Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the (Convention) Application made by: WLAJKO MIHIC

for a patent for an invention entitled: ARRANGEMENT IN CUTTING INSERTS, ESPECIALLY FOR TURNING TOOLS

I (~~We~~) WLAJKO MIHIC

~~of and care of the applicant company~~ do solemnly and sincerely declare as follows:

a) I am (~~We are~~) the applicant(~~s~~) for the patent
or
b) I ~~am (We are) authorised by the applicant(s) for the patent to make this declaration on its/their behalf.~~

Delete the following if not a Convention Application.

The basic application(s) as defined by section 141 (142) of the Act was (~~were~~) made

on 7 August 1987 in Sweden (Appln No. 8703085-4)

on in

on in

by Wlajko Mihic

The basic application(~~s~~) referred to in this paragraph is (~~are~~) the first application(~~s~~) made in a Convention country in respect of the invention the subject of the application.

a) I am (~~We are~~) the actual inventor(~~s~~) of the invention.

or
b)

~~Is (are) the actual inventor(s) of the invention and the facts upon which~~

~~is (are) entitled to make the application are as follows:~~

Declared at GÄVLE this 20th day of December 19 89

Signed ..... ~~Status~~ Status Applicant/inventor

Declarant's Name WLAJKO MIHIC

F. B. RICE & CO PATENT ATTORNEYS

This form is suitable for any type of Patent Application. No legalisation required.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-23114/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 603260

(54) Title
ARRANGEMENT IN CUTTING INSERTS, ESPECIALLY FOR TURNING TOOLS

International Patent Classification(s)
(51)[4] B23B 027/08

(21) Application No. : 23114/88 (22) Application Date : 08.08.88

(87) WIPO Number : WO89/01375

(30) Priority Data

(31) Number	(32) Date	(33) Country
8703085	07.08.87	SE SWEDEN

(43) Publication Date : 09.03.89

(44) Publication Date of Accepted Application : 08.11.90

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(56) Prior Art Documents
EP 222951
EP 245225

(57) Claim

1. An arrangement in a cutting insert, especially for turning tools, comprising an insert body (1) having a substantially transverse front portion provided with a cutting edge, and a rear portion (3) to be mounted on and clamped to an insert holder, a cutting surface (10) which connects with said cutting edge (9) being formed with a central chip-forming recess (11), wherein said chip--forming recess (11) has a concave bottom surface (13) which is arcuately curved about an axis extending substantially in parallel with said cutting edge and whose front end connects with the centre portion of the transverse cutting edge (9) and whose rear end connects with the rest of the cutting surface (10) spaced from said cutting edge, c h a r a c t e r i s e d in that said recess (11) is laterally restricted by inclined, convex sides or walls (14) having such a curvature and shape relative to the concave bottom surface (13) that the upper

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and lower edges of each side substantially converge adjacent the bottom surface end connecting with said cutting edge (9) while the lower edge of each side defines the bottom surface in lateral direction, so that the bottom surface width at first decreases, as seen in the direction away from said cutting edge and backwards, and then increases again, and in that the cutting edge portