

(19)



(11)

EP 2 195 479 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
17.08.2011 Bulletin 2011/33

(51) Int Cl.:
D04H 1/00 (2006.01) **D04H 1/72** (2006.01)
D01G 23/00 (2006.01)

(21) Application number: **08800454.4**

(86) International application number:
PCT/CH2008/000408

(22) Date of filing: **02.10.2008**

(87) International publication number:
WO 2009/043195 (09.04.2009 Gazette 2009/15)

(54) **FIBRES FEEDING DEVICE**

FASERZUFUHRVORRICHTUNG

DISPOSITIF D'ALIMENTATION EN FIBRES

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR**

(30) Priority: **03.10.2007 FR 0706949**

(43) Date of publication of application:
16.06.2010 Bulletin 2010/24

(73) Proprietor: **Rieter Technologies AG**
8406 Winterthur (CH)

(72) Inventor: **WEISKOPF, Charles**
F-60000 Beauvais (FR)

(56) References cited:
EP-A1- 1 437 435 GB-A- 2 183 683
US-A- 3 071 822 US-A- 4 168 959
US-A- 4 523 351 US-A- 5 213 817

EP 2 195 479 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The invention relates to a feeding device for advancing fiber material to a collecting device, such as a rotary drum, a collecting belt or product moulds.

[0002] In the automotive industry fiber felt materials are used in a broad range of products for sound insulation for instance in the doors, roof lining and particularly in the floor area. These products are formed and cut to fit the space. Furthermore certain areas of the product contain a higher amount of material to obtain a higher sound insulation. For instance at the underdash extra material is used to reduce noise from the vehicle engine. The added material is also needed in certain areas of the undercarpet or floors to increase the acoustic insulation locally. Felt products can be combined with a heavy layer material to form a spring mass system or with a air flow resistant layer to form an acoustic absorbent system.

[0003] These products need to have fiber free areas e.g. for fastening means, or to go around appliances in a vehicle and they have to follow a certain contour like the door or the floor to be placed exactly in the vehicle. Therefore the products are cut after the stiffening step. The scraps, left over after cutting, are of mixed material already set by a heating step. Most of these materials are therefore difficult to recycle. This is a real problem in the modern automotive industry.

[0004] Fiber-felt products are classically produced from preformed fiber mats containing binder fibers, which are pressed in a heated mould and cut to obtain the desired form and stiffness. A disadvantage of this method is that the grammage of the product depends on the fiber mat and is therefore restricted. Areas with a higher grammage can only be achieved by additionally supplying the material by hand. This is time consuming and very expensive. Furthermore because the fiber mats are delivered as a roll good or as pre-cut mats the production process is bound to render a lot of scrap material.

[0005] An other disadvantage of the use of preformed fiber mats is that they easily tear or break when they are pressed in more extreme contoured moulds.

[0006] Schlichter in the article "Alternative Anwendungen für Flockenspeiser" in Melliand Textilberichte (7-8/2001) suggested to use a lap-forming machine which is able to produce a profiled lap, whereby the profile lies in the direction of the width of the web formed. The lap is collected on a moving collecting belt and therefore the profile is only apparent in the width and not in the length of the web formed. To obtain such a width profile the feed tray comprises a plurality of small feed trays which are separately adjustable in their nipping distance to obtain a height profile in the lap formed. The disadvantage of the system is that it can only be adjusted before the production and not during production. Furthermore it only allows a profile in the width of the lap, resulting in a striped profile in the final lap produced. It is not possible to obtain a grammage difference in a local area or to obtain material free areas.

[0007] An other production method is directly blowing fibers in a mould. US3697208 or US20070007695 discloses a method where the mould is completely filled with the fibrous material. Also here the disadvantage is that the amount of locally different fibers grammage can only be set by making the moulds and the way the moulds are pressed together to obtain the final product. It is not possible to obtain open areas or gaps in the product.

[0008] EP 770154 discloses a system of at least one filling hose placed above the mould for the loading of the moulds with fiber material. The mould is placed on top of a vacuum air duct to confine the fibers to the mould. The fiber clusters are fed into each hose. Air tubes allow for a stream of air to be used to drive the clusters out of the hose or into the next gated section. To obtain areas of different density into one moulded product a programmable positioning device can be used to manipulate the mould fill hose. It can then be positioned in different areas of the mould and with time the amount of fibers can be regulated in each area. This can also be done with more than one hose per mould. The disadvantage of this system is a complex expensive machinery leaving not much room for a flexible process.

[0009] It is therefore an object of the invention to obtain fiber delivering device which is able to deliver fiber material in the quantity and on the area needed. The fiber delivering device can be used to produce nonwoven fiber web or laps, to fill moulds or to produce nonwoven fibrous product with a 3 Dimensional shape.

[0010] The object is achieved by the fiber delivering device according to claim 1, in particularly by deflecting the fiber flow in the direction of the collection device or in the direction of a recycling device the fibers are not blocked or condensed at any state before the final collection on the collecting device. Furthermore by dividing the width of the machine in small sectors each having means for directing the fiber flow in either the direction of the fiber collecting device for the final product or in the direction of a recycling device for later use of the "discarded" material again, it is possible to deliver fiber material in specific areas of the final product, in specified grammage or even to let out certain areas of the product. The product is not fixed to a mould but can also be in the form of a lap, a 3 Dimensional shaped mat or product. And can either be a continuous fiber material web with a 3 dimensional structure or can be discrete products.

[0011] A Fiber delivery device according to the invention comprises fiber feeding means, feeding fiber material via a carding or opening roll to fiber distribution means whereby the fiber distribution means are perpendicular to the collection means divided in a plurality of small fiber distribution means, which are build such that a continuous flow of fiber material can be directed either in the direction of the collection means or in a direction away from the collection means.

[0012] The small fiber distribution means can be either:

- a movable ejector nozzle, whereby the ejector nozzle

230a sprays fibers onto the collecting device 208 in a first position and sprays fibers away from the collecting device 208a in the second position, or

- a small chute separated from neighbouring small chutes by a wall, whereby the small chute contains a swivelling flap located such, that it can direct the fiber flow to the collecting device or away from the collecting device.

[0013] The fibers directed away from the collecting device can be directed to an recycling device, preferably in the form of a duct. The collecting means can be a moving perforated belt, or moving perforated plate or moving perforated mould or perforated rotary drum.

[0014] Vacuum means can be placed underneath the collecting means in line with the position where the fiber material will be placed by the distribution means.

