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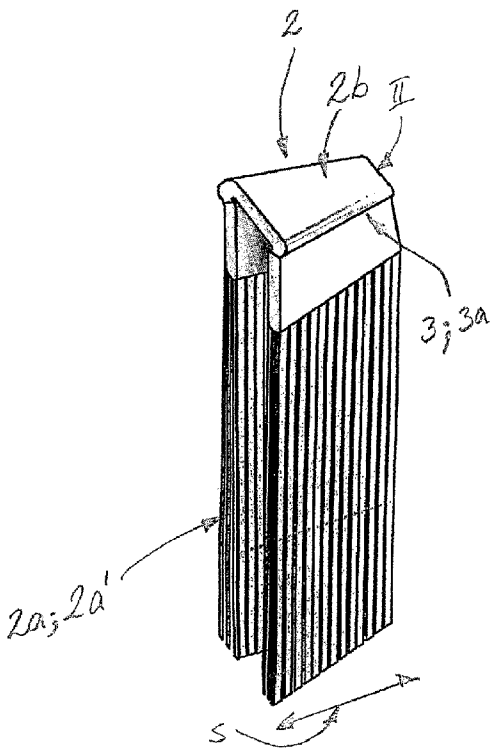
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(54) **Title:** BRUSH ELEMENT



(57) **Abstract:** The invention relates to a brush element which is intended for use, along with a number of others like it, especially in a circular brush rotatable around an axis of rotation, attachable to the frame of a sweeping machine, and including a head segment which comprises a substantially flat disc assembly provided with a coupling system for coupling brush elements (2) therewith. Bristles (2a') which make up a bristle segment (2a) for the brush element are coupled for an integral unit with a body segment (2b) connecting the same. The brush element has its bristles (2a1) coupled with the body segment (2b) in a configuration tapering in a substantially conical manner towards one end (II) of the body segment (2b) in its lengthwise direction (s) as viewed from above.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Brush element

The invention relates to a brush element which is intended for use, along with a number of others like it, especially in a circular brush rotatable around an axis of rotation, attachable to the frame of a sweeping machine, and including a head segment which comprises a substantially flat disc assembly provided with a coupling system for coupling the brush elements therewith. Bristles which make up a bristle segment of the brush element are coupled for an integral unit with a body segment connecting the same.

Circular brushes of the above type are traditionally constructed, on a principle illustrated for example in fig. 1, by means of a head segment made of flat plywood board having pairs of holes in inclined orientation provided across a zone sufficiently wide in radial direction extending from the hub of the head segment and included in its outer circle. The bristle formation of such a circular brush is obtained by threading bristles in through one hole of each pair of holes and out through the other, followed by securing the bristles in position, for example by means of a plywood or metal plate attached to the back of the head segment. A drawback in this type of solution is especially the inconvenience of its manufacture as the head segment must be first drilled to form an enormous number of paired holes, whereafter the bristles threaded therein must still be secured in position by means of a back cover. Another problem is the fact that the bristle segment in this type of circular brush is limited in terms of its density, because the hole formations can only accommodate a limited number of bristles. A further notable drawback is the fact that the foregoing type of circular brush is non-returnable, because removing the bristles from the head segment is not

economically viable as it makes more sense to replace the entire circular brush with a new one.

On the other hand, applying a so-called cartridge principle is currently known in the above context. This type of solutions for a circular brush, as shown for example in figure 2, include a head segment, which is manufactured e.g. from a rather thin sheet metal by moulding for forming therein a coupling system set in an inclined orientation with respect to the circular-brush attachment plane, which makes it possible to have such a coupling system removably fitted with bristle segments manufactured in a prefabrication process. Bristle segments used in this context are currently fabricated in such a way that the bristles are tied together at one end thereof, e.g. by means of a mouldable head plate, which is capable of being slid into slots functioning as the coupling system. In reference to what is shown e.g. in figure 3, one optional solution in this context is such that the head segment is provided with holes through which the bristles are threaded, followed by attaching to the back of the head segment a suitable clamping plate for securing the bristles in position. Further, US patent 3,678,530 discloses an alternative solution, in which the body segment, holding each bristle segment together, is composed of a three-component body assembly which is further fastened to the head segment of a circular brush.

Neither are this type of solutions, based on a so-called cartridge principle, highly functional in the currently used configuration thereof, which is mainly a result of the inconvenience and high cost of making moulded head segments and coupling systems included therein, due to an unacceptable amount of manual labour.

US patent publication 4,236,269 discloses another solution, in which the head segment of a circular brush comprises a flat disc assembly, which is integrally provided with a coupling system for connecting bristle segments therewith by a bayonet coupling principle. In this instance, the coupling system consists of wings formed on the head segments, between which the U-shaped bristle segments are capable of being secured. A particular problem with this type of solution lies in the fact that the bristle segments cannot be provided with sufficiently reliable locking, because there is no way of implementing any sort of actual locking in this particular solution. For this reason, the positions of bristle segments are also subject to some shifting on the circular brush, resulting firstly from manufacturing tolerances of the bristle segments' U-shape and secondly from the disc-carried wings bending in extended use. This aspect as such has a significant meaning also in terms of maintaining the integrity of a circular brush. Hence, in practice, the discussed type of solution is not capable of providing a circular brush that would be sufficiently reliable in operation.

A brush element according to the present invention is aimed at providing a decisive remedy for the above-described problems and at raising thereby the state of the art. In order to accomplish this objective, a brush element of the invention is principally characterized in that the brush element has its bristles coupled with the body segment in a configuration tapering in a substantially conical manner towards one end of the body segment in its lengthwise direction as viewed from above.

The most important benefits gained by a brush element of the invention should be mentioned to include especially its simplicity and efficiency of manufacture and construction,

which by virtue enables an extremely simple manufacturing process, as well as an extremely user-friendly way of installing and replacing brush elements in a circular brush. The brush element according to the invention enables the circular brush to be provided with a completely flat head segment, which is a significant factor in terms of reducing the manufacturing costs of a circular brush. It is further possible to manufacture the head segment of a circular brush not in metal but e.g. in plastics or wood, by using simple coupling means, which are exploited in a brush element of the invention as a preferred implementation and which are constituted either by clamping slots opening all the way to the edges in the head segment or else by trapezoidal cutouts present therein, in which the brush elements are insertable from above, whereby, in an assembled circular brush, the brush elements, by virtue of a tapering configuration thereof, brace themselves effectively as the circular brush is rotating. It is also possible to implement a brush element of the invention as a totally plastic structure, such that both its head segment and its bristles are manufactured in the same recyclable plastic-based material, such as polypropylene or the like, in which process it is further possible to make the brush element manufacture even more efficient by using prefabricated bristle segments, in which the bristles have their ends fused together.

