

Description

This invention relates to polycrystalline diamond cutters mounted to insert studs that are mounted within the body of a rotary drag bit.

Flat diamond cutting disks or elements mounted to tungsten carbide substrates are well-known in the prior art. Insert blanks or studs, for example, are fabricated from a tungsten carbide substrate with a diamond layer sintered to a face of the substrate, the diamond layer being composed of a polycrystalline material. The synthetic polycrystalline diamond layer is manufactured by the "Specialty Material Department of General Electric Company of Worthington, Ohio." The foregoing drill cutter blank goes by the trademark name "Stratapax" drill blanks. The Stratapax cutters typically are comprised of a flat thin diamond disk that is mounted to a cylindrical substrate which in turn is mounted to a tungsten carbide stud. Such a cutter may be seen in U.S. Patents 4,098,362 and 4,109,737, for example. Typically, the cutters are strategically secured within the face of a rotary drag bit such that the cutting elements cover the bottom of a borehole to more efficiently cut the borehole bottom, thereby advancing the drag bit in a borehole.

Drag bits with strategically placed polycrystalline diamond inserts in the face of the bit also require a generous supply of coolant liquid to cool and clean the cutters as they work in a borehole. It is well-known in the drag bit art that if diamond material is exposed for a prolonged time in a borehole without adequate cooling, the overheated diamond will convert to graphite.

Since the polycrystalline diamond disk of the cutter is flat, the detritus, or debris, from the borehole bottom tends to pile up against the face of the diamond cutter thereby inhibiting flow of coolant past the cutting face of the cutter, thereby interfering with the cooling effect of the liquid against the cutting face of each of the diamond cutters.

U.S. Patent No. 4,570,726 describes cutter elements for drag-type rotary drill bits which have an abrasive face contact portion in a curved shape. The curved shape directs the loosened material to the side of the contact portion of the abrasive element. The curve, however, is in one plane so that the rake angle, with respect to a centerline of a drag bit, is constant, thereby providing a stagnation point along this plane which would tend to ball or jam the cutter as it works in a borehole.

Principles of heat transfer and fluid dynamics teach that the convection heat transfer coefficient for a body, such as a cutting element for a drag bit, passing through a fluid varies greatly depending on the shape of the body. Planar faces having fluid

flowing normal to them are among the least effective at convective cooling in the fluid. This result is caused in part by the stagnation layer in the fluid that is set up against the working surface of the cutting element. Since the insert, as taught by U.S. Patent 4,570,726 has a constant planar surface of rake angle, the cooling effect of the fluid along this plane would be somewhat minimized.

The polycrystalline cutting element of the present invention is spherically shaped, rather than just a curved planar surface. The rake angle, whether it is in a substantially vertical plane or a horizontal plane is constantly variable, thus the convex cutting element moves through a liquid medium with the greatest possible transfer of heat from the diamond cutting face to the fluid. The spherical cutting element of the present invention would have a definite advantage over the foregoing invention.

US Patent No. 4,593,777 describes a stud type cutting element having a diamond cutting face, the cutting face being adapted to engage an earth formation and cut the earth formation to a desired three-dimensional profile. The cutting faces defined a concave surface in one embodiment which has back rake angles which decrease with distance from the edge. While the rake angle changes with penetration of the insert in a formation it changes in only the vertical plane, the horizontal plane remains constant, thus detritus would tend to pile up in front of this concave surface. Another embodiment discloses an insert having a circular concave surface with a negative rake angle with respect to a formation bottom. This type of insert would direct the detritus towards the center of the cutting element, thus balling the face of the cutting element, thereby detracting from the efficiency of the cutter and adding to its destruction by preventing adequate cooling of fluid to the cutting face.

GB 2188354 describes a drill bit provided with cutting elements having a convex polycrystalline front layer. The thickness of the convex front layer increases from the outer circumference to the center of the layer such that the magnitude of the build-up edge is variable according to wear of the cutting elements. The effect on torque can thus be used to monitor wear. GB 2188354 does not describe the use of insert studs.