[0015] In case the small fiber distribution means are small chutes they can contain at least 2 outlets, one directed to the collecting device and the other outlet directed to a recycling duct and the swivelling flap is located such that at least one of the outlets can be closed. Or the small chute can contain at least 2 outlets, one outlet directed to the collecting device and the other outlet directed to a recycling duct and the swivelling flap is located such that upon opening of one outlet the other outlet is closed simultaneously.

[0016] The small fiber distribution means can have each pneumatic attenuation means and can each individually be controlled by a PLC.

[0017] A first device according to the invention contains a first main chute with means for feeding fiber material to a second chute feed section. The second chute feed section is in its width divided in sections. These sections are separated with walls to obtain a plurality of small chutes. The feeding means are located just above these small chutes and the material flow is automatically divided in smaller fiber flows due to these separating walls. Each of these small chutes contains two channels, one directed to the fiber collection device and the other directed to a recycling device. At the crossing of the two channels, where the two channels separate to follow different directions, a swivelling flap is located such that it can close at least one of the channels. This swivelling flap can guide the fiber flow either in the direction of the collecting device or away from the collection device in the direction of the recycling device. Instead of channels it is also feasible to have at least 2 outlets.

[0018] The recycling device can be just a large bin or box for discarding the fiber material, but it can also be a duct system with a ventilator, preferably the duct system is connected with the first main chute.

[0019] Although a simple open/close system of the small chutes with only one outlet which can be open or closed with a valve would be an option. The system with at least two outlets and a swivelling flap is more preferred, having the advantage that at no time during the process the fiber material stands and get compressed unneces-

sary. This has the additional advantage that the flaps can not be blocked by plugs of fibers. Therefore a more even density distribution of the material flow over the whole width of the product is assured.

[0020] To be able to control the direction of the fiber material flow in each of the small chute the swivelling flaps are controlled. The swivelling motion can be done by hydraulic or pneumatic means known in the art. These means for the swivelling motion can be controlled and regulated. Preferably a computer control system is connected to each of the swivelling flaps, to enable to control the position of the flaps and the timing when the position has to be changed. By controlling each flap separately it is possible to control the amount of fiber material and the place of the fiber material relative to the product or fiber mat.

[0021] Due to the plurality of small chutes the width of the collecting device is divided in small areas, the length and width of these areas are dependent on the width and length of the small chutes. The total number of areas in the width direction parallel to the main chute is the same as the total number of small chutes.

[0022] By controlling the swivelling flaps and therefore the direction of the fiber flow it is possible to feed through each small chute "no fibers" or a certain amount of fiber material dependent on the time the fiber flow is directed to the collecting device and the fiber flow rate of the fiber feeding means. The fiber flow rate is defined by the feeding means which delivers fiber material to all small chutes at the same time. So for instance the collection device is a continuous moving flat perforated belt and all flaps are set such that the fiber flow is in the direction of this belt, than the result would be a normal nonwoven lap or web with an even distribution of the fibers over the width and length of the web. (length is in the direction of the moving belt).

[0023] It would also be possible to move the belt discontinuously in a step wise fashion. The step can copy the length of the small chutes. If the swivelling flaps are then controlled to direct the fiber flow to the collecting device in a discontinuous flow than this can be regarded as portioning of the fiber material. In case of a moving belt this would mean that it is possible to put discrete portions of fibres material in discrete areas on the belt. Dependent on the step wise movement of the belt these discrete portions are separate or overlap. To create an area without fiber material it is only necessary to direct the fiber material during a certain time period away from the collection device.

[0024] Using this system it is possible to obtain areas with no fibres material, fiber flow is directed away from the collecting device, or a defined amount of material, by timing the fiber flow directed to the collecting device in relation to the movement of the collecting device underneath the fiber delivering device.

[0025] A second alternative device according to the invention can have, instead of static small chute with a swivelling flap each to direct the fiber material either to

or away from the collecting device, a plurality of ejector nozzles distributed transversely with respect to the direction of travel of the collection device, whereby each of the ejector nozzle is movable between a first position in which said nozzle sprays fibers onto said collecting device and a second position in which said nozzle sprays fibers away from said collecting device. In one particular embodiment, the device for producing a web of nonwoven fibers comprises a recycling device for recycling fibers sprayed by ejector nozzles that are in the second position.

[0026] The device for producing a web of nonwoven fibers advantageously comprises a reprocessing device for returning fibers recycled by the recycling device to the fiber feed device.

[0027] The invention also provides a process for producing a web of nonwoven fibers, comprising:

- a step of moving a collecting device past a fiber feed device comprising a plurality of ejector nozzles distributed transversely with respect to the direction of travel of the collecting device;
- a step of spraying fibers continuously through said plurality of ejector nozzles; and
- for each ejector nozzle, steps of movement between a first position in which the fibers are sprayed onto said collecting device and a second position in which the fibers are not sprayed onto said collecting device and vice versa.

[0028] Advantageously, each step of movement between the first position and the second position is followed by a fiber recycling step.

[0029] Advantageously, fibers recycled in the fiber recycling step undergo a step of transportation to the fiber feed device.

[0030] The invention also provides a web of nonwoven fibers produced by a production process according to one of the preceding variants.

- Figure 1. Schematic side view of the fibre distribution device according to the invention following the first alternative;
- Figure 2. A-A' front view of the fibre distribution device according to the invention;
- Figure 3. Alternative solution for the placement of the swivelling flap;
- Figure 4. shows an example of a web of nonwoven fibers according to the invention;
- Figure 5. Schematic view of a device for producing a web of nonwoven fibers according to the invention following the second alternative;
- Figure 6. Schematic drawing of the device for producing a web of nonwoven fibers according to the invention following the second alternative;
- Figure 7. Schematic diagram for the production of a complex 3 dimensional product.

[0031] The fibre distribution device is now explained with help of the front and side view in figures 1 and 2 following the first alternative.

[0032] The fibre distribution device according to the invention comprises an main chute (1) for storing the fibre material. This chute can have the usual appliances for obtaining an homogeneous fibre mass as known in the art, like for instance a back wall, which moves back and forth, or a perforated back wall with an aeration system (not shown). The homogenous fiber mass is then fed to a carding- or opening roll (3) by two feeding rolls (2). Other feeding means for transporting fiber material known in the art, like for instance a feeding roll - tray combination, can also be used. The carding or opening roll is used for the final dedensification of the fiber mass. Normally the fibers are delivered in compacted fiber bales. Therefore the fibers are more in clusters than loose fiber material. The opening roll opens these clusters, giving a more even fiber material. Furthermore it is possible to mix binder fibers with the basic fiber material. Then the carding- opening roll functions additionally as a mixing device.

