(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 273 270 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.11.2023 Bulletin 2023/45

(21) Application number: **23170019.6**

(22) Date of filing: **26.04.2023**

(51) International Patent Classification (IPC):
C14B 1/56 *(2006.01)* ***B41J 11/00*** *(2006.01)*
C14C 15/00 *(2006.01)* ***D06P 3/32*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
C14B 1/56; B41J 11/007; C14C 15/00; D06P 3/32;
B05B 13/0484; D06B 13/00

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **29.04.2022 IT 202200008696**

(71) Applicant: **Todesco S.r.l.**
36051 Creazzo (VI) (IT)

(72) Inventors:
- **TODESCO, Giorgio**
  36051 Creazzo (VI) (IT)
- **TODESCO, Paolo**
  36050 Monteviale (VI) (IT)

(74) Representative: **Autuori & Partners**
Strada del Megiaro, 261
36100 Vicenza (VI) (IT)

(54) **STATION FOR PLASMA PRE-TREATMENT OF LEATHER, AS WELL AS SYSTEM FOR PROCESSING LEATHER COMPRISING SUCH STATION AND METHOD FOR PROCESSING THEREOF**

(57) A station for the pre-treatment of at least one animal leather or leather of animal origin or at least partially synthetic leather (**P**), the station being suitable to be used in a system (**I**) for processing the at least one leather (**P**) and comprising a station (**SV**) for the diffuse coating of the at least one leather (**P**). The pre-treatment station comprises an inlet (**IPT**) and an outlet (**UPT**) for the leather (**P**) and means (**20**) for advancing the leather (**P**) interposed between the inlet (**IPT**) and the outlet (**UPT**) of the pre-treatment station (**PT**). In this manner the pre-treatment of the leather (**P**) and the advancement of the latter from the inlet (**IPT**) of the pre-treatment station (**PT**) towards the outlet (**UPT**) of the latter is allowed. The pre-treatment station (**PT**) further includes plasma generation means (**10**) which include at least one torch (**12**) at least partially mutually facing the advancement means (**20**) suitably configured and sized to act on at least one portion of the leather (**P**) to be pre-treated.

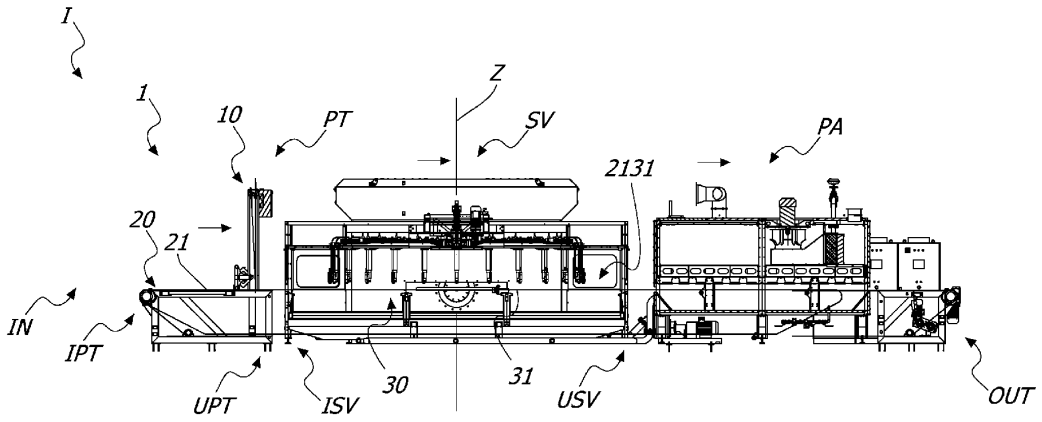

FIG. 1

EP 4 273 270 A1

Description

Technical field

[0001] The present invention generally relates to the technical field of methods for processing animal leather or leather of animal origin or at least partially synthetic leather and in particular it relates to processes subsequent to tanning, for example in refining processes. Therefore, the present invention relates to a station for the plasma pre-treatment of leather, as well as a system for processing leather which includes such station and a method for processing the latter.

Definitions

[0002] In the present document, the expression "hide" or "leather" is used to indicate any layer, whether it be grain, crust or sub-crust, of the leather of an animal, in particular of a bovine, but also of sheep/goats, exotic, fur, wild animals or others.

[0003] In particular, the expression "a leather" or "the leather" is used to indicate at least one part of the leather of a single animal, which may therefore be of any shape. For example, the leather may be whole leather, half leather, shoulders, hunch, back, hips, rear or front parts of the body.

[0004] The expression "animal leather or leather of animal origin" is used to indicate the so-called "genuine leather", the so-called "leatherette" or "faux leather" or other similar composite products containing animal leather.

[0005] In the present document, the expression "diffuse coating" is used to indicate deposition of one or more layers of dye coating in a diffused and homogeneous manner on the leather, by spraying using appropriate nozzles or guns or using roller machines, spreading machines or buffer machines.

[0006] In the present document, the expression "preparation" or derivatives thereof is used to indicate the provision of an element of interest to a process step of interest, thus including any preventive treatment aimed at the optimal execution of the step of interest, from simple collection and possible storage to heat and/or chemical and/or physical pre-treatments and the like.

[0007] In the present document, the expression "pre-treatment" or derivatives relating to an animal leather or leather of animal origin or at least partially synthetic leather, is used to indicate the preliminary treatment carried out thereon before the subsequent and more important processing stages are carried out.

[0008] In the present document, the expression "torch" or the like, is used to indicate a device which generates a direct flow of plasma from a nozzle following the application of an appropriate potential difference between two electrodes.

[0009] In the present document, the expression "contact angle" is used to indicate the thermodynamic quantity to determine the wettability of a surface, defined by the angle comprised between the direction of the solid-liquid tension and the direction of the liquidvapour tension, tangent to the outer surface of the drop, with the vertex in the liquid-solid-vapour three-phase point, according to the UNI EN 828:2013 standard.

