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(54) **Method for manufacturing an item of textile material having a phosphorescent effect**

(57) The present invention relates to a process for manufacturing an item of textile material with phosphorescent effect. The invention also relates to a tape of textile material obtained by said process and to a plant for manufacturing said tape. The process according to the invention comprise the steps of preparing a paste

with phosphorescent effect, applying such a paste on one or more portions of an item of textile material, subjecting the textile item to an heat cycle to heat set the paste on the portion or portions of the item of textile material.

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Description

[0001] The present invention refers to a process for manufacturing an item of textile material with phosphorescent effect. The invention also refers to a tape of textile material obtained with this process and to a plant for manufacturing this tape.

[0002] The use is known of different products with phosphorescent effect, that is, products that emit luminescent radiation for a certain period of time, after having been exposed to natural or artificial light. The main object of the subject matter of the present invention is to provide a process for manufacturing an item of textile material having a phosphorescent effect.

[0003] Within the scope of this aim, an object of the present invention is to provide a process that is distinguished by a relatively limited number of steps.

[0004] A further object of the subject matter of the present invention is to provide a process for manufacturing an item of textile material with phosphorescent effect that is reliable and easy to manufacture at competitive costs.

[0005] This aim and these and other objects that will be more apparent during the description are achieved through a process for manufacturing an item of textile material with phosphorescent effect characterized in that it comprises the steps of:

- preparing a paste with phosphorescent effect;
- applying this paste with phosphorescent effect to one or more portions of the item of textile material;
- subjecting the item of textile material to an heat cycle to heat set said paste with phosphorescent effect on the portions of the item of textile material to which it was previously applied.

[0006] It must be understood that the expression "phosphorescent" is used to indicate the property of a body to emit light for a certain period of time after it has previously been illuminated. The term "luminescent" must be considered a synonym of phosphorescent, while on the contrary the term "fluorescent" indicates the property of a body to emit light while it is illuminated.

[0007] The process according to the present invention can be applied to a considerable range of items that can be manufactured in a wide range of textile materials. For example, these items can be manufactured in nylon or rayon fibres, in hand processed fibres, in natural fibres such as cotton, wool, jute, linen, silk, in polyester fibres, in plastic, cellulose, cellulose acetate, polyamide, acetate, acrylic, polyacrylic, azlon, modacrylic, nitrile, olefin, SPANDEX, vinyl, vinyon, rubber, polybutadiene fibres, in composite fibres such as vinyl and wool.

[0008] From a structural viewpoint, the textile material can have both a weft and warp structure, which notoriously distinguishes fabric, and a less regular structure such as that distinguishing a non-woven fabric.

[0009] Further characteristics and advantages will be

more apparent from the description of preferred, but not exclusive, embodiments of the invention shown by way of non-limiting example in the accompanying drawings, wherein:

- Figure 1 is a schematic view of a tape of textile material with phosphorescent effect obtained through the process according to the present invention;
- Figure 2 is a block diagram of a plant for manufacturing a tape of textile material with phosphorescent effect obtained through a process according to the present invention;
- Figure 3 is a further schematic view of a plant for manufacturing a tape of textile material with phosphorescent effect;
- Figures 4 and 5 show a possible application of a tape of textile material with phosphorescent effect obtained through a process according to the present invention.

[0010] The process according to the present invention is characterized in that it comprises the steps of:

- preparing a paste with phosphorescent effect;
- applying this paste with phosphorescent effect to one or more portions of an item of textile material;
- subjecting the item of textile material to an heat cycle so as to heat set said paste with phosphorescent effect on said one or more portions of the item of textile material.

[0011] According to the invention, the paste with phosphorescent effect is obtained by mixing a first quantity of phosphorescent powder with a second quantity of thickening agent which can, for example, be a thickener for printing. Through the heat cycle to which it is subjected, the paste thus formed is fixed in the interstices defined by the structure of the textile material. These interstices can be regular, as those in the structure of the fabric, or can have an irregular arrangement as in the case of a non-woven fabric.