US 4098362 describes a polycrystalline diamond insert according to the preamble of claim 1, comprising a cylindrical-shaped hardmetal insert stud body having a first base end and a second cutter end, a generally cylindrical support member brazed on one end face thereof to the second end of the stud body and a cutter element comprising a layer of polycrystalline diamond having a substantially constant thickness bonded to the other end face of the cylindrical support member; the axis of

the cylindrical support member and the cutter element being inclined relative to the centerline of the cylindrical insert stud body.

The present invention provides a polycrystalline diamond insert characterised in that the said other end face of the cylindrical support member comprises a convex surface, the layer of polycrystalline diamond is convex-shaped, and the axis of the support member and the cutter element is inclined to the centerline of the cylindrical insert stud body so that the negative rake angle of the convex layer of polycrystalline diamond (being defined as the angle between the centerline of the stud body and a tangent to the convex layer of polycrystalline diamond) varies over a range of about 45° to 0° inclusive.

In a rock bit this provides better heat dissipation due to the spherical shape of the diamond cutter element, the detritus being moved away from the center of the convex cutter face, thus allowing a coolant to better cool and clean the diamond during operation of the bit in a borehole.

The invention further provides a diamond rotary drag bit comprising:

a drag bit body having a first open pin end for threadably engaging a drilling string and a second cutter face at the other end, the bit body further having an internal chamber communicating with the first open pin end and one or more strategically positioned nozzles secured within the second cutter face of the bit body, the nozzles communicating between the chamber and an exterior area adjacent the second cutter face of the bit body;

the second cutter face having a multiplicity of strategically positioned diamond insert holes retaining diamond inserts in accordance with the invention wherein the outer peripheral cutting edge of each cutter element is oriented to provide a negative rake angle of about 45° for forcing detritus from an earth formation away from a center of the convex surface of the cutting element during a borehole drilling operation.

The convex cutter element consists of a convex layer of polycrystalline diamond material bonded to a cylindrical hardmetal backup portion such as cemented tungsten carbide. The backup cylinder has a first convex surface which is bonded to the polycrystalline diamond layer. The base of the backup material for the diamond is metallurgically bonded to the cutting end of the stud which is secured to the cutting face of the drag bit. The convex cutter element is typically brazed to the insert stud portion.

Each of the multiplicity of strategically positioned diamond inserts mounted within the insert holes formed by the cutter face of the bit body is oriented with the convex polycrystalline cutter element faced toward the direction of rotation of the

diamond drag bit. The center of the convex curved surface therefore, of each of the cutter elements is substantially coincident with a radius line of the cutter face, thus providing both positive and negative side rake to the cutter elements. This orientation allows each of the cutter elements to engage the earth formation with less friction, the positive and negative side rake angles force debris toward both sides of each cutter element effecting efficient cooling and cleaning of the cutting face of the diamond drag bit.

An advantage, then, of the present invention over the prior art is the ever changing rake angle of the convex polycrystalline cutter element both in the vertical and horizontal planes to efficiently penetrate a formation while directing loosened debris away from the advancing curved surface of the cutter element.

Another advantage of the present invention over the prior art is the better heat dissipation of the convex cutter element due to the mechanism of moving the debris away from the convex cutting face, thereby exposing the curved surface to the cooling fluid exiting nozzles in the drag bit face.

Still another advantage of the present invention over the prior art is the mechanism of the extruding ultrasoft formations to their elastic limit so that they may be subsequently cut by trailing inserts. A conventional drag bit would tend to spin on these earth formations even though the bit may not be balled up.

The above-noted objects and advantages of the present invention will now be more fully understood upon a study of the following description in conjunction with the detailed drawings.