[0010] In the present document, the expression "cold plasma" or derivatives is used to indicate a type of plasma in which the electrons are not in thermodynamic equilibrium with the other species, given that they are characterised by a much higher temperature with respect to that of the heavier species (ions and neutral species). In these conditions, the energy of the electrons may be described by using probability distribution functions, such as for example Maxwell or Druyvesteyn distributions.

State of the Art

[0011] Plants for processing leather which include - in succession - several stations, including a station for the diffuse coating animal leather, are known.

[0012] Therefore, the leather is loaded at the inlet of the system and transported using conveyors in series which move it along the subsequent processing stations.

[0013] The waterproof characteristic of leather complicates the coating thereof, causing the creation of drops of paint thereon which tend to create stains with ensuing aesthetic defect.

[0014] In addition, the impermeability of leather together with the diffuse coating treatment lead to a surface deposition of paint, entailing a high use of the latter and a consistent stationing of the leather in the coating station given that there are required multiple passes on the same leather portion in order to create a complete and uniform spreading thereof.

[0015] Therefore, this results in a high waste of time and resources.

Summary of the invention

[0016] An object of the present invention is to at least partly overcome the drawbacks illustrated above by providing a particularly functional station for the pre-treatment of leather.

[0017] A further object of the present invention is to provide a station which allows a coating of the leather with low amount of paint.

[0018] Another object of the present invention is to provide a station which allows a coating of the leather with significant saving of time.

[0019] Another object of the present invention is to provide a system for processing leather that is highly functional.

[0020] Another object of the invention is to provide a method for processing leather that is particularly quick.

[0021] These and other objects which will be more apparent hereinafter, are attained by a station and/or by a system and/or by a method as described, illustrated

and/or claimed herein.

[0022] The dependent claims define advantageous embodiments of the invention.

Brief description of the drawings

[0023] Further characteristics and advantages of the invention will be more apparent in light of the detailed description of a preferred but non-exclusive embodiment of the invention, illustrated by way of non-limiting example with reference to the attached drawings, wherein:

FIG. 1 is a front schematic view of the system **I**;
FIG. 2 is a top schematic view of the system **I**;
FIG. 3 is a top schematic view of the apparatus **1;**
FIG. 4 is an axonometric schematic view of the apparatus **1;**
FIG. 5 is a front schematic view of the apparatus **1.**

Detailed description of some preferred embodiments

[0024] With reference to the attached figures, herein described is a system **I** for carrying out one or more processing operations on the leather **P.** The system **I** may therefore comprise one or more processing stations for carrying out one or more processing operations subsequent to tanning, such as for example fleshing , breaking, shaving, dyeing, greasing, desiccation (or drying), possibly staking and/or nailing, refining, stretching, pressing and/or measuring.

[0025] In particular, the system **I** may have an inlet **IN** for the leather **P** to be processed and an outlet **OUT** for the processed leather **P.**

[0026] In a per se known manner, the leather **P** may be moved between consecutive stations by means of appropriate advancement means.

[0027] Advantageously, the advancement means may include one or more conveyors in series and, consecutive thereto, means for unloading and/or loading the leather, for example one or more rollers arranged between a pair of stations.

[0028] The conveyors may for example be wire or slat conveyors or any other appropriate technology, known in the industry.

[0029] In this specific case, the advancement means may include all means which allow to move and advance the leather **P** between the inlet of a first station and the inlet of a second and subsequent station.

[0030] Basically, in each station, the advancement means may be defined by one or more conveyors in series and the consecutive rollers which allow the unloading and the subsequent loading of the leather towards the inlet of the subsequent station.

[0031] Or, as particularly shown in **FIG. 1,** the advancement means may be defined by a single conveyor movable between consecutive stations.

[0032] Preferably, the system **I** may include a pre-treatment station **PT** of the leather **P** having an inlet **IPT** and an outlet **UPT.**

[0033] Preferably, the inlet **IPT** may correspond with the inlet **IN** of the system **I**.

[0034] In addition, consecutively to the station **PT,** the system **I** may include a diffuse coating station **SV** with an inlet **ISV** consecutive to the outlet **UPT** and an outlet **USV.**

[0035] Preferably, the diffuse coating station **SV** may include a plurality of nozzles rotating around an axis **Z** perpendicular to the plane defined by the conveyors and cyclically passing through the surface of the leather **P.**

[0036] It is therefore clear that the side of the leather **P** whose surface faces the nozzles may be coated.

[0037] Furthermore, it is clear that the system **I** may include a station **PA** for curing the paint consecutive to the diffuse coating station **SV** and other potential processing stations without departing from the scope of protection of the attached claims.

[0038] In particular, the pre-treatment station **PT** may include a conveyor **21** of the type described above, which may extend between the inlet **IPT** and the outlet **UPT** of the station **PT.**

[0039] The conveyor **21** may define an axis **Y** which may coincide with the advancement direction thereof.

[0040] This will allow to move the leather **P** between the inlet **IPT** and the outlet **UPT** of the station **PT** to allow the pre-treatment thereof.

[0041] The conveyor **21** may have a width **Ia21** along a direction perpendicular to the axis **Y**, for example measuring 70 - 380 cm.

[0042] Furthermore, between the inlet **UPT** and the outlet **ISV** there may be present special rollers to allow the unloading of the pre-treated leather **P** and the loading thereof towards the coating station **SV.**

[0043] In particular, the conveyor **21** and the rollers may define means **20** for advancing the leather **P.**

[0044] However, it is clear that the advancement means **20** may be defined solely by the conveyor **21** without departing from the scope of protection of the attached claims.

[0045] Furthermore, it is clear that the advancement means **20** may advance along the axis **Y** so as to move the leather **P** along a direction defined by the latter.

