

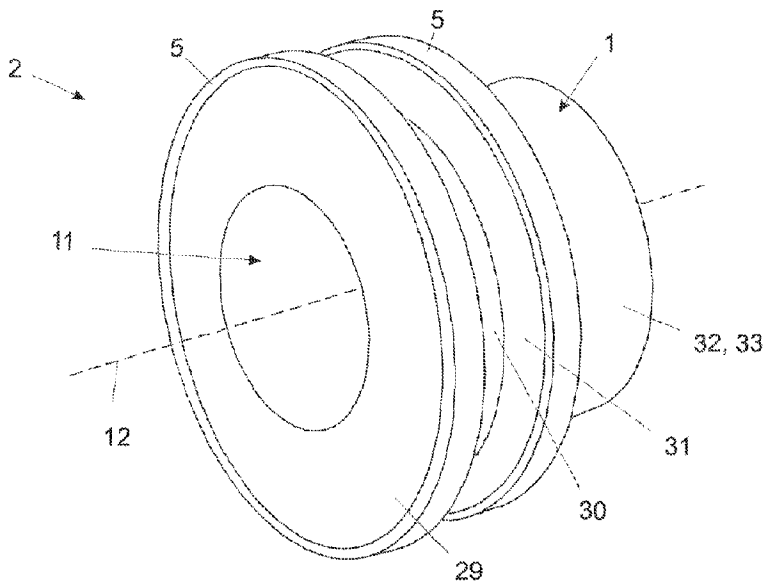


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(54) Titre : CORPS DE SUPPORT POUR UN OUTIL DE PONCAGE ET PROCEDE SERVANT A FABRIQUER UN CORPS DE SUPPORT

(54) Title: SUPPORTING BODY FOR A GRINDING TOOL AND METHOD OF PRODUCING A GRINDING BODY



(57) **Abrégé/Abstract:**

The invention relates to a supporting body (1) for a grinding tool (2), which comprises an abrasive pad (5) having a preferably circumferential supporting surface (3) for an abrasive material (4), particularly a superabrasive material, the supporting body (1) consisting substantially of a composite material (6) which is free of abrasive material and consists of a plurality of layers (7) of a natural fiber material which are arranged one atop the other and are connected to each other by plastic (8), preferably phenolic resin, the natural fiber material preferably being a cotton fabric or paper, wherein the supporting body (1) comprises a first, preferably cylindrical or hollow cylindrical body (29, 30, 31, 32, 33) and at least one additional, preferably cylindrical or hollow cylindrical body (29, 30, 31, 32, 33), wherein the bodies (29, 30, 31, 32, 33) are connected, preferably adhesively bonded, to each other.

## Abstract

The invention relates to a supporting body (1) for a grinding tool (2), which comprises an abrasive pad (5) having a preferably circumferential supporting surface (3) for an abrasive material (4), particularly a superabrasive material, the supporting body (1) consisting substantially of a composite material (6) which is free of abrasive material and consists of a plurality of layers (7) of a natural fiber material which are arranged one atop the other and are connected to each other by plastic (8), preferably phenolic resin, the natural fiber material preferably being a cotton fabric or paper, wherein the supporting body (1) comprises a first, preferably cylindrical or hollow cylindrical body (29, 30, 31, 32, 33) and at least one additional, preferably cylindrical or hollow cylindrical body (29, 30, 31, 32, 33), wherein the bodies (29, 30, 31, 32, 33) are connected, preferably adhesively bonded, to each other.

Supporting body for a grinding tool and method of  
producing a grinding body

The invention concerns a support body for a grinding tool, and a grinding tool  
5 having such a support body and an abrasive layer which has abrasive means, in  
particular superabrasive means, and which is arranged on a preferably  
circumferential support surface of the support body, preferably wherein the  
abrasive layer is formed from a continuous abrasive ring or individual abrasive  
segments. The invention further concerns a method of producing a support body  
10 and a method of producing a grinding tool having such a support body.

Support bodies for grinding tools should be as far as possible stable, light  
and with a damping action in particular in so-called centerless grinding tools.

It is known from the state of the art to produce support bodies from a  
phenolic moulding material by hot pressing and hardening. Then either mixtures of  
15 synthetic resin, fillers and superabrasive means are pressed hot on to those  
supports or ceramic superabrasive layers are adhesively bonded in place. A support  
body produced in that way is light and damps vibrations in the grinding process so  
that wear of the layers in comparison for example with layers with aluminium  
supports in grinding use is reduced and the surface quality of the ground  
20 components is improved, this being manifested by a lower degree of roughness,  
lesser break-outs and the absence of chatter marks.

It will be noted however that those support bodies suffer from the  
disadvantage that a relatively great uncontrolled wastage occurs in the production  
of the supports and only a limited spectrum of support bodies in regard to the  
25 dimensions thereof can be produced. In addition cracking occurs in the grinding  
operation. The maximum working highest speed is limited to about 63 m/s.

US No 2 069 116 discloses a grinding tool having a support body formed  
from layers of a fibrous layer material. The grinding tool is produced jointly with the  
support body in a press of fixed dimensions, wherein the individual layers of the  
30 layer material have to be successively laid in the press. That manufacturing  
procedure is highly time-consuming. In addition only grinding tools of the fixed size  
can be produced by means of the press so that it is not possible to produce a  
grinding tool of differing dimensions.

It is further known from the state of the art to produce support bodies from a carbon fibre-reinforced plastic. That material makes it possible to produce light and at the same time dimensionally stable support bodies. However that involves very complicated production and very high manufacturing costs.

5           The object of the present invention is to at least partially overcome the disadvantages of the state of the art and to provide a support body which is lighter and improved in relation thereto as well as a grinding tool having such a support body. A further object is to provide a method of producing a support body and a grinding tool having such a support body, wherein the method is in particular  
10 distinguished in that support bodies and grinding tools of differing dimensions can be flexibly produced, more specifically in a short time and at reasonable production costs.

          According to an aspect of the present invention, there is provided a support body for a grinding tool, the support body comprising a support surface for an  
15 abrasive layer having abrasive means, wherein the support body substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material which are connected together by plastic, wherein the support body has a first body and at least one further body,  
20 wherein the bodies are connected together, and wherein the first body and the at least one further body are made of the abrasive means-free composite material comprising the plurality of mutually superposed layers of natural fibre material which are connected together by said plastic.

          According to another aspect of the present invention, there is provided a grinding tool having a support body as described above and an abrasive layer which  
25 has abrasive means, and which is arranged on the support surface of the support body.

