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(54) **SELECTOR ROLLER**

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns machines for selecting woody material which is then used to obtain chipboard panels, for example panels such as "Particleboards" and OSB (Oriented Strand Boards), and in particular concerns the selector rollers used in them.

[0002] These machines are also used in the production of MDF (Medium Density Fiberboard) panels, and in particular to remove the fine chips from the mass of chips before they are de-fibered.

BACKGROUND OF THE INVENTION

[0003] By chipboard panels we mean those panels made of wood chips of medium, fine and very fine size, bonded with suitable glues.

[0004] The panels are normally characterized by a multilayer structure or by a structure which is defined as having a "continuously variable particle size".

[0005] Generally, in industrial processes, from a mass of chips, the chips are selected either at constant size, or at variable size.

[0006] OSB panels, on the other hand, are formed by of three layers, respectively consisting of large fibers, in the specific field also defined as "strands", or "wafers" suitably oriented in the external layers, and of small fibers, or "strands" with the addition of chips of the type used in chipboard panels, also suitably oriented, in the central layer.

[0007] Also in this case the strands and the chips are bonded with suitable glues.

[0008] Both for chipboard panels and also for OSB panels, the mass of chips for the former, and of strands plus chips for the latter, in any desired stratification, is then used to generate a chip mattress. The mattress is then subjected to hot pressing in continuous processes to obtain the panels in the desired formulation.

[0009] A panel thus obtained exits the press with a very low humidity, in the order of 5 - 6%, or less.

[0010] Since the objects obtained with these panels in any case remain in contact with the air, since there is always a humidity in the air higher than these values, the panels progressively absorb humidity.

[0011] After a certain period of this process of absorbing ambient humidity, the panels reach a condition of equilibrium which, in normal climates, stands at a humidity of around 9-15%.

[0012] The increase in humidity from 5-6% to 9-15% is absorbed and retained by the wood particles (the chips or strands) that make up the panel.

[0013] If the wood particles (chips or strands) have a reduced thickness, the panel increases in volume without modifying its flatness.

[0014] On the other hand, when chips with a significant thickness, or cube-shaped chips, are present in the pan-

el, risk conditions are created.

[0015] In fact, the chips which do not have a reduced thickness, while accumulating almost the same unitary volume of water as the remaining chips, due to their cube-shaped and/or thick conformation, swell more than the thin chips, which also enjoy greater specific insulation because of the glue, generating areas or points of swelling located in the panel, and consequently in the piece of furniture of which the panel is part.

[0016] This phenomenon, which damages the surface flatness of the panel to the point of spoiling it, is also known as "orange peel surface", and is the cause of serious disputes.

[0017] To overcome these problems, in the current state of the art the chips are screened into suitable particle sizes, each of which is pneumatically selected to remove the cubic and/or thick particles in order to have a reasonable certainty that the so-called anomalous chips are not present in the panel.

[0018] This process is carried out in a dry condition, and ends with the refining of the cubic or thick particles previously removed from the mass.

[0019] However, dry refining generates a large quantity of dust which must then be screened and burned, with a considerable increase in the costs of the raw material (expensive wooden mass that is burned rather than used in the panel) and of electric energy absorbed by the refining machines.

[0020] This is a very important problem for the producers of chipboard panels of high or very high quality who have to operate in a highly competitive market.

[0021] The solution to the problem is to remove the cubic and/or thick particles in a humid condition, to be able to refine them with the minimum generation of dust.

[0022] Applicant has therefore set himself the task of studying in depth the phenomenon of simplifying and better guaranteeing the quality of the selection so as to obtain a considerable reduction in costs, and at the same time a guaranteed exclusion of the chips with undesired geometric characteristics.

[0023] Applicant therefore examined the state of the art and found EP-B-1007227 which proposes selection screens in which there are selector rollers having a cusp conformation with reciprocal cooperation (see figs. 1a and 1b) in which, opposite to steps of a certain height there are steps of a lower height. The steps of a certain height cooperate with the steps of a lower height that may or may not have circumferential discontinuity. This generates free areas that allow the transit of chips having unsuitable sizes.

[0024] With reference to the attached drawings, figs. 1a - 1b show a known but purely theoretical selector roller 110.

[0025] The known selector roller 110 has a hole (not shown) so that it can be keyed on a roller bearing shaft.

[0026] The roller 110 has circumferential cusps 111 so that a plurality of rollers 110 (fig. 1a) can be faced and positioned on parallel shafts 12, in staggered order.

[0027] The circumferential cusps 111 have a plurality of steps 113 (fig. 1b) which develop along the circumference of the roller 110, and which alternately have different heights.

[0028] Each step 113 has a surface working defined by recesses 114 staggered with respect to each other along the circumferential development of two adjacent steps 113 of the roller 110.

[0029] In particular, the recesses 114 are made on a plane orthogonal to a plane of each step 113, so that along the circumference of each step 113 empty spaces 115 are created.

[0030] Moreover, these known rollers 110 have the disadvantage that, due to the different heights of the vertices 118 of the staggered steps 113, when two rollers 110 are disposed facing each other, interspaces 116 are formed between the respective cusps 111 which do not allow an accurate and precise selection of the chips.

[0031] The rollers, according to the other proposal present in document EP-B-1007227 (see fig. 2b), can have the walls of the cusps with pseudo-radial milling or upsetting.

[0032] From these practical experiences, these rollers do not guarantee the complete and current selection of chips having cube-shaped or thick sizes.

[0033] These known and generally used selector rollers 210 are shown in figs. 2a-2c, where the cusps 211 have radial millings or upsettings 214 which develop in a radial direction with respect to the central axis X of the roller 210, and affect the entire lateral surface of the cusp 211 itself.

[0034] The radial millings 214 are possibly separated by circumferential furrows 215.

[0035] This type of millings or upsettings 214 and furrows 215, however, are not able to retain only the cube-shaped particles, unless the interspaces, or gaps 216 that are created between two facing rollers 210 are not exaggeratedly open, in this case making also the cube-shaped particles pass together with those of acceptable thickness, instead of retaining them.

[0036] Applicant has found that the two types of rollers, while improving the quality of the selection, are in fact unable to remove the cubic particles, with unsuitable sizes, and still maintain the percentage of chips with unsuitable sizes, particularly of a cubic shape, still high, because the interspaces that are created between the rollers do not allow a more precise selection.

[0037] This means that the material selected in this way must be recovered and reprocessed in a dry condition, with an increase in energy costs and a great loss of wood material due to the dust generated by the dry refining machines.

[0038] The purpose of the present invention is to improve the high selection capability of any selection machine with rollers located on adjacent and parallel axes. The rollers operate separate and laterally displaced in relation to the rows of cooperating rollers located parallel.

[0039] The purpose of the present invention is there-

fore to obtain selector rollers which, already in the humid processing step, guarantee the removal from the mass of chips of the cubic and/or thick particles, to prevent the selected material having to be recovered in the subsequent dry step, with an increase in costs due to the waste of raw material and energy.

[0040] Another purpose is also to reduce investments, the energy consumption and the necessary labor, all of which entail a substantial reduction in costs and pollution.

[0041] Another purpose is to make the selection of the chips in the humid step efficient, so as to prevent the formation of dust which can be harmful to the operators or the environment.

[0042] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0043] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0044] In accordance with the above purpose, the inventive idea which provides the basis for this significant technical progress is to provide improved selector rollers and to make them work differently from known selector rollers.

[0045] To make them work in such a way that the wood chips of cubic or thick shape, whose geometry does not correspond to the needs set forth above, are discarded and advantageously refined already in the humid processing step, Applicant has studied, experimented and created a new and more suitable profile of the selector rollers.