[0046] Preferably, the station **PT** may include plasma generation means **10.**

[0047] There may be arranged above the conveyor **21** so as to at least partially face the advancement means **20,** for example should the latter also include possible subsequent loading/unloading means.

[0048] Specifically, the conveyor **21** may include a progressive planar advancement portion **210** of the leather **P** and the plasma generation means **10** may be positioned above the latter.

[0049] It is therefore clear that the progressive planar advancement portion **210** may be that conveyor portion **21** which may be in contact with the leather **P** so as to support it and allow the advancement thereof.

[0050] Generally, the plasma generation means **10**

may include one or more torches **12** which generate a laminar plasma discharge along an axis **X** incident with respect to the axis **Y**.

[0051] Preferably, the axes **X** and **Y** may be perpendicular to each other.

[0052] Such plasma laminar discharge may therefore act on at least one portion of the leather **P.**

[0053] This will allow to pre-treat the leather **P** through a single processing cycle, that is through a single pass under the one or more torches **12.**

[0054] As a result, this will allow to massively reduce the processing times thereof.

[0055] In addition, the one or more torches **12** may be integrally joined with the support structure of the system **I** so as to remain fixed in particular during the pre-treatment of the leather **P.**

[0056] However, the one or more torches **12** may be movable along the axis **Y** without departing from the scope of protection of the attached claims.

[0057] According to a first embodiment, the plasma generation means **10** may include a torch **12** with a pair of electrodes **11** facing each other through which there will flow the gas selected for generating plasma, in a per se known manner.

[0058] Furthermore, the electrodes **11** may both face the conveyor **21,** even more specifically, the progressive planar advancement portion **210,** on the same side.

[0059] In other words, both the electrodes **11** may be positioned above the conveyor **21,** as well as the progressive planar advancement portion **210.**

[0060] Preferably, the electrodes **11** may be metallic and flat and they may each have a length **lu11** measured along the axis **X** measuring 60 - 100 cm, preferably 70 - 90 cm.

[0061] Advantageously, the length **lu11** may be equal to or greater than the width **la21** so that the plasma discharge extends over the entire width of the conveyor **21.**

[0062] For example, should the axes **Y** and **X** not be perpendicular to each other, the length **lu11** may be greater than the width **la21,** while should the axes **Y** and **X** be perpendicular to each other, the length **lu11** may be equal to the width **la21.**

[0063] This will allow to act over the entire surface of the leather **P,** given that the laminar plasma discharge may have a length corresponding to the length **lu11.**

[0064] To this end, the distance between the outlet of the torch **12** and the conveyor **21** may have a size **d** for example measuring 1-20 mm, more preferably 5-15 mm, so as to allow to obtain a matching length between the laminar plasma discharge and the length **lu11,** in a per se known manner.

[0065] According to a second embodiment, the plasma generation means **10** may include a plurality of torches **12,** each with a pair of electrodes **11** facing each other, positioned consecutively in series along the axis **X.**

[0066] Even in this case, both the electrodes **11** of each torch **12** may be facing the conveyor **21,** as well as the progressive planar advancement portion **210,** on the same side.

[0067] Therefore, both the electrodes **11** of each torch **12** may be positioned above the conveyor **21,** as well as above the progressive planar advancement portion **210.**

[0068] Preferably, the electrodes **11** may be metallic and flat and they may each have a length **lu11** measured along the axis **X** measuring 60 - 100 cm, preferably 70 - 90 cm.

[0069] Therefore, the succession of electrodes **11** of the plurality of torches **12** may have an overall length **luS11** along the axis **X** with size equal to or greater than the width **la21,** so that the plasma discharge extends over the entire width of the conveyor **21** to act on the entire surface of the leather **P.**

[0070] As described above, should the axes **Y** and **X** not be perpendicular to each other, the length **luS11** may be greater than the width **la21,** while should the axes **Y** and **X** be perpendicular to each other, the length **luS11** may be equal to the width **la21.**

[0071] For example, the conveyor **21** may have a width **la21** equal to 380 cm and the plasma generation means **10** may include a series of several torches **12** each with a pair of electrodes **11** having length **lu11** such that the overall length **luS11** is equal to 380 cm.

[0072] It is clear that the laminar plasma discharge may have a length corresponding to the length **luS11.**

[0073] To this end, the distance between the outlet of the torches **12** and the conveyor **21** may measure **d** for example 1-20 mm, more preferably 5-15 mm, so as to allow a matching length between the laminar plasma discharge and the length **luS11,** in a per se known manner.

[0074] According to a further preferred but not exclusive embodiment, the plasma generation means **10** may include a succession of torches **12** or a series of torches **12** positioned parallel along the axis **Y**.

[0075] This will allow to reduce the power density imparted on each torch **12** to prevent the formation of arcs.

[0076] According to a particular aspect of the invention, the pre-treatment station **PT** may include an apparatus **1** which comprises - in a single structure - the plasma generation means **10** and the advancement means **20,** as particularly shown in **FIGS. 3, 4** and **5.**

[0077] Preferably, the plasma may be generated by applying - to the electrodes **11** - a power density amounting to about 30 - 250 W/cm, more preferably amounting to 100 - 200 W/cm.

[0078] On the other hand, the advancement means **20,** specifically the conveyor **21,** may have a speed of 1-12 m/min.

[0079] This will allow to obtain cold plasma at atmospheric pressure.

[0080] In addition, such power density and advancement speed values may allow to act on the leather **P** so as to create a temporary permeability on the portion thereof treated with the plasma to optimise the subsequent coating in the station **SV.**

[0081] As a matter of fact, the plasma pre-treatment will allow to increase the penetration and the absorption

of the paint, with an ensuing reduced amount of paint required and lesser stationing in the coating station so as to obtain a uniform spreading on the entire surface of the leather **P.**

[0082] According to a preferred but not exclusive embodiment, although the selected gas may be compressed air so as to reduce costs, plasma may be generated starting from any other gas without departing from the scope of protection of the attached claims.