[0012] Phosphorescent powders marketed by the firm USR OPTONIX INC have proved particularly suitable for the purposes of the present invention. These powders comprise magnesium and strontium salts preferably doped with europium. These powders containing parts of silicic acid and/or dysprosium have proved particularly effective, above all in terms of duration of the phosphorescent effect. In fact, it has been found that the use of these powders leads to a duration of the phosphorescent effect in the order of several hours.

[0013] The thickening agents used to produce the phosphorescent paste are macromolecular substances which are conventionally used to increase the viscosity of a solution due to their swelling powers. According to the present invention, the thickening agent is instead used as means to fix the luminous powder to the portions of the item of textile material.

[0014] In order to make the paste with phosphorescent effect more fluid, this paste is diluted with a third quantity of thinner. This thinner can be represented, for example, by a slip additive used in the preparation of printing inks.

[0015] Pastes with phosphorescent effect obtained by mixing approximately one part of phosphorescent powder with approximately a number of parts of thickener for printing variable from 1.5 to 5 and a number of parts of thinner variable from 0 to 2 has proved to be particularly suitable for the purposes of the present invention.

[0016] It was seen that the phosphorescent pastes thus obtained can be heat set on the portions of textile material to which they are applied through heating to a temperature of between 140°C and 170°C for a time of between 3 and 10 minutes.

[0017] According to a first embodiment, the paste with phosphorescent effect is obtained by mixing approximately one part of phosphorescent powder with approximately three parts of thickening agent. In this regard, the phosphorescent powders marketed by the firm USR OPTONIX INC together with the thickeners for printing marketed with the name SERIPLASTIK SMP® have proved particularly suitable. These thickeners generate phosphorescent pastes that require an heat cycle constituted by heating to a temperature of between 140°C and 170°C for a time of between 3 and 6 minutes. More in detail, within the sphere of this type of thickening agents, the thickener marketed with the name SERIPLASTIK SMP® Base Gloss has proved particularly suitable for the purposes. The use of this thickener requires an heat cycle defined by heating lasting for approximately 4 minutes to a temperature of approximately 160°C.

[0018] According to a preferred embodiment of the invention, the paste with phosphorescent effect is obtained by mixing one part of phosphorescent powder with 4.5 parts of thickener for printing and with 1.5 parts of thinner. In this regard, the thickener marketed with the name PAS-TOPAQUE HS® mixed, in the parts indicated above, again with phosphorescent powders marketed by the firm USR OPTONIX INC, have proved particularly suitable for this embodiment. It was found that this product requires heating to a temperature of between 150°C and 155°C for a time of approximately 6 minutes to be heat set to a textile material surface. It was also found that the paste with phosphorescent effect in question leads to a duration of the phosphorescent effect exceeding 12 hours.

[0019] The temperatures and times indicated above, i.e. the heat cycle conditions, were observed using an air circulation oven without infrared radiation, while using a medium wave infrared oven the times of the heat cycle are further reduced.

[0020] As mentioned above, the presence of a thickening agent makes the phosphorescent paste extremely viscous and for this reason advantageously applicable to the portions of the item of textile material, for example through a simple surface brushing operation. This operation can be performed manually by an operator or alternatively

natively by automatic means capable of depositing, according to a specific pattern, the phosphorescent paste on one or more portions of the item of textile material. The phosphorescent paste can be applied, for example, according to continuous lines on the item or alternatively according to a dotted arrangement.

[0021] The process according to the present invention can advantageously be integrated with a step that provides for application of a non-slip substance to one or more surfaces of the item of textile material. This solution proves particularly advantageous, for example, in the case that the item of textile material is constituted by a mat or by another similar item. Application of the non-slip substance can advantageously be implemented in parallel to application of the phosphorescent paste to the item. In this way, the heat cycle to which the textile item is subsequently subjected allows heat setting on the surfaces thereof both of the non-slip substance and the phosphorescent paste.

[0022] Again according to a preferred embodiment of the invention, after having been subjected to the aforesaid heat cycle, the item of textile material can be dyed in order to give it the desired aesthetic appearance. This dyeing can, for example, be implemented through the use of direct and reactive dyes. If a first item of textile material requires to be combined with a second item of textile material, after having been mutually fastened, for example by stitching, the two items can be dyed according to the known method conventionally called "garment dyeing".

