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(72) Inventor: **Hemmilä, Ari**
18100 Heinola (FI)

(74) Representative: **Schmidt, Karsten et al**
ZACCO GmbH
Bayerstrasse 83
80335 München (DE)

(71) Applicant: **Swedspan International s.r.o.**
85101 Bratislava (SK)

(54) **Method and apparatus for making particle boards having a non-uniform density distribution**

(57) The present invention is in the technical field of producing particle boards. More specifically, the present invention relates to the production of particle boards hav-

ing varying density in the longitudinal and/or in the lateral dimension of the board. The present invention further relates to apparatuses for in the production of such particle boards, and to methods of using same.

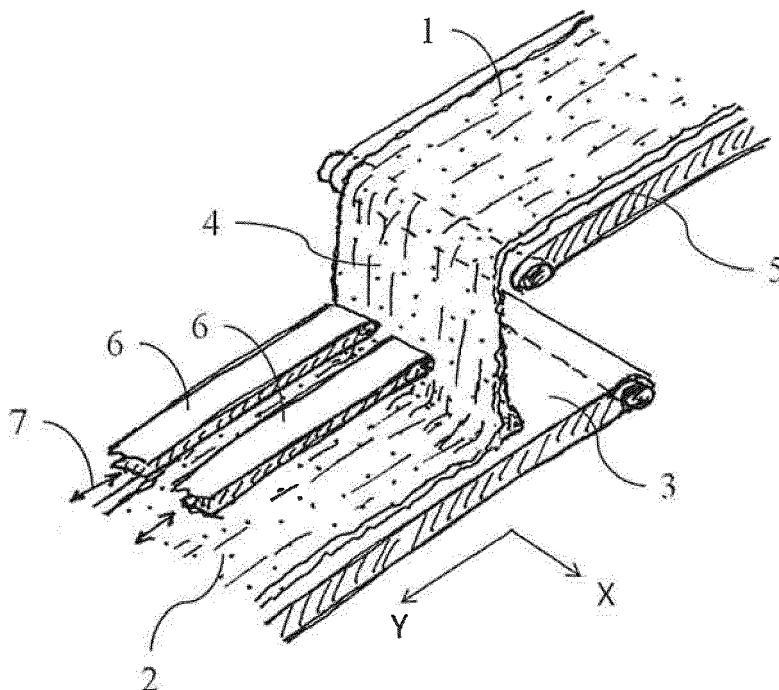


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention is in the technical field of producing particle boards. More specifically, the present invention relates to the production of particle boards having varying density in the longitudinal and/or in the lateral dimension of the board. The present invention further relates to apparatuses for use in the production of such particle boards, and to methods of using same.

BACKGROUND OF THE INVENTION

[0002] Particle boards are widely used in the furniture and construction industry. Various types of particle boards are known. Among those, particle boards made from lignocellulosic particles such as wood chips or strands are probably the most widely used. In the production of such particle boards, lignocellulosic particles are thoroughly mixed or coated with an adhesive binder and then distributed on a horizontal support to form a mat. The mat is compressed under high pressure and/or temperature to form a particle board. The particle board is cooled and cut into the desired shape to form the final product. Standard particle boards have a substantially constant density along their longitudinal and lateral dimensions.

[0003] From WO 2005/046950 is known the production of a particle board having a varying local density [kg/m³] along the longitudinal and/or lateral dimension of the board. Such boards having a non-uniform density distribution are produced by using additional spreader elements which scatter an additional amount of particles to certain areas of the mat.

[0004] When a mat having a varying amount of particles per unit area [kg/m²] is pressed to a particle board of uniform thickness, a particle board of non-uniform density distribution is formed. Such boards are useful for providing increased stability in areas where increased stability is needed (e.g., at the edges of the board). Nevertheless the board is relatively lightweight and its production requires a relatively small amount raw material. WO 2005/046950 also discloses corresponding methods of producing particle boards having a non-uniform density distribution. In one embodiment, particle boards having density variation in the lateral dimension are produced by adding stripes of additional material to the mat and then pressing the mat to uniform thickness. The stripes of additional material are added across the entire board in the longitudinal and lateral dimension of the mat. When such stripes are both added in the longitudinal and in the lateral dimension, the additional material is added twice at the intersections of the longitudinal and lateral stripes. This two-fold addition of the material at the intersections of the stripes leads to an undesired further increase in density in these areas of the resulting particle board. Furthermore, two-fold addition of raw material at the inter-

section of the stripes may lead to undesired variations in the thickness of the particle board, which may in turn damage the press or sanding machine in a subsequent processing step.

[0005] From EP0162118 is known a process and an arrangement for the production of a mat in a particle board production process, which mat has a predetermined area-specific weight. Through the disclosed method, a predetermined distribution of weight per unit area in the lateral direction of the mat is produced by means of stripper devices, which strip off particles in the mat above a certain, adjustable, height. Thereby, multiple stripes of different height are produced in the mat. When the mat is pressed into a board of uniform thickness, stripes of different density result. The method used in EP0162118 is, however, not suitable for very high production speed. Furthermore, stripes extending in the lateral dimension of the mat (transverse to the direction of production) cannot be produced.

SUMMARY OF THE INVENTION

[0006] Against this background it is one object of the present invention to provide a method and an apparatus for producing a particle board having areas of a first density and areas of a second density, wherein the first density is higher than said second density.

[0007] Another object of the invention is to provide a method and an apparatus for the production of a particle board having varying density in the longitudinal and/or lateral direction, which method avoids the wasting valuable raw material.

[0008] Another object of the invention is to provide a method and apparatus for the production of a particle board having varying density in the longitudinal and/or lateral direction, in which method the amount of material added to the areas of increased density can be finely adjusted.