          According to another aspect of the present invention, there is provided a method of producing a support body for a grinding tool, wherein the support body includes a support surface for an abrasive layer having abrasive means, and  
30 substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, wherein the natural fibre material is a cotton fabric or paper, the abrasive means-free composite material is provided in the form of a

plate in a first method step and in a second method step a body is cut out of the plate with predetermined dimensions.

According to another aspect of the present invention, there is provided a method of producing a grinding tool having a support body which includes a support surface for an abrasive layer, and substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, and the abrasive layer which has abrasive means and which is arranged on the support surface of the support body, wherein firstly the support body is provided and then the abrasive layer having the abrasive means is arranged on the support surface of the support body, and one of or both (1) wherein the support body is produced by the method described above, and (2) wherein the support body has a first body and at least one further body, wherein the bodies are connected together, and wherein the first body and the at least one further body are made of the abrasive means-free composite material comprising the plurality of mutually superposed layers of natural fibre material which are connected together by said plastic.

The support body substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material and which are connected together by plastic, preferably phenolic resin.

The term abrasive means in connection with the present invention is used to denote hard material grains which are used to achieve removal of material from a workpiece. In that respect natural grain materials (flint, quartz, corundum, emery, granite, natural diamond) and synthetic grain

materials (corundums, silicon carbides, chromium oxides, cubic boron nitride, diamonds) are differentiated.

The term superabrasive means is used to denote professional diamond and cubic boron nitride.

5 If there are no abrasive or superabrasive means present in a material then they are of an abrasive means-free nature in accordance with the present invention.

Abrasive means-free composite materials comprising a plurality of mutually superposed layers of a natural fibre material which are connected  
10 together by plastic, preferably phenolic resin, wherein the natural fibre material is a cotton fabric or paper, are known from the technical field of the production of electrical and thermal insulation components for machine and equipment construction - in the case of cotton fabric - as hard cotton fabric and - in the case of paper - in the form of hard papers.

15 In comparison with the support bodies known from the state of the art and comprising a phenolic moulding material the support body according to the invention has an approximately 30% higher flexural breaking stress, an elongation at break which is about three times greater and a higher elasticity, and is about 15% lighter. Higher operational speeds  
20 are possible, for example 125 m/s and more.

In addition in the production of the support body or a grinding tool having such a support body, no or markedly reduced wastage occurs.

When an abrasive layer mixture for producing an abrasive ring is pressed on to the support body a lower pressure is required for that  
25 purpose in the pressing operation. The grinding tool is markedly easier to remove from the mould as the support body does not expand after the hot pressing operation. Pressing without a flange is also easier, thereby subsequently giving a potential saving in a machining operation.

The use of the composite material also makes it possible to produce  
30 support bodies in a wider range of sizes. Thus support bodies for example up to a diameter of 1050 mm and a height of 100 mm can be readily produced.

The composite material further has the advantage that it can be more easily machined with carbide metal. Usually expensive tools with PCD cutting edges have to be used in comparison therewith for machining the materials used in the state of the art. Furthermore the composite material can be very well combined with other materials like for example carbon fibre reinforced plastic, glass fibre reinforced plastic, Al or steel, for example by glueing or screwing.

Advantageously the composite material used in some embodiments of the present invention is thermosetting, that is to say it is no longer deformable after setting.

By virtue of the fact that the support body has a first, preferably cylindrical or hollow-cylindrical body and at least one further, preferably cylindrical or hollow-cylindrical body, wherein the bodies are connected together, preferably by glueing, it is possible in a flexible fashion to construct light support bodies of complex shapes, as could be achieved in the state of the art only with carbon fibre-reinforced plastic, but in a markedly shorter time and at markedly lower cost.

According to advantageous embodiments the natural fibre material is a cotton fabric or paper.

In regard to its physical properties it has proven to be advantageous if the composite material is of a density of 1.0 to 2.0 g/cm<sup>3</sup>, preferably 1.4 g/cm<sup>3</sup> (for example measured in accordance with the testing standard ISO 1183) and/or has a water absorption of 1.5 to 7.5%, preferably 2.4% or 5.2% (for example measured in accordance with the testing standard ISO 62).

In regard to the thermal properties it has proven to be advantageous if the composite material has a length extension coefficient of 20 to 40 x 10<sup>-6</sup> K<sup>-1</sup>, preferably 30 x 10<sup>-6</sup> K<sup>-1</sup> (for example measured in accordance with the testing standard DIN 51045) and/or thermal conductivity of 0.1 to 0.3 W/mK, preferably 0.2 W/mK (for example measured in accordance with the testing standard DIN 52612).

The temperature of use can be continuously or temporarily 110°C or 180°C.

In regard to the mechanical properties it is appropriate if the composite material has a compressive strength at 23°C of 200 to 400 N/mm<sup>2</sup>, preferably 300 N/mm<sup>2</sup> or 320 N/mm<sup>2</sup> (for example measured in accordance with the testing standard ISO 604) and/or a flexural strength at 5 23°C of 50 to 150 N/mm<sup>2</sup>, preferably 100 N/mm<sup>2</sup> or 135 N/mm<sup>2</sup> (for example measured in accordance with the testing standard ISO 178) and/or a modulus of elasticity (from a bending test) of 6000 to 8000 N/mm<sup>2</sup>, preferably 7000 N/mm<sup>2</sup> (for example measured in accordance with the testing standard ISO 178) and/or a tensile strength of 50 to 150 10 N/mm<sup>2</sup>, preferably 80 N/mm<sup>2</sup> or 120 N/mm<sup>2</sup> (for example measured in accordance with the testing standard ISO 527) and/or a splitting force of 1500 to 3500 N, preferably 1900 N or 3000 N (for example measured in accordance with the testing standard DIN 53463).

In regard to the electrical properties the composite material can have 15 a tracking resistance CTI 100 (for example measured in accordance with the testing standard IEC 112) and/or an electrical dielectric strength (perpendicular) of 1.5 KV/3 mm or 10 KV/3 mm (for example measured in accordance with the testing standard IEC 243-1) and/or an electrical dielectric strength (parallel) of 1.0 KV/25 mm or 10 KV/25 mm (for 20 example measured in accordance with the testing standard IEC 243-1).

According to a preferred embodiment of the invention the support body has at least one side surface which is separate from the support surface for the abrasive layer and at which a layer of the composite material is arranged flat.

25 It is further appropriate if the support body has a central coupling region, preferably with a central bore, for connection to a rotary drive for rotating the support body or a grinding tool formed therewith about an axis of rotation extending through the coupling region and/or the support body is of a substantially rotationally symmetrical configuration.

30 It has proven to be advantageous if the first and the at least one further body are cylindrical or hollow-cylindrical bodies which are connected together at side surfaces, preferably wherein axes of symmetry of the

bodies are substantially congruent. The support bodies or grinding tools which can be produced in that way are particularly well suited for example for grinding camshafts.

