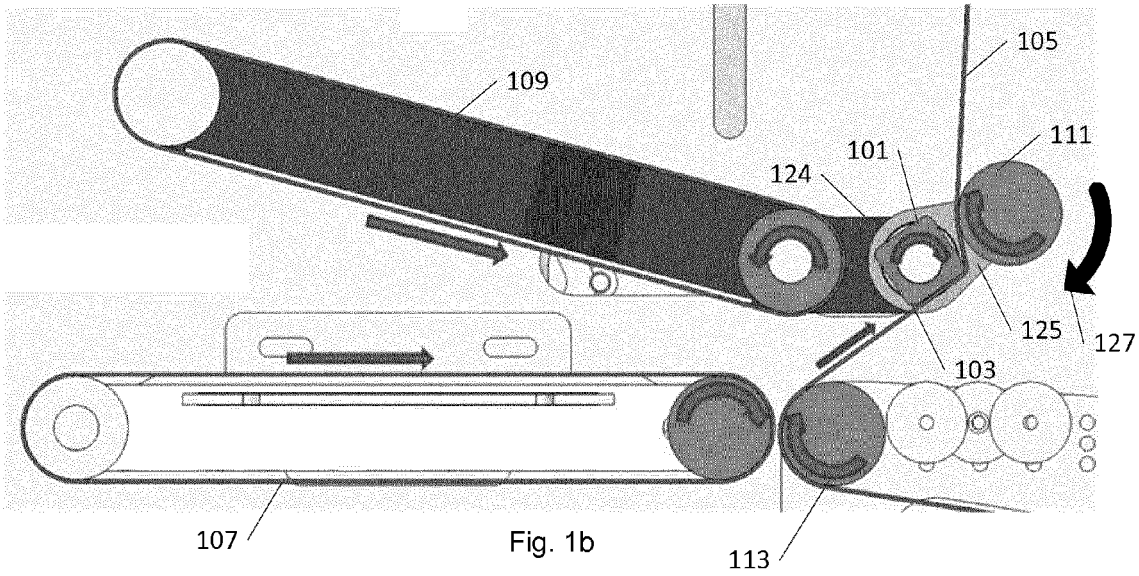
Fig. 1a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125
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113