[0009] Another object of the invention is to provide a method and apparatus for the production of a particle board having varying density in the longitudinal and/or lateral direction, which method allows for the production of well defined areas of increased density, said defined areas exhibiting, e.g., sharp boundaries between areas of normal and increased density.

[0010] One aspect of the invention relates to a method of forming a layer of particles of a particle mat; said layer of particles extending in a longitudinal dimension and in a lateral dimension; said method comprising:

- (i) providing a movable support for supporting said layer of particles or particle mat, and moving said movable support in a direction parallel to said longitudinal dimension;
- (ii) providing a curtain of downfalling particles, said curtain extending from said particle providing means towards said movable support; and
- (iii) at least temporarily removing particles from said

curtain of downfalling particles at predetermined or otherwise defined positions in the lateral dimension;

thereby forming a layer of particles of a particle mat.

[0011] In one embodiment of the invention, the particle mat is a multi-layered particle mat.

[0012] Preferably, said curtain of downfalling particles is provided continuously.

[0013] In another embodiment of the invention said longitudinal dimension and said lateral dimension are in a horizontal plane and are perpendicular to each other.

[0014] In a further embodiment said curtain of downfalling particles extends substantially over the entire lateral width of the particle mat or layer of particles.

[0015] In a preferred embodiment the particle flow per unit lateral width [in kg/s/cm] in said curtain of downfalling particles, preferably before the removal of particles in step (iii), is substantially constant over the entire lateral width of the curtain of downfalling particles.

[0016] Preferably the particle flow [in kg/s] in said curtain of downfalling particles, preferably before the removal of particles in step (iii), is substantially constant over time.

[0017] In preferred embodiments the particles are selected from the group consisting of lignocellulosic particles, wood particles, wood chips, and wood fibers. Other types of particles are also envisaged.

[0018] In preferred embodiments, the particles are admixed with an adhesive substance. Suitable methods of admixing the adhesive substance, or binder, with particles are well known in the art.

[0019] In preferred embodiments of the invention, the particle providing means is in form of a conveyor belt. The conveyor belt is preferably of a lateral width which corresponds to the lateral width of said movable support.

[0020] In preferred embodiments, the movable support is a conveyor belt. However, other movable supports are also envisaged. For example the movable support can be in form of a movable rigid plate, or it can be a movable mesh.

[0021] Preferably, step (iii) of removing downfalling particles is effected by positioning particle removing means in said curtain of downfalling particles. This procedure ensures a rather even distribution of particles in the areas of the particle layer where the particles are not removed. This procedure also allows high mass flows, i.e., a high speed of production. It also results in a sharp delimitation of areas of normal thickness and areas of reduced thickness in the particle mat. It hence results in sharp edges between such areas.

[0022] In a preferred embodiment the particle removing means comprises (or is) at least one conveyor belt. The particle removing means, however, can also be in form of at least one screw conveyor, funnel, or at least one air suction line.

[0023] Preferably, the particle removing means is retractable.

[0024] The particle removing means is preferably ar-

ranged in parallel orientation to said longitudinal dimension Y.

[0025] It is preferred that the particle removing means is only temporarily introduced into said curtain of downfalling particles. This allows for a pattern of first and second areas of distinct thickness also in the longitudinal dimension of the mat. Hence, it is preferred that said particle removing means is introduced into said curtain of downfalling particles at predetermined points in time, and for predetermined periods of time. The predetermined points in time and time periods define the pattern of first and second areas of distinct thickness in the longitudinal dimension (direction of production).

[0026] In a preferred embodiment the position of the particle removing means is adjustable in the lateral dimension X. This serves to define the pattern of first and second areas of distinct thickness in the lateral dimension of the mat.

[0027] Preferably, the width of said particle removing means in the lateral dimension is adjustable. The adjustment of the width is preferably accomplished by pivoting a pair of deflecting means provided at opposite sides of said particle removing means. The pair of deflecting means may be a pair of inclined plates extending along said longitudinal dimension (direction of production, Y) and being pivotable about an axis parallel to said longitudinal dimension Y.

[0028] The invention further relates to a method of producing a particle mat, wherein at least one layer of said particle mat is produced by a method of forming a layer as described above.

[0029] The mat produced by methods of the invention preferably includes multiple layers.

[0030] In preferred embodiments of the invention, the method of forming a mat includes a method of forming a first layer of particles as described above, and forming at least one further layer of particles, above or below said first layer of particles. (In these embodiments, the expression "first layer" shall not be understood as meaning that the first layer is produced earlier than the "further" layers. The expressions "first" and "further" layer are used solely to clarify that these layers are distinct.) The at least one further layer of particles has preferably a substantially constant thickness or substantially constant weight per unit area. In a preferred embodiment, the at least one further layer of particles is vertically below said first layer of particles. In another embodiment the at least one further layer of particles is vertically above said first layer of particles. In most preferred embodiments the further layers are the upper and the lower surface layer of a multi-layered particle board or mat.

[0031] In a preferred embodiment of the invention, the particles of the first layer of particles have a greater average particle size (or average particle weight) as compared to the average particle size (or average particle weight) of the further layer of particles.

[0032] In one embodiment, the particle mat has at least first and second areas, said first area having a first thick-

ness (or weight per unit area, kg/m^2), said second area having a second thickness (or weight per unit area, kg/m^2), wherein said first thickness (or weight per unit area, kg/m^2) is greater than said second thickness (or weight per unit area, kg/m^2).

[0033] In preferred embodiments, said first thickness (or weight per unit area, kg/m^2) is at least 10%, 20%, 50% or 100% greater than said second thickness (or weight per unit area, kg/m^2).

[0034] The invention further relates to a method of producing a particle board, said method comprising:

- (i) providing a particle mat using a method of producing a particle at described above; and
- (ii) compressing said particle mat to form the particle board.

[0035] The particle board according to the invention may be a chipboard, fiber board, an oriented strand board (OSB), MDF board or the like.

