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(71) Applicant: **Guangdong RuiTuo Environmental Protection Machinery Co., Ltd**
Puning City, Guangdong 515300 (CN)

(72) Inventor: **DE RIGO, Flavio**
Puning City, Guangdong 515300 (CN)

(74) Representative: **Lunati & Mazzoni S.r.L.**
Via Carlo Pisacane, 36
20129 Milano (IT)

(54) GRINDING DEVICE

(57) A grinding device (1) for the grinding of textile material sheets (1 a) is provided, which comprises a hollow box-like support (3) defining an inner chamber (3a); abrasive brushes (2), each defining an abrasive surface (2a), fastened to the box-like support (3); a vacuum unit (4) adapted to place the inner chamber (3a) under vacuum so as to suck the dust produced during the grinding process. The box-like support (3) comprises lateral bodies (31), each of which is interposed between a pair of adjacent abrasive brushes (2), laterally closing, together with the abrasive brushes (2), the inner chamber (3a) and defining intake slits (3c) between the abrasive brushes (2) and the lateral bodies (31), so that during the grinding process the lateral bodies (31) are not in contact with the textile material sheet (1 a), defining, together with the pair of adjacent abrasive brushes (2) and the textile material sheet (1 a), secondary chambers (3d) insulated from the outside and placed in connection with the inner chamber (3a) through the intake slits (3c) so as to be under vacuum.

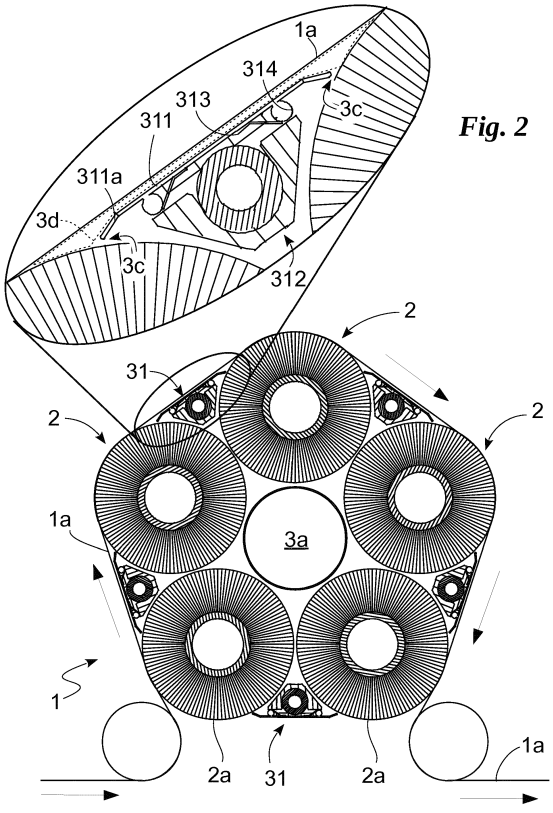

Fig. 2

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Description

[0001] The present invention relates to a grinding device comprising a support to which one or more abrasive brushes are fastened, each defining an abrasive surface suitable to grind a textile material sheet as specified in the preamble of the first claim.

[0002] In particular, the device is adapted to be used in the textile or preferably in the tanning industry to sand the surface of a fabric/leather to give the processed material a velvety or peach-skin appearance (for example referred to as suede in leather goods).

[0003] As is known, grinding is a process used in tanning to obtain suede leather through the removal of the upper part of the grain layer (designation of the outermost skin layer) so as to smooth the surface and remove the major natural markings. Grinding is also used to sand the surface of a fabric in order to obtain a peach-skin effect. In this case, grinding gives the surface a velvety appearance, slightly hiding the weft and warp weave. It is performed on finished fabric pieces obtained with synthetic and/or natural textile fibres.

[0004] The devices known to date are characterised by a set of abrasive brushes along which the material to be processed runs, which are suitable for removing the grain layer. Said brushes are ceramic or carbon fibre brushes, or diamond cloth-coated brushes.

[0005] The described prior art has a few major drawbacks.

[0006] A first major drawback is that the abrasive ability of the known grinding devices decreases rapidly.