5 It has further proven to be desirable if the support body has an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive connected, preferably glued to at least one of the bodies, preferably wherein the adaptor substantially comprises a metal and/or is of a substantially hollow-cylindrical configuration.

10 In this connection it is appropriate if the support body has a central bore and the adaptor is at least region-wise arranged in the central bore, preferably wherein the adaptor extends only over a part of the length of the central bore, particularly preferably wherein the central bore has a funnel-shaped insertion opening. A funnel-shaped insertion opening makes it easier to clamp the support body.

15 Protection is also claimed for a grinding tool having a support body according to the invention and an abrasive layer which has abrasive means, in particular superabrasive means, and which is arranged on the preferably circumferential support surface of the support body, preferably wherein the abrasive layer is formed from a continuous abrasive ring or individual  
20 abrasive segments.

Furthermore protection is claimed for a method of producing a support body for a grinding tool, wherein the support body includes a preferably circumferential support surface for an abrasive layer having abrasive means, in particular superabrasive means, and substantially  
25 comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, preferably phenolic resin, preferably wherein the natural fibre material is a cotton fabric or paper, wherein the abrasive means-free composite material is provided in the form of a plate  
30 in a first method step and in a second method step a preferably cylindrical or hollow-cylindrical body is cut out of the plate with predetermined dimensions preferably by water jet cutting or by means of a band saw.

According to an advantageous configuration it is provided that in the course of the second method step at least one further, preferably cylindrical or hollow-cylindrical body is cut out of the plate with predetermined dimensions and connected to the first body, preferably by adhesive.

5 In this connection it is appropriate if the first and the at least one further body is cylindrical or hollow-cylindrical bodies, the bodies being connected together at side surfaces, preferably wherein axes of symmetry of the bodies are brought substantially into congruent relationship.

It has proven to be advantageous if in a third method step the body  
10 or bodies is or are re-worked, preferably by cutting machining and/or balancing and/or by fitting a central bore.

It has proven to be desirable if at least one of the bodies in a further method step which follows the second method step or the third method step is connected to an adaptor for connecting the support body or a  
15 grinding tool formed therewith to a rotary drive, preferably by adhesive, preferably wherein the adaptor substantially comprises a metal and/or is of a substantially hollow-cylindrical configuration.

In addition protection is claimed for a method of producing a grinding tool having a support body which includes a preferably  
20 circumferential support surface for an abrasive layer having abrasive means, in particular superabrasive means, and substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, preferably phenolic resin, preferably wherein the natural fibre  
25 material is a cotton fabric or paper, and an abrasive layer which has abrasive means, in particular superabrasive means and which is arranged on the preferably circumferential support surface of the support body, preferably wherein the abrasive layer is formed from a continuous abrasive ring or individual abrasive segments, wherein firstly a support body  
30 preferably produced by means of the method for production of the support body is provided and then an abrasive layer having abrasive means, preferably superabrasive means, is arranged on a preferably

circumferential support surface of the support body, preferably by pressing thereon and/or adhesive bonding, preferably wherein the abrasive layer is formed from a continuous abrasive ring or individual abrasive segments.

Further details and advantages of some embodiments of the invention will be described more fully hereinafter by means of the specific description with reference to the drawings in which:

Figure 1a) is a diagrammatic side view of a support body,

Figure 1b) is a diagrammatic cross-sectional view along section plane 24 of the support body of Figure 1a,

Figure 2 is a diagrammatic side view of a grinding tool according to a first preferred embodiment,

Figure 3a) is a photograph of a grinding tool according to a second preferred embodiment as a side view,

Figure 3b) is a microscope image of a cross-sectional surface of the composite material used in the grinding tool according to the second preferred embodiment,

Figures 4a) and b) show microscope images of a further composite material which is preferably used of a side surface (Figure 4a)) and a cross-sectional surface,

Figure 5 shows a diagrammatic view by means of a flow chart of a method of producing a support body and a cutting tool, and

Figures 6a) and b) show a further grinding tool as a diagrammatic perspective view (Figure part a)) and a diagrammatic cross-sectional view (Figure part b)).

Figures 1a) and 1b) show a support body 1 for a grinding tool 2 (see also Figure 2) which is substantially rotationally symmetrical and includes a circumferential support surface 3 for an abrasive layer 5 having abrasive means 4, in particular superabrasive means.

The support body 1 substantially comprises an abrasive means-free composite material 6 comprising a plurality of mutually superposed layers 7 of a natural fibre material connected together by plastic 8. That is diagrammatically indicated in the view on an enlarged scale of the portion

in Figure 1b). The plastic 8 can be a hardened synthetic resin, preferably phenolic resin.

Directly adjacent layers 7 can be at a very small spacing relative to each other and even at least region-wise touch. The layers 7 are oriented  
5 substantially parallel to side surfaces.

Two embodiments have proven to be particularly advantageous in relation to the composite material 6.

In the first embodiment the natural fibre material is a cotton fabric. In that case the composite material 6 is of a density of  $1.4 \text{ g/cm}^3$  and has  
10 water absorption of 2.4%. In addition the composite material 6 has a length extension coefficient of  $30 \times 10^{-6} \text{ K}^{-1}$  and a thermal conductivity of  $0.2 \text{ W/mK}$ . And finally the composite material 6 has a compressive strength at  $23^\circ\text{C}$  of  $320 \text{ N/mm}^2$ , a flexural strength at  $23^\circ$  of  $100 \text{ N/mm}^2$ , a modulus of elasticity of  $7000 \text{ N/mm}^2$ , a tensile strength of  $80 \text{ N/mm}^2$  and a splitting  
15 force of 3000 N.

In the second embodiment the natural fibre material is paper. In that case the composite material 6 is of a density of  $1.4 \text{ g/cm}^3$  and has water  
20 absorption of 5.2%. In addition the composite material 6 has a length extension coefficient of  $30 \times 10^{-6} \text{ K}^{-1}$  and a thermal conductivity of  $0.2 \text{ W/mK}$ . And finally the composite material 6 has a compressive strength at  $23^\circ\text{C}$  of  $300 \text{ N/mm}^2$ , a flexural strength at  $23^\circ$  of  $135 \text{ N/mm}^2$ , a modulus of elasticity of  $7000 \text{ N/mm}^2$ , a tensile strength of  $120 \text{ N/mm}^2$  and a splitting  
force of 1900 N.

The support body 1 has two oppositely disposed side surfaces 9  
25 which are separate from the support surface 3 for the abrasive layer 5 and at which a respective layer 7 of the natural fibre material is arranged flat (see also Figure 3a)).

