

Description

This invention relates to a rotary milling cutter according to the precharacterising part of claim 1, see e.g. EP-A-0 392 729.

It is well known that in many milling operations it is desirable to ensure that the milling force component acting normally on the surface to be milled should be as low as possible, and this in order to minimize phenomena such as strain hardening, which render the milling operation more difficult and which reduce the life of the milling tool. A well known way of ensuring this is to use milling tools wherein the milling cutters present positive axial rake angles, the more positive the angle the greater the reduction of the milling forces acting normally on the milled surface. However, and in practice, as the magnitude of the positive axial rake angle is increased, there comes a stage when the milling force component changes its direction and instead of constituting a force which presses against the milled surface, it is transformed into a force which tends to draw the workpiece being milled from its clamping mechanism and/or to detach the cutting tool from the milling machine quill. The magnitude of the force which acts to detach the workpiece from its clamping mechanism is a function of the magnitude of the positive rake angle, and as this angle increases, so does this detaching force.

It is furthermore well known that the magnitude of these milling forces is directly proportional to the depth of milling effected during each single milling operation. As a consequence, the greater the length of milling contact between the cutting edge and the workpiece, the greater will be the milling forces.

It therefore follows that, in milling operations using milling tools having milling cutters displaying relatively highly positive axial rake angles and wherein the entire length of the cutting edge of the milling cutters is employed in each milling operation, the stability of the workpiece can be deleteriously affected and it is well known that in such cases workpieces tend to be detached from their clamping devices, and that undesirable vibrations, or "chatter", are set up in the milling cutter assembly.

Clearly, these disadvantages could be reduced by ensuring that only a portion of the overall length of the cutting edge of each milling cutter is employed during each single milling operation, but such a solution is clearly disadvantageous when, for example, in carrying out shoulder milling it would necessitate repeated successive milling operations in order to achieve the required depth of milling, and this would not only be burdensome but would, of necessity, give rise to the production of a more or less serrated, milled surface as well as

reducing the overall production rate.

It is an object of the present invention to provide a new and improved milling cutter, for face milling operations, wherein the above-referred-to disadvantages are substantially reduced.

According to the present invention, there is provided a rotary milling cutter tool comprising a cutting insert having a cutting edge defined between a cutting rake surface and a relief flank and having a base edge defined between said relief flank and a base surface

wherein

said cutting edge comprises first and second successive component cutting edges which merge continuously with each other, said first and second component cutting edges having respective axial rake angles γ_1 and γ_2 with respect to an axis of rotation of the cutting tool wherein γ_1 is significantly greater than γ_2 ; γ_1 lies substantially within the range 4° - 30° and γ_2 lies substantially within the range $\pm 15^\circ$; wherein said cutting edge projects a length a with respect to the axis of rotation, whilst the first component cutting edge projects a length a_1 with respect to the axis of rotation wherein a_1 lies within the range 0.6 - $0.9a$ and wherein said relief flank and the component cutting edges are so shaped and disposed that the intersection of a plane passing through the rotational axis of the milling cutter tool with a surface milled by said cutting edge is substantially rectilinear.

Seeing that the angle γ_1 is significantly greater than the angle γ_2 , i.e. the first component cutting edge exhibits a greater positive axial rake angle than does the second component cutting edge and, as has been indicated above, cutting inserts having cutting edges with a relatively high positive axial rake angle, are subjected to cutting forces which increasingly tend to detach the cutting tool from the milling machine quill or the workpiece from its clamping device. In view of the fact, however, that the first component cutting edge having this relatively high positive axial rake angle does not extend over the whole length of the cutting edge, but is rather followed by a second component cutting edge having a smaller positive axial rake angle (in fact, the axial rake angle can even be negative up to -15°), the overall cutting forces acting on the insert are significantly reduced when compared, for example, with the same cutting forces acting on a conventional cutting insert. Thus, with such a conventional cutting insert not exhibiting such components of the cutting edges with different inclinations, the entire cutting edge length cannot be employed efficiently in each cutting operation.