[0023] According to a further embodiment of the present invention, the process according to the invention can comprise a further step comprising the application of a double-sided adhesive tape to one of the surfaces of the tape 1 of textile material with phosphorescent effect. This solution allows the functions of the textile tape 1 to be increased, as it allows easier application as one of the surfaces of the textile tape 1 in fact becomes an adhesive surface.

[0024] With reference to Figure 1, the present invention also refers to a tape 1 of textile material (fabric or non-woven fabric), which is characterized by the fact that it is manufactured through a process according to the aforesaid indications. A tape with phosphorescent effect, as is intuitable, can be used in a wide range of applications. An example of these might, for example, be represented by mats usually used as furnishing elements for the bathroom. The tape with phosphorescent effect can advantageously be applied to the contour of the mat so as to generate a luminous trace when the tape is not illuminated. Alternatively the tape 1 with phosphorescent effect could also be used to indicate paths, for example in theatres or cinemas which must remain darkened during performances.

[0025] As already indicated above, it has been seen that the tape 1 of textile material with phosphorescent effect can advantageously be applied to one side of a double-sided adhesive tape to increase the number of

possible applications thereof. In other words, this solution offers a tape provided on one side with a surface of textile material with phosphorescent effect and on the other with an adhesive surface that allows easy application thereof. A tape of this kind could be used for various purposes, such as to illuminate the contours of door and window frames, of furniture, of decorative elements, etc. In the domestic environment it could also be used to highlight boxes containing switches, meters, differentials or plates relative to lighting points and/or electrical sockets.

[0026] Therefore, it is evident that a textile tape with phosphorescent effect can be applied in any situation in which there is the need to highlight contours in environments destined to remain without illumination for a certain period of time.

[0027] According to a preferred embodiment of the textile tape 1, this comprises a first half 2A, considered with respect to the direction of extension of the tape (indicated by the axis with the reference 4), provided with one or more phosphorescent traces 5 and a second half 2B instead provided with one or more non-slip elements 6. The textile tape 1 thus constituted can, for example, be applied to the edge of a mat. More precisely, it can be folded and applied to the edge of the mat so that the first half substantially surrounds the visible surface of the mat while the second half instead surrounds the underside surface of the mat. In this way, the non-slip elements 6 can prevent the mat from slipping, while the phosphorescent traces 5 advantageously delimit the edge of the mat. Naturally, the shape and extension of the phosphorescent traces and of the non-slip elements can vary according to cases. In a possible embodiment, for example, the phosphorescent traces 5 and/or the non-slip elements 6 could extend according to lines more or less inclined with respect to the axis of extension of the tape 1.

[0028] Figures 4 and 5 refer to a possible application of a tape of textile material according to the present invention. More in detail, these figures are views relative to a slipper 9 to which a textile tape 1 according to the invention is applied. The slipper 9 shown comprises a sole 25 (preferably made of a non-hydrophilic material) and an upper 26, of textile material, connected to a first side of the sole 25. The sole 25 is constituted by two surfaces, the first of which, called lower surface 28, is intended to be placed on the ground during normal use of the slipper. A second surface, called upper surface 27, opposite the first surface 28 is instead coated with textile material and represents the surface intended to come into contact with the foot of the user. The upper 26 is conventionally stitched to the upper surface 27 of the sole 25.

[0029] The slipper 9 comprises a plurality of portions covered with a textile tape 1 according to the present invention. As shown, the tape 1 is applied to the edges of the slipper 1 so that the phosphorescent traces are disposed on the upper surface 27. The edges of the slipper 9 are defined by the profile of the sole 25 and by the free edge of the upper 26 that in practice allows the slipper

9 to be put on.

[0030] Through application of the textile tape 1, the contours of the slipper 9 advantageously remain visible in the dark or in poor lighting conditions, allowing the user to find the footwear at any time without using other sources of lighting. This application is thus extremely advantageous above all in the domestic environment.

