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(71) Applicant: **I.N.T. Radko Krcma**
460 05 Liberec 5 (CZ)

(72) Inventors:
- **Krcma, Radko**
  46005 Liberec (CZ)
- **Hanus, Jaroslav**
  46001 Liberec (CZ)
- **Jirsak, Oldrich**
  46000 Liberec (CZ)
- **Kolcava, Ludek**
  44001 Louny (CZ)
- **Kotek, Vaclav**
  46005 Liberec (CZ)
- **Machova, Iva**
  46005 Liberec (CZ)
- **Sanetrnik, Filip**
  46000 Liberec (CZ)
- **Vitak, Josef**
  46001 Liberec (CZ)

(74) Representative:
Jeck, Anton, Dipl.-Ing.
Patentanwalt,
Klingengasse 2
71665 Vaihingen/Enz (DE)

(54) Manufacturing technology and equipment of vertically layered bulky textiles

(57) The manufacturing process and equipment of bulky textile configurations by vertical layering of fabrics based on formation into folds vertical to product level and their pressing to a required density, where - according to the invention concept - in places of compacting of vertically layered bulky textiles to such a density, pressures forming flat fabric formation into folds cease to be applied by from place to place in jumps.

The equipment for production of bulky textile configurations above consisting of fold forming body, which represents a rotating body (4) fitted with punches and identified by the fact that punch (2) containing bars (3) pass through radial grooves of discs (7) fixed to the driving shaft (11), which rotates the grooved discs (7) and, consequently, the bars (3) round the shaft (11) centre line and where the bars (3) are controlled by cams (8) influencing radially orientated movements of the bars (3).

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Description

Scope of technology

[0001] The patent objective is the manufacturing process and equipment for bulky textile formations by vertical layering of fabrics, particularly in the case of fibrous webs from carding machines.

State of the art

[0002] It has been proved that basic functional properties of bulky textile materials - such as: bulkiness, breathability, thermal insulation, deformation stability under permanent or repeated load - do not depend only on properties of applied fibres and layout of their binding warp but also on parent fibre-layer structures. In addition, the share of fibres laid crosswise (approx. vertically) to the product plane plays an important role.

[0003] Two basic principles are used in the manufacture of layers with fibres laid crosswise to the product plane. The vibration principle consists of fibrous web formation as it leaves a carding machine (or in fact any other fiat textile configuration) to vertical folds by an oscillating saw the amplitude of which is equal to the fold height, while the rotation principle is based on formation of a flat textile formation in vertical folds by its bringing into gaps between cogs of the working cylinder. Concrete design concepts of the vibration principle are well known from, inter alia, CZ P 37619, 56029, 87556, 235494, 263300, 263075 and 284296.

[0004] Similarly, also rotation principle designs are known from CZ P 273997, 269300, 273997, or EP 0516964.

[0005] By the development of the above principles the design of CZ P 284296 has been finalised, where the fleece is formed out of fibrous webs by the use of two moving elements - a saw and compacting bar -connected to a specifically designed driving assembly. Such equipment is capable of producing uniform folds even under the condition of high product density and smooth surface. The machine output is then given by frequency of working elements, web square density and required product thickness. The equipment disadvantage is that, owing to unacceptable machine vibrations, throughput of carding machines can not be fully utilised if an output higher than that one given by the working element frequency - i.e. over 1,300 cycles per minute - is required.

[0006] The rotation principle of so-called 'vertical layering' is typical for designs protected by CZ P 273997. Fabric web is brought through the feeding device consisting of a pane and cylinder assembled of a row of discs into rotating-body cog discs, where the cogs form the necessary formation space for web folds. Folds created between the cogs are laid in a vertical position between the conveyer and spacer grid. An easy control of product thickness and density and, regarding carding machine capacity, practically unlimited discharge rate, are ensured. Undesirable product surface embossing in a form of lengthwise strips as formed by the spacer grid and certain fibre thickening under cog discs on their exit of fleece, is considered a drawback. This embossing prevents to use such products to the purposes, where extraordinary requirements for fold uniformity and smooth surfaces are the case.

Principle of the invention

[0007] The above setbacks are eliminated in the manufacturing process and equipment of bulky textile configurations by vertical layering of fabrics based on formation into folds vertical to product level and their pressing to a required density, where - according to the invention concept - in places of compacting of vertically layered bulky textiles to such a density, pressures forming flat fabric formation into folds cease to be applied by from place to place in jumps.

