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(54) Title: METHODS OF COMBINING BRUSH HEAD PLATES WITH BRUSH BODIES

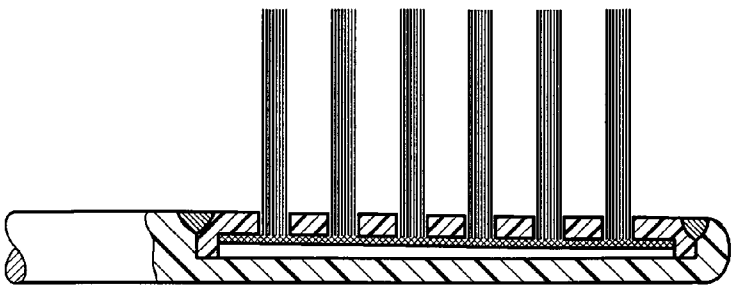


Fig. 16A

(57) Abstract: A method of combining a brush head plate with a brush handle or part of brush handle is disclosed which makes use of any of a mechanical, friction, welding, gluing and molding technique or of a combination of these techniques.

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## Methods of Combining Brush Head Plates with Brush Bodies

Several methods of making brushes are known. Conventionally, a brush body is provided with an array of holes corresponding to the desired array of bristles. Bundles or tufts of bristles are then inserted into the holes of the brush body and anchored therein by means of pressed-in small metallic anchors or by means of loops.

In an alternative method of making brushes, which has gained acceptance within just a few years and is referred to as AFT method (Anchor Free Tufting), the tufts of bristles are attached to a small brush head plate without the use of loops or anchors, and the carrier plate is then installed in or attached to a brush body or handle. In a variant of the AFT method, brush handles are produced with a pattern of holes corresponding to a desired tuft pattern. Tufts of bristles are inserted into such holes and attached to the brush handles. The attachment ends of the tufts are then covered with a small plate which in turn is attached to the brush handle.

In the attached drawings #1 to #18, different techniques of combining head plates with a brush handle or part thereof are illustrated.

In the existing machinery, there are two main ways of attaching the head plate to a handle :

The first method is by placing the head plate into a recess of the handle (illustrated in drawing #1), and ultrasonically weld both parts together (illustrated in drawing #3). This is a quick and reliable method of joining the parts. The disadvantage of this method is that it leaves a void between the back part of the head plate and the front face of the recess in the brush handle (illustrated in drawing #2). This can be remedied by placing a quantity of filler material in this recess that fills this void (illustrated in drawing #5). This filler material could be a

resin that solidifies over time, or an expanding material that fills the void as it cures.

The second method that is currently used, is by overmoulding the head plate with the handle. In this case, the tufted head plate is placed into a mould cavity, after which the handle is overmoulded against the head plate, bonding solidly. This method has certain disadvantages : the pressure of the overmoulding material reaches the surface of the head plate where the filaments are joined together, giving a risk for leakage of overmoulding material between the filaments. Overmoulding hot resin against a cold head plate will also lead to deformation of the complete parts once the warm resin solidifies, cools down and shrinks, bending the head plate that was in a cooled-down state to begin with.

The present invention is directed to a number of alternative methods to combine such carrier head plates with brush bodies, each such method having specific advantages.

Basically, head plates can be assembled into or onto the handles or part there-of by means of

**Friction welding.**

- Linear welding, such as by means of ultrasonic vibration (see drawing #3)
- Planetary welding (see drawing #4)
- High frequency welding

**Mechanical connection**

- Snapping the head plate into the handle (see drawing #6)
- Sliding the head plate into an undercut of the head, after which it can be locked in place. Locking in place can be by means of a mechanical click system, or by spot welding, or by spot gluing (drawing #7).
- Staking the plate on the toothbrush handle : pressing (a recess or hole in the head plate) onto a protruding part ( or stud) of the toothbrush handle. For a

more solid connection, a 3rd element can be pressed into the hollow protrusion, to make it expand and form an undercut (see drawings #8A and 8B).

- Staking the plate on the toothbrush handle : pressing protrusion(s) or studs on the head plate into recesses in the toothbrush handle. For a more solid connection, a 3rd element can be pressed into the hollow protrusion, to make it expand and form an undercut (see drawings #9A and 9B).

**Welding** :

- Heating both parts and pressing them onto each other, material from both parts melting into each other (drawing #10). The parts or one of the parts can be given a certain texture (drawing #10B )so that the surface of the part is bigger, and a bigger quantity of plastic material is plasticized, in order to make a stronger bond, and fill up any voids between both parts. Heating of the parts can be by means of a hot gas ( such as air, or an inert gas such as nitrogen), or by means of a hot die that touches one or both parts during the heat-up phase, or by means of radiation ( such as a hot object that is held between both parts during the heat-up phase, radiating its heat to the surfaces that are to be plasticized).

- Heating one of the two parts and pressing protrusions into the plasticized material, waiting until it re-solidifies, so that it is locked in place by means of an interference fit formed by an undercut in the protruding part (drawing #11).

- A metal part can be put between the head plate and the handle, after which they can be induction welded together, heating the intermediate part, and pressing both plastic parts on it. The toothbrush handle itself could of course be partially or totally metallic as well (drawing #12).

- Solvent welding : both part scan be coated with a solvent, which softens the surface that will be mated together. After evaporation of the solvent, the head plate will be fixed to the toothbrush handle

- Laser welding : either the base material of the head plate or the material of the toothbrush handle must be transparen tor at least semi-transparent, for the light beam of the laser light source to pass through, so that the materials are heated up only at the mating surfaces that are pressed together tightly until the materials re-solidify (drawing #13).

- High frequency welding : in case the materials of the head plate and/or the toothbrush handle are bipolar, the material of one or both the mating surfaces can be plasticized by means of high frequency electromagnetic waves.

**Gluing** :

- By means of an adhesive that bonds to both the head plate and the toothbrush handle, and solidifies by evaporation of a solvent.

- By means of an adhesive that bonds to both the head plate and the toothbrush handle, and solidifies by exposure to humidity, or radiation, or a polymerization triggering chemical, or light of any kind, or a combination thereof.

- By means of "hot glue" or "hot melt adhesive" ( thermoplastic adhesive) : the hot adhesive can be put on either the head plate or the toothbrush handle, or both, in fluid condition ( pre-heated), after which both parts are assembled.

- By means of "hot glue" or "hot melt adhesive" ( thermoplastic adhesive) : the hot adhesive can be put on either the head plate or the toothbrush handle, or both, in solid state ( cold), after which both parts are heated during assembly, melting the glue in this step. The glue can be added in under the form of a film, a pellet or granulate.

