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(54) **ABSORBENT AND DESORBENT DEVICE**

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(57) **ABSTRACT**

The invention relates to an absorbent and desorbent device, characterised in essentially comprising at least one micro-porous membrane (1) with absorbent and desorbent properties, by means of at least one porous permeable cover (2) and at least one impermeable cushioning sub-layer (3). The invention is particularly applicable in the field of absorbent materials, most particularly when used for items of clothing or domestic products.

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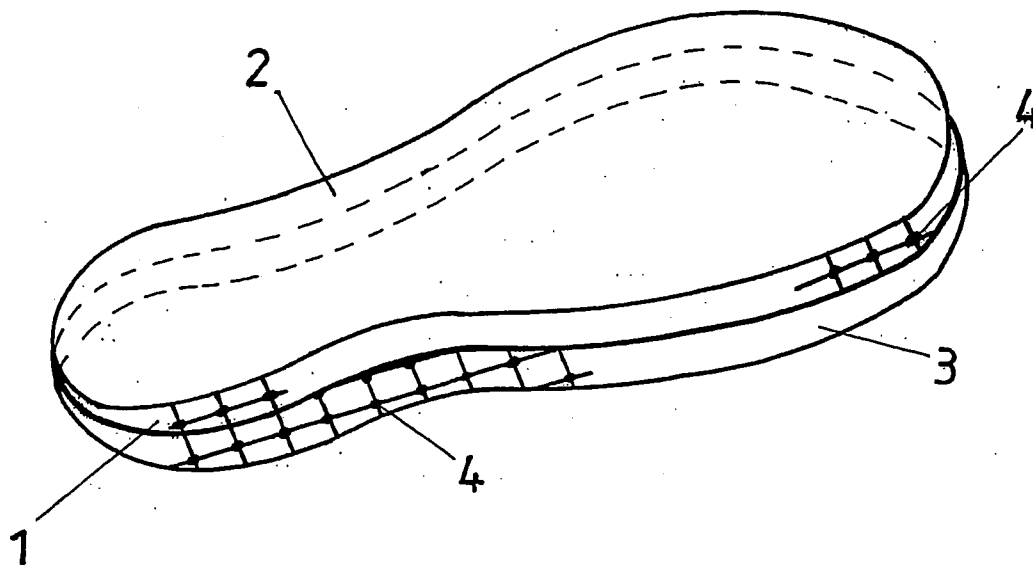