[0008] The very principle of the equipment for bulky textile configurations by vertical layering of fabrics consisting of fold forming body, which represents a rotating body (4) fitted with punches, is - according to the invention concept - that punch (2) containing bars (3) pass through radial grooves of discs (7) fixed to the driving shaft (11), which rotates the grooved discs (7) and, consequently, the bars (3) round the shaft (11) centre line and where the bars (3) are controlled by cams (8) influencing radially orientated movements of the bars (3).

[0009] The bar (3) radial movement in direction of the rotating body (4) from its centre is, to the system benefit, created by the cam (8) while the movement towards its centre by spring elements (9).

[0010] The punches (2) can be arranged in in rows under the angle β in a flexible continuous belt (17) tightened between cylinders (18) & (19) and sloping to the conveyor level (6) under angle □.

[0011] The flat textile formation is brought between two rows of punches fixed to the bars moving round the forming body centre line along the track that enables to create space necessary for fold forming in the quadrant I. of the forming body and space of the fold pressing to the required density of bulk material in the quadrant II. of the forming body, while the quadrant I/II interface is gradually created by radial jumping movements of the bars in places of minimum distances between the rotating body surface and the conveyor.

[0012] The invention principle originates from the idea where the web, or any other flat textile formation (such as needled textiles), is brought by a feeding device (best of all a pane-type) between direct punches fixed to moving bars that form a rotating body of variable diameter. The bars are arranged in a collar to create space necessary to form the folds out of a flat textile material, while moving, at the same time, along a track permitting to fill the space among the bars in the first quadrant and quick exit of fleece at the boundary of first

and second quadrants of the rotating body. In filling the space between punches with the flat textile material, the punches establish the vertical direction to the rotating body centre line, the diameter of which increases in this interval to its maximum value. The fleece created in this process leaves the punches at the boundary of first and second quadrants almost by jumping, approximately in a vertical direction to the level of the conveyor removing the bulk layer away, while the diameter of the rotating body drops in this interval to its minimum value.

[0013] The manufacturing equipment for vertically layered bulky textile products is based upon the principle of having a rotating body of a variable diameter, the surface of which is formed with punches fixed to bars moving in radial grooves of disc fixed to a driving shaft and controlled by cams that influence their radial direction movements.

[0014] The method and equipment for vertically layered bulky textile products according to this invention improves, in a comparison with already known techniques based on the rotation principle, the layer structure, which results in particularly uniform folds in the whole profile of bulky textile products and elimination of the specific embossing patterns, which improves smoothness qualities of both surfaces. Practically the same effects as with vibration laying techniques is achieved this way, however, the output in question is several times higher so that the equipment can be integrated into high-throughput manufacturing units.

Index of Figures

[0015]

Fig. 1 shows the equipment utilising the variable-diameter rotating body for fold forming.

Fig. 2 shows the equipment, where the movement of bars (3) fitted with punches (2) is created by the cam (8).

Fig. 3 shows the row arrangement of direct punches (2) fixed under the angle □ = 45° into the continuous flexible belt (17) tightened between the top cylinder (18) and driven bottom cylinder (19).

Design examples:

Example 1

[0016] The equipment shown in Fig. 1 consists of the fold forming body created by the rotating body (4) with variable diameter, the surface of which is formed by punches (2) fitted into bars (3) guided in radial grooves of rotating grooved discs (7) fixed to the driving shaft (11) and shifted in the direction of grooved disc (7) diameters from the discs centres by cams (8) fixed by the fastener (14) to the frame (15) and shifted to the disc centres (7) by spring elements (9) so that the body (4) diameter increases to its maximal diameter in the first quadrant and decreases to its minimum diameter in the second quadrant. The bar transition from the minimum diameter to the minimum one is made in a jump to the quadrant I/II interface of the body (4). The pane assembly (10) is assigned in the first (I.) quadrant to the body (4), as well as guiding wires (12) and guiding metal sheet (13).