[0033] The loose fiber material is thrown from the carding roll into the lower chute (10). This lower chute is in the width of the machine divided in smaller section (9), each section is separate from the neighbouring section with a wall, forming in a plurality of small chutes. Each of these chutes (9) has at least 2 outlets one is connected to the recycling duct (5) and the second outlet (6) is directed to a collecting device, here in the form of a perforated moving belt (8) with a suction device (7) underneath the belt, placed directly opposite the outlets (6) of the small chutes. The collecting device moves in a direction perpendicular to the width (W) of the fiber delivery device, this direction is called the length of the fiber web or the product produced. Basically the width W is restricted to the width of the fiber delivery device, however the length L is not restricted and depends on the product or web produced.

[0034] A swivelling flap (4) is situated between the two outlets (5, 6) such that it can guide the fiber stream either in the direction of the recycling duct (6) or in the direction of the collecting device (5). In a first embodiment the flap is mounted to the upper wall of the duct and can swivel such that the channel to the recycling duct is open or closed. The recycling duct is connected to a ventilator to obtain a suction power evenly spread over the whole width of the channel. If the flap opens the channel to the recycling duct this suction power will be such that the fibers released from the carding roll are sucked into the channel instead of falling into the outlet duct directed to the collecting device. If the flap closes the channel to the recycling duct the suction power is stopped and the fibers will fall/are directed into the duct or outlet directed to the collecting device. Alternatively the flap can be situated in the corner between the outlet directed to the recycling duct and the outlet directed to the collection device (figure 3) in this situation the swivel point is in the middle of the

flap, at the same time opening one duct and closing the other duct.

[0035] In both cases each of the flaps is connected to its own pneumatic means for controlling and making the swivelling movement of the flap.

[0036] The fibers will be gathered on a collecting device (8). This can be a moving perforated belt (as shown) or a rotary drum. The surface of the collecting device can be either flat or have a surface in the form of moulds. Underneath the collecting surface located directly under the fiber delivering device a vacuum duct (7) is placed to keep the fiber material on the collecting surface and prevent the fibers from being blown away.

[0037] Preferable the carding roll has a saw tooth wire with large tooth (11). In one preferred embodiment the saw tooth is placed such that it function as a screw and pushes the fiber material to side making an easy and even access to the small chutes possible.

[0038] The control of the direction of the fibre stream has the advantage that a discrete amount of fiber material can be placed on a specific part of the surface of the collecting device. A fiber distribution device divided in X smaller chutes over the total width of the machine, would equal X discrete areas on the collection device underneath the outlets, where a discrete amounts of fiber material can be dropped. Over the width each of the flaps can be set separately to either distribute the fibers to the collecting device or to the recycling duct, therefore of the X positions there can be certain which are empty or which receive an amount of material.

[0039] Figure 7 show a typical controlling plan for the step wise production of a 3 dimensional product. The total area of the collecting device is divided in small square whereby each square equal the width W' and length L' of the small chutes. If a square is empty this is to indicate no fiber material, and corresponds to a signal to the analogue small chute flap to direct the material away from the collecting device for instance to the recycling device. The amount of fiber material is given in each square where material is needed, this corresponds to the time the material flow is directed to the collecting belt.

[0040] In the direction of the moving collecting device perpendicular to the width of the fiber delivering device the length is divided in rows, each row is achieved by a stepwise movement of the collecting device. This stepwise movement is dependent on the length of the small chutes, the amount of overlap of the rows needed. When a stepwise movement occurs, is dependent on the time a row needs, which is dependent on the time needed by a small chute to deliver the largest amount of fiber necessary in that row. By this flexible way of controlling the movement of the collection device and the fiber flow direction in time, it is possible to obtain a fiber web in the form of the wanted product with variable densities throughout the product and even with areas without fiber material. It is even possible to have these fiber free areas in the middle of the product and not only at the border.

[0041] Figure 4 shows an example of web of nonwoven

fibers 220 bounded by an outline 402 that includes a re-entrant portion 408, a hole 404, and a reduction in thickness 406.

[0042] Fig. 5 shows a second alternative device according to the invention for producing a web of nonwoven fibers 200..

[0043] The device for producing a web of nonwoven fibers 200 comprises:

- a fiber feed device 124;
- a collecting device 208
- a suction device.

[0044] The collecting device 208 is supplied with fibers by the fiber feed device 124. It is movable relative to the fiber feed device 124 and contains perforations. The collecting device 208 moves in the direction represented by arrow 210. The movement of the collecting device 208 distributes the fibers so that they do not accumulate in one place. In another embodiment the collecting device 208 could be stationary while the fiber feed device 124 moves. The suction device is designed to draw air through the perforations and so press the fibers against the collecting device 208. This device can be the same for both alternative solutions.

[0045] The feed device 124 comprises a plurality of ejector nozzles 230a, 230b distributed transversely perpendicular) with respect to the direction of travel 210 of the collecting device 208 and each ejector nozzle 230a, 230b is movable between a first position 230a and a second position 230b. Each nozzle 230a, 230b can therefore position itself in either the first or second position, and can do so independently of the others.

[0046] Each ejector nozzle 230a which is in the first position sprays fibers onto the collecting device 208 and each ejector nozzle 230b which is in the second position sprays fibers away from the collecting device 208. In other words, only fibers sprayed by ejector nozzles 230a which are in the first position reach the collecting device 208 and agglomerate to form the web of nonwoven fibers 220.

[0047] The position of each ejector nozzle 230a, 230b is controlled by a positioning means such as a pneumatic actuator or a servomotor. A control unit controls each positioning means in accordance with the desired position of the ejector nozzle 230a, 230b to which it is connected.

[0048] By controlling the position of each ejector nozzle 230a, 230b, it is possible to modify the quantity of fibers sprayed onto the collecting device 208 in front of each nozzle 230a, 230b, and thereby produce a web 220 of variable thickness. That face of the web 220 which is against the collecting device 208 is flat, while the other face of the web 220 exhibits variations of height, each corresponding to a variation of thickness of the web 220.

[0049] Fig. 6 shows a web 220 comprising a reduction in thickness 310 brought about by positioning the corresponding ejector nozzle in the first position for a certain

period and in the second position after the end of this period.

[0050] The speed of travel of the collecting device 208 and the flow rate of the fibers through the ejector nozzles 230a, 230b must be matched to each other in such a way as to produce the maximum desired thickness. The speed of travel of the collecting device 208 is made dependent on the fiber flow rate in order to achieve a preferred fiber grammage on the collecting device 208.