The brush element according to the invention enables further a brush element with a metal-plated body segment, wherein the inclination of bristles with respect to the body segment, as required in a circular brush, is implemented by bending the metal-plated body segment to a U-configuration converging conically towards one of its ends in the longitudinal direction as viewed from above. In this connection, it is further possible to make use of

an implementation, in which the brush element's coupling means, in view of fastening it to the coupling system of a circular brush, are established simply by way of a shoulder bend present at the upper edge of its body segment.

Preferred embodiments for a brush element of the invention are defined in dependent claims directed thereto.

The invention will be described in detail in the following specification while making reference to the accompanying drawings, in which

figs. 1-3
depict a few traditional circular brush embodiments,

figs. 4a-4d
illustrate one preferred brush element according to the invention, 4a being a perspective view thereof, 4b being an end view thereof, 4c being a plan view o a head segment used in connection therewith, and 4d being a cross-sectional view of a circular brush consisting of brush elements as described above,

figs. 5a-5d
illustrate one alternative brush element of the invention in views similar to those shown in fig. 4,

fig. 6
is an end view of yet another preferred brush element of the invention,

fig. 7
is another end view of one brush element which is an alternative to that shown in fig. 6, and

figs. 8 and 9
are perspective views of still some alternative brush element configurations.

The invention relates to a brush element which is intended for use, along with a number of others like it, especially in a circular brush rotatable around an axis of rotation y, attachable to the frame of a sweeping machine, and including a head segment A which comprises a substantially flat disc assembly provided with a coupling system K for coupling brush elements 2 therewith. Bristles 2a' which make up a bristle segment 2a for the brush element are coupled for an integral unit with a body segment 2b connecting the same. The brush element has its bristles 2a', e.g. in reference to figs. 4a, 4b and 5a, 5b, coupled with the body segment 2b in a configuration tapering in a substantially conical manner towards one end II of the body segment 2b in its lengthwise direction s as viewed from above.

The brush element has its body segment 2b further provided with coupling means 3 for fastening the brush element to the coupling system K present in the head segment A of a circular brush, said means being provided by way of shoulder members 3a protruding from the body segment 2b on the opposite sides thereof.

In particular reference to figs. 4d and 5d, the bristles 2a' of a bristle segment are set, as viewed in lateral direction, relative to the body segment 2b at an angle a which deviates substantially from the perpendicular

direction, as opposed to the traditional solutions shown in figs. 2 and 3, which necessitate the use of an edge-bent head segment or separate elbow joint connections.

In particular reference to the embodiments shown in figs. 5a-5d and 9, the brush element has its body segment 2b manufactured in a plastic-based material, in which the bristles 2a' of a bristle segment are anchored by one end thereof.

On the other hand, in reference to the preferred embodiments shown e.g. in figs. 4a-4d, 6, 7 and 8, the brush element's 2 body segment comprises a thin metal plate, such as a piece of sheet metal or the like, in which the bristle segment's bristles 2a' are anchored by bending the body to what in cross-section is substantially a U-shape. The bristle segment has its bristles 2a', as viewed in lateral direction, set relative to the body segment at an angle a, which deviates substantially from the perpendicular direction, by bending the metal-plated body segment 2b to a U-shape tapering in a substantially conical manner towards one II of its ends in its lengthwise direction s as viewed from above.

In a type of embodiment as described above, the brush element's coupling means 3 for fastening it to the circular brush's coupling system K are provided by way of a shoulder bend 3a present at the top edge of its body segment 2b.

In a further preferred embodiment, the brush element has the bristles 2a' of its bristle segment produced at least partially by using bristles made of a plastic-based material, such as polypropylene, polyamide or the like.

In yet another preferred embodiment, the brush element has the bristles 2a' of its bristle segment produced at least partially by using bristles made of a metal material, such as steel. Thus, specifically in reference to the embodiments shown in figs. 4a, 6 and 7, the bristle segment's bristles 2a' are produced at least partially by using bristles extending in a configuration flat in cross-section.

In a still further preferred embodiment, the bristles 2a' of the brush element's bristle segment enable the use of longitudinally corrugated, spirally twisted and/or the like bristles (not specifically shown in the drawings).

Fig. 6 shows in an end view a brush element of the same type as that shown in fig. 4a, wherein the head segment has its side walls in a substantially vertical orientation with respect to the head segment's top. In the brush element shown in fig. 7, the head segment's side walls are slightly inclined towards each other, whereby the bristles also extend slightly towards each other. Furthermore, fig. 8 shows in a perspective view an implementation, which is alternative to the brush elements shown e.g. in figs. 6 and 7 and in which the bristle segment's bristles consist e.g. of straight or corrugated steel wires. Still, fig. 9 shows an implementation, which is alternative e.g. to the brush element shown in fig. 5a provided with a similar head segment and in which the bristles are coupled with the head segment in such a way that the bristle segment has what is referred to as an opened-up or V-shaped bottom end.

It is clear that the invention is not limited to the embodiments described or specified above, but it can be varied within the basic inventive concept in accordance with given applications and conditions. Hence it is first

of all obvious that the head segment may have a shape other than what has been described, depending on how it is coupled in any particular case with the brush frame of a sweeping machine. In addition, its dimensions and appearance are naturally subject to variations, depending on the dimensions of each brush cartridge to be manufactured and on materials used therefor. Specifically, when making use of a plastic-built body segment for the brush element, its manufacturing is possible e.g. by injection moulding from a chemically setting two-component material, such as polyprourethane, epoxy or the like, or else e.g. from a substantially rigid-structured plastic, metal, ceramic, composite material and/or the like. Naturally, it is further possible to manufacture brush elements of the invention, regarding both the body segment and bristle arrangements thereof, from essentially one and the same recyclable plastic-based material, such as polypropylene, or to construct the bristle segments by making use of dissimilar types of bristles, such as those of plastic and steel, etc. Of course, it is also clear that the coupling systems and means can be provided with mating surfaces in most diverse forms for effecting the coupling and clamping of bristle segments with a head segment.

Claims

1. A brush element which is intended for use, along with a number of others like it, especially in a circular brush rotatable around an axis of rotation (y), attachable to the frame of a sweeping machine, said circular brush including a head segment (A) which comprises a substantially flat disc assembly provided with a coupling system (K) for coupling brush elements (2) therewith, and bristles (2a') which make up a bristle segment (2a) for said brush element are coupled for an integral unit with a body segment (2b) connecting the same, **characterized** in that the brush element has its bristles (2a') coupled with the body segment (2b) in a configuration tapering in a substantially conical manner towards one end (II) of the body segment (2b) in its lengthwise direction (s) as viewed from above.

2. A brush element as set forth in claim 1, the body segment (2b) of which is provided with coupling means (3) for fastening the brush element to the coupling system (K) present in the head segment (A) of a circular brush, **characterized** in that the coupling means (3) are provided by way of shoulder members (3a) protruding from the body segment (2b) on the opposite sides thereof.