Example 2

[0017] The equipment shown in Fig. 2 shows the equipment design differing to the one in Fig. 1 only in the point that movements of bars (3) with punches (2) is actuated by the cam (8), which is designed as a grooved one and fixed to the frame (15) by the fastener(14). The bar (3) movement in the cam (8) groove is derived from grooved disc (7) rotation movements over the swing lever (16) mounted to the disc (7), which is fixed to the driving shaft (11).

Example 3

[0018] The equipment shown in Fig. 1 consists of an assembly of the direct punches (2) that are arranged under the angle □ = 45° into the continuous flexible belt (17) tightened between the top cylinder (18) and driven bottom cylinder (19). The line of cylinder (18 & 19) centres contains angle □ = 45° with the conveyor (6) level. When the belt (17) passes over the cylinder (19), the puch (2) rows are being open and, in this position, the web fabric (1) is being brought by the feeder (10) into the space created in the I. quadrant of the cylinder (19) boundaries of which are formed by the punches (2), guiding metal sheet (13) and guiding wires (12). In the II. quadrant of the cylinder (19) the bulky textile material (5) leaves the punches (2) in the direction vertical to the conveyor (6) level.

Industrial applications

[0019] The equipment can be utilised mainly in the textile industry in manufacturing processes of bulky and thermal insulation / filtration textile materials. The process permits to utilise maximum throughput capacities of fleece-making machines arranged to a manufacturing line.

Claims

1. The manufacturing process for equipment for bulky textile formations based on their forming into folds vertical to the product level and their compacting to the required density, identified by the fact that in places of compacting of vertically layered bulky textiles to such a density, pressures forming flat fabric formations into folds cease to be applied by from place to place in jumps.

2. The equipment for production of bulky textile configurations as set out in Point 1 above consisting of fold forming body, which represents a rotating body (4) fitted with punches and identified by the fact that punch (2) containing bars (3) pass through radial grooves of discs (7) fixed to the driving shaft (11), which rotates the grooved discs (7) and, consequently, the bars (3) round the shaft (11) centre line and where the bars (3) are controlled by cams (8) influencing radially orientated movements of the bars (3).

3. The equipment as set out in Point 2 above an identified by the fact that the movement of the bars (3) in the direction of radially rotating body (4) from its centre line is caused by the cam (8), while the movement towards the centre line is caused by the spring elements (9).

4. The equipment by Claim 1 identified by the fact that the punches (2) are arranged in rows under the angle β in a flexible continuous belt (17) tightened between cylinders (18) & (19) and sloping to the conveyor level (6) under angle □.