The present invention is, in fact, based on an observation that in practice with milling tools used for face milling, and in the overwhelming majority of the cases, the depth of cut does not exceed a

depth corresponding to 0.6 times the length of the cutting edge. In other words, the remaining portion of the cutting edge does not, in fact, take part in the face milling operation. For the minority of cases where it is intended to effect milling over the entire length of the cutting edge and where, therefore, the generation of the axial cutting forces tends to give rise to vibrations and general instability in the cutting operations, particularly where the cutting edge has an increased positive axial rake angle, the present invention comes to ensure that operation over this residual portion of the cutting edge is effected with a cutting edge whose axial rake angle is significantly less than the positive axial rake angle of the major portion of the cutting edge lying between $\pm 15^\circ$, and preferably zero. In this way it is ensured that, even in those cases where it is desired to use the cutting tool for effecting milling over the entire length of the cutting edge of the insert, it is possible to have an insert having, at least over its major initial portion, a relatively highly positive axial rake angle, thereby ensuring easy entrance of the insert into the metal, whilst over its minor remaining portion, the cutting edge is of significantly lesser axial rake angle which can even be negative.

One embodiment of a rotary milling cutter in accordance with the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an insert which may be employed in the inventive rotary milling cutter;

Fig. 2 is a side elevation of a milling cutter incorporating inserts as shown in Fig. 1, shown during a face milling operation;

Fig. 3 illustrates schematically forces acting on a standard milling cutting insert having a positive axial rake angle;

Fig. 4 illustrates schematically forces acting on a milling cutting insert employed in the invention;

Fig. 5 is a plan view from above of a cutting insert employed in the inventive rotary milling cutter, showing schematically the various stages involved in proceeding from a standard insert to an insert as used in the rotary milling cutter of the invention;

Fig. 6 is a side elevation of the insert shown in Fig. 5, also showing schematically the stages involved in proceeding from a standard insert to an insert as used in the rotary milling cutter of the invention;

Fig. 7 shows a side elevation of an insert mounted in a milling cutting tool embodying the invention, which is designed to rotate about a rotational axis;

Fig. 8a shows a longitudinal sectional view of a milled surface when milled by a rotary milling cutter having component cutting edges in accordance with the invention but without appropriate compensation of the associated relief flank; and **Fig. 8b** shows the same milled surface as milled with a rotary milling cutter in accordance with the invention, provided with the appropriate compensation for the relief flank surface.

As seen in the drawings, a hard metal cutting insert 10 for example formed of tungsten carbide, is of generally parallelepipedal shape having a central bore 11 surrounded by a peripheral upper cutting rake surface 12. The insert is formed with a planar base surface 20. The insert is furthermore formed with two pairs of relief flanks 13 and, at the corners, with wipers 14 of conventional construction. It will of course be realised that the corners may be merely radiused and not be provided with wipers.

Defined between each relief flank 13 and the upper cutting rake surface 12 is a cutting edge 15 comprising successive component cutting edges 15a and 15b. As can be seen from the drawings, and in particular Figs. 2 and 4 thereof, the insert is so formed and is so mounted in a tool holder 16 that the component cutting edge 15a defines a highly positive axial rake angle γ_1 whilst the component cutting edge 15b defines an axial rake angle γ_2 which is significantly less than γ_1 and, in the illustrated example, is substantially zero.

Furthermore, and as can be seen from Figs. 2 and 4 of the drawings, whilst the projection of the longitudinal extent of the cutting edge 15 as a whole with respect to the rotation axis equals a , the corresponding projection of the component cutting edge 15a equals a_1 .

If now we consider and compare the situations represented respectively by Figs. 3 and 4 of the drawings it is seen that the bases of both inserts are inclined with respect to the tool axis at a same angle of inclinations γ_3 , namely the situations involving respectively a standard milling insert and that involving a milling insert which is incorporated in a rotary milling cutter in accordance with the invention, we can see (in Fig. 3) that the axial rake angle presented by the cutting edge of the standard cutting insert γ_3 is equal to the inclination of its base and is less than the axial rake angle γ_1 presented by the component cutting edge 15a of the insert used in the rotary milling cutter of the invention. In the case of the standard cutting insert as shown in Fig. 3, the forces represented by the arrows 17 act in the same direction over the entire length of the cutting edge, giving rise to a resultant force

FA_1

which tends to detach the tool holder from the quill. It will be readily seen that this force increases with increasing axial rake angle. Thus, if one was to use the standard milling cutting insert and position it so as to represent an increased axial rake angle, i.e. having an increased axially positive rake angle, the resultant forces tending to detach the tool holder from the quill would be significantly increased.

If we now consider the situation as represented in Fig. 4 of the drawings, namely that the component cutting edge 15a presents a relatively high positive axial rake angle γ_1 immediately followed by a component cutting edge 15b of significantly reduced axial rake angle γ_2 (in the present case, e.g., an axial rake angle of zero), it will be readily seen that the component forces acting on the insert so as to tend to detach the tool holder from the quill with an increased depth of cut, are significantly reduced. In this way, it is possible to obtain the distinct advantages of milling inserts having a high positive axial rake angle without incurring the serious disadvantages which would normally be consequent thereon, namely an increased risk of detachment of the tool holder from the quill or the workpiece out of its clamping device.