FIG. 1 is a perspective view of a diamond rotary drag bit with two of the insert studs exploded from the cutting face of the drag bit;

FIG. 2 is a partially cutaway cross section taken through 2-2 of FIG. 1 illustrating a diamond insert with spherically shaped cutting face mounted to the insert stud;

FIG. 3 is a partially cutaway cross section of a drag bit of the prior art illustrating an insert having a flat polycrystalline disk bonded to the cutting end of the stud of the insert;

FIG. 4 is an end view of the cutting face of the rotary drag bit illustrating the specific orientation of the multiplicity of diamond inserts, each of the inserts having a rounded cutting face facing the direction of rotation of the drag bit;

FIG. 5 is a partially broken away cross section of the cutting end of a drag bit illustrating the insert of the present invention with the convex cutting face contacting an earth formation, the negative rake angles of which vary, depending upon the depths of penetration of each of the multiplicity of the inserts mounted in the face of

the drag bit; and

FIG. 6 is a view taken through 6-6 of FIG. 5 illustrating a single diamond cutter insert, the center of the curved diamond cutting element being precisely oriented such that a line tangent to the center of the curved surface of the diamond cutter face is coincident with a radius line of the bit face.

Turning now to the perspective view of FIG. 1, the diamond rotary drag bit, generally designated at 10, comprises a drag bit body 12 with a pin end 14 and a cutting end generally designated as 16. The threaded pin end of the rotary drag bit is typically connected to a rotary drilling string (not shown). The drilling string normally supplies a liquid commonly known as "mud" to the interior chamber 19 formed within the bit body 12 (not shown). The mud directed to chamber 19 is accelerated out of one or more nozzles 20 positioned within the face 17 of the cutting end 16. A multiplicity of insert retention holes 22 are strategically positioned within the cutting face 17 of the bit body. Three raised ridges 18, positioned 120° from each other, serve to back up inserts 30 inserted within the insert holes 22. The ridges additionally serve to direct hydraulic fluid accelerated through the nozzles 20 past the cutting face of the inserts.

The diamond cutting inserts generally designated as 30 consist of an insert stud body 32 having a base end 34 and a cutting end 36. The studs are generally fabricated from a hardmetal, such as tungsten carbide. At the cutting end 36 of the stud body cemented there is a mounting surface 35 for mounting of a polycrystalline diamond cutter 40. The polycrystalline diamond cutting element comprises a convexly-shaped diamond layer 40 bonded to a generally cylindrical diamond backup support 39, typically formed of cemented tungsten carbide. The backup support at its base end is typically brazed at juncture 41 to the surface 35 of the stud body 32. The inserts 30 may be interference-fitted within the insert retention holes 22 formed in the face of the bit body. The outside diameter of the stud body is slightly larger than the diameter of the insert retention hole, hence, a great deal of pressure is required to press the inserts within their retention holes.

Alternatively, the stud bodies 32 may be metallurgically bonded within the insert retention holes 22 without departing from the scope of this invention. A slot 33, paralleling the axis of the stud body 32, serves to align the stud body accurately to position the cutting face such that it will most efficiently cut an earth formation during operation of the drag bit in a borehole.

Turning now to FIG. 2, the insert 30 is more clearly shown inserted within an insert hole 22

formed in the cutting face 17 of the bit body 12. The convex, or spherically shaped, polycrystalline layer 40 is secured to the backup support cylinder 39 by a known process. For example, the convex polycrystalline diamond compact cutter is fabricated by a process as described in U.S. Patent No. 4,604,106. The polycrystalline diamond layer is formed in a convex shape such that the rounded surface serves to move debris away from the most advanced surface 42 as the insert is advanced rotationally through the formation 25 (see FIG. 5). The backup support cylinder is bonded at juncture 41 between the backup support 39 and surface 35 through, for example, a braze bond. The diamond cutting element 40 is tilted rearward at an angle from 0° to 45°, inclusive, to give the necessary clearance between the heel 37 of the cutter body 32 and the surface 25 of the earth formation 24 (FIG. 5). Generally this back rake angle, or negative rake angle, is determined by the physical characteristics of the formations to be drilled.