[0051] Webs 220 of variable widths can also be produced by setting the outer ejector nozzles in the second position.

[0052] Thus, in the case of web 220 in fig. 6, the reduction in thickness 406 is achieved by spraying fibers for a period less than that necessary to produce a greater thickness through the ejector nozzle or nozzles located approximately in the center of the collecting device 208. The hole 404 is similarly produced by deflecting all of the fibers sprayed by the relevant ejector nozzle or nozzles away from the collecting device 208. The re-entrant portion 408 is itself created by deflecting all of the fibers sprayed by the relevant ejector nozzle or nozzles away from the collecting device 208.

[0053] In order to ensure that fibers ejected by the ejector nozzles 230b which are in the second position are not wasted, the production device 200 comprises a recycling device 302 for recycling said fibers. In the present case the recycling device 302 is in the form of a funnel.

[0054] To re-inject the recycled fibers into the fiber feed device 124, the production device 200 comprises a re-processing device for returning fibers recycled by the recycling device 302. The fibers thus follow arrow 304 which represents the reprocessing device.

[0055] In one particular embodiment, the production device 200 comprises boundary walls 232 placed on the collecting device 208. These boundary walls 232 help to maintain the structure of the web 220 before it has undergone post-treatment to give it mechanical strength. The boundary walls 232 are set approximately orthogonally to the collecting device 208 and preferably form a closed loop.

[0056] The post-treatment device may be a heating tunnel in which hot air acts on the binder. Once stiffened, the web of nonwoven fibers 220 is moulded using pressure and heat to give it its final shape.

[0057] The principle of operation of the production device 200 of the invention will now be described (Figure 6). On leaving the fiber hopper 102, the fibers 120a are directed to the two rollers 104 rotating in the directions of the arrows 114, which form the distribution device or feeding means. The fibers 120b leaving the distribution device then pass onto the card roll 106 which opens them. On leaving the card roll 106, the fibers 120b are distributed to the various ejector nozzles 230a, 230b and are ejected by these ejector nozzles, either towards the collecting device 208 or away from it.

[0058] This spraying of fibers by all the ejector nozzles 230a, 230b, even if some are directed away from the

collecting device 208, has another advantage over the practice of opening and closing each ejector nozzle according to demand. The problem with closing the ejector nozzles is that it increases the pressure on the fibers inside the closed ejector nozzles, and can cause clogging. Furthermore every time the nozzle open again a condensed fiber material plug will be sprayed in stead of loose fiber material.

[0059] As explained above, the process for producing the web of nonwoven fibers 220, comprises:

- a step of moving the collecting device 208 past the fiber feed device 124 comprising a plurality of ejector nozzles 230a, 230b distributed transversely with respect to the direction of travel of the collecting device 208;
- a step of spraying fibers continuously through the plurality of ejector nozzles 230a, 230b; and
- for each ejector nozzle 230a, 230b, steps of movement between a first position in which the fibers are sprayed onto the collecting device 208 and a second position in which the fibers are not sprayed onto the collecting device 208 and vice versa.

[0060] In one particular embodiment of the invention, each step of movement between the first position and the second position is followed by a fiber recycling step.

[0061] Advantageously too, fibers recycled in the fiber recycling step undergo a step of transportation to the fiber feed device 124.

[0062] The process produces webs 220 in three dimensions by modulation of the quantity of fibers sprayed onto a particular location on the collecting device 208.

[0063] This production process can be followed by moulding the web 220 with applied pressure and heat, in the course of which certain parts of the web 220 are compressed to a greater or lesser extent in order to vary the density of certain locations on the basis of where the noise sources are.

[0064] Figure 7 shows a schematic diagram of the way the control and the production of a discrete product with areas with different grammage of fiber material or no fiber material. Dark areas are areas with high grammage, grey areas are product areas with normal grammage and white areas are fiber free areas. Comparable with the product in figure 4 the re-entrant portion 408 and the outline 402 are lined with white areas and the area with the reduction in thickness 406 would be grey.

[0065] The Width W of the product is equivalent with the width of the fiber distribution device (12), the small chutes (9) are shown schematically to understand the principle of the fiber distribution method. The surface of the collection device is moving in direction L. Following is an example for discontinuous stepwise process which can have following steps. The collecting surface is moved for a distance L' in direction L. L' is around the same distance as the length of the small chutes (9), to obtain an empty surface underneath the distribution device. The

swivelling flaps are set to either direct the fiber material to the collecting surface or to direct the fiber material away from the surface. After a certain amount of time small chutes delivering the fiber material to the collecting belt can be redirected to stop the fiber material flow to the collecting surface, while neighbouring chute still deliver. This will create local areas with a higher grammage of material. Finally all fiber flows are directed away from the collecting surface. The surface is moved again over a length of L' .

[0066] In practise it can be useful to move the collecting surface over a distance larger than L' to create a break for instance between products. Depending on the fiber material the fibers will stick or fall in the form of a mountain with a peak. Therefore it can also be an advantage to move over a slightly smaller distance than L' to create a slight overlap and to compensate.

[0067] It is not always necessary to direct all fiber flows away from the collecting surface. A continuous movement of the collecting surface during the distribution of the fiber material on the surface can result in a more gradual profile of grammage.

[0068] A computer control panel can mirror the diagram of figure 7 with a possibility to set the wanted amount of fiber material in each individual area in advance.

[0069] By using the device and process according the invention it is possible to obtain products with different grammage areas or fiber free areas throughout the product, to follow the wanted outer contours of the product and therefore to minimise the cutting step after the product formation. Reducing the process steps during the process and the total amount of waste scrap material.

[0070] The invention is not of course limited to the examples and embodiments described and illustrated but can be the subject of numerous variants accessible to a person skilled in the art. Aspects only disclosed in combination with one variant can be used also with the other variant according to the invention staying in the general scope of the invention as such.

Claims

1. Fiber delivery device comprising fiber feeding means, feeding fiber material via a carding or opening roll to fiber distribution means **characterized in that** the fiber distribution means are perpendicular to the collection means and divided in a plurality of small fiber distribution means, which are built such that a continuous flow of fiber material can be directed either in the direction of the collection means or in a direction away from the collection means.
2. Fiber delivery device according to claim 1, whereby the small fiber distribution means is a movable ejector nozzle, whereby the ejector nozzle 230a sprays fibers onto the collecting device 208 in a first position

and sprays fibers away from the collecting device 208a in the second position.

