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European Patent Office
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(11) **EP 2 078 472 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.07.2009 Bulletin 2009/29

(51) Int Cl.:
A46B 3/06 *(2006.01)* ***A46D 3/04*** *(2006.01)*

(21) Application number: **09075002.7**

(22) Date of filing: **05.01.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

(30) Priority: **10.01.2008 BE 200800020**
25.03.2008 BE 200800178

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(54) Stamp for pressing bundles of fibres

(57) Stamp for fusing and locally pressing on bundles of fibres, whereby the stamp can be heated, characterised in that the stamp (1) is at least partially made of carbon on the contact surface (2) where the stamp presses bundles of fibres (4) on a holder (3). A second stamp (16) which is appropriate for a final pressing and whose temperature is lower than that of the first stamp (1), is provided.

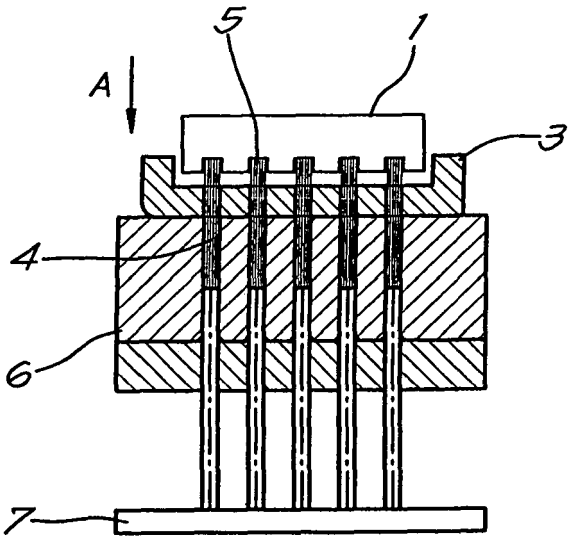

Fig.2

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Description

[0001] The present invention concerns a stamp for pressing synthetic bundles of fibres on a holder, in particular for bundles of fibres of brushes.

[0002] It is known that a brush is formed of a body to which a number of bundles of fibres are fixed. The bundles of fibres are usually fixed to a holder which is partially or entirely part of the brush body, or in some cases it may be the brush body itself.

[0003] To this end, the holder contains holes in a certain pattern, whereby the diameter of the holes depends on the thickness of the fibre bundles, whereby holes of different diameters may be provided.

[0004] Whereas, in former days, brushes used bundles of fibres made of natural materials, it is common now that the fibres in the bundles of industrially manufactured brushes are made of synthetic material. Typical examples are polyethylene terephthalate, polyvinyl chloride, polypropylene or nylon.

[0005] It is known to use fixing techniques in order to fix the bundles of fibres on the holder that make use of metal clamps or plates. According to more modern techniques, use is made of what are called anchorless techniques such as disclosed for example in EP 0,972,465.

[0006] Bundles of fibres are hereby put in a holder by means of a device, and the holder is carried to what is called a fusion module via a revolving table in order to fasten the bundles of fibres by fusing the far ends of the bundles of fibres that protrude from the holder.

[0007] This fusing module can use different techniques, such as ultrasonic welding of the bundles of fibres. Another, simpler technique consists of mechanically pressing the bundles of fibres in or on the holder by means of a heated stamp.

[0008] As a result, the far ends of the bundles of fibres are locally fused. If the far ends are long enough, a molten film can even be created between the heated stamp and the holder as the far ends of different bundles of fibres melt together. Next, the stamp is withdrawn and the molten far ends start to cure.

[0009] These stamps are typically rather thin. The stamps are heated up to a temperature which is dependent of the melting temperature of the material out of which the bundles of fibres are made, for example up to a temperature of 300°C, by sending a big electric current through them for a short duration, after which the stamps quickly cool down again. This technique is described in EP 1,136,017.