[0046] According to the invention, the selector rollers are always cusp-shaped, so that the cusp of one roller cooperates with the opposite walls of the cusps of two adjacent rollers.

[0047] It is the profile of the cusps that is innovated to constitute a substantial innovation in the selection process.

[0048] According to the invention, the two sides of each cusp of a single selector roller, or more simply roller, have a desired number of steps.

[0049] The steps of a roller, in operation, face the two faces of the two opposite rollers, which also have specular steps.

[0050] The central portion of the roller, also known as the upper bench, farthest from the axis of rotation of the roller, is conformed so as to face the throat which the two adjacent and opposite rollers create.

[0051] The central portion is conformed so as to generate on the wood scale, or chips, both a drawing action and also a mechanical action of compression and flaking of the coarse particles passing through it.

[0052] According to some embodiments, the central

portion has a flat and smooth surface.

[0053] According to variant embodiments, the central portion has a beveled surface along the circumferential sides.

[0054] According to other variants, the central portion has a surface provided with millings and/or hollows and/or upsettings.

[0055] According to other variants, the surface of the central portion has central depressions with, or without, circumferential interceptions.

[0056] According to another variant, the circumferential central portion can have at least one circumferential groove.

[0057] According to a variant, the circumferential groove develops in a spiral.

[0058] The steps on the sides of the cusp are sufficient in number to be consistent with the type of chip and the action to be exerted thereon.

[0059] Therefore, due to the maximum diameter of the roller and the width of the cusp or V-shaped elements, interconnected with the V-shaped throats of the adjacent rollers, there may be from three to eight steps, advantageously but not restrictively, four or five or six.

[0060] According to one formulation of the invention, the two sides of the cusp are specular.

[0061] According to another formulation, the two sides of the cusp have the same number of steps with different morphologies.

[0062] Another variant is also possible which provides the two sides of the cusp with a different number of steps, which thus entails the need for a correct correlation between the rollers positioned on one shaft and the rollers positioned on the neighboring and parallel shafts.

[0063] One roller must have a size correlated to the interaxis between two rows of rollers except for a value that guarantees non-interference in any working condition.

[0064] Thus, for example, a pitch or interaxis between the rows of rollers of about 82-86 mm brings the maximum diameter of the roll to around 98-102 mm.

[0065] However, screens can also be constructed with smaller or larger interaxes between the rows of rollers, which therefore give smaller or larger maximum diameters of the rollers, compared with the approximate sizes indicated above.

[0066] According to the invention, the tread of the steps will advantageously be substantially parallel to the axis, while the riser can advantageously be substantially orthogonal to the axis.

[0067] According to variants, the tread can have a positive or negative inclination with respect to the parallelism with the axis, which can even reach 25°-30°.

[0068] According to variants, the riser can have a positive or negative inclination with respect to the orthogonality to the axis of rotation, which can even reach 25°-30°.

[0069] According to another variant, the steps all have the same characteristics.

[0070] According to a variant, the steps have one or more differentiations.

[0071] According to a first formulation, the tread of all the steps has the same width.

5 **[0072]** According to a variant, at least one step has a tread with a different measurement.

[0073] According to one formulation, the riser of all the steps has the same measurement.

10 **[0074]** According to a variant, at least one step has a different height.

[0075] According to the invention, the leading edge of each step is at least partly affected by a milling which creates a circumferential furrow.

15 **[0076]** Hereafter, where the term milling is used, said term is generic, since the same effect can be obtained by rolling, or also by molding.

[0077] The milling can also affect the entire step in a circumferential direction.

20 **[0078]** According to the invention, transverse furrows are present along the perimeter profile of each step, at regular intervals along the circumferential development of the step.

25 **[0079]** According to some embodiments, the transverse furrows are each made on a radial plane with respect to the axis of the roller.

[0080] According to some embodiments, the transverse furrows are made in a helical pattern along the external surface.

30 **[0081]** According to some embodiments, the transverse furrows of one row of steps at intervals with respect to the transverse furrows of the upper and lower row.

35 **[0082]** According to a variant, the furrows of the steps are positioned to create a progressive development in the rows of the steps toward the central axis, or toward the cusp.

[0083] The furrows can be parallel to the axis, that is, with a right-handed or left-handed development, that is, at intervals with a desired cadence to the right or to the left.

40 **[0084]** According to a variant, each roller can be made from two semi-rollers which normally affect half the roller and, facing each other on the back, obtain the roller.

45 **[0085]** The solution of providing two semi-rollers allows to characterize the two halves of the cusp in a differentiated manner, said differentiation can be deliberately modified with every change of wood and/or chip and/or other factor incident on the selection.

[0086] Instead of the two semi-rollers, rollers can also be made with the two parts that make up the cusp which are specialized in different ways.

50 **[0087]** According to the invention, the part closest to the axis located in the sides of the roller, also called the lower bench, is flat.

55 **[0088]** The variants identified have the function on the one hand of maximizing the selective result according to the structure of the selection machine and the speed of feed, and on the other hand to make the rollers compatible with the presence of any vibrating motions.

[0089] Another characteristic of the variants is to identify the need to improve the selective appearance due to the type of wood and/or the characteristics of the chips to be selected.

[0090] Another characteristic of the variants is to attach any unsuitable chips and to flake or break them.

BRIEF DESCRIPTION OF THE DRAWINGS

[0091] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings.

[0092] The attached drawings not only identify the state of the art but also show two possible construction variants.

- figs. 1a-1b show a first known model of a selector roller;
- figs. 2a-2c show a second known model of a selector roller used in the state of the art;
- figs. 3a-3f show a possible roller with five steps according to embodiments of the present invention;
- figs. 4a-4b show a possible roller with four steps according to embodiments of the present invention;
- fig. 5 shows a detailed view, partly in section, of a portion of the roller in figs. 4a-4b;
- figs. 5a-5b show detailed views along the section line V-V of fig. 5;
- fig. 6 shows a detailed view, partly in section, of a portion of two opposite rollers of fig. 4a.

[0093] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0094] The selector rollers 10 according to the invention, hereafter also referred to as "rollers", are shown by way of example in figs. 3a to 6.

[0095] The rollers 10 have an annular shape, which develops around a central axis X, defining the axis of rotation, and are provided with a central hole 20 through which the roller 10 can be keyed onto a shaft 12 disposed parallel to the central axis X.

[0096] The rollers 10 according to the invention have a lateral surface with a cusp shape 11.

[0097] According to some embodiments, the rollers 10 comprise a circumferential central portion 18, having an annular shape, which defines the tip of the cusp 11.

[0098] According to some embodiments, the cusps 11 have a stepped development 13.

[0099] By way of example, the rollers 10 according to the invention are shown with cusps 11 which, in this case,

have five (figs. 3a-3b) and four (figs. 4a-4b) steps 13 per side.

[0100] In particular, the steps 13 are defined by cylindrical surface portions with a gradually decreasing diameter, which are progressively disposed toward the outside from the circumferential central portion 18.

[0101] According to some embodiments, the rollers 10 according to the invention have lateral shoulders 17 with an annular shape, which protrude from the lower step 13 of the cusp portion 11 in a direction parallel to the central axis of the roller 10.

[0102] When two rollers 10 are adjacent, the lateral shoulders 17 of two rollers 10 create a circumferential ring 19 which cooperates with the circumferential central portion 18 of the opposite and staggered roller 10 (figs. 3a-3b and 4a-4b).

[0103] According to some embodiments, the lateral shoulders 17 can be smooth or they have grooves or incisions.

[0104] According to some embodiments, a roller 10 can be obtained in a single body and with the two sides of the cusp 11 identical, that is, with the two sides of the cusp 11 differently specialized.

