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(54) **Method for the production of anchorless brushes, more in particular toothbrushes**

(57) Method for the production of anchorless brushes, more in particular toothbrushes, made out of a carrier element (1) provided with holes (2) throughout in which fibers (3) are introduced that on one side of the carrier element (1) are fused together and are at least partly covered by a covering part (11) whereby the method comprises the following steps:
- provide a carrier element (1) with holes throughout;
- introduce fibers (3) into the holes (2) of the carrier element (1) with one extremity protruding through the carrier element (1);
- fuse the protruding extremities (4) of the fibers (3) by applying heat to these extremities until they melt;
- inspect the molten fiber mass (7)in molten condition in a non-destructive way; and,
- cover the fiber mass (7) by a covering part (11).

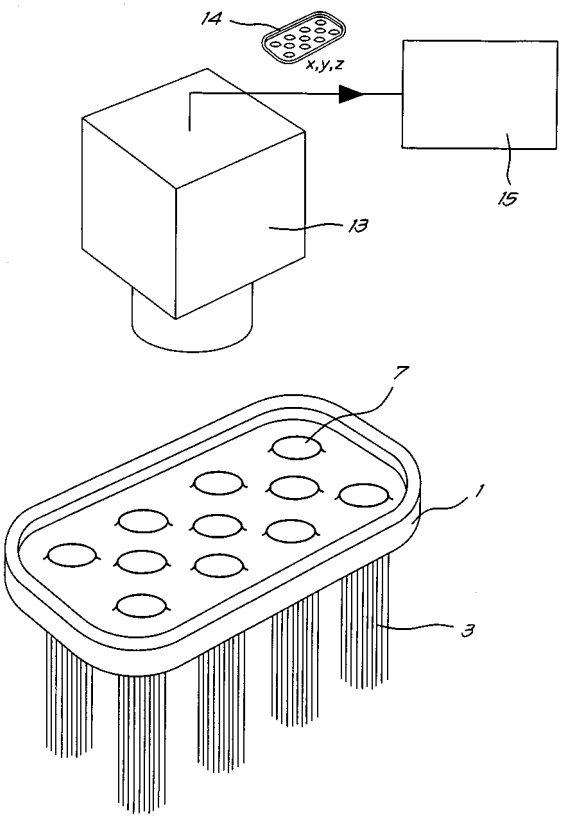

Fig.9

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Description

[0001] The present invention relates to a method for the production of anchorless brushes, more in particular toothbrushes.

[0002] It is known that toothbrushes are made of a handle to which a carrier element is provided with holes throughout in which fibers are introduced that on one side of the carrier element are attached to the carrier element using metallic fixation means referred to as anchors, which are covered afterwards by a cover part.

[0003] In recent years, anchorless toothbrushes made without the use of metallic fixation means for the fibers have gained morepopularity.One method for producing such brushes without metallic fixation means consists of making use of a carrier element with openings throughout, in which fibers can be shoved. These fibers are linked to each other on one side of the carrier element by fusing the extremities of the fibers by means of heat.

[0004] The carrier element with the fibers can be linked in a non detachable fashion with a toothbrush body, or a toothbrush body can be created onto the carrier element, for instance by injection moulding.

[0005] The toothbrush body will then at least partly cover that side of the carrier element where the fibers are linked to one another.

[0006] Production techniques for producing such brushes were already described in the following patents of the present applicant : EP 0.972.464 en EP 0.972.465.

[0007] It is important for the quality of the toothbrush that the fibers are attached firmly to the brush, so as to avoid the detachment of fibers during use of the toothbrush.

Detachment of the fibers during use can lead to swallowing of the fibers by the user, and to further complications.

[0008] To check whether the fibers are linked correctly to the toothbrush, one can carry out discrete destructive tests by pulling out the fibers throughout the carrier element which holds the fibers and by measuring the force required to do so.

[0009] A disadvantage of this known method is that it destroys the products that have been tested and does not assure an even distribution of the force needed to detach the fibers from the toothbrushes that have not been tested.

[0010] If the molten fiber mass is covered by injection moulding, , it is necessary to avoid that the mass of added plastic penetrates through the molten fiber mass and protrudes between the fibers of the brush.

[0011] This would not only adversely affect a proper anchoring of the fibers to the toothbrush but would also adversely affect the appearance of the brush on the opposite side of the injection moulded cover.

[0012] One way of inspecting such a toothbrush after the injection moulding step would be to visually inspect every toothbrush produced to verify that the molten plastic does not protrude on the opposite side of the toothbrush holder.

[0013] A disadvantage of such a visual inspection method is that it is not only tedious and laborious, but also unreliable since human observation is not always consistent.

[0014] Another disadvantage of such a visual inspection is that it does not guarantee the quality of the fusion of the fibers since the extremities of the fibers that are fused together are not visible since they are covered by the covering part.

[0015] It is therefore an objective of the invention to give a solution to one or more of the above mentioned disadvantages.Since the fibers are fused to each other by means of heat, and since it was discovered that the shape and the dimensions of the layer of molten fiber material are directly linked to the strength of the link of the fibers, it is possible to check the uniformity of the pulling force required to detach the fibers from the brush by inspecting the shape and dimensions of the layer of molten fiber material.

[0016] To this end the present invention provides a method for the production of anchorless brushes, more in particular toothbrushes, made out of a carrier element provided with holes throughout in which fibers are introduced which are fused together on one side of the carrier element and are at least partly covered by a covering part whereby the method comprises the following steps:

- provide a carrier element with holes throughout;
- introduce fibers into the holes of the carrier element with one extremity protruding through the carrier element;
- fuse the protruding extremities of the fibers by applying heat to these extremities until they melt;
- inspect the molten fiber mass in molten condition in a non-destructive way; and,
- cover the fiber mass by a covering material.