[0010] A disadvantage of this technique, however, is that, due to the local melting, molten material may stick to the stamp and not to the holder as was intended, when the latter is withdrawn after the pressing. Thus, the bundles of fibres cannot be fixed that well to the holder. This disadvantage is all the more important as the holders get larger, and at present it bars this technique for household brushes.

[0011] An additional disadvantage is that the stamp must be regularly cleaned, which implies a loss of time and as a result of which the manufacturing process is slowed down. The fastest manner to clean the stamp often consists in briefly heating the stamp up to for example 600°C in order to scorch the material that sticks to it. However, this requires a strong electric current and hence a strong power consumption. In any case, it is clear that cleaning is time-consuming.

Moreover, this technique is not beneficial to the lifetime of the stamp, and it will have to be regularly replaced, which renders this fixing technique very expensive in the end compared with fixing techniques without any contact such as convection air heating, ultrasonic welding and the like.

[0012] Another disadvantage is that the surface of the fused fibres is not entirely flat, such that covering with a cover plate or any other further processing, for example filling with injection moulding material, may be desirable or necessary.

[0013] A further disadvantage is that microscopically small holes and pores may still be present in the mass of the fused fibres, which may cause the injection moulding material to leak during any further processing.

[0014] The present invention aims to remedy one or several of the above-mentioned or other disadvantages.

[0015] To this end, the invention concerns a stamp for melting and locally pressing bundles of fibres, whereby the stamp can be heated, characterised in that the stamp is at least partially formed of at least one layer of carbon on the contact surface where the stamp presses the bundles of fibres onto a holder.

[0016] An advantage of a stamp according to the invention is that the stamp with the aforesaid layer of carbon can press the bundles of fibres on to a holder, after which the stamp can be withdrawn without any fibre bundle material sticking on the stamp.

[0017] Thus, brushes can be manufactured in a more efficient and cheaper way with this stamp, whereby less energy is consumed and the stamps have a longer lifetime.

[0018] The layer of carbon with which the stamp is provided is commonly more known as a layer of graphite.

[0019] Graphite, as is known, is a form of carbon element carbon and one of the softest materials. The crystalline structure is hexagonal. From an atomic point of view, it is formed of layers which can easily slide off one another. That is why it is also used as a dry lubricant.

[0020] Up to now, the industry did not regard graphite as an appropriate material to be used for the manufacturing of pressure stamps, as it was generally considered to be much too brittle and frangible.

[0021] In order to better explain the characteristics of the invention, the following preferred embodiments are described by way of example only, without being limitative in any way, with reference to the accompanying drawings, in which:

figures 1 to 3 included schematically represent the

stamp according to the invention and a situation in which it is used;
figure 4 schematically shows a cross section of a brush made according to the invention, whereby the solidly fused fibres are covered with a cover plate;
figures 5-9 schematically represent the successive steps of a method in which the stamp according to the invention is used, followed by a final pressing with a second stamp at a lower temperature;
figures 10, 11, 12 show examples of brushes that can be manufactured with a stamp according to the invention.

[0022] Figure 1 schematically represents the stamp 1 according to the invention, which in this case is made of solid graphite. In practice, a layer of graphite with a certain thickness will be provided on the contact surface 2 of a stamp 1 which is part of a mechanical pressing device. Research has proven that, instead of pure graphite, also graphite containing copper provides very good results. This composition, which contains for example 20% of copper, is less brittle than pure graphite.

[0023] In figure 1, said contact surface 2 is provided with a embossed pattern, but this is not necessarily so and, in most cases, a flat contact surface 2 is preferred.

[0024] Figures 1 to 3 show that the stamp 1 is close to a holder 3 in which has been provided an amount of fibre bundles 4 through the holder 3 and whereby the far ends 5 of the bundles of fibres 4 protrude on the side of the stamp 1. The bundles of fibres 4 are hereby kept in place by a positioning device 6 and a device with pens 7.