- By means of "thermohardening adhesive" : the adhesive can be put on either the head plate or the toothbrush handle, or both, in liquid state, after which both parts are heated during assembly, activating the adhesive in this step.

- By means of an expanding or foaming adhesive : the adhesive can be put on either the head plate or the toothbrush handle, or both, after which both parts are held together and the adhesive is activated, be it by means of heat, or radiation, or humidity, or any other form of influence (drawing #14). An advantage of this type of adhesive is that it will fill any voids in the toothbrush head, avoiding any build-up of contaminations and bacteria.

**In-mould assembly** :

- The tufted head plate can be placed into the mould cavity, after which the handle is overmoulded against the head plate, bonding solidly (drawing #15).

This method is currently used, and has certain disadvantages : the pressure of the overmoulded material reaches the surface of the head plate where the filaments are joined together, giving a risk for leakage of overmoulding material between the filaments. Overmoulding hot resin against a cold head plate will lead to deformation of the complete parts once the warm resin solidifies, cools down and shrinks.

- The tufted head plate and the pre-moulded handle can be placed into a mould, after which a small quantity of resin is overmoulded in the area where both pre-made parts have to be joined (drawing #16A). The overmoulding material will have to bond to both pre-made parts, in order to join the parts together. The overmoulding material could be normal plastic resin, or a compatible thermoplastic elastomer. The same overmoulding material could form additional element on the brush head, such as cleaning or whitening elements ( cleaning fingers, cleaning lamels, ...). The overmoulding material can also be used to form certain other textures on the brush head, such as scrapers, elastic tooth picks, or tongue cleaners (drawing #16B). The same overmoulding material could be used to fill the void between the back of the head plate and the recess in the pre-moulded handle ( drawing #16C).

For any of these assembly methods, a material or materials can also be added separately to fill the void between the back of the head plate and the recess in the pre-moulded handle. A quantity of material, such as e.g. plastic resin can be put on the back of the head plate and spread over the back of the head plate by means of a plunger while it is still in a plasticized state (drawing #17A), or it can be spread over the back of the head plate during the assembly step( drawing #17B), when the head plate is put into the recess in the pre-moulded handle while the added plastic material is still in a plasticized state.

As another method to fill the void between the between the back of the head plate and the recess in the pre-moulded handle, a material can be injected into the void after the assembly step, effectively filling this void in order to avoid that any foreign matter can deposit and accumulate there (drawing #17C).

- As an alternative, the head plate can be overmoulded with a plastic material with the sole purpose of fixing the filament in the head plate and sealing the area around the tuft base from the surroundings, avoiding that humidity, water

and/or bacteria penetrate to the tuft base area (drawing #18). This overmoulded head plate can then be assembled into a handle by any method described earlier: welding, gluing, overmoulding, clicking or any combination thereof.

It will be understood that many of the techniques described above can be applied in combination. For example, a mechanical snapping connection may be combined with a welding or gluing step or an over-molding step. It is intended to include these combinations in the present disclosure.

In the attached drawing #19, the head and neck parts 10 and 5 of a toothbrush are shown partially sectioned. The head part 10 is a shell with a bottom wall and peripheral walls erected from the bottom wall and defining a recess. The bottom wall has through holes in a pattern corresponding to a desired tuft pattern, and tufts 4 of bristles are inserted into these holes and attached to the bottom wall inside of the recess. The recess is then closed with a closure member shown as a small plate 34 that fits into the recess and is attached to the head part 10. For attaching the plate 34 on the head part 10 of the brush handle, any of the techniques described above may be used. As an alternative, the closure member is molded, e.g. the recess is filled with an appropriate material in a molding step similar to any of the molding techniques described above.

Claim

A method of combining a brush head plate with a brush handle or part of a brush handle, or combining a brush handle or part thereof to which tufts of bristles are attached, with a closure member that covers the attachment ends of the tufts,

characterized by any of the

mechanical,

friction,

welding,

gluing,

molding

techniques described above or any combination of the mechanical, friction, welding, gluing and molding techniques therein.

