(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 893 572 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
10.12.2003 Bulletin 2003/50

(51) Int Cl.[7]: **E21B 10/56**

(21) Application number: **98305510.4**

(22) Date of filing: **10.07.1998**

(54) **Improvements in or relating to elements faced with superhard material**

Verbesserungen an Schneidelementen mit einer Oberfläche aus superhartem Werkstoff

Amélioration des éléments de coupe avec une surface en materiaux extra-dur

(84) Designated Contracting States:
BE DE FR IE

(30) Priority: **26.07.1997 GB 9715771**
01.06.1998 GB 9811560

(43) Date of publication of application:
27.01.1999 Bulletin 1999/04

(73) Proprietor: **Camco International (UK) Limited**
Stonehouse, Gloucestershire GL10 3RQ (GB)

(72) Inventor: **Matthias, Terrry R.**
Upton St. Leonards, Gloucestershire (GB)

(74) Representative: **Bailey, Richard Alan et al**
Marks & Clerk,
27 Imperial Square
Cheltenham, GL50 1RQ (GB)

(56) References cited:
EP-A- 0 638 383
EP-A- 0 655 549
EP-A- 0 687 797
EP-A- 0 688 937
EP-A- 0 738 823
EP-A- 0 764 760
US-A- 5 351 772
US-A- 5 709 279

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 893 572 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to elements faced with superhard material, and particularly to preform elements comprising a facing table of superhard material having a front face, a peripheral surface, and a rear surface bonded to a substrate of material which is less hard than the superhard material.

[0002] Preform elements ofthis kind are often used as cutting elements on rotary drag-type drill bits, and the present invention will be particularly described in relation to such use. However, the invention is not restricted to cutting elements for this particular use, and may relate to preform elements for other purposes. For example, elements faced with superhard material, of the kind referred to, may also be employed in workpiece-shaping tools, high pressure nozzles, wire-drawing dies, bearings and other parts subject to sliding wear, as well as elements subject to percussive loads as may be the case in tappets, cams, cam followers, and similar devices in which a surface of high wear resistance is required.

[0003] Preform elements used as cutting elements in rotary drill bits usually have a facing table of polycrystalline diamond, although other superhard materials are available, such as cubic boron nitride. The substrate of less hard material is often formed from cemented tungsten carbide, and the facing table and substrate are bonded together during formation of the element in a high pressure, high temperature forming press. This forming process is well known and will not be described in detail.

[0004] Each preform cutting element may be mounted on a carrier in the form of a generally cylindrical stud or post received in a socket in the body of the drill bit. The carrier is often formed from cemented tungsten carbide, the surface of the substrate being brazed to a surface on the carrier, for example by a process known as "LS bonding". Alternatively, the substrate itself may be of sufficient thickness as to provide, in effect, a cylindrical stud which is sufficiently long to be directly received in a socket in the bit body, without being brazed to a carrier. The bit body itself may be machined from metal, usually steel, or may be moulded using a powder metallurgy process.

[0005] Such cutting elements are subjected to extremes of temperature during formation and mounting on the bit body, and are also subjected to high temperatures and heavy loads when the drill is in use down a borehole. It is found that as a result of such conditions spalling and delamination of the superhard facing table can occur, that is to say the separation and loss of the diamond or other superhard material over the cutting surface of the table.

[0006] This may also occur in preform elements used for other purposes, and particularly where the elements are subjected to repetitive percussive loads, as in tappets and cam mechanisms.

[0007] Commonly, in preform elements of the above type the interface between the superhard table and the substrate has usually been flat and planar. However, particularly in cutting elements for drill bits, attempts have been made to improve the bond between the superhard facing table and the substrate by configuring the rear face of the facing table so as to provide a degree of mechanical interlocking between the facing table and substrate.

[0008] One such arrangement is shown in U.S. Patent Specification No. 5120327 where the rear surface of the facing table is integrally formed with a plurality of identical spaced apart parallel ridges of constant depth. The facing table also includes a peripheral rim of greater thickness, the extremities of the parallel ridges intersecting the surrounding ring. US Specification No. 4784023 illustrates a similar arrangement but without the peripheral ring. Other configurations of the rear face of the facing table are described in British Patent Specifications Nos. 2283772 and 2283773.

[0009] Although such arrangements have improved the bond between the superhard facing table and the substrate and have reduced the incidence of spalling and delamination, these effects still occur particularly where the preform elements are liable to be the subject to impact conditions.

[0010] Hitherto, it has been considered advantageous to provide in the substrate of each element a peripheral rebate which extends around the whole of the periphery of the substrate so as to provide a corresponding continuous peripheral wall or rim of superhard material extending around the periphery of the facing table and overlapping the periphery of the substrate, as shown in the above-mentioned US Specification No. 5120327. According to the present invention the surprising discovery has been made that spalling and delamination is less likely to occur if such a wall or rim extends around only part of the periphery of the preform element, or is interrupted so as to provide a plurality of shorter wall or rim parts spaced apart around the periphery of the cutting element. Such arrangements may provide advantage with any configuration of other recesses and projections at the interface between the facing table and substrate.

[0011] EP 0655549 describes an arrangement having a peripheral rebate extending around the full periphery of the cutter. EP 0764760 describes an arrangement having a plurality of recesses located at the periphery of the cutter.

[0012] According to one aspect of the invention, therefore, there is provided a preform element including a facing table of superhard material having a front face, a peripheral surface, and a rear surface bonded to the front surface of a substrate which is less hard than the superhard material, the front surface of the substrate being formed with a plurality of recesses into which extend corresponding projections formed on the rear surface of the facing table, said recesses including at least one rebate which extends along only a part of the periphery of the substrate and into which extends a projection on the

facing table which provides a part of the peripheral surface of the facing table, the at least one rebate having a bottom wall and an inner wall, the bottom wall being flat and generally parallel to the front face of the substrate, the recesses further including a plurality of elongated grooves, at least one of which extends from the interior of the surface to the periphery of the substrate along which the rebate is formed.

