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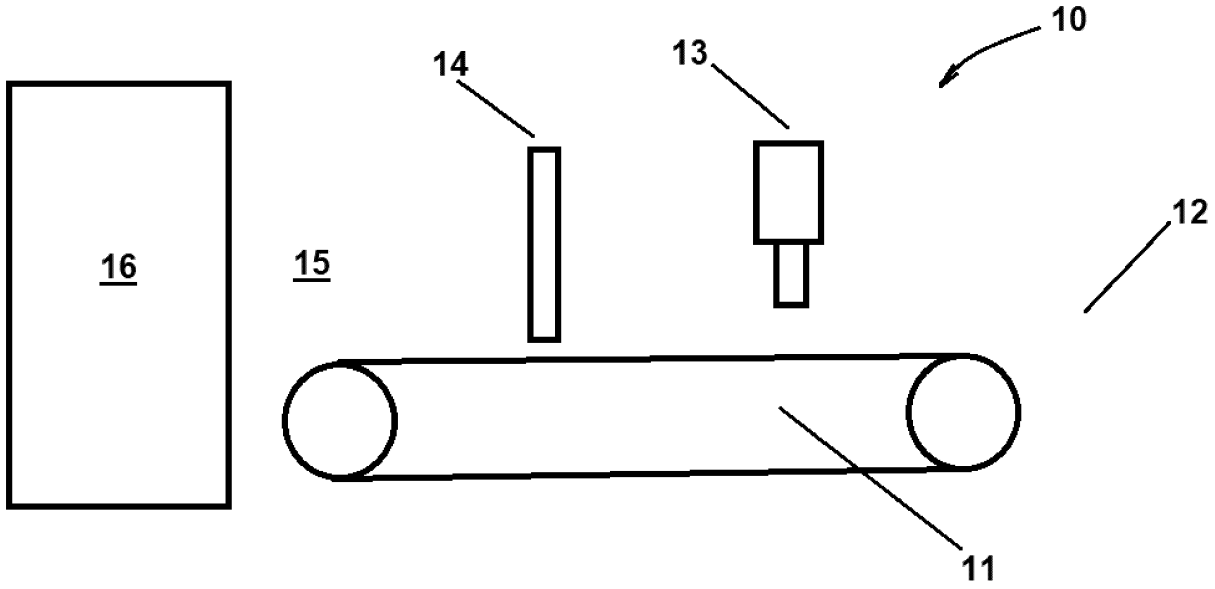
(54) **METHOD FOR TRACEABILITY AND QUALITY CONTROL OF HIDES USING MACHINE-READABLE CODE IDENTIFICATION AND IT INTEGRATION**

(57) The present invention introduces an integrated system for the leather industry, combining hide quality assessment with traceability. By inkjet printing unique machine-readable barcodes to hides and linking these to quality data obtained from imaging analyses, the system ensures accurate tracking and management of hides through IT system integration. The system comprises an apparatus, comprising a conveyor belt (11) for translating the hides along an operating line of the apparatus (10), an imaging station (14) configured for imaging each hide, and a coding station (13) configured for applying a unique machine-readable code to each hide.

Figure1



EP 4 567 133 A1

Description

[0001] The present invention introduces an integrated system for the leather industry, combining hide quality assessment with traceability. By applying unique machine-readable codes to hides and linking these to quality data obtained from imaging analyses, the system ensures accurate tracking and management of hides through IT system integration.

[0002] Leather is used in a broad range of goods such as leather upholstery, leather footwear, leather bags, leather garments, and so on. The raw material used in leather industry are hides (for smaller animals often referred to as skins) derived, for the most part, as waste product from the meat industry. The raw hides are processed and converted into usable material in tanneries. Tanning is the process that converts the protein of the raw hide any yield stable and flexible tanned hides, which will not putrefy and are suitable for a wide variety of end applications. Leather and its products are one of the most heavily traded products globally, with an annual trade volume in the range of US$ 100 billion.