[0007] This drawback lies in the fact that the dust produced during the processing of the leather/fabric tends to accumulate on the rollers, making them smoother and, therefore, less abrasive.

[0008] Moreover, in the case of processing of fabrics of different colours, the dust remaining on the abrasive brushes after the processing of a first fabric/leather may be deposited on a second fabric/leather of different colour, resulting in the staining thereof.

[0009] A major drawback is the need to perform frequent maintenance work on the known grinding devices, which, besides representing a considerable cost for the company, requires long machine downtimes.

[0010] Another drawback related to the formation of this dust is that it can be dispersed into the environment and then be inhaled, causing respiratory disorders. Moreover, such a dust, being suspended in the working environment, can enter the machinery, causing the deterioration and, in some cases, the breakage thereof.

[0011] In order to reduce these drawbacks, the working environments are often provided with extractor hoods which, by sucking the air, decrease dust dispersion. However, such hoods, while allowing dusts to be reduced, are expensive and of limited effectiveness.

[0012] In this context, the technical task underlying the present invention is to devise a grinding device, which is capable of substantially obviating at least some of the above-mentioned drawbacks.

[0013] Within the scope of said technical task, a major object of the invention is to obtain a grinding device whose operation is not affected by the dust that is produced during processing.

[0014] Another major object of the invention is to provide a grinding device that does not require frequent and costly maintenance operations.

[0015] A further object of the present invention is to provide a grinding device that does not degrade the work environment.

[0016] The technical task and the specified objects are achieved by means of a grinding device as claimed in the appended claim 1. Examples of preferred embodiments are described in the dependent claims.

[0017] Preferred embodiments are set forth in the dependent claims.

[0018] The features and advantages of the invention will be apparent from the detailed description of preferred embodiments of the invention, with reference to the accompanying drawings, in which:

Fig. 1 shows a section of the grinding device according to the invention; and

Fig. 2 shows a second section of the grinding device.

[0019] In the present document, the measures, values, shapes and geometric references (such as perpendicularity and parallelism), when associated with terms such as "about" or with other similar terms such as "almost" or "substantially", are to be understood as contemplating the possibility of measurement errors or inaccuracies due to production and/or manufacturing defects and, especially, contemplating the possibility of a slight difference in the value, measure, shape or geometric reference with which it is associated. For example, these terms, if associated with a value, preferably indicate a difference of not more than 10% of the value itself. Furthermore, when used, terms such as "first", "second", "higher", "lower", "main" and "secondary" do not necessarily identify an order, a priority relationship or a relative position, but can simply be used to distinguish more clearly the different components from each other.

[0020] The measurements and the data reported in this text are to be considered, unless otherwise indicated, as carried out in the ICAO International Standard Atmosphere (ISO 2533).

[0021] With reference to the Figures, the grinding device according to the invention is indicated as a whole by the numeral **1.**

[0022] The grinding device 1 is adapted to be used for the finishing of fabrics and leather for the purpose of removing material, giving them valuable aesthetic effects such as, for example, ageing, pre-wash and suede effects.

[0023] It is adapted to perform the processing of synthetic or natural textile materials (e.g. leather, cotton and wool) hereinafter simply referred to with the expression

"textile material sheets" **1a**. In detail, the grinding device 1 is adapted to perform the processing and, specifically, the grinding of finished textiles\fabrics obtained with synthetic\natural textile fibres, and\or of leather.

[0024] The grinding device 1 comprises a hollow box-like support **3** defining an inner chamber **3a** and a centroidal axis **3b**; one or more abrasive brushes **2**, each defining an abrasive surface **2a** suitable to grind a textile material sheet 1 a and a longitudinal axis **2b**; and a vacuum unit **4** adapted to place the inner chamber 3a under vacuum, allowing for the suction of the dust produced during the grinding process.

[0025] The term vacuum is intended to mean that the vacuum unit 4 is capable of placing the inner chamber 3a under a pressure lower than the atmospheric pressure. Preferably, the vacuum unit 4 is adapted to place the inner chamber 3a under a relative pressure (measured with reference to the atmospheric pressure) substantially lower than -1000 Pa, specifically lower than -2000 Pa, and suitably substantially comprised between -2000 Pa and -2500 Pa. Preferably, the relative pressure is substantially -2200 Pa.