Fig. 1

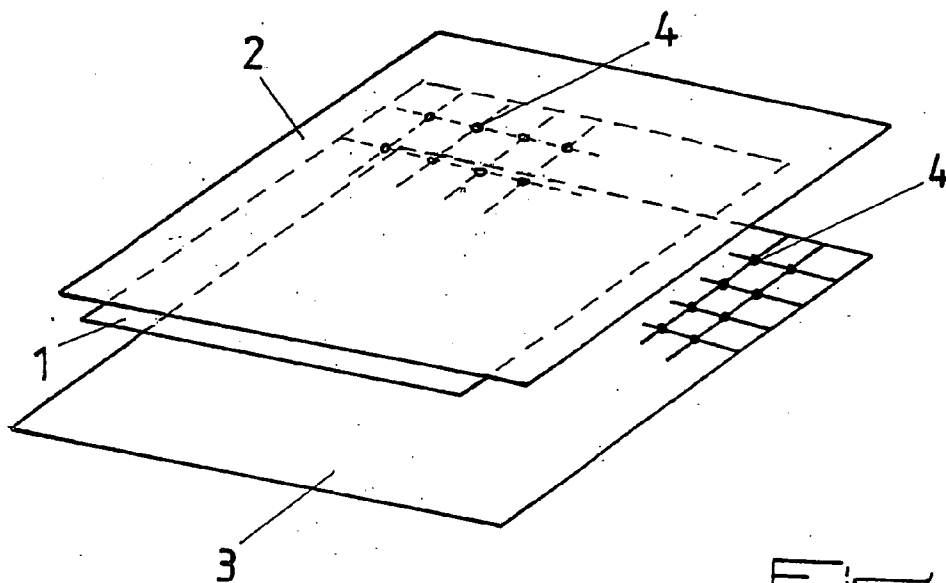
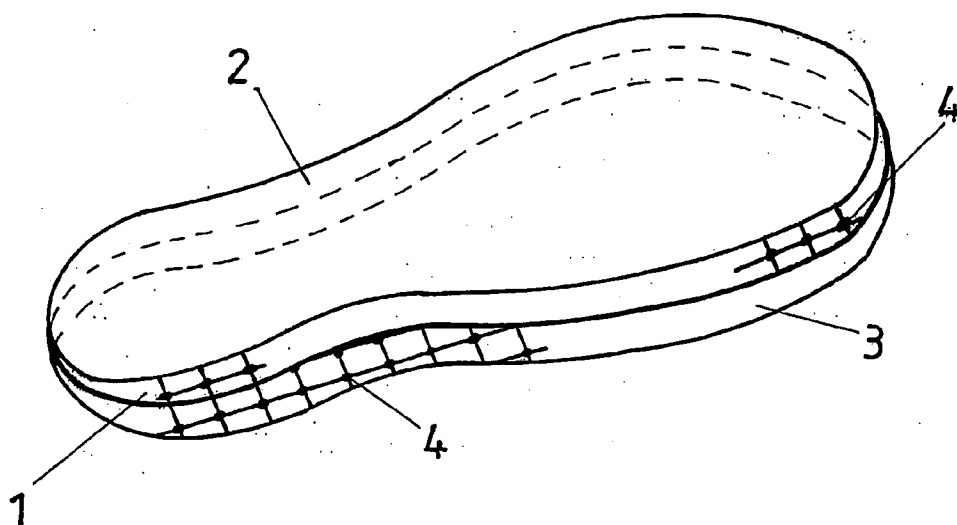


Fig. 2

ABSORBENT AND DESORBENT DEVICE

[0001] The present invention relates to the field of absorbent materials, in particular used as articles of clothing or as products for domestic use and has for its object an absorbent and desorbent device.

[0002] The absorption of moisture, in particular excretions or projections of water in the domestic field, constitutes a permanent problem. Thus, this absorption, which is generally carried out by means of particularly absorbent tissues, requires proceeding to frequent changes of said absorbent products, for their cleaning and their drying.

[0003] This problem is particularly important in the case of excessive perspiration, called hyperidrose, and particularly as to sweating by the feet. In this latter case, the sweating is largely accentuated, even aggravated by wearing shoes. Daily life thus becomes somewhat difficult for the wearer of shoes whose obliged to fight against perspiration and the sometimes devastating effects of the latter.

[0004] Participants in sports are widely exposed to the effects of sweating, because of the fact of wearing shoes that are often impervious, for long periods.

[0005] To avoid these drawbacks, various improvements of shoes have been proposed, particularly by use of lightweight materials, in particular foams to absorb the microshocks and by the use of the circulation of air in the structure itself of the shoe. However, these various improvements have not permitted limiting hypersudation and improve the interior itself of the shoe, mainly the sanitary shoe sole.

[0006] It has also been proposed to add so-called "anti-perspirant" soles, whose efficiency is however quite often very limited.

[0007] The problem of hypersudation or hyperidrose has also been treated by the use of products to be applied directly to the skin such as gels, sprays, powders or other particular preparations, or else by spraying anti-mycosal and antibacterial products directly into the shoes. However, all these processes of treatment have been only of low effectiveness.

[0008] It has also been proposed to produce soles with active carbon, of copper or of synthetic fibers, which have good capacities for absorption of moisture and fight against odors. However, when saturation has been reached, the moisture remains trapped in the shoe and gives rise to maceration favorable to bacterial growth and the retention of odors.