[0083] Specifically, should the plasma be generated starting from compressed air, with the aforementioned power density values, the contact angle measured on the pre-treated and coated leather **P** at the outlet **USV** may be 35° - 75°, more preferably 40° - 65° according to the UNI EN 828:2013 standard and any updates of such regulation subsequent to the date of filing of the present document.

[0084] Preferably, the coating station **SV** may include advancement means **30** which include a conveyor **31.**

[0085] Specifically, the advancement means **20** and **30** may be consecutive with respect to each other so as to allow a continuous advancement of the leather **P,** as well as a continuous processing of the latter.

[0086] This will allow to reduce the processing times of the leather **P.**

[0087] According to a preferred but not exclusive embodiment, as shown in **FIG. 1,** the conveyor **21** and the conveyor **31** may define a single conveyor **2131,** should there not be interposed means for loading and/or unloading the leather in particular between the pre-treatment station **PT** and the coating station **SV.**

[0088] From an operative point of view, after an appropriate preparation of the leather **P,** the latter may be loaded at the inlet **IN** of the system **I**, that is - in this case - at the inlet **IPT** of the pre-treatment station **PT.**

[0089] The leather **P** may also be moved between the inlet **IPT** and the outlet **OUT** passing through the pre-treatment station **PT** and the coating station **SV** so as to allow the plasma treatment and the subsequent coating.

[0090] In addition, the coated leather **P** may pass through the curing station **PA** for fixing the paint and through possible subsequent additional processing stations.

[0091] According to a further aspect of the invention, there may be per se considered a pre-treatment station **PT** as described above and which can be used in any system **I** as described above, therefore comprising a diffuse coating station **SV** consecutive to the pre-treatment station **PT.**

[0092] Therefore, it is clear that a such pre-treatment station **PT,** a such system **I** and a method as described may allow to create a temporary permeability to the leather to be coated so as to reduce the amount of paint required, as well as the overall processing thereof.

[0093] The present invention may include various parts and/or similar or identical elements. Unless otherwise specified, similar or identical parts and/or elements will be indicated using a single reference number, it being clear that the described technical characteristics are common to all similar or identical parts and/or elements.

[0094] The invention is susceptible to numerous modifications and variants, all falling within the scope of protection of the attached claims. All details can be replaced by other technically equivalent elements, and the materials can be different depending on the needs, without departing from the scope of protection of the invention defined by the attached claims.

Claims

1. A station for the pre-treatment of at least one animal leather or leather of animal origin or at least partially synthetic leather **(P),** the station being suitable to be used in a system (**I**) for processing at least one leather **(P)** comprising a diffuse coating station **(SV)** of the at least one leather **(P)** with first means **(30)** for advancing the latter and a plurality of coating nozzles rotating around a first axis **(Z)** substantially perpendicular to said first advancement means **(30)** to cyclically dispense paint on at least one portion of the surface of the at least one leather **(P)** mutually facing the nozzles, the pre-treatment station comprising:

   - an inlet **(IPT)** for the at least one leather **(P)** to be pre-treated and an outlet **(UPT)** for the at least one pre-treated leather **(P);**
   - second advancement means **(20)** of the at least one leather **(P)** at least interposed between the inlet **(IPT)** and the outlet **(UPT)** of the pre-treatment station **(PT)** to allow the pre-treatment of the at least one leather **(P)** and promote the advancement of the latter from the inlet **(IPT)** of the pre-treatment station **(PT)** towards the outlet **(UPT)** of the latter;
   - plasma generation means **(10)** including at least one torch **(12)** with at least one pair of mutually facing electrodes **(11),** said at least one torch **(12)** mutually at least partially facing said second advancement means **(20),** the plasma generation means **(10)** being suitably configured and sized to act on at least one portion of said at least one leather **(P)** to be pre-treated.

2. Station according to claim 1, wherein said second advancement means **(20)** are configured to advance longitudinally along a second axis **(Y),** said second advancement means **(20)** including at least one conveyor **(21)** having a predetermined width (**Ia21**) along a direction perpendicular to said second axis (**Y**), said plasma generation means**(10)** being configured to generate a substantially laminar plasma discharge along a third axis **(X)** incident with respect to said second axis (**Y**), preferably perpendicular.

3. Station according to the preceding claim, wherein

said pair of electrodes **(11)** are substantially planar and have a predetermined length (**lu11**) along a direction parallel to said third axis **(X)** substantially equal to or greater than the width (**la21**) of said at least one conveyor **(21)** to generate said laminar discharge extending along the entire width (**la21**) of the latter.

4. Station according to claim 2, wherein said plasma generation means **(10)** comprise a plurality of said at least one torch **(12),** said at least one pair of electrodes **(11)** of each of the latter being substantially planar, the torches **(12)** being arranged consecutively in series along said third axis **(X),** the succession of the pairs of electrodes **(11)** of said plurality of electrodes **(12)** having a predetermined overall length **(luS11)** along a direction parallel to said third axis **(X)** substantially equal to or greater than the width **(la21)** of said at least one conveyor **(21)** to generate said laminar discharge extending along the entire width **(la21)** of the latter.

5. Station according to claim 3 or 4, wherein said plasma generation means **(10)** further comprise a succession of said at least one torch **(12)** or of said plurality of said at least one torch **(12)** positioned parallel along said second axis **(Y).**

6. Station according to any one of claims 2 to the preceding, wherein said plasma generation means **(10)** are positioned above said at least one conveyor **(21).**

7. Station according to the preceding claim, wherein both said electrodes **(11)** of said at least one torch **(12)** are mutually facing said at least one conveyor **(21)** on the same side.