For the situation wherein axial rake angle γ_1 lies in the upper regions of this range it is desirable, as shown in Fig. 4 of the drawings, that the component cutting edge 15a slopes downwardly with respect to the base 20 of the insert. In this way it is possible to accommodate inserts with high positive angle rake angles γ_1 without at the same time weakening the support provided by the tool holder. Thus, for example, and as shown in Fig. 4 of the drawings where the base 20 of the cutting insert defines the same angle γ_3 as in the conventional cutter with the rotational axis of the cutting tool, and the cutting edge component 15a defines an angle γ_1 with respect to this axis, the cutting edge component 15a is inclined with respect to the insert base by an angle $\gamma_4 = (\gamma_1 - \gamma_3)^\circ$. Preferably, the component cutting edge 15a is inclined with respect to the base of the insert by an angle which lies substantially within the range 2° - 12° (a preferred value being substantially 5°). On the other hand, the component cutting edge 15b is inclined with respect to the base of the cutting insert by an oppositely directed angle which lies substantially in the range 15° - 30° (a preferred value being substantially 20°). The component cutting edge 15a can present a positive axial rake angle γ_1 which can lie within the range 4° - 30° . The component cutting edge 15b, on the other hand, can present an axial rake angle γ_2 which is significantly less than γ_1 and which lies within the range $\pm 15^\circ$. A

preferred value for the axial rake angle γ_1 presented by the component cutting edge 15a is 25° , whilst the preferred value for the axial rake angle γ_2 presented by the component cutting edge 15b is 0° .

Preferably, a_1 lies within the range of 0.6-0.9a. A preferred value of a_1 equals 0.7a.

It should be explained that, if no steps were taken to correct the situation arising out of the division of the cutting edge into two separate component cutting edges 15a and 15b presenting differing axial rake angles γ_1 and γ_2 , this would give rise, during a milling operation, to the production of a milled cylindrical or conical surface which was characterised by successive ridges, i.e. by the production of a non-smooth surface. This is in view of the fact that, the component cutting edges would not be designed to be formed on the surface of rotation of a straight line, constituting a plane with the axis of rotation.

In order to overcome this problem, the relief flank and, in consequence, the component cutting edges, are so shaped and positioned on the surface of revolution that the intersection of a plane passing through the rotational axis of the milling cutter tool with a surface milled by said cutting edge is substantially rectilinear.

This will now be explained with reference to Figs. 5, 6, 7, 8a and 8b of the drawings.

As can be seen in Figs. 5 and 6 of the drawings, the cutting edge of a cutting insert of standard construction such as that, for example, shown in Fig. 3 of the drawings, is represented in chain dotted lines, with the extremities of the cutting edge represented by the letters A and C.

At a first step, the cutting edge AC is subdivided into a main component cutting edge AB, and a minor component cutting edge BC, and next step where the component cutting edges are rendered as further explained. The component cutting edge AB having an axial rake angle which is axially positive to a significantly higher degree than that of the minor component cutting edge BC. In consequence the positioning of the point B, when the cutting tool in which the cutting insert is located is rotated as shown in Fig. 7 about a rotational axis R_A , there will be produced a milled cylindrical or conical surface such as that shown in Fig. 8a of the drawings, which is of course not smooth but is discontinuous at a position B corresponding to the junction B of the component cutting edges of the insert,

In order to overcome this problem the component cutting edges and the relief flank surfaces are rendered angularly convex, when viewed from above in plan view, in such a way that the component cutting edges and their junction point E are effectively displaced from the component cutting

edges AB and BC as seen in the drawings, to the position represented by the segments AE and EC which, in fact, are portions of the surface of rotation and come very close to the straight line cutting edge of the standard insert shown in Figs. 5 and 6 of the drawings. In this way, and as seen in Fig. 8b of the drawings, the intersection of a plane passing through the rotational axis of the milling tool with the surface milled by the component cutting edges is substantially rectilinear. In other words, the point E on this surface corresponding to the position of the junction of the component cutting edges is, as can be seen in Fig. 8b, not displaced out of the milled surface.