[0025] The functioning of a stamp 1 according to the invention is simple and as follows.

[0026] Figure 1 shows that the stamp 1 is brought towards the holder 3 in a direction A in order to press the bundles of fibres 4 on the holder 3 with its contact surface 2, as shown in figure 2.

[0027] The stamp 3 is preferably heated, such that the far ends 5 of the bundles of fibres will locally fuse while the latter are being pressed on. Thus, the bundles of fibres 4 will be pressed onto the holder 3 in a more efficient way.

[0028] The stamp 3 may for example be heated by means of electric heating elements which are not represented in the figures and which are provided in or under the stamp.

[0029] In a practical example, the bundles of fibres 4 are formed for example of polyethylene terephthalate, polyvinyl chloride, polypropylene or nylon, and the bundles of fibres are either or not locally fused when at least their respective melting temperatures are reached.

[0030] When the bundles of fibres 4 have been pressed on long enough, the stamp 1 is withdrawn in a direction B and removed from the holder 3, as shown in figure 2.

[0031] Figure 3 also shows that, thanks to the embossed pattern on the contact surface 2, the bundles of fibres 4 can be pressed on in a cleaner way as they fuse locally in the cavities of the relief pattern.

[0032] The far ends 5 of the fibres of individual bundles of fibres 4 are hereby fused. It is also clear that the embossed pattern may have different shapes, depending on the desired pattern for the pressed-on material.

[0033] There may also be no embossed pattern 2 at all, such that the far ends 5 of the bundles of fibres 4 can fuse so as to create a film layer over the holder 3 when the far ends 5 are sufficiently long. This may be advantageous in certain applications whereby for example a second plastic component 7 is injected over the fused far ends 5 of the bundles of fibres 4 in a following step of the manufacturing process, since, as a result, the injection is exposed to less resistance than in case the fused far ends are not being pressed on flat.

[0034] Figure 4 shows how the holder 3 with pressed-on bundles of fibres 4 can subsequently be covered with a cover plate 8, whereby the holder 3 may be part of a brush body or may be the brush body itself.

[0035] The cover plate 8 may be a separate part which is connected to the holder 3 by means of mounting, welding, gluing or other techniques, as is described for example in EP 0,972,464.

[0036] According to an alternative embodiment, the cover plate 8 is directly provided on the holder 3 by means of injection moulding, as described in EP 0,972,465.

[0037] Figures 5 to 9 included schematically represent the successive steps of a method in which the stamp according to the invention is used, followed by a final pressing with a second stamp at a lower temperature.

[0038] Figure 5 shows how the stamp 1 is brought to the holder 3 in a direction A so as to press the bundles of fibres 4 on the holder 3 with its contact surface 2, as shown in figure 6.

[0039] The stamp 1 is preferably heated, such that the far ends 5 of the bundles of fibres are locally fused while the stamp is being pressed on. As a result, the bundles of fibres 4 are pressed on the holder 3 more efficiently.

[0040] As soon as the bundles of fibres 4 have been pressed on long enough, as represented in figure 6, the stamp 1 will be withdrawn in a direction B and removed from the holder 3, as shown in figure 7.

[0041] Next, a colder stamp 16 is used for the final pressing, as represented in figures 7 to 9.

[0042] The method according to this alternative embodiment is as follows.

[0043] The fusion by means of the heated stamp 1 is followed by a final pressing with a cold stamp 16. This implies that the heated stamp 1 is withdrawn from the fibre mass, which is still entirely or partly plastic and hot, in the direction B as described above, and that, instead of making this fibre mass cure in the open air thereafter, it is immediately put into contact with a cold stamp, for example made of a metal such as steel or copper, either or not cooled externally, and against which the fibre mass then cools down.

[0044] Thus is obtained a very smooth surface at the molten and/or fused and solidified far ends of the fibres,

as represented in figure 9.

[0045] This produces different advantages.