Fig. 1b

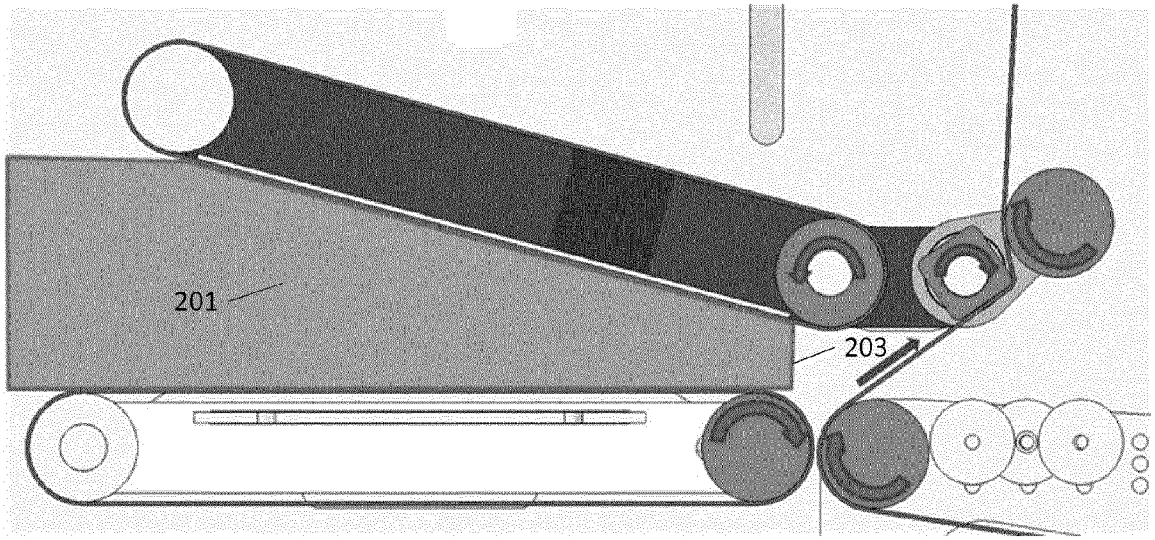

Fig. 2a

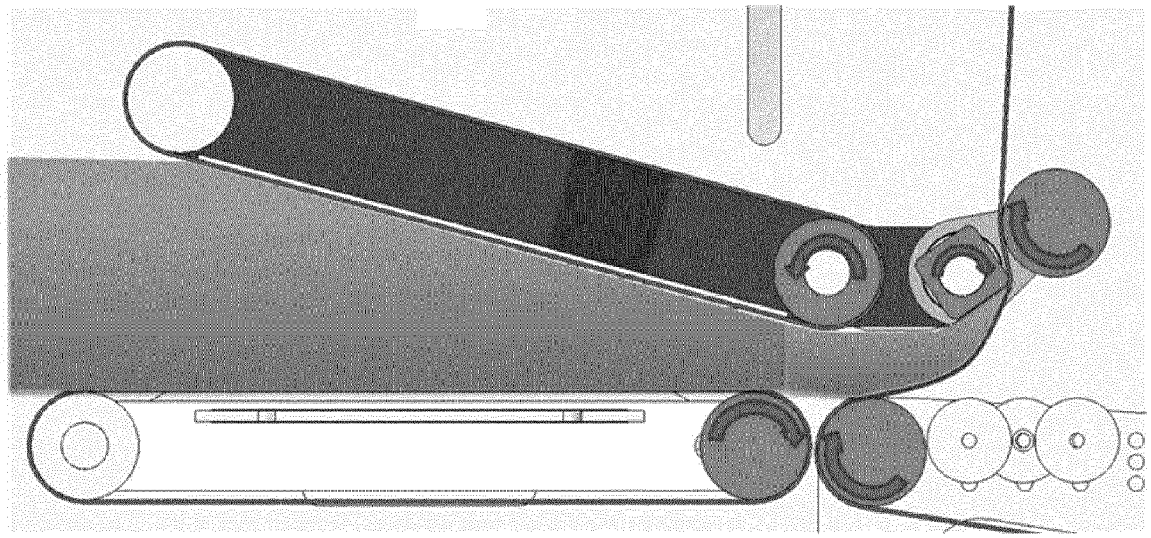

Fig. 2b

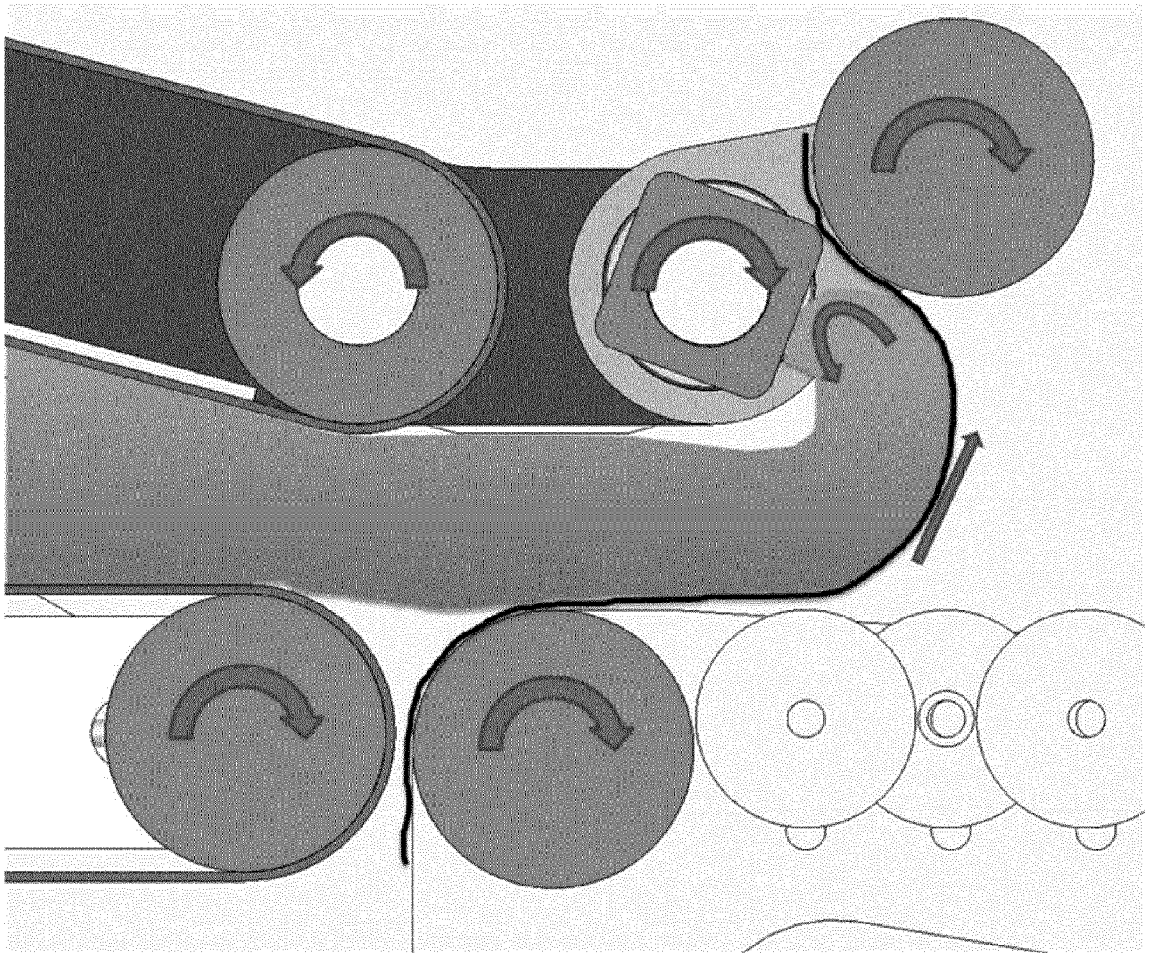

Fig. 2c

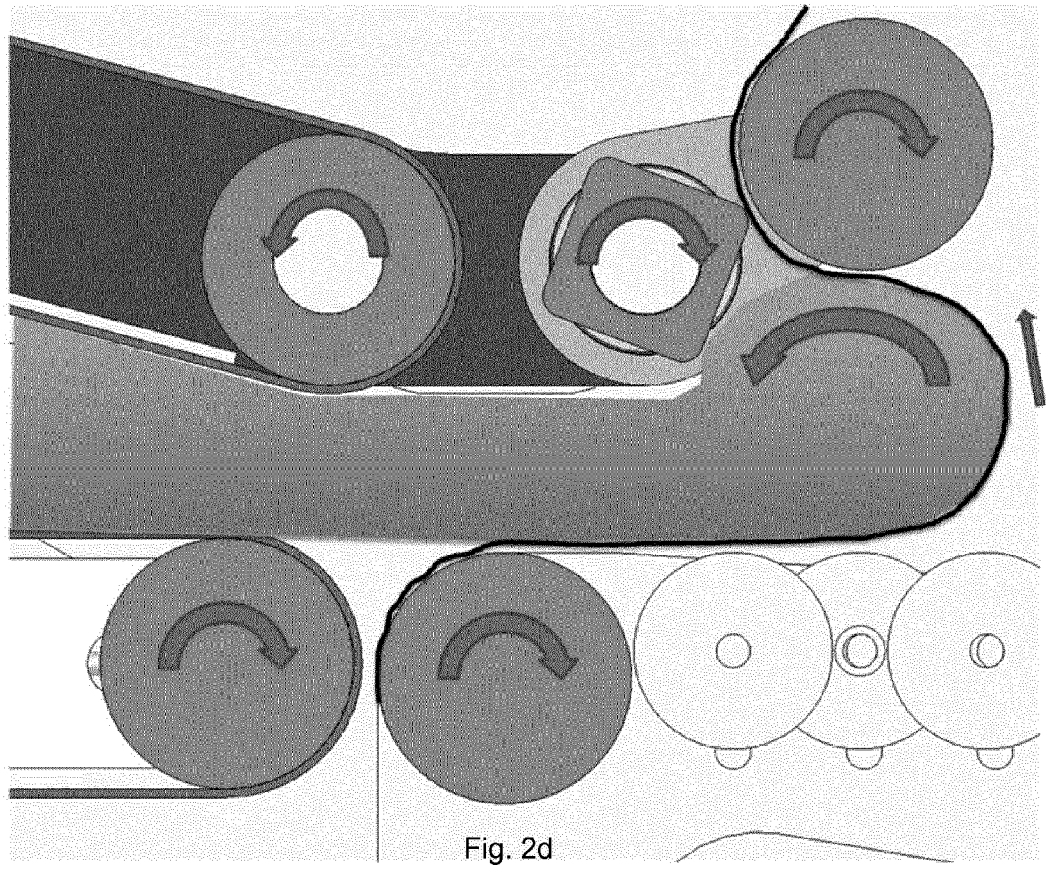

Fig. 2d