[0031] According to a preferred embodiment, the textile tape 1 shown schematically in Figure 1, can be advantageously applied to the slipper 9. In detail, the tape 1 can be applied to the edges of the slipper 9 (i.e. by stitching) so that a first half 2A of the tape 1 provided with phosphorescent traces is disposed on the side of the upper surface 27, while the second half 2B provided with non-slip elements is disposed on the side of the lower surface 28 of the sole 25. This solution is evidently advantageous as it limits slipping of the slipper above all on particularly smooth surfaces.

[0032] The present invention also refers to a plant 10 for manufacturing a tape of textile material 1 with phosphorescent effect according to the description above. Figures 2 and 3 represent two schematic views of a possible embodiment of a plant 10 according to the present invention. In particular, the plant in Figure 2 is characterized by the fact that it comprises a first operating unit 11 arranged to automatically apply a paste with phosphorescent effect to one or more portions of the textile tape 1. A second operating unit 12, preferably constituted by a heating oven, is instead arranged to subject the tape 1 of textile material to an heat cycle for the purpose of heat setting the paste with phosphorescent effect on the corresponding portion or portions of tape 1. The plant 10 shown in Figure 2 also comprises means 15 for continuous movement of the tape 1 from the first 11 to the second 12 operating unit.

[0033] According to a preferred embodiment of the invention, the moving means 15 comprise an automatic feed line 16 arranged between the first 11 and the second 12 operating unit. These means also comprise a feed spool 17 loaded with tape of textile material intended to acquire phosphorescent characteristics according to the steps of the process described above. The feed spool 17 is preferably located downstream of the first operating unit 11 to continuously feed the feed line 16. The tape 1 delivered from the second operating unit 12 is collected continuously on a pick-up spool 18 which in practice makes the tape available for the various applications for which it may be intended.

[0034] According to a possible, and therefore non exclusive, embodiment of the plant 10, the first operating unit 11 comprises a rotating applicator 21 constituted by a wheel provided with shaped radial ends 22. This applicator 21 has a rotation axis preferably orthogonal to the direction of feed of the tape 1 along the feed line 16 and is located in a position under this tape. Due to rotation of the applicator 21, the shaped ends 22 pick up a certain quantity of phosphorescent paste from a container 26 and deposit it automatically on the tape 1 which is moving

towards the second operating unit 12. A rotating counter element 29 can advantageously be applied in a position opposite the applicator 21 so as to allow correct deposit of the phosphorescent paste on the surface of the tape 1. This solution in substance allows the phosphorescent paste to be deposited on the tape 1 at regular intervals. The width of these intervals can, for example, depend on the number of shaped ends 22 and on the rotation speed of the applicator 21 about the rotation axis thereof. The shape of the applications on the tape 1 instead depends on the configuration of the ends 22 which can take different configurations according to the cases.

[0035] To obtain a deposit according to continuous lines, the rotating applicator 21 can be replaced by a continuous applicator which continuously deposits the phosphorescent paste on the surface of the tape 1, so as to define continuous lines along the entire extension of the textile tape 1.

[0036] Any alternative embodiments of the plant to those described, providing they are functionally equivalent, are considered to fall within the scope of the inventive concept.

[0037] The technical solutions adopted for the process for manufacturing an item of textile material with phosphorescent effect allow the proposed aims and objects to be fully achieved. In particular the process is implemented through a limited number of steps which can advantageously be produced through automatic and/or semi-automatic plant. It has also been seen that this process can lead to the implementation of a considerable variety of items, such as tapes, of textile material with phosphorescent effect which can have great versatility of use.

[0038] The process for the manufacturing of an item of textile material with phosphorescent effect thus conceived is susceptible to numerous modifications and variants, all falling within the inventive concept; moreover all details can be constituted by other technically equivalent details.

[0039] In practice, the materials used and the sizes and contingent shapes can be any, according to requirements and the state of the art.

Claims

1. Process for manufacturing an item of textile material with phosphorescent effect, **characterized in that** it comprises the steps of:

- preparing a paste with phosphorescent effect;
- applying said paste with phosphorescent effect to one or more portions (2) of said item of textile material (1);
- subjecting said item of textile material to an heat cycle to heat set said paste with phosphorescent effect on said one or more portions (2) of said item of textile material to which it was

previously applied.