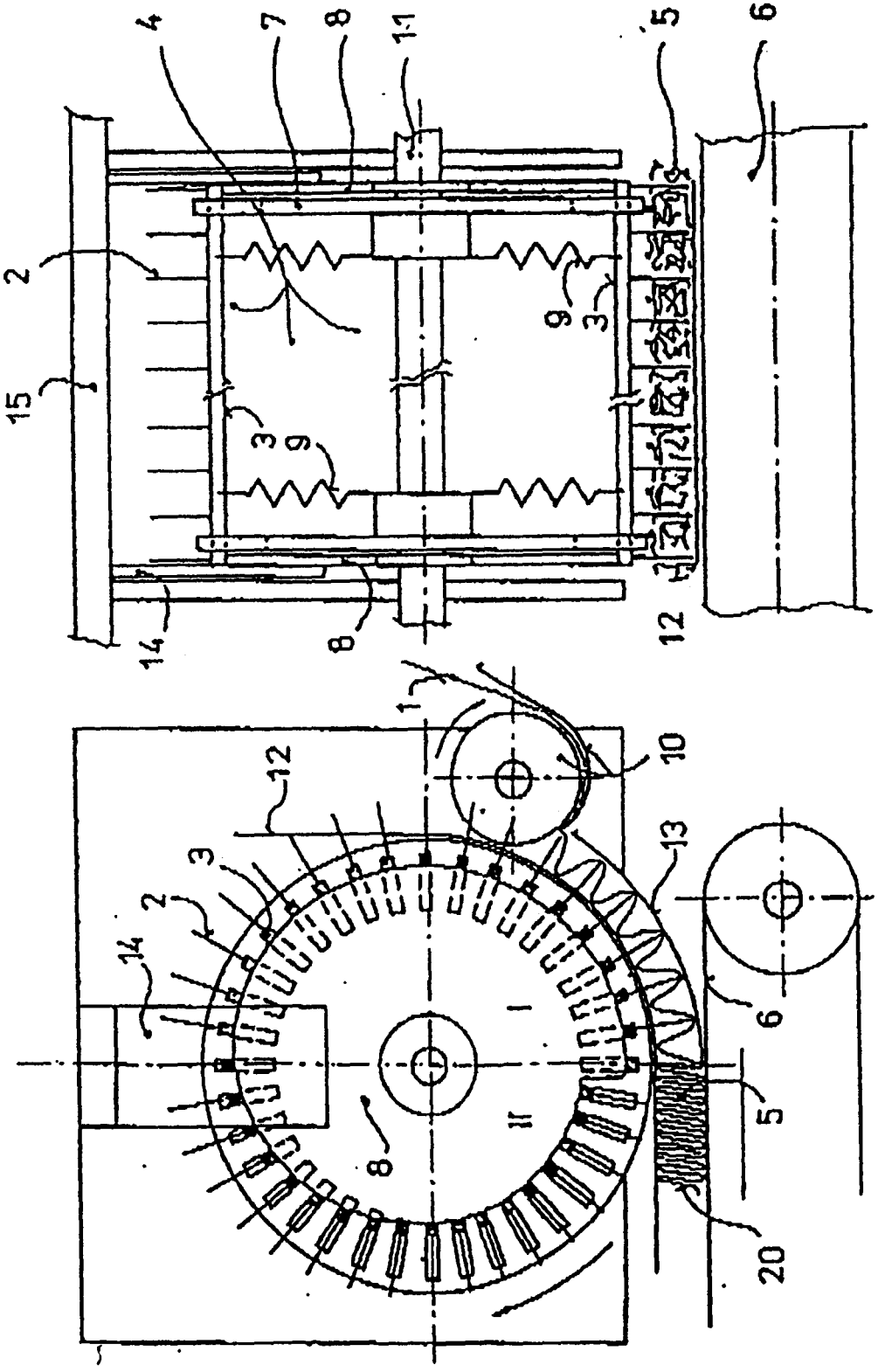

Fig. 1

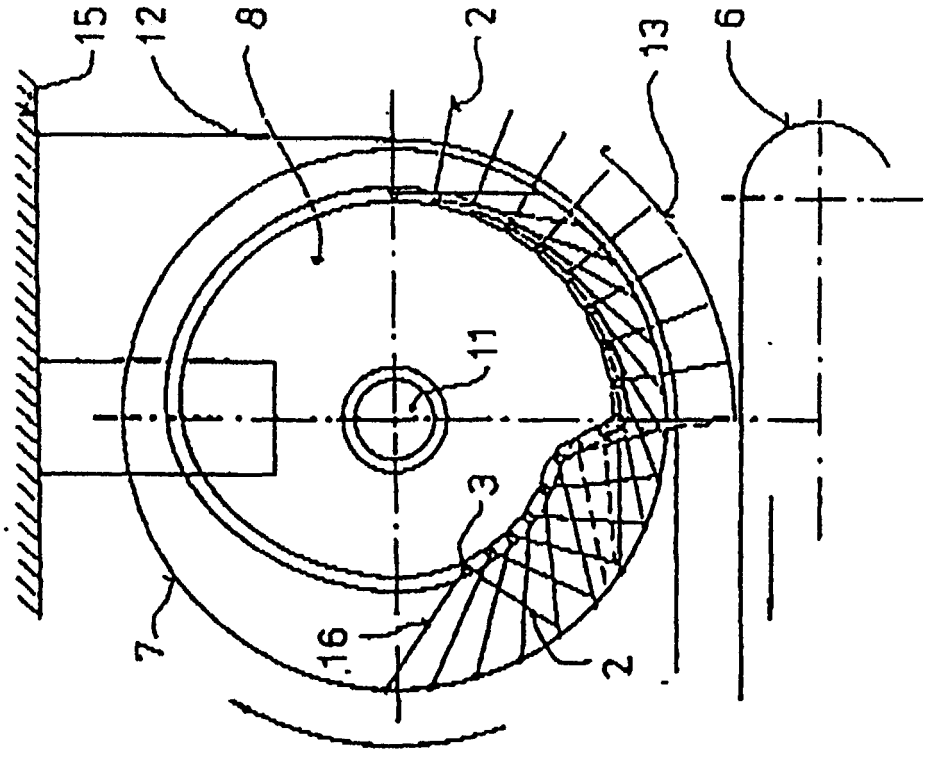

Fig. 2

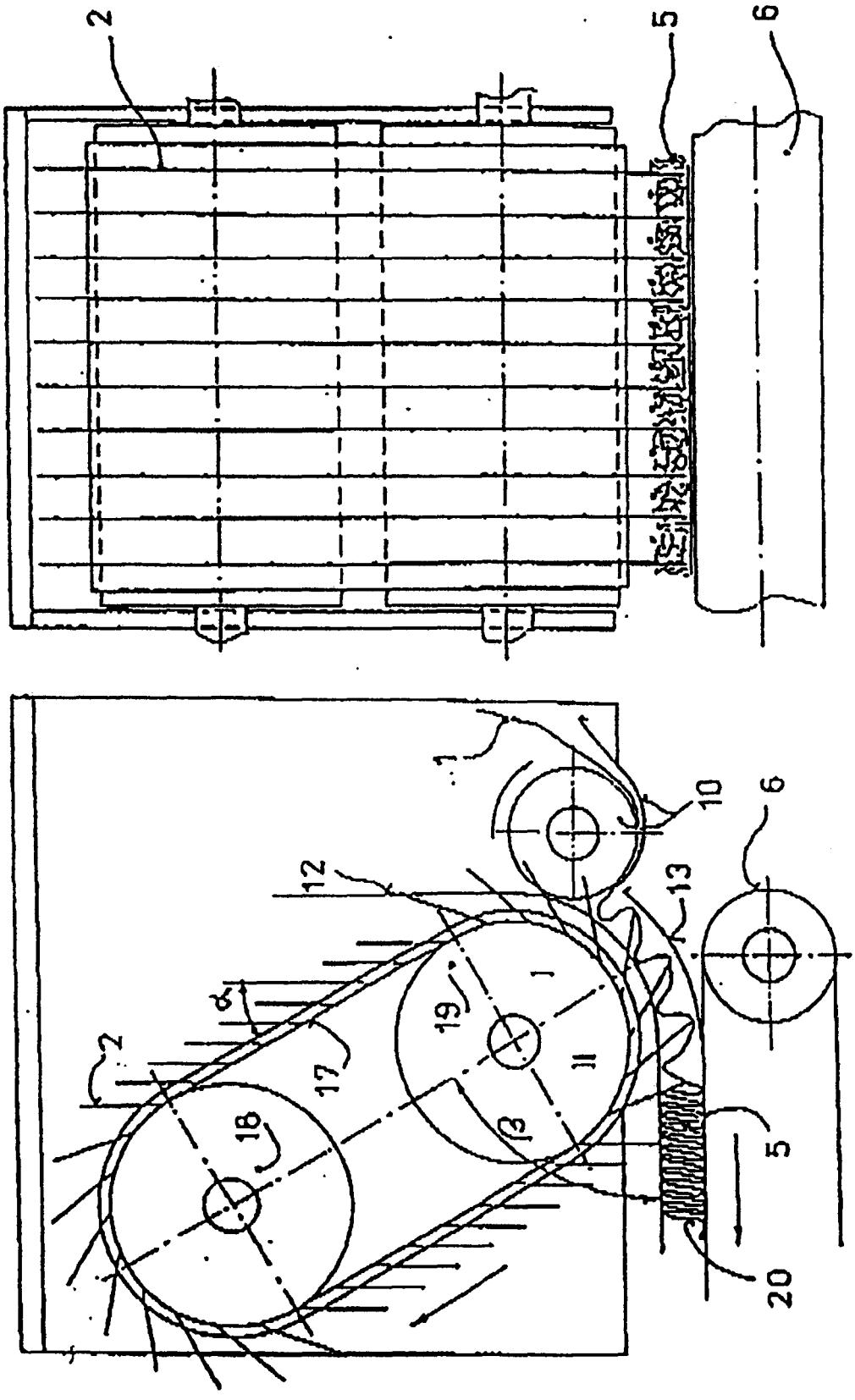

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 3666

DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 October 2000	V Beurden-Hopkins, S

CATEGORY OF CITED DOCUMENTS

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