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(54) **Method for fixing a footwear sole to the footwear upper**

(57) The present invention relates to a method for fixing a footwear sole to the footwear upper. The method of the invention is envisaged for gluing a footwear sole to the footwear upper, without prior or external manipulation of the sole and without applying chlorinated solvents or organic solvents for treating the surfaces of the soles that is performed conventionally. The method involves different steps consisting of receiving the soles, recognizing the soles by means of modeling in three dimensions, followed by another step of determining the thermodynamic variables of the materials making up the

sole, this phase being performed by means of thermal parameterization and cleaning of the surfaces, for subsequently treating the sole by means of ultraviolet radiation and applying ozone in combination. The corresponding adhesive is then applied both on the sole and the upper, with subsequent fixing and drying by providing heat energy, a step of removing the solvent from the adhesive both in the sole and in the upper then being performed, and finally the adhesive both of the surface of the upper and of the surface of the sole are adapted so that they contact one another and gluing or attaching the sole and the upper by means of suitable pressure.

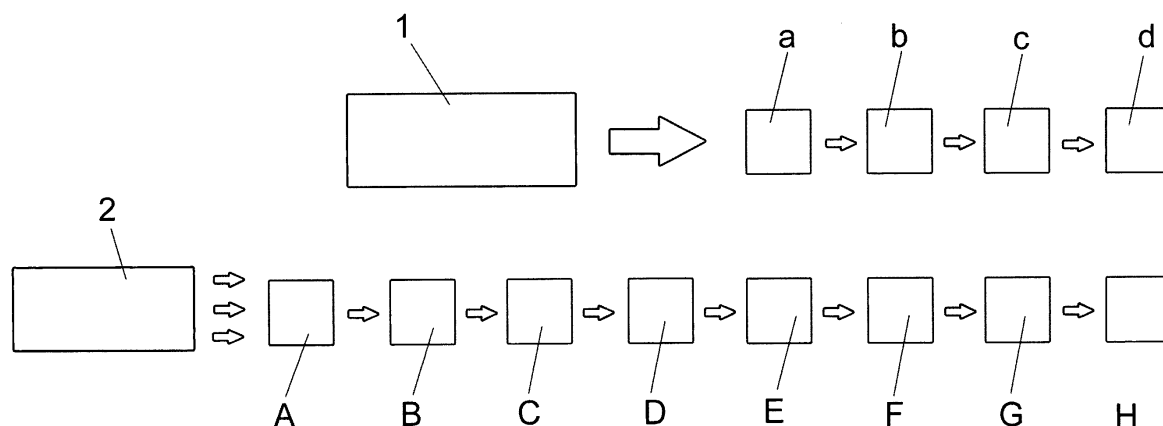


FIG. 1

Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a method for gluing a footwear sole to the footwear upper which is based on performing a continuous gluing process, all external sole manipulations being eliminated without the need of applying chlorinated solvents or organic solvents for treating the surfaces.

BACKGROUND OF THE INVENTION

[0002] Conventional methods for gluing soles to the assembled uppers of footwear incorporate the uppers on one hand and the soles on the other, but the soles are conveniently treated, i.e., it is necessary to previously prepare the sole and have it ready so that it reaches the assembly line at the same time as the lasted upper.

[0003] As conventionally done, the process for preparing soles is discrete and external to the operations of gluing the soles on the assembled upper, with the special particularity that, in most cases surface treatment with chlorinated solvents or with organic solvents are used in the process for preparing soles, the solvents being hazardous both for the environment and for the health of the operator involved in the sole treatment process.

[0004] There is obviously a need to carry out a process for removing the solvent in the sole treatment process as well as for removing the adhesive used for attaching the footwear sole to the footwear upper, or in other words, for removing the chlorinated and organic volatiles, all of which entails performing phases additional to those included in the gluing process itself which furthermore is a non-continuous process.

DESCRIPTION OF THE INVENTION

[0005] The proposed method has been envisaged for solving the aforementioned drawback based on the fact that the process in question is performed continuously without providing chlorinated solvents or organic solvents, which leads to the elimination of process phases and therefore a reduction in the footwear manufacturing process because the footwear can be made continuously in a single cycle as from receiving the sole because said process is carried out continuously and without waiting times in any of its steps, since both the sole and the upper will be in constant motion, which allows performing said process in an automated manner depending on the preceding and subsequent steps.