[0105] According to a variant, a roller 10 can also be obtained with two facing semi-rollers and possibly joined together in relation to the circumferential central portion 18. In this case, each semi-roller will have a circumferential semi-portion having a width correlated to that of the circumferential central portion 18 of a roller 10 in a single body.

[0106] According to some embodiments, the steps 13 of a cusp 11 can all be the same, or differentiated on one side with respect to the other.

[0107] Furthermore, according to possible variants, the steps 13 can also be differentiated on the same side.

[0108] According to some embodiments, the steps 13 each have a tread 14, and a riser 15.

[0109] According to some embodiments, during operation, the treads 14 and the risers 15 of the steps 13 of respective cusps 11 of facing rollers 10 respectively face each other in a close position and cooperate with each other to prevent the transit of chips having a cubic and/or thick shape, and to allow the transit of only chips of suitable shape.

[0110] In this way, when two rollers 10 are disposed facing each other, the treads 14 and the risers 15 of the respective steps 13 of one and the other roller 10 define interspaces 32 which are consistent with the sizes of the chips to be selected.

[0111] Only the particles and chips having a thickness smaller than the height of the interspace 32 can transit through the interspaces 32, while the chips of cubic form, or thick, are retained.

[0112] According to some embodiments, the riser 15 of one step 13 of a cusp 11 is parallel and close to the riser 15 of the previous step 13 of the other cusp 11, and the tread 14 of one step 13 of a cusp 11 is parallel and close to the tread 14 of a following step 13 of the other

cusps 11.

[0113] According to other embodiments, all the treads 14 of the steps 13 on at least one side of the cusp 11 develop parallel to each other.

[0114] According to other embodiments, all the risers 15 of the steps 13 on at least one side of the cusp 11 develop parallel to each other.

[0115] According to some embodiments, the tread 14 and the riser 15 of each step 13 develop substantially orthogonal to each other.

[0116] According to some embodiments, the tread 14 is substantially parallel to the central axis X, while the riser is substantially orthogonal to the central axis X.

[0117] According to possible variants, the tread 14 can have a positive or negative inclination with respect to the parallelism with the central axis X.

[0118] According to other variants, the riser 15 can have a positive or negative inclination with respect to the orthogonality to the central axis X.

[0119] According to some embodiments, the interaxes between the shafts 12 can be modified to adjust the distance between the respective treads 14 of the facing rollers 10, and thus modify the size of the interspaces 32 and therefore the thickness of the chips which can transit through them.

[0120] According to some embodiments, the interaxis between the shafts 12 can be variable with a desired progression or fixed, that is, at predefined intervals.

[0121] According to variant embodiments, the interaxis between the shafts 12 can be variable with a progressively increasing or decreasing development, from the beginning toward the discharge of a screen of a selection machine.

[0122] The variations of the interaxes can be manual or governed and can be performed manually or in assisted mode, or again in a controlled and possibly programmed manner.

[0123] For example, in a selection machine there can be positioning means (not shown) suitable to allow the reciprocal positioning of the shafts 12. The positioning means can be the manual type, or automated.

[0124] According to some embodiments, the roller 10 comprises a circumferential furrow 33 in correspondence with at least part of the leading edge of one or each step 13.

[0125] According to some embodiments, the roller 10 comprises a circumferential furrow 33 in correspondence with the whole leading edge of each step 13.

[0126] According to some embodiments, the steps 13 have transverse furrows 21, made in a transverse direction in the tread 14 and respectively in the riser 15.

[0127] According to some embodiments, for example visible in figs. 5 and 6, the furrows 21 continue beyond the edge of the step defined by respective riser 15 and tread 14 with a curved shape.

[0128] According to some embodiments, the curved shape of the furrow 21 advantageously has a radius of curvature substantially tangent to the tread 14 and to the

riser 15 of the bordering steps 13.

[0129] In particular, the curve has an outward facing concavity.

[0130] According to some embodiments, for example shown in fig. 5a, the base of the furrow 21 is substantially linear.

[0131] According to possible variant embodiments, for example shown in figs. 5b and 5c, the base of the furrow 21 has a certain thickness, having a substantially rectangular shape in plan view.

[0132] According to some embodiments, the transverse furrows 21 are associated with hollows 22 made in the thickness of the step 13.

[0133] According to some embodiments, the hollows 22 have a flared shape with respect to the plane of the transverse furrow 21.

[0134] For example, the hollows 22 can define in the steps 13 inclined walls with an inclination comprised between about 30° and about 60°.

[0135] According to some embodiments, the hollows 22 are symmetrical to each other with respect to the respective transverse furrow 21.

[0136] According to possible variant embodiments, the hollows 22 can have smooth walls (figs. 5a and 5b) or have surface workings (fig. 5c).

[0137] According to possible solutions, described by way of example only, the transverse furrows 21 are disposed radially with respect to the central axis X, so as to define, together with the associated hollows 22, a pyramidal or truncated-pyramidal morphology, in which all the vertexes, or minor bases 23, are disposed substantially on a conical lateral surface.

[0138] In particular, the pyramids or truncated-pyramids of each step 13 are disposed in succession along the same annular crown.

[0139] According to some embodiments, the transverse furrows 21 of one row of steps 13 are separated by the transverse furrows 21 of the upper and lower row.

[0140] According to some embodiments, the vertices 23 of each step 13 are all disposed on a common circumference defined by the intersection between the respective risers 15 and tread 14.

[0141] Moreover, the pyramidal working minimizes the blockages of wood particles or chips between the profiles of adjacent concurrent rollers 10, preventing mechanical blockages and limiting the power absorbed by the drive system of the rollers.

[0142] According to some embodiments, each tread 14 is defined by a succession of triangular portions 24, disposed with the base toward the central axis X and the vertex 23 facing toward the outside (see figs. 3c and 3d).

[0143] According to these embodiments, moreover, each riser 15 is also defined by a succession of triangular portions 25, disposed with the base toward the circumferential central portion 18, and the vertex 23 facing toward the outside (see figs. 3c and 3d).

[0144] According to possible embodiments, the transverse furrows 21 and the associated hollows 22 can be

disposed in an oblique and/or helical direction with respect to the central axis X.

[0145] According to possible embodiments, the characteristics of the steps 13, that is to say, the transverse furrows 21 and the separated hollows 22, can be obtained by milling, rolling, or molding.

[0146] According to an advantageous implementation, the transverse furrows 21 and the hollows 22 can be made with a circular cutter, also automatically.

[0147] The circular cutter (not shown) can have a shaped profile even if the representation in fig. 5 identifies, by way of example only, the hollows 22 with identical walls.

[0148] According to some embodiments, the circumferential central portion 18 can have a flat external surface.

[0149] According to other embodiments, the circumferential central portion 18 can have grooves 26 disposed on the external surface, disposed at intervals along the circumference, which can have the most suitable shaping and conformation on each occasion.

[0150] According to some embodiments, the grooves 26 can be parallel to the central axis X.

[0151] According to these embodiments, the circumferential central portion 18 has an external surface defined by a succession of pyramidal or truncated pyramidal portions 29, defined by the grooves 26, with respective vertices, or minor bases, disposed substantially along the same circumference passing through the center line of the circumferential central portion 18.

[0152] According to variant embodiments, the grooves 26 are made with a helical or oblique development with respect to the central axis X.

[0153] According to other variants, the external surface of the circumferential central portion 18 has upsettings, millings, or other workings.

[0154] According to variant embodiments, the circumferential central portion 18 has a central segment 27, on which the grooves 26 or other workings can be made, and lateral bevels 28.

[0155] The bevels 28 can be flat or have specialized hollows.

[0156] Both the circumferential central portion 18 and the lateral shoulders 17 can have specialized shapes in the case of particular needs, or specific chips.