[0017] It is particularly advantageous to integrate this inspection of the molten fiber mass into the production steps of the toothbrush, since in this way destruction of good brushes and materials is avoided.

[0018] Another advantage of this non-destructive inspection is that it enables the inspection of all the fused extremities of the fibers without destroying them.

[0019] The inspection of the molten fiber mass can happen in a contactless way, or in a way that makes contact with the molten material. It is clear that a contactless inspection protects the inspection instruments against contaminations from the inspected materials, preventing that these instruments need to be cleaned.

[0020] An advantage of contact making inspection means is that they are generally less complex and less costly.

[0021] With the intention of better showing the characteristics of the method for producing anchorless brushes according to the invention, hereby, as an example without any limitative character, preferred production methods are described, with reference to the accompanying draw-

ings, wherein:

figure 1 and 2 schematically represent two successive steps of the method according to the invention;
figures 3 and 4 are variants of the step represented in figure 2;
figures 5 to 8 represent different types of finished toothbrushes;
figure 9 represents a further step of the method of the invention following the step represented in figure 2;
figures 10 to 12 represent variants of the step of the method represented in figure 9;
figure 12 is figure 11 with comparison of the rod position to a reference position.

[0022] figure 1 represents a first step of the method for producing toothbrushes starting from a carrier element 1 in the form of a plate provided with openings 2 throughout the plate, wherein fibers 3 or fiber bundles have been shoved through the openings 2 in such a way that the fibers protrude from either side of the plate, respectively with a short part 4 and a long part 5.

[0023] In a following step represented in figure 2, the extremities 6 of the short part are fused together by applying heat to these extremities so that these extremities 6 are fused into a molten fiber mass 7.

[0024] In the example shown in figure 2 the molten fiber mass 7 has the shape of one continuous film 8.

[0025] Alternatively the molten fiber mass 7 can have the shape of discrete islands 9 as represented in figure 3, or can have a defined topography 10 as represented in figure 4.

[0026] The carrier element 1 can in an alternative embodiment be covered by a covering part 11 that is part of a handle 12 as represented in figure 5 and 6, where the covering part 11 in the case of figure 5 is a preformed platelet which is fixed on the carrier element 1 and which in the case of figure 6 is a platelet which has been obtained by injection moulding.

[0027] In another alternative embodiment the fused extremities 6 can be covered by a part of the handle 12 which acts as a covering part 11, whereby the handle 12 can either be of a preformed type as represented in figure 7, or can be obtained by injection moulding as in figure 8.

[0028] Following the steps of the method of the invention as represented in figures 1 and either one of the figures 2 to 4, a further step of the method is the non-destructive inspection of the molten fiber mass 7, while this mass 7 is still in a molten condition.

[0029] One way of executing such a non-destructive inspection is shown in figure 9.

[0030] Figures 9 and 10 show a contactless inspection of the molten fiber mass 3 by means of an image recorder 13 which records an image of the molten fiber mass by means of triangulation techniques, whereby a recorder 13 registers a cloud of digital measuring points of the surface of the molten figure mass, and compares them with a reference image in a digital processing unit 15, as illustrated in figure 9 for three-dimensional images 14 and in figure 10 for two-dimensional images 16

[0031] Depending on the tolerances set, the carrier element with the fused fibers can be accepted or refused and removed from the production process.

[0032] Another contactless way is the inspection by means of a camera which records an image of the molten fiber mass and compares it with a reference image in a digital way by a processing unit 15, as illustrated in figure 10.

[0033] The image may comprise the colors of molten fiber mass, or may be a heat image which shows the heat distribution in the molten fiber mass, which can be a measure of the quantity of molten fiber mass and of its distribution.

[0034] As illustrated in figure 11 the inspection of the molten fiber mass 7 can also happen through contact with the surface, for instance by means of one or more measuring rods 17, which make contact with the surface of the molten fiber mass 7. The position 18 of each measuring rod 10 can then be compared with a reference position in a processing unit 15, as illustrated in figure 12.

[0035] After the inspection the product is left undamaged, and it can be linked to the covering part, either immediately, or at a later time. The carrier elements with fibers may also be sold as loose parts, with the intention for the end user to mount it onto a handle 12 so as to cover the molten fiber mass 7.

Claims

1. Method for the production of anchorless brushes, more in particular toothbrushes, made out of a carrier element (1) provided with holes (2) throughout in which fibers (3) are introduced that on one side of the carrier element (1) are fused together and are at least partly covered by a covering part (11) whereby the method comprises the following steps:

   - provide a carrier element (1) with holes throughout;
   - introduce fibers (3) into the holes (2) of the carrier element (1) with one extremity protruding through the carrier element (1);
   - fuse the protruding extremities (4) of the fibers (3) by applying heat to these extremities until they melt;
   - inspect the molten fiber mass (7)in molten condition in a non-destructive way; and,
   - cover the fiber mass (7) by a covering part (11).

2. Method according to claim 1, **characterized in that** the non-destructive inspection happens in a contactless way.

3. Method according to claim 1, **characterized in that**

the non-destructive inspection happens in a contact making way.

4. Method according to claim 1, **characterized in that** the inspection happens according to the colors of the molten fiber mass (7).

5. Method according to claim 1, **characterized in that** the inspection happens according to the shape of the molten fiber mass (7).

6. Method according to claim 1, **characterized in that** the inspection happens according to the temperature of the molten fiber mass (7).

7. Method according to claim 1, **characterized in that** the inspection happens according to the dimensions of the molten fiber mass (7).

