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(54) **Laser carding process**

(57) Laser carding process consisting in the opening of channels (6), in the leather areas to be glued, with depth, length and distribution suitable to the convenient penetration of the glue solvents. The channels are performed by the incidence of a laser beam (4) automatically guided.

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Description

[0001] The present invention has, as goal, a carding process done by laser, specially, in leather and to be used, mainly, in the necessary tasks to perform the gluing, or vulcanisation, between two surfaces.

[0002] In the shoe industry in particular and in leather segments in general, carding consists in the surfaces physical or chemical abrasion, as a way of preparation, so that the vulcanisation or gluing process will be effective in terms of adhesion, to secure the values established by the international norms, or by the clients in particular.

[0003] The industrial leather is a natural raw material that in its transformation process from raw leather to leather usable in the industry, suffers various chemical and physical treatments, so that it becomes lasting, resistant and aesthetically pleasant.

[0004] The leather surface is treated so that it has the aspect, the touch and the impermeability characteristics required.

[0005] The existence of a finishing compact and soft surface, soaked in more or less impermeable substances, makes the gluing (adhesion) to other substances almost impossible if the referenced superficial layer is not eliminated.

[0006] Carding consists in the necessary operations for the removal of the referenced superficial layer removal or at least the changing of its characteristics.

[0007] The state of the art recognizes physical and chemical processes.

- In physical processes the extraction of the leather superficial layer is done, for example, by a sand-paper, a metallic or plastic brush. The relative movement between the sand-paper or brush and the leather can be performed manually or mechanically with the help of robot harms.
- In the chemical process the extraction or changing of the leather surface characteristics is performed by a chemical agent, that by a surface corrosion process, or by a changing process of the chemical connection characteristics, is going to allow as a final result, an adhesion of the leather surface to another surface.

[0008] The present patent refers to a new carding process using a laser that performs channels in the leather surface that will allow the glue solvents penetration in the fibres located under the finishing surface.

[0009] The process described in the presented patent allows, contrary to the other known processes, a precise control of the "wearing out" performed in the leather superficial layer. In reality, the present process allows "to dig" channels with defined length, depth, shape and development as well as enlarge or cross several channels.

[0010] The process object of the present patent is de-

scribed in detail further ahead with the help of figures :

Figure 1 - Laser carding device scheme.

Figure 2 - Perspective view of a channel shape, performed by the process object of the patent.

Figure 3 - Plant view of the shape of several parallel channels performed by the project object of the patent.

Figure - Perspective view of the shape of several parallel channels, performed by the process object of the present patent.

Figure 5 - Cut view of several parallel channels performed by the process object of the present patent.

[0011] From a laser font (1) and through a beam transportation and treatment system (3) it reaches a galvanometric mirror system (2) that direct the beam (4) to the surface of the leather to card (5).

[0012] The laser beam (4) with a diameter of only a few tenths of millimetres is guided at a velocity that can reach 10 meters per second and an acceleration to a 100 m/s² limit.

[0013] The spot small dimension (diameter of laser incidence) causes the energy density to reach values in the order of 6.000 Watt/mm², this value is high enough for a channel to be done (6) figure 2, in the beam incidence point at high velocity.

[0014] Figure 2 represents a channel in perspective (6) open by the laser beam in an aniline leather surface of traditional cut enlarged about sixty times.

[0015] The carding consists in the opening of several channels with lengths between 0,1 and 1,0 mm parallel, or oriented according a second and determined angle, separate by distances of order of the channels length greatness, as represented in the plant view of figure 3 and the in the enlarged perspective of figure 4.

[0016] The path followed by the laser in each one of the lines that make the channels at the leather surface, in the areas where the adhesion with the sole is going to take place, is previously defined in computer in a graphic program attacking the leather surface in accordance with the organic fibres orientations.

[0017] This practical possibility offered by the process presented in the present patent, of the channel opening according to the leather fibres is absolutely revolutionary, because it avoids the transversal cut of the fibres, increasing the adhesion index of the materials that are a part of the sole.

[0018] In figure 5 is represented, in enlarged cut, a leather skin carded by the process presented in the present patent where we can identify the channels opened by the laser (6) and through the arrows (7) the migration way of the solvents used in the connection of the leather to the sole.