[0046] First of all, by pressing with a cold stamp, to which nothing sticks, the fibre mass which has been plasticized beforehand can be connected more efficiently to the holder 3. This is also the case when it is made of another material than fibres, which normally only occurs when the fibres and holders are made of one and the same or a similar synthetic material which is compatible. It is assumed that this can be explained in that, due to the pressure of the cold stamp 16 on the fibre mass and the underlying holder, said fibre mass penetrates partly in the bundle openings of the holder, or in that these openings and/or the holder itself can be deformed, which results in a mechanical anchoring between the fibre melt 5 and the holder 3.

[0047] A further advantage is that, by pressing with the stamp 16, a smoother and more even surface of the solidified melt is obtained than if this was not the case.

[0048] As a result, in case a plastic is injected over the molten and solidified fibres in order to complete the brush body, it is possible to use injection pressures that are less high. Consequently, there will be less leakage of the injection moulding material.

[0049] Another advantage is that, by pressing with the stamp 16, the fibre melt is compressed and is made more compact during the solidifying process. As a result, microscopically small holes and pores that might still be present in the melt are filled. This in turn results in a more homogenous fibre layer, so that there will be less leakage problems while injection moulding.

[0050] Figures 10 to 11 included represent a somewhat more specific example.

[0051] Figure 5 shows a top view of material that has been pressed onto holder 3 and figure 6 also shows the bundles of fibres 4 in perspective. A specific pattern is used thereby which concentrates the bundles of fibres 4 on the outer side of the holder 3.

[0052] Figure 12 shows how the holder 3 of figure 11 is covered with a cover plate 8 containing a connecting opening 9 for a brush handle.

[0053] The present invention is in no way restricted to the embodiments described by way of example and represented in the accompanying drawings; on the contrary, such a stamp according to the invention can be made in many different ways while still remaining within the scope of the invention.

Claims

1. Stamp for fusing and locally pressing on bundles of fibres, whereby the stamp can be heated, **characterised in that** the stamp (1) is at least partially made of carbon on the contact surface (2) where the stamp presses bundles of fibres (4) on a holder (3).

2. Stamp according to claim 1, **characterised in that** the above-mentioned stamp (1) is at least partly made of carbon in the form of graphite.

3. Stamp according to claim 1 or 2, **characterised in that** the above-mentioned stamp (1) is at least partly composed of copper and graphite.

4. Stamp according to any one of claims 1-3, **characterised in that** the contact surface (2) is provided with an embossed pattern.

5. Stamp according to claim 1 or 2, **characterised in that** the above-mentioned stamp (1) is flat on the contact surface (2).

6. Stamp according to any one of the preceding claims, **characterised in that** the stamp (1) is heated up to a temperature which is at least the melting temperature of the material out of which the bundles of fibres (4) are made.

7. Stamp according to any one of the preceding claims, **characterised in that** the stamp (1) is heated by means of one or several electric heating elements.

8. Stamp according to any one of the preceding claims, **characterised in that** the stamp (1) is made as a solid block of carbon.

9. Stamp according to any one of the preceding claims, **characterised in that** the carbon is provided as a coating on the above-mentioned contact surface (2) of the stamp (1).

10. Stamp according to claim 8, **characterised in that** the above-mentioned coating is provided by means of an injection moulding technique.

11. Device for manufacturing brushes which consists of a positioning device (6) on which is provided a holder (3), whereby a number of bundles of fibres (4) are provided loosely in the holder (3), **characterised in that** it provides for a stamp (1) according to any one of the preceding claims with which the far ends (5) of the bundles of fibres can be pressed on.

12. Device for manufacturing brushes according to claim 11, **characterised in that** it provides for a second stamp (16) which is appropriate for a final pressing and whose temperature is lower than that of the first stamp (1).

13. Method for manufacturing brushes according to claim 12, **characterised in that** the second stamp (16) is being cooled.