The support body 1 includes a central coupling region 10 having a central bore 11 for connection to a rotary drive for rotating the support  
30 body 1 or a grinding tool 2 formed therewith about an axis of rotation 12 extending through the coupling region 10. The axis of rotation 12 extends

through the centre 25 of the central bore 11 and is oriented substantially normal to the side surfaces 9.

The dimensions of the support body 1 can be characterised by its diameter 17, its thickness 18 and the diameter 19 of the central bore 11.

5 The grinding tool 2 shown in Figure 2 includes a support body 1 and an abrasive layer 5 having abrasive means 4, in particular superabrasive means, arranged on the circumferential support surface 3 of the support body 1. The abrasive means 4 is diagrammatically indicated in the enlarged portion. The abrasive means 4 is embedded in a binding, for example a  
10 ceramic binding.

The abrasive layer 5 can be formed from a continuous abrasive ring or, as indicated in the lower region of the grinding tool 2, individual abrasive elements 13.

15 In the grinding tool 2 shown in Figure 3a) the support body 1 has a side surface 9 which is separate from the support surface 3 for the abrasive layer 5 and at which a layer 7 of a natural fibre material in the form of a cotton fabric is arranged flat. That can be seen in particular from the enlarged view in which the fabric structure comprising substantially perpendicularly crossing fabric threads with weft and warp threads 26 can  
20 be seen.

To improve the rotary characteristic of the grinding tool 2 the support body 1 can have balancing bores 22 and/or a step 23.

25 Figure 3b) shows a microscope image of a cross-sectional surface of the composite material used in the grinding tool 2 of the second preferred embodiment. It is possible clearly to see the layers 7 of the cotton fabric, which are arranged in mutually superposed relationship in the direction of the axis of rotation 12 and which are made up of individual cotton fibres 26.

30 Figures 4a) and 4b) show microscope images of a further composite material which is preferably used, more specifically a side surface (Figure 4a)) and a cross-sectional surface (Figure 4b)). In this case the natural fibre material is paper. Figure 4a) shows individual paper fibres 27

arranged stochastically within a layer 7. Figure 4b) shows a structure comprising mutually superposed layers 7.

Particularly preferred embodiments of the method of producing a support body and the method of producing a grinding tool are illustrated by reference to the flow chart shown in Figure 5.

In the method 14 of producing a support body 1 in a first method step 15 the abrasive means-free composite material 6 comprising a plurality of mutually superposed layers 7 of a natural fibre material, that are connected together by plastic 8, preferably phenolic resin, is provided in the form of a plate.

In a second method step 16 a body is cut out of the plate with predetermined dimensions 17, 18, 19 (see Figures 1a) and 1b)), preferably by water jet cutting or by means of a band saw. In the case of the support body 1 shown in Figure 1 the body is a round disc.

In a third method step 20 the body is re-worked, preferably by cutting machining and/or balancing.

That method 14 can be expanded to constitute a method 21 of producing a grinding tool 2 insofar as, in a further method step 28, an abrasive layer 5 having abrasive means 4, preferably superabrasive means, is arranged on a preferably circumferential support surface 3 of the support body 1, preferably by pressing and/or adhesive bonding thereon, preferably wherein the abrasive layer 5 is formed from a continuous abrasive ring or individual abrasive segments 13.

The third method step 20 can optionally also be carried out only after the abrasive layer 5 is arranged on the support surface 3 of the support body 1.

Figures 6a) and 6b) show a grinding tool 2 having a support body 1 which is made up of five hollow-cylindrical bodies 29, 30, 31, 32, 33, wherein the bodies 29, 30, 31, 32, 33 are glued together at side surfaces 9. The axes of symmetry 12 of the bodies 29, 30, 31, 32, 33 are substantially coincident. Depending on the respective shape of the support body 1 it is

also possible to use another number of cylindrical or hollow-cylindrical bodies 29, 30, 31, 32, 33.

The support body 1 has an adaptor 34 for connecting the support body 1 or the grinding tool 2 formed therewith to a rotary drive which is adhesively secured to the bodies 32 and 33. The adaptor 34 can also be  
5 connected to more than two or only to one of the bodies 29, 30, 31, 32, 33, in particular in dependence on the stiffness to be achieved for the grinding tool 2.

The adaptor 34 can substantially comprise a metal and, as in the  
10 illustrated case, can be substantially hollow-cylindrical.

As in the illustrated case the adaptor 34 can have bores 37 for receiving fixing means, by way of which the adaptor 34 can be connected to a machine spindle.

The support body 1 has a central bore 11. The adaptor 34 is  
15 arranged in the central bore 11, with the adaptor 34 extending only over a part of the length 35 of the central bore 11. The central bore 11 has a funnel-shaped insertion opening 36.

A respective abrasive disc 5 is circumferentially arranged on the bodies 29 and 31.

For producing the support body 1 it is appropriate in a first method  
20 step 15 to provide a plate of a thickness 18 and in a second method step 16 to cut out of the plate with predetermined dimensions 17, 18, 19, three cylindrical or hollow-cylindrical bodies 30, 32 and 33, preferably by water jet cutting or by means of a band saw.

It is also appropriate in the course of the first method step 15 to  
25 provide a further plate of a differing thickness 18 and in the course of the second method step 16 to cut out of the plate two cylindrical or hollow cylindrical bodies 29 and 31, of predetermined dimensions 17, 18, 19, preferably by water jet cutting or by means of a band saw.

In the course of the second method step 16 the bodies 29, 30, 31,  
30 32, 33 are connected together after they have been cut out of the plates at

side surfaces 9, wherein axes of symmetry 12 of the bodies 29, 30, 31, 32, 33 are brought substantially into coincident relationship.

In a third method step 20 the bodies 29, 30, 31, 32, 33 are re-worked by cutting machining, in particular to impart predetermined  
5 dimensions to the central bore 11.

In a further method step the bodies 32, 33 are connected to the adaptor 34.

CLAIMS

1. A support body for a grinding tool, the support body comprising a support surface for an abrasive layer having abrasive means, wherein the support  
5 body substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material which are connected together by plastic, wherein the support body has a first body and at least one further body, wherein the bodies are connected together, and wherein the first body and the at least one further body are made of the abrasive  
10 means-free composite material comprising the plurality of mutually superposed layers of natural fibre material which are connected together by said plastic.

2. The support body according to claim 1, wherein the support surface is a circumferential support surface.

15

3. The support body according to claim 1 or 2, wherein the abrasive means comprises superabrasive means.

4. The support body according to any one of claims 1 to 3, wherein said  
20 plastic comprises phenolic resin.

5. The support body according to any one of claims 1 to 4, wherein the natural fibre material is a cotton fabric or paper.