[0013] Although only a single rebate may be provided, there might also be provided two or more of such rebates spaced apart along the periphery of the substrate. For example, said rebates may be of substantially equal length and may be substantially equally spaced apart along the periphery of the substrate.

[0014] The or each rebate may be of substantially constant width as measured from the periphery of the substrate transverse to the length of the rebate.

[0015] Alternatively, the rebate may vary in width as it extends along a part of the periphery of the substrate. For example, the rebate may have a minimum width at each end thereof and a maximum width at a location intermediate the ends thereof. The width of the rebate may vary smoothly and continuously between said minimum width and said maximum width.

[0016] The inner wall may extend generally at right angles to the front surface ofthe substrate, but is preferably inclined outwardly towards the periphery of the substrate as it extends away from the front surface of the substrate.

[0017] Alternatively, the or each rebate may be defined by a wall which extends continuously from the front surface of the substrate to the periphery thereof.

[0018] The aforesaid recesses in the front surface of the substrate may also include recesses of any other shape.

[0019] At least some of said grooves may intersect one or more of said rebates extending along the periphery of the substrate.

[0020] At least some of said grooves may have central longitudinal axes which radiate from a common point. Said common point may lie at the centre of the substrate or may be spaced from the centre of the substrate. For example, said common point may lie on a line passing through the centre of the substrate and through one of said rebates at the periphery thereof.

[0021] Alternatively, at least some of said grooves may have longitudinal axes which extend inwardly away from the periphery of the substrate at an angle which is inclined at less than 90° to said periphery.

[0022] In any of the above arrangements at least some of said grooves may vary in width and/or depth along the length thereof. For example said grooves may increase in width and/or depth as they extend towards the periphery of the substrate.

[0023] Said grooves may extend up to the periphery of the substrate, so that the ends of the ribs of superhard material which extend into the grooves form part of the exposed peripheral surface of the facing table.

[0024] In any of the above arrangements there may be provided a transition layer between the superhard material and the less hard material, the transition layer comprising material having one or more properties which is intermediate the corresponding properties of the superhard and less hard materials.

[0025] In this case the transition layer may be regarded as forming part of the substrate or part of the facing table, depending on the configuration.

[0026] The following is a more detailed description of embodiments of the invention, by way of example, reference being made to the accompanying drawings in which:

Figure 1 is a section on the Line 1-1 ofFigure 2 through one form ofpreform element in accordance with the present invention,
Figure 2 is a plan view of the substrate of the element of Figure 1, the facing table being omitted to show the configuration of the front face of the substrate.
Figure 3 is a perspective view of the substrate shown in Figure 2,
Figure 4 is a perspective view showing how the substrate of Figures 2 and 3 may be cut from an intermediate member,
Figure 5 is a perspective view of the substrate of an alternative embodiment of the invention,
Figure 6 is a plan view of the substrate of Figure 5,
Figures 7-13 are sectional views through preform elements according to other embodiments of the invention,
Figure 14 is a half-section through another preform element in accordance with the invention,
Figure 15 is a plan view of the substrate of the embodiment of Figure 14,
Figures 16 and 17 are similar views to Figures 14 and 15 of an alternative embodiment,
Figures 18 and 19 are similar views to Figures 14 and 15 of another embodiment,
Figure 20 is a section through a further preform element in accordance with the invention, and
Figure 21 is a perspective view of the substrate of the element shown in Figure 20.

[0027] Figure 1 is a section through a preform element for use as a cutting element in a rotary drag-type drill bit. The arrangement and mounting of such cutting elements on a drill bit, as well as the general characteristics of such drill bits, are well known and will not therefore be described in detail. The present invention is concerned solely with the construction of each preform cutting element.

[0028] Referring to Figure 1, the cutting element comprises a front facing table 10 of polycrystalline diamond or other superhard material, the rear surface 11 of which is bonded to the front face of a substrate 12 of less hard material, usually cemented tungsten carbide.

[0029] As is well known, the usual method of manufacturing such elements is first to form the substrate with an appropriate configuration on its front face and then to apply to the front face of the substrate a layer of polycrystalline diamond particles which fills the recesses in the front face. The assembly is then subjected to extremely high pressure and temperature in a press so that the diamond particles bond together to form the front facing table 10 and also bond to the substrate 12.

[0030] It is well known to configure the front face of the substrate with projections and recesses so that there is a degree of mechanical interlock between the front facing table and substrate so as to enhance the bond between them and therefore reduce the risk of delamination or spalling of the facing table.

[0031] As previously described , it is also common practice to form around the entire periphery of the substrate a continuous annular rebate so that when the diamond particles fill the rebate they create a solid peripheral wall or rim of diamond around the periphery of the facing table. This is not only believed to further enhance the bonding of the facing table to the substrate, but the increased thickness of the diamond at the peripheral cutting edge of the element is believed to enhance the element's resistance to impact.

[0032] According to the present invention, however, the substrate is formed with a rebate which extends around only a part of the periphery of the substrate so that the corresponding wall or rim of diamond formed on the facing table also extends only around a part of the periphery of the cutting element. As previously explained, this has surprisingly been found to enhance the resistance of the cutting element to spalling or delamination of the diamond table.

[0033] In the embodiment of Figure 1, therefore, according to the invention, the circular substrate 12 is formed with a peripheral rebate 13 which extends around only a part of the periphery of the substrate 12. The rebate 13 has a flat bottom wall 14 which is parallel to the front surface 15 of the facing table 10 and an inclined inner wall 16. The inner wall 16 is arcuate and is of greater radius of curvature than the substrate 12 itself.