[0006] More specifically, the method of the invention comprises the following operating phases:

A) Receiving soles. Soles are received directly from the supplier and they can be made of rubber, EVA, polyurethane or other materials for the attachment thereof to the corresponding assembled upper. Ac-

cording to the method of the invention, the mentioned materials are free of external manipulations and contamination, the surfaces of said materials being adapted to the adhesives used in the process of gluing the upper to the sole, the operator placing the materials in a conveyor mechanism which introduces them in the subsequent process step.

B) Recognizing the structure in three dimensions which is done by means of modeling the surface of the sole in three dimensions to clean and adapt that surface, the modeling being able to be performed by any 3D recognition system which will provide information to the system about the surfaces and the positions thereof for cleaning and adapting the material for gluing.

C) Determining the thermodynamic variables of the sole materials by means of thermal parameterization and cleaning of the surfaces, determining the heat absorption/removal capacity thereof and placing the surfaces at the temperature necessary so that the cleaning of the substances which prevent an efficient surface treatment of the sole material and a correct adhesion to the adhesives is achieved. In this step, a specific emission of heat energy is applied and data concerning temperature increase is acquired by means of a physical temperature transducer -mVolts/mAmperes-providing information to the system about the energy to be provided to reach the temperature necessary for cleaning and adapting the sole material, such that by knowing the increase in temperature due to the heat energy applied, in a second phase of this step, the heating means will adapt the power and time thereof to place the surfaces to be cleaned at the necessary temperature so that they are removed or are transparent to the subsequent step of surface treatment by means of ultraviolet radiation with ozone (UV/O₃).

D) Treating the surfaces of the sole materials by means of ultraviolet radiation combined with ozone (UV/O₃) enabling the interaction of said sole material with the adhesive, such that adapting the corresponding emissive power, the wavelength and the amount of ozone striking the substrate allows making the surface of the sole material compatible with the adhesives used in the footwear for attaching the sole to the upper.

E) Applying the adhesive on the surfaces to be attached, i.e., on the surface of the sole and on the surface of the assembled upper.

F) Fixing the adhesive in the sole and drying the adhesives such that in this step and with the prior knowledge of both spatial parameters, according to step B), and thermodynamic parameters of the surfaces

of the sole materials, according to step C), the distribution of the heat energy will be applied to the adhesive layer which has been applied in the preceding step, to achieve by means of heat energy an efficient interaction of the adhesive with the substrate treated by means of ultraviolet radiation and ozone.

[0007] At the same time that the system recognizes the geometric arrangement of the surfaces of the soles, the system will know the geometric arrangement of the surfaces of the upper where adhesives have been applied, adapting the heat energy of the heat emitters to radiate the energy necessary for efficiently removing the solvent from the adhesive. Therefore, the adhesive interrelates with the substrate of the sole and of the upper perfectly, providing it with the heat energy necessary for correct drying.

G) Removing the solvent from the adhesive. Once enough heat energy has been provided to the adhesives of the surface of the upper and sole, the adhesives need some time in order for their solvent to evaporate, such that this state change can be forced by applying air, by means of vacuum, by natural evaporation, etc., obtaining in any case adhesive on the surfaces to be attached in solid state and ready for activation or softening.

H) Adapting the adhesive for attachment, i.e., adapting the adhesive of the surface of the upper and of the sole so that they contact one another and suitable pressure is applied so that the attachment has a correct initial and final adhesion. This phase is called adhesive activation, being performed by means of heat, having a system parameterized with the thermal variables of step C); by adapting this thermal emission, the temperature for softening the adhesive is achieved such that all the adhesive of the surfaces of the sole and of the upper reach a uniform softening state.

[0008] Based on the described method all external sole manipulations are eliminated, the process of gluing the upper and the sole being performed continuously, which allows using chlorinated solvent-free and organic solvent-free adhesives, for example water-based adhesives, whereby the process is completely free of organic solvents, except water.

[0009] Another advantage is that the described method eliminates any type of contaminant.

[0010] Likewise, the finished footwear could be made in a single cycle, as from receiving the sole, since it is a continuous process and there will be no waiting times in any of its steps, both in the incorporation of the sole and in the incorporation of the upper, since these two components or elements are in constant motion.

[0011] In conclusion:

- The cleaning of the sole is performed in a shorter time without having to wait.
- The treatment with UV radiation and ozone can automatically be adapted to any type of sole (with different heights, geometries, thickness, etc.).
- The adhesive activation temperature is established in an automatic and electronically controlled manner for any sole and upper, being able to be different for both adhesives on both materials.
- The process can be carried out automatically.