25 6. The support body according to any one of claims 1 to 5, wherein the first body comprises a cylindrical or hollow-cylindrical body.

7. The support body according to any one of claims 1 to 6, wherein the at least one further body comprises a cylindrical or hollow-cylindrical body.

30

8. The support body according to any one of claims 1 to 7, wherein the bodies are adhesively bonded together.

9. The support body according to any one of claims 1 to 8, wherein the composite material is of a density of 1.0 to 2.0 g/cm<sup>3</sup>.

10. The support body according to claim 9, wherein the composite material  
5 is of a density of 1.4 g/cm<sup>3</sup>.

11. The support body according to any one of claims 1 to 10, wherein the composite material has a water absorption of 1.5 to 7.5%.

10 12. The support body according to any one of claims 1 to 10, wherein the composite material has a water absorption of 2.4% or 5.2%.

13. The support body according to any one of claims 1 to 12, wherein the composite material has a length extension coefficient of 20 to 40 x 10<sup>-6</sup> K<sup>-1</sup>.

15

14. The support body according to any one of claims 1 to 12, wherein the composite material has a length extension coefficient of 30 x 10<sup>-6</sup> K<sup>-1</sup>.

15. The support body according to any one of claims 1 to 14, wherein the  
20 composite material has a thermal conductivity of 0.1 to 0.3 W/mK.

16. The support body according to any one of claims 1 to 14, wherein the composite material has a thermal conductivity of 0.2 W/mK.

25 17. The support body according to any one of claims 1 to 16, wherein the composite material has a compressive strength at 23°C of 200 to 400 N/mm<sup>2</sup>.

18. The support body according to any one of claims 1 to 16, wherein the composite material has a compressive strength at 23°C of 300 N/mm<sup>2</sup> or  
30 320 N/mm<sup>2</sup>

19. The support body according to any one of claims 1 to 18, wherein the composite material has a flexural strength at 23°C of 50 to 150 N/mm<sup>2</sup>.

20. The support body according to any one of claims 1 to 18, wherein the composite material has a flexural strength at 23°C of 100 N/mm<sup>2</sup> or 135 N/mm<sup>2</sup>.

21. The support body according to any one of claims 1 to 20, wherein the  
5 composite material has a modulus of elasticity of 6000 to 8000 N/mm<sup>2</sup>.

22. The support body according to any one of claims 1 to 20, wherein the composite material has a modulus of elasticity of 7000 N/mm<sup>2</sup>.

10 23. The support body according to any one of claims 1 to 22, wherein the composite material has a tensile strength of 50 to 150 N/mm<sup>2</sup>

24. The support body according to any one of claims 1 to 22, wherein the composite material has a tensile strength of 80 N/mm<sup>2</sup> or 120 N/mm<sup>2</sup>.

15

25. The support body according to any one of claims 1 to 24, wherein the composite material has a splitting force of 1500 to 3500 N.

20 26. The support body according to any one of claims 1 to 24, wherein the composite material has a splitting force of 1900 N or 3000 N.

25 27. The support body according to any one of claims 1 to 26, wherein the support body has at least one side surface which is separate from the support surface for the abrasive layer and at which a layer of the natural fibre material is arranged flat.

30 28. The support body according to any one of claims 1 to 27, wherein the support body has a central coupling region for connection to a rotary drive for rotating the support body or a grinding tool formed therewith about an axis of rotation extending through the coupling region.

29. The support body according to any one of claims 1 to 27, wherein the support body has a central coupling region with a central bore.

30. The support body according to any one of claims 1 to 29, wherein the support body is of a substantially rotationally symmetrical configuration.

31. The support body according to any one of claims 1 to 30, wherein the  
5 first and the at least one further body are cylindrical or hollow-cylindrical bodies which are connected together at side surfaces.

32. The support body according to any one of claims 1 to 31, wherein axes  
10 of symmetry of the bodies are substantially congruent.

33. The support body according to any one of claims 1 to 32, wherein the support body has an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive connected to at least one of the bodies.

34. The support body according to any one of claims 1 to 32, wherein the  
15 support body has an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive glued to at least one of the bodies.

35. The support body according to claim 33 or 34, wherein the adaptor  
20 substantially comprises a metal.

36. The support body according to any one of claims 33 to 35, wherein the adaptor is of a substantially hollow-cylindrical configuration.

37. The support body according to any one of claims 33 to 36, wherein the  
25 support body has a central bore and the adaptor is at least region-wise arranged in the central bore.

38. The support body according to claim 37, wherein the adaptor extends  
30 only over a part of the length of the central bore.

39. The support body according to claim 37 or 38, wherein the central bore has a funnel-shaped insertion opening.

40. A grinding tool having a support body according to any one of claims 1 to 39 and an abrasive layer which has abrasive means, and which is arranged on the support surface of the support body.

5 41. A grinding tool according to claim 40, wherein the abrasive layer is formed from a continuous abrasive ring or individual abrasive segments.

10 42. A method of producing a support body for a grinding tool, wherein the support body includes a support surface for an abrasive layer having abrasive means, and substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, wherein the natural fibre material is a cotton fabric or paper, the abrasive means-free composite material is provided in the form of a plate in a first method step and in a second method step a body is  
15 cut out of the plate with predetermined dimensions.

43. The method according to claim 42, wherein the support surface is a circumferential support surface.

20 44. The method according to claim 42 or 43, wherein the abrasive means comprises superabrasive means.

45. The method according to any one of claims 42 to 44, wherein said plastic comprises phenolic resin.  
25

46. The method according to any one of claims 42 to 45, wherein, in the second method step, the body is a cylindrical or hollow-cylindrical body.

30 47. The method according to any one of claims 42 to 46, wherein the body is cut out of the plate by water jet cutting or by means of a band saw.

48. The method according to any one of claims 42 to 47, wherein the body is a first body, and wherein, in the course of the second method step, at least one

further body is cut out of the plate with predetermined dimensions and connected to the first body.

49. The method according to claim 48, wherein  
5 the at least one further body comprises a cylindrical or hollow-cylindrical body.

50. The method according to claim 48 or 49, wherein the at least one  
10 further body is connected to the first body by adhesive.

51. The method according to any one of claims 48 to 50, wherein the first  
body and the at least one further body are cylindrical or hollow-cylindrical bodies,  
the bodies being connected together at side surfaces.

52. The method according to any one of claims 48 to 50, wherein the first  
15 body and the at least one further body are cylindrical or hollow-cylindrical bodies,  
the bodies being connected together at side surfaces, wherein axes of symmetry of  
the bodies are brought substantially into congruent relationship.