[0034] Also formed in the front surface of the substrate 12 are a series of elongate grooves 17 which extend from the interior of the surface to the part of the periphery of the substrate along which the rebate 13 is formed. The grooves 17 increase linearly in both width and depth as they extend outwardly towards the periphery of the substrate.

[0035] In the completed element, a peripheral wall or rim 18 is formed on the diamond table 10, projecting into the rebate 14 and thereby forming a thickened rim around a part of the periphery of the cutting element. Ribs 19 are also formed on the rear surface 11 of the facing table 10, projecting into the grooves 17 in the substrate.

[0036] In use the thickened rim 18 portion of the cutting element is used as the cutting edge of the element on the drill bit and thus the increased thickness of the facing table in this region enhances the impact resistance of the cutting edge which is further enhanced by the ends of the ribs 19 which are exposed at the periphery of the cutting element adjacent the cutting edge. It will be noted that, at the periphery, the ribs 19 are of greater depth than the partial rim 18. The partial rim 18 and ribs 19 also serve to enhance the bond between the facing table and substrate.

[0037] As described in co-pending British Patent Application No. 9715771.3, a number of such substrates 12 may be formed from a single intermediate member, as shown in Figure 4. The tungsten carbide intermediate member 20 has an annular rebate 21 extending around the whole periphery thereof and grooves 22 extending radially inwards from the per iphery of the intermediate member. Circular substrates 12 are then cut, for example by electron discharge machining, from a portion of the intermediate member 20 adjacent the periphery and it will thus be seen that this produces a substrate of the kind shown in Figures 2 and 3.

[0038] Figures 5 and 6 show in perspective and plan view the substrate of an alternative embodiment of preform cutting element according to the invention. In this case the tungsten carbide substrate 23 is formed with three rebates 24 which are equally spaced apart around the periphery of the substrate, the spacings between the rebates being indicated at 25. It will be seen that the length of each rebate 24 is greater than the peripheral spacing between adjacent rebates, and the rebates together extend around the majority of the periphery of the substrate. Generally it is preferred that the peripheral length of each rebate is at least more than twice its maximum width. Although three rebates are shown in this example, any greater number of rebates may be provided. However, it may be preferable for there to be no more than five rebates.

[0039] Grooves 26 extend inwardly from the periphery of the substrate and in this case the grooves 26 have longitudinal axes which are inclined at less than 90° to the periphery of the substrate. As best seen in Figure 6, a groove 26 is formed at each end of each rebate 24.

[0040] As in the previous arrangement, in the finished cutting element the rebates 24 are each filled with a partial projecting rim or wall on the rear surface of the facing table which is applied to the substrate, and the grooves 26 are filled with outwardly extending ribs formed on the rear surface of the facing table. In this case also, the fact that each rebate extends around only a part of the periphery of the cutting element enhances the resistance of the element to spalling or delamination, as previously described, but since three separate rims are spaced apart around the periphery, the cutting element may be used in any orientation on the drill bit since any part of the periphery can serve as the cutting edge.

[0041] Figure 7 is a section through an alternative form of cutting element according to the invention where the rear surface 27 of the facing table 28 is flat apart

from the partial rim 29 which projects into a rebate 30 in the substrate 31 which extends around only a part of the periphery of the substrate. The rebate 30 may extend around any portion of the periphery of the substrate and preferably extends around at least a third of the periphery. The rebate is of substantially constant width as in the arrangement of Figures 5 and 6, or may vary in width as in the arrangement of Figures 1-3 where the width of the rebate is a minimum at its ends and increases gradually to a maximum at a position between the ends of the rebate.

[0042] It will be appreciated that the partial rebate on the substrate and corresponding partial rim on the facing table may be of any desired cross-sectional shape and the rest of the interface between the substrate and facing table may be of any configuration. Figures 8-19 show, by way of further example, other configurations in accordance with the invention. Figures 8-13 are all sectional views of the cutting element.

[0043] In the arrangement of Figure 8 the partial rim 32 on the facing table 33 is generally rectangular in cross-section but has a curved inner edge 34. The front surface ofthe substrate 35 is formed with recesses into which extend corresponding projections 36 on the facing table 33. The recesses and projections 36 may be of any required configuration, for example the projections may comprise parallel ribs extending transversely across the cutting element, or concentric spaced circular ribs, or individual spaced circular domed protuberances formed on the underside of the facing table 33.

[0044] The arrangement of Figure 9 is similar to that of Figure 8 except that the inner wall 37 of the rebate 38 is inclined at greater than 90° to the bottom wall.

[0045] The arrangement of Figure 10 is similar to that of Figure 9 except that there is a curved bevel 39 between the flat bottom wall 40 and the inclined inner wall 41 of the rebate in the substrate.

[0046] In the modified arrangement of Figure 11 there is a smoothly curved junction 42 between the inclined inner wall 43 of the rebate in the substrate and the front surface 44 of the substrate. The bottom wall 45 of the rebate is again flat.

[0047] In the arrangement of Figure 12 the inner wall 46 of the rebate in the substrate is stepped in cross-section.

[0048] In the arrangement of Figure 13, the partial rebate in the substrate 47 is smoothly curved in section there being a smoothly curved junction between the inclined inner wall 48 and the bottom wall 49 and between the inner wall 48 and the front surface of the substrate.

[0049] The front surface of the substrate is formed with tapered recesses 50 alternating with tapered projections 51. The recesses and projections 50, 51 may be elongate and extend in parallel arrays across the width of the cutting element, or they may comprise individual frusto-conical recesses and projections alternating in two dimensions across the area of the central region of the substrate.