DESCRIPTION OF THE DRAWINGS

[0012] To complement the description of the invention and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a single drawing is attached as an integral part of said description in which the following has been depicted with an illustrative and non-limiting character:

[0013] The only figure shown in the sheet of drawings corresponds to the diagram corresponding to the process of gluing a footwear sole to the footwear upper, all this being performed according to the object of the invention.

PREFERRED EMBODIMENT OF THE INVENTION

[0014] As can be seen in the aforementioned figure, to glue a footwear sole to the footwear upper, the upper must be received in step (1), called the incorporation of the upper, whereas the sole is received in a step referred to as step (2).

[0015] Therefore, the method starts from a step of receiving (A) followed by a step of recognizing (B) to then carry out a step of determining the materials (C) followed by a step of treating (D) by means of ultraviolet radiation combined with ozone.

[0016] Step (A) does not involve any type of external manipulation or contamination, whereas step (B) allows recognizing the structure in three dimensions for cleaning and adapting the surfaces of the materials to be attached. Step (C) in turn establishes the determination of the thermodynamic variables of the sole materials by means of thermal parameterization and cleaning of the surfaces, performing a treatment by means of radiating the surfaces of the soles in step (D), which treatment is performed by means of ultraviolet radiation in combination with the application of ozone.

[0017] After the step of treatment (D), the sole processed in the preceding steps is subjected to step (E), while at the same time the upper is subjected to step (a), both steps involve the application of adhesive, such that both applications of adhesive are performed at the same time because both the upper and the sole are suitably moved to reach that step of applying adhesive in unison, after which step (F) of fixing the adhesive in the sole is performed at the same time as performing a step (b) of fixing the adhesive to the upper, and in both cases the

adhesive films are dried (i.e., solvent is removed) by means of providing heat, air, by vacuum, by natural evaporation, etc.

[0018] Step (G) of activating the adhesive which corresponds with step (c) of the upper is then carried out, the softening of the two dry adhesive films applied on the sole and the upper being carried out by means of applying heat, the system having parameterized thermal variables, such that all the adhesive of the surfaces of the sole and of the upper reach a uniform softening state.

[0019] Finally, step (H) with respect to the sole and step (d) with respect to the upper are carried out, such that in this step both surfaces of the adhesives applied on the upper and the sole are contacted with one another, pressure being applied to achieve a suitable attachment or gluing of the sole to the assembled upper.

Claims

1. A method for fixing a footwear sole to the footwear upper, incorporating on one hand the assembled upper originating from a point or an initial incorporation (1) and incorporating on the other hand the sole originating from a point or incorporation (2), **characterized in that** the sole is subjected to the following operating phases:

A) Receiving soles that are not externally manipulated or contaminated.

B) Recognizing the sole structure in three dimensions by means of modeling in any 3D recognition system to obtain information about the surfaces and the positions thereof for cleaning and adapting for gluing.

C) Determining the thermodynamic variables of the sole materials by means of thermal parameterization and cleaning of the surfaces.

D) Treating the sole itself by means of ultraviolet radiation combined with ozone to achieve optimum compatibility of the surface of the sole material with the adhesives used in the footwear for attaching said sole with the upper.

E) Applying the adhesive on the surfaces of the sole, as well as applying the adhesive on the upper in step a).

F) Fixing the adhesive on the sole and drying it, and fixing the adhesive in the upper according to step b).

G) Removing the solvent from the adhesive in the sole and removing the adhesive in the upper according to step c).

H) Adapting the adhesive of the sole for the attachment thereof with the upper by means of simultaneously activating two adhesive films on the upper and the sole, followed by attaching the two surfaces under pressure according to step d) for the upper.

2. The method for fixing a footwear sole to the footwear upper according to claim 1, **characterized in that** sole processing phases (E), (F), (G) and (H) correspond with steps or phases (a), (b), (c) and (d) respectively in assembled upper processing, such that adhesive is applied to the upper in step (a), whereas the adhesive is fixed and dried in said upper in step (b) in order to remove the solvent from the adhesive in the upper in step (c), the adhesive in the upper being adapted in step (d) for the attachment thereof with the corresponding adhesive applied on the sole.

3. The method for fixing a footwear sole to the footwear upper according to claim 1, **characterized in that** the thermal parameterization and cleaning of corresponding surfaces in sole processing phase (C) is performed by means of emitting heat energy through a physical temperature transducer, providing information about the energy necessary to reach the temperature necessary for cleaning and adapting the substrate.