14. Method for manufacturing brushes according to any one of claims 12 to 13, **characterised in that** the

contact surface of the second stamp (16) is flat.

15. Method for manufacturing brushes whereby a holder (3) is placed on a positioning device (6), and whereby a number of fibre bundles (4) are loosely provided in the holder (3), whereby the bundles of fibres (4) protrude from the holder (3) with one far end (5) and whereby the far ends (5) of the bundles of fibres are pressed on with a stamp (1) whose contact surface (2) temperature is at least as high as the melting temperature of the material out of which the bundles of fibres (4) are made, **characterised in that**, immediately after the hot stamp (1) has been used, a second colder stamp (16) is used for final pressing.

16. Method for manufacturing brushes according to claim 15, **characterised in that** the hot stamp (1) is a stamp having the characteristics of any one of claims 1-10, in particular a stamp whose contact surface (2) is at least partly made of carbon.

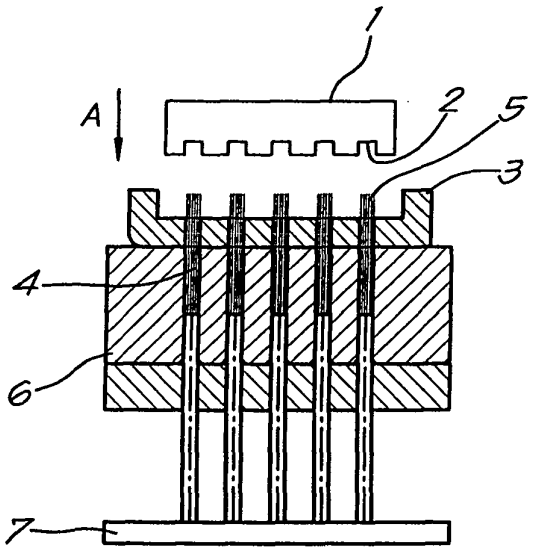

Fig.1

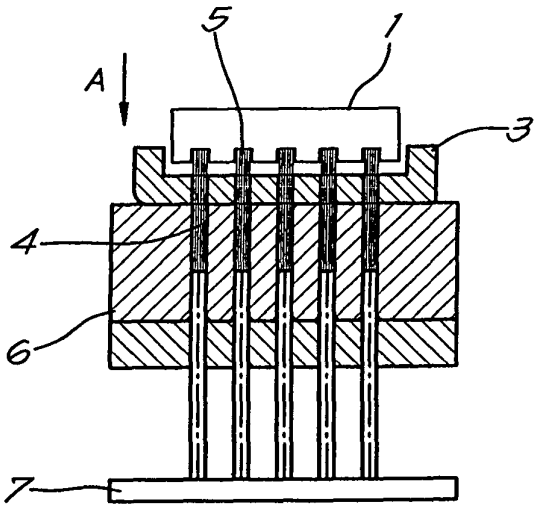

Fig.2