It will be appreciated that, whilst the present invention has been specifically described with reference to milling inserts having two component cutting edges for face milling, and of substantially parallelepipedal shape, inserts of other shapes can equally well be employed such as, for example, inserts of triangular or rhombic shape, and comprising more than two component cutting edges.

Claims

1. Rotary milling cutter tool comprising a cutting insert having a cutting edge (15) defined between a cutting rake surface (12) and a relief flank (13) and having a base edge (21) defined between said relief flank and a base surface (20),

characterized in that

said cutting edge (15) comprises first and second successive component cutting edges (15a, 15b) which merge continuously with each other; said first and second component cutting edges (15a, 15b) having respective axial rake angles γ_1 and γ_2 with respect to an axis of rotation of the cutting tool wherein γ_1 is significantly greater than γ_2 ; γ_1 lies substantially within the range 4° - 30° and γ_2 lies substantially within the range $\pm 15^\circ$; wherein said cutting edge (15) projects a length a with respect to the axis of rotation, whilst the first component cutting edge (15a) projects a length a_1 with respect to the axis of rotation wherein a_1 lies within the range 0.6 - $0.9a$ and wherein said relief flank (13) and the component cutting edges (15a, 15b) are so shaped and disposed that the intersection of a plane passing through the rotational axis of the milling cutter tool with a surface milled by said cutting edge (15) is substantially rectilinear.

2. Rotary milling cutter tool according to Claim 1, characterized in that said axial rake angle γ_1 is substantially equal to 25° .

3. Rotary milling cutter tool according to Claim 1 or 2, characterized in that said axial rake angle γ_2 is substantially equal to 0° .

4. Rotary milling cutter tool according to any one of the preceding claims, characterized in that a_1 is substantially equal to $0.7a$.

5. Rotary milling cutter tool according to any one of the preceding claims, characterized in that said first component cutting edge (15a) is inclined with respect to the base of the cutting insert by an angle of inclination which lies substantially in the range 2° - 12° .

6. Rotary milling cutter tool according to Claim 5, characterized in that said angle of inclination is substantially equal to 5° .

7. Rotary milling cutter tool according to Claim 5 or 6, characterized in that said second component cutting edge (15b) is inclined with respect to the base of the cutting insert by an oppositely directed angle of inclination which lies substantially within the range 15° - 30° .

8. Rotary milling cutter tool according to Claim 7, characterized in that said oppositely directed angle of inclination is substantially equal to 20° .

9. Rotary milling cutter tool according to any one of the preceding claims, characterized in that said insert is of substantially parallelepipedal shape.

10. Rotary milling cutter tool according to any one of Claims 1 to 8, characterized in that said insert is of substantially triangular shape.

11. Rotary milling cutter tool according to any one of the preceding claims, characterized in that corners of the insert are formed with wipers (14).

12. Rotary milling cutter tool according to any one of Claims 1 to 10, characterized in that corners of the insert are radiused.

Patentansprüche

1. Rundfräswerkzeug mit einem Fräs- oder Schneideinsatz mit einer Schneidkante (15), die von einer Spanwinkelfläche (12) und einer Freiflanke (13) begrenzt wird und eine Basis-kante (21) aufweist, die von der Freiflanke und einer Basisfläche (20) begrenzt wird, dadurch gekennzeichnet, daß



edges AB and BC as seen in the drawings, to the position represented by the segments AE and EC which, in fact, are portions of the surface of rotation and come very close to the straight line cutting edge of the standard insert shown in Figs. 5 and 6 of the drawings. In this way, and as seen in Fig. 8b of the drawings, the intersection of a plane passing through the rotational axis of the milling tool with the surface milled by the component cutting edges is substantially rectilinear. In other words, the point E on this surface corresponding to the position of the junction of the component cutting edges is, as can be seen in Fig. 8b, not displaced out of the milled surface.

It will be appreciated that, whilst the present invention has been specifically described with reference to milling inserts having two component cutting edges for face milling, and of substantially parallelepipedal shape, inserts of other shapes can equally well be employed such as, for example, inserts of triangular or rhombic shape, and comprising more than two component cutting edges.