[0003] Since hides are natural products, they are never identical, and differ greatly in their quality and usefulness for different applications. For example, for making upholstery, the hides would need to have a certain minimum size and shape of a defect-free zone. For making handbags or watchstraps, smaller defect-free zones may be tolerated, demands for the leather quality inside the defect-free zone may be higher.

[0004] Evaluating, categorizing and sorting of hides has long been intensive in manual labour. As a result, the assignment of certain data to hides and a resulting tracking and management of hides was not fully reproducible, rendering hides largely non-fungible goods. More recently, industrial size scanners enable an automated and reproducible assignment of parameters / data to a hide, and hence form the basis for categorizing of hides and their fungibility for an intended application. Yet, tracking and management of hides still involves manual labour and is work intensive and error prone.

[0005] In the prior art, DE 10 2014 118 460 B3 discloses a two-stepped evaluation process for hides, including printing an identifier to the hide in a first of the two evaluation cycles and reading in the prints with a camera. US 2010-058818 A1 discloses an evaluation and sorting process for hides, where a grading at station may be automated by visual instruments and accompanied by a coding before grading. Barcode tags are disclosed as potential codes. EP 3 800 275 A1 discloses coding of hides after grading.

[0006] The invention aims to provide improved means to further improve and automate tracking and management of hides.

[0007] Against this background, the invention proposes a method for processing a plurality of hides, the method comprising the following automated steps: inkjet printing a unique machine-readable barcode to each hide; generating quality data for each hide by utilizing imaging techniques to assess the quality of each hide; generating combined data for each hide by linking the quality data for each hide to the machine-readable barcode for the respective hide; and integrating the combined data for effective traceability of each hide and quality management of the plurality of hides. The inkjet printing of the machine-readable bar code and the imaging are carried out during one in-line process, where the hides are moved on a conveyor belt, inkjet printed with the machine-readable barcode at a coding station, and imaged at an imaging station located before or after the coding station. Printing is understood as printing directly onto the hide, as opposed to applying a label or printing on a label.

[0008] The invention further proposes an apparatus for processing a plurality of hides, the apparatus comprising: a conveyor belt for translating the hides along an operating line of the apparatus; an imaging station configured for imaging each hide; a coding station comprising an inkjet barcode printer and configured for inkjet printing a unique machine-readable barcode onto the surface of each hide; and an IT system configured for generating combined data for each hide by linking the quality data for each hide to the machine-readable code for the respective hide, and for integrating the combined data for effective traceability of each hide and quality management of the plurality of hides. The hides are inkjet printed with the machine-readable barcode at the coding station and imaged scanned at the imaging station during translation.

[0009] Key features of the invention are that the machine-readable codes are barcodes and that they are inkjet-printed to the hides while they translate along the conveyor belt, i.e. during a translational movement of the hide relative to the coding station on the moving conveyor belt. In other words, the hides do not stop while the barcode is being printed onto the surface. This reduces operating time and improves efficiency.

[0010] A barcode has sufficient capacity for information for the application at hand and is quite insensible to deformation and misprint or misreading despite a translational movement of the hide during printing and reading. This does not likewise apply to more complex types of machine-readable codes, like, for example, QR codes.

[0011] Inkjet printing is advantageous over, for example, laser printing, as laser printing may lead to thermal deformation and imprecise prints on the uneven and moist materials. For printing barcodes onto moving hides of potentially varying surface properties and moistness, inkjet printing has been found to be the most stable process.

[0012] The hides can be various types of leather products including, for example, raw hides, wet semi-finished products like wet blue and wet white, dried semi-finished products such as crust, and finished leather.

[0013] The imaging station may be positioned, with respect to the direction of operation of the apparatus and translation of the hides, before or after the coding

station. In a preferred embodiment, the coding station is positioned before the imaging station, so that the machine-readable code forms part of the image taken at the imaging station.

[0014] The coding station can include a movable device, which for each hide approaches the conveyor belt and hide for coding and then retracts. The device can be a robotic arm or hydraulic piston or wheel. Before the imaging and/or before the coding, the conveyor belt can include an inclined section to support a smoothing out of the hides.

[0015] The imaging station preferably comprises a line scanner. Preferably, the surface of each hide is imaged during translational movement of the hide relative to the coding station on the moving conveyor belt. In other words, the hides preferably do not stop while they are being imaged. Like in printing, this also reduces operating time and improves efficiency. If the printing is done prior scanning and if code reading is done during imaging, the barcodes are stably read even while the hides are moving. In an embodiment, the hides translate through the coding station and the imaging station in the same direction, i.e. without being rotated relative to the direction of movement in the plane of the conveyor belt.

[0016] In one embodiment, quality data comprise, for example, number of defects per unit area, or size and shape of defect-free zones, at different definitions what a defect may be, for example an imperfection, hole or cut. Also, surface quality in terms of, for example, full-grain quality, top-grain quality, genuine leather quality or corrected-grain leather can be used as a parameter, or size and shape of areas where the hide has a certain surface quality.

[0017] In one embodiment, integrating the combined data comprises categorizing each hide based on one or more of the quality data, or other information related to the hide. The categorization can mark each hide for suitability for a certain application, or assign certain quality grades specific or unspecific for a certain application to each hide.

[0018] The other information related to each hide can include, for example, hide thickness data, hide colour, or supplier data. Hence, for effective traceability and quality management the method of the invention may use data beyond only the quality data obtained by imaging.

[0019] In one embodiment, the method further includes physically storing the hides in a storage. Integrating the combined data can comprise recording the position of each hide in the storage and/or sorting the hides in the storage based on one or more of the quality data or based on categorization. Preferably, the hides are hung on a rack in the storage, in a way that the machine-readable code is accessible for automated or manual access with a code reader.

[0020] According to the invention, coding, imaging and data integration for effective traceability of each hide and quality management of the plurality of hides is automated. Picking up the hides from a conveyor for physical storage can also be automated, as well as sorting or resorting in the storage. Loading the hides onto the conveyor can be automated or manual labour. Categorization can be automated based on user-defined parameters.

[0021] The apparatus of the invention comprises an IT system in communication with the coding station and the imaging station. It preferably comprises a screen to visualize the images, quality and combined data and/or categorization.

[0022] Further details and advantages of the invention are described with reference to the following figures and example. The figures show:

Fig. 1 a schematic illustration for an exemplary apparatus to carry out a method of the invention; and

Fig. 2: a schematic flow diagram for an exemplary method of the invention.

[0023] The apparatus 10 shown in Fig. 1 is suitable for generating data for effective traceability of each hide and quality management of the plurality of hides, according to a method of the invention. The apparatus 10 comprises a conveyor belt 11 and a loading station 12, where hides can be loaded, e.g. manually loaded, to the conveyor belt 11. Arranged in series along the conveyor belt 11, downline the loading station 12, are a coding station 13, more specifically an inkjet printer, and an imaging station 14, more specifically a scanner. On the far end of the conveyor belt 11 is a pick-up station 15 to pick up hides from the conveyor belt and load them into a storage 16. The pick-up station 15 can be designed for manual pick up of the hides, or comprise a robot for automated pick-up of the hides and transfer to the storage. The storage can comprise a rack. An IT system 20 is in connection with both the printer of coding station 13 and the scanner of imaging station 14.

[0024] In a first step of loading 100, previously tanned hides, e.g. cowhides, can be loaded onto the conveyor belt 11 at loading station 12. The loading 100 can be manual or automated.