53. The method according to any one of claims 42 to 52, wherein, in a third  
20 method step, the body is re-worked.

54. The method according to any one of claim 53, wherein, in the third  
method step, the body is re-worked by one or more of cutting machining, balancing  
25 or by fitting a central bore.

55. The method according to any one of claims 48 to 52, wherein, in a  
third method step, one of or both (1) the first body and (2) the at least one further  
body is or are re-worked.  
30

56. The method according to any one of claims 48 to 52, wherein, in a  
third method step, one of or both (1) the first body and (2) the at least one further  
body is or are re-worked by one or more of cutting machining, balancing or by  
fitting a central bore.

57. The method according to any one of claims 42 to 56, wherein the body in a further method step which follows the second method step is connected to an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive.

58. The method according to claim 57, wherein the body in the further method step is connected to the adaptor by adhesive.

59. The method according to claim 57 or 58, wherein the adaptor substantially comprises a metal.

60. The method according to any one of claims 57 to 59, wherein the adaptor is of a substantially hollow-cylindrical configuration.

61. The method according to any one of claims 53 to 56, wherein the body in a further method step which follows the third method step is connected to an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive.

62. The method according to claim 61, wherein the body in the further method step is connected to the adaptor by adhesive.

63. The method according to claim 61 or 62, wherein the adaptor substantially comprises a metal.

64. The method according to any one of claims 61 to 63, wherein the adaptor is of a substantially hollow-cylindrical configuration.

65. The method according to any one of claims 48 to 56, wherein one of or both (1) the body and (2) the at least one further body in a further method step which follows the second method step is connected to an adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive.

66. The method according to any one of claim 65, wherein one of or both (1) the body and (2) the at least one further body in the further method step which follows the second method step is connected to the adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive by adhesive.

5

67. The method according to claim 65 or 66, wherein the adaptor substantially comprises a metal.

68. The method according to any one of claims 65 to 67, wherein the  
10 adaptor is of a substantially hollow-cylindrical configuration.

69. The method according to claim 55 or 56, wherein one of or both (1) the body and (2) the at least one further body in a further method step which follows the second method step or the third method step is connected to an adaptor  
15 for connecting the support body or a grinding tool formed therewith to a rotary drive.

70. The method according to claim 69, wherein one of or both (1) the body and (2) the at least one further body in the further method step which follows  
20 the second method step or the third method step is connected to the adaptor for connecting the support body or a grinding tool formed therewith to a rotary drive by adhesive.

71. The method according to claim 69 or 70, wherein the adaptor  
25 substantially comprises a metal.

72. The method according to any one of claims 69 to 71, wherein the adaptor is of a substantially hollow-cylindrical configuration.

73. A method of producing a grinding tool having a support body which  
30 includes a support surface for an abrasive layer, and substantially comprises an abrasive means-free composite material comprising a plurality of mutually superposed layers of a natural fibre material, which are connected together by plastic, and the abrasive layer which has abrasive means and which is arranged on

the support surface of the support body, wherein firstly the support body is provided and then the abrasive layer having the abrasive means is arranged on the support surface of the support body, and one of or both (1) wherein the support body is produced by the method according to any one of claims 42 to 72, and (2)  
5 wherein the support body has a first body and at least one further body, wherein the bodies are connected together, and wherein the first body and the at least one further body are made of the abrasive means-free composite material comprising the plurality of mutually superposed layers of natural fibre material which are connected together by said plastic.

10

74. The method according to claim 73, wherein the support surface is a circumferential support surface.

15

75. The method according to claim 73 or 74, wherein the abrasive means comprises superabrasive means.

76. The method according to any one of claims 73 to 75, wherein said plastic comprises phenolic resin.

20

77. The method according to any one of claims 73 to 76, wherein the natural fibre material is a cotton fabric or paper.

25

78. The method according to any one of claims 73 to 77, wherein the abrasive layer is formed from a continuous abrasive ring or individual abrasive segments.

79. The method according to any one of claims 73 to 78, wherein the abrasive layer is arranged on the support surface of the support body by one of or both (1) pressing thereon and (2) adhesive bonding.

Fig. 1a)

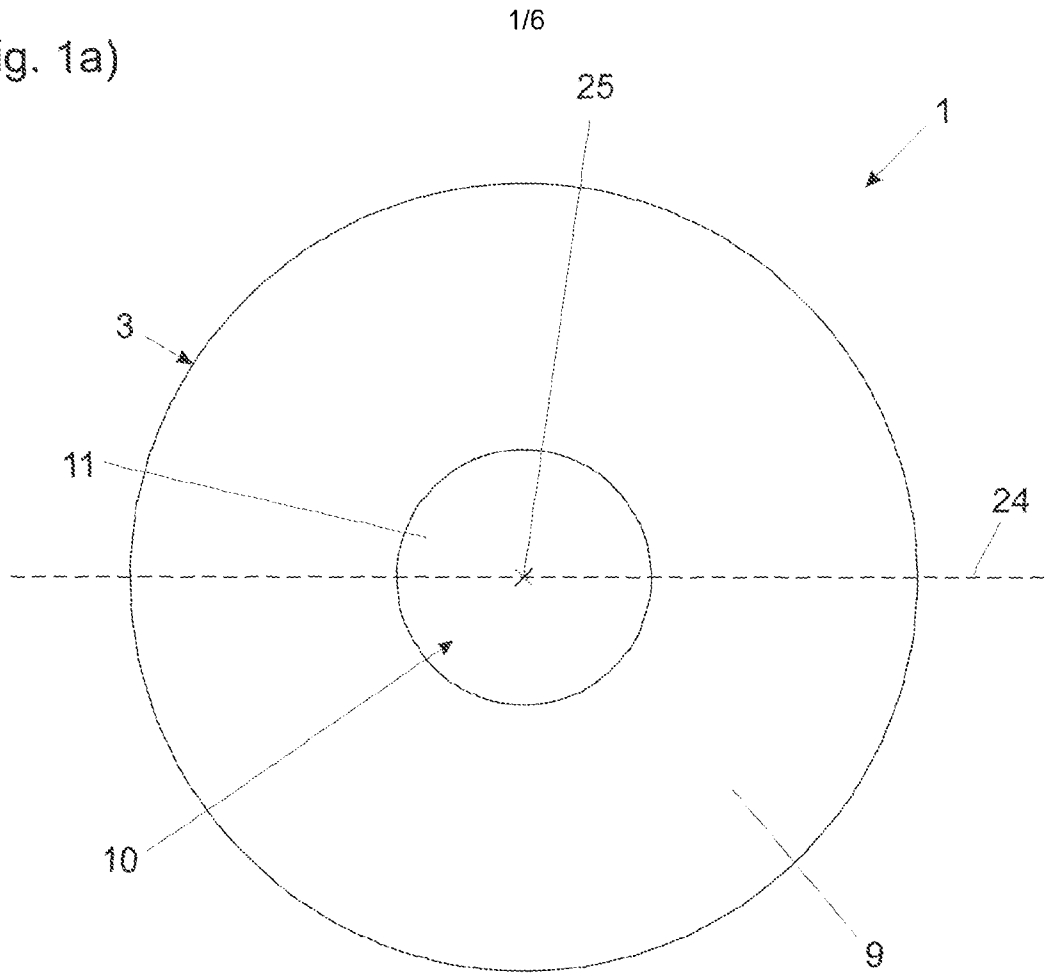


Fig. 1b)