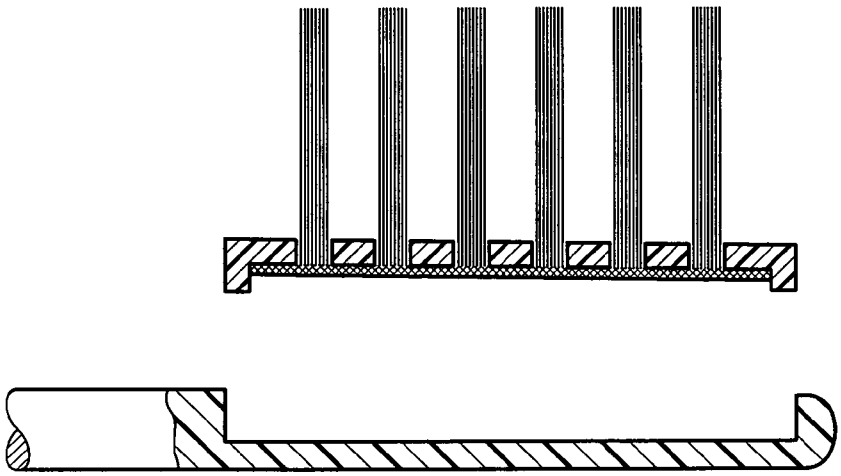


Fig. 1

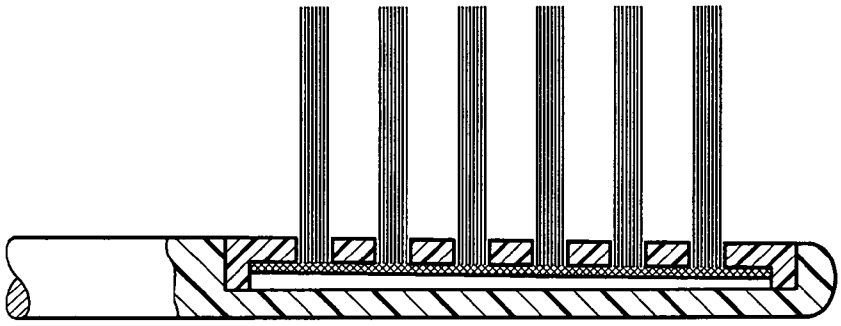


Fig. 2

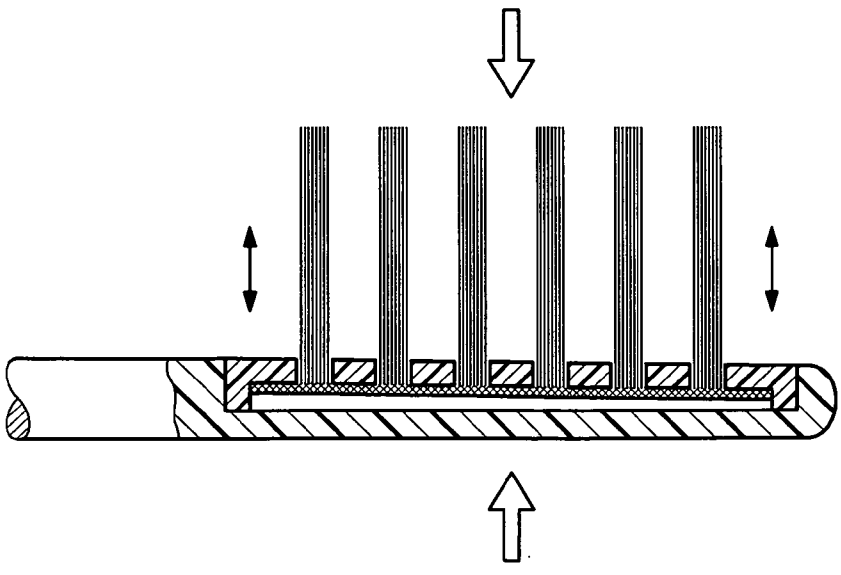


Fig. 3

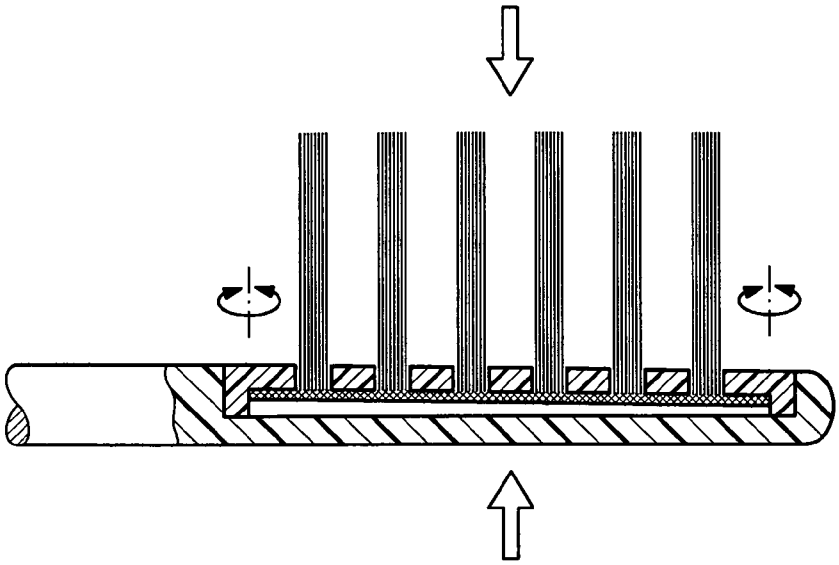


Fig. 4

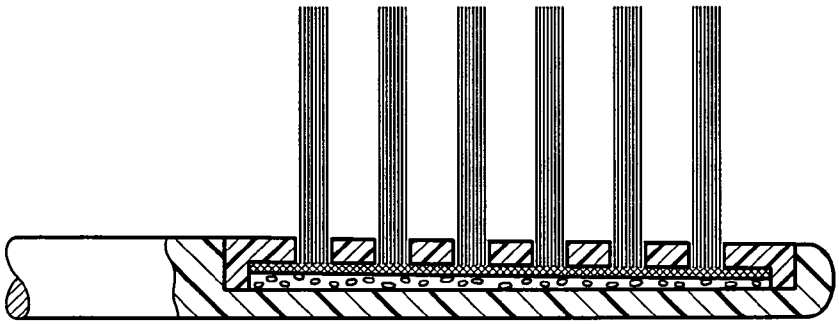


Fig. 5

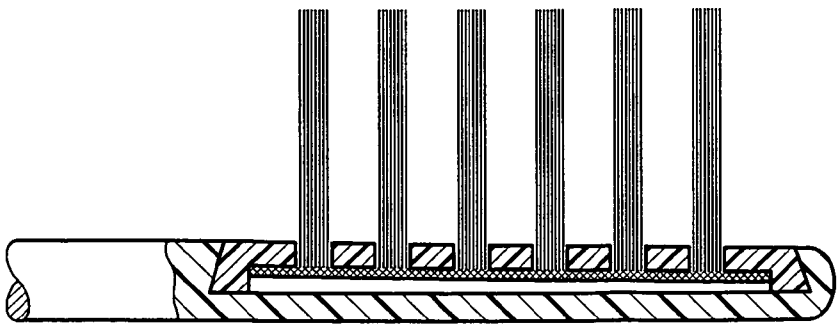


Fig. 6

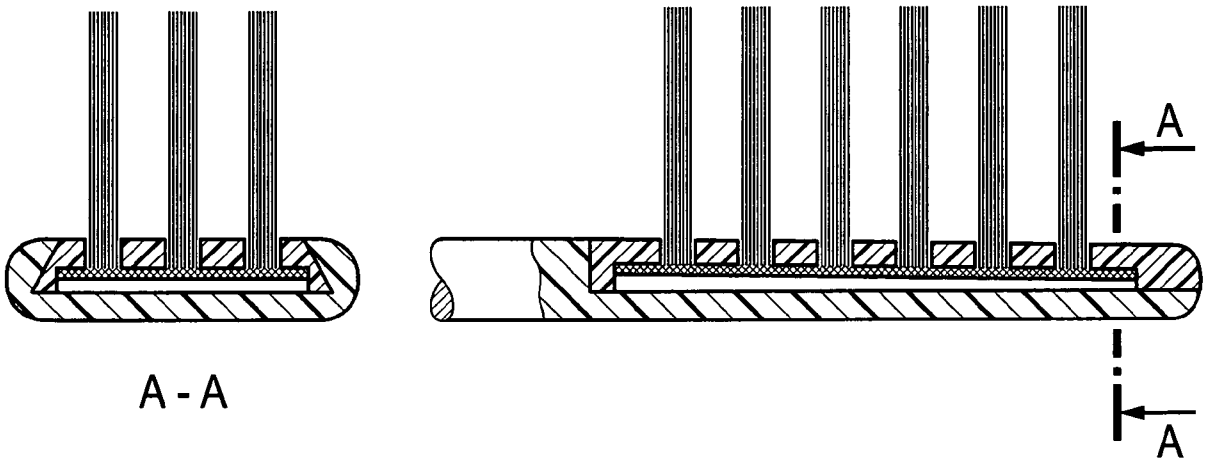



Fig. 7

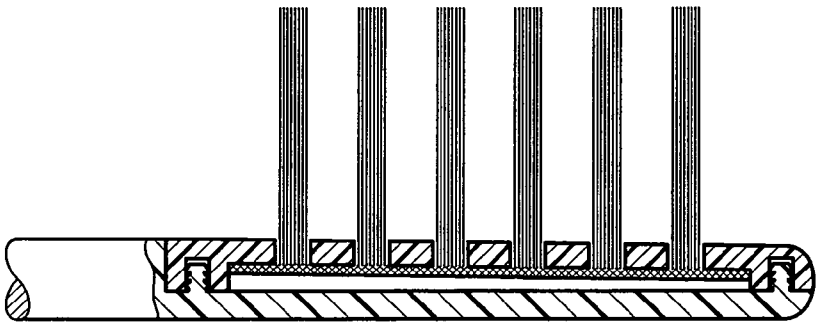