[0157] According to some embodiments, also the grooves 26 and/or the bevels 28 of the circumferential central portion 18 can be made by milling, rolling, or molding.

[0158] By way of example only, the roller 10 can have an external diameter comprised between about 90 and 105 mm, and a thickness comprised between about 30 and 40 mm.

[0159] By way of example only, the central hole 20 can have a diameter comprised between about 50 and 60 mm, although this size can vary according to the length of the shaft 12 and the total number of rollers 10 to be positioned adjacent.

[0160] It is clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of roller 10, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Selector roller for the selection of wood chip, positionable on a shaft (12) alone, or adjacent to and at intervals from other selector rollers positioned on parallel shafts (12), said roller being shaped like a cusp (11), the cusp (11) of one roller cooperating, during use, with the cusp (11) of two other facing rollers, said roller having from three to eight steps (13) for each side of said cusp (11), a circumferential central portion (18) and lateral shoulders (17), **characterized in that** at least said steps (13) have deformations defined by transverse furrows (21) advantageously positioned in differentiated circumferential positions, in one step (13) with respect to the preceding step (13) and the subsequent step (13).
2. Roller as in claim 1, **characterized in that** the transverse furrows (21) have a flared hollow (22), with smooth or worked surfaces, substantially connected with a tread (14) and a riser (15) of the respective bordering steps (13).
3. Roller as in claim 1 or 2, **characterized in that** at least one side of the cusp (11) has from four to five steps (13).
4. Roller as in any claim hereinbefore, **characterized in that** the steps (13) of one side of the cusp (11) have at least the same characteristics of size as the steps (13) of the other side.
5. Roller as in any of the claims from 1 to 3, **characterized in that** the steps (13) of one side of the cusp (11) have at least the characteristics of size different from the steps (13) of the other side.
6. Roller as in any claim hereinbefore, **characterized in that** all the steps (13) of each side of said cusp (11) have their circumferential vertex (23) lying on a same conical surface.
7. Roller as in any of the claims from 1 to 5, **characterized in that** the steps (13) of each side of said cusp (11) have their circumferential vertex (23) lying on at least two conical surfaces.
8. Roller as in any claim hereinbefore, **characterized in that** at least some of the furrows (21) and/or the hollows (22) are oriented axially.

9. Roller as in any of the claims from 1 to 7, **characterized in that** at least some of the furrows (21) and/or the hollows (22) are oriented inclined with respect to the central axis (X) of the roller.
10. Roller as in any of the claims from 1 to 7, **characterized in that** the bases of said transverse furrows (21) are disposed in a radial direction with respect to the central axis (X) of the roller.
11. Roller as in any claim hereinbefore, **characterized in that** said circumferential central portion (18) has lateral circumferential bevels (28) which are smooth or with incisions.
12. Roller as in any claim hereinbefore, **characterized in that** said circumferential central portion (18) has grooves (26) along at least part of the surface.
13. Roller as in claim 12, **characterized in that** said transverse furrows (21) and/or said grooves (26) are made in a transverse direction to the central axis (X) of the roller.
14. Roller as in any claim hereinbefore, **characterized in that** it comprises a circumferential furrow (33), continuous or at intervals, extending in correspondence with at least part of the leading edge of one or of each step (13).
15. Roller as in any claim hereinbefore, **characterized in that** it is defined by two adjacent semi-rollers facing the circumferential central portion (18).
16. Machine to select wood chip comprising at least two roller-bearing shafts (12), parallel and at intervals, **characterized in that** each shaft (12) comprises at least two rollers (10) as defined in any of the claims hereinbefore, said rollers (10) having respective cusps (11) facing and cooperating with each other, wherein respective treads (14) and risers (15) of two opposite steps (13) are facing each other and in close position, the riser (15) of one step (13) of one cusp (11) being parallel and close to the riser (15) of the preceding step (13) of the other cusp (11) and the tread (14) of one step (13) of one cusp (11) being parallel and close to the tread (14) of a subsequent step of the other cusp (11), said treads (14) and said risers (15) of facing cusps (11) defining between them interspaces (32) for the passage of chip of the desired size.
17. Machine as in claim 16, **characterized in that** the interaxis between said shafts (12) is variable, in a constant manner, or with a progressively increasing or decreasing development, from the beginning toward the discharge of the selector machine, in order to allow to adjust the sizes of said interspaces (32)

and therefore the thickness of the chip retained and that of the chip that can pass through them.

18. Machine as in claim 16, **characterized in that** the adjacent shafts (12) have axes with a fixed distance with respect to each other.

19. Machine as in claim 16 or 17, **characterized in that** it comprises positioning means suitable to allow the reciprocal positioning of the adjacent shafts (12), said positioning means being chosen from among manual means, governed means, or controlled and programmed means.

Patentansprüche

- Sortierrolle zum Sortieren von Hackschnitzeln, positionierbar auf einer Welle (12) allein, oder angrenzend an und in Intervallen von anderen Sortierrollen, die auf parallelen Wellen (12) positioniert sind, wobei die genannte Rolle wie eine Spitze (11) ausgebildet ist, wobei die Spitze (11) der einen Rolle, während der Benutzung, mit der Spitze (11) von zwei anderen gegenliegenden Rollen zusammenwirkt, wobei die genannte Rolle drei bis acht Stufen (13) für jede Seite der genannten Spitze (11), einen umlaufenden Mittelabschnitt (18) und seitliche Schultern (17) aufweist, **dadurch gekennzeichnet, dass** zumindest die genannten Stufen (13) Verformungen aufweisen, die von querlaufenden Rillen (21) definiert sind, die vorteilhaft in differenzierten umlaufenden Positionen, in einer Stufe (13) mit Bezug auf die vorhergehende Stufe (13) und auf die nachfolgende Stufe (13), positioniert sind.
- Rolle nach Anspruch 1, **dadurch gekennzeichnet, dass** die querlaufenden Rillen (21) einen aufgeweiteten Hohlraum (22), mit glatten oder bearbeiteten Flächen, haben, die im Wesentlichen mit einem Auftritt (14) und einer Stufenhöhe (15) der jeweiligen angrenzenden Stufen (13) verbunden sind.
- Rolle nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** zumindest eine Seite der Spitze (11) vier bis fünf Stufen (13) aufweist.
- Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Stufen (13) der einen Seite der Spitze (11) zumindest die gleichen Größenmerkmale haben wie die Stufen (13) der anderen Seite.
- Rolle nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Stufen (13) der einen Seite der Spitze (11) zumindest die Größenmerkmale haben, die anders sind als die Stufen (13) der anderen Seite.

6. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** alle Stufen (13) jeder Seite der genannten Spitze (11) ihren umlaufenden Scheitelpunkt (23) haben, der auf einer gleichen konischen Fläche liegt. 5
7. Rolle nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Stufen (13) jeder Seite der genannten Spitze (11) ihren umlaufenden Scheitelpunkt (23) haben, der auf zumindest zwei konischen Flächen liegt. 10
8. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest einige der Rillen (21) und/oder der Hohlräume (22) axial ausgerichtet sind. 15
9. Rolle nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** zumindest einige der Rillen (21) und/oder der Hohlräume (22) geneigt mit Bezug auf die Mittelachse (X) der Rolle ausgerichtet sind. 20
10. Rolle nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** die Basen der genannten querlaufenden Rillen (21) in einer radialen Richtung mit Bezug auf die Mittelachse (X) der Rolle angeordnet sind. 25
11. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der genannte umlaufende Mittelabschnitt (18) seitliche umlaufende Abschrägungen (28) hat, die glatt sind oder Einschnitte haben. 30
12. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der genannte umlaufende Mittelabschnitt (18) Nuten (26) entlang zumindest eines Teils der Oberfläche hat. 35
13. Rolle nach Anspruch 12, **dadurch gekennzeichnet, dass** die genannten querlaufenden Rillen (21) und/oder die genannten Nuten (26) in einer Querrichtung zur Mittelachse (X) der Rolle ausgebildet sind. 40
14. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine umlaufende Rille (33), durchgehend oder in Intervallen, umfasst, die sich an zumindest einem Teil der Vorderkante einer oder jeder Stufe (13) erstreckt. 45
15. Rolle nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie durch zwei angrenzende Halbrollen definiert ist, die dem umlaufenden Mittelabschnitt (18) gegenüberliegen. 50
16. Maschine zum Sortieren von Hackschnitzeln, umfassend zumindest zwei Wellen (12), die die Rollen

tragen, parallel und in Intervallen, **dadurch gekennzeichnet, dass** jede Welle (12) zumindest zwei Rollen (10) wie nach einem der vorhergehenden Ansprüche definiert umfasst, wobei die genannten Rollen (10) jeweilige Spitzen (11) aufweisen, die einander gegenüberliegen und miteinander zusammenwirken, worin jeweilige Auftritte (14) und Stufenhöhen (15) von zwei entgegengesetzten Stufen (13) einander gegenüberliegen und einander nahe stehen, wobei die Stufenhöhe (15) der einen Stufe (13) einer Spitze (11) parallel zu und nahe bei der Stufenhöhe (15) der vorhergehenden Stufe (13) der anderen Spitze (11) ist, und der Auftritt (14) der einen Stufe (13) einer Spitze (11) parallel zu und nahe bei dem Auftritt (14) einer nachfolgenden Stufe der anderen Spitze (11) ist, wobei die genannten Auftritte (14) und die genannten Stufenhöhen (15) von gegenüberliegenden Spitzen (11) dazwischen Zwischenräume (32) für den Durchgang von Schnitzeln der gewünschten Größe definieren.

17. Maschine nach Anspruch 16, **dadurch gekennzeichnet, dass** der Achsenabstand zwischen den genannten Wellen (12), in einer andauernden Weise, oder mit einem fortschreitend zunehmenden oder abnehmenden Verlauf, vom Anfang zur Abgabe der Sortiermaschine veränderlich ist, um zu ermöglichen, die Größen der genannten Zwischenräume (32) und daher die Dicke der zurückbehaltenen Schnitzel und diejenige der Schnitzel, die dadurch laufen können, anzupassen.
18. Maschine nach Anspruch 16, **dadurch gekennzeichnet, dass** die angrenzenden Wellen (12) Achsen mit einem festen Abstand in Bezug zueinander haben.
19. Maschine nach Anspruch 16 oder 17, **dadurch gekennzeichnet, dass** sie Positionierungsmittel umfasst, die dazu geeignet sind, die gegenseitige Positionierung der angrenzenden Wellen (12) zu ermöglichen, wobei die genannten Positionierungsmittel aus handbetätigten Mitteln, verriegelten Mitteln, oder gesteuerten und programmierten Mitteln ausgewählt sind.

Revendications

1. Rouleau sélecteur pour la sélection de copeaux de bois, positionnable sur un arbre (12) seul, ou adjacent et à intervalles d'autres rouleaux sélecteurs positionnés sur des arbres parallèles (12), ledit rouleau étant conformé en pointe (11), la pointe (11) d'un rouleau coopérant, en cours d'utilisation, avec la pointe (11) de deux autres rouleaux se faisant face, ledit rouleau ayant de trois à huit crans (13) pour chaque côté de ladite pointe (11), une partie centrale circonférentielle (18) et des épaulements latéraux

- (17), **caractérisé en ce qu'au** moins lesdits crans (13) ont des déformations définies par des sillons transversaux (21) avantageusement positionnés dans des positions circonférentielles différenciées, dans un cran (13) par rapport au cran précédent (13) et au cran suivant (13). 5
2. Rouleau selon la revendication 1, **caractérisé en ce que** les sillons transversaux (21) présentent un creux évasé (22), avec des surfaces lisses ou travaillées, essentiellement relié à une bande de roulement (14) et à une colonne montante (15) des crans en bordure respectifs (13). 10
3. Rouleau selon la revendication 1 ou 2, **caractérisé en ce qu'au** moins un côté de la pointe (11) présente quatre à cinq crans (13). 15
4. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les crans (13) d'un côté de la pointe (11) ont au moins les mêmes caractéristiques de taille que les crans (13) de l'autre côté. 20
5. Rouleau selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** les crans (13) d'un côté de la pointe (11) présentent au moins les caractéristiques de taille différentes des crans (13) de l'autre côté. 25
6. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce que** tous les crans (13) de chaque côté de ladite pointe (11) ont leur sommet circonférentiel (23) reposant sur une même surface conique. 30
7. Rouleau selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** les crans (13) de chaque côté de ladite pointe (11) ont leur sommet circonférentiel (23) reposant sur au moins deux surfaces coniques. 35
8. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'au** moins quelques-uns des sillons (21) et/ou des creux (22) sont orientés axialement. 40
9. Rouleau selon l'une quelconque des revendications 1 à 7, **caractérisé en ce qu'au** moins certains des sillons (21) et/ou des creux (22) sont orientés de manière inclinée par rapport à l'axe central (X) du rouleau. 45
10. Rouleau selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** les bases desdits sillons transversaux (21) sont disposées dans une direction radiale par rapport à l'axe central (X) du rouleau. 50
11. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite partie centrale circonférentielle (18) comporte des chanfreins circonférentiels latéraux (28) qui sont lisses ou avec des incisions. 55
12. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite partie centrale circonférentielle (18) comporte des rainures (26) le long d'au moins une partie de la surface.
13. Rouleau selon la revendication 12, **caractérisé en ce que** lesdits sillons transversaux (21) et/ou lesdites rainures (26) sont réalisés dans une direction transversale à l'axe central (X) du rouleau.
14. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend un sillon circonférentiel (33), continu ou à intervalles, s'étendant en correspondance avec au moins une partie du bord d'attaque de l'un ou de chaque cran (13).
15. Rouleau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** est défini par deux demi-rouleaux adjacents faisant face à la partie centrale circonférentielle (18).
16. Machine de sélection de copeaux de bois comprenant au moins deux arbres de roulement à rouleaux (12), parallèles et à intervalles, **caractérisée en ce que** chaque arbre (12) comprend au moins deux rouleaux (10) tels que définis dans l'une quelconque des revendications précédentes, lesdits rouleaux (10) ayant des pointes respectives (11) tournées l'une vers l'autre et coopérant l'une avec l'autre, où les bandes de roulement respectives (14) et les colonnes montantes (15) de deux crans opposés (13) sont opposées l'une à l'autre et en position fermée, la colonne montante (15) d'un cran (13) d'une pointe (11) étant parallèle et proche de la colonne montante (15) du cran précédent (13) de l'autre pointe (11) et la bande de roulement (14) d'un cran (13) d'une pointe (11) étant parallèle et proche de la bande de roulement (14) d'un cran suivant de l'autre pointe (11), lesdites bandes de roulement (14) et lesdites colonnes montantes (15) de pointes opposées (11) définissant entre elles des espaces (32) pour le passage de copeaux de la taille désirée.
17. Machine selon la revendication 16, **caractérisée en ce que** l'axe intermédiaire entre lesdits arbres (12) est variable, de manière constante, ou avec un développement progressivement croissant ou décroissant, depuis le début vers la décharge de la machine de sélection, afin de permettre d'ajuster les tailles desdits espaces intermédiaires (32) et donc l'épaisseur des copeaux retenue et celle des copeaux qui

peut les traverser.