3. Fiber delivery device according to claim 1, whereby the small fiber distribution means is a small chute separated from neighbouring small chutes by a wall, whereby the small chute contains a swivelling flap located such, that it can direct the fiber flow to the collecting device or away from the collecting device.
4. Fiber delivery device according to one of the preceding claims, whereby the fibers directed away from the collecting device are directed to an recycling device, preferably in the form of a duct.
5. Fiber delivery device according to one of the preceding claims whereby the collecting means is a moving perforated belt, or moving perforated plate or moving perforated mould or perforated rotary drum.
6. Fiber delivery device according to one of the preceding claims whereby vacuum means are placed underneath the collecting means in line with the position where the fiber material will be placed by the distribution means.
7. Fiber delivery device according to claim 3 whereby the small chute contains at least 2 outlets, one directed to the collecting device and the other outlet directed to a recycling duct and the swivelling flap is located such that at least one of the outlets can be closed.
8. Fiber delivery device according to according to claim 3 whereby the small chute contains at least 2 outlets, one outlet directed to the collecting device and the other outlet directed to a recycling duct and the swivelling flap is located such that upon opening of one outlet the other outlet is closed simultaneously.
9. Fiber delivery device according to one of the claims whereby the small fiber distribution means have each pneumatic attenuation means and are each individually controlled by a PLC.

Patentansprüche

1. Faserfördervorrichtung umfassend Mittel für die Fasereinspeisung, die Fasermaterial über eine Karde- oder Öffnungswalze für die Faserverteilungsmittel zuführt, **dadurch gekennzeichnet, dass** die Faserverteilungsmittel zu den Sammelmitteln senkrecht angeordnet und in eine Vielzahl von kleinen Faserverteilungsmitteln unterteilt sind, welche derart aufgebaut sind, dass ein durchgehender Strom von Fasermaterial entweder in Richtung auf die Sammelmittel oder in einer Richtung von den Sammelmitteln

weggeleitet werden kann.

2. Faserfördervorrichtung nach Anspruch 1, wobei das kleine Faserverteilungsmittel eine bewegbare Ausstoßdüse ist, wobei die Ausstoßdüse 230a in einer ersten Position Fasern auf die Sammelvorrichtung 208 sprüht und in der zweiten Position Fasern von der Sammelvorrichtung 208a wegsprüht. 5
3. Faserfördervorrichtung nach Anspruch 1, wobei das kleine Faserverteilungsmittel eine kleine Rinne ist, die von benachbarten kleinen Rinnen durch eine Wand getrennt ist, wobei die kleine Rinne eine Drehklappe enthält, die derart angeordnet ist, dass sie den Faserstrom auf die Sammelvorrichtung oder von der Sammelvorrichtung weggleiten kann. 10
4. Faserfördervorrichtung nach einem der vorhergehenden Ansprüche, wobei die Fasern, die von der Sammelvorrichtung weggeleitet werden, auf eine Wiederverwertungsvorrichtung, bevorzugt in Form eines Rohrs, geleitet werden. 20
5. Faserfördervorrichtung nach einem der vorhergehenden Ansprüche, wobei das Sammelmittel ein sich bewegendes perforiertes Band oder eine sich bewegendes perforierte Platte oder eine sich bewegendes perforierte Form oder eine perforierte Drehtrommel ist. 25
6. Faserfördervorrichtung nach einem der vorhergehenden Ansprüche, wobei Vakuummittel unter den Sammelmitteln angeordnet sind, und zwar auf die Position ausgerichtet, in der das Fasermaterial von den Verteilungsmitteln angeordnet wird. 30
7. Faserfördervorrichtung nach Anspruch 3, wobei die kleine Rinne mindestens 2 Auslässe enthält, wobei einer auf die Sammelvorrichtung gerichtet ist und der andere Auslass auf ein Wiederverwertungsrohr gerichtet ist, und die Drehklappe derart angeordnet ist, dass mindestens einer der Auslässe geschlossen werden kann. 40
8. Faserfördervorrichtung nach Anspruch 3, wobei die kleine Rinne mindestens 2 Auslässe enthält, wobei ein Auslass auf die Sammelvorrichtung gerichtet ist und der andere Auslass auf ein Wiederverwertungsrohr gerichtet ist, und die Drehklappe derart angeordnet ist, dass beim Öffnen eines Auslasses der andere Auslass gleichzeitig geschlossen wird. 50
9. Faserfördervorrichtung nach einem der Ansprüche, wobei die kleinen Faserverteilungsmittel jeweils pneumatische Dämpfungsmittel aufweisen und jeweils einzeln von einer PLC gesteuert werden. 55

Revendications

1. Dispositif d'alimentation en fibres comprenant des moyens d'alimentation en fibres, acheminant un matériau fibreux via un rouleau de cardage ou d'ouverture à des moyens de distribution de fibres, **caractérisé en ce que** les moyens de distribution de fibres sont perpendiculaires aux moyens collecteurs et divisés en une pluralité de petits moyens de distribution de fibres, qui sont conçus de sorte qu'un flux continu de matériau fibreux puisse être dirigé dans la direction des moyens collecteurs ou dans une direction s'écartant des moyens collecteurs.
2. Dispositif d'alimentation en fibres selon la revendication 1, dans lequel le moyen de distribution de fibres est une buse d'éjection mobile, dans lequel la buse d'éjection 230a projette des fibres sur le dispositif collecteur 208 dans une première position et projette des fibres en les écartant du dispositif collecteur 208a dans la seconde position.
3. Dispositif d'alimentation en fibres selon la revendication 1, dans lequel le petit moyen de distribution de fibres est une petite goulotte séparée des petites goulottes voisines par une paroi, dans lequel la petite goulotte comporte un volet pivotant situé de sorte qu'il puisse diriger l'écoulement de fibres vers le dispositif collecteur ou les écarter de celui-ci.
4. Dispositif d'alimentation en fibres selon l'une quelconque des revendications précédentes, dans lequel les fibres écartées du dispositif collecteur sont dirigées vers un dispositif de recyclage, de préférence sous la forme d'un conduit.
5. Dispositif d'alimentation en fibres selon l'une quelconque des revendications précédentes, dans lequel le moyen collecteur est une bande perforée mobile, une plaque perforée mobile, un moule perforé mobile ou un tambour rotatif perforé.
6. Dispositif d'alimentation en fibres selon l'une quelconque des revendications précédentes, dans lequel des moyens sous vide sont disposés en dessous des moyens collecteurs alignés avec la position où le matériau fibreux sera placé par les moyens de distribution.
7. Dispositif d'alimentation en fibres selon la revendication 3, dans lequel la petite goulotte contient au moins 2 sorties, l'une dirigée vers le dispositif collecteur et l'autre dirigée vers un conduit de recyclage et le volet pivotant est placé de sorte qu'au moins l'une des sorties puisse être fermée.
8. Dispositif d'alimentation en fibres selon la revendication 3, dans lequel la petite goulotte contient au

moins 2 sorties, l'une dirigée vers le dispositif collecteur et l'autre dirigée vers un conduit de recyclage et le volet pivotant est placé de sorte qu'à l'ouverture d'une sortie, l'autre sortie soit fermée simultanément.