[0050] In the arrangement of Figures 14 and 15, the peripheral rim 52 of the facing table 53 varies in width periodically as it extends around part of the periphery of the facing table. As may be seen from Figure 15, the front surface of the substrate 54 is formed with two rebates 55 which are spaced apart and each extend around part of the periphery of the substrate. The cross-sectional shape of each rebate 55 and partial rim 52 is generally in the form of part of a sine wave which varies from a minimum thickness indicated at 56 to a maximum thickness indicated at 57.

[0051] Figures 16 and 17 show a modified arrangement where there is provided only a single rebate 58 which extends around approximately half of the periphery of the substrate 59. In this case the rebate 58 and corresponding partial peripheral rim 60 on the facing table 61 vary in depth as well as in width, the portions 62 of greater width and depth having a double curved configuration as best seen in Figure 16.

[0052] Figures 18 and 19 are somewhat similar to the arrangement of Figures 16 and 17 but in this case the single rebate 63 in the substrate 64 extends around more than half of the periphery of the substrate. Also the portions 65 of the rim 66 which are of greater width and depth have a cross-section in the form of a single smooth curve.

[0053] In each of the arrangements described above the front surface of the substrate comprises a generally flat central portion, with or without recesses in it, the peripheral rebates being clearly distinct from the central flat region. However, the invention is also applicable to arrangements where the peripheral rebates comprise the outer deepest portions of a continuously shaped front surface on the substrate, for example where the front surface of the substrate is generally convexly curved. Such an arrangement is shown in Figures 20 and 21 where the substrate 67 has a front surface 68 which is basically convexly domed so that the peripheral regions 69 of the facing table 70 are thicker than the central region of the facing table so as to provide a similar effect to the previously described arrangements where the facing table is formed with a distinct peripheral wall or rim.

[0054] In prior art arrangements where the substrate has a convexly curved surface, the surface is generally continuous over the whole area of the substrate and is the same in all diametral cross-sections, so that the effective peripheral rim extends around the whole periphery of the element. In accordance with the present invention, however, and as shown in Figures 20 and 21, the convexly curved front surface of the substrate 67 does not extend over the whole of the substrate but is interrupted by a number of angularly spaced lands 71, three such lands being provided in the arrangement shown in the drawings. The lands 71 on the substrate have the effect of making the peripheral rim on the facing table 70 discontinuous so as to provide, in effect, three circumferentially spaced rim portions 69.

[0055] Figure 21 is a perspective view of the substrate, without the facing table, to show clearly the shapes of the three rebates formed in the substrate.

[0056] The invention is also applicable to other arrangements where the front surface of the substrate is continuously shaped. For example, arrangements are possible where a convexly curved surface, similar to the surface 68, is formed with grooves or other kinds of recesses, for example concentric grooves. Also, instead of the front surface of the substrate being smoothly convex it may be of any other generally convex configuration.

[0057] It will be appreciated that the above configurations are by way of example only, and modifications may be made both the cross-sectional shape of the rebates and corresponding peripheral rims on the facing table, as well as to the configuration of the rest of the interface between the substrate and facing table.

Claims

1. A preform element including a facing table (10) of superhard material having a front face (15), a peripheral surface, and a rear surface bonded to the front surface of a substrate (12) which is less hard than the superhard material, the front surface of the substrate being formed with a plurality of recesses (13, 17) into which extend corresponding projections (18, 19) formed on the rear surface of the facing table, said recesses including at least one rebate (13) which extends along only a part of the periphery of the substrate (12) and into which extends a projection (18) on the facing table which provides a part of the peripheral surface of the facing table, said at least one rebate having a bottom wall and an inner wall, the bottom wall being flat and generally parallel to the front surface of the substrate, and **characterised in that** the recesses further include a plurality of elongated groves (17), at least one of which extends from the interior of the surface to the periphery of the substrate along which the rebate (13) is formed.

2. A preform element according to Claim 1, wherein there are provided two or more of such rebates (24) spaced apart along the periphery of the substrate (23).

3. A preform element according to Claim 2, wherein said rebates (24) are of substantially equal length.

4. A preform element according to Claim 2 or Claim 3, wherein said rebates (24) are substantially equally spaced apart along the periphery of the substrate (23).

5. A preform element according to any one of the preceding claims, wherein the or each rebate (24) is of substantially constant width as measured from the periphery of the substrate (23) transverse to the length of the rebate.

6. A preform element according to any of the preceding Claims 1 to 4, wherein the rebate (13) varies in width as it extends along a part of the periphery of the substrate (12).

7. A preform element according to Claim 6, wherein the rebate (13) has minimum width at each end thereof and a maximum width at a location intermediate the ends thereof.

8. A preform element according to Claim 7, wherein the width of the rebate (13) varies smoothly and continuously between said minimum width and said maximum width.

9. A preform element according to Claim 1, wherein the inner wall (16) is inclined outwardly towards the periphery of the substrate (12) as it extends away from the front surface of the substrate.

10. A preform element according to any of the preceding Claims 1 to 8, wherein the or each rebate is defined by a wall (41) which extends continuously from the front surface of the substrate to the periphery thereof.

11. A preform element according to any of the preceding claims, wherein the aforesaid recesses in the front surface of the substrate also include other recesses (17) in addition to said rebate or rebates.

12. A preform element according to any one of the preceding claims, wherein at least some of said grooves (17) intersect one or more of said rebates (13) extending along the periphery of the substrate (12).

13. A preform element according to any one of the preceding claims, wherein at least some of said grooves (17) have central longitudinal axes which radiate from a common point.