[0036] Preferably, the particle board has a substantially uniform thickness.

[0037] In a preferred embodiment the particle board has at least one first area of a first density [kg/m^3] and at least one second area of a second density [kg/m^3], wherein said first density is greater than said second density. Preferably, said first density is 10%, 20%, 50% or 100% greater than said second density. In one embodiment the first density is from 550 to 700 kg/m^3 and said second density is from 200 to 500 kg/m^3 .

[0038] The invention also relates to an arrangement for forming a layer of particles in a particle mat; said layer of particles extending in a longitudinal dimension (Y) and in a lateral dimension (X); said apparatus comprising:

- a movable support movable in said longitudinal dimension (Y) and adapted to support said layer of particles, or particle mat;
- particle providing means for providing a curtain of downfalling particles, said curtain of downfalling particles extending from said particle providing means in the direction of said movable support; and
- particle removing means for at least temporarily removing downfalling particles from said curtain of downfalling particles at defined positions in the lateral dimension (X).

[0039] It is understood that the curtain of downfalling particles need not necessarily extend all the way from the particle providing means to a surface of the movable support, e.g., in case the layer of particles is produced on top of a further layer of particles already present on said movable support.

[0040] Preferably the particle providing means is a conveyor belt. However, the particle providing means can also be an inclined plate, or a chute.

[0041] In a preferred embodiment, the particle providing means has a lateral width substantially equal to the

lateral width of said particle mat, or of said movable support.

[0042] Preferred particle providing means are adapted to produce a particle flow per unit lateral width [kg/s/cm] which is substantially constant over the entire lateral width of the curtain of particles. Furthermore, preferred particle providing means are adapted to produce a substantially constant particle flow [kg/s] over time.

[0043] Preferably, the particles are selected from the group consisting of lignocellulosic particles, wood particles, wood chips, and wood fibers.

[0044] Other preferred embodiments include means for admixing said particles with an adhesive substance. This can be, e.g., a spray nozzle in combination with a mixer.

[0045] In preferred embodiments the movable support is a conveyor belt. The movable support, however, can also be in form of a rigid plate, or a movable mesh.

[0046] The removing means may be in form of, or comprise, at least one conveyor belt, or at least one screw conveyor, or at least one funnel, or at least one air suction line.

[0047] Preferably, the particle removing means comprises at least one conveyor belt arranged in parallel orientation to said longitudinal dimension (Y). The particle removing means may be retractable, e.g., capable of performing a reciprocating movement.

[0048] In preferred arrangements of the invention, particle removing means is adapted to only temporarily remove particles from said curtain of downfalling particles. For example, the particle removing means may be adapted to remove particles from said curtain of downfalling particles (only) at predetermined points in time and for predetermined periods of time.

[0049] The position of said particle removing means in the lateral dimension (X) is preferably adjustable. This allows for modification of the pattern of first and second areas of distinct thickness in the lateral dimension of the mat.

[0050] Also preferred are arrangements in which the width of said particle removing means in the lateral dimension (X) is adjustable. This provides further means to modify the pattern of first and second areas of distinct thickness in the lateral dimension of the mat.

[0051] In a preferred embodiment, the arrangement includes particle removing means comprising a pair of deflecting means, preferably pivotably connected to said particle removing means. The pair of deflecting means may be, e.g., a pair of inclined plates extending alongside the lateral sides of said particle removing means, preferably being mounted for pivotable movement about an axis parallel to the longitudinal dimension.

[0052] In a particularly preferred embodiment, the arrangement further includes particle spreading means for spreading particles in the longitudinal dimension. For example, the spreading means may be in form of a deck of rotating rollers. Preferably, the rollers are adapted to rotate about an axis parallel to said lateral dimension X.

The deck of rollers preferably comprises 1 to 20, more preferably 3-12 rollers. The spreading means may also include air stream producing means, producing a horizontal air stream spreading particles in the longitudinal dimension.

[0053] The invention also relates to an apparatus for producing a particle mat, said apparatus comprising at least one arrangement for forming a layer of particles as described above.

[0054] In a preferred embodiment, the apparatus comprises at least one further particle providing means for providing a second curtain of downfalling particles, so as to produce a further layer of particles in said particle mat.

[0055] The invention further relates to a device for manufacturing a particle board, said device comprising an arrangement of the above defined kind, and further comprises a press for compressing a particle mat to form a particle board.

BRIEF DESCRIPTION OF THE FIGURES

[0056]

Figure 1 shows a first embodiment of an arrangement according to the invention.

Figure 2 shows a conventional particle mat (A) and a particle mat according to the invention (B).

Figure 3 shows different stages in a method of producing a layer of particles according to the invention.

Figure 4 shows different stages in a method of producing a multi-layered particle mat according to the invention.

Figure 5 shows various configurations of an arrangement for forming a layer of particles according to the invention.

Figure 6 shows side and front view of particle removing means according to a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0057] The present invention shall now be described with reference to the appended drawings.

[0058] Figure 1 shows a perspective view of an arrangement for forming a layer of particles 2 on a movable support 3, according to the invention. The apparatus is capable of producing a single-layered discontinuous layer 2 by providing particles in form of a curtain of downfalling particles 4 and removing particles from said curtain 4, using particle removing means 6.

