

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 May 2012 (10.05.2012)

(10) International Publication Number
WO 2012/060726 A1

(51) International Patent Classification:
CUB 17/00 (2006.01) **G01N 33/44** (2006.01)
G01N 21/88 (2006.01) **G06T 7/00** (2006.01)

(74) Agent: **JOÃO PAULO SENA MIOLUDO**; Rua Sousa Martins, 10 - 7º, PT 1050-218 LISBOA (PT).

(21) International Application Number:
PCT/PT20 10/000045

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date:
4 November 2010 (04.11.2010)

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,

(25) Filing Language: English

(26) Publication Language: English

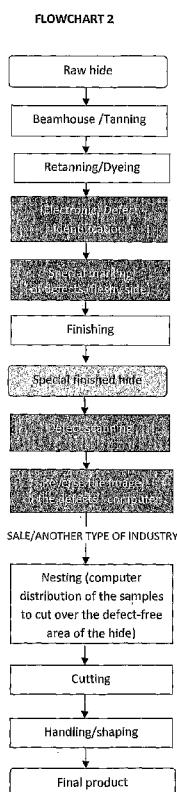
(71) Applicant (for all designated States except US): **COURO AZUL - INDÚSTRIA E COMÉRCIO DE COUROS, SA** [PT/PT]; PONTE DO PERAL - GOUXARIA, PT 2380 - 182 ALCANENA (PT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **CARVALHO, ANTÓNIO JOSE PEREIRA DE** [PT/PT]; CASAL VAL, Casa 1, PT 2350-476 - TORRES NOVAS (PT).

[Continued on nextpage]

(54) Title: PROCESS TO DETECT DEFECTS IN LEATHER



(57) **Abstract:** This invention relates to a new process to mark the defects on the hide at the hide processing stage, i.e., in the hide that has been tanned and dyed, but not finished where they may be identified. At this stage, it becomes easy to identify such defects, as they are all visible and the marking of such defects at this stage is carried out by applying special inks on the defect areas on the fleshy side of the hide. The special marking inks will have more than one colour, corresponding to the several types of defects. This marking is carried out with a printing means, which receives the information from the defect scanner and reverses the reading made on fleshy side to the outer side. Once the hide is finished, the same device which scanned the defects will read those markings on the posterior side of the hide (the fleshy side) and through a computer program will adjust them to the outer side of the hide. With the presented process it is possible to obtain a hide that clearly identifies its defects. Moreover as said identification is made on a non-used area of the hide, there will be no use problems for any type of industry. The hide may be tracked at this stage through a defect data file, to allow the end client a better use without the need to mark the defects, with all the advantages achieved through this process.

SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, Published:

GW, ML, MR, NE, SN, TD, TG).

— *with international search report (Art. 21(3))*

DESCRIPTION**PROCESS TO DETECT DEFECTS IN LEATHER**

This invention relates to a new process to detect and mark the defects at the hide processing stage and the corresponding identification at the finishing stage.

BACKGROUND OF THE INVENTION

1 - Leather processing - Prior Art

The transformation and manufacture of a leather article usually follows a set of stages which, in the specific terminology of this industry, are called: beamhouse operations, tanning, dyeing, finishing.

Beamhouse operations: - The hide is cleaned off the remaining meat, blood, manure and dirt, and depending on the future use of the hide, hair may be as well removed. At this stage, the hide is called **pelt**.

Tanning: - The hide is stabilized, i.e., it becomes rot-proof and it may be preserved for more or less longer periods of time, depending on the type of tanning applied. This stage comprises a set of mechanical actions to remove excess moist and to define the thickness of the hide, and physical-chemical actions to allow the penetration and fixation of the tanning agents. At this stage the hide is called **tanned hide**.

Retanning / Dyeing: - The hide endures further physical-chemical actions, being dipped into an aqueous bath of tanning agents and fats (conferring touch and mechanical properties) and of colouring agents (conferring colour) and mechanical actions,

mainly associated to drying (setting and buffing, vacuum drying, etc.) . This process sets the colour and the touch and the required mechanical properties for the article at issue. At the end of this stage, the hide is called **crust**.

Finishing: The hide undergoes the superficial application of several layers of products, such as special dyes with greater or lesser coating ability and also other mechanical operations, such as sanding, embossing, etc. At this stage, the hide acquires its final colour and superficial properties (touch and appearance) depending on the type of article at issue, minimizing or concealing the natural defects of the hide, which can be observed at the crusting stage. At the end of the whole process, the hide is **finished**.

Finished hide is the hide used by downstream industries, where it is marked (identification of defects), cut, shaped, until the intended final article.

The identification of defects is currently made on finished hides .