5

9. Dispositif d'alimentation en fibres selon l'une quelconque des revendications précédentes, dans lequel les petits moyens de distribution de fibres ont chacun des moyens d'atténuation pneumatiques et sont chacun individuellement commandés par un PLC.

10

15

20

25

30

35

40

45

50

55

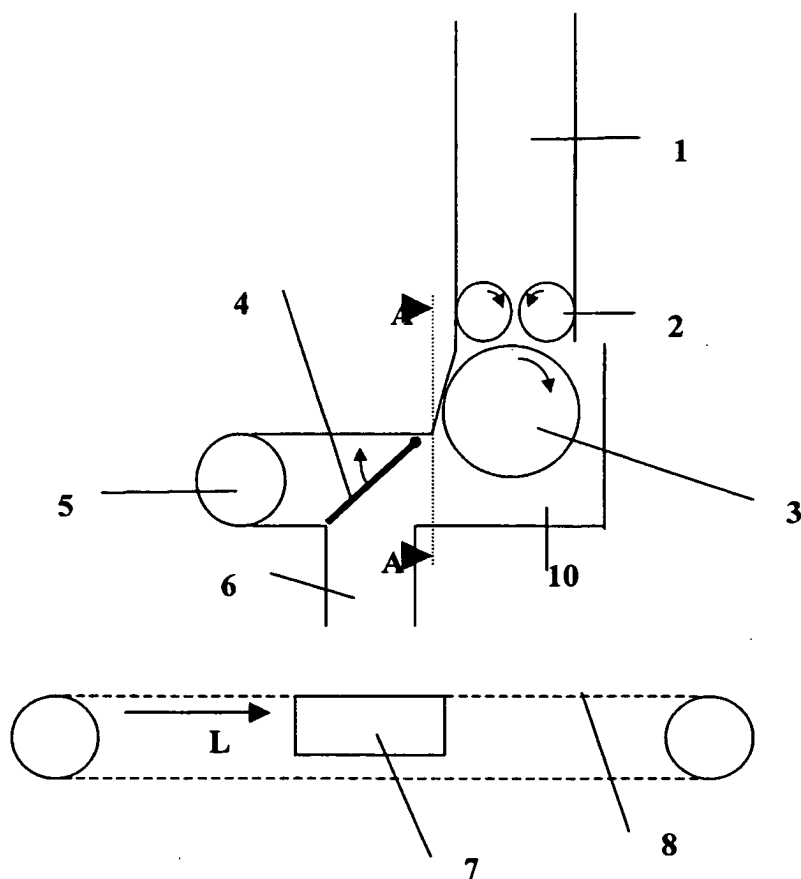
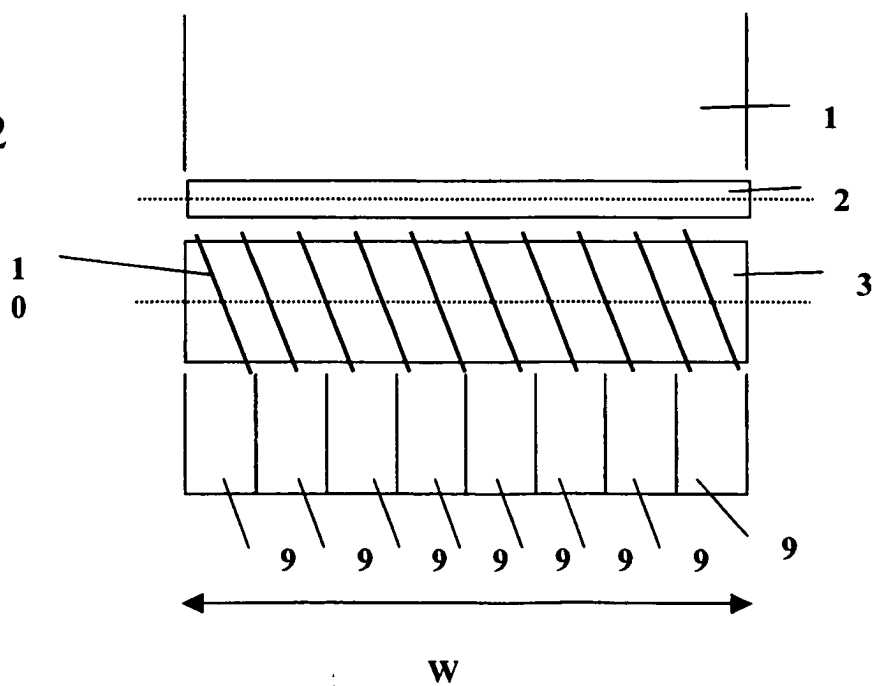
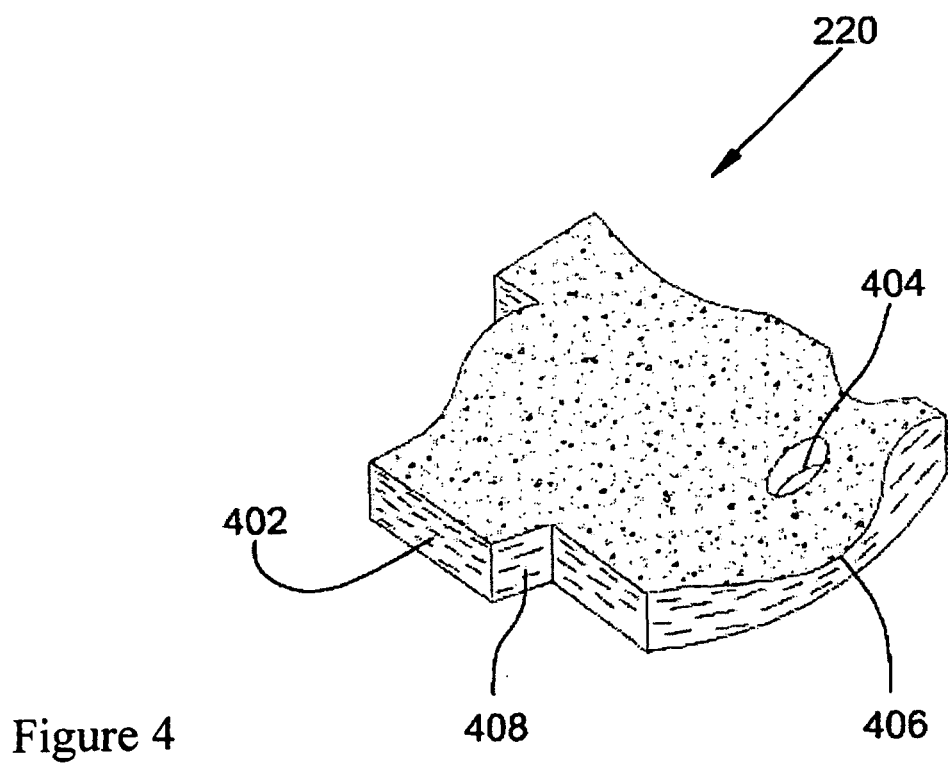
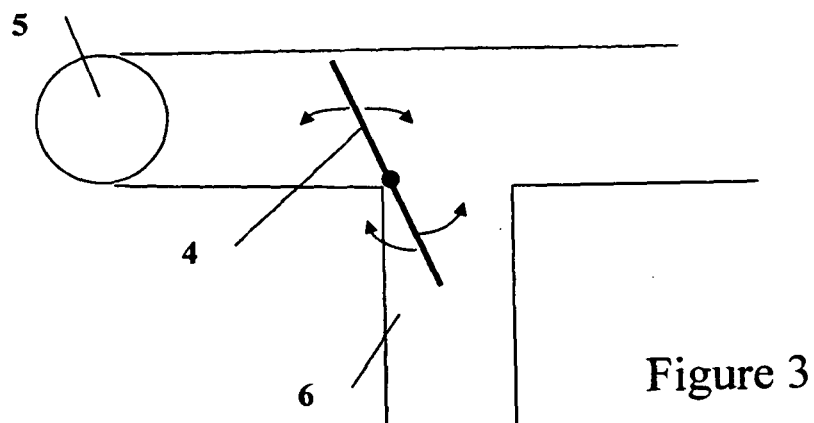