[0059] The apparatus works as follows: particles 1 are provided by particle providing means 5 to form of a curtain of downfalling particles 4. Particle providing means 5, in this embodiment, is in form of a conveyor belt providing a preferably constant stream of particles 1 to a terminal edge of the conveyor belt. The particles falling down from particle providing means 5 form a curtain of downfalling

particles 4. Movable support 3 is provided in the form of a further conveyor belt. The conveyor belt constituting particle providing means 5 and the conveyor belt constituting movable support 3 are preferably of substantially the same width in the lateral dimension X. The fallen particles form a layer of particles 2 on movable support 3. The layer of particles 2 is transported by movable support 3 along the longitudinal dimension Y, i.e., along the direction of production. As is readily apparent to the person skilled in the art, an approximately constant flow of downfalling particles in curtain 4 produces a layer of particles of approximately constant thickness [mm] (or weight per unit area [kg/m²]). Also shown in Figure 1 are retractable particle removing means 6, for removing particles from the curtain of downfalling particles 4, when particle removing means are in an extended position. In the embodiment shown, particle removing means 6 are in the form of two retractable conveyor belts. In other embodiments, particle removing means 6, however, can also be in the form of a screw conveyor, a funnel, a chute, or a metal plate arranged such that it removes particles from the curtain 4 of downfalling particles. In yet other embodiments, particle removing means 6 can also be in form of suction tube removing particles from curtain 4 through air suction. As indicated by arrows 7, particle removing means 6 are able to reciprocate, i.e., they can assume a retracted position or an extended position. Figure 1 shows removing means 6 in the retracted position. In this position, particle removing means 6 do not intersect or reach into curtain 4 of downfalling particles, hence, particle removing means 6 do not remove any particles from curtain 4 in this position. In the extended position (not shown), particle removing means 6 intersect, or reach into, curtain 4 and remove all or part of the downfalling particles at the lateral positions in which particle removing means 6 intersect, or reach into, curtain 4. By positioning particle removing means 6 at appropriate lateral positions, and by extending or retracting particle removing means 6 at the appropriate times, a desired pattern of particles can be produced on movable support 3 (An exemplary pattern is shown in Figure 2B.) In the embodiment shown in Figure 1, a discontinuous layer of particles 2 can be produced. The discontinuous layer particle has areas of a first thickness and areas of a reduced thickness. The reduced thickness is preferably zero. The areas of reduced thickness are preferably of rectangular shape. The lateral width (i.e., in the X dimension) of the rectangular areas of reduced thickness is determined by the lateral width of the particle removing means 6. The length (i.e., Y dimension) of the areas of reduced thickness is determined by the time period in which the particle removing means 6 are in the extended state relative to the speed of movable support 3 in the longitudinal direction Y.

[0060] Figure 2A shows a conventional particle mat 11 having a substantially uniform thickness (or weight per unit area, kg/m²) over its entire area. Figure 2B shows a particle mat 11 producible by methods and apparatuses

of the present invention. The mat includes (at least) two layers of particles: a first, discontinuous, layer producible by the arrangement shown in Figure 1, and a second, continuous, layer having substantially constant thickness (or weight per unit area, kg/m²) over its entire area, producible by conventional methods. Upon compression of the mat 11 into a fiber board of approximately constant thickness, a fiber board having areas of a first density and areas of a second, higher, density can be produced.

[0061] Figure 3 shows various states in a process of producing a layer of particles 2, according to the invention. Figures 3A, 3B, and 3C show schematic side-views at different points in time, during the layer-forming process. In particular, Figures 3A, 3B and 3C show different configurations of particle removing means 6, and the resulting pattern of particles in layer 2, in a temporal sequence.

[0062] In Figure 3A, particles 1 are transported on particle providing means 5 towards a terminal edge thereof. Particles 1 fall from the terminal edge of particle providing means 5 to form a curtain 4 of downfalling particles. Particles fall onto movable support 3, which in this case is in the form of a conveyor belt. A layer of particles 2 is formed on movable support 3. Particle removing means 6 are present, but in the retracted position. Hence, they do not remove any particles from curtain 4. A continuous layer of particles of approximately constant thickness is thus produced.

[0063] In Figure 3B, particle removing means 6 are in the extended position. In this position, particle removing means 6 remove substantially all particles from curtain 4 at the lateral positions in which particle removing means 6 intersect with curtain 4. As a result, void areas with no particles are created in layer 2. It will be appreciated that the void areas are only created at lateral positions vertically below the particle removing means 6. At lateral positions not overlapping particle removing means 6, non-void areas (of normal thickness) are formed. The void areas formed, in one embodiment, are thus rectangular in shape, e.g., when particles are removed from curtain 4 by retractable conveyor belts. The lateral widths of the void areas of mat 11 are determined by lateral width of particle removing means 6. The longitudinal extent of the void areas is determined by the time span during which particle removing means 6 removes particles from curtain 4, relative to the speed by which movable support 3 moves along the longitudinal dimension Y.

[0064] In Figure 3C particle removing means 6 is again in the retracted position. No particles are removed from curtain 4, thus a layer of particles (a non-void area) is formed on movable support 3.

[0065] As is readily apparent, various rectangular patterns of void areas in a layer 2 or mat 11 can be created by providing particle removing means 6 of appropriate width (and number), and by timing the extension or retraction of the particle removing means 6 into or from curtain 4, such that a desired pattern is obtained.

[0066] Figure 4 depicts an apparatus for forming a mat,

in this case a multi-layered mat, according to the invention. In this embodiment a particle mat 11 having two layers is produced. Mat 11 comprises a discontinuous layer of particles 2, produced according to the invention, vertically above a further layer of particles 12, which is produced by conventional methods. Further layer 12 is produced from particles provided by further particle providing means 13. Particle providing means 5 and further particle providing means 13, in the embodiment shown, are both in the form of a conveyor belt.

[0067] Figure 4A depicts a situation in which particle removing means 6 is in a retracted position. In this retracted position particle removing means 6 do not remove particles from curtain 4.

[0068] Figure 4B shows particle removing means 6 in its extended position. In the extended position, particle removing means 6 remove particles from the curtain 4, thus, no particles reach movable support 3 to contribute to layer 2 of mat 11. Thereby, areas of reduced thickness 15 are produced in mat 11.