2 - Related documents

North-American Patent No. US 6157730 describes a visual inspection system particularly designed for imaging relatively non-rigid materials in order to identify defects and the position of defects on the material particularly for leather comprising a leather handling means, tensioning means for tensioning at least an area of the sample and imaging means for obtaining an image of the area under tension and image processing means to provide information on any defects which may exist .

This process relates to a system to inspect defects which improves the merely visual process through an image obtained

from the leather areas under analysis.

North-American Patent No. US 4982437 relates to a method of cutting a hide with a tool controlled by a computer system and in accordance with a cutting program that may depend on certain particularities of the sheet.

The computer system examines the hide with a video camera. Prior to scanning, an operator marks certain particularities directly on the hide using a fluorescent marker, the marking being in the form of distinctive symbols which are detectable by the camera and which are interpretable as signs to be taken into account by the cutting program.

This Patent relates to the leather hide already showing the defects marked with symbols which are detectable by the camera and which are taken into account for the cut to be made.

International Patent No. WO 2005/069220 relates to a method for qualifying leather, using a mapping device comprising means for obtaining a digital image of the leather and by processing the image obtained.

Said method comprises at least one phase, following optional previous steps, wherein a statistical algorithm of the generalised likelihood ratio test "GLRT" is applied to the image of the leather.

Said algorithm enables the likelihood ratio test of the presence of a defect in a first region to be compared to a second region.

Basically, this patent relates to the computer system to mark the defects and improve the qualification of the leather without mentioning the stage at which this takes place.

The fact is that the known methods have been proved

insufficient, because when the leather is subjected to tension during the application, such as in wheels in the automobile industry, it may reveal defects that could not be observed in the finished hide (before cutting), but could be identified in stages prior to the finishing.

It must be taken into account that hide defects, even if detected at processing stages, must be further identified and marked, because the finishing of hides renders dimensional variations in several directions of the hide, which leads to mislocation of such defects at the end of the process, even with good computer projections inspecting the dimension of the hide at the dyeing stage and at the finished hide stage.

Description of the method

The purpose of this invention is to identify and mark the defects at a process stage where they are perfectly visible and may be identified - Crust state (the hide has already been tanned and dyed, but it is not finished).

This identification is made on the non-usable part of the hide (the flesh side) where the defects are more visible and they are marked with a special ink so that they may be identified later, after the finishing stage.

Since these marking are made on the non-usable part of the hide, it will cause no use problems in any industry.

The marking is made by an electronic scanner, which reads the hide and simultaneously marks the analysed defects with a suitable ink through a printing device.

The scanner scans the hide and prints the marking of the defects with ink on the flesh side.

Afterwards it, comes the finishing stage, in which the hide

undergoes dimensional changes and, simultaneously, the defects that were previously visible at the crusting stage are "concealed" through the application of inks/resins.

Thus, the defects that were visible before the finishing stage are now "concealed/covered" and their identification is no longer possible.

However, as the method of this invention has identified and marked them at the crusting stage on the flesh side of the hide, it is possible to identify them in the new dimensional condition of the hide through an electronic reading made on the flesh side and then store said location in an electronic file.

As the scanner scans the hide and prints the marking of the defects with ink on the flesh side, it simultaneously stores the reversed image to be used at the final identification before the cut.

The scanned hide may be sold at this stage, along with a defect file, thus allowing a better use for the end user. Alternatively, it may be used internally at the Cutting Section, with all the advantages of an automatic method which replaces the previous manual/visual method.

The reversed image, which corresponds to the outer side of the hide, allows the exact location of the defects marked on the flesh side.

1. Process Flowcharts

This invention is illustrated with two flowcharts, which are part of the invention, in that:

- Flowchart 1 represents the prior art process.

- Flowchart 2 represents the process of this invention.

3- Purpose of this invention

As it may be seen on Flowchart 1, which reflects the prior art, the identification and marking of defects on the hide takes place only after the finishing stage.

The identification and marking of the defects takes place at the finishing stage and on the outer side of the hide.

The hide is commercialized as a finished article without the identification of the defects or after having the defects identified and marked is prepared for the nesting stage, cut and shaping .

This procedure obviously entails unidentified defects as they are invisible once the skin is subjected to the finishing treatments .

In this manner, namely in more demanding use conditions, there is a great deal of scrap material with all the implicated costs.

Flowchart 2 lays out the process according to this invention.

It is easily seen that the process for identifying and marking defects takes place after the dyeing stage.

At this stage, the defects of the hide (the flesh side) are totally visible, which makes it possible to identify and mark them completely and this marking is carried out on the posterior part (the flesh side) .

The defect detection system at this stage, apart from the detection itself, also classifies the seriousness of the defect, the area of the sample and the special requirements of some customers regarding the respective marking.