8. Station according to claim 6 or 7, wherein the outlet of said at least one torch **(12)** and said at least one conveyor **(21)** have a mutual predetermined distance **(d)** measuring 1-20 mm, more preferably measuring 5-15 mm.

9. Station according to any one of the preceding claims, wherein the power density absorbed by said at least one torch **(12)** of said plasma generation means **(10)** is about 30 - 250 W/cm, more preferably 100 - 200 W/cm, said advancement means **(20)** advancing at a speed of 1-12 m/min.

10. Station according to the preceding claim, wherein said plasma generation means **(10)** generate cold plasma at atmospheric pressure.

11. Station according to claim 9 or 10, wherein the plasma is generated starting from compressed air, the contact angle measured on the at least one pre-treated and coated leather **(P)** measuring about 35° - 75°, more preferably 40° - 65° according to the UNI EN 828:2013 standard.

12. A system for processing at least one animal leather or leather of animal origin or at least partially synthetic leather **(P),** having an inlet **(IN)** for the at least one leather **(P)** to be processed and an outlet **(OUT)** for the at least one processed leather **(P),** comprising in series:

- a station **(PT)** for the pre-treatment of the at least one leather **(P)** according to one or more of claims 1 to 11;
- a station **(SV)** for the diffuse coating of a pre-treated leather **(P)** having an inlet **(ISV)** consecutive to the outlet **(UPT)** of the pre-treatment station **(PT);**

wherein said diffuse coating station **(SV)** includes first advancement means **(30)** at the inlet **(ISV)** of the latter, said first advancement means **(30)** being mutually consecutive to said second advancement means **(20)** so as to allow the continuous processing of the at least one leather **(P)**; and

wherein said diffuse coating station **(SV)** includes a plurality of coating nozzles rotating around a first axis **(Z)** substantially perpendicular to the plane defined by said first advancement means **(30)** so as to cyclically dispense paint on at least one portion of the surface of the at least one leather **(P)** mutually facing the nozzles.

13. A method for processing at least one animal leather or leather of animal origin or at least partially synthetic leather **(P)** through a system according to the preceding claim, consecutively comprising the steps of:

- preparation of the at least one leather **(P)** to be processed;
- pre-treatment of the at least one leather **(P)** to be processed with plasma in said pre-treatment station **(PT)**;
- diffuse coating of the leather **(P)** in said diffuse coating station **(SV).**