18. Machine selon la revendication 16, **caractérisée en ce que** les arbres adjacents (12) ont des axes ayant une distance fixe les uns par rapport aux autres. 5
19. Machine selon la revendication 16 ou 17, **caractérisée en ce qu'**elle comprend des moyens de positionnement aptes à permettre le positionnement réciproque des arbres adjacents (12), lesdits moyens de positionnement étant choisis parmi des moyens manuels, des moyens commandés, ou des moyens commandés et programmés. 10

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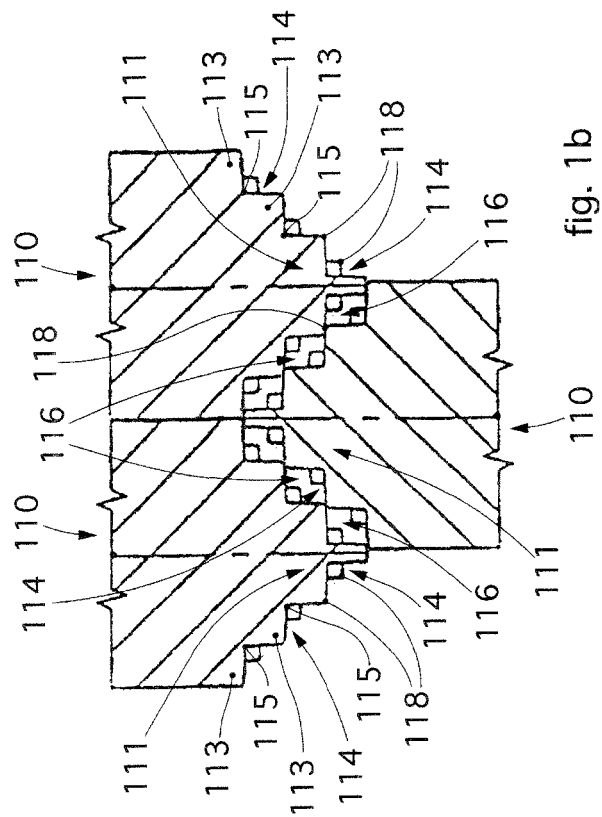
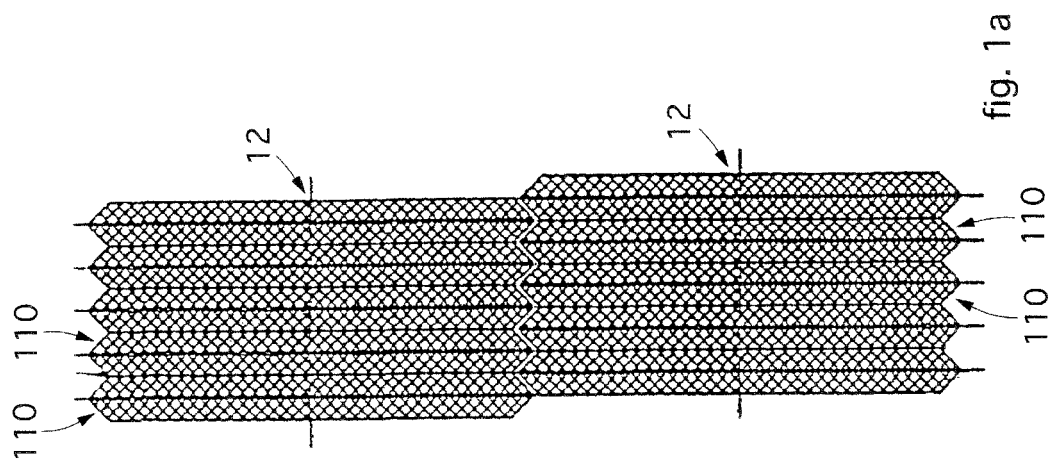
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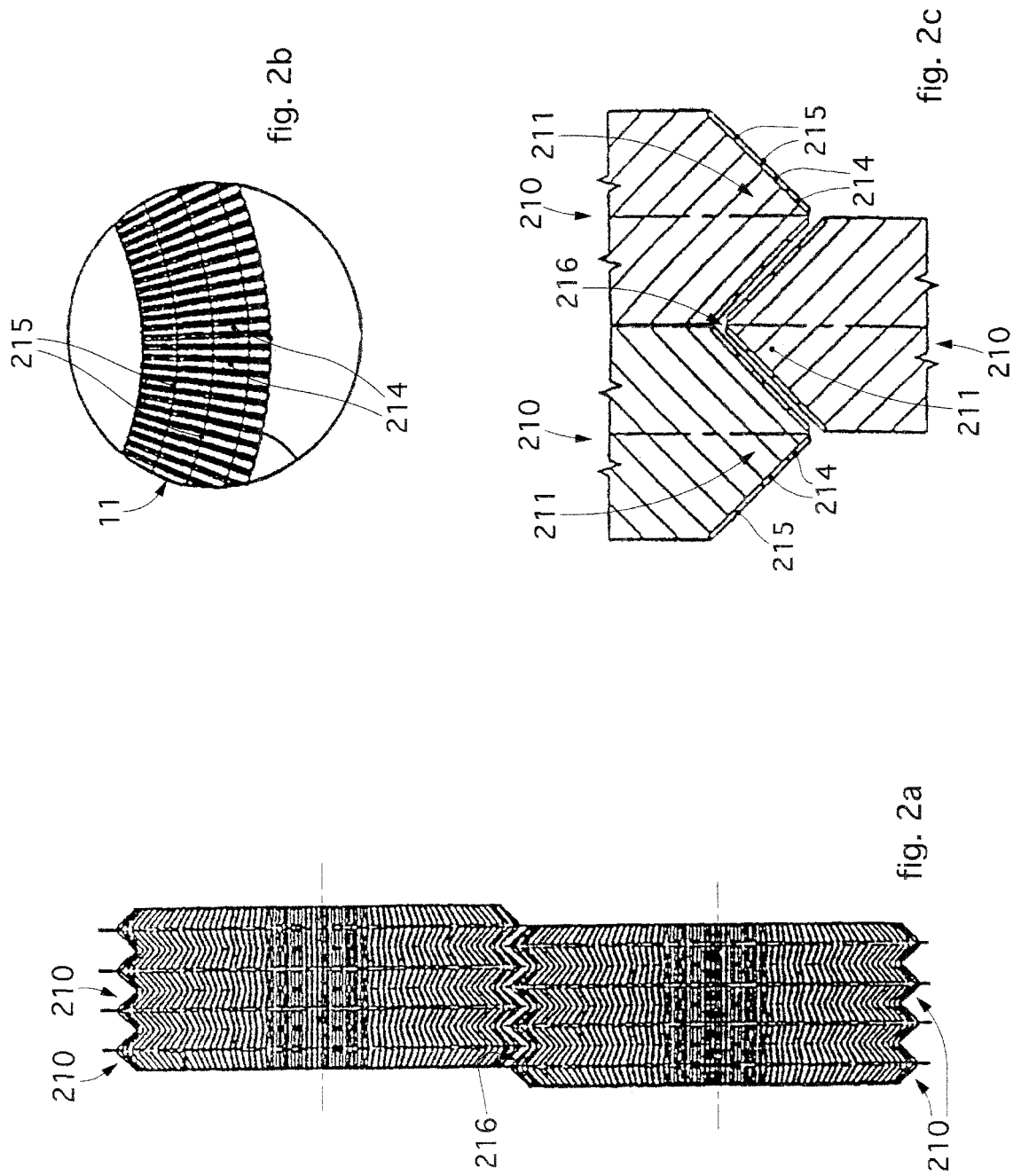
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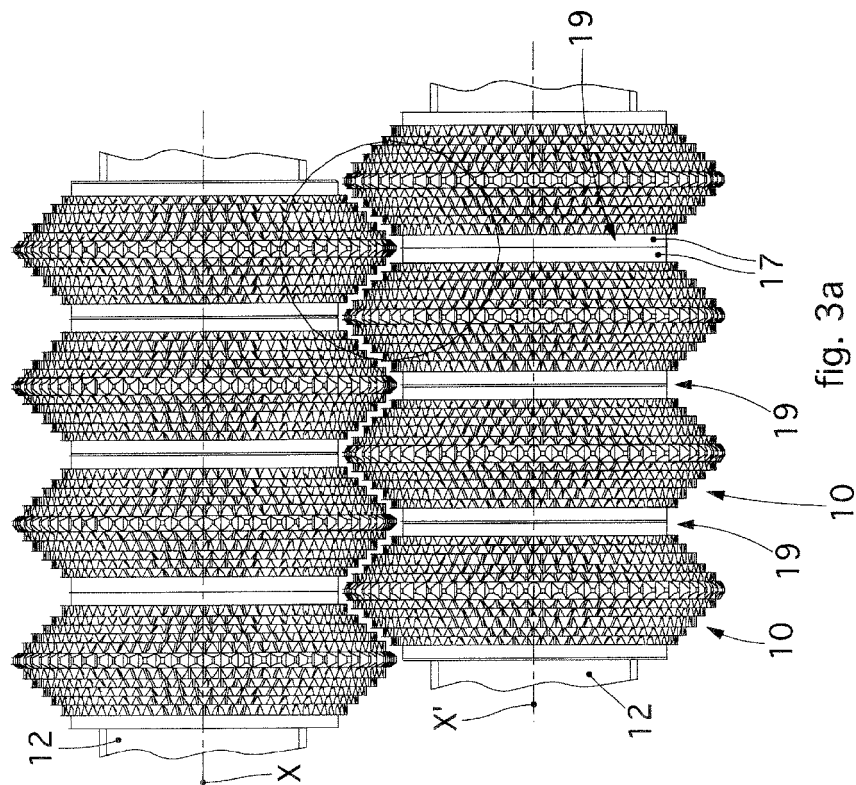