In fact, the detection of defects after the finishing stage becomes more difficult, in the sense that the treatments the hide is subjected to conceals many defects no matter how thorough the detection is.

Thus, when the destination of the hide is to be shaped for determined coverings and to be subjected to tension, there are defects which become visible and end up increasing the scrap material percentage.

It is therefore essential to reduce such scrap material percentage to improve the performance of the finishing line and the after-sale of leather.

It is guaranteed that the cut leather parts are defect-free or they have only the allowed defects, without rejects found internally or at the client who installs leather on final parts, thus reducing costs.

Indeed, it will be easier to identify such defects in the dyed hide, as they are all visible, and nowadays there are automatic processes that may detect such defects.

This invention foresees the identification of such defects at this stage and the respective marking, by applying special inks on the defect areas (jet painting), but on the posterior part of the hide (the flesh side that will not be used in the future).

The marking on that side is made through a printing device which receives the information from the defect scanner and reverses the image of the reading, made on the posterior side of the

hide, to the outer side.

Special marking inks may have more than one colour, each one corresponding to the classification of the several types of defects .

Once the hide is finished, the scanner will read those markings on the posterior side of the hide (the flesh side) and through a computer program, will adjust them to the outer side of the hide .

4 - Advantages and innovation of this method

1) The marking of defects is carried out at an intermediate stage of the tanning process and not on the finished piece resulting from the tanning industry.

2) The production of hides is no longer fragmented, because this system comprises the needs of downstream tanning industry, linking the manufacturer of hides (tannery) and the hide user (footwear, clothing, furniture and automobile industry) .

3) This process replaces lengthy and subjective manual operations (visual inspection and manual marking) by standard automatic procedures.

4) It shows a product with its defects marked, which allows downstream industry to know beforehand the expectable performance and use.

5) It is also time-efficient, because the electronic communication means will allow a downstream tannery industry to carry out the "nesting" (computer system which allows the distribution of the hide samples to cut, optimizing their yield and avoiding the defects) of a hide that is underway, thus

achieving better "just in time" situations and less periods in stock.

CLAIMS

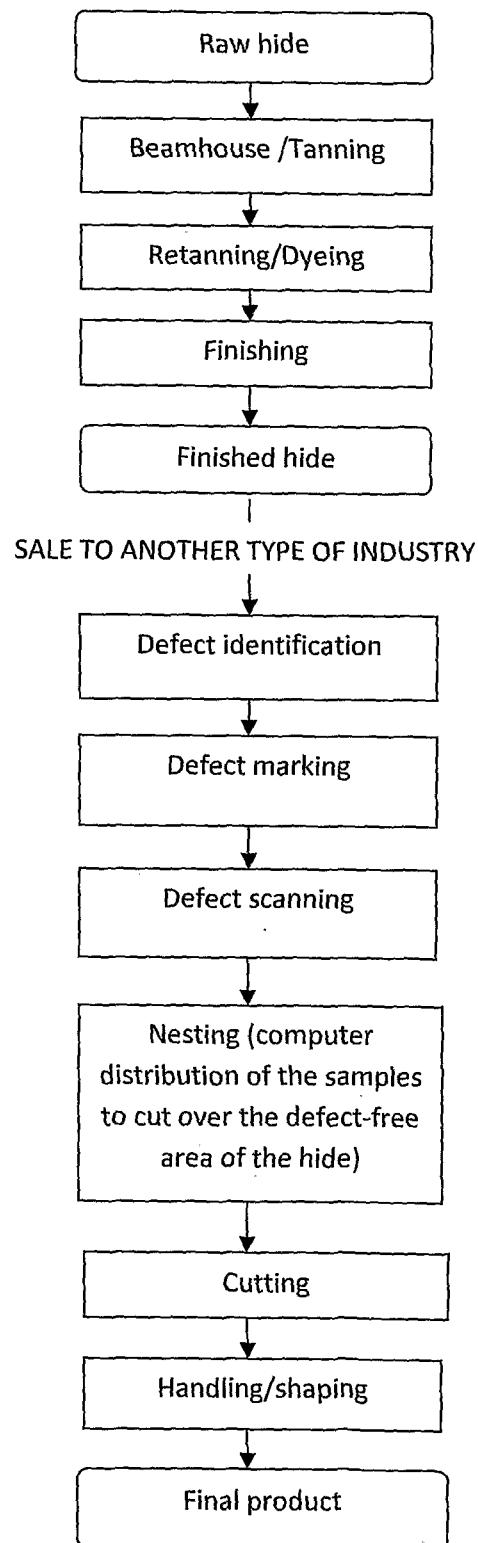
1. Process to detect defects in leather, characterized in that the defects which are identified and marked during the processing step on the fleshy side of the hide, may be subsequently identified in the finished hide.
2. Process to detect defects, according to claim 1, characterized in that the identification of the defects is carried out through an electronic process which simultaneously prints on the material and on the defect area with a suitable ink to be identified at a later stage.
3. Process to detect defects, according to claim 2, characterized in that the ink may have several colours to classify the type of defect.
4. Process to detect defects, according to claims 1 and 2, characterized in that the marking electronic image of the fleshy side of the hide is reversed in order to transfer the marking image to the outer side of the hide.
5. Process to detect defects, according to claims 1 to 3, characterized in that the electronic process includes a scanner connected to a computer system which detects the defects with an immediate print (marking) of the defect with a specific ink.
6. Process to detect defects, according to claims 1 to 4, characterized in that the hide subjected to this process may be tracked in the commercialization circuit through a