Fig. 8A

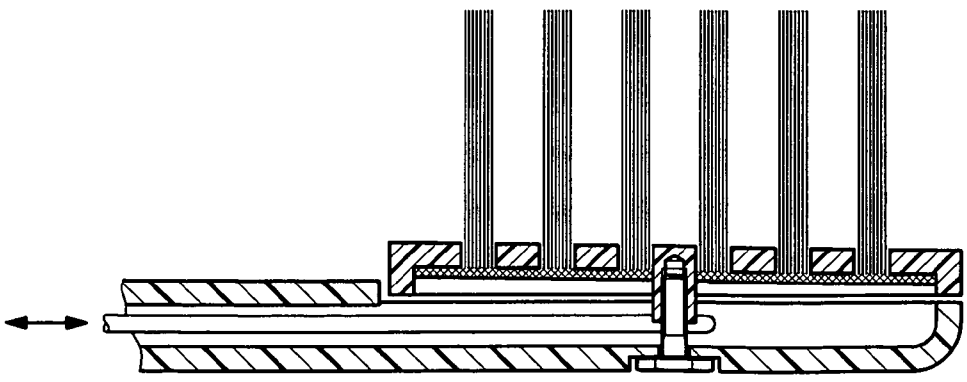


Fig. 8A

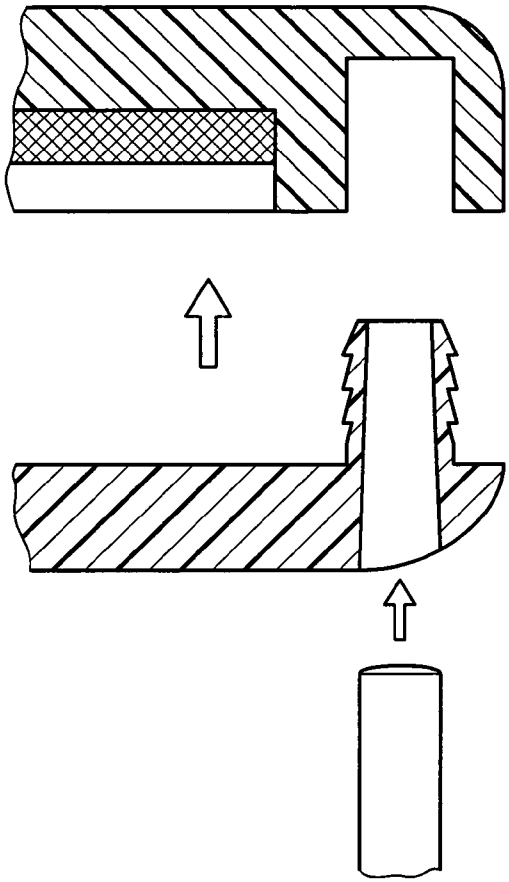


Fig. 9A

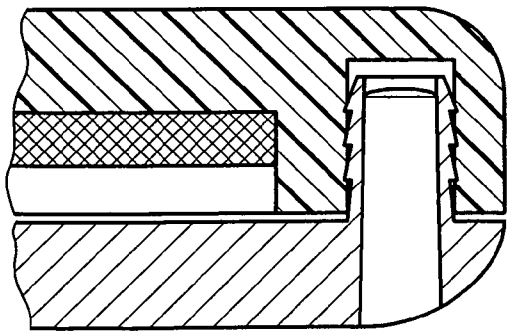


Fig. 9B

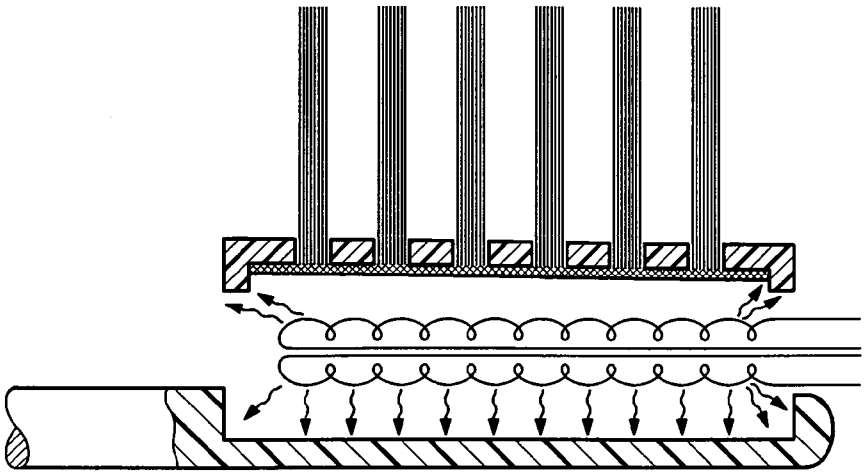


Fig. 10A

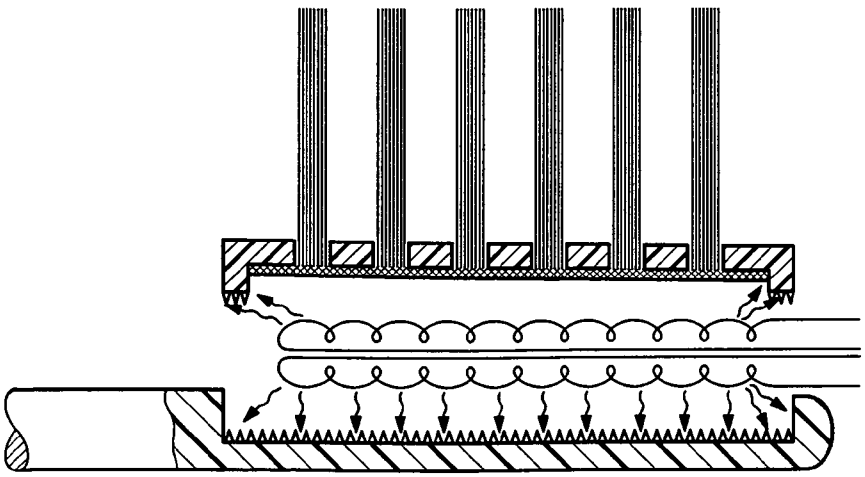


Fig. 10B

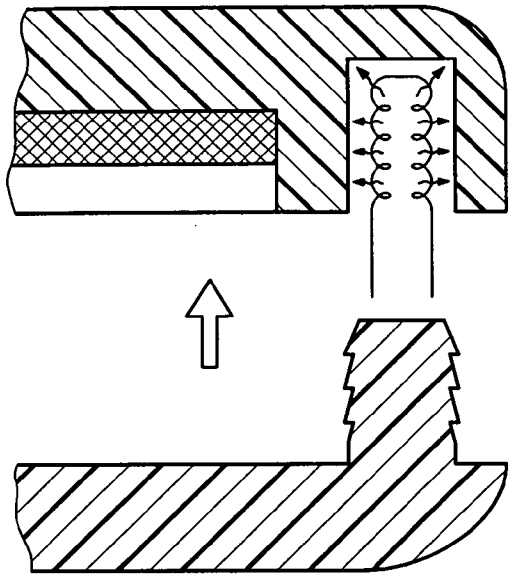


Fig. 11

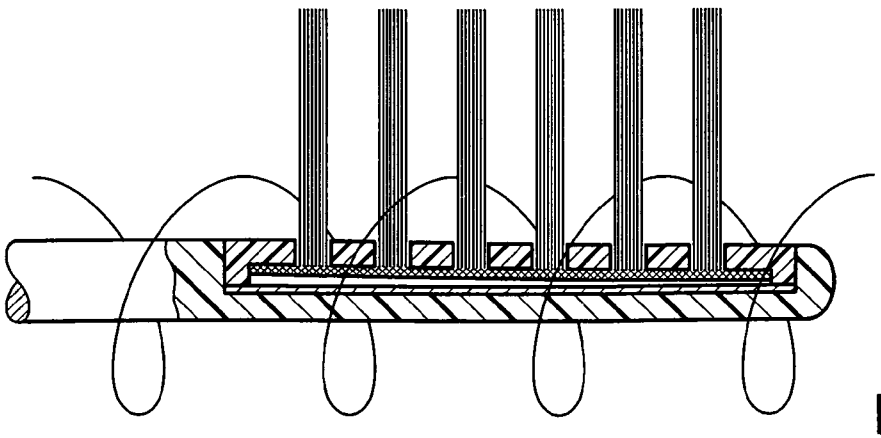


Fig. 12

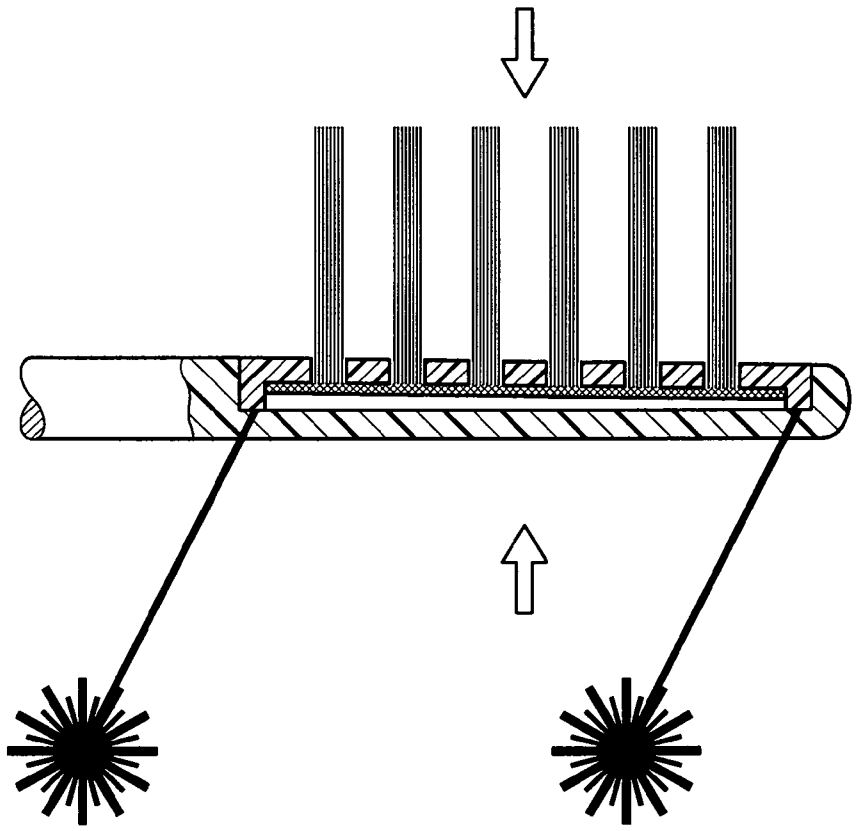