[0025] In a second step of printing 200, a machine-readable barcode is inkjet printed onto the hide by printer of coding station 13, preferably at a position close to an edge of the hide to minimize impact to a useable area of the hide. The printer of coding station 13 comprises a robot arm that carries a printing head. For each hide that passes the printer of coding station 13, the printing head approaches the conveyor belt 11 from above, prints the machine-readable barcode onto the hide, and again retracts from the conveyor belt 11. While printing 200, the hide is translating towards the scanner of imaging station 14 on the conveyor belt 11.

[0026] In a third step of scanning 300, the hide, with the machine-readable barcode printed on its surface, passes the scanner of imaging station 14 and is scanned to

obtain a scanned image of the hide. The scanning 300 involves an optical scan of the hide surface and the conversion of the data to a digital image.

[0027] Meanwhile, in a fourth step of evaluating 400, a software operated on IT system 20 derives quality data for the hide from the image. The quality data comprise, at least, parameters representative for number of defects per unit area, size and shape of defect-free zones, and surface quality in terms of grain. Together with an identifier that is based on the machine-readable barcode contained on the scanned image, the quality data form combined data.

[0028] In a fifth step of categorizing 500, the software proceeds to categorize the hide based on one or more of the quality data. The categorization is in respect of each hide's suitability for a certain application. For example, for making upholstery, the hide would need to have a certain minimum size and shape of a defect-free zone.

[0029] In a sixth step of storing 600, a combined data for each hide are stored in the memory of the IT system 20, or any external memory or cloud.

[0030] In a seventh step of pick-up and storage 700, the hides are removed from the conveyor 11 and hung up on a rack of the storage 16. The step 700 can be carried out in an automated manner by a robot, which sorts the hides according to their categorization. The information for the sorting is provided to the robot by the IT system 20.

[0031] In summary, the method allows for applying physical identifiers (machine-readable codes) to hides and for assigning quality data to hides without requiring any offline steps. The hides can automatically be sorted or re-sorted, depending on an intended use (suitable for, e.g., upholstery, shoes or watchstraps).

Claims

1. A method for processing a plurality of hides, the method comprising the following automated steps:

   applying a unique machine-readable code to each hide;
   generating quality data for each hide by utilizing imaging techniques to image and assess the quality of each hide;
   generating combined data for each hide by linking the quality data for each hide to the machine-readable code for the respective hide; and
   integrating the combined data for effective traceability of each hide and quality management of the plurality of hides;
   wherein the applying of the machine-readable code and the imaging is carried out during one in-line process, where the hides are moved on a conveyor belt (11), provided with the machine-readable code at a coding station (13), and imaged at an imaging station (14) located before or after the coding station (13);

   characterized in that

   the machine-readable codes are machine-readable barcodes;
   the machine-readable barcodes are inkjet printed on the surface of each hide; and
   the machine-readable barcodes are inkjet printed on the surface of each hide during translational movement of the hide relative to the coding station (13) on the moving conveyor belt (11).

2. The method of claim 1, wherein the speed of the translational movement of the hide on the moving conveyor belt (11) when passing the coding station (13) and being inkjet printed with the machine-readable barcode does not change relative to the speed of the translational movement of the hide before passing the coding station (13).

3. The method of any preceding claim, wherein the speed of the translational movement of the hide on the moving conveyor belt (11) after passing the coding station (13) does not change relative to the speed of the translational movement of the hide when passing the coding station (13) and being inkjet printed with the machine-readable barcode.

4. The method of any preceding claim, wherein the machine-readable codes are applied to the hides before the hides are imaged.

5. The method of any preceding claim, wherein the imaging station (14) comprises a line scanner.

6. The method of any preceding claim, wherein the surface of each hide is imaged during translational movement of the hide relative to the coding station (13) on the moving conveyor belt (11).

7. The method of any preceding claim, wherein the hides translate through the coding station (13) and the imaging station (14) without being rotated relative to the direction of movement in the plane of the conveyor belt (11).

8. The method of any preceding claim, wherein the quality data comprise one or more of number of defects per unit area, size and shape of defect-free zones, surface quality in terms of grain, or size and shape of areas where the hide has a certain surface quality.