8. Method according to any of the preceding conclusions, **characterized in that** the inspection happens according to any combination of claims 2 to 7 included.

9. Method according to any of the preceding conclusions, **characterized in that** the inspection happens by means of a measuring system which measures a cloud of measuring points (14) of the surface of the molten fiber mass (7), and compares this with a reference image in a digital way.

10. Method according to any of the preceding conclusions, **characterized in that** the inspection happens by means of a measuring system which creates a two dimensional image (16) of the surface of the molten fiber mass (7), and compares this with a reference image in a digital way.

11. Method according to any of the preceding conclusions, **characterized in that** the inspection happens by means of a measuring system which operates in an optical way.

12. Method according to claim 11, **characterized in that** the inspection happens by means of at least one measuring rod which makes contact with the surface of the molten fiber mass, and the position (18) of which is compared with a reference position.

13. Method according to claim 12, **characterized in that** the evaluation of the position (18) of the measuring rod happens in a digital way.

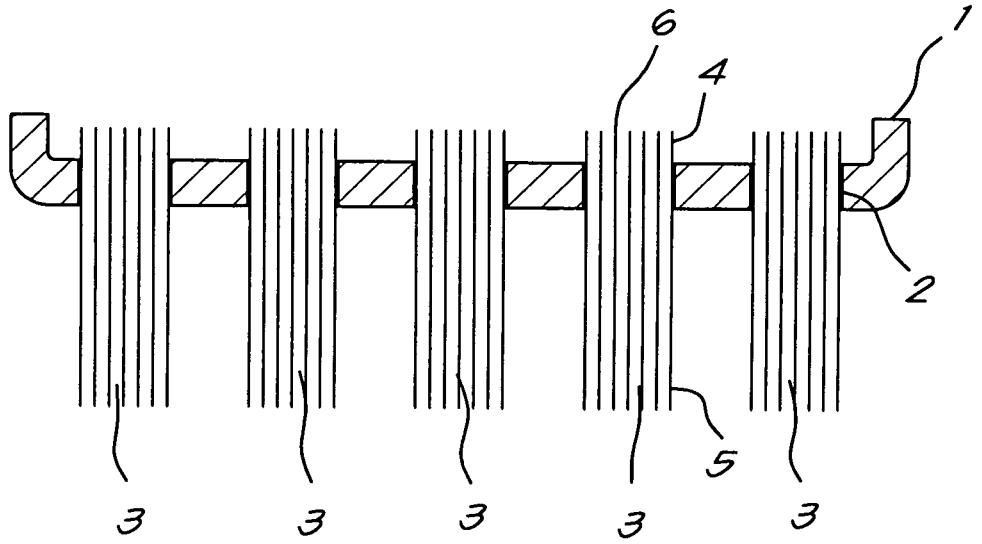

Fig. 1

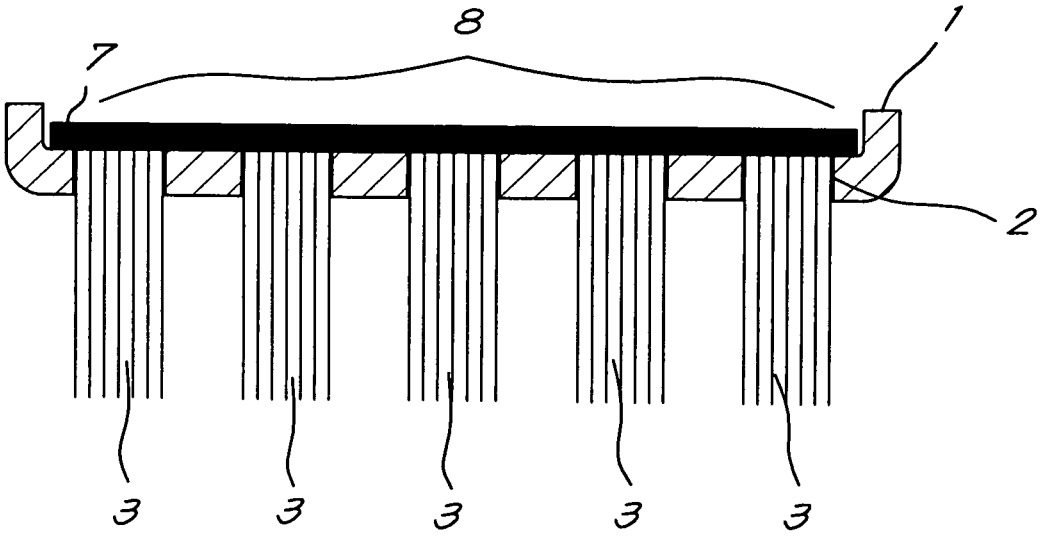

Fig. 2

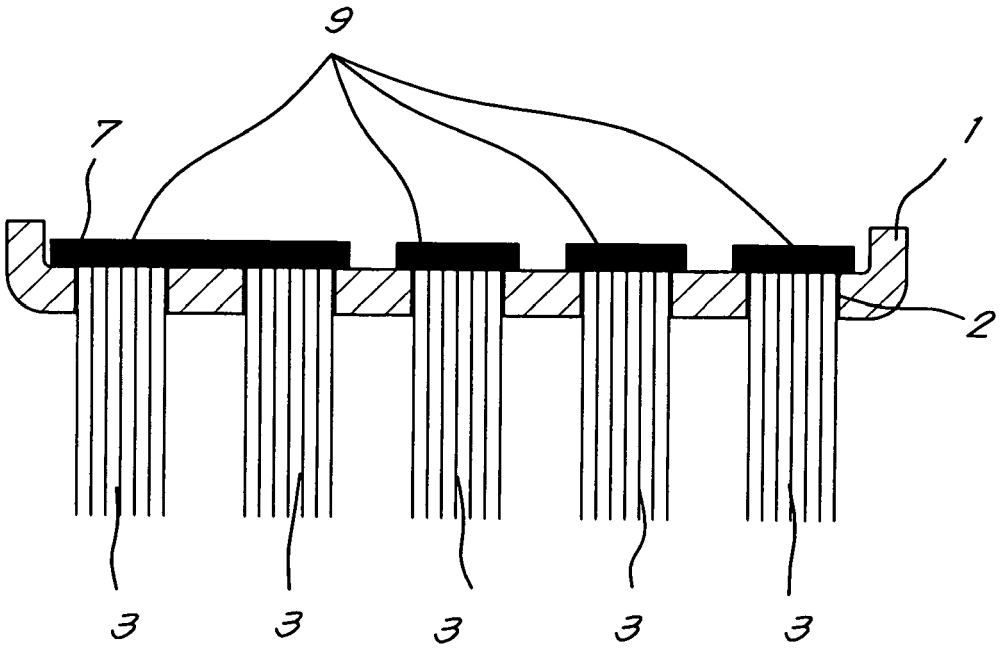

Fig.3

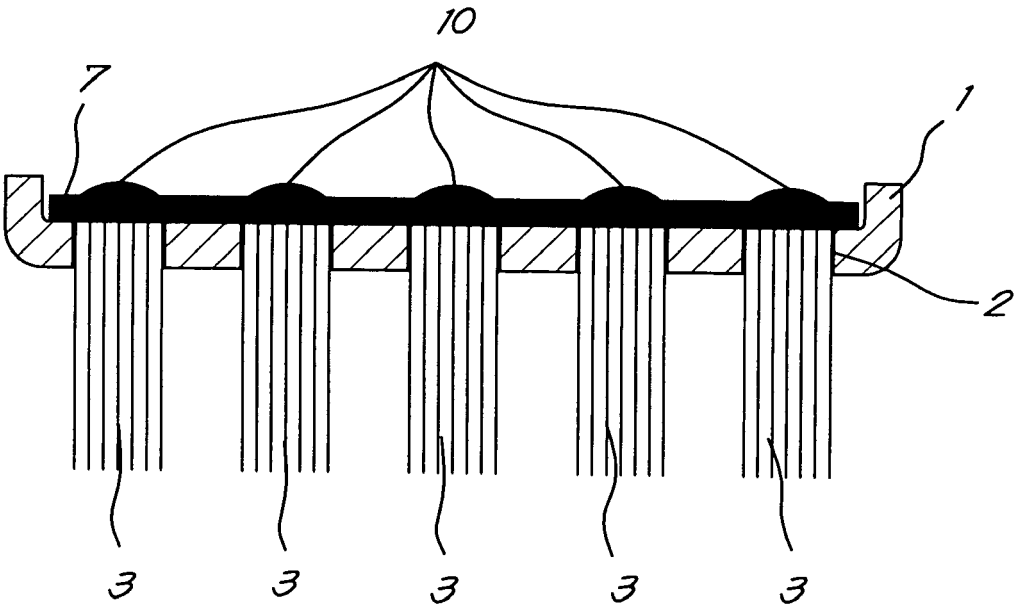

Fig.4

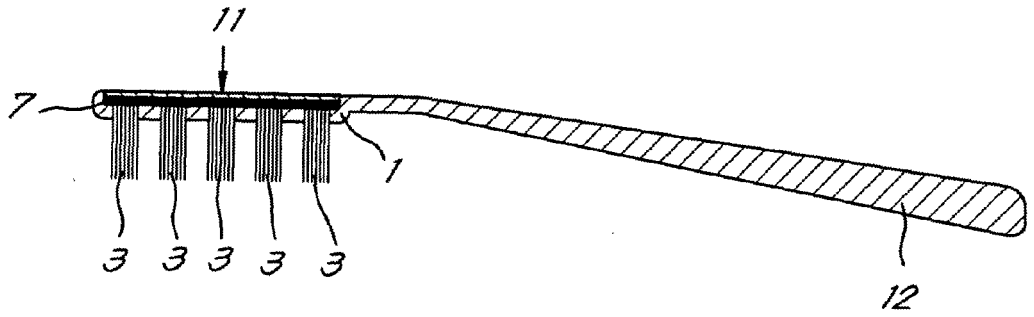

Fig.5

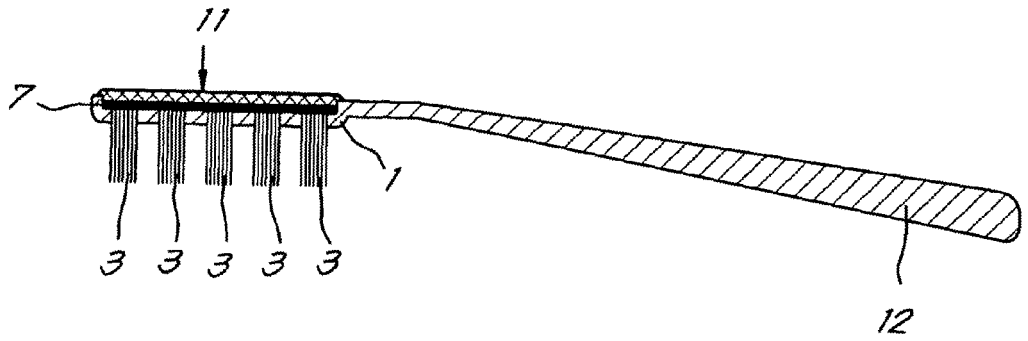

Fig.6

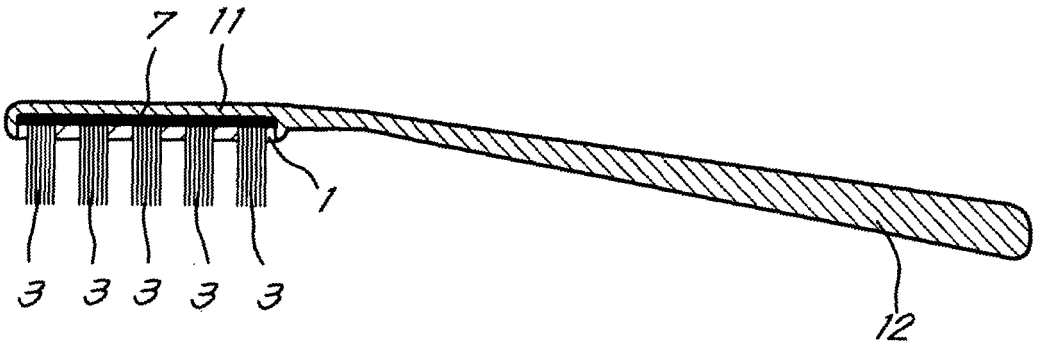

Fig.7

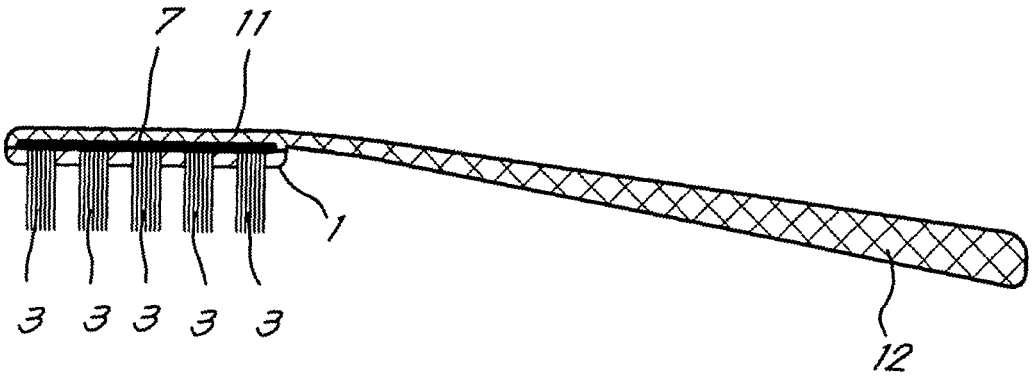

Fig.8

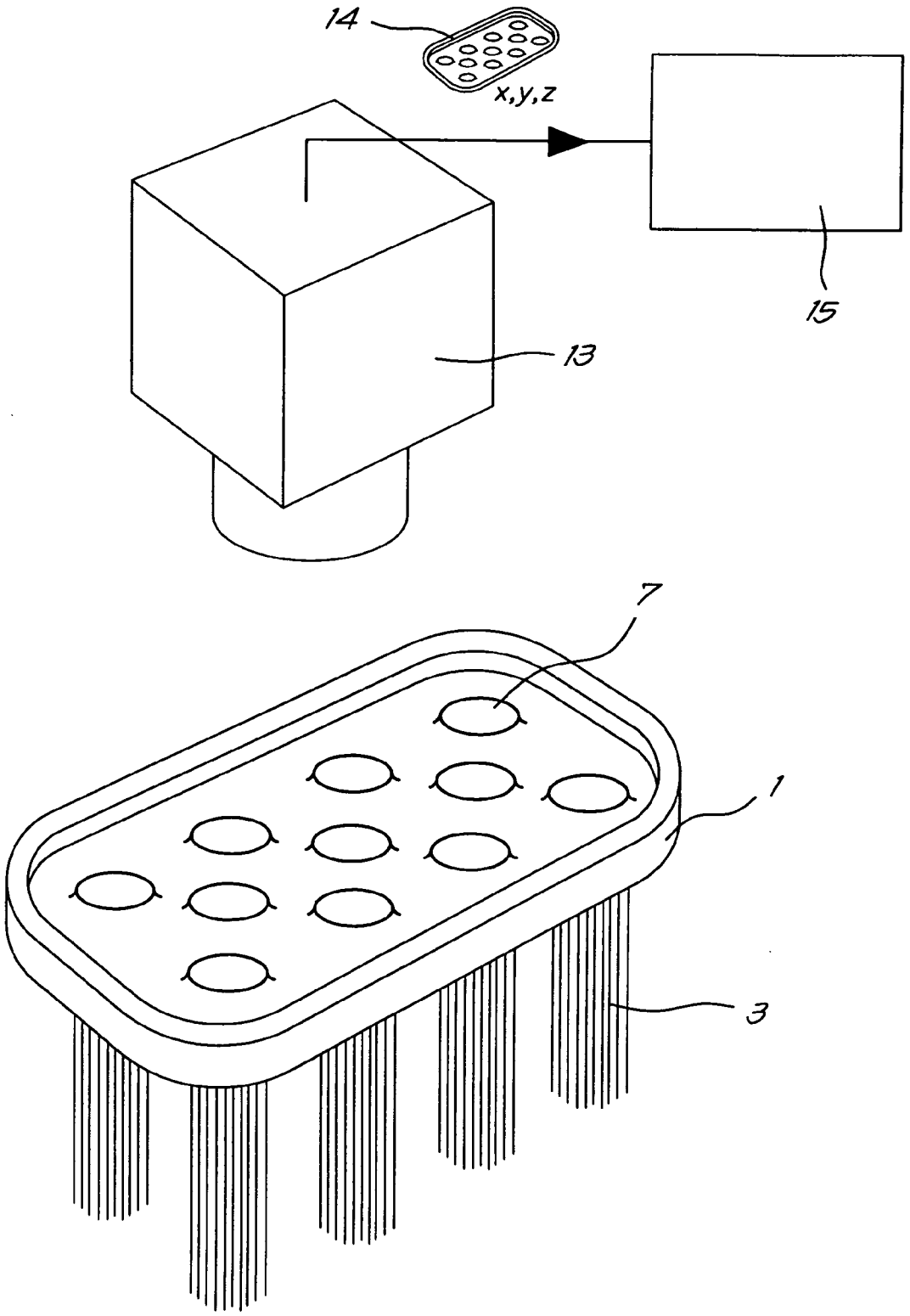