14. A preform element according to Claim 13, wherein said common point lies at the centre of the substrate.

15. A preform element according to Claim 13, wherein said common point is spaced from the centre of the substrate.

16. A preform element according to Claim 15, wherein said common point lies on a line passing through the centre of the substrate and through one of said

rebates at the periphery thereof.

17. A preform element according to any one of Claims 1 to 12, wherein at least some of said grooves (26) have longitudinal axes which extend inwardly away from the periphery of the substrate (23) at an angle which is inclined at less than 90° to said periphery.

18. A preform element according to any of the preceding claims, wherein at least some of said grooves (26) vary in width and/or depth along the length thereof.

19. A preform element according to Claim 18, wherein said grooves (26) increase in width and/or depth as they extend towards the periphery of the substrate.

20. A preform element according to any of the preceding claims, wherein said grooves (26) extend up to the periphery of the substrate (23), so that the ends of the ribs of superhard material which extend into the grooves form part of the exposed peripheral surface of the facing table.

21. A preform element according to any of the preceding claims, wherein there is provided a transition layer between the superhard material (10) and the less hard material (12), the transition layer comprising material having one or more properties which is intermediate the corresponding properties of the superhard and less hard materials.

Patentansprüche

1. Vorformelement, das eine Belagplatte (10) aus superhartem Werkstoff mit einer Vorderfläche (15), einer Umfangsfläche und einer Hinterfläche aufweist, die mit der Vorderfläche eines Trägers (12) verbunden ist, der weniger hart als der superharte Werkstoff ist, wobei die Vorderfläche des Trägers mit einer Vielzahl von Aussparungen (13, 17) ausgebildet ist, in die sich entsprechende Vorsprünge (18, 19) erstrecken, die auf der Hinterfläche der Belagplatte gebildet werden, wobei die Aussparungen mindestens eine Ausfalzung (13) umfassen, die sich längs nur eines Teils des Umfanges des Trägers (12) erstreckt, und in die sich ein Vorsprung (18) an der Belagplatte erstreckt, der einen Teil der Umfangsfläche der Belagplatte bereitstellt, wobei die mindestens eine Ausfalzung eine Bodenwand und eine Innenwand aufweist, wobei die Bodenwand flach ist und im allgemeinen parallel zur Vorderfläche des Trägers verläuft, und **dadurch gekennzeichnet, daß** die Aussparungen außerdem eine Vielzahl von länglichen Nuten (17) umfassen, von denen sich zumindestens eine vom Inneren der Fläche zum Umfang des Trägers erstreckt, längs dessen die Ausfalzung (13) gebildet wird.

2. Vorformelement nach Anspruch 1, bei dem zwei oder mehr derartige Ausfalzungen (24) vorhanden sind, die längs des Umfanges des Trägers (23) beabstandet sind.

3. Vorformelement nach Anspruch 2, bei dem die Ausfalzungen (24) eine im wesentlichen gleiche Länge aufweisen.

4. Vorformelement nach Anspruch 2 oder Anspruch 3, bei dem die Ausfalzungen (24) im wesentlichen längs des Umfanges des Trägers (23) gleich beabstandet sind.

5. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem die oder jede Ausfalzung (24) von im wesentlichen konstanter Breite ist, gemessen vom Umfang des Trägers (23) quer zur Länge der Ausfalzung.

6. Vorformelement nach einem der vorhergehenden Ansprüche 1 bis 4, bei dem die Ausfalzung (13) in der Breite variiert, während sie sich längs eines Teils des Umfanges des Trägers (12) erstreckt.

7. Vorformelement nach Anspruch 6, bei dem die Ausfalzung (13) eine minimale Breite an jedem Ende davon und eine maximale Breite an einer Stelle zwischen dessen Enden aufweist.

8. Vorformelement nach Anspruch 7, bei dem die Breite der Ausfalzung (13) gleichmäßig und kontinuierlich zwischen der minimalen Breite und der maximalen Breite variiert.

9. Vorformelement nach Anspruch 1, bei dem die Innenwand (16) nach außen in Richtung des Umfanges des Trägers (12) geneigt ist, während sie sich von der Vorderfläche des Trägers weg erstreckt.

10. Vorformelement nach einem der vorhergehenden Ansprüche 1 bis 8, bei dem die oder jede Ausfalzung durch eine Wand (41) definiert wird, die sich kontinuierlich von der Vorderfläche des Trägers zu dessen Umfang erstreckt.

11. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem die vorangehend erwähnten Aussparungen in der Vorderfläche des Trägers ebenfalls weitere Aussparungen (17) zusätzlich zur Ausfalzung oder den Ausfalzungen umfassen.

12. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem mindestens einige der Nuten (17) eine oder mehr der Ausfalzungen (13) schneiden, die sich längs des Umfanges des Trägers (12)

erstrecken.

13. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem mindestens einige der Nuten (17) mittlere Längsachsen aufweisen, die von einem gemeinsamen Punkt strahlenförmig ausgehen.

14. Vorformelement nach Anspruch 13, bei dem der gemeinsame Punkt in der Mitte des Trägers liegt.

15. Vorformelement nach Anspruch 13, bei dem der gemeinsame Punkt von der Mitte des Trägers beabstandet ist.

16. Vorformelement nach Anspruch 15, bei dem der gemeinsame Punkt auf einer Linie liegt, die durch die Mitte des Trägers und durch eine der Ausfalzungen an dessen Umfang verläuft.

17. Vorformelement nach einem der Ansprüche 1 bis 12, bei dem mindestens einige der Nuten (26) Längsachsen aufweisen, die sich nach innen weg vom Umfang des Trägers (23) unter einem Winkel erstrecken, der unter weniger als 90° zum Umfang geneigt ist.

18. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem mindestens einige der Nuten (26) in der Breite und/oder Tiefe längs deren Länge variieren.

19. Vorformelement nach Anspruch 18, bei dem die Nuten (26) in der Breite und/oder Tiefe größer werden, während sie sich in Richtung des Umfanges des Trägers erstrecken.

20. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem sich die Nuten (26) bis zum Umfang des Trägers (23) erstrecken, so daß die Enden der Rippen aus superhartem Werkstoff, die sich in die Nuten erstrecken, einen Teil der freigelegten Umfangsfläche der Belagplatte bilden.

21. Vorformelement nach einem der vorhergehenden Ansprüche, bei dem eine Übergangsschicht zwischen dem superharten Werkstoff (10) und dem weniger harten Werkstoff (12) vorhanden ist, wobei die Übergangsschicht einen Werkstoff mit einer oder mehr Eigenschaften aufweist, die zwischen den entsprechenden Eigenschaften des superharten und des weniger harten Werkstoffes liegen.

Revendications

1. Elément d'ébauche englobant une table de dressage (10) de matériau superdur comportant une face avant (15), une surface périphérique et une surface arrière liée à la surface avant d'un substrat (12) composé d'un matériau moins dur que le matériau superdur, la surface avant du substrat comportant plusieurs évidements (13, 17) dans lesquels s'étendent des saillies correspondantes (18, 19) formées sur la surface arrière de la table de dressage, lesdits évidements englobant au moins une entaille (13) s'étendant uniquement le long d'une partie de la périphérie du substrat (12), dans laquelle s'étend une saillie (18) sur la table de dressage constituant une partie de la surface périphérique de la table de dressage, ladite au moins une entaille comportant une paroi inférieure et une paroi interne, la paroi inférieure étant plate et en général parallèle à la surface avant du substrat, **caractérisé en ce que** les évidements englobent en outre plusieurs rainures allongées (17), dont au moins une s'étend à partir de l'intérieur de la surface vers la périphérie du substrat, le long de laquelle est formée l'entaille (13).

2. Elément d'ébauche selon la revendication 1, comportant deux ou plusieurs entailles de ce type (24) espacées le long de la périphérie du substrat (23).

3. Elément d'ébauche selon la revendication 2, dans lequel lesdites entailles (24) ont une longueur pratiquement égale.

4. Elément d'ébauche selon la revendication 2 ou la revendication 3, dans lequel lesdites entailles (24) sont espacées de manière pratiquement égale le long de la périphérie du substrat (23).

5. Elément d'ébauche selon l'une quelconque des revendications précédentes, dans lequel l'entaille ou chaque entaille (24) a une largeur pratiquement constante mesurée à partir de la périphérie du substrat (23), transversalement à la longueur de l'entaille.

6. Elément d'ébauche selon l'une quelconque des revendications 1 à 4, dans lequel l'entaille (13) a une largeur variable lors de son extension le long d'une partie de la périphérie du substrat (12).

7. Elément d'ébauche selon la revendication 6, dans lequel l'entaille (13) a une largeur minimale au niveau de chaque extrémité correspondante et une largeur maximale au niveau d'un emplacement situé entre les extrémités correspondantes.

8. Elément d'ébauche selon la revendication 7, dans lequel la largeur de l'entaille (13) varie de manière lisse et continue ente ladite largeur minimale et ladite largeur maximale.

9. Elément d'ébauche selon la revendication 1, dans

lequel la paroi interne (16) est inclinée vers l'extérieur en direction de la périphérie du substrat (12) lors de son extension à l'écart de la surface avant du substrat.

10. Elément débauche selon l'une quelconque des revendications 1 à 8, dans lequel l'entaille ou chaque entaille est définie par une paroi (41) s'étendant de manière continue de la surface avant du substrat vers la périphérie correspondante.

11. Elément d'ébauche selon l'une quelconque des revendications précédentes, dans lequel lesdites évidements dans la surface avant du substrat englobent aussi d'autres évidements (17), en plus de ladite entaille ou desdites entailles.

12. Elément d'ébauche selon l'une quelconque des revendications précédentes, dans lequel au moins certaines desdites rainures (17) coupent une ou plusieurs desdites entailles (13) s'étendant le long de la périphérie du substrat (12).

13. Elément d'ébauche selon l'une quelconque des revendications précédentes, dans lequel au moins certaines desdites rainures (17) comportent des axes longitudinaux centraux s'étendant de façon rayonnante à partir d'un point commun.

14. Elément d'ébauche selon la revendication 13, dans lequel ledit point commun se situe au niveau du centre du substrat.

15. Elément d'ébauche selon la revendication 13, dans lequel ledit point commun est espacé du centre du substrat.

16. Elément d'ébauche selon la revendication 15, dans lequel ledit point commun se situe sur une ligne traversant le centre du substrat et une desdites entailles au niveau de la périphérie correspondante.

17. Elément d'ébauche selon l'une quelconque des revendications 1 à 12, dans lequel au moins certaines desdites rainures (26) comportent des axes longitudinaux s'étendant vers l'intérieur et à l'écart de la périphérie du substrat (23) à un angle incliné à moins de 90° par rapport à ladite périphérie.

18. Elément d'ébauche selon l'une quelconque des revendications précédentes, dans lequel au moins certaines desdites rainures (26) ont une largeur et/ou une profondeur variables le long de la longueur correspondante.

19. Elément d'ébauche selon la revendication 18, dans lequel lesdites rainures (26) ont une largeur et/ou une profondeur accrues lors de leur extension vers la périphérie du substrat.

20. Elément débauche selon l'une quelconque des revendications précédentes, dans lequel lesdites rainures (26) s'étendent jusqu'à la périphérie du substrat (23), de sorte que les extrémités des nervures de matériau superdur s'étendant dans les rainures font partie de la surface périphérique exposée de la table de dressage.