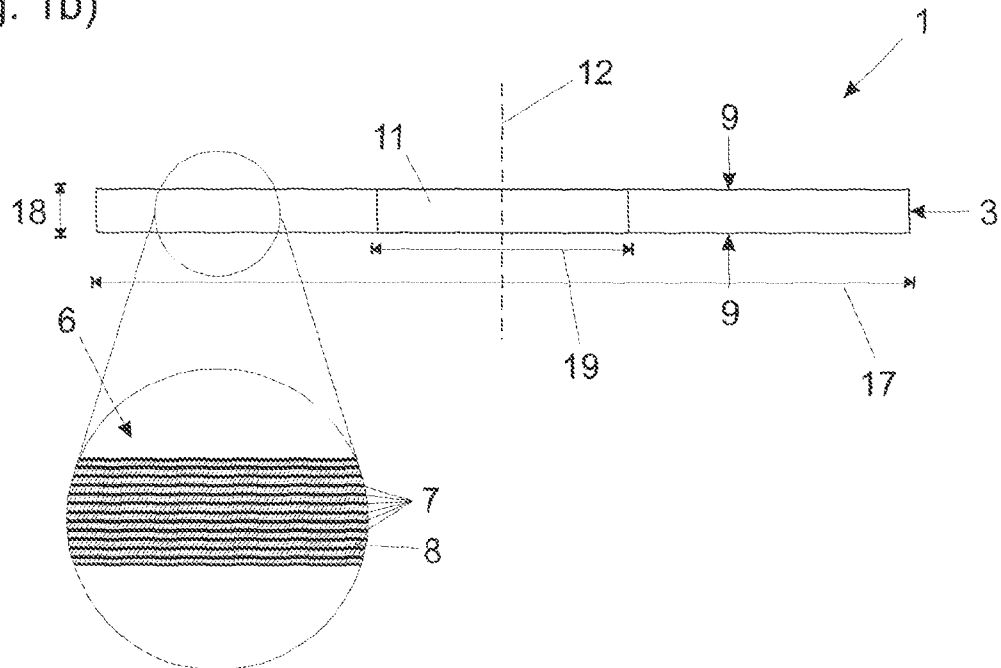


Fig. 2

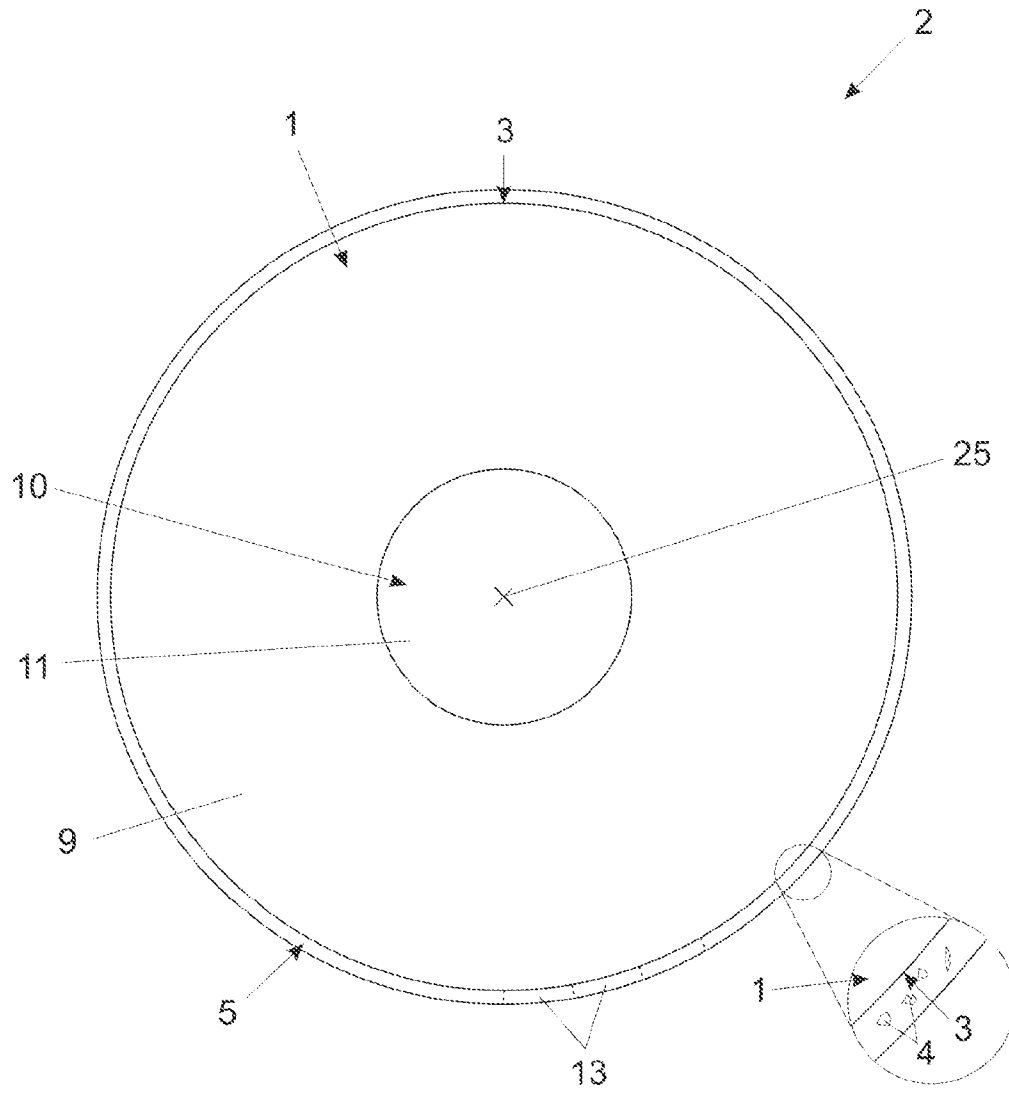


Fig. 3a)