2. Process according to claim 1, wherein said paste with phosphorescent effect is obtained by mixing a first quantity of phosphorescent powder with a second quantity of thickening agent.
3. Process according to claim 2, where said paste with phosphorescent effect is obtained by mixing a first quantity of phosphorescent powder with a second quantity of thickening agent for printing.
4. Process according to claim 2 or 3, wherein said paste with phosphorescent effect is diluted with a third quantity of thinner.
5. Process according to one or more of claims from 2 to 4, **characterized in that** said paste with phosphorescent effect is obtained by mixing a part of phosphorescent powder with a number of parts of thickener for printing variable from 2 to 5 and with a number of parts of thinner variable from 0 to 2.
6. Process according to claim 5, **characterized in that** that said paste with phosphorescent effect is obtained by mixing a part of phosphorescent powder with three parts of thickener for printing.
7. Process according to claim 5, **characterized in that** that said paste with phosphorescent effect is obtained by mixing a part of phosphorescent powder with 4,5 parts of thickener for printing and 1,5 parts of thinner.
8. Process according to one or more of claims from 1 to 7, **characterized in that** said item of textile material is dyed after having been subjected to said heat cycle, said dyeing being implemented through the use of direct and reactive dyes.
9. Textile tape (1) with phosphorescent effect, **characterized in that** it is manufactured through a process according to one or more of claims from 1 to 8.
10. Textile tape (1) according to claim 9, **characterized in that** it is made in fabric or non-woven fabric (TNT).
11. Textile tape (1) according to claim 9 or 10, **characterized in that** it comprises a plurality of non-slip element (6).
12. Plant (10) for manufacturing a tape of textile material according to one or more of claims from 9 to 11, **characterized in that** it comprises:
 - a first operating unit (11) provided to automatically apply a paste with phosphorescent effect on one or more portions of said tape of textile

material (1);

- a second operating unit (12) provided to subject said tape of textile material (1) to an heat cycle so as to heat set said paste with phosphorescent effect on said one or more portions of said tape of textile material (1);

- means (15) for continuous movement of said tape of textile material (1) from said first operating unit (11) to said second operating unit (12).

13. Plant (10) according to claim 12, **characterized in that** said means for movement (15) comprise an automatic feed line (16) arranged between said first operating unit (11) and said second operating unit (12), said means for movement (15) comprise an feed spool (17) arranged upstream of said first operating unit (11) and a pick-up spool (18) downstream to said second operating unit (12), said plant comprising a rotating applicator (21) located under said feed line (16), said rotating applicator (21) comprising a plurality of shaped radial ends (22) provided for picking up a quantity of phosphorescent paste from a container (26), said shaped radial ends (22) depositing said phosphorescent paste on said tape (1) follow-up the rotation of said rotating applicator (21).