11

magnetic data carrier containing the data resulting from the scan .

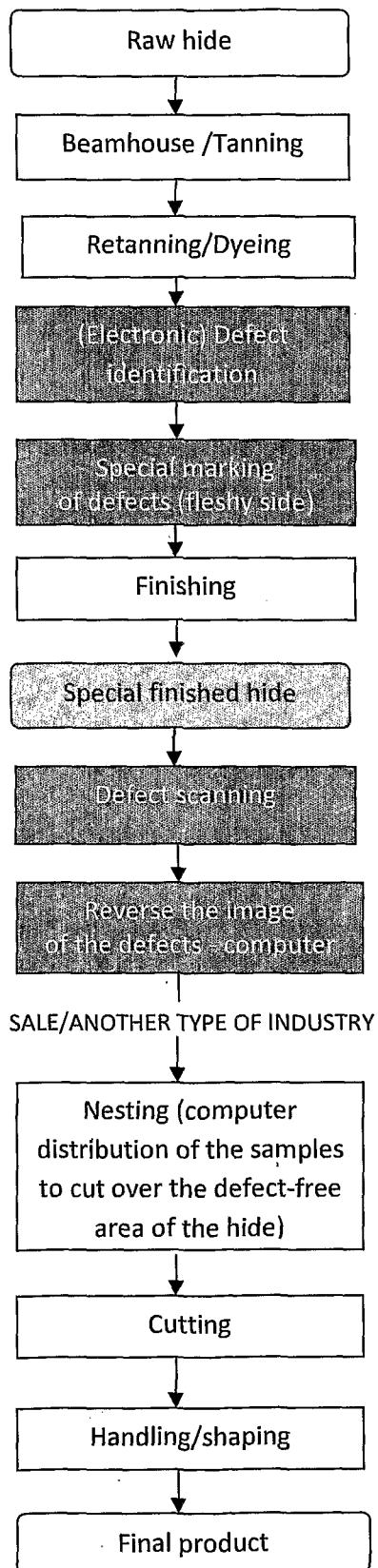
1 / 2

FLOWCHART 1



2 / 2

FLOWCHART 2



INTERNATIONAL SEARCH REPORT

International application No
PCT/PT2010/000045

A. CLASSIFICATION OF SUBJECT MATTER	INV. C14B17/00	G01N21/88	G01N33/44
ADD.			

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C14B G01N G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 42 16 469 A1 (DI EHL GMBH & co [DE]) 25 November 1993 (1993-11-25) column 1, line 3 - column 2, line 59 -----	1-6
A	WO 03/076915 A1 (BASF AG [DE] ; PABST GUNTHER [DE] ; IGL GEORG [DE] ; HOERNER KLAUS DIETER) 18 September 2003 (2003-09-18) page 5, lines 35-46; claim 1 -----	1-6
A	US 5 258 917 A (BRUDER WOLFGANG [DE] ET AL) 2 November 1993 (1993-11-02) claims 1-4 -----	1-6
A	GB 2 320 099 A (DUERKOPP ADLER AG [DE]) 10 June 1998 (1998-06-10) claim 1 -----	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 April 2011	29/04/2011
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Bi chi , Marco

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/PT2010/000045
--

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
DE 4216469	AI 25-11-1993	IT IT	MI930407 1264457	UI BI	19-11-1993 23-09-1996

WO 03076915	AI 18-09-2003	AU CN DE EP US	2003209725 1650161 10211293 1488220 2005180607	AI A AI AI AI	22-09-2003 03-08-2005 25-09-2003 22-12-2004 18-08-2005

US 5258917	A 02-11-1993	DE ES FR IT JP JP	4012462 2037582 2661193 1245714 3108456 4225100	AI AI AI B B2 A	24-10-1991 16-06-1993 25-10-1991 14-10-1994 13-11-2000 14-08-1992

GB 2320099	A 10-06-1998	DE	19650234	CI	30-04-1998