[0026] The abrasive brushes 2 are fastened to the box-like support 3 so as to define an active portion of the abrasive surface 2a, i.e. protruding and external to the box-like support 3 and, therefore, able to perform the grinding operation. Said active portion has an angular extent substantially smaller than 180° and, precisely, substantially comprised between 120° and 90°.

[0027] The abrasive brushes 2 have longitudinal axes 2b suitably equidistant with respect to the centroidal axis 3b. More preferably, their longitudinal axes 2b are located along a circumference centred on the centroidal axis 3b, and more suitably, equally angularly spaced apart from one another.

[0028] The abrasive brushes 2 are identifiable as known abrasive rollers such as, for example, ceramic or carbon fibre brushes, or diamond cloth-coated brushes.

[0029] The box-like support 3 comprises lateral bodies **31** laterally delimiting the inner chamber 3a and two base bodies **32** enclosing the bases of the chamber 3a and supporting the lateral bodies 31 and the abrasive brushes 2.

[0030] The inner chamber 3a is thus delimited laterally by the lateral bodies 31 and by the non-active portions of the abrasive surface 2a (internal to the box-like support 3 and facing the inner chamber 3a) and, axially, i.e. along the centroidal axis 3a, by the base bodies 32.

[0031] In particular, the box-like support 3 has a lateral body 31 interposed between each pair of adjacent abrasive brushes 2 (specifically, between the active portions of the abrasive surfaces of a pair of adjacent abrasive brushes 2) and not in contact with the same, defining, between each lateral body 31 and each brush 32, an intake slit **3c** which separates each abrasive brush 2 from the lateral body 31.

[0032] The intake slits 3c define the only passage openings between the inner chamber 3a and the outside of the same inner chamber 3a.

[0033] Each intake slit 3c extends parallel to the longitudinal axis 2b and conveniently has an axial length equal to that of the abrasive brush 2.

[0034] Its thickness, calculated perpendicular to the longitudinal axis 2b, is reduced so as to allow the inner chamber 3a to be maintained under vacuum. The thickness of the intake slits 3c is substantially not greater than 1.5 cm and, specifically, substantially comprised between 1 cm and 3 mm.

[0035] During the grinding process, each lateral body 31 is adapted not to contact the textile material sheet 1a, defining a secondary chamber **3d** laterally enclosed between the portion of the textile material sheet 1a subtended between two adjacent abrasive brushes 2, the active portions of the surfaces 2a, and the lateral body 31.

[0036] Axially, the secondary chamber 3d is enclosed by the base bodies 32.

[0037] The secondary chamber 3d is insulated from the outside and placed in connection with the inner chamber 3a exclusively through the intake slits 3c. Therefore, it is under vacuum and, suitably, has the same pressure as the inner chamber 3a.

[0038] To ensure the maintenance of this pressure in the secondary chamber 3d, the secondary chamber 3d has reduced dimensions. Therefore, the distance between the portion of the textile material sheet 1a subtended between two adjacent abrasive brushes 2 and the corresponding lateral body 31 is substantially not greater than 1.5 cm and, specifically, substantially comprised between 1 cm and 3 mm.

[0039] It is noted that, in the event that the axial distance between the base bodies 32 is greater than the axial width of the textile material sheet 1a, the box-like support 3 may comprise rings **33** adapted to axially enclose the textile material sheet 1a (magnifications of Fig. 1).

[0040] The lateral body 31 comprises a thin plate **311** defining, in cooperation with the abrasive brushes 2, the intake slits 3c; and a crosspiece **312** supporting the thin plate 311 and integral with the base bodies 32.

[0041] The thin plate 311 is transiently fastened to the crosspiece 312 so as to be radially movable with respect to said crosspiece, varying the opening of the slits 3b and, preferably, the size of the secondary chamber 3d.

[0042] Conveniently, the lateral body 31 comprises at least one spring **313** which fastens the crosspiece 312 to the thin plate 311 and operates the radial movement of the thin plate 311 in opposition to the vacuum in the inner chamber 3a; and, suitably, at least one end stop 314 adapted to define a minimum distance between the thin plate 311 and the crosspiece 312 and, therefore, a minimum opening of the slits 1b.