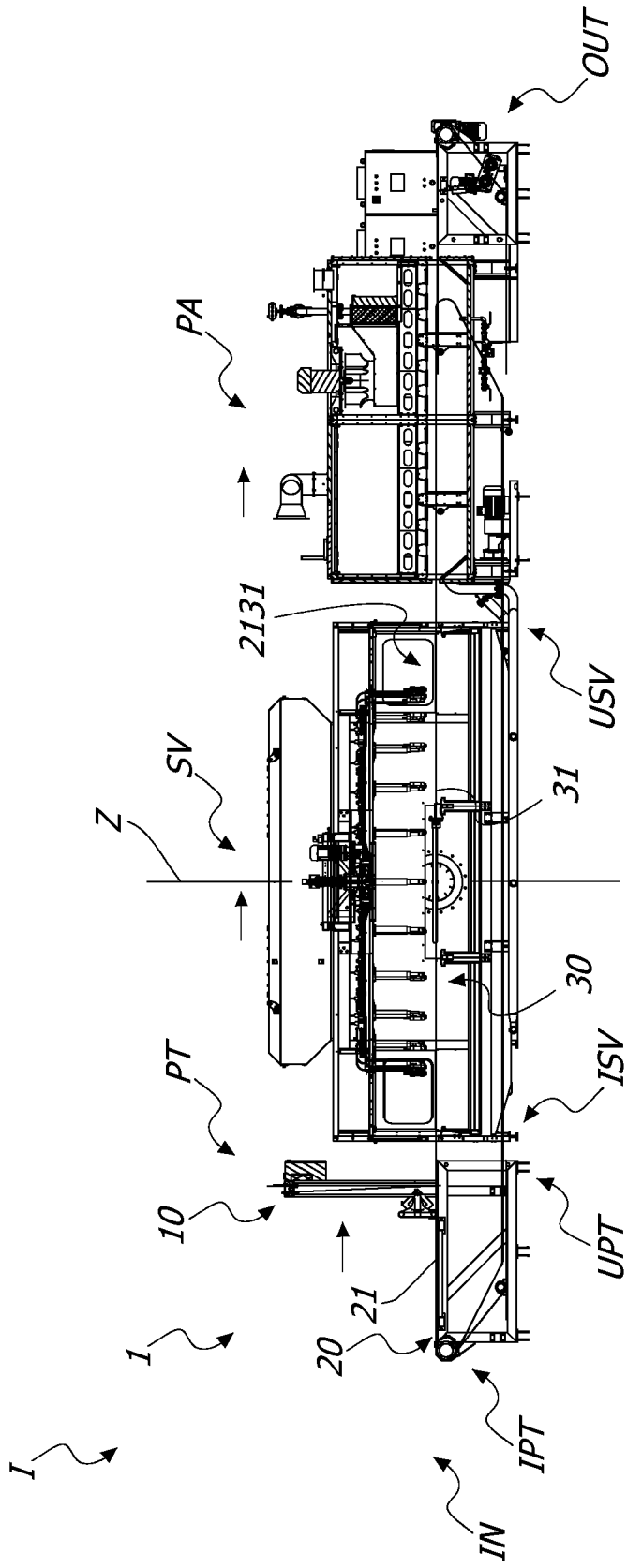

FIG. 1

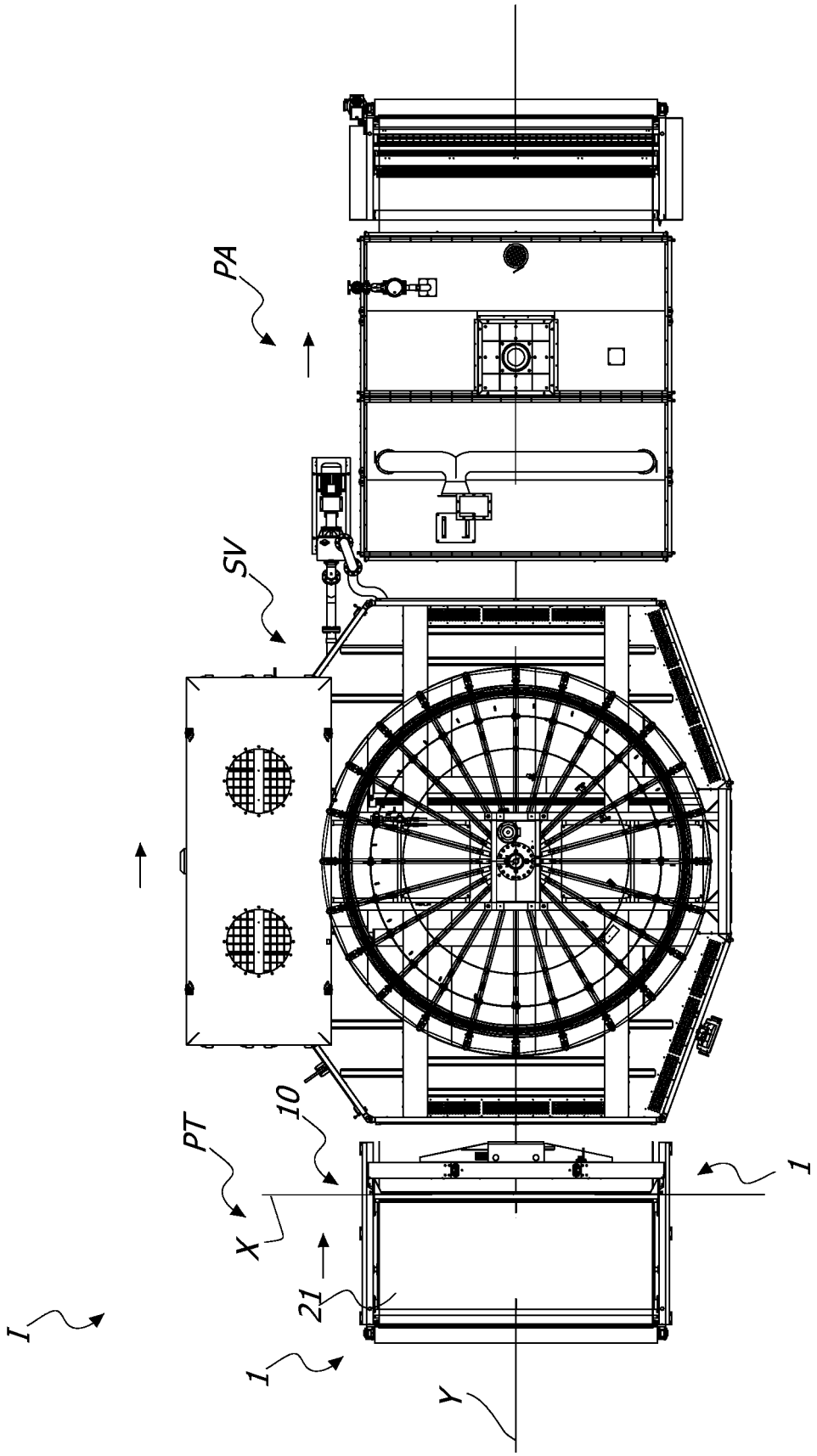

FIG. 2

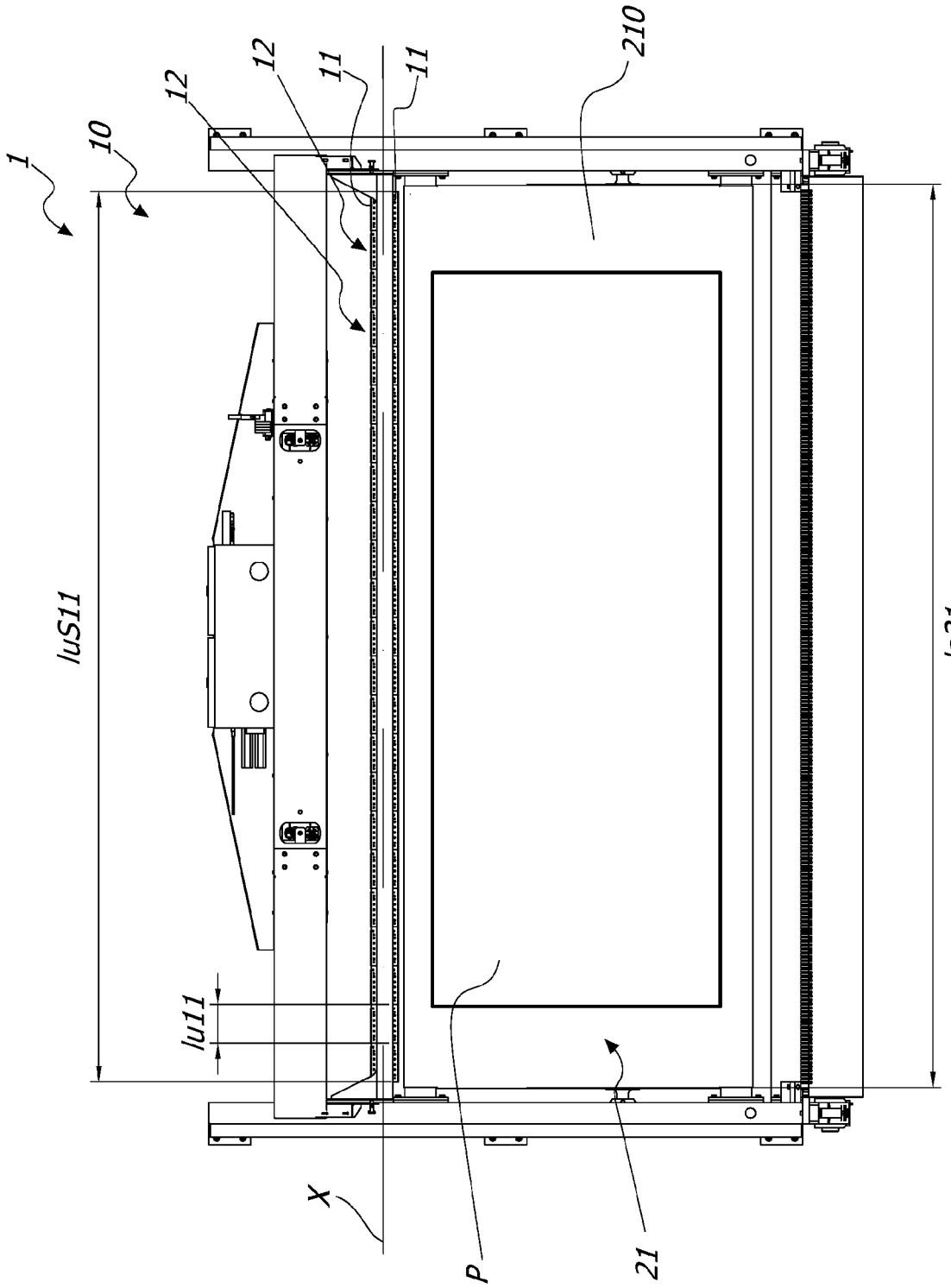

FIG. 3

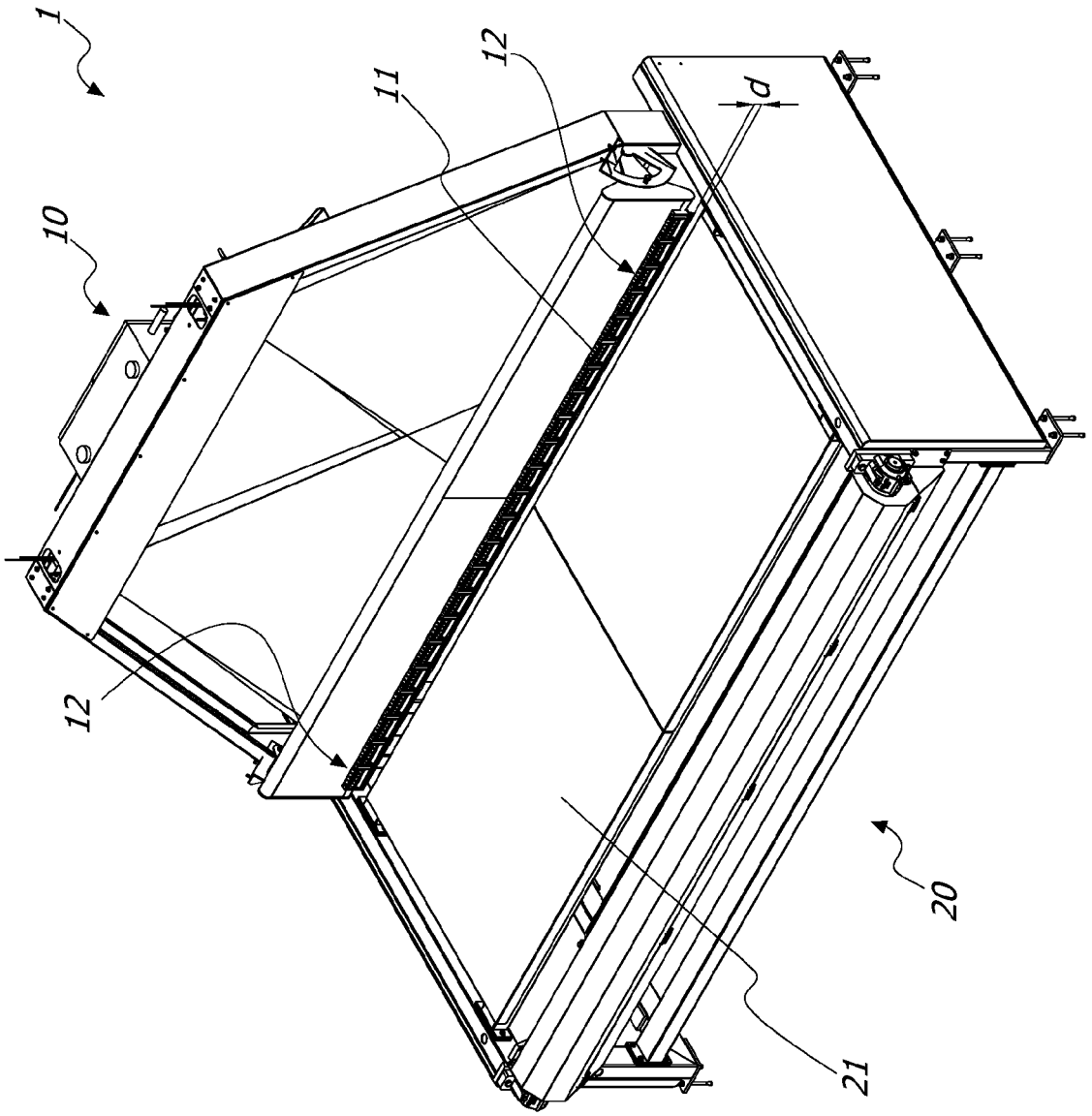

FIG. 4

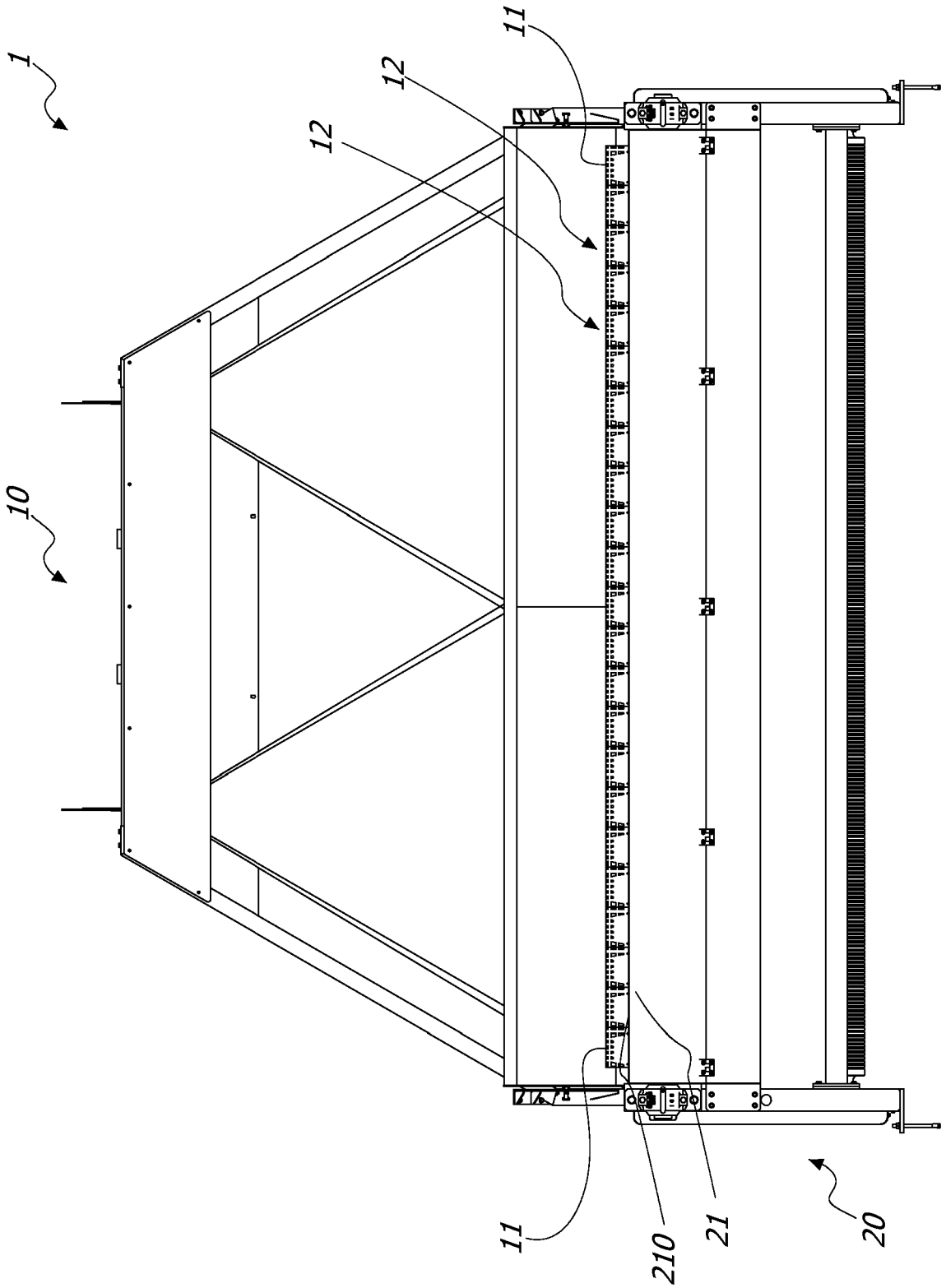

FIG. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 17 0019

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2017/098380 A1 (MS PRINTING SOLUTIONS S R L [IT]) 15 June 2017 (2017-06-15)	1,9,10, 12,13	INV. C14B1/56
A	* page 59, paragraph 3 - page 60, paragraph 1 * * figures 1,2,5 * * claim 1 * * page 115, paragraph 2-3 * * page 11, paragraph 2 * * page 115, paragraph 3 - page 116, paragraph 1 *	2-8,11	B41J11/00 C14C15/00 D06P3/32