Fig. 13

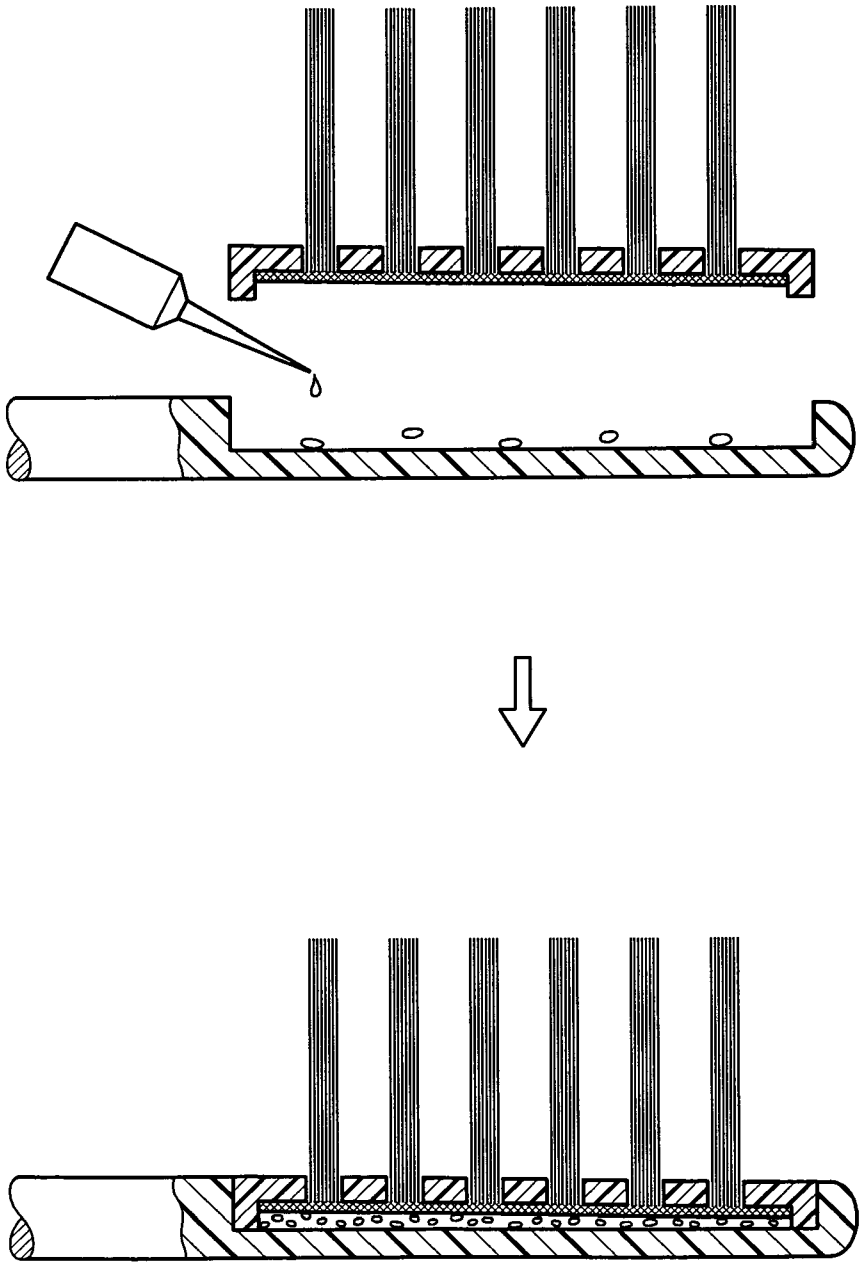


Fig. 14

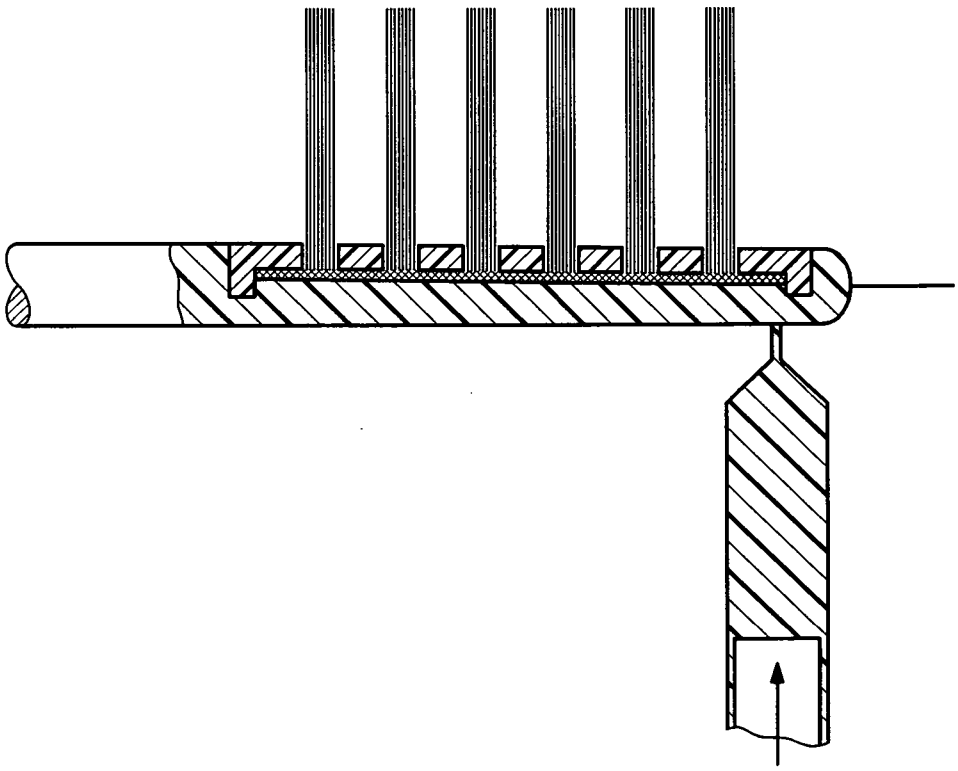


Fig. 15

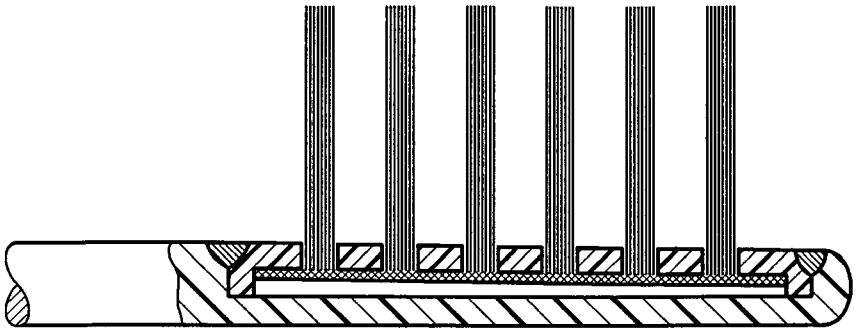


Fig. 16A

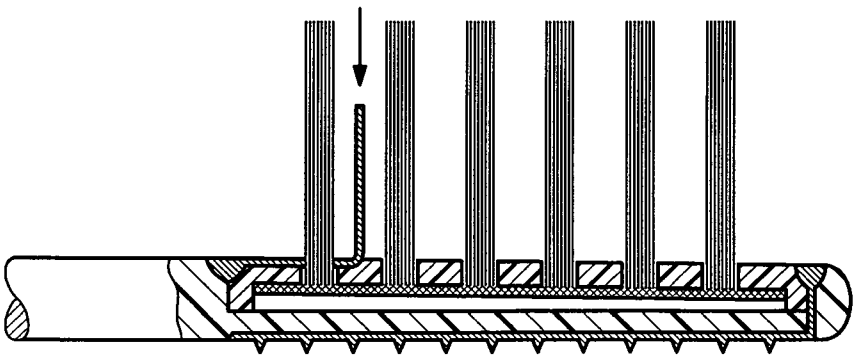


Fig. 16B

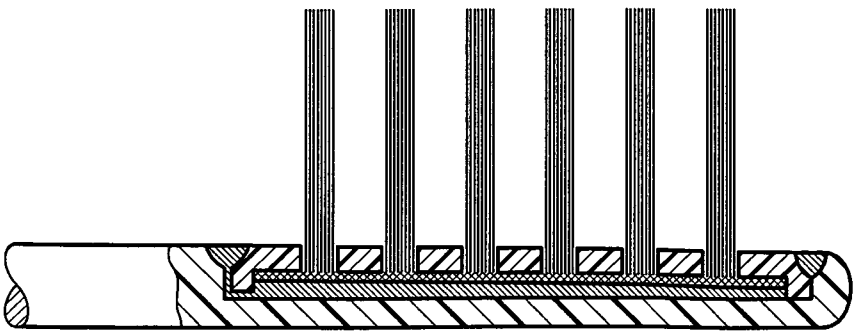


Fig. 16C

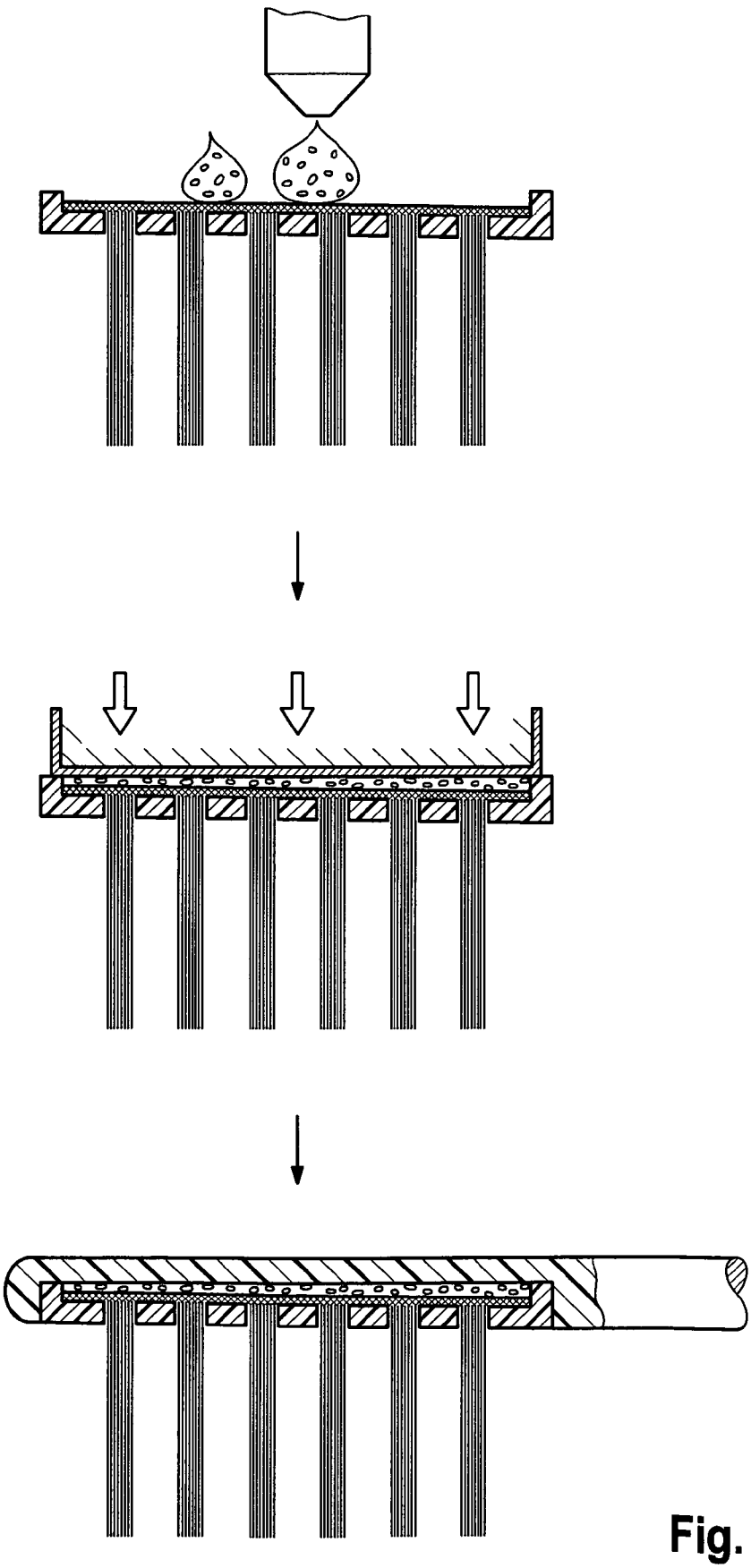


Fig. 17A

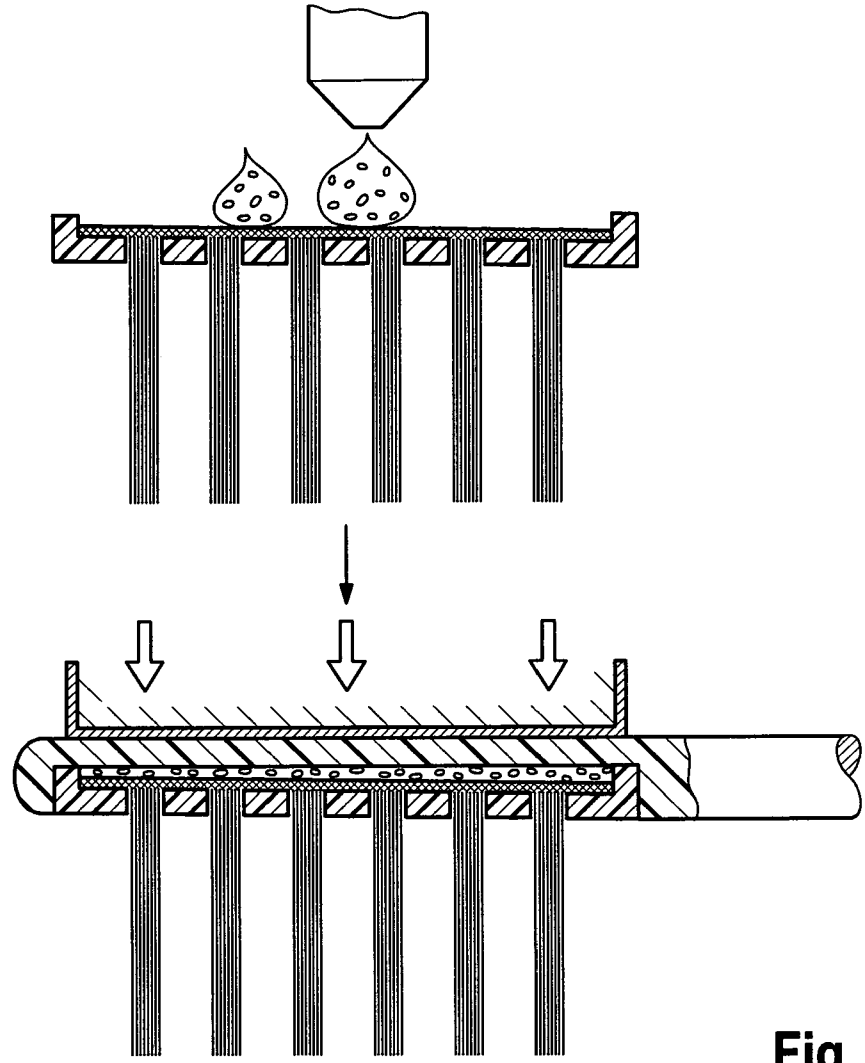


Fig. 17B