[0069] Figure 4C then shows the particle removing means 6 in the retracted position again. Hence, down-falling particles in curtain 4 contribute to layer 2 of mat 11 at this stage.

[0070] Using the apparatus and method depicted in Figure 4, a mat 11 having areas of distinct first and second thickness can be produced.

[0071] Figure 5 shows an arrangement of the invention in which the curtain of downfalling particles is spread in the longitudinal dimension (Y) by spreading means 14. Spreading means 14, in this embodiment, are in form of a deck of rotating rollers. The rollers are mounted for rotation about a horizontal axis, arranged in parallel orientation to the lateral dimension, i.e., perpendicular to the direction of movement of movable support 3. Particles fall from particle providing means 5 onto the deck of rollers, where they are spread (or scattered) in the longitudinal dimension. The curtain of particles 4 thus has a certain longitudinal extension of, e.g. greater than 0.5, 1 or 2 meters.

[0072] Particle removing means 6 are shown in Figures 5A, 5B, 5C in three different positions in which particle removing means 6 remove different amounts of particles from curtain 4. This results in a mat of particles having a first (normal) thickness and including stripes of a reduced thickness, wherein the reduced thickness can be adjusted by varying the longitudinal position of the particle removing means 6. For example, the reduced thickness can be 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, or 90% of the first thickness. The reduced thickness can also be zero.

[0073] In Figure 5A particle removing means 6 are in a retracted position. In this position, no particles are removed from curtain 4. Hence, the resulting layer of particles 2 at the lateral positions overlapping with particle removing means 6 is relatively thick. If particle removing means 6 are fixed/kept in the position shown in Figure 5A, a layer of substantially constant thickness along the

lateral and longitudinal dimension will be formed.

[0074] In Figure 5B particle removing means 6 is in a partially extended position. In this position, particle removing means 6 remove a part of the particles falling down in curtain 4, at the lateral positions overlapping with particle removing means 6. The resulting layer of particles 2 at the overlapping lateral positions is thus thinner than in the situation shown in Figure 5A. If particle removing means 6 are fixed/kept in the position shown in Figure 5B, a layer of particles having areas of a first thickness and areas of a second thickness will be formed. If the lateral position and lateral width of the particle removing means 6 does not change, stripes of reduced thickness are produced.

[0075] In Figure 5C is shown the situation in which particle removing means 6 are in a fully extended position. In this position, particle removing means 6 extend all the way through the longitudinal extent of curtain 4. Hence, substantially all particles are removed from curtain 4 at the lateral positions overlapping with particle removing means 6. Hence, the resulting layer of particles formed will have areas of a first thickness and areas of substantially zero thickness, i.e., void areas. Since the position and width of the particle removing means 6 in the lateral dimension does not change, stripes of zero thickness (void stripes) are produced at the lateral positions vertically below particle removing means 6.

[0076] Hence, the arrangement shown in Figures 5A to 5C can be used to produce a layer of particles having longitudinal stripes of distinct thickness. In the arrangement shown, it is possible to scatter particles onto movable support 3 at very high speed, while nevertheless producing stripes of distinct thickness having relatively sharp edges between the stripes. Such sharp delimitation between stripes of different thickness, at high production speed, was heretofore not achievable by other arrangements or methods.

[0077] It must be mentioned that, although reciprocating movement of the particle removing means 6 is not needed (nor desired) when producing layers of particles with continuous longitudinal stripes of different thickness, reciprocating movement may nevertheless be used to produce, e.g., a layer of particles having a variation in thickness also along the longitudinal dimension. Particle removing means 6 are then introduced into or retracted from curtain 4 as desired. In order to produce relatively sharp transitions from areas of normal thickness to areas of reduced thickness, it is particularly preferred to introduce the particle removing means 6 into the curtain of downfalling particles 4 in the direction of movement of movable support 3. In a very preferred embodiment, particle removing means 6 is introduced into curtain 4 in the direction of movement of movable support 3 and at the same speed as movable support 3. Sharp edges parallel to the lateral dimension can thereby be obtained.

[0078] Figure 6 shows the particle removing means 6 according to a preferred embodiment of the invention. Particle removing means 6 includes a conveyor belt and,

attached thereto, a pair of deflecting means 17. Deflecting means are in form of a pair of plates, pivotably mounted along opposite sides of particle removing means 6. Deflecting means are pivotable about axis 16, which is arranged parallel to the longitudinal dimension Y. As depicted by arrows 7, particle removing means 6 of this embodiment is able to perform a reciprocating movement along the longitudinal dimension.

[0079] The present invention is not limited to the exemplary embodiments described above, but it should be understood that the scope of the invention is solely limited by the terms of the appended claims.

REFERENCE NUMERALS

[0080]

- 1 - particles
- 2 - layer of particles
- 3 - movable support
- 4 - curtain of downfalling particles
- 5 - particle providing means
- 6 - particle removing means
- 7 - reciprocating movement
- 8 - area of a first thickness
- 9 - area of a second thickness
- 10 - second curtain of downfalling particles
- 11 - particle mat
- 12 - further layer of particles
- 13 - further particle providing means
- 14 - particle spreading means
- 15 - area of reduced thickness
- 16 - axis
- 17 - deflecting means

Claims

1. A method of forming a layer (2) of particles in a particle mat (11); said layer of particles (2) extending in a longitudinal dimension (Y) and in a lateral dimension (X); said method comprising:
 - (i) providing a movable support (3) for supporting said layer of particles (2) or particle mat (11), and moving said movable support (3) in a direction parallel to said longitudinal dimension (Y);
 - (ii) providing a curtain of downfalling particles (4), said curtain extending from particle providing means (5) towards said movable support (3); and
 - (iii) at least temporarily removing particles from said curtain of downfalling particles (4) at predetermined positions in the lateral dimension (X); thereby forming said layer of particles.
2. Method of claim 1, wherein said particles (1) are se-

lected from the group consisting of lignocellulosic particles, wood particles, wood chips, and wood fibers.