The prior art shown in FIG. 3 illustrates a state-of-the-art cutter, heretofore mentioned, that has a flat polycrystalline diamond disk mounted to a cylindrical substrate that is, in turn, brazed to a tungsten carbide insert stud, the stud, of course, being pressed into an insert hole in the face of a drag bit. Cutters of the prior art tend to ball up because the detritus piles up against the flat face of the diamond disk, thus inhibiting coolant flow across the cutting face of the insert while inhibiting the progress of the drag bit in a borehole.

Turning now to FIG. 4, the end view of the diamond rotary drag bit illustrates the careful orientation of each of the insert studs 32 within their insert retention holes 22 formed in the face 17 of the bit body 12. Each polycrystalline curved diamond cutting face 42 is oriented towards the direction of drag bit rotation 49 such that the centerline 51 of the diamond backup support cylinder 39 is oriented substantially 90° through a radial line from the central axis 48 of bit body 12. In other words, there is no skew of the diamond face 42 with respect to a radial line 50 of the insert. The cutters 30 are mounted so that a radial line 50 is tangent to the centers of the convex surface 42. The centerline 51 of the backup cylinder 39 through the curved surface 42 of the diamond cutter face is coincident with the radius line 50 of the bit face 17. This cutter orientation, in effect, provides both positive and negative side rake angles to the cutters 30. Thus, the rounded polycrystalline diamond cutting face allows the cutters to engage and drill the earth formation 24 with considerably less friction than that which would take place with the state-of-the-art flat cutters shown in FIG. 3. This double side rake angle orientation forces the rock cuttings, or detritus, to

s wear, the side rake angles will vary, as will the angles "A" and "B", as shown in FIG. 4. The infinitely variable side rake angles and vertical rake angles assure constant movement of the debris away from the cutting face, thus improving penetration rates of the drag bit in the formation 24.

It will, of course, be realized that various modifications can be made in the design and operation of the present invention without departing from the teachings of the invention as defined in the claims. For example, one could use an insert with a convex polycrystalline cutter element oriented relative to a centerline of the insert stud with a positive rake angle.

Claims

1. A polycrystalline diamond insert (30) comprising: a cylindrical-shaped hardmetal insert stud body (32) having a first base end (34) and a second cutter end (36), a generally cylindrical support member (41) brazed on one end face thereof to the second end (36) of the stud body (32) and a cutter element (40) comprising a layer of polycrystalline diamond having a substantially constant thickness bonded to the other end face of the cylindrical support member (41); the axis of the cylindrical support member and the cutter element being inclined relative to the centerline of the cylindrical insert stud body (32), characterized in that: the said other end face of the cylindrical support member (41) comprises a convex surface, the layer of polycrystalline diamond is convex-shaped, and the axis of the support member and the cutter element is inclined to the centerline of the cylindrical insert stud body (32) so that the negative rake angle of the convex layer of polycrystalline diamond, being defined as the angle between the centerline of the stud body and a tangent to the convex layer of polycrystalline diamond, varies over a range of about 45° to 0° inclusive.

2. The polycrystalline diamond insert as set forth in claim 1 wherein the convex-shaped cutter element is a portion of a sphere.

3. The polycrystalline diamond insert as set forth in any of the preceding claims wherein the insert stud body and cylindrical support member are fabricated from cemented tungsten carbide.

4. A diamond rotary drag bit comprising: a drag bit (12) body having a first open pin

both sides of the cutting face 42, thus automatically clearing the diamond cutting face to effect better cooling and cleaning of the polycrystalline diamond, as heretofore stated. The rounded cutting face 42 reduces friction for a given amount of earth formation removed and significantly lowers the torque imparted to the drill string, as compared to the flat-faced cutters.