Y	EP 2 189 544 A1 (ERRETRE SPA [IT]) 26 May 2010 (2010-05-26) * claim 1; figure 1 *	1,9,10, 12,13	
A	US 2019/270320 A1 (DE ROECK LUC [BE]) 5 September 2019 (2019-09-05) * paragraph [0095]; figures 1,2 *	1,12	
A	KR 2003 0039405 A (LEE KYU YONG [KR]) 22 May 2003 (2003-05-22) * abstract; figure 5 *	1,12	

TECHNICAL FIELDS SEARCHED (IPC)

C14B
D06Q
B41J
C14C
D06B
D06P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 September 2023	Iamandi, Daniela

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 17 0019

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-09-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017098380 A1	15-06-2017	BR 112018011773 A2	04-12-2018
		CN 108779603 A	09-11-2018
		EP 3387185 A1	17-10-2018
		US 2018361759 A1	20-12-2018
		WO 2017098380 A1	15-06-2017
EP 2189544 A1	26-05-2010	EP 2189544 A1	26-05-2010
		IT 1392759 B1	16-03-2012
US 2019270320 A1	05-09-2019	AU 2017357584 A1	04-07-2019
		BR 112019009659 A2	10-09-2019
		CN 109922967 A	21-06-2019
		EP 3538371 A1	18-09-2019
		US 2019270320 A1	05-09-2019
		WO 2018087119 A1	17-05-2018
KR 20030039405 A	22-05-2003	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82