[0009] The problem of absorption of moisture is also very crucial in the domestic field, where it is often necessary to provide rapid absorption of water spills, in particular in bathrooms, for example by means of bathmats or the like. In such cases, the absorption means are very rapidly saturated and a use of these means over a long term, without specific drying after a high absorption, cannot be tolerated. Thus, keeping a bathmat highly impregnated with moisture gives rise inevitably to the impossibility of this mat to dry rapidly and its deterioration with the simultaneous development of undesirable microorganisms harmful to the health.

[0010] The present invention has for its object to overcome these drawbacks by providing an absorbent and desorbent device permitting, on the one hand, rapid and effective

absorption of all moisture, in particular of excessive perspiration or a spilling of water, and, on the other hand, rapid desorption of the accumulated moisture avoiding any mycosal formation or undesirable bacteria.

[0011] To this end, the absorbent and desorbent device according to the invention is characterized in that it is essentially constituted by at least one microporous membrane with absorbent and desorbent properties, by at least one porous permeable covering and by at least one impermeable shock absorbing sub-layer, essentially with closed cells.

[0012] The invention will be better understood, from the following description, which relates to preferred embodiments, given by way of non-limiting examples, and explained with reference to the accompanying schematic drawing, in which:

[0013] **FIG. 1** is an exploded perspective view of a device according to the invention in the form of a shoe sole, and

[0014] **FIG. 2** is a view analogous to that of **FIG. 1** of a device in the form of a bathmat.

[0015] **FIGS. 1 and 2** of the accompanying drawings show an absorbent and desorbent device which is essentially constituted by at least one micro-porous membrane **1** with absorbent and desorbent properties, by at least one porous permeable covering **2** and by at least one impermeable shock absorbing layer, essentially with closed cells.

[0016] The micro-porous membrane with absorbent and desorbent properties **1** is permeable to all the fluids on its two surfaces. Such a membrane **1** is preferably of micro-porous polyolefin base of the polyethylene type with ultra-high density loaded with silica, such as that disclosed in EPO 892 647.

[0017] This member, whose porosity is greater than 60%, has a very high absorbent power and desorbs very rapidly, such that a return to the initial characteristics of the product can be obtained in less than two hours. Moreover, the material constituting this membrane **1** has a high absorbent capacity for shocks, thereby avoiding the effect of microshocks and increases the comfort during walking and the practice of sports. Moreover, this membrane, which can be cut out very easily and which remains indeformable even after intensive use, is very easy to use, being adapted to be washed with water and soap, and takes part very effectively to guard against micosal and bacterial infections, because of the fact that the latter can grow in a much more difficult way in a dry medium than in a moist one.

[0018] According to a characteristic of the invention, the micro-porous membrane with absorbent and desorbent properties **1** can be provided with grooves forming channels for the evacuation of moisture.

[0019] The porous permeable covering **2** can be constituted, in the case of use of the device as a shoe sole, either in the form of a woven, non-woven or synthetic textile covering, this covering being provided with micro-perforations or being highly porous and having good drying properties (**FIG. 1**). Such a porous covering **2** is essentially adapted to permit comfortable contact with the upper portion of the device and must be easily permeable to water and to air, so as to permit easy and rapid passage of liquids toward

the membrane **1** and the rapid desorption of the membrane **1** disposed below this porous covering **2**.

[0020] In the case of the use of the device in the form of a bathmat, for example, the porous permeable covering **2** can preferably be constituted by a woven or non-woven cloth covering with high porosity and low capacity for the absorption of water. Thus, in such a case, it is necessary that the moisture essentially penetrate rapidly in the micro-porous membrane **1** and that during desorption, the moisture can evaporate rapidly without being retained by the covering **2**, this latter obviously being adapted to dry very rapidly.