Of course, the reduced friction significantly reduces the heat buildup in the polycrystalline diamond layer, thereby minimizing any thermal degradation, as compared, again, to the normal flat-faced-type diamond cutters. This slower thermal degradation rate keeps the cutters intact and sharp measurably longer than state-of-the-art cutters under like conditions. In addition, an added advantage is that the rounded, or spherically shaped, diamond cutters inherently are stronger in both impact and shear than are normal state-of-the-art flat-faced cutters.

Turning, specifically, now to FIG. 5, the partial cross section of the insert 30 illustrates the insert working in an earth formation 24. The outer peripheral cutting edge 31, in direct contact with the surface 25 of the earth formation 24, is at a negative rake angle 90°-B, this angle being approximately 45° negative rake angle relative to the surface 25 of the earth formation 24. As the insert 30 penetrates further, or conversely, is worn further, the negative rake angle lessens, as shown by angle "A", thus offering a different negative rake angle as the insert 30 works in a borehole. Since the surface 42 of the convex diamond cutting face is rounded, the debris, or detritus, 26 is directed away from the most advanced portion of the curved surface indicated as 42. Thus, it can be readily realized that the detritus will not back up against the curved surface, since the curved surface moves the debris away in all directions from the curved surface 42 of the insert 30.

Turning now to FIG. 6, the orientation of the diamond cutters 30 is shown with respect to a radial line emanating from a centerline 48 of the bit body 12 such that a centerline of the stud body 39 intersects the radial line 50, 90° to the radial line 50, thereby assuring that the most advanced portion of the curved surface 42 is directed equally into the formation so that the detritus 26 is pushed along side rake angle represented by angles "C" and angles "D", dependent upon the depth of penetration of cutting edge 31 on the periphery of the curved diamond cutter element 40.

As mentioned before, as each of the diamond inserts 30 varies in its penetration of the formation 24, these side rake angles will be infinitely variable, dependent upon the depth of penetration, thus assuring that the detritus is continually moved away from the rounded surface. Additionally, as the in-

both sides of the cutting face 42, thus automatically clearing the diamond cutting face to effect better cooling and cleaning of the polycrystalline diamond, as heretofore stated. The rounded cutting face 42 reduces friction for a given amount of earth formation removed and significantly lowers the torque imparted to the drill string, as compared to the flat-faced cutters.

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serts wear, the side rake angles will vary, as will the angles "A" and "B", as shown in FIG. 4. The infinitely variable side rake angles and vertical rake angles assure constant movement of the debris away from the cutting face, thus improving penetration rates of the drag bit in the formation 24.

It will, of course, be realized that various modifications can be made in the design and operation of the present invention without departing from the teachings of the invention as defined in the claims. For example, one could use an insert with a convex polycrystalline cutter element oriented relative to a centerline of the insert stud with a positive rake angle.

Claims

1. A polycrystalline diamond insert (30) comprising: a cylindrical-shaped hardmetal insert stud body (32) having a first base end (34) and a second cutter end (36), a generally cylindrical support member (41) brazed on one end face thereof to the second end (36) of the stud body (32) and a cutter element (40) comprising a layer of polycrystalline diamond having a substantially constant thickness bonded to the other end face of the cylindrical support member (41); the axis of the cylindrical support member and the cutter element being inclined relative to the centerline of the cylindrical insert stud body (32), characterised in that: the said other end face of the cylindrical support member (41) comprises a convex surface, the layer of polycrystalline diamond is convex-shaped, and the axis of the support member and the cutter element is inclined to the centerline of the cylindrical insert stud body (32) so that the negative rake angle of the convex layer of polycrystalline diamond, being defined as the angle between the centerline of the stud body and a tangent to the convex layer of polycrystalline diamond, varies over a range of about 45° to 0° inclusive.
2. The polycrystalline diamond insert as set forth in claim 1 wherein the convex-shaped cutter element is a portion of a sphere.
3. The polycrystalline diamond insert as set forth in any of the preceding claims wherein the insert stud body and cylindrical support member are fabricated from cemented tungsten carbide.
4. A diamond rotary drag bit comprising: a drag bit (12) body having a first open pin