[0043] Said spring 313 can be a flexure spring and, specifically, a thin plate spring 311. Preferably, the thin plate 311 is parallel to the textile material sheet 1 a. Therefore, the springs 313 are two, so as to ensure that the thin plate 311 is parallel to the textile material sheet.

Similarly, the lateral body 31 comprises two end stops 314. The thin plate 311 may have edges **311a** bent towards the inner chamber 3a, i.e. edges that are close to the abrasive brushes 2 folded towards the inner chamber 3a.

[0044] The base bodies 32 are adapted to enclose between them and support both said at least one abrasive brush 2 and said at least one lateral body 31.

[0045] In detail, the base bodies 32 can be integral with the at least one lateral body 31 and transiently fastened to the at least one abrasive brush 2, which can thus rotate around the longitudinal axis 2b.

[0046] To this end, the rotation member may comprise rotation means **5a** that are adapted to allow each abrasive brush 2 to rotate, suitably in an idle way, with respect to the base body 32 and around the longitudinal axis 2b.

[0047] The rotation means 5a may comprise bearings or bushings.

[0048] The rotation member may comprise, in addition to or in substitution of the rotation means 5a, a rotation apparatus **5b** designed to allow the box-like support 3 and the one or more abrasive brushes 2 to rotate around the centroidal axis 3b.

[0049] The rotation apparatus 5b is adapted to control the rotation of the box-like support 3 and the abrasive brushes 2, by acting on the base bodies 32. It is known per se.

[0050] It is noted that, in the case of a rotation member comprising rotation means 5a and a rotation apparatus 5b, the abrasive brushes 2 can perform a rotational motion about the longitudinal axis 2b and a motion of revolution around the centroidal axis 3b, dragged by the box-like support 3.

[0051] Advantageously, the grinding device 1 comprises a vacuum unit 4 adapted to place the inner chamber 3a, and preferably the secondary chambers 3d, under vacuum by sucking the dust produced during the grinding process.

[0052] The vacuum unit 4 comprises a pipe **41** integral with the base body 32 and adapted to be connected to a suction system for placing the inner chamber 3a under vacuum.

[0053] The centroidal axis of the pipe 41 coincides with the centroidal axis 3b and can rotate around the centroidal axis 3b dragged by the box-like support 3.

[0054] Its axial length is less than the axial length of the box-like support 3 and, specifically, substantially less than 50%, and more specifically, less than 30% of the axial length of the box-like support 3.

[0055] The pipe 41 is identifiable as a tube devoid of lateral openings and, therefore, able to allow the air to enter and exit exclusively through its bases.

[0056] To allow the pipe 41, and thus the inner chamber 3a, to be connected to a suction system external to the grinding device 1, the vacuum unit 4 can be provided with an additional pipe **42** adapted to be fastened to said external system; and a mechanical seal **43**, for example an O-ring, interposed between the pipes 41 and 42 and adapted to avoid losses during the passage between the pipes 41 and 42. The operation of the grinding device 1, previously described in structural terms, is as follows.

[0057] First of all, the pump places the inner chamber 3a under vacuum by sucking air through the intake slits 3c from the outside into the chamber 3a, placing the secondary chambers 3d under vacuum.

[0058] When the textile material sheet 1 a runs along the abrasive brushes 2 it is abraded by the abrasive surface 2a, producing dust which is collected in the secondary chambers 3d and drawn by the vacuum into the inner chamber 3a through the intake slits 3c.

[0059] It is noted that the presence of the secondary chambers 3d, by intercepting the surface of the textile material sheet 1a exiting the abrasive brush 2, on the one hand prevents dispersion of the dust into the environment and, on the other hand, maximizes the ability of the inner chamber 3a to suck the dust.

[0060] Furthermore, the rotation of the abrasive brushes 2, driven by friction with the textile material sheet 1 a in the case of idle rotation means 5a, ensures that every portion of the abrasive surface 2a, as it removes material from the textile material sheet 1a, arrives at the inner chamber 3a, which eliminates the dust accumulated thereon.