[0021] The impermeable shock absorbing sub-layer **3** is preferably pierced with holes sufficiently large and numerous to permit the evacuation of the moisture from below by evaporation. According to a modified embodiment of the invention, the impermeable shock absorbing sub-layer **3** can also not be provided with holes, when the micro-porous membrane **1** is provided with grooves forming channels for the evacuation of moisture.

[0022] The impermeable shock absorbing sub-layer **3** can be constituted by a foam of an ethylene/vinyl acetate copolymer that is micro-perforated and of small thickness, namely of the order of 2 mm in the case of a shoe sole. Such a foam permits simultaneously ensuring absorption of the micro-shocks during pressure on the device, for example in the course of walking, and an exchange of air with the micro-porous membrane **1**, in particular from the lower surface of the device, to promote desorption, when said device is no longer loaded.

[0023] The foam constituting the impermeable micro-porous sub-layer **3** has good mechanical properties of traction against tearing and abrasion, as well as good dynamic resilience properties and resistance to bending. Moreover, such a foam is of low sensitivity to aging due to air, light, ozone and heat and strongly resists the effects of cold and fire. Moreover, this foam has a good strength against liquids, such as oils, solvents, ketones, acids, gases and water.

[0024] The elements constituting the absorbent and desorbent device according to the invention can be assembled together in a functional sandwich by stitching or by gluing.

[0025] In the case of stitching, the latter is carried out over all the periphery of the device with the provision of supplemental stitching lines between the peripheral stitching, along diagonals and/or transverse and/or longitudinal lines. Such supplemental stitching lines are necessary to avoid the appearance of folds giving rise to trouble during pressure on the device, for example during walking, such that the porous permeable covering **2** would rapidly wear.

[0026] In the case of an assembly by gluing, this is preferably carried out by dots of glue or by thermo-gluing by means of a thermo-gluing product **4** having a mesh structure and interposed on opposite sides of the micro-porous membrane **1**, respectively between the porous covering **2** and the micro-porous membrane **1** and between this membrane **1** and the impermeable shock absorbing sub-layer **3** (FIGS. **1** and **2**). Such a gluing product is particularly available in strips deposited on a transverse support, the assembly being rolled up on spools.

[0027] The thermo-gluing product has a mesh such that it occupies a very small portion of the total surface of the

micro-porous membrane **1** and preferably about 12% of this surface, such that the capacities, on the one hand, for transmission of moisture through the permeable porous covering **2** toward the membrane **1** and, on the other hand, of evaporation of moisture from the membrane **1** through the permeable porous covering **2**, are maintained optimal. This property is also usefully used to ensure the possibility of air circulation between the lower surface of the membrane **1** and the impermeable shock absorbing sub-layer **3**.

[0028] Assembly by thermo-gluing permit guaranteeing a perfect connection between the consecutive elements **1** to **3** of the device according to the invention.

[0029] According to a characteristic of the invention, the absorbent and desorbent device can be present in the form of a shoe sole to be inserted in a shoe or in the form of a shoe sole integrated permanently in a shoe and constituting the first assembly or sanitary sole of the shoe.

[0030] According to another characteristic of the invention, the absorbent and desorbent device can be provided, by covering, by spraying or the like, with one or several layers of antibacterial and/or fungicidal agents. The provision of such supplemental layers can permit responding to the severe requirements for prevention of the spreading of bacteria or mycose, particularly in the fields of dermatology, diabetics, as concerns the sole and hotels, bath therapies, and generally speaking public places as to bathmats.

[0031] The device according to the invention permits responding in a particularly effective manner to the problems raised by the need for rapid absorption of moisture, particularly resulting from hypersudation. This device can be reused very rapidly, and effectively, because of its power of rapid desorption which permits it returning to the initial characteristics in a very short time.

[0032] Moreover, because of its porosity, the device according to the invention can ensure the function of insulation, both from heat and from cold.

[0033] Finally, because this device draws moisture to then dissipate it into the air, it is particularly useful for physiological perspiration, contrary to the local antiperspirant treatments, when it is used as a sole in an article of footwear.