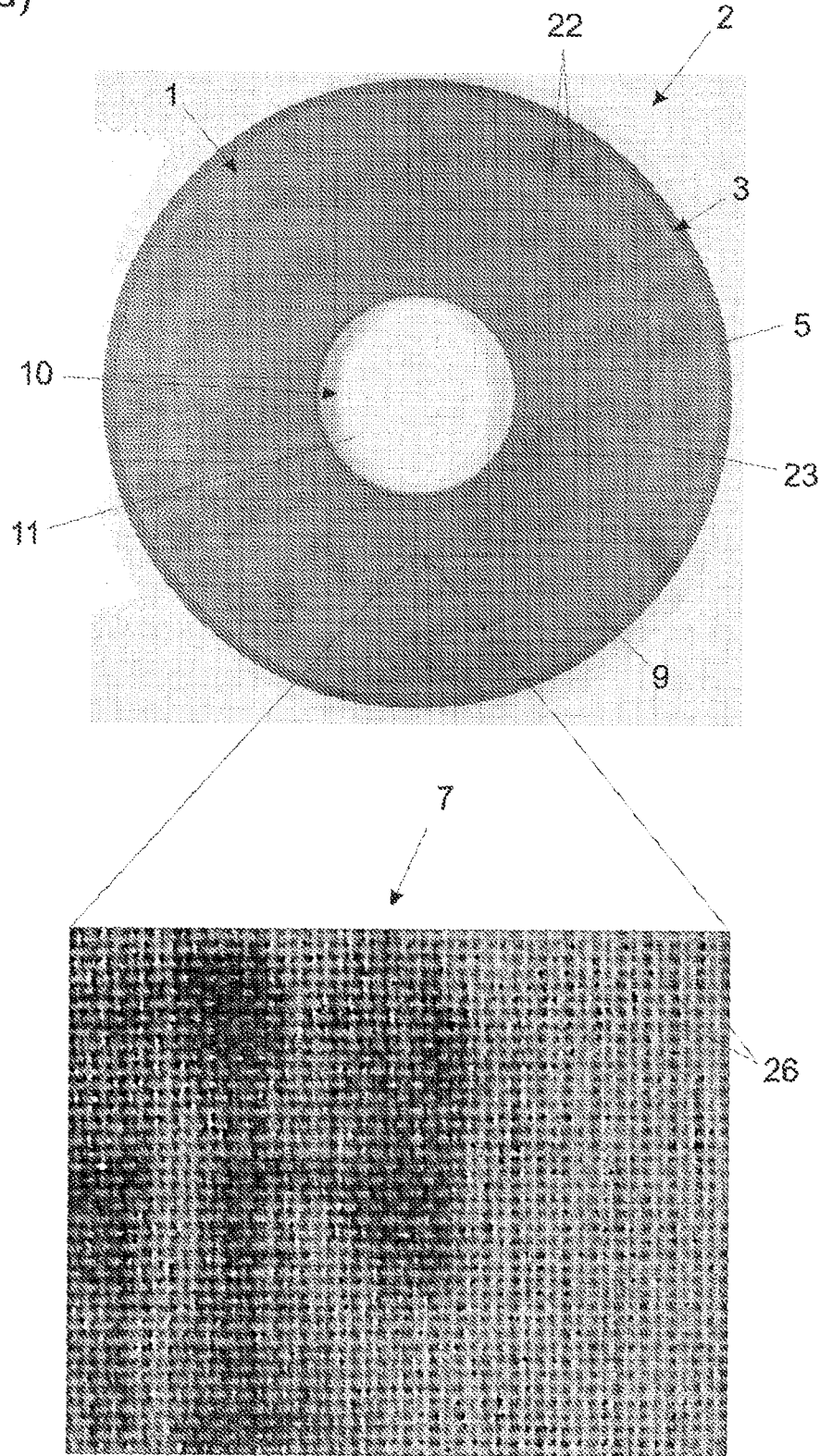


Fig. 3b)

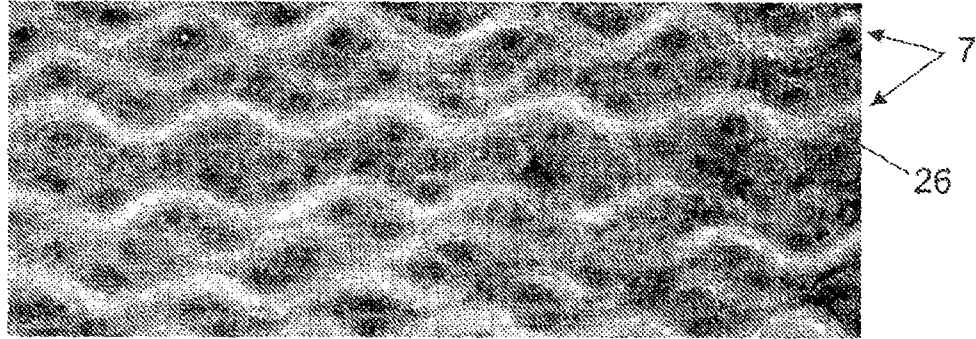


Fig. 4a)

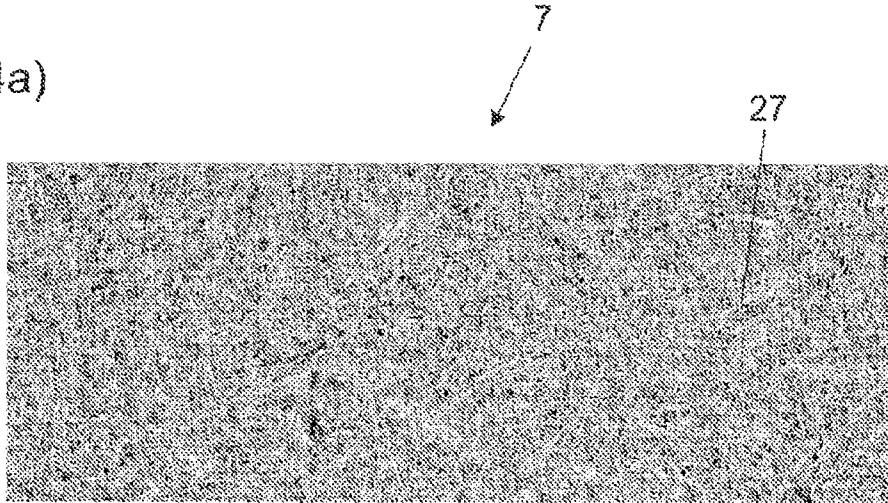


Fig. 4b)



Fig. 5