9. The method of any preceding claim, wherein the integrating the combined data comprises categorizing each hide based on one or more of the quality data, or other information related to the hide, wherein the categorization preferably is made in view of a

suitability of each hide for a certain application or a certain quality grade of each hide specific or unspecific to a certain application.

10. The method of any preceding claim, wherein the method further includes physically storing the hides in a storage, and wherein integrating the combined data comprises recording the position of each hide in the storage and/or sorting the hides in the storage based on one or more of the quality data or based on categorization.

11. An apparatus (10) for processing a plurality of hides according to a method of any preceding claim, the apparatus (10) comprising:

a conveyor belt (11) for translating the hides along an operating line of the apparatus (10);
an imaging station (14) configured for imaging each hide;
a coding station (13) configured for applying a unique machine-readable code to each hide, wherein the coding station (13) comprises an inkjet printer configured for inkjet printing machine-readable barcodes onto the surface of each hide while translating on the conveyor belt (11); and
an IT system configured for generating combined data for each hide by linking the quality data for each hide to the machine-readable code for the respective hide, and for integrating the combined data for effective traceability of each hide and quality management of the plurality of hides.

12. The apparatus of claim 11, wherein, relative to the operating line of the apparatus (10), the coding station is positioned before the imaging station (14).

13. The apparatus of claim 11 or 12, wherein the imaging station (14) comprises a line scanner.

Figure1

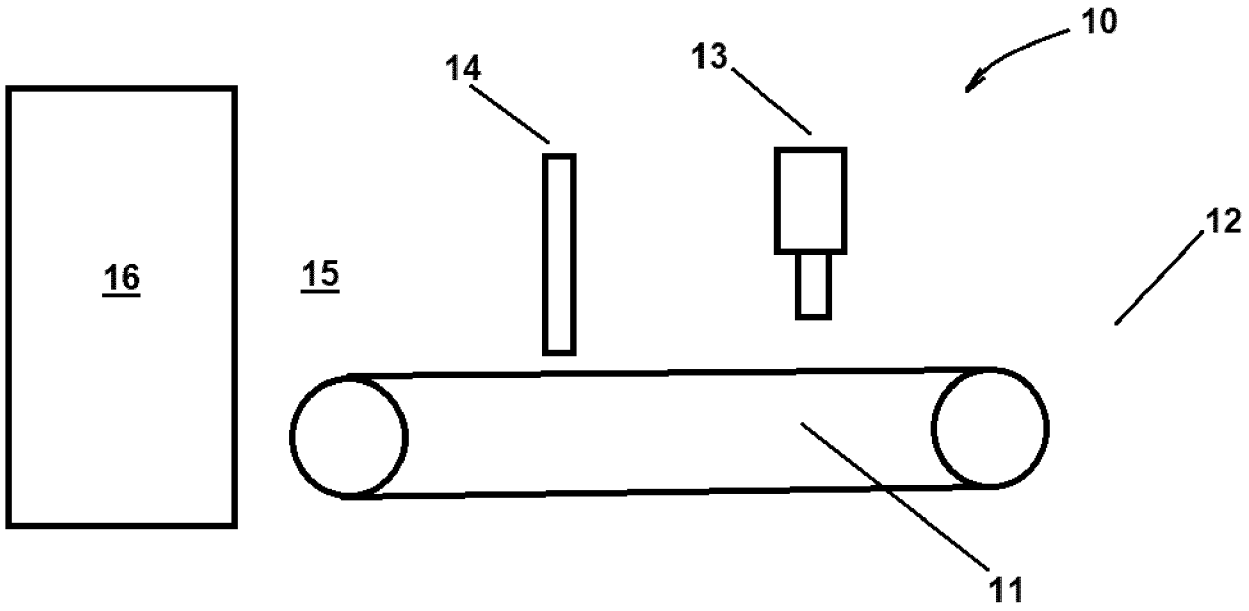
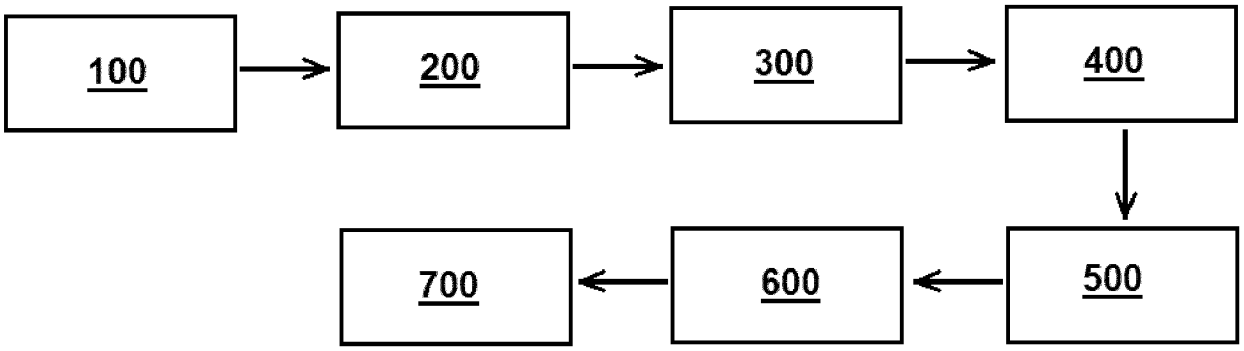