Fig.9

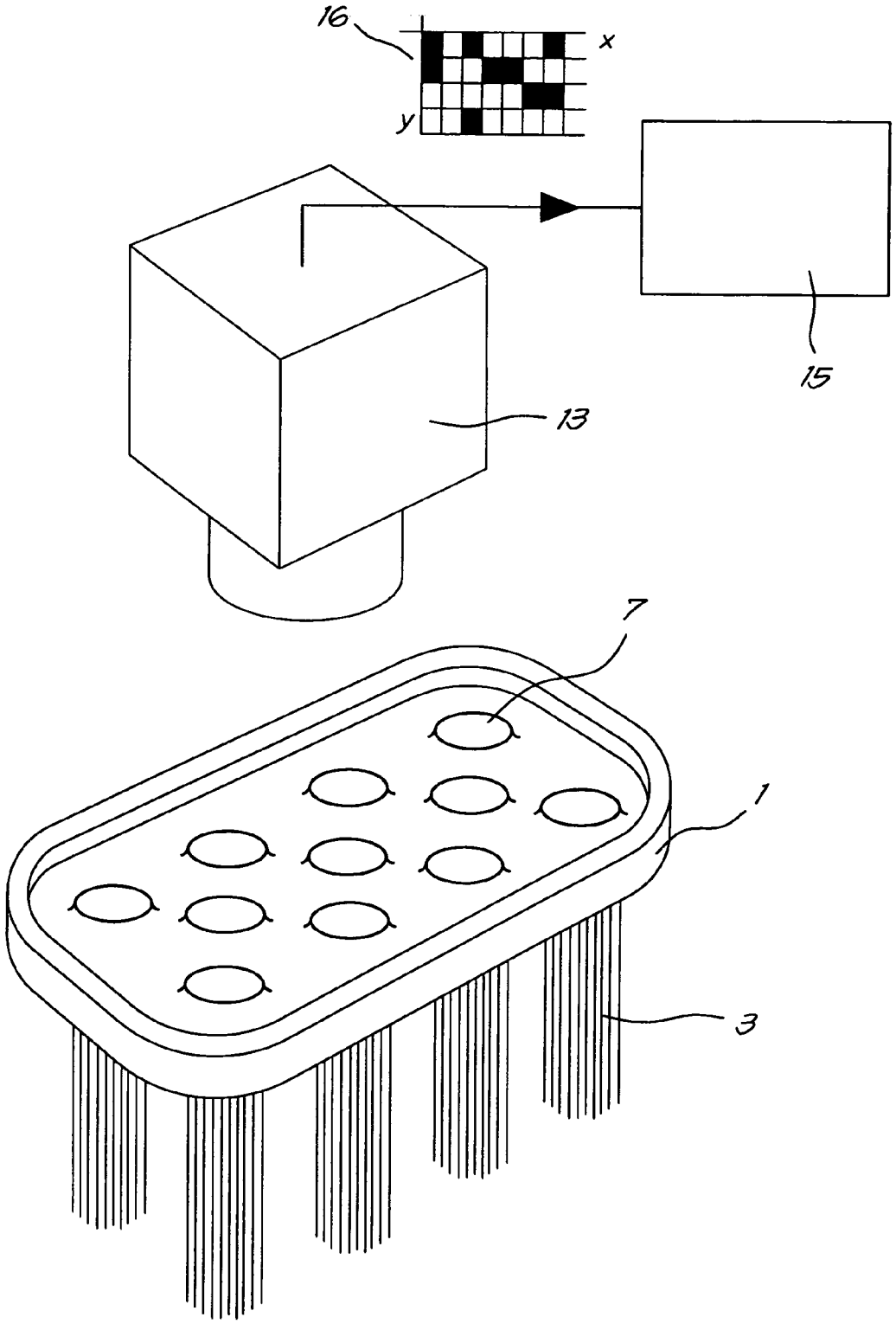

Fig.10

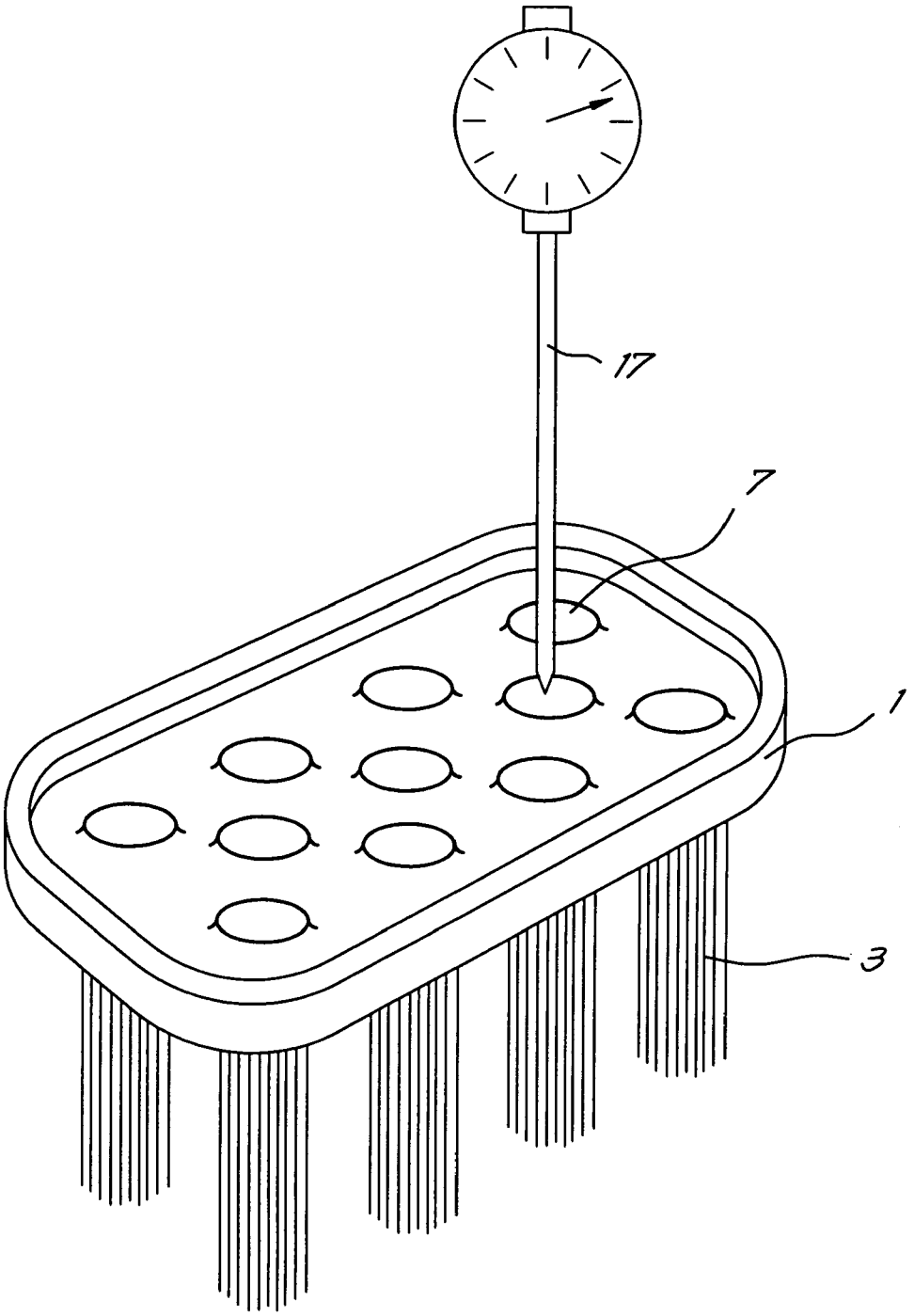

Fig.11

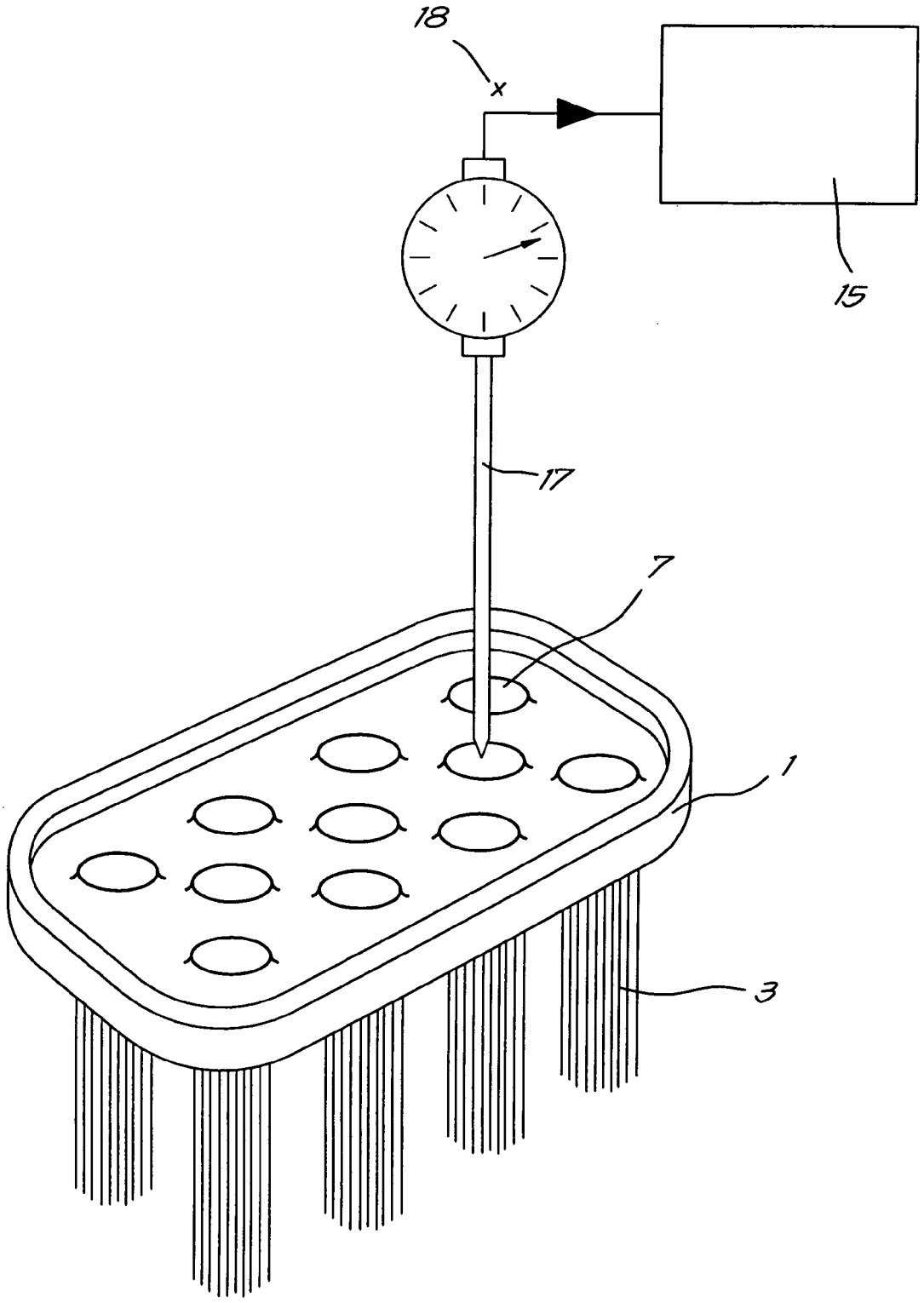

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 10 00 0457

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	DE 43 02 870 A1 (ZAHORANSKY ANTON FA [DE]) 4 August 1994 (1994-08-04)	1-8,11	INV. A46B3/06
A	* the whole document *	9,10,12, 13	A46D3/04

X	EP 0 405 204 A (RUEB FRITZ [DE] FRISETTA GMBH [DE]) 2 January 1991 (1991-01-02)	1-8,11	
A	* the whole document *	9,10,12, 13	

X	EP 0 972 465 A (BOUCHERIE NV G B [BE]) 19 January 2000 (2000-01-19)	1-8,11	
A	* the whole document *	9,10,12, 13	

X	US 2004/117934 A1 (PFENNIGER PHILIPP [CH] ET AL) 24 June 2004 (2004-06-24)	1-8,11	
A	* the whole document *	9,10,12, 13	

X	WO 03/017801 A (KAO CORP [JP]; OKABE KENICHI [JP]; WATANABE TOSHIO [JP]; KIMURA TSUYOS) 6 March 2003 (2003-03-06)	1-8,11	TECHNICAL FIELDS SEARCHED (IPC)