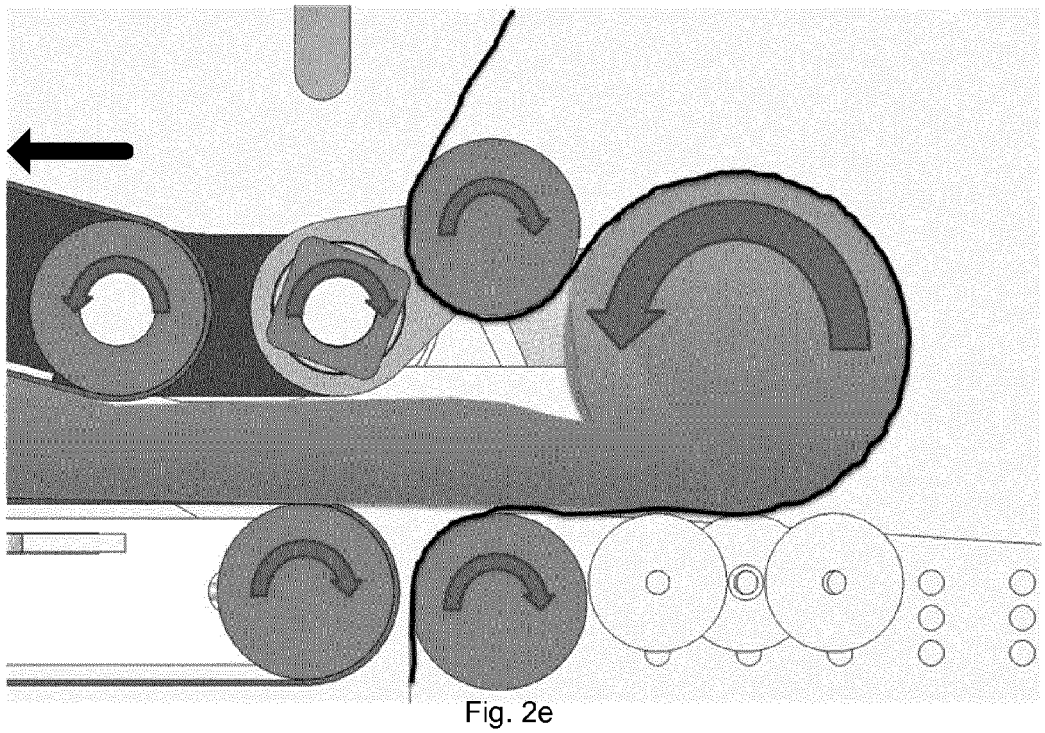

Fig. 2e

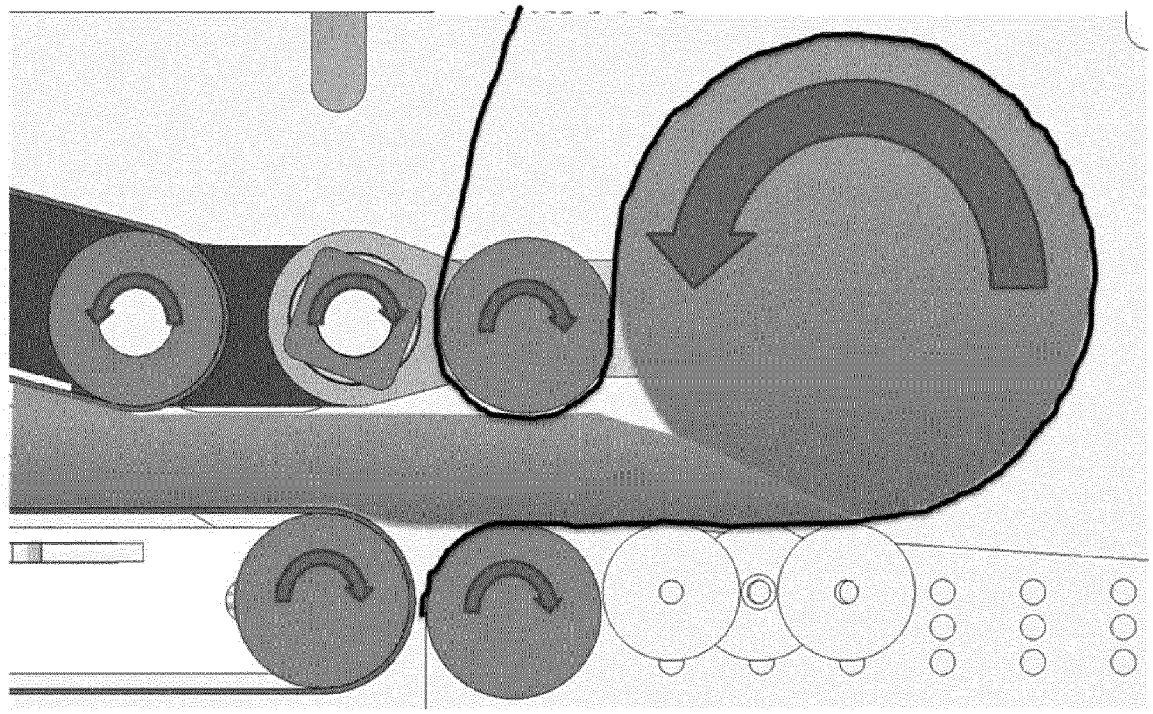

Fig. 2f

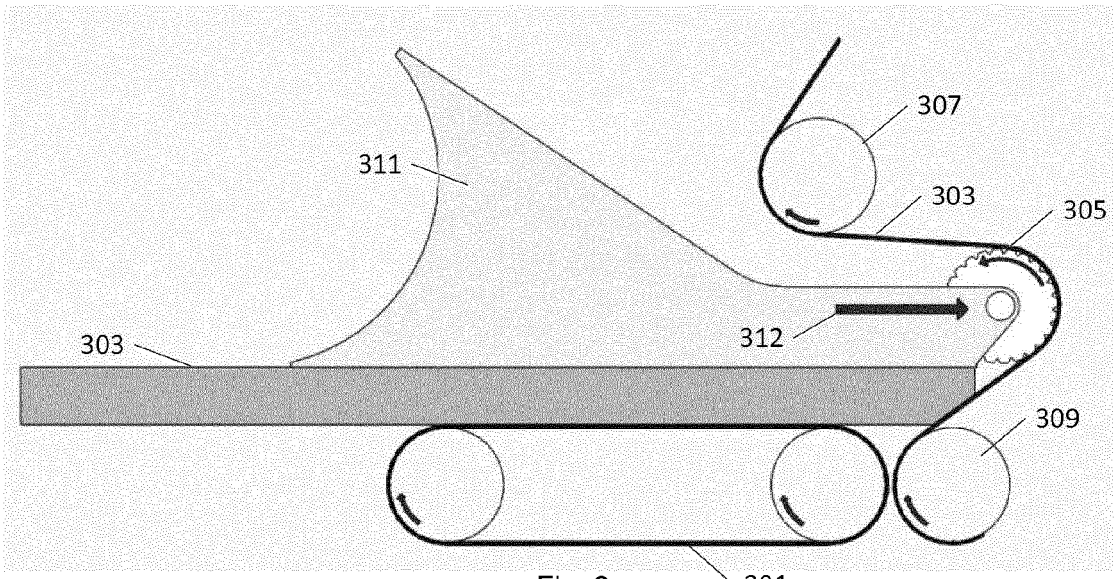

Fig. 3a

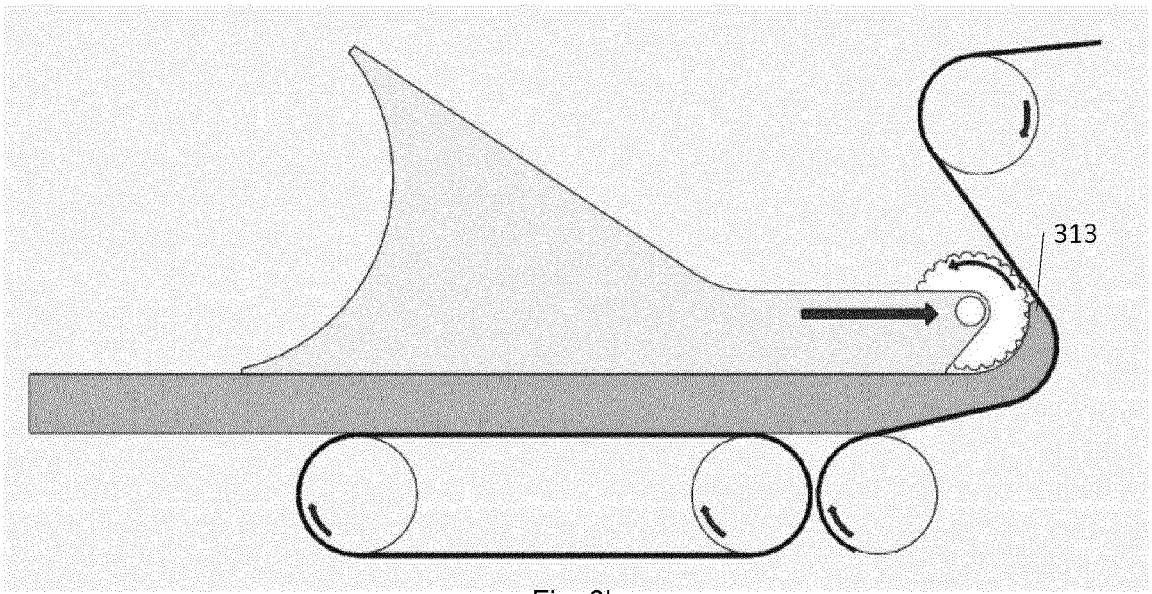

Fig. 3b

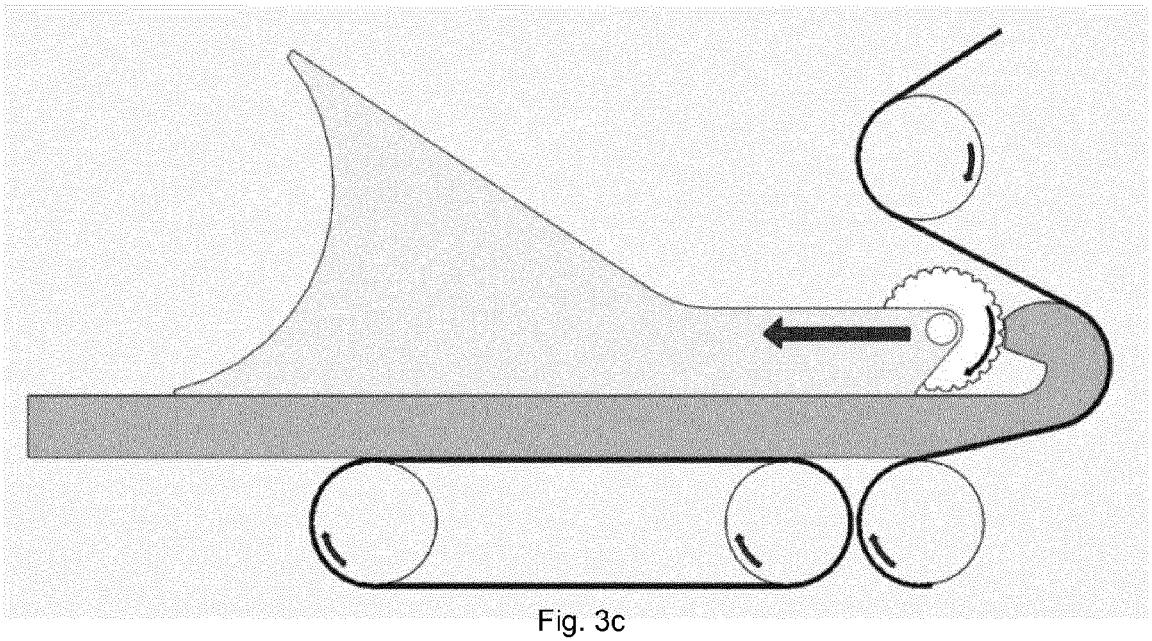

Fig. 3c

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 5443

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 294 290 A2 (SAINT GOBAIN ISOVER [FR]) 7 December 1988 (1988-12-07)	1,3,4,10	INV. B65H18/22
A	* column 6, line 2 - column 9, line 3 *	2,5-9	
A	US 5 305 963 A (HARVEY III EMERSON C [US] ET AL) 26 April 1994 (1994-04-26) * claims; figures *	1,10	
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B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 January 2016	Haaken, Willy

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 17 5443

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08-01-2016

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