Figure 2





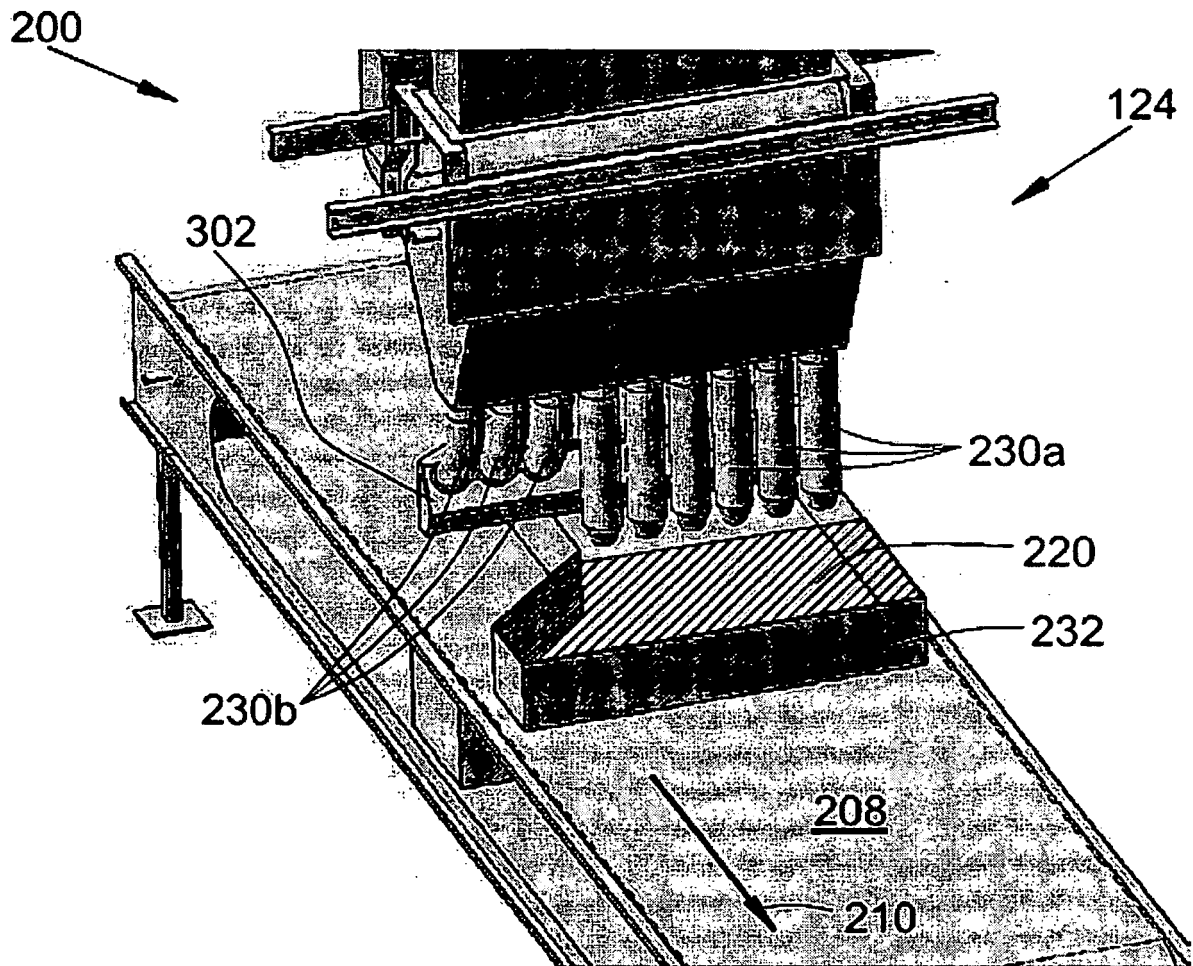


Figure 5

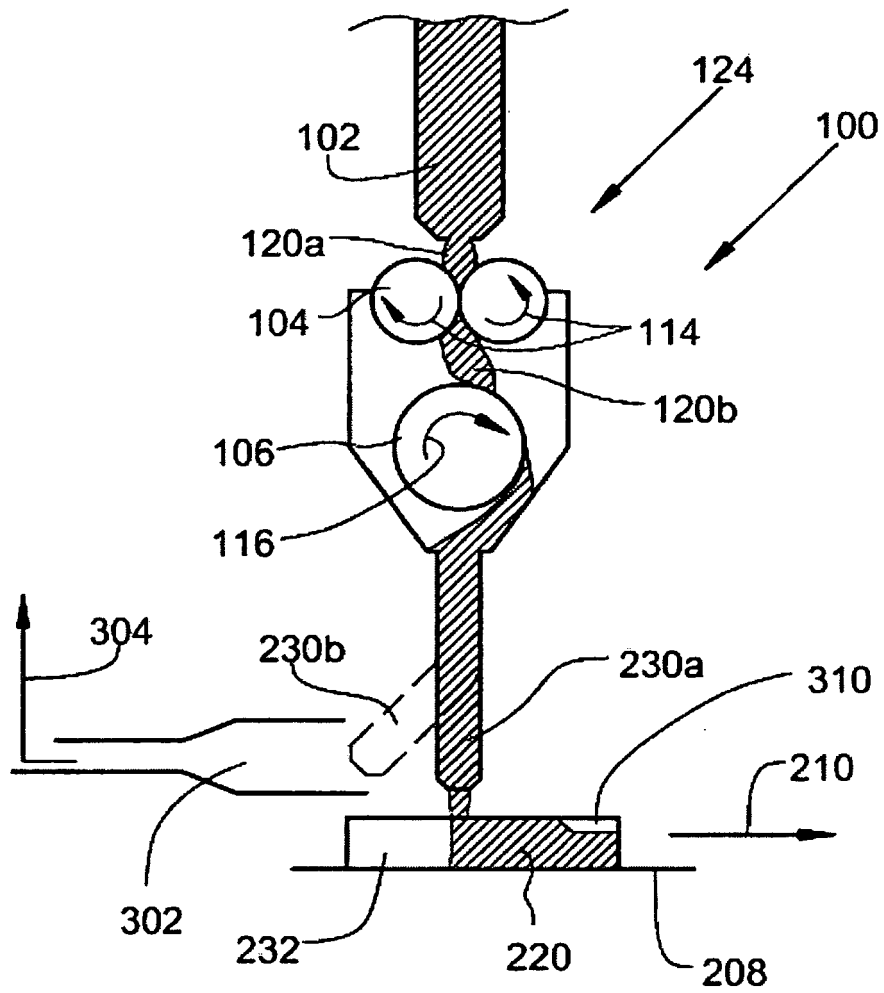


Figure 6

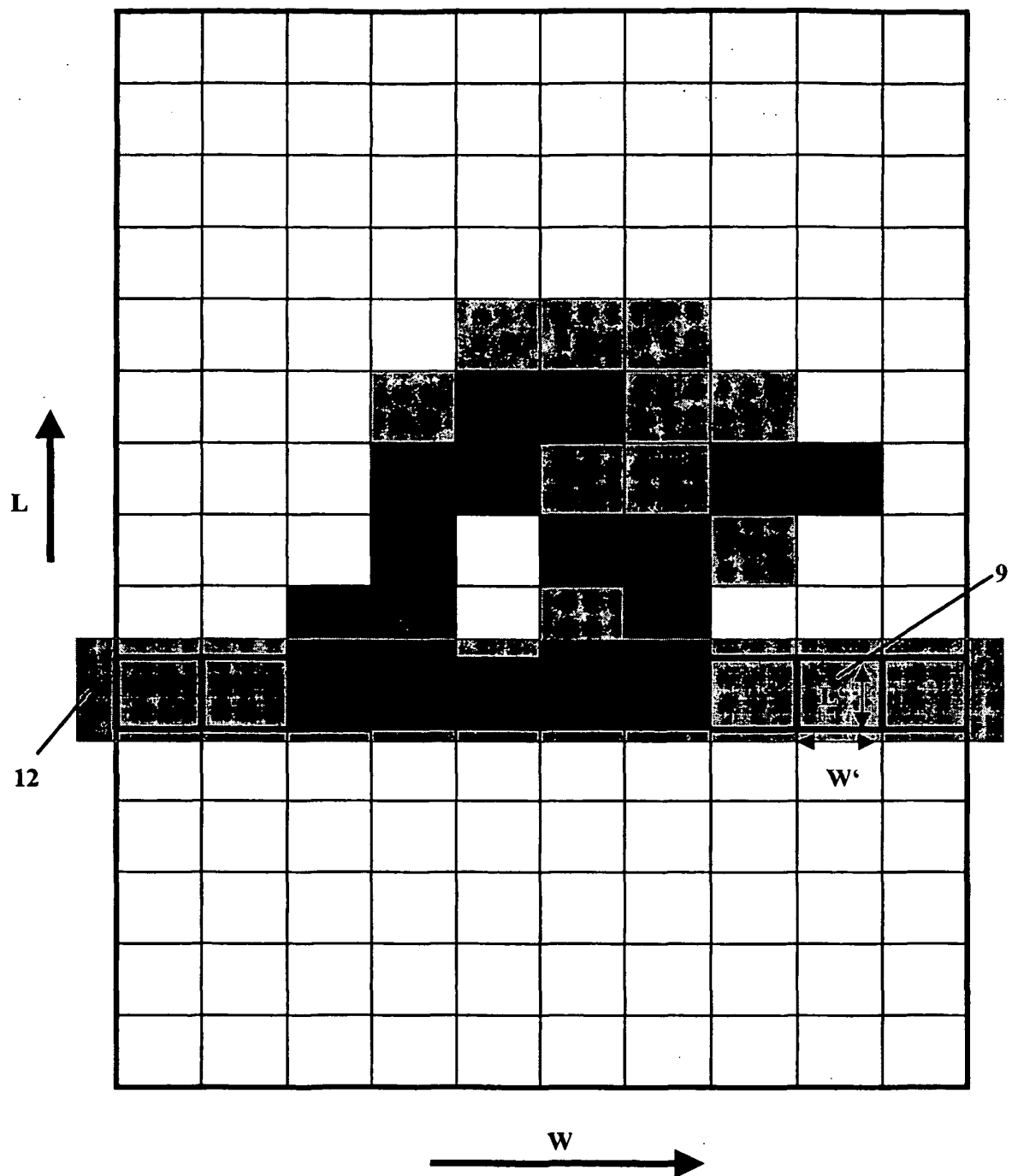


Figure 7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3697208 A [0007]
- US 20070007695 A [0007]
- EP 770154 A [0008]

Non-patent literature cited in the description

- Alternative Anwendungen für Flockenspeiser. *Melli- and Textilberichte*, July 2001 [0006]