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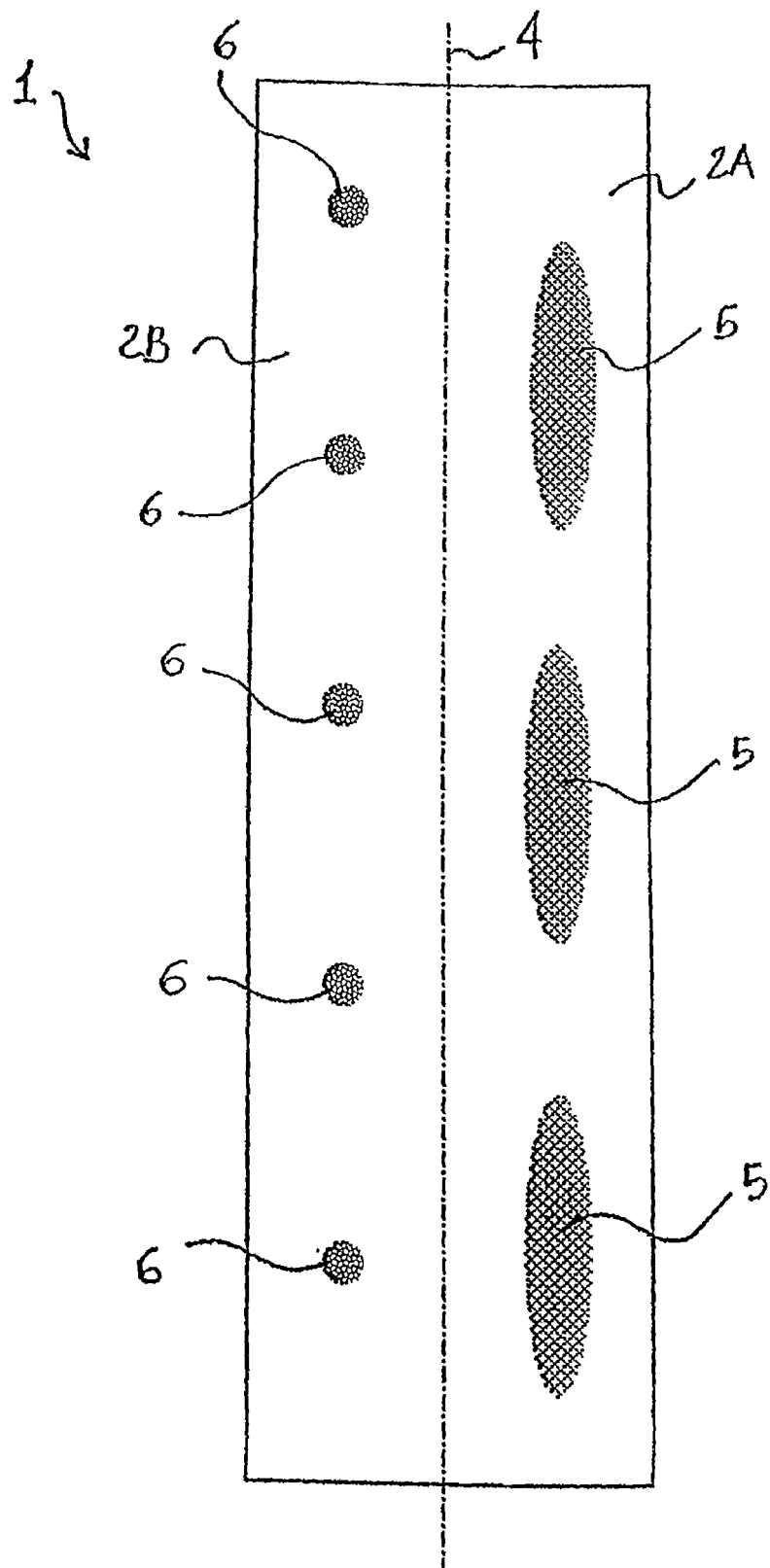