fig. 3a

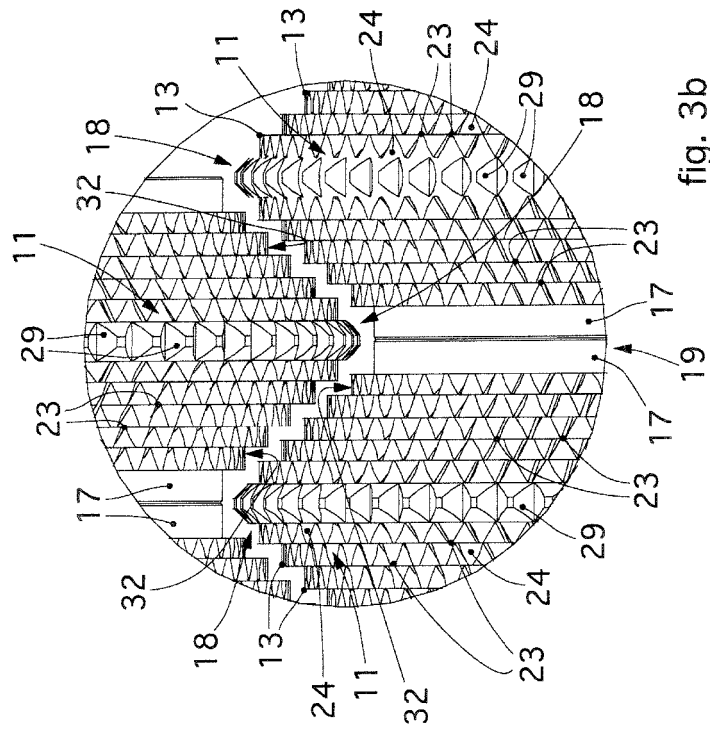


fig. 3b

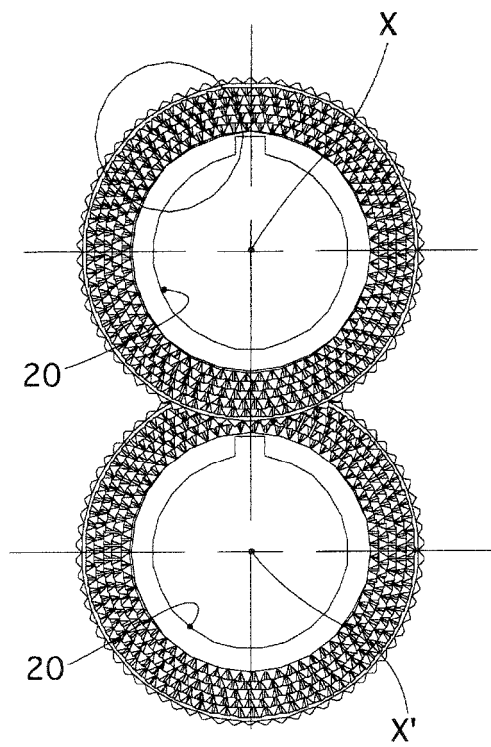


fig. 3c

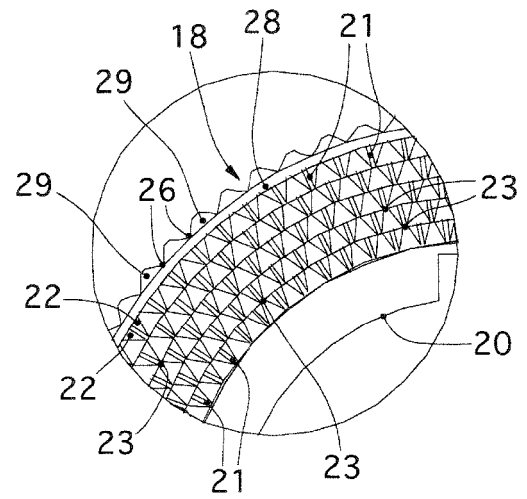


fig. 3d

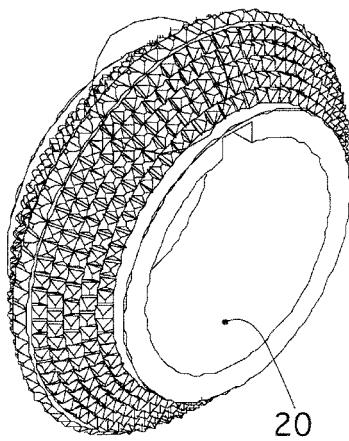


fig. 3e

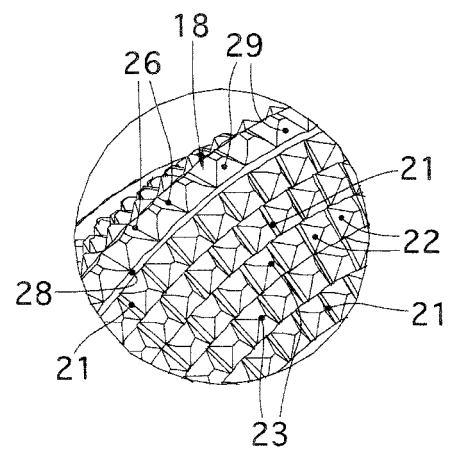


fig. 3f