A	* figures 4-45 *	9,10,12, 13	A46B A46D

X	EP 1 136 016 A (BOUCHERIE NV G B [BE]) 26 September 2001 (2001-09-26)	1-8,11	
A	* the whole document *	9,10,12, 13	

X	US 4 635 313 A (FASSLER FRIEDBERT [US] ET AL) 13 January 1987 (1987-01-13)	1-8,11	
A	* the whole document *	9,10,12, 13	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 June 2010	Haller, E

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 10 00 0457

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 A	DE 197 38 256 A1 (F A RUEB HOLDING GMBH [DE]) 11 March 1999 (1999-03-11) * the whole document * -----	1-8,11 9,10,12, 13	
X,P	EP 2 078 472 A (BOUCHERIE NV G B [BE]) 15 July 2009 (2009-07-15) * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

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Munich	11 June 2010	Haller, E

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 00 0457

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11-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4302870 A1	04-08-1994	BE 1008696 A3	02-07-1996
		US 5474366 A	12-12-1995
EP 0405204 A	02-01-1991	AT 110942 T	15-09-1994
		AU 624048 B2	28-05-1992
		AU 5769090 A	03-01-1991
		CA 2019662 A1	24-12-1990
		ES 2060869 T3	01-12-1994
		JP 2774185 B2	09-07-1998
		JP 3215211 A	20-09-1991
		US 5033797 A	23-07-1991
EP 0972465 A	19-01-2000	DE 69906425 D1	08-05-2003
		DE 69906425 T2	08-01-2004
		DE 69915180 D1	08-04-2004
		DE 69915180 T2	30-12-2004
		EP 0972464 A1	19-01-2000
		ES 2217733 T3	01-11-2004
		ES 2200491 T3	01-03-2004
		US 6290303 B1	18-09-2001
		US 6290302 B1	18-09-2001
US 2004117934 A1	24-06-2004	AU 2003293588 A1	14-07-2004
		BR 0317399 A	16-11-2005
		CA 2503778 A1	08-07-2004
		CN 1713838 A	28-12-2005
		CN 101332012 A	31-12-2008
		DE 10259723 A1	01-07-2004
		WO 2004056235 A1	08-07-2004
		EP 1571945 A1	14-09-2005
		HK 1082393 A1	11-12-2009
		KR 20050084431 A	26-08-2005
		MX PA05005332 A	16-08-2005
		RU 2334445 C2	27-09-2008
		US 2006080795 A1	20-04-2006
		US 2009193604 A1	06-08-2009
		US 2007094824 A1	03-05-2007
WO 03017801 A	06-03-2003	CN 1547442 A	17-11-2004
EP 1136016 A	26-09-2001	DE 50100326 D1	31-07-2003
		ES 2200997 T3	16-03-2004
		US 2001038237 A1	08-11-2001
US 4635313 A	13-01-1987	NONE	

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 00 0457

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19738256 A1	11-03-1999	AT 220303 T	15-07-2002
		AU 8862798 A	22-03-1999
		WO 9911156 A1	11-03-1999
		EP 1009255 A1	21-06-2000
EP 2078472 A	15-07-2009	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0972464 A **[0006]**
- EP 0972465 A **[0006]**