3. Method of any one of the preceding claims, wherein said step (iii) of removing downfalling particles is effected by at least temporarily positioning particle removing means (6) in said curtain of downfalling particles (4). 5
4. Method of claim 3, wherein said particle removing means (6) comprises at least one conveyor belt. 10
5. A method of producing a particle mat (11), wherein at least one layer (2) of said particle mat (11) is produced by a method according to any one of the claims 1 to 4. 15
6. Method of claim 5, wherein said particle mat (11) has at least first (8) and second areas (9), said first area (8) having a first thickness, said second area (9) having a second thickness, wherein said first thickness is greater than said second thickness. 20
7. A method of producing a particle board, said method comprising: 25
 - (i) producing a particle mat (11) by a method of claim 5 or 6; and
 - (ii) compressing said particle mat (11) to form the particle board. 30
8. Method of claim 7, wherein said particle board has a substantially uniform thickness. 35
9. An arrangement for forming a layer of particles (2) in a particle mat (11); said layer of particles (2) extending in a longitudinal dimension (Y) and in a lateral dimension (X); said apparatus comprising: 40
 - a movable support (3) movable in said longitudinal dimension (Y) and adapted to support said layer of particles (2) or particle mat (11);
 - particle providing means (5) for providing a curtain (4) of downfalling particles, said curtain of downfalling particles (4) extending from said particle providing means (5) in the direction of said movable support (3); and
 - particle removing means (6) for at least temporarily removing downfalling particles from said curtain of downfalling particles (4) at defined positions in the lateral dimension (X). 45
10. Arrangement of claim 9, wherein said particle removing means (6) comprises at least one conveyor belt. 50
11. Arrangement of claim 10, wherein said particle removing means (6) comprises a pair of deflecting 55

means (17), connected to opposite sides of said particle removing means (6), and arranged for pivotable movement about an axis (16) parallel to said longitudinal dimension (Y).

12. Arrangement of any one of claims 9 to 11, further comprising particle spreading means (14), such as a deck of rollers, for spreading particles along the longitudinal dimension (Y).
13. An apparatus for producing a particle mat (11), said apparatus comprising at least one arrangement of any one of claims 9 to 12.
14. Apparatus of claim 13, said apparatus comprising at least one further particle providing means (13) for providing a second curtain of downfalling particles (10) so as to produce a further layer of particles (12) in said particle mat (11).
15. Device for manufacturing a particle board, said device comprising an apparatus of claim 13 or 14, and further comprising a press for compressing said particle mat (11) to form a particle board.