Figure 2



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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 7468

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	US 2010/058818 A1 (HOUTZ RONN A [US]) 11 March 2010 (2010-03-11)	11-13	INV. C14B17/00
A	* paragraphs [0001], [0007], [0027], [0041] - [0047]; claims; figures *	1-10	
Y	EP 3 388 491 A1 (AGFA NV) 17 October 2018 (2018-10-17)	11-13	
A	* paragraphs [0009] - [0014], [0019] - [0043]; claims; figures *	1-10	
A	DE 10 2014 118460 B3 (PQC PROCESS QUALITY COMPETENCE GMBH [DE]) 24 March 2016 (2016-03-24) * paragraphs [0001] - [0003], [0020], [0068], [0081] - [0088], [0101], [0102], [0110]; claims; figures *	1-13	
A	EP 3 800 275 A1 (GRAMMER AG [DE]) 7 April 2021 (2021-04-07) * paragraphs [0001], [0019], [0037], [0044] - [0046], [0051]; claims; figures *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC) C14B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 April 2025	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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24-04-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010058818 A1	11-03-2010	US 2010058818 A1	11-03-2010
		WO 2008022248 A2	21-02-2008
EP 3388491 A1	17-10-2018	BR 112019021470 A2	12-05-2020
		CN 110494511 A	22-11-2019
		DK 3388491 T3	21-09-2020
		EP 3388491 A1	17-10-2018
		EP 3702422 A1	02-09-2020
		ES 2810124 T3	08-03-2021
		JP 6902621 B2	14-07-2021
		JP 2020516735 A	11-06-2020
		KR 20190122853 A	30-10-2019
		PL 3388491 T3	14-12-2020
		PT 3388491 T	13-07-2020
		RU 2745321 C1	23-03-2021
		RU 2020142950 A	15-01-2021
		US 2020101783 A1	02-04-2020
		WO 2018189002 A1	18-10-2018
DE 102014118460 B3	24-03-2016	NONE	
EP 3800275 A1	07-04-2021	CN 112676183 A	20-04-2021
		DE 102019006835 A1	01-04-2021
		EP 3800275 A1	07-04-2021
		WO 2021063446 A1	08-04-2021

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 102014118460 B3 **[0005]**
- US 2010058818 A1 **[0005]**
- EP 3800275 A1 **[0005]**