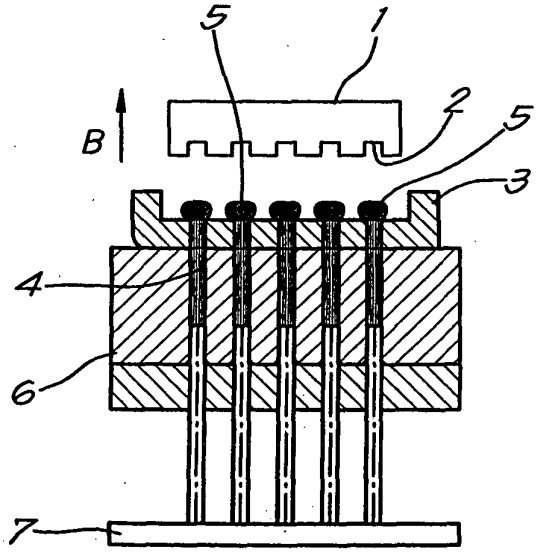

Fig.3

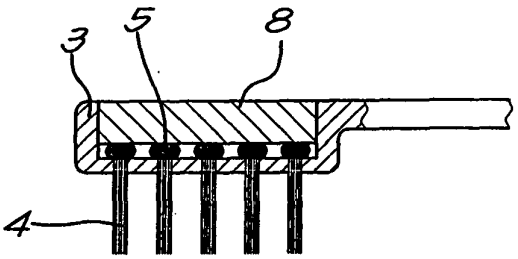

Fig.4

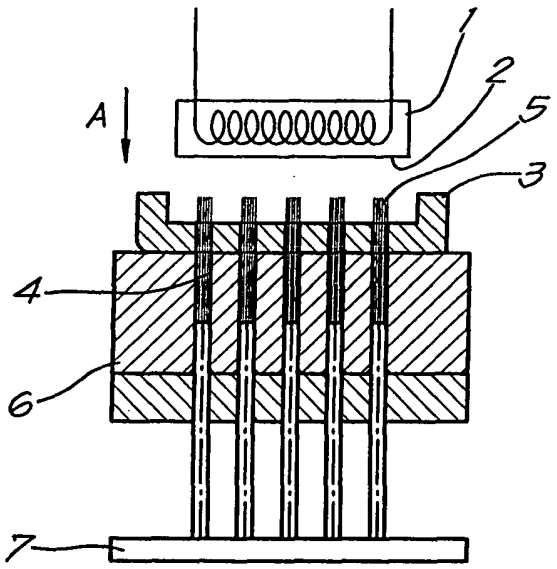

Fig.5

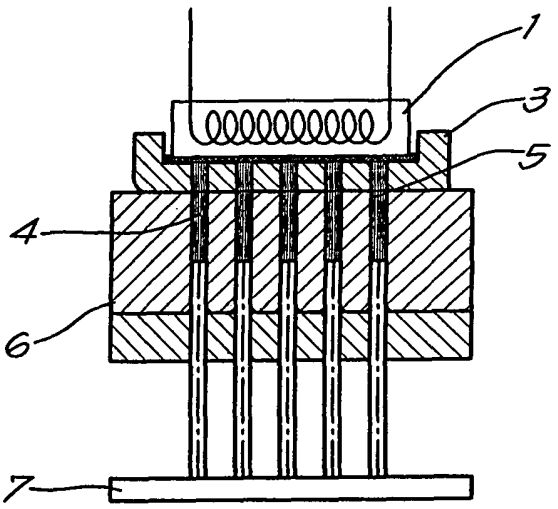

Fig.6

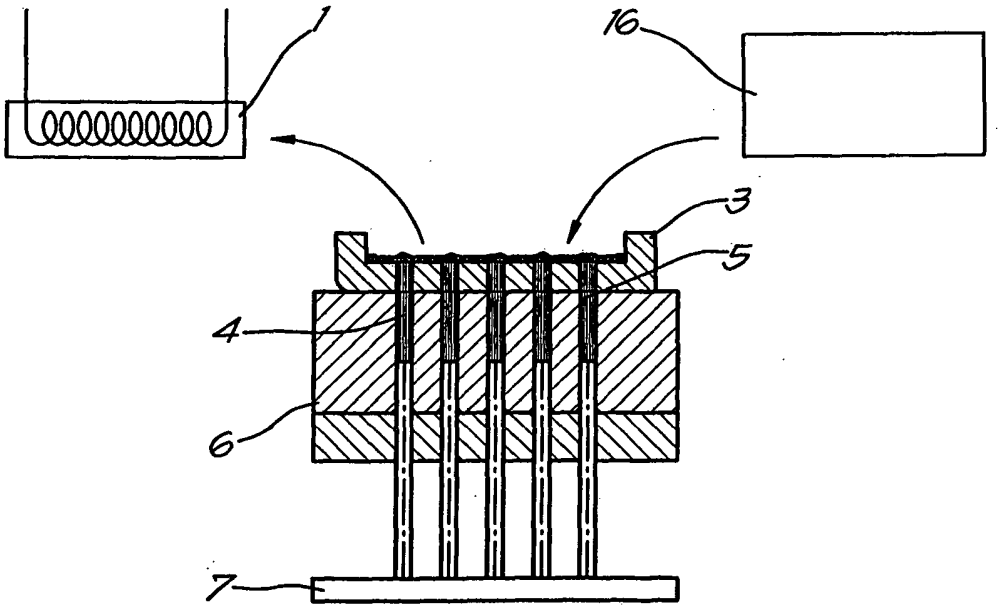

Fig.7

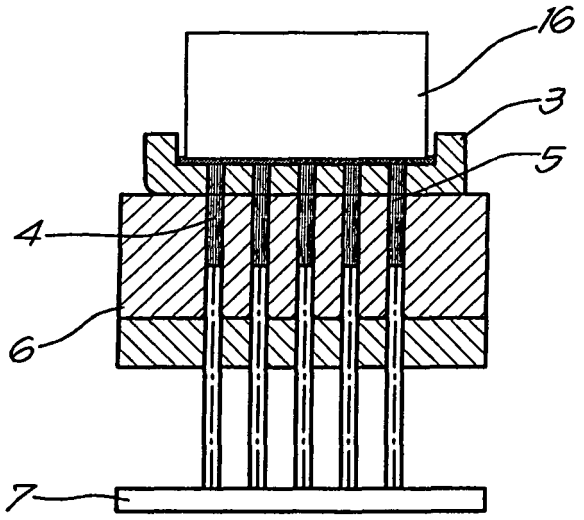

Fig.8

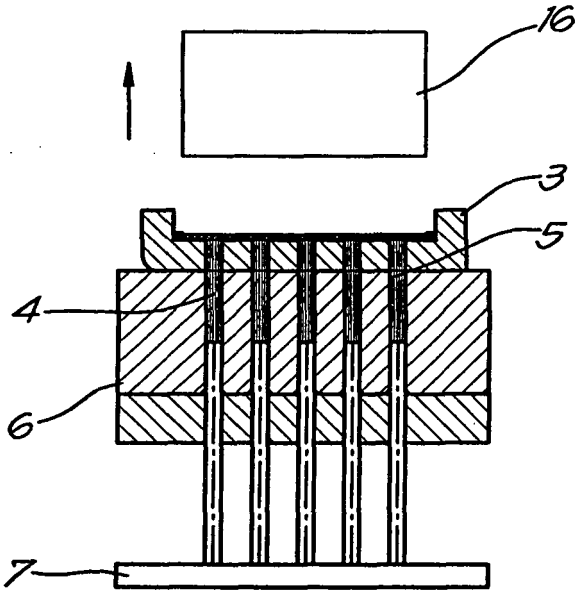

Fig.9

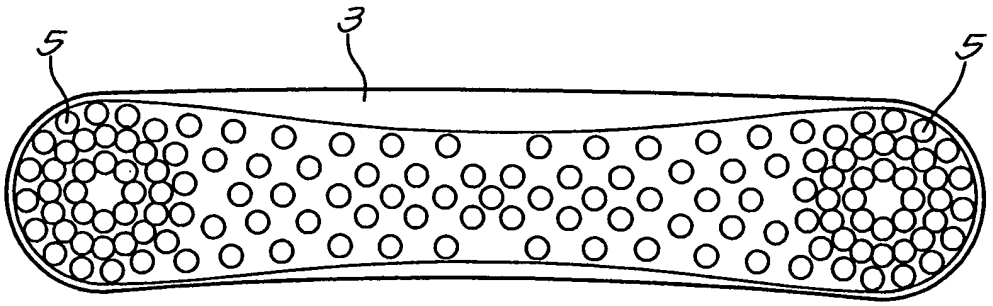

Fig.10

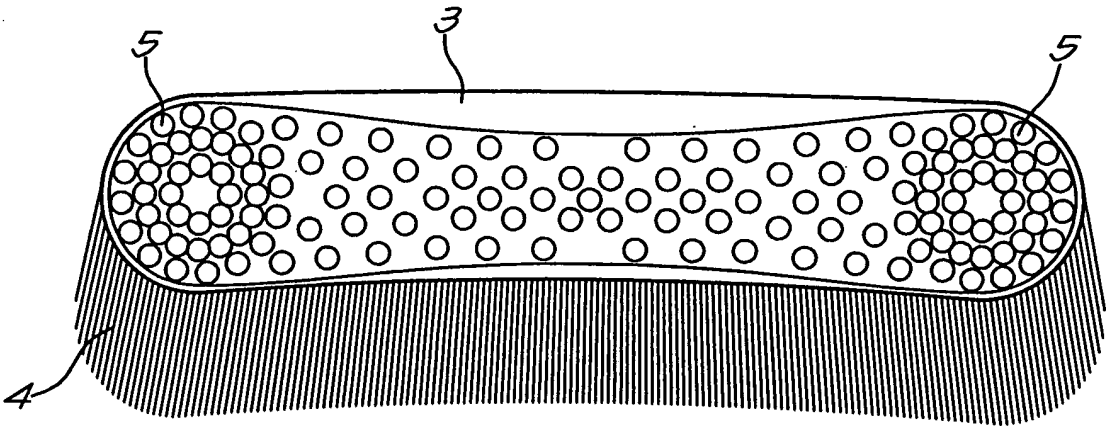

Fig.11

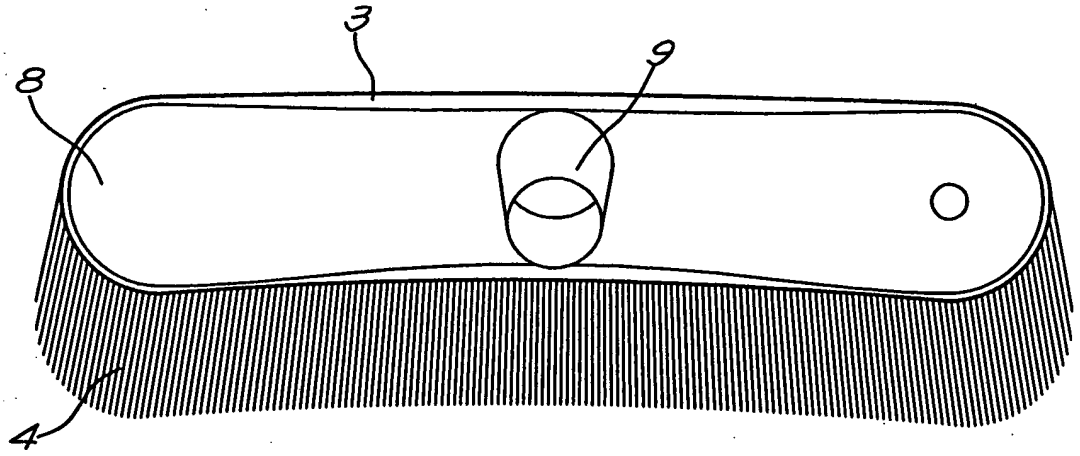

Fig.12

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EUROPEAN SEARCH REPORT

Application Number
EP 09 07 5002

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 136 017 A (BOUCHERIE NV G B [BE]) 26 September 2001 (2001-09-26) * abstract * * paragraphs [0005] - [0011]; figures 1-10 *	1-11	INV. A46B3/06 A46D3/04
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TECHNICAL FIELDS SEARCHED (IPC)

A46D
A46B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 May 2009	Nicolás, Carlos

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1

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27-05-2009

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