[0061] The grinding device 1 according to the invention achieves important advantages. In fact, the grinding device 1, in contrast with the known devices, is able to minimise the dispersion of dusts into the environment, allowing for a working area free of hazards to health or other machinery next to the grinding device 1.

[0062] Another advantage is that the abrasive brushes 2, by continuously bringing the abrasive surface 2a into the inner chamber 3a, allow the dust attached thereon to be removed, ensuring a longer life of the rollers without a decrease in their abrasive ability.

[0063] An important advantage is thus represented by the reduced number of maintenance operations required by the grinding device 1 and, hence, by the reduced machine downtimes that characterise it compared to the devices known to date.

[0064] The invention is susceptible of variations falling within the scope of the inventive concept as defined by the claims.

[0065] In this context, all details are replaceable by equivalent elements and any type of materials, shapes and dimensions may be present.

Claims

1. A grinding device (1) for the grinding of textile material sheets (1 a) comprising:

   - a hollow box-like support (3) defining an inner chamber (3a);
   - abrasive brushes (2), each defining an abrasive surface (2a), fastened to said box-like sup-

port (3);
- a vacuum unit (4) adapted to place said inner chamber (3a) under vacuum so as to suck the dust produced during said grinding process,
- and **characterized in that** said box-like support (3) comprises lateral bodies (31), each of which is interposed between a pair of adjacent abrasive brushes (2), substantially laterally closing, together with said abrasive brushes (2), said inner chamber (3a) and defining intake slits (3c) between said abrasive brushes (2) and said lateral bodies (31);
- and **in that** during said grinding process, said lateral bodies (31) are not in contact with said textile material sheet (1 a), defining, together with said pair of adjacent abrasive brushes (2) and said textile material sheet (1 a), secondary chambers (3d) substantially insulated from the outside and placed in connection with said inner chamber (3a) through said intake slits (3c) so as to be under vacuum.

2. A grinding device (1) according to claim 1, wherein during said grinding process the distance between said lateral bodies (31) and said textile material sheet (1 a) is substantially comprised between 1 cm and 3 mm.

3. A grinding device (1) according to at least one of the preceding claims, wherein the thickness of said intake slits (3c) is substantially comprised between 1 cm and 3 mm.

4. A grinding device (1) according to at least one of the preceding claims, wherein said lateral body (31) comprises a thin plate (311) defining, in cooperation with said abrasive brushes (2), said intake slits (3c), and a crosspiece (312) supporting said thin plate (311); and wherein said thin plate (311) is transiently fastened to said crosspiece (312) so as to be radially movable with respect to said crosspiece (312), varying the opening of said intake slits (3c).

5. A grinding device (1) according to the preceding claim, wherein said lateral body (31) comprises at least one spring (313) which fastens said crosspiece (312) to said thin plate (311) and operates the radial movement of said thin plate (311) in opposition to said vacuum in said inner chamber (3a).

6. A grinding device (1) according to at least one of claims 4-5, wherein said lateral body (31) comprises at least one end stop (313) adapted to define a minimum distance between said crosspiece (312) and said thin plate (311) and, thus, a minimum opening of said intake slits (3c).

7. A grinding device (1) according to at least one of claims 4-6, wherein said thin plate (311) has edges (311 a) bent towards said inner chamber (3a).

8. A grinding device (1) according to at least one of the preceding claims, wherein said vacuum unit (4) comprises a pipe (41) adapted to be connected to a suction system for placing said inner chamber (3a) under vacuum, and having an axial length substantially less than 50% of the axial length of said box-like support (3).

9. A grinding device (1) according to at least one of the preceding claims, wherein said vacuum unit (4) is adapted to place said inner chamber (3a) under a relative pressure substantially comprised between -2 kPa and -2.5 kPa.