21. Elément d'ébauche selon l'une quelconque des revendications précédentes, comportant une couche de transition entre le matériau superdur (10) et le matériau moins dur (12), la couche de transition étant composée d'un matériau présentant une ou plusieurs propriétés intermédiaires par rapport aux propriétés correspondantes du matériau superdur et du matériau moins dur.

FIG 1

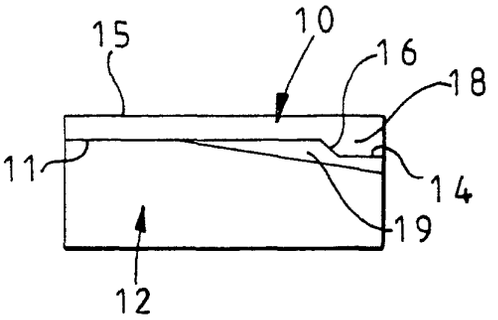


FIG 2

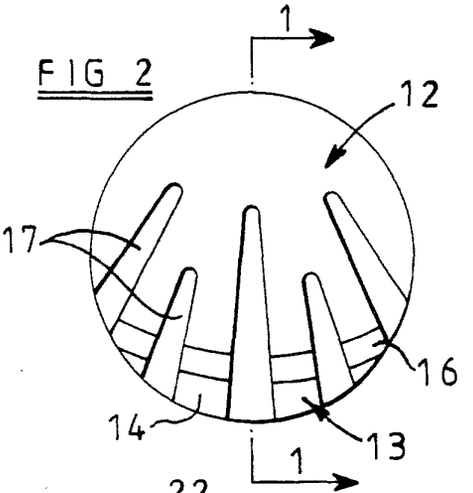


FIG 3

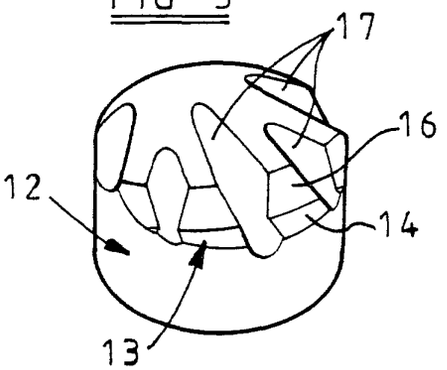


FIG 4

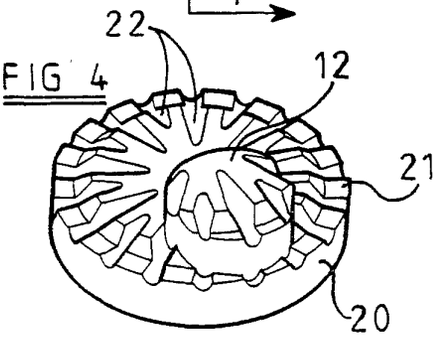


FIG 5

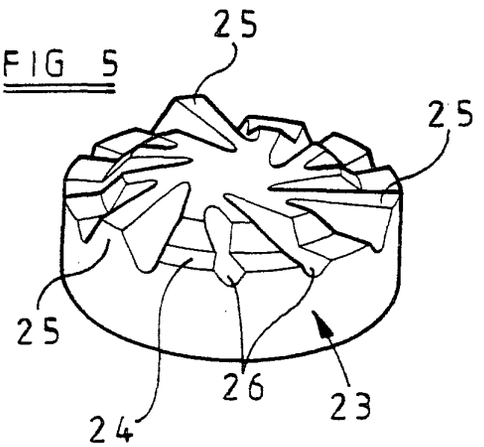


FIG 6

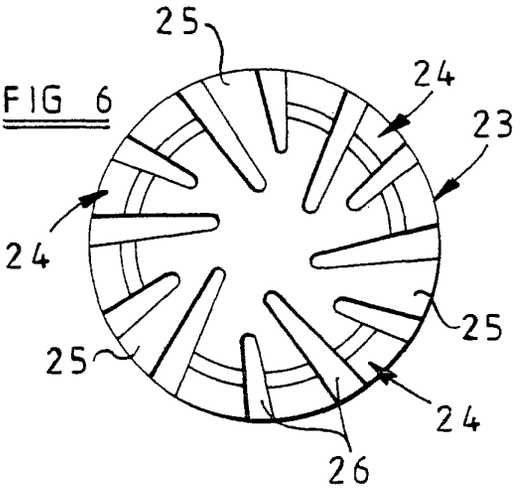


FIG 7