Claims

1. Rotary milling cutter tool comprising a cutting insert having a cutting edge (15) defined between a cutting rake surface (12) and a relief flank (13) and having a base edge (21) defined between said relief flank and a base surface (20),

characterized in that

said cutting edge (15) comprises first and second successive component cutting edges (15a, 15b) which merge continuously with each other; said first and second component cutting edges (15a, 15b) having respective axial rake angles γ_1 and γ_2 with respect to an axis of rotation of the cutting tool wherein γ_1 is significantly greater than γ_2 ; γ_1 lies substantially within the range 4° - 30° and γ_2 lies substantially within the range $\pm 15^\circ$; wherein said cutting edge (15) projects a length a with respect to the axis of rotation, whilst the first component cutting edge (15a) projects a length a_1 with respect to the axis of rotation wherein a_1 lies within the range 0.6 - $0.9a$ and wherein said relief flank (13) and the component cutting edges (15a, 15b) are so shaped and disposed that the intersection of a plane passing through the rotational axis of the milling cutter tool with a surface milled by said cutting edge (15) is substantially rectilinear.

2. Rotary milling cutter tool according to Claim 1, characterized in that said axial rake angle γ_1 is substantially equal to 25° .

3. Rotary milling cutter tool according to Claim 1 or 2, characterized in that said axial rake angle γ_2 is substantially equal to 0° .

4. Rotary milling cutter tool according to any one of the preceding claims, characterized in that a_1 is substantially equal to $0.7a$.

5. Rotary milling cutter tool according to any one of the preceding claims, characterized in that said first component cutting edge (15a) is inclined with respect to the base of the cutting insert by an angle of inclination which lies substantially in the range 2° - 12° .

6. Rotary milling cutter tool according to Claim 5, characterized in that said angle of inclination is substantially equal to 5° .

7. Rotary milling cutter tool according to Claim 5 or 6, characterized in that said second component cutting edge (15b) is inclined with respect to the base of the cutting insert by an oppositely directed angle of inclination which lies substantially within the range 15° - 30° .

8. Rotary milling cutter tool according to Claim 7, characterized in that said oppositely directed angle of inclination is substantially equal to 20° .

9. Rotary milling cutter tool according to any one of the preceding claims, characterized in that said insert is of substantially parallelepipedal shape.

10. Rotary milling cutter tool according to any one of Claims 1 to 8, characterized in that said insert is of substantially triangular shape.

11. Rotary milling cutter tool according to any one of the preceding claims, characterized in that corners of the insert are formed with wipers (14).

12. Rotary milling cutter tool according to any one of Claims 1 to 10, characterized in that corners of the insert are radiused.

Patentansprüche

1. Rundfräswerkzeug mit einem Fräs- oder Schneideinsatz mit einer Schneidkante (15), die von einer Spanwinkelfläche (12) und einer Freiflanke (13) begrenzt wird und eine Basis-kante (21) aufweist, die von der Freiflanke und einer Basisfläche (20) begrenzt wird, dadurch gekennzeichnet, daß