3. A brush element as set forth in claim 1 or 2, **characterized** in that the bristles (2a') of a bristle segment are set relative to the body segment (2b) at an angle (a) which deviates substantially from the perpendicular direction.

4. A brush element as set forth in any of preceding claims 1-3, **characterized** in that its body segment (2b) is manufactured in a plastic-based material, in which the

bristles (2a') of a bristle segment are anchored by one end thereof.

5. A brush element as set forth in claim 1 or 2, wherein the brush element's (2) body segment comprises a thin metal plate, such as a piece of sheet metal or the like, in which the bristle segment's bristles (2a') are anchored by bending the body to what in cross-section is substantially a U-shape, **characterized** in that the bristle segment has its bristles (2a') set relative to the body segment at an angle (a), which deviates substantially from the perpendicular direction, by bending the metal-plated body segment (2b) to a U-shape tapering in a substantially conical manner towards one (II) of its ends in its lengthwise direction (s) as viewed from above.

6. A brush element as set forth in claim 5, **characterized** in that the brush element's coupling means (3) for fastening it to the circular brush's coupling system (K) are provided by way of a shoulder bend (3a) present at the top edge of its body segment (2b).

7. A brush element as set forth in any of preceding claims 1-6, **characterized** in that the bristle segment's bristles (2a') are produced by using bristles made of a plastic-based material, such as polypropylene, polyamide or the like.

8. A brush element as set forth in any of preceding claims 1-7, **characterized** in that the bristle segment's bristles (2a') are produced at least partially by using bristles made of a metal material, such as steel.

9. A brush element as set forth in any of preceding claims 8, **characterized** in that the bristle segment's bristles (2a') are produced at least partially by using bristles extending in a configuration flat in cross-section.

10. A brush element as set forth in any of preceding claims 7-9, **characterized** in that the bristle segment's bristles (2a') are produced by using longitudinally corrugated, spirally twisted and/or the like bristles.