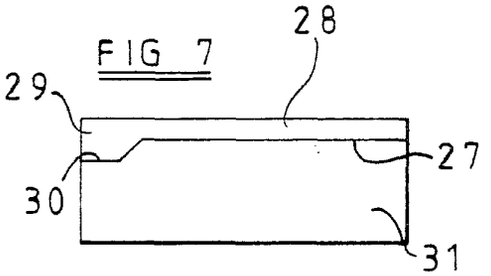


FIG 8

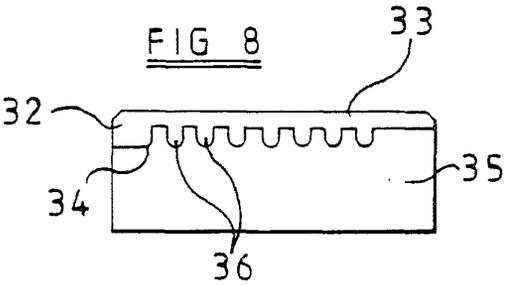


FIG 9

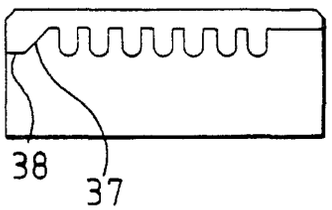


FIG 10

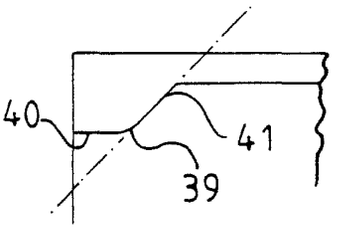


FIG 11

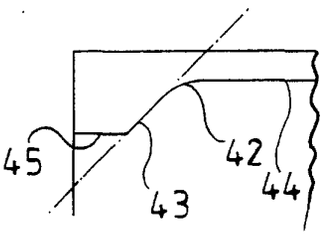


FIG 12

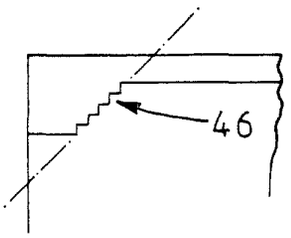


FIG 13

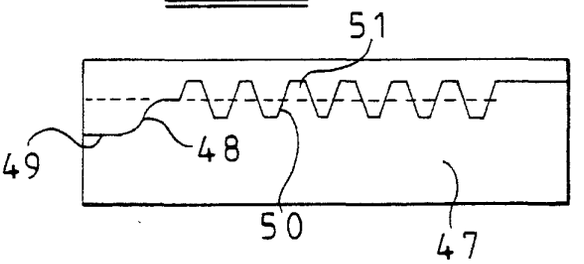


FIG 14

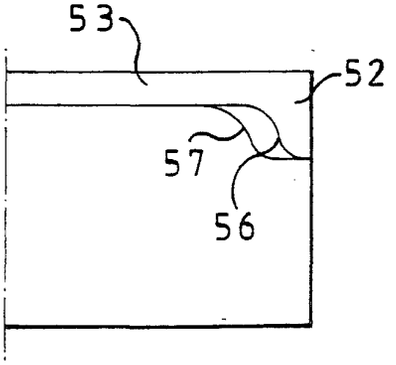


FIG 15

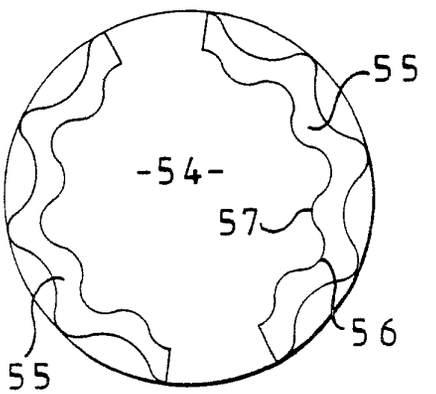


FIG 16

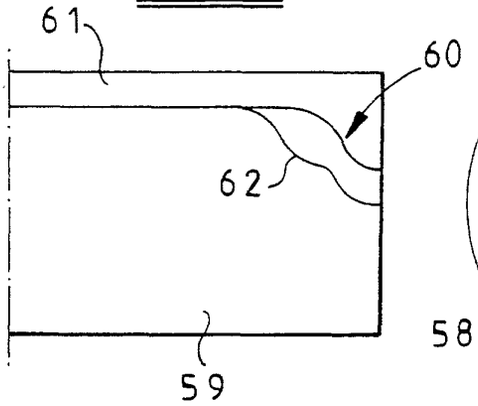


FIG 17

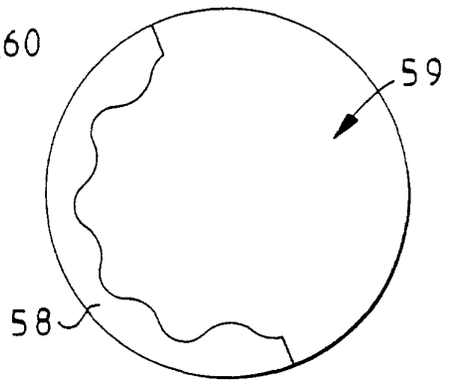


FIG 18

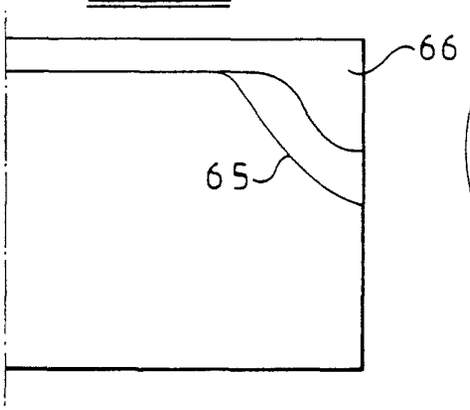


FIG 19

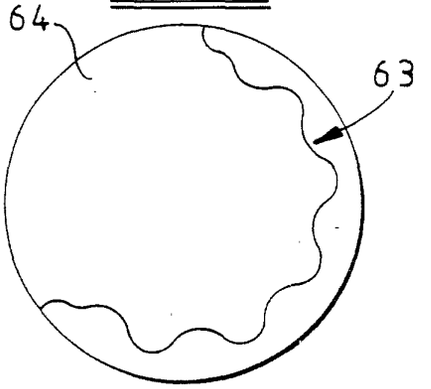


FIG 20

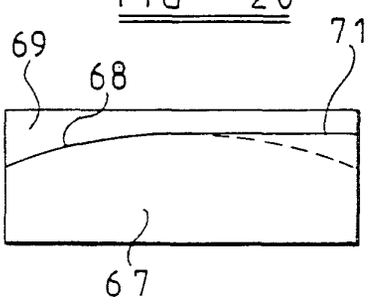


FIG 21