[0034] Clinical studies have demonstrated that the use of the device according to the invention, in the form of a sole in shoes, permits solving satisfactorily practically all of the problems connected either with perspiration in sporting shoes during use, or hyperhidrosis.

[0035] Moreover, the device according to the invention provides no favorable terrain for the development of allergies, no allergenic components entering into its construction.

[0036] Finally, the device permits improvement from certain trophic troubles, such as mycoses or eczemas, the factor aggravating these troubles being again permanent moisture.

[0037] Thanks to the invention, it is possible to provide a device permitting rapidly and effectively absorbing large moisture and desorbing, also rapidly, said moisture, upon the disappearance of the source of moisture.

[0038] This device is more particularly applicable in the form of a shoe sole; soles to be inserted or original soles, but it is also applicable to other fields, particularly domestic, for example for the rapid absorption of spills and for corre-

sponding desorption, permitting prolonged use of the absorption means and not a systematic replacement of the latter with the corresponding costs of washing and drying.

[0039] Of course, the invention is not limited to the embodiments described and shown in the accompanying drawing. Modifications remain possible, particularly as to the construction of the various elements or by substitution of technical equivalents, without thereby departing from the scope of protection of the invention.

1. Absorbent and desorbent device characterized in that it is essentially constituted by at least one micro-porous membrane (1) with absorbent and desorbent properties, by at least one permeable covering (2) and by at least one impermeable sub-layer (3), essentially with closed cells.

2. Device according to claim 1, characterized in that the micro-porous membrane (1) with absorbent and desorbent properties is permeable to all the fluids on its two surfaces.

3. Device according to any one of claims 1 and 2, characterized in that the micro-porous membrane (1) with absorbent and desorbent properties is based on a micro-porous polyolefin or the polyethylene type with ultra high density loading with silica.

4. Device according to claim 1, characterized in that the micro-porous membrane with absorbent and desorbent properties (1) is provided with grooves forming channels for evacuating moisture.

5. Device according to claim 1, characterized in that the permeable porous covering (2) is constituted either by a woven or non-woven textile or a synthetic covering, and has good drying properties.

6. Device according to claim 1, characterized in that the permeable porous covering (2) is constituted by a cloth or non-woven covering capable of ensuring rapid transfer of liquids toward the absorbent membrane (1) and with low capacity to absorb water.

7. Device according to claim 1, characterized in that the impermeable sub-layer (3) is pierced with holes sufficiently large and numerous to permit the evacuation of moisture from below by evaporation.

8. Device according to claim 1, characterized in that the impermeable micro-porous sub-layer (3) is constituted by a perforated foam of an ethylene/vinyl acetate copolymer.

9. Device according to any one of claims 1 to 8, characterized in that the constituent elements are assembled together in a functional sandwich by stitching or gluing.

10. Device according to claim 9, characterized in that the stitching is carried out over all the periphery of the device with the provision of supplemental stitch lines between the peripheral stitching, along diagonals and/or transverse lines and/or longitudinal lines.

11. Device according to claim 7, characterized in that the gluing is carried out by dot gluing or by thermo-gluing at points by means of a thermo-gluing product (4) having a mesh structure and interposed on opposite sides of the micro-porous membrane (1), respectively between the porous covering (2) and the micro-porous membrane (1) and between this membrane (1) and the impermeable shock absorbing sub-layer (3).

12. Device according to claim 11, characterized in that the thermo-gluing product has a mesh such that it occupies a very small portion of the total surface of the micro-porous membrane (1) and, preferably, about 12% of this surface.

13. Device according to claim 1, characterized in that it is present in the form of a sole to be inserted in a shoe or in the form of an integral sole permanently in a shoe and constituting the first assembly or sanitary sole of the shoe.

14. Device according to claim 1, characterized in that it is provided, by covering, by spraying or the like, with one or several layers of antibacterial and/or fungicidal agents.

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