[0019] As referenced before, through the programming of the laser beam guidance it is possible to control the depth, length and space between channels and in this way increase the glue contact surface. The depth

of the channels can vary between 0.1 mm e 1.0 mm but preferable between 0.3 and 0.35 mm. The length of the channels can vary between 0.1 mm and 1.0 mm but preferable between 0.6 e 0.7 mm. The space between channels (length of the intact leather between channels) can vary between 0.01 and 0.3 mm. 5

[0020] Due to the outline shape performed in the leather by the carding process object of the present patent and represented in figure 5 the contact surface of the glue (between the two surfaces to adhere) is increased comparatively to the one obtained by the carding made by the traditional processes that limit to redraw the leather superficial finishing layer. The increasing of the surface can reach, for the depths, lengths and spacing of the channels referenced as preferential, about 30 %. 10 15

Claims 20

1. ^a - Leather carding process **characterized by** the incidence of a laser beam guided, that perform channels on the leather surface with length, depth and pre established development. 25
2. ^a - Leather carding process according to claim 1, **characterized by** the beam diameter being inferior to 1,0 mm and guided at a velocity until 10 m/s with a limit acceleration of 100 m/s². 30
3. ^a - Leather carding process according to claims 1 and 2, **characterized by** the beam energy density that can reach 6000 Watt/mm². 35
4. ^a - Leather carding process according with claim 1, 2 and 3, **characterized by** the performance of several parallel channels, each one with the depth and length between 0.1 and 1 mm and leaving intact a length between 0.01 and 3,0 mm. 40
5. ^a - Leather carding process according with claims 1, 2, 3 and 4, **characterized by** the several parallel channels each one with a depth of 0.05 to 1.0 mm, a length of 0.6 to 0.7 mm, leaving between them only 0.01 mm of intact leather. 45

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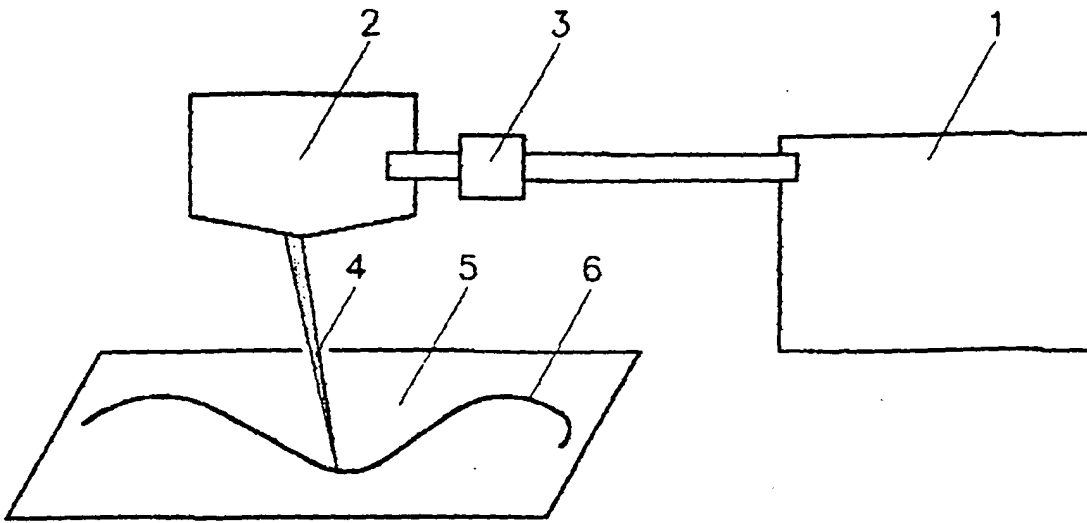