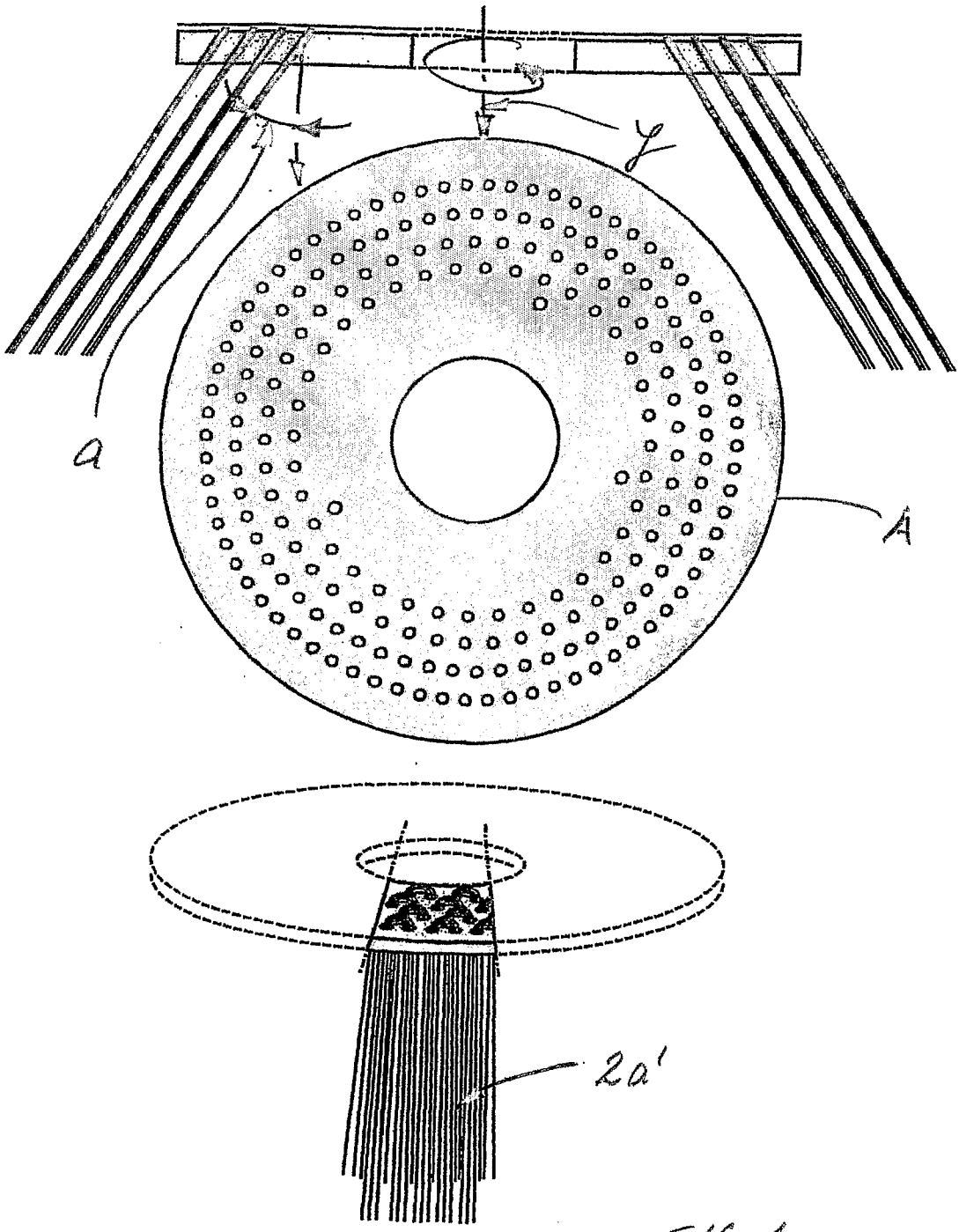


FIG. 1
Prior Art

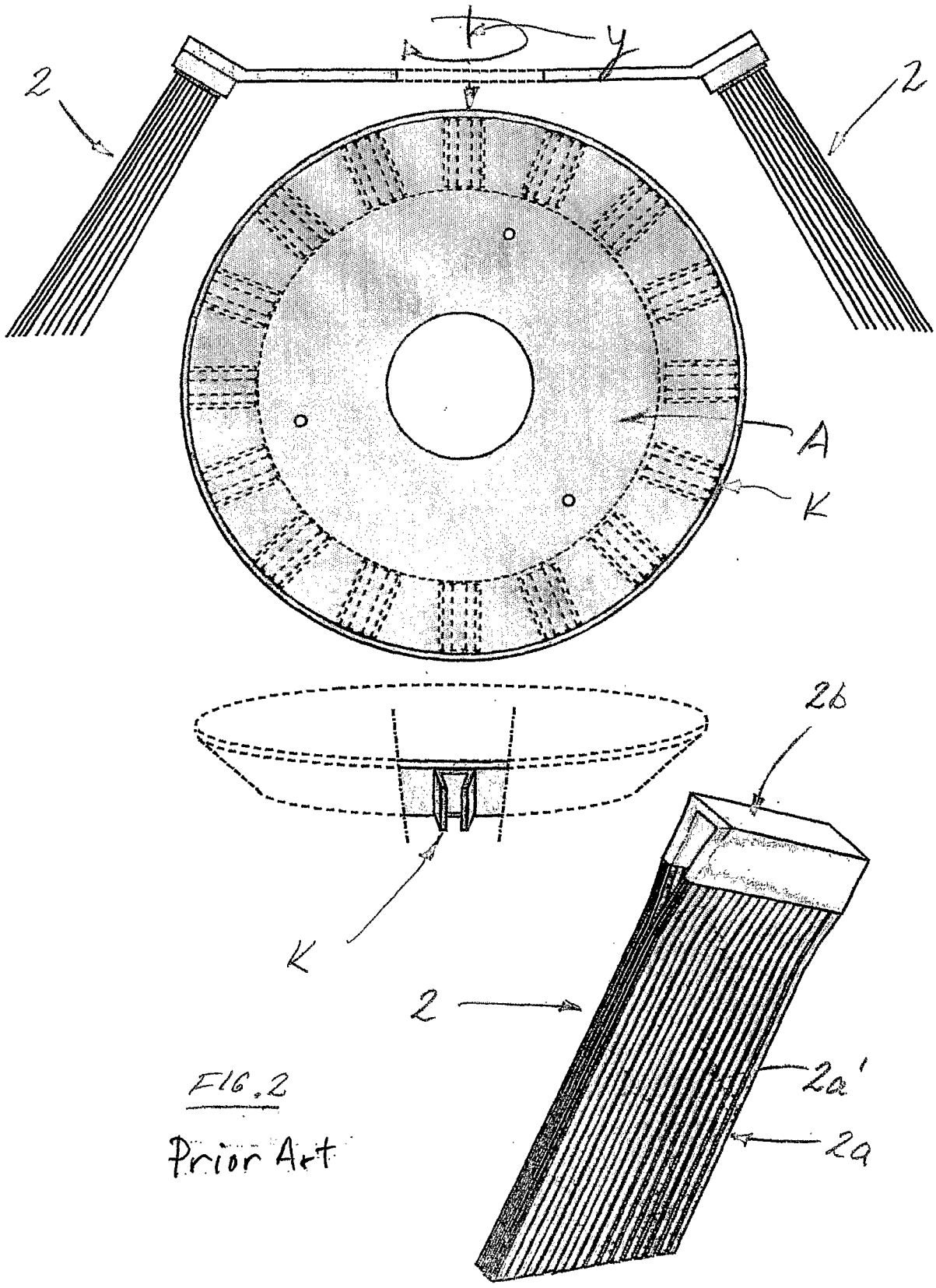


FIG. 2
Prior Art

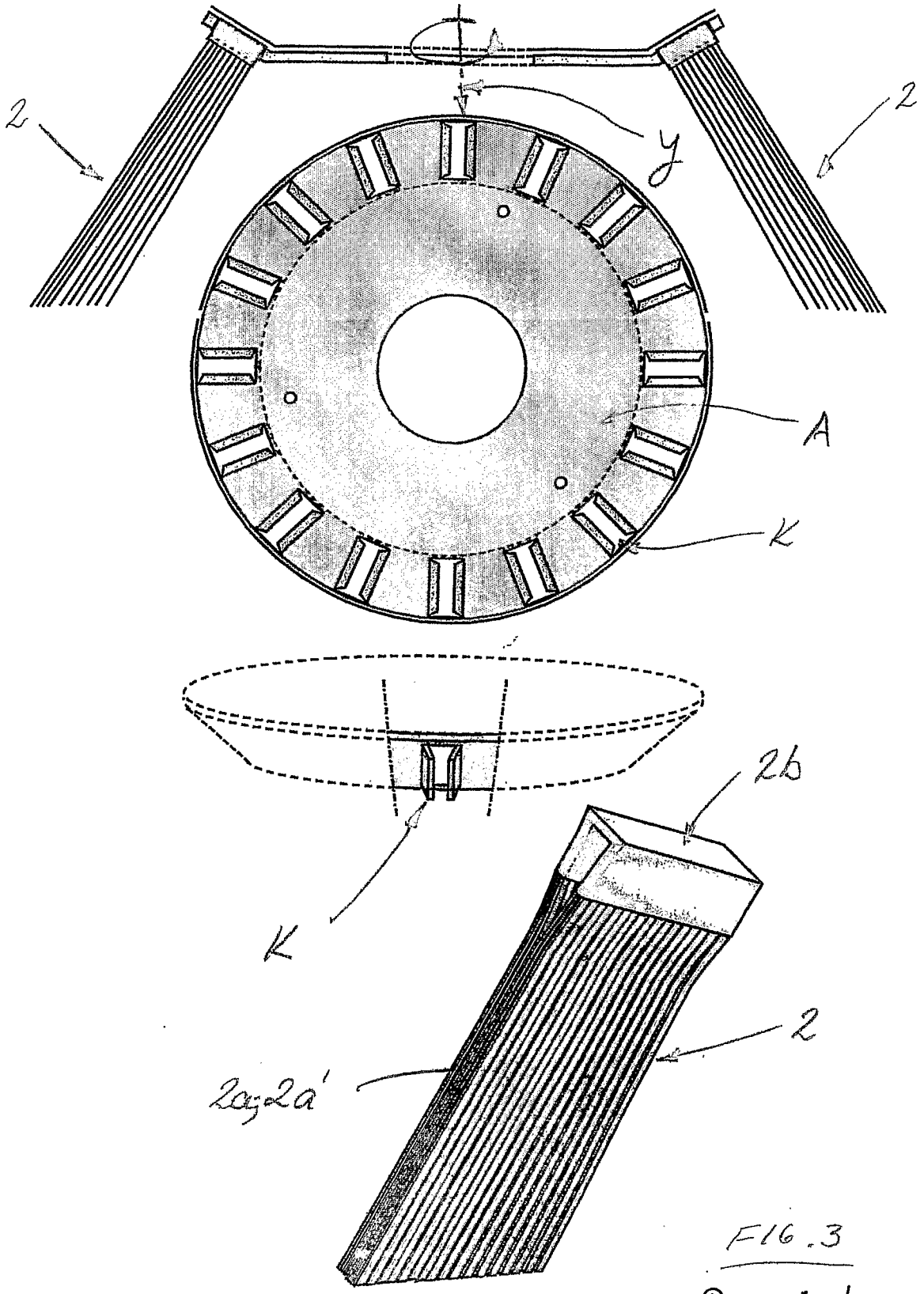


FIG. 3
Prior Art

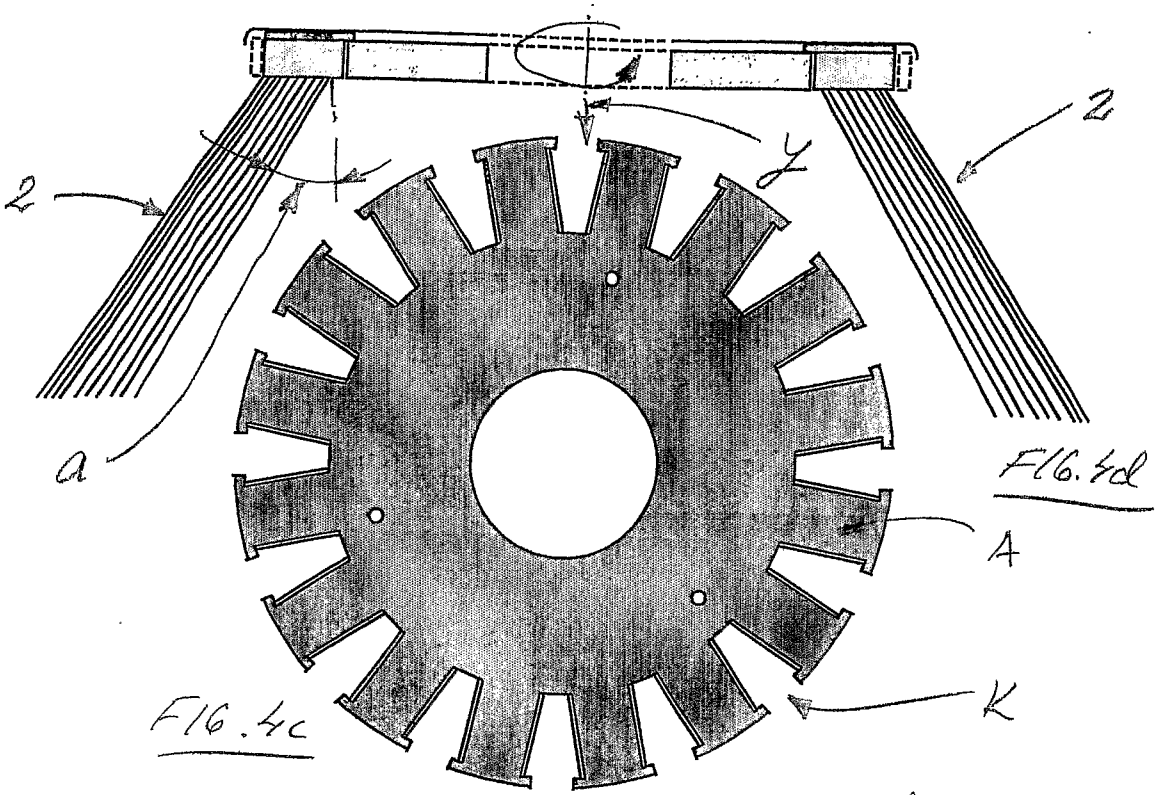


FIG. 4d

FIG. 4c

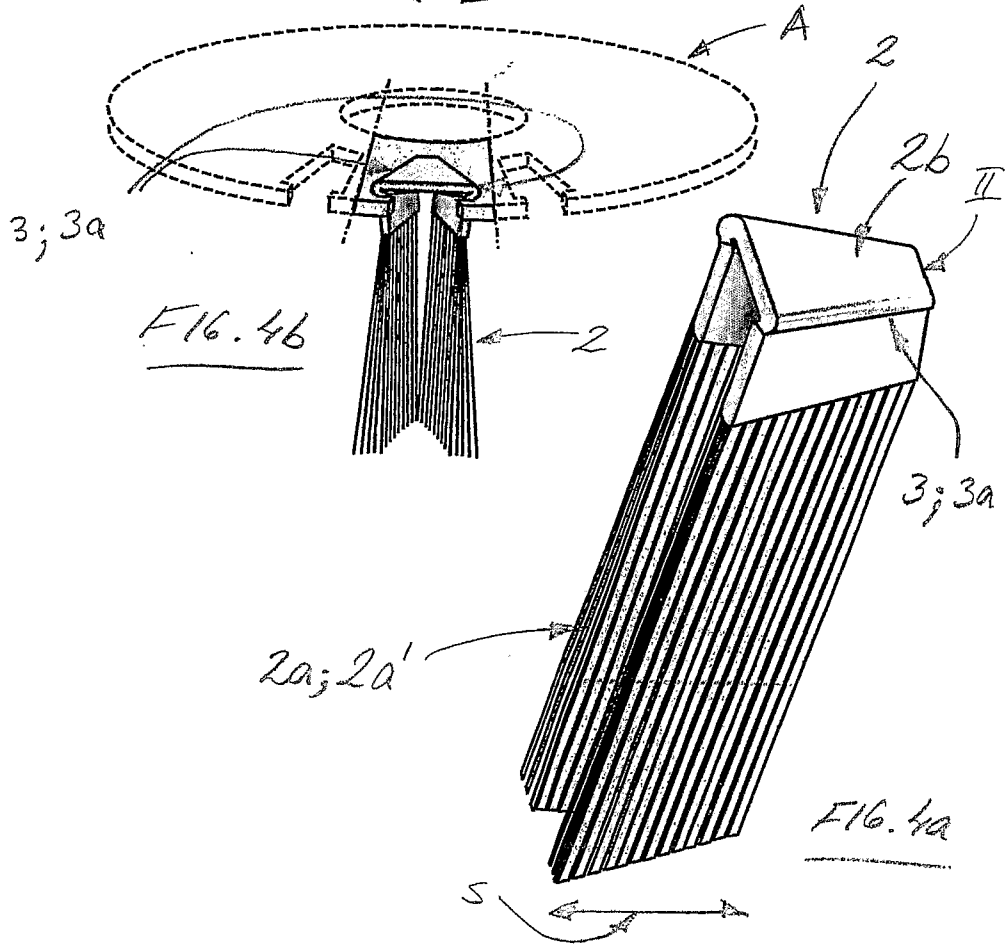


FIG. 4b

FIG. 4a

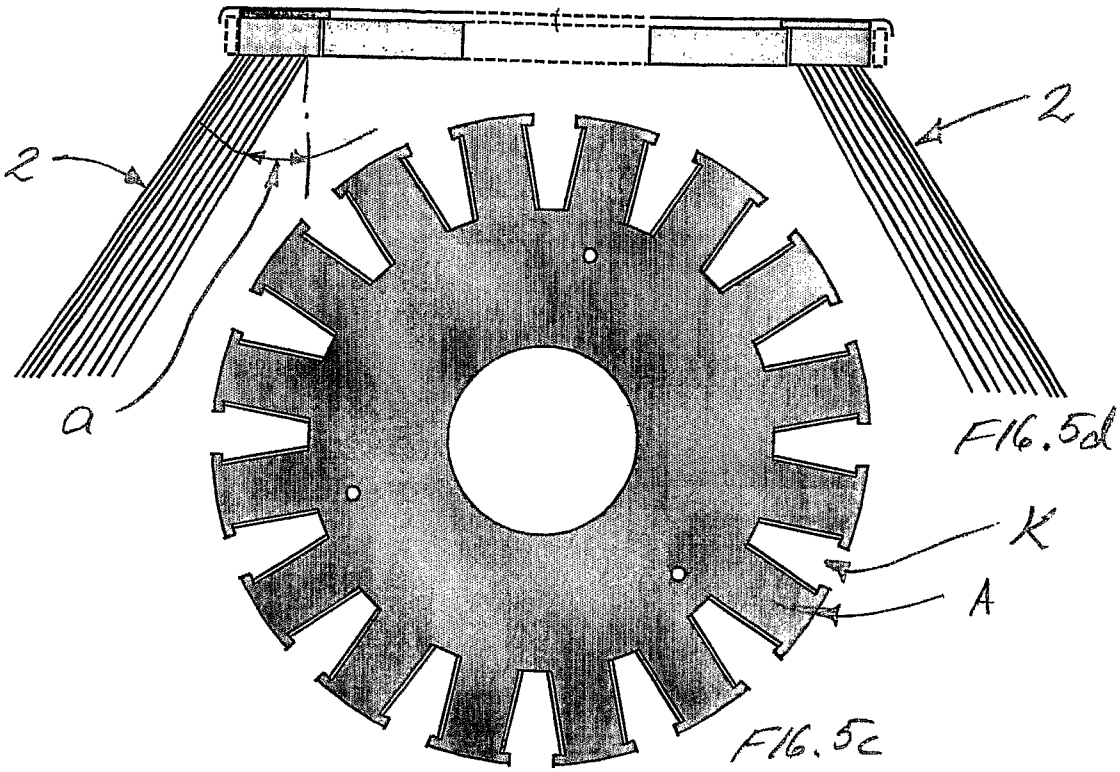


FIG. 5d

FIG. 5c