end (14) for threadably engaging a drilling string and a second cutter face at the other end, the bit body further having an internal chamber (19) communicating with the first open pin end and one or more strategically positioned nozzles (20) secured within the second cutter face of the bit body, the nozzles communicating between the chamber and an exterior area adjacent the second cutter face of the bit body;

the second cutter face having a multiplicity of strategically positioned diamond insert holes (22) retaining diamond inserts in accordance with claim 1.

5. The rotary drag bit as set forth in claim 4 wherein each convex-shaped cutter element is a portion of a sphere.
6. The rotary drag bit as set forth in claim 4 wherein each of the diamond inserts mounted within the insert holes in the second cutter face of the bit body is oriented with the convex polycrystalline cutter element face toward the direction of rotation of the diamond drag bit such that a center of the convex surface of each of the cutter elements is substantially coincident with a radius line of the cutter face, thus providing both positive and negative side rake to the cutter elements.

Patentansprüche

1. Polykristalliner Diamanteinsatz (30) mit einem zylindrisch geformten Hartmetall-Einsatzzapfenkörper (32) mit einem ersten Basis-Ende (34) und mit einem zweiten Schneid-Ende (36), mit einem im wesentlichen zylindrischen Stützelement (41), das an einer seiner Endflächen mit dem zweiten Ende (36) des Einsatzzapfenkörpers (32) hartverlötet ist, und mit einem Schneidelement (40), das über eine Schicht von polykristallinem Diamant mit einer im wesentlichen konstanten Dicke verfügt und das mit der anderen Endfläche des zylindrischen Stützelementes (41) verbunden ist, wobei die Achse des zylindrischen Stützelementes und des Schneidelementes relativ zur Mittellinie des zylindrischen Einsatzzapfenkörpers (32) geneigt ist, dadurch gekennzeichnet,

daß die andere Endfläche des zylindrischen Stützelementes (41) über eine konvexe Oberfläche verfügt,

daß die polykristalline Diamantschicht konvex geformt ist, und

daß die Achse des Stützelementes und des Schneidelementes zur Mittellinie des zylindrischen Einsatzzapfenkörpers (32) geneigt ist,

so daß der negative Einstellwinkel der konvexen polykristallinen Diamantschicht, der als der Winkel zwischen der Mittellinie des Einsatzzapfenkörpers und einer Tangente zu der konvexen polykristallinen Diamantschicht definiert ist, in einem Bereich zwischen 45 ° und einschließlich 0 ° veränderbar ist.

2. Polykristalliner Diamanteinsatz nach Anspruch 1, dadurch gekennzeichnet, daß das konvex geformte Schneidelement als ein Kugelabschnitt ausgebildet ist.
3. Polykristalliner Diamanteinsatz nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Einsatzzapfenkörper und das zylindrische Stützelement aus zementiertem Wolframkarbid hergestellt sind.
4. Rotierender Diamant-Bohrmeißel mit einem Bohrmeißelkörper (12) mit einem ersten offenen Zapfenende (14) zur gewindeten Einführung eines Bohrstranges und mit einer zweiten Schneidfläche an dem anderen Ende, wobei der Bohrmeißelkörper zusätzlich über eine innere Kammer (19) verfügt, die mit dem ersten offenen Zapfenende zusammenwirkt, und mit einer oder mehrerer entsprechend vorbestimmt positionierter Düsen (20), die in der zweiten Schneidfläche des Bohrmeißelkörpers befestigt sind, wobei die Düsen zwischen der Kammer und einem äußeren Bereich kommunizieren, der zu der Schneidfläche des Bohrkörpers benachbart ist, wobei die zweite Schneidfläche über eine Vielzahl von entsprechend vorbestimmt angeordneten Diamanteinsatzlöchern (22) verfügt, die Diamanteinsätze in Übereinstimmung mit Anspruch 1 aufnehmen und zurückhalten.
5. Rotierender Bohrmeißel nach Anspruch 4, dadurch gekennzeichnet, daß jedes konvex geformte Schneidelement als ein Kugelabschnitt ausgebildet ist.
6. Rotierender Bohrmeißel nach Anspruch 4, dadurch gekennzeichnet, daß jeder der Diamanteinsätze, die in den Einsatzlöchern in der zweiten Schneidfläche des Bohrmeißelkörpers angeordnet sind, mit der konvexen polykristallinen Schneidelementfläche in die Drehrichtung des Diamant-Bohrmeißels ausgerichtet ist, so daß ein Mittelpunkt der konvexen Oberfläche jedes Schneidelementes im wesentlichen mit einer Radiuslinie der Schneidfläche übereinstimmt, womit den Schneidelementen sowohl positive als auch negative Neigungswinkel mit-