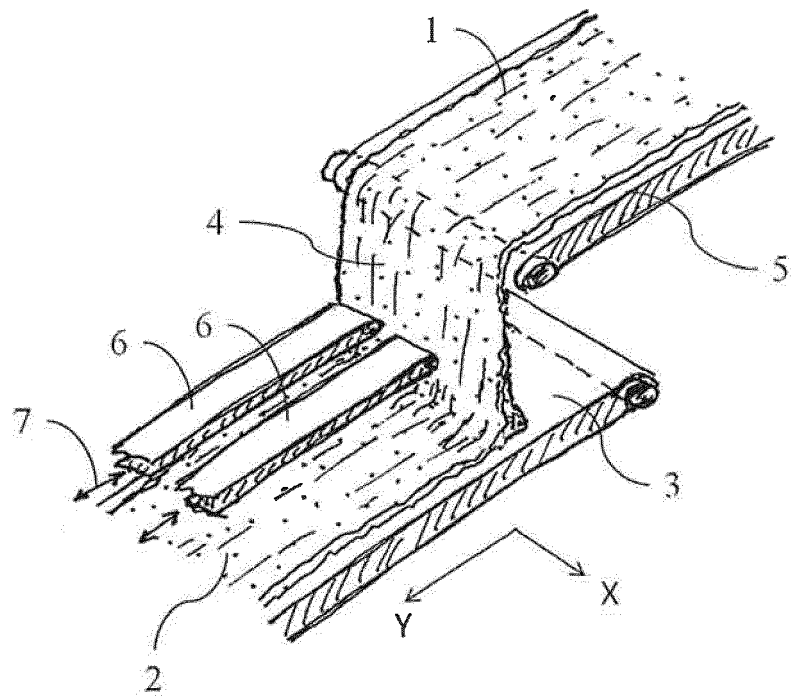


Fig. 1

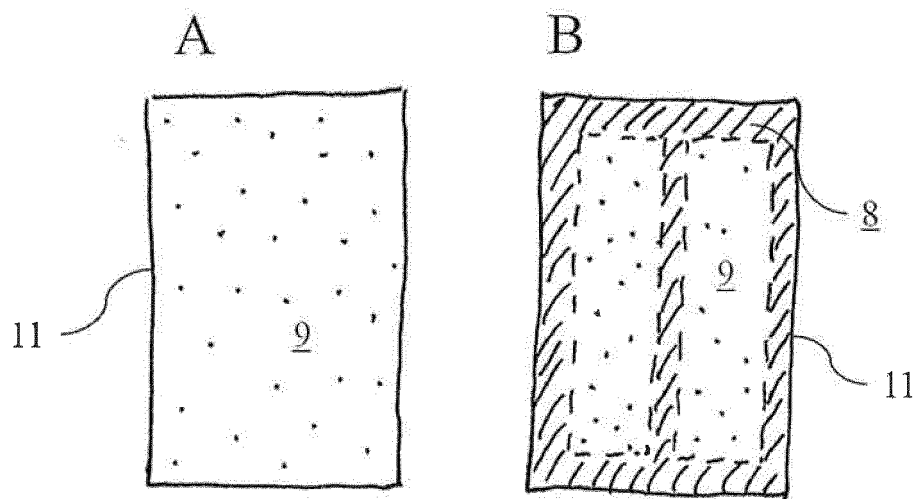


Fig. 2

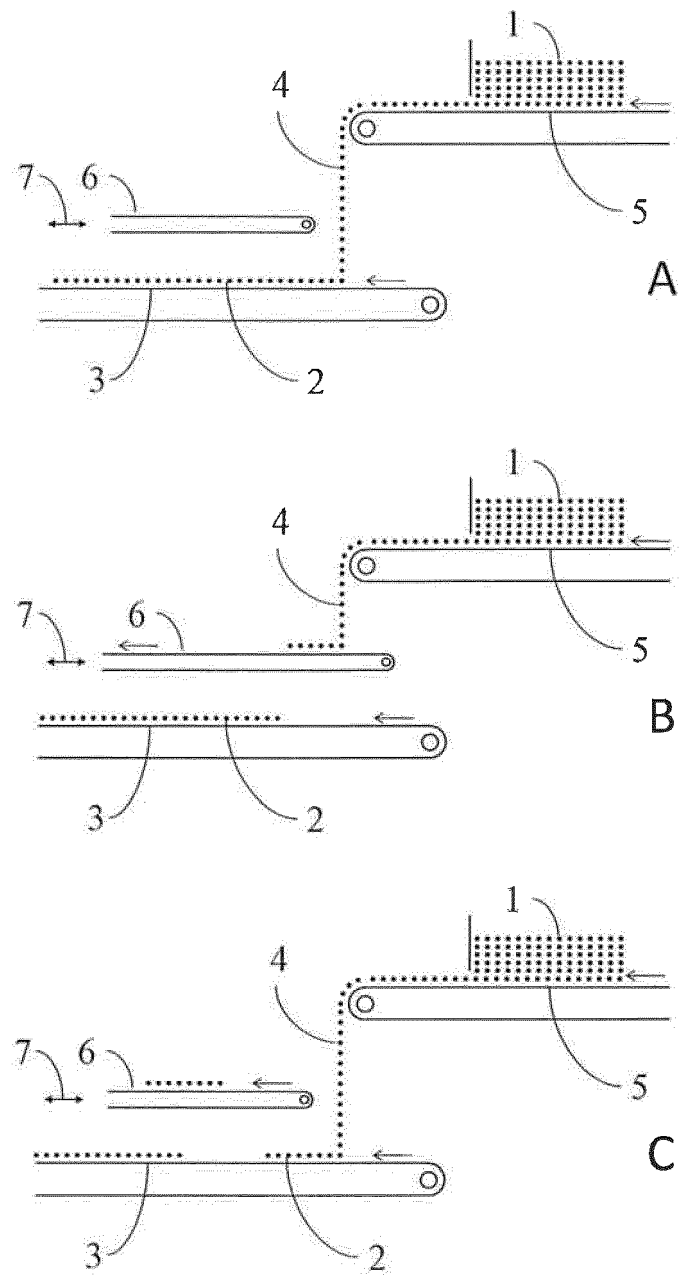


Fig. 3

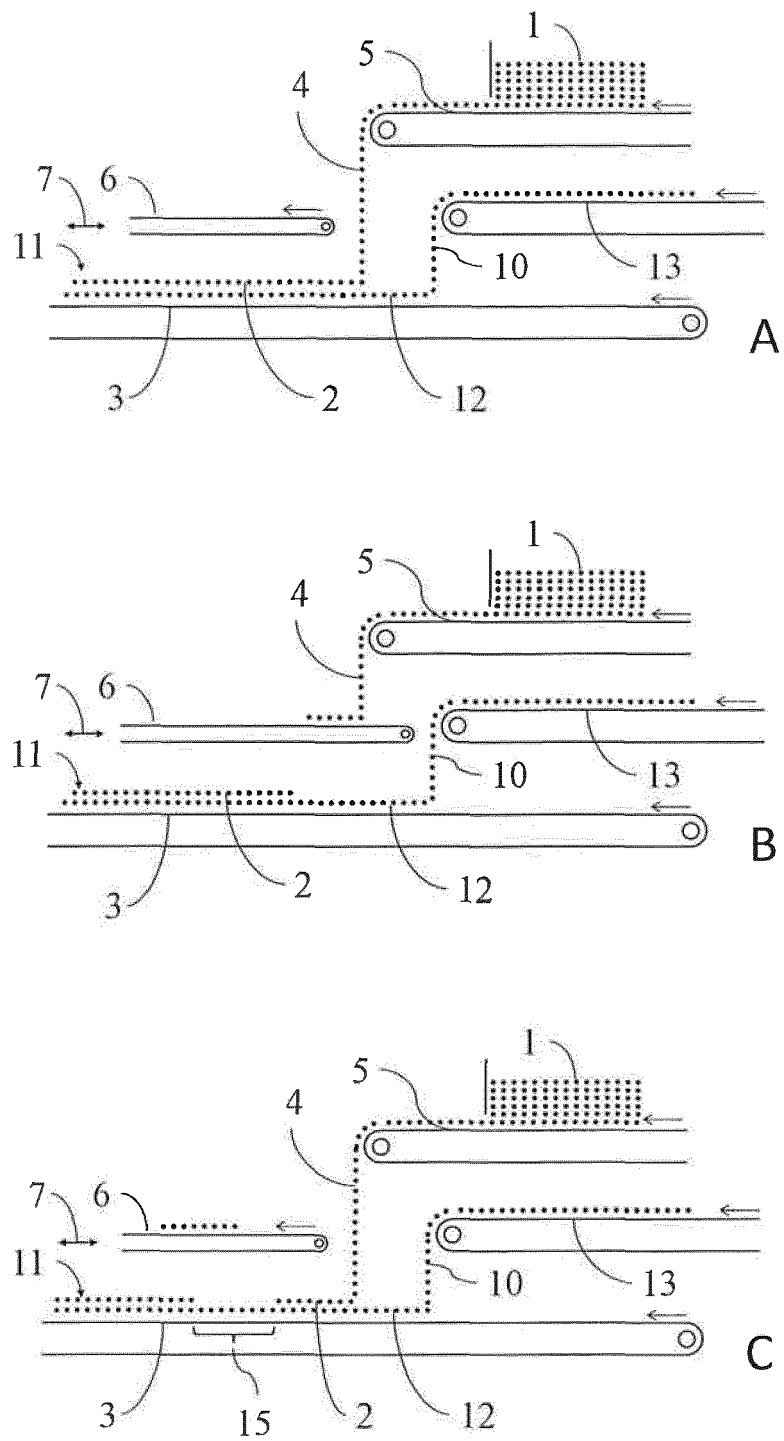


Fig. 4

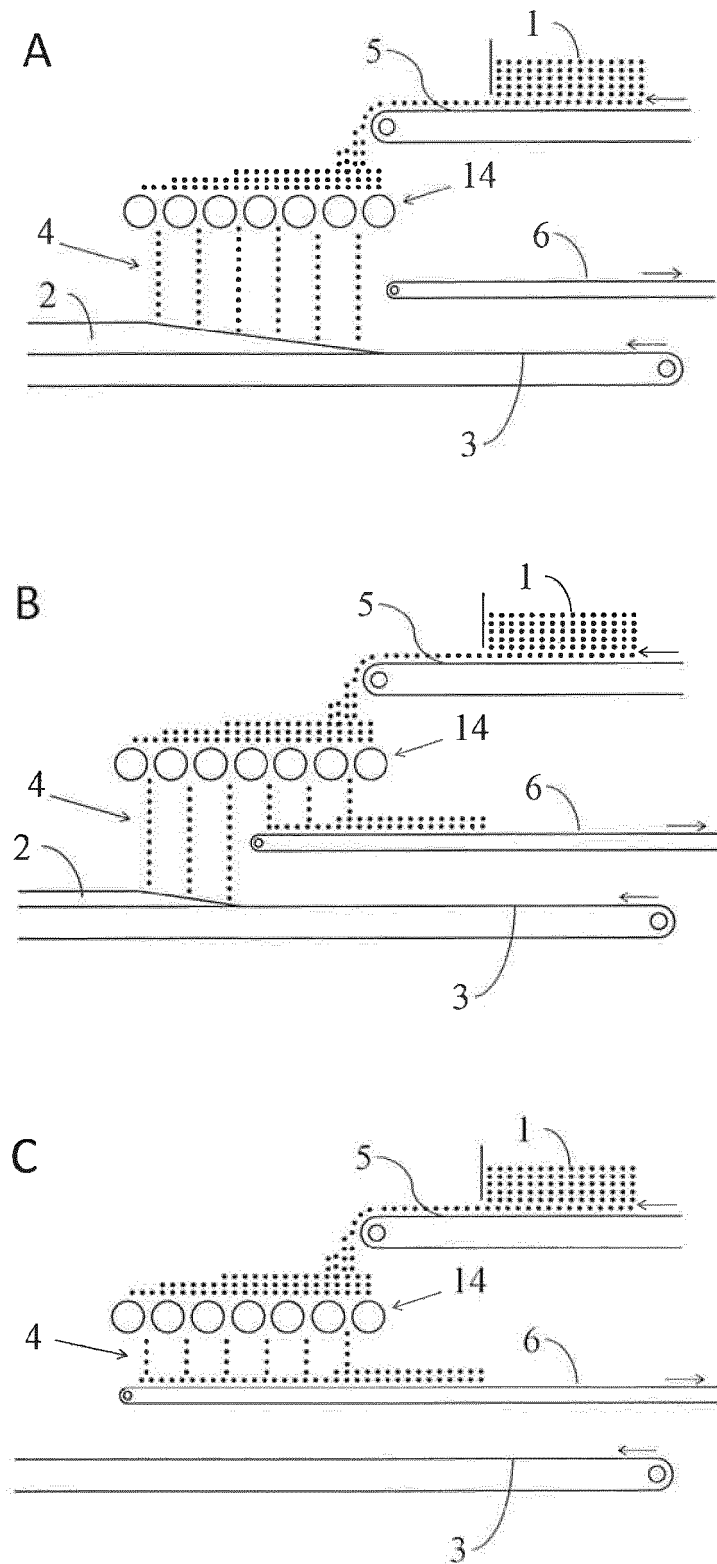


Fig. 5

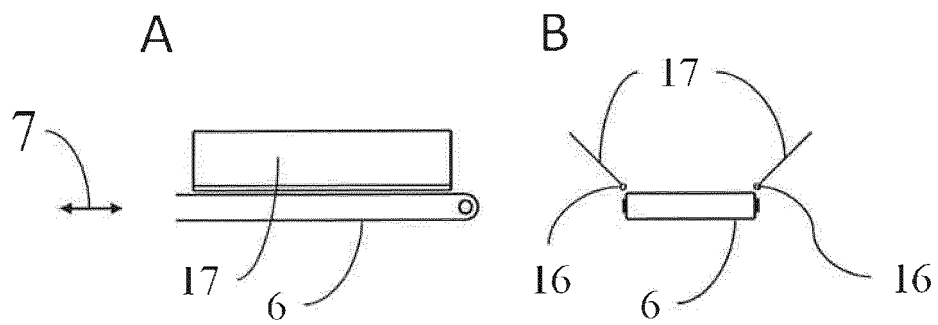


Fig. 6



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Application Number
EP 12 16 4668

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Place of search The Hague		Date of completion of the search 11 July 2012	Examiner Söderberg, Jan-Eric
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