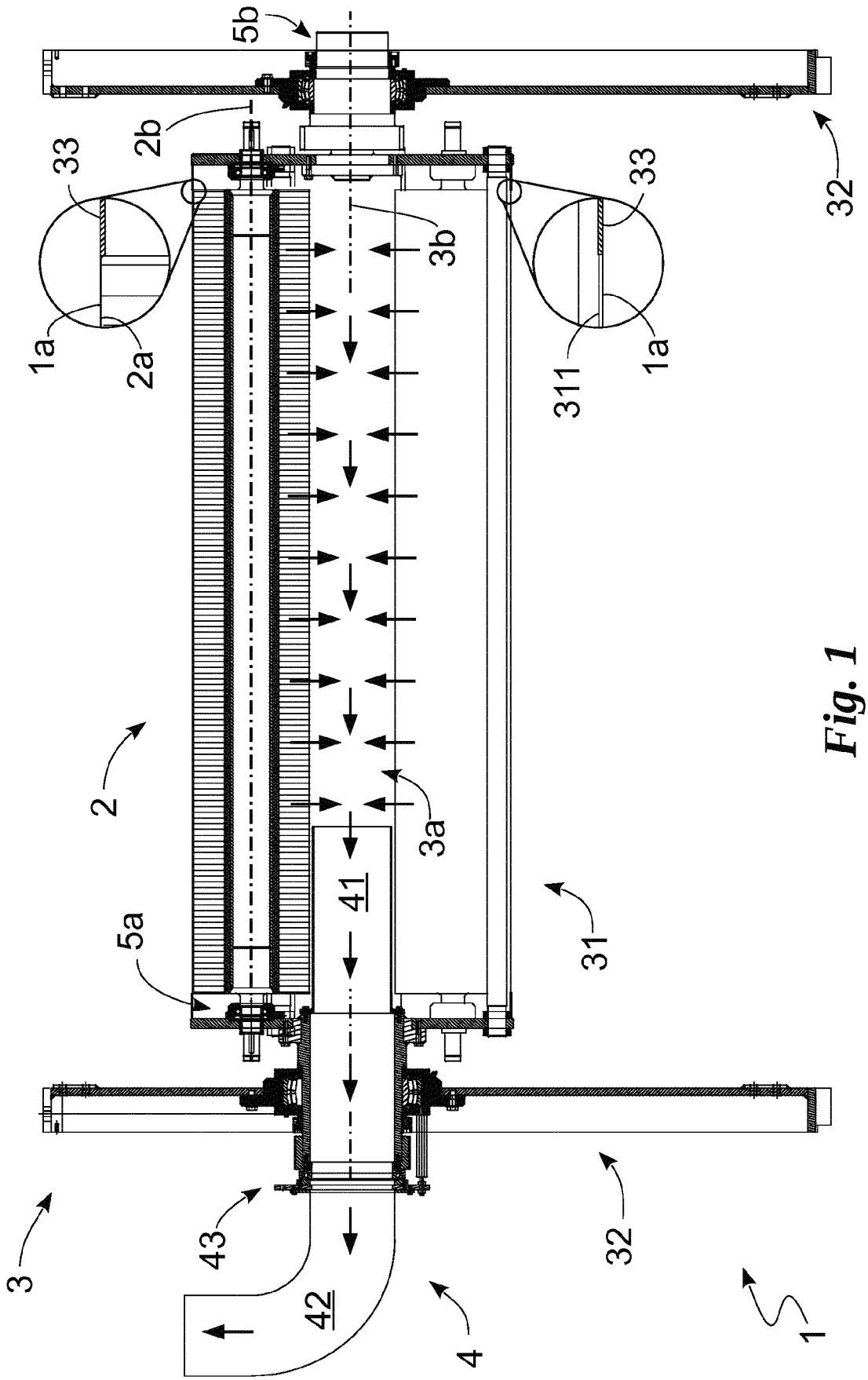

Fig. 1

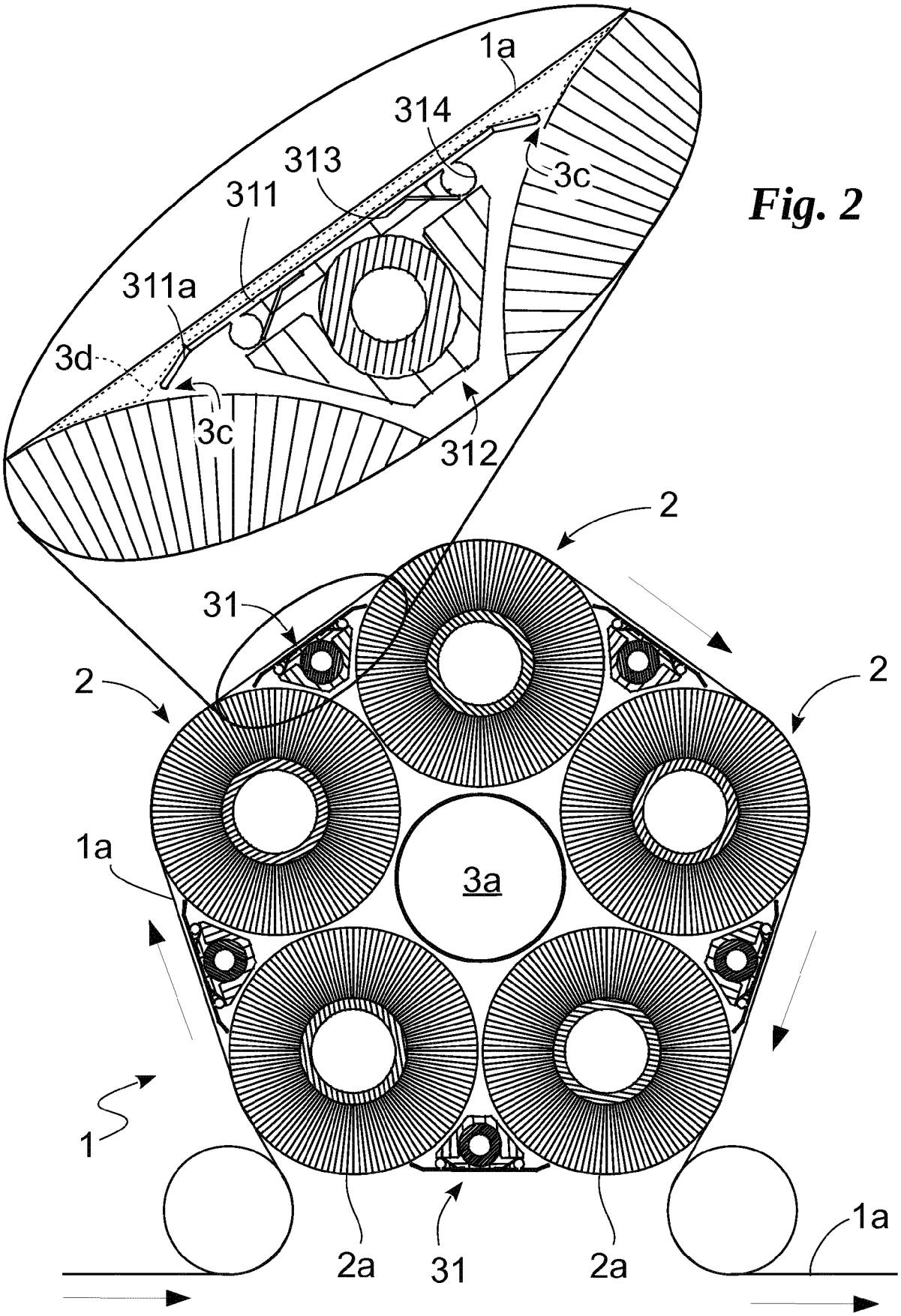

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 7244

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	ES 2 245 568 A1 (TORRES MAQUINARIA TEXTIL S A [ES]) 1 January 2006 (2006-01-01) * abstract; figures 1,2 * -----	1-9	INV. D06C11/00
A	CN 104 911 856 B (GUANGDONG RUITUO ENVIRONMENTAL PROT MACHINERY CO LTD) 24 August 2016 (2016-08-24) * abstract; figures 1-7 * -----	1-7	
A	CN 203 639 702 U (GUANGDONG RUITUO ENVIRONMENTAL PROT MACHINERY CO LTD) 11 June 2014 (2014-06-11) * abstract; figures 1,2 * -----	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

D06C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 August 2017	Iamandi, Daniela

CATEGORY OF CITED DOCUMENTS

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23-08-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
ES 2245568 A1	01-01-2006	NONE	
CN 104911856 B	24-08-2016	NONE	
CN 203639702 U	11-06-2014	NONE	

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