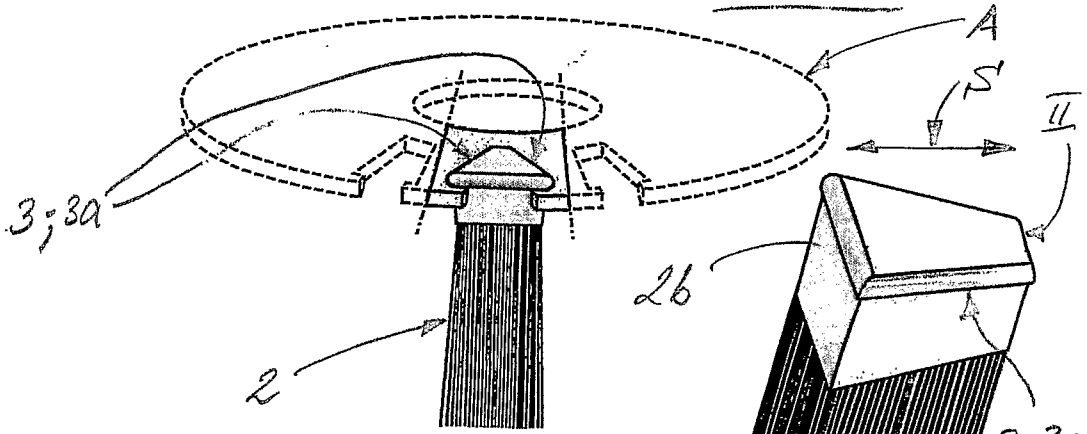


FIG. 5b

FIG. 5a

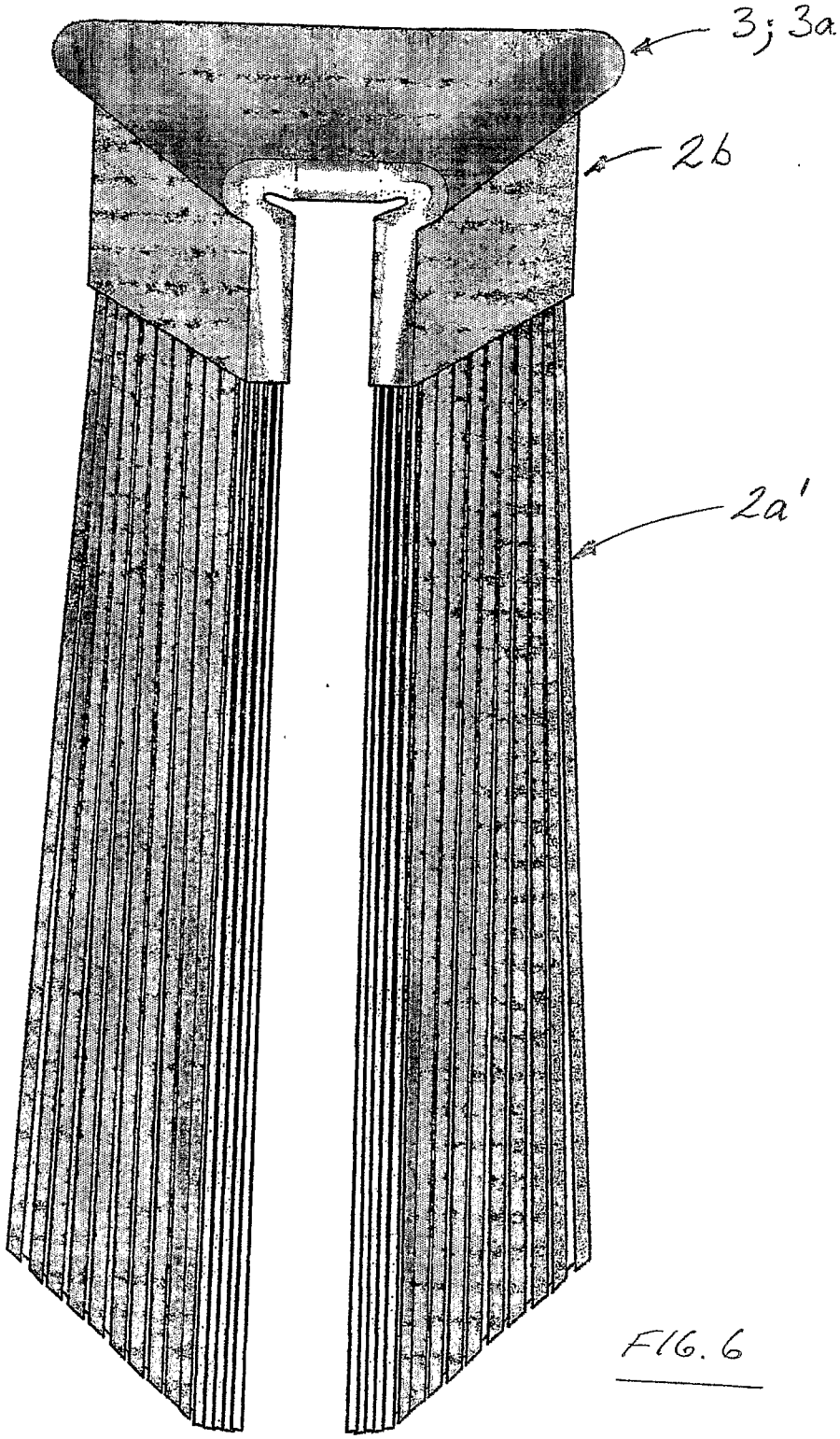


FIG. 6

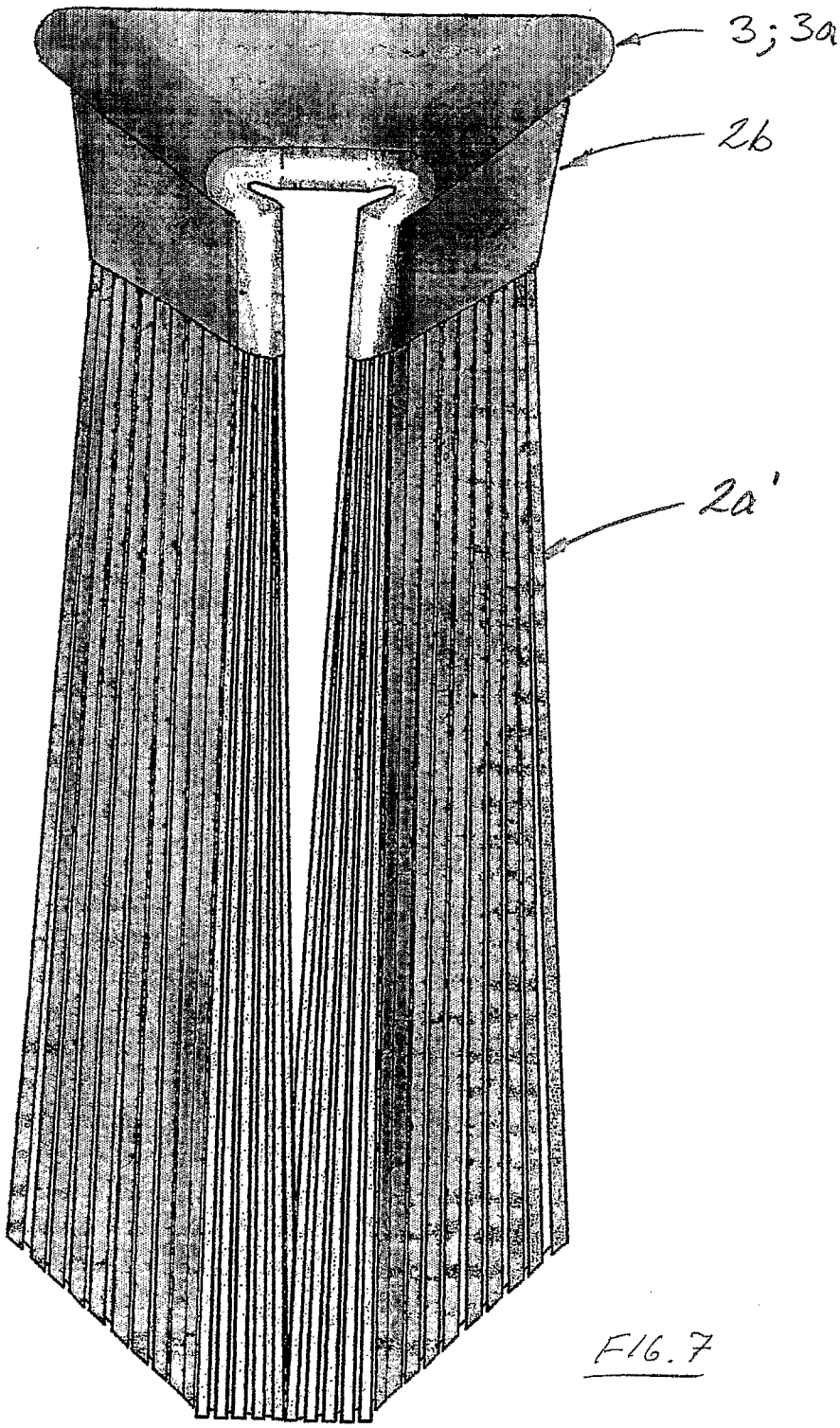


FIG. 7

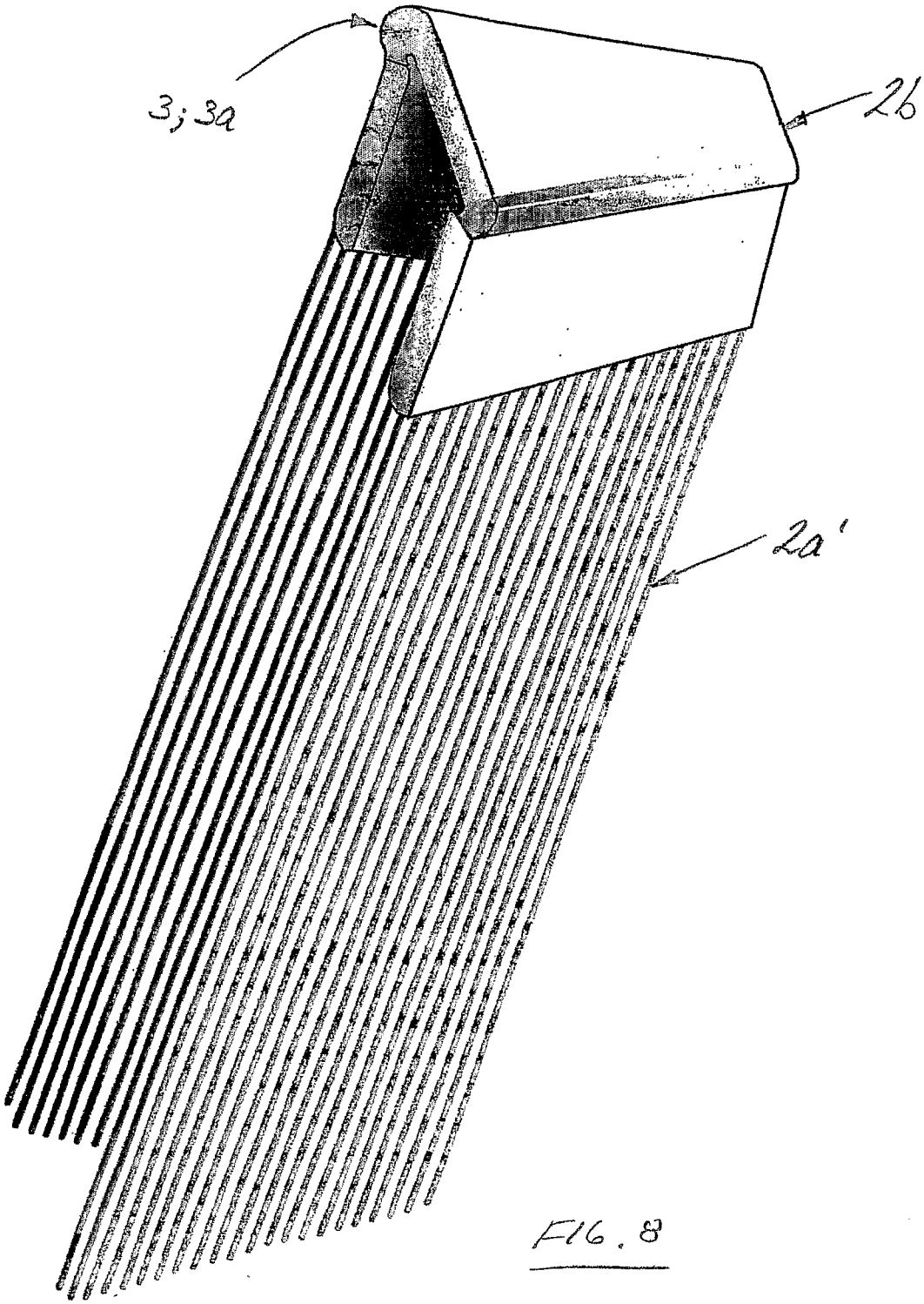


FIG. 8

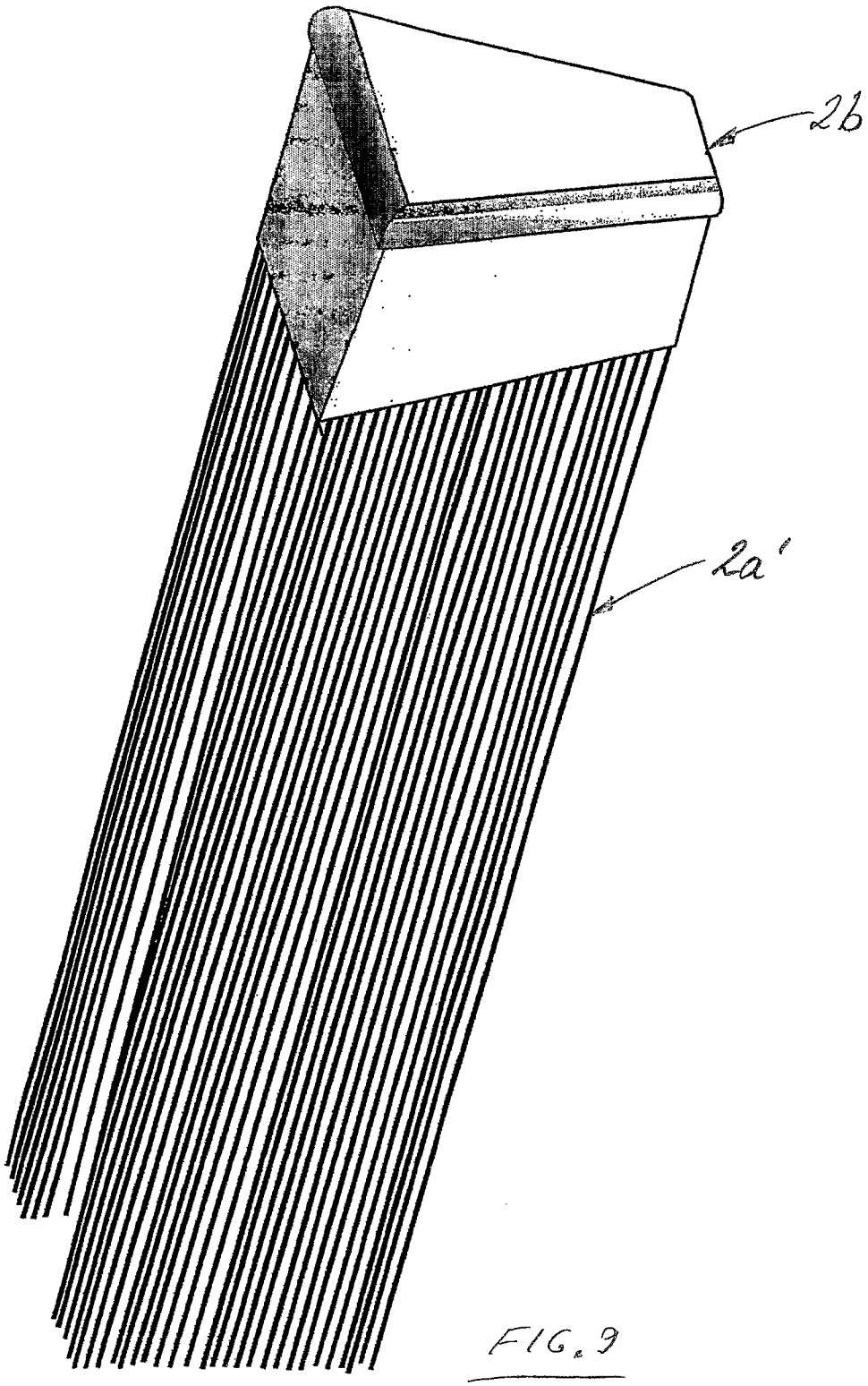


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2006/000417

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
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)

IPC: A46B, A47L

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4236269 A (T.S. BLOCK), 2 December 1980 (02.12.1980), figure 1.2, abstract ---	1-10
A	EP 1618814 A1 (KOTI ONROEREND GOED B.V.), 25 January 2006 (25.01.2006), figures 3E-4C, abstract ---	1-10
A	FR 2614188 A1 (ROZIER, H.), 28 October 1988 (28.10.1988), figures 1,4-9, abstract ---	1-10
A	EP 1623652 A1 (KOTI ONROEREND GOED B.V.), 8 February 2006 (08.02.2006), figures 2-5, abstract ---	1-10

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Date of the actual completion of the international search	Date of mailing of the international search report
4 April 2007	05 -04- 2007
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Tommy Blomberg / MRo Telephone No. +46 8 782 25 00

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Cited literature, if any, will be enclosed in paper form.

US	4236269	A	02/12/1980	CA	1152268	A	23/08/1983
EP	1618814	A1	25/01/2006	NONE			
FR	2614188	A1	28/10/1988	NONE			
EP	1623652	A1	08/02/2006	NONE			