Fig. 1

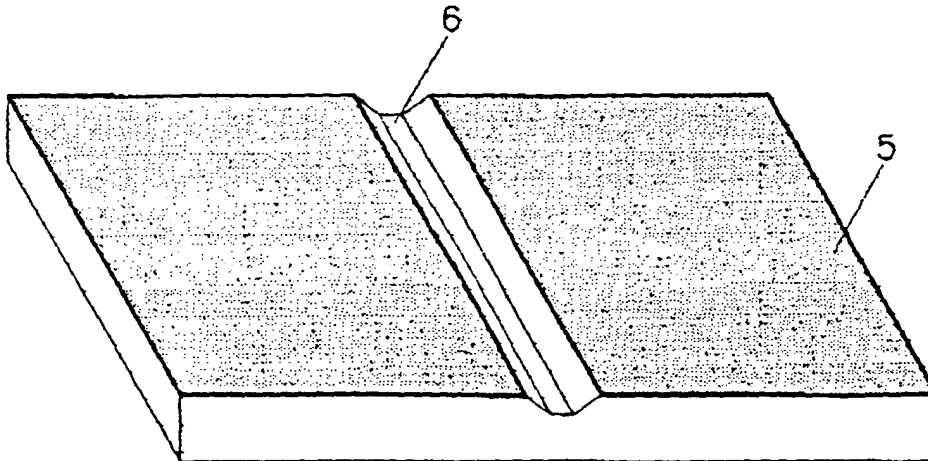


Fig. 2

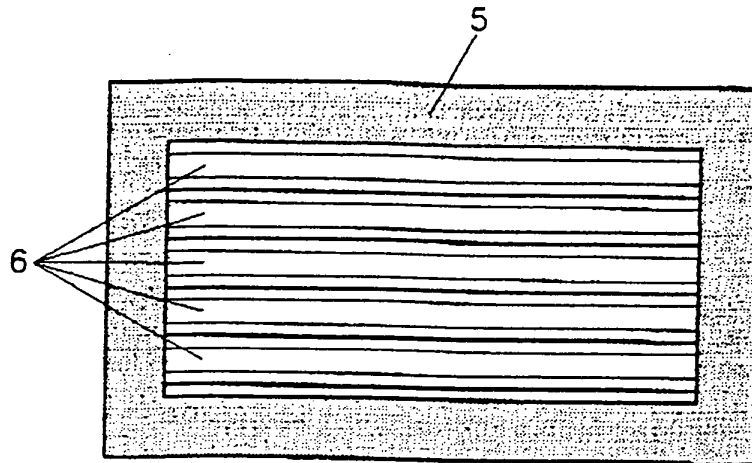


Fig. 3

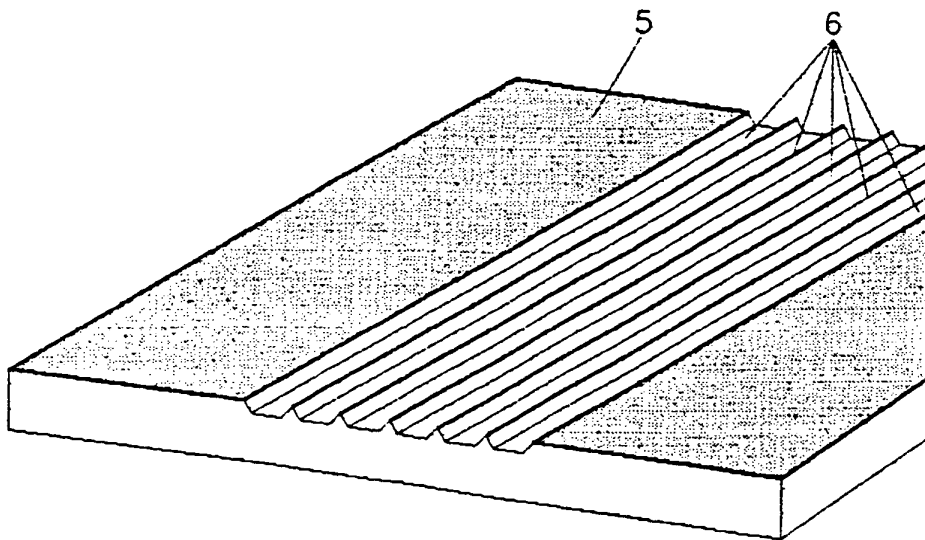


Fig. 4

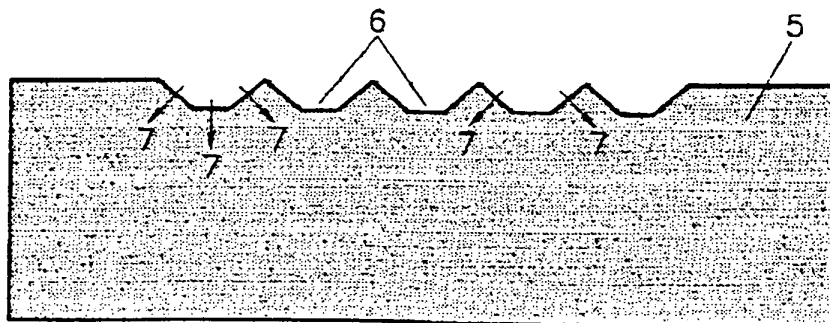


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 05 39 8002

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
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| The present search report has been drawn up for all claims | | | |
| Place of search The Hague | | Date of completion of the search 7 October 2005 | Examiner De Rijck, F |
| CATEGORY OF CITED DOCUMENTS | | 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 | |
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 39 8002

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
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07-10-2005

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