Fig. 1

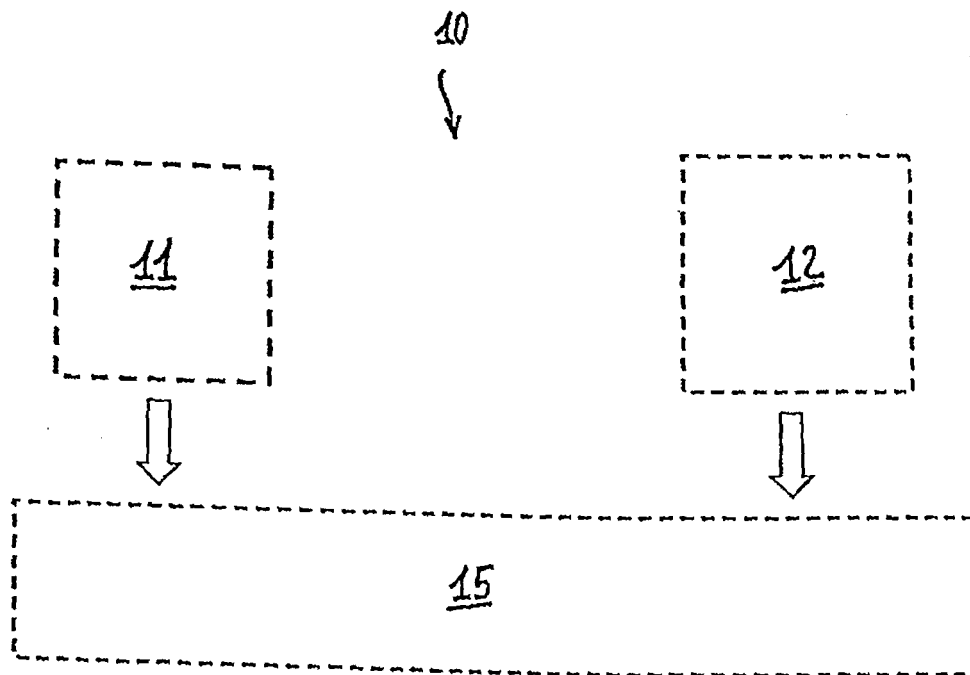


Fig. 2

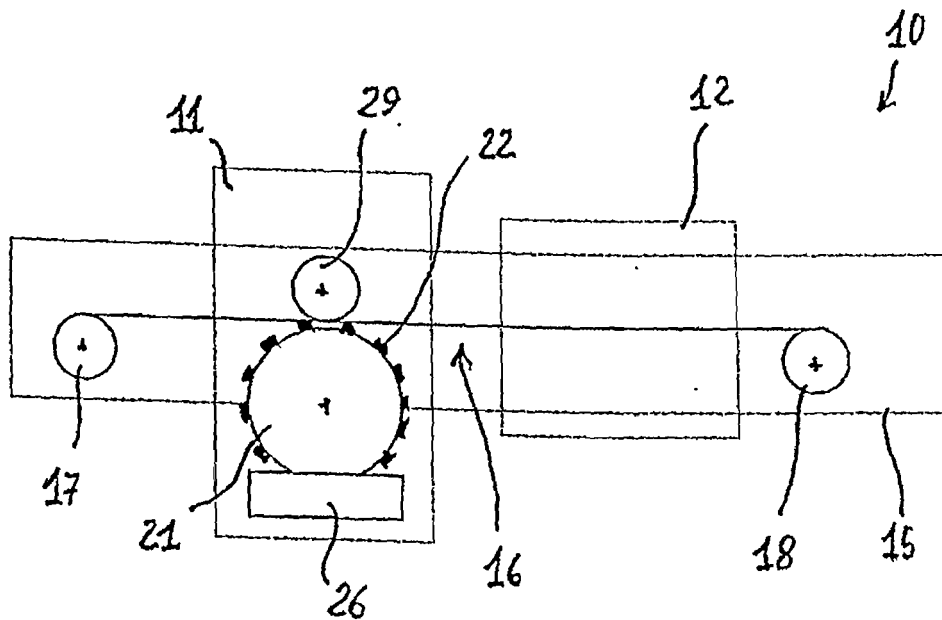


Fig. 3

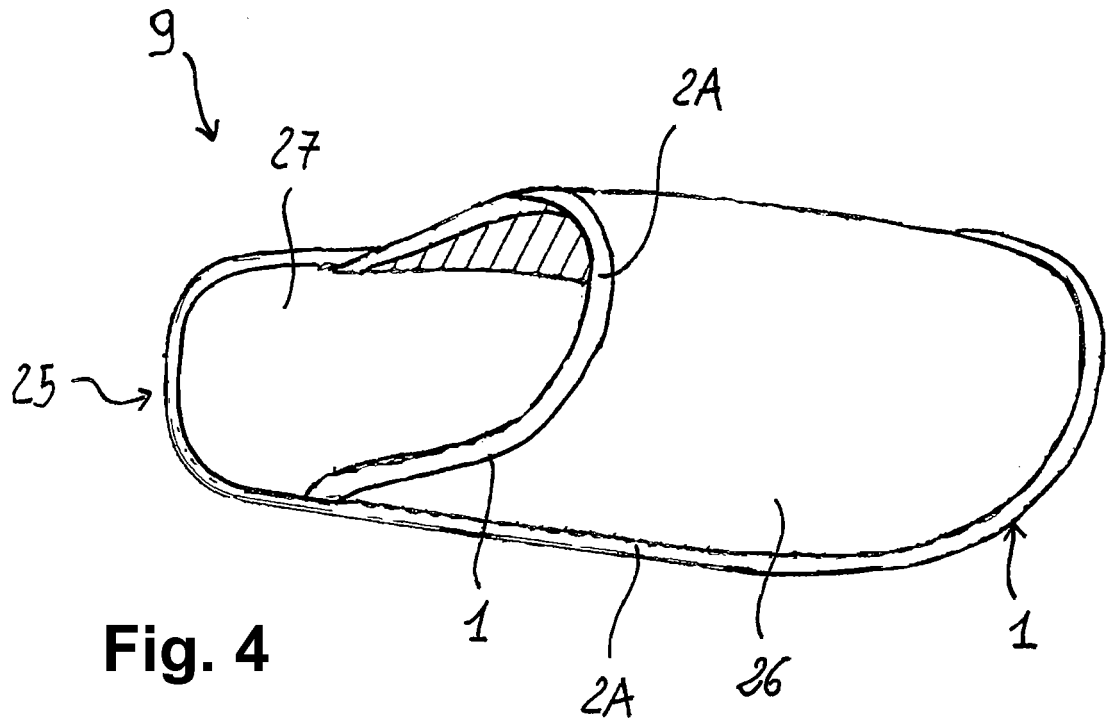


Fig. 4

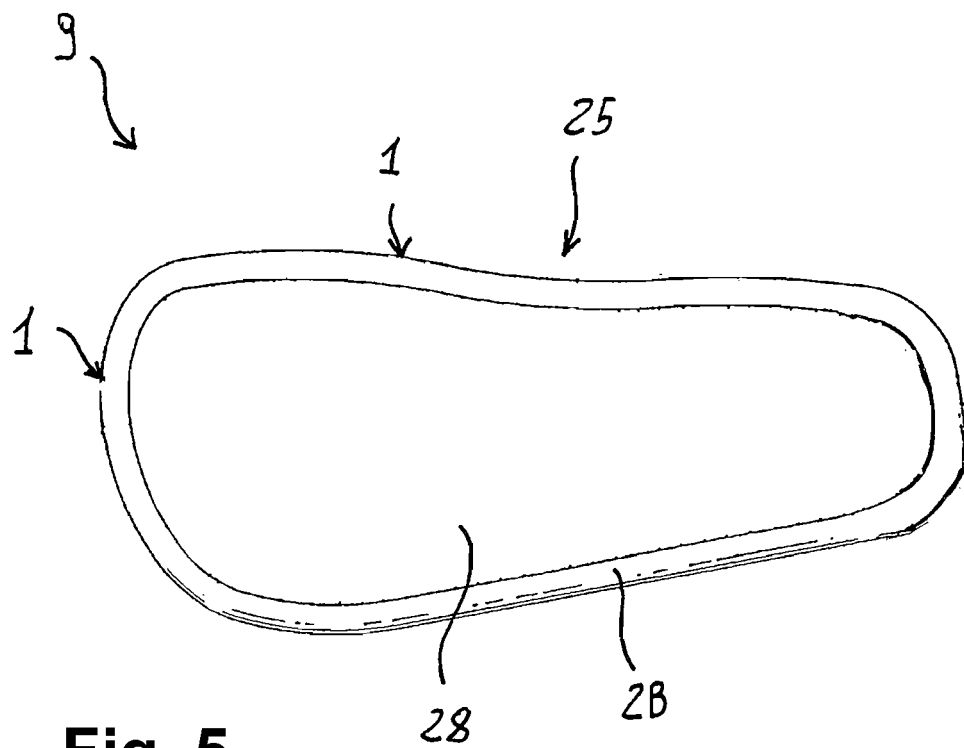


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 15 0258

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			D01F D01D D06B D06M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 March 2008	Examiner Lux, Rudolf
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.**

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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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18-03-2008

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