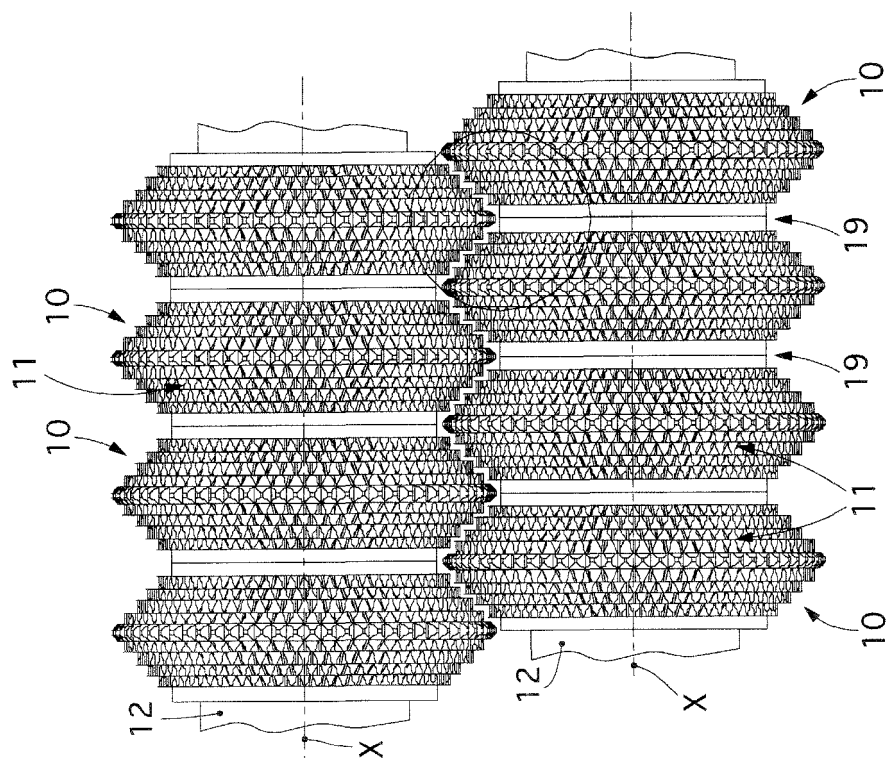


fig. 4a

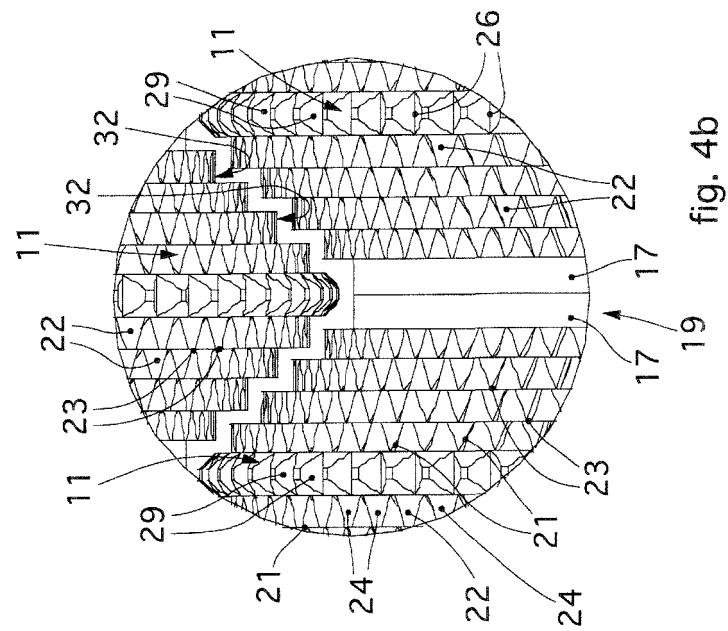


fig. 4b

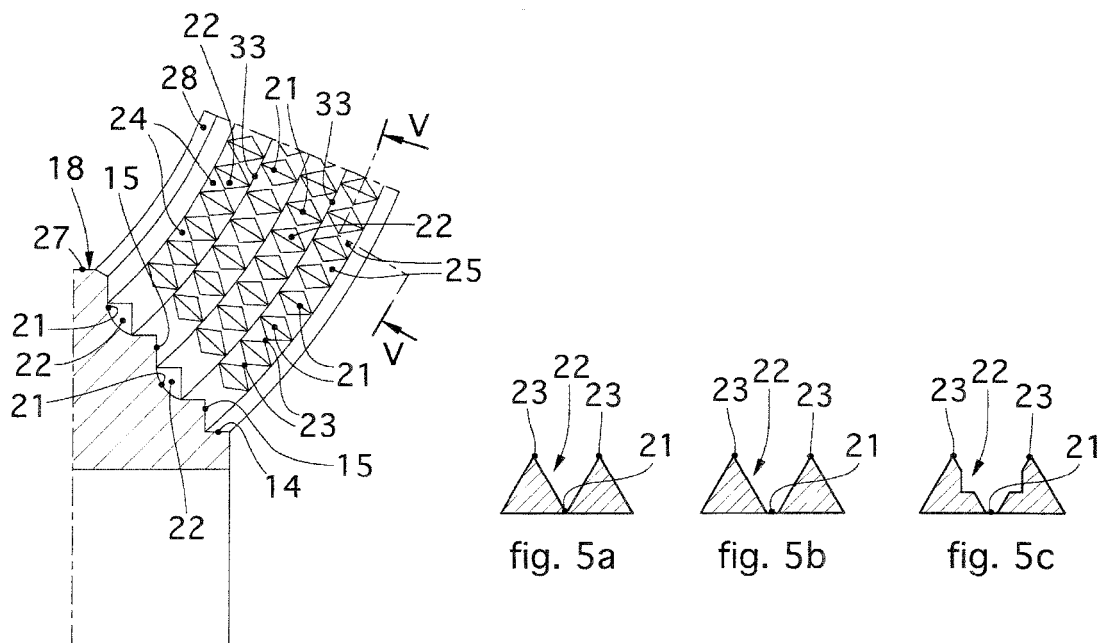


fig. 5

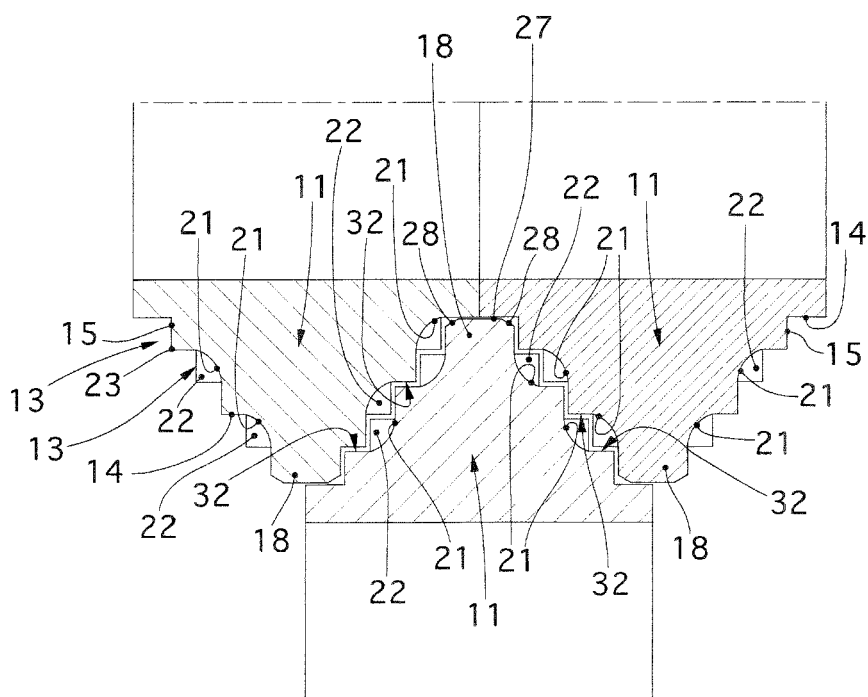


fig. 6

REFERENCES CITED IN THE DESCRIPTION

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