- die Schneidkante (15) erste und zweite aufeinanderfolgende Teilschneidkanten (15a, 15b) aufweist, die fortlaufend ineinander übergehen; die ersten und die zweiten Teilschneidkanten (15a, 15b) axiale Spanwinkel γ_1 bzw. γ_2 bezüglich einer Drehachse des Schneidwerkzeugs aufweisen, wobei γ_1 bedeutend größer als γ_2 ist; γ_1 im wesentlichen in dem Bereich von 4° - 30° liegt und γ_2 im wesentlichen in dem Bereich von $\pm 15^\circ$ liegt; wobei sich die Schneidkante (15) um eine Strecke a bezüglich der Drehachse erstreckt, während sich die erste Teilschneidkante (15a) um eine Strecke a_1 bezüglich der Drehachse erstreckt, wobei a_1 in dem Bereich $0,6$ - $0,9a$ liegt und wobei die Freiflanke (13) und die Teilschneidkanten (15a, 15b) so ausgebildet und angeordnet sind, daß die Schnittlinie einer Ebene, die durch die Drehachse des Fräswerkzeugs verläuft, mit einer mit der Schneidkante (15) gefrästen Oberfläche im wesentlichen geradlinig ist.
2. Rundfräserwerkzeug nach Anspruch 1, dadurch gekennzeichnet, daß der axiale Spanwinkel γ_1 im wesentlichen gleich 25° ist.
 3. Rundfräserwerkzeug nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der axiale Spanwinkel γ_2 im wesentlichen gleich 0° ist.
 4. Rundfräserwerkzeug nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß a_1 im wesentlichen gleich $0,7a$ ist.
 5. Rundfräserwerkzeug nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die erste Teilschneidkante (15a) bezüglich der Basis des Schneideinsatzes um einen Neigungswinkel geneigt ist, der im wesentlichen im Bereich von 2° - 12° liegt.
 6. Rundfräserwerkzeug nach Anspruch 5, dadurch gekennzeichnet, daß der Neigungswinkel im wesentlichen gleich 5° ist.
 7. Rundfräserwerkzeug nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß die zweite Teilschneidkante (15b) bezüglich der Basis des Schneideinsatzes um einen entgegengesetzt gerichteten Neigungswinkel geneigt ist, der im wesentlichen im Bereich von 15° - 30° liegt.
 8. Rundfräserwerkzeug nach Anspruch 7, dadurch gekennzeichnet, daß der entgegengesetzt gerichtete Neigungswinkel im wesentlichen gleich 20° ist.
 9. Rundfräserwerkzeug nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Einsatz im wesentlichen eine parallelepipedische Form hat.
 10. Rundfräserwerkzeug nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß der Einsatz im wesentlichen eine dreieckige Form hat.
 11. Rundfräserwerkzeug nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß Ecken des Einsatzes mit Abstreifern (14) ausgebildet sind.
 12. Rundfräserwerkzeug nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, daß Ecken des Einsatzes abgerundet sind.
- ### 20 Revendications
1. Outil de coupe pour fraisage rotatif, comprenant une plaquette de coupe rapportée ayant une arête tranchante (15) définie entre une face d'attaque (12) et une face en dépouille (13), et ayant une arête de base (21) définie entre ladite face en dépouille et une surface de base (20),
caractérisé en ce que
ladite arête tranchante (15) comprend des première et deuxième arêtes tranchantes partielles successives (15a, 15b) qui se suivent sans solution de continuité, lesdites première et deuxième arêtes tranchantes partielles (15a, 15b) ayant des angles d'attaque axiaux respectifs γ_1 et γ_2 mesurés par rapport à un axe de rotation de l'outil de coupe, où γ_1 est beaucoup plus grand que γ_2 ; γ_1 est à peu près compris dans l'intervalle de 4° à 30° et γ_2 est à peu près compris dans l'intervalle de $\pm 15^\circ$; où la projection de ladite arête tranchante (15) sur l'axe de rotation a une longueur a , tandis que la projection de la première arête tranchante partielle (15a) sur l'axe de rotation a une longueur a_1 , où a_1 est compris dans l'intervalle $0,6$ à $0,9 a$ et ladite face en dépouille (13) et les arêtes tranchantes partielles (15a, 15b) sont configurées et disposées de manière que l'intersection d'un plan qui passe par l'axe de rotation de l'outil de coupe de fraisage et d'une surface fraisée par ladite arête tranchante (15) soit à peu près rectiligne.
 2. Outil de coupe pour fraisage rotatif selon la revendication 1, caractérisé en ce que ledit angle d'attaque axial γ_1 est à peu égal à 25° .



3. Outil de coupe pour fraisage rotatif selon la revendication 1 ou 2, caractérisé en ce que ledit angle d'attaque axial γ_2 est à peu près égal à 0° . 5
4. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications précédentes, caractérisé en ce que a_1 est à peu près égal à $0,7 a$. 10
5. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications précédentes, caractérisé en ce que ladite première arête tranchante partielle (15a) est inclinée par rapport à la base de la plaquette de coupe rapportée d'un angle d'inclinaison qui est à peu près dans l'intervalle de 2° à 12° . 15
6. Outil de coupe pour fraisage selon la revendication 5, caractérisé en ce que ledit angle d'inclinaison est à peu près égal à 5° . 20
7. Outil de coupe pour fraisage rotatif selon la revendication 5 ou 6, caractérisé en ce que ladite deuxième arête tranchante partielle (15b) est inclinée par rapport à la base de la plaquette de coupe rapportée d'un angle d'inclinaison dirigé en sens inverse, qui est à peu près compris dans l'intervalle de 15° à 30° . 25
8. Outil de coupe pour fraisage rotatif selon la revendication 7, caractérisé en ce que ledit angle d'inclinaison dirigé en sens inverse est à peu près égal à 20° . 30
9. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications précédentes, caractérisé en ce que ladite plaquette de coupe rapportée est de forme sensiblement parallépipédique. 35
10. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications 1 à 8, caractérisé en ce que ladite plaquette de coupe rapportée est de forme à peu près triangulaire. 40
11. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications précédentes, caractérisé en ce que les coins de la plaquette rapportée sont munis d'éléments de grattoirs (14). 45
12. Outil de coupe pour fraisage rotatif selon l'une quelconque des revendications 1 à 10, caractérisé en ce que les coins de la plaquette rapportée sont arrondis. 50