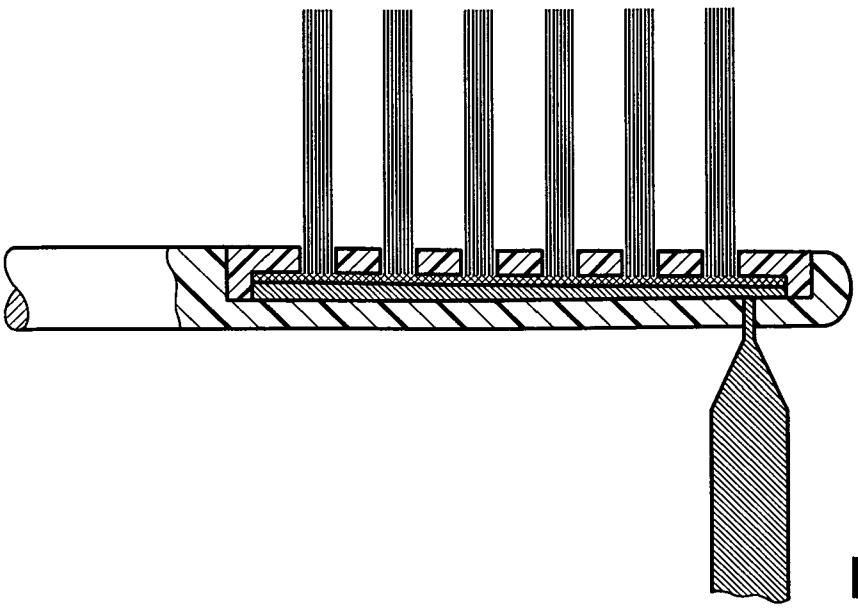


Fig. 17C

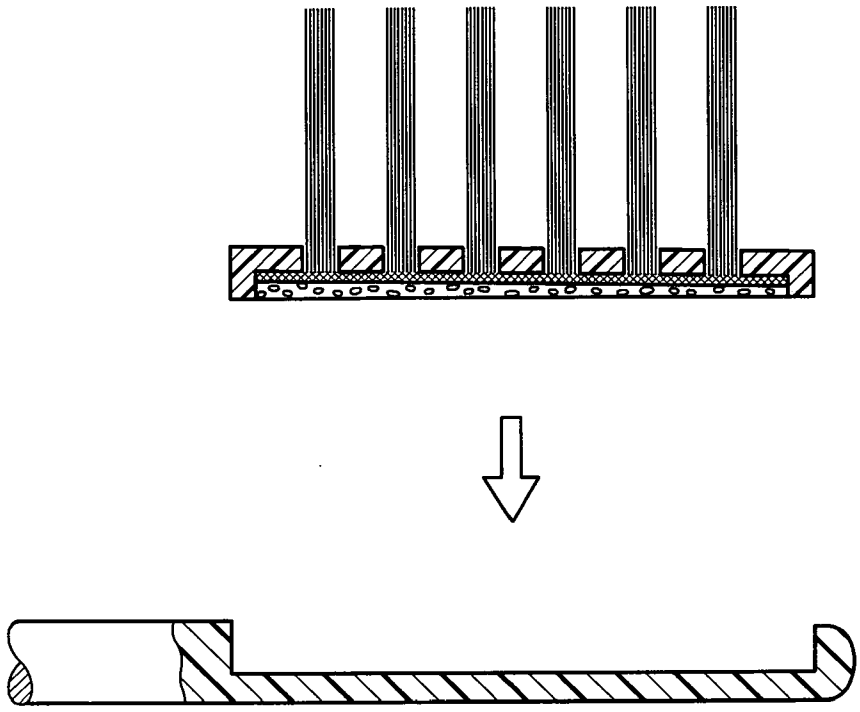


Fig. 18

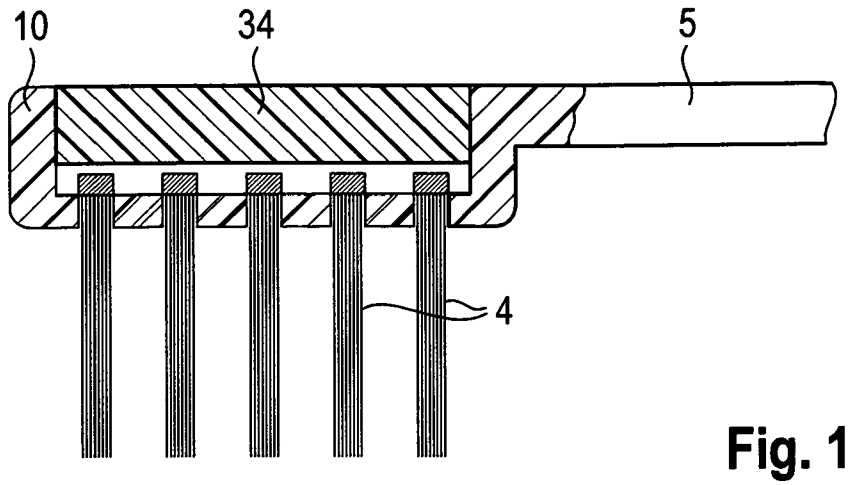



Fig. 19

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/007709

A. CLASSIFICATION OF SUBJECT MATTER
INV. A46B3/02 A46B3/06 A46B3/04 A46B7/00 A46D3/00
A46D3/04
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A46B A46D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | DE 10 2008 019111 A1 (BOUCHERIE NV G B [BE]) 22 October 2009 (2009-10-22) paragraphs [0031], [0034], [0035], [0036]; figure 1 | 1 |
| X | DE 200 06 311 U1 (BOUCHERIE NV G B [BE]) 9 August 2001 (2001-08-09) page 4, lines 6-27; figures 1-12 | 1 |
| X | EP 0 972 465 A1 (BOUCHERIE NV G B [BE]) 19 January 2000 (2000-01-19) paragraphs [0041], [0047]; figures 24,26-28 | 1 |
| X | DE 198 18 553 C1 (F A RUEB HOLDING GMBH [DE]) 5 August 1999 (1999-08-05) column 5, lines 18-28; claim 8; figures 3,4 | 1 |

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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| 24 March 2011 | 04/04/2011 |

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International application No
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