4. The method for fixing a footwear sole to the footwear upper according to claims 1 and 2, **characterized in that** the step of applying an adhesive (E) in the sole and (a) in the upper is performed continuously, after placing the sole and the upper according to synchronized movements thereof.

5. The method for fixing a footwear sole to the footwear upper according to the preceding claims, **characterized in that** removing the solvent from the adhesive in the upper in steps (G) and (c) is performed by means of evaporating said solvent either forcefully by applying air, by means of vacuum, by natural evaporation or another suitable system.

6. The method for fixing a footwear sole to the footwear upper according to the preceding claims, **characterized in that** adapting the adhesive of the sole in step (H) and of the upper in step (d) is performed by means of attaching the surfaces of both sole and upper by contact, applying suitable pressure so that the attachment has a correct initial and final adhesion.

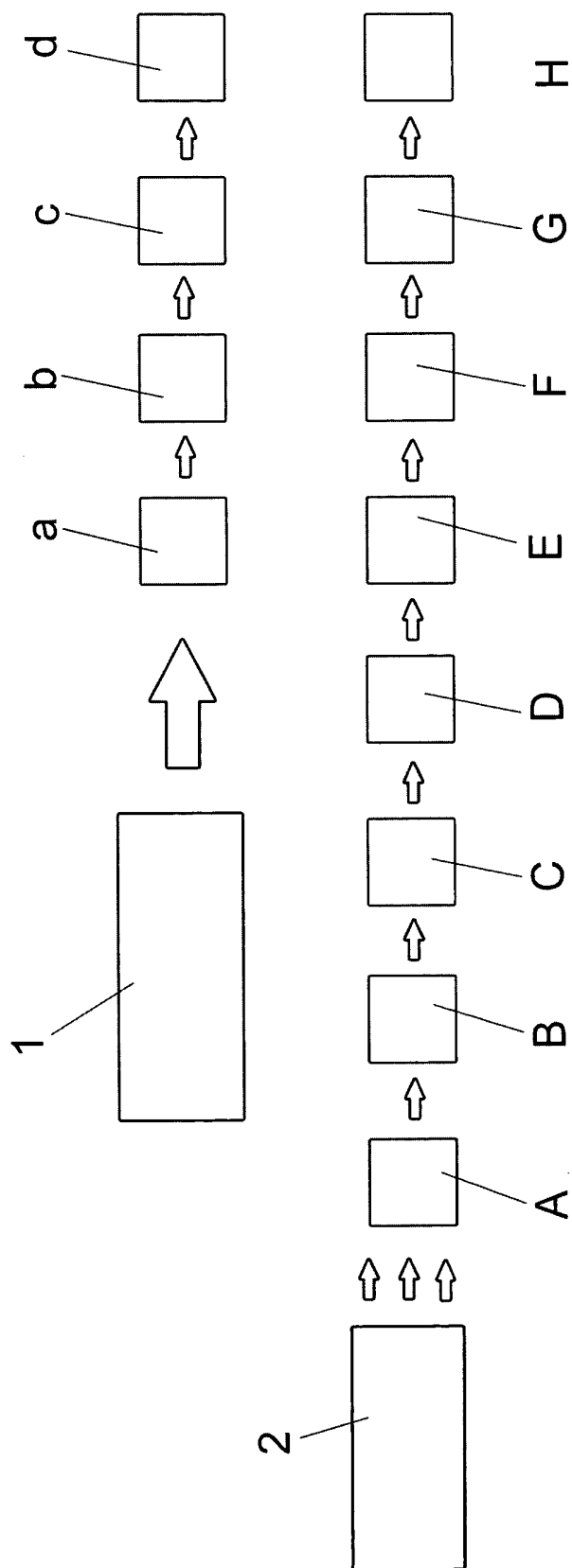


FIG. 1



EUROPEAN SEARCH REPORT

Application Number
EP 13 00 0594

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	WO 2008/122874 A1 (ALC FLENCO S R L [IT]; SAURWEIN RAFFAELE [CH] ALC FLENCO GROUP S R L []) 16 October 2008 (2008-10-16) * page 2, line 5 - line 6; figure 3 * * page 4, line 28 *	1	INV. A43B9/12 A43D1/08 A43D25/20
A	EP 1 234 517 A1 (VIATECNIA SL [ES]) 28 August 2002 (2002-08-28) * claims; figures *	1	
A	US 2010/040889 A1 (HARANO KENICHI [JP] ET AL) 18 February 2010 (2010-02-18) * claims; figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A43B A43D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 May 2013	Examiner Gkionaki, Angeliki
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 00 0594

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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