gegeben werden.

Revendications

1. Insert diamanté polycristallin (30) comprenant :
 - un corps d'insertion cylindrique (32) en métal trempé avec une base (34) et une extrémité de coupe (36),
 - un élément support (41) généralement cylindrique soudé par une de ses faces d'extrémité près de l'extrémité de coupe (36) du corps (32),
 - et un élément de coupe (40) comportant une couche de diamant polycristallin d'épaisseur sensiblement constante fixée sur l'autre extrémité de l'élément support (41), l'axe de l'élément support cylindrique (41) et de l'élément de coupe étant incliné relativement à la ligne centrale du corps d'insertion cylindrique (32) caractérisé en ce que :
 - l'autre extrémité de l'élément support (41) comporte une surface convexe,
 - la couche de diamant polycristallin est de forme convexe, et l'axe de l'élément support de l'élément de coupe est incliné vers la ligne centrale du corps d'insertion cylindrique (32) de façon à ce que l'angle négatif d'attaque de la couche convexe en diamant polycristallin, défini comme l'angle entre la ligne centrale du corps d'encastrement et une tangente à la couche convexe de diamant polycristallin, varie sur une plage d'environ 45° à 0° compris.
2. Insert diamanté polycristallin selon la revendication 1 dans lequel l'élément de coupe de forme convexe est une portion de sphère.
3. Insert diamanté polycristallin selon l'une quelconque des revendications précédentes dans lequel le corps d'insertion et l'élément support cylindrique sont fabriqués en carbure de tungstène cimenté.
4. Trépan rotatif diamanté comprenant un corps de trépan (12) avec une première extrémité ouverte en forme de broche pour coopérer par vissage avec un cordon de forage, et avec une face de coupe à sa seconde extrémité, le corps du trépan ayant en outre une chambre interne (19) communiquant avec la première extrémité ouverte de la broche, et au moins un ajutage positionné stratégiquement, les ajutages faisant communication entre la chambre et une surface extérieure voisine de la face de

coupe de la seconde extrémité du trépan, la face de coupe ayant une pluralité de trous (22) pour insert diamanté positionnés stratégiquement pour recevoir des inserts diamantés selon la revendication 1.

5. Trépan rotatif selon la revendication 4 dans lequel chaque élément de coupe de forme convexe est une portion de sphère.
6. Trépan rotatif selon la revendication 4 dans lequel chaque insert diamanté monté dans un trou pour insert de la surface de coupe du corps du trépan présente la face de l'élément de coupe convexe polycristallin tournée dans le sens de rotation du trépan diamanté de telle sorte que le centre de la surface convexe de chaque élément de coupe se trouve sensiblement en coïncidence avec le rayon de la surface de coupe, ceci étant prévu aussi bien sur les bords d'attaque positive que sur les bords d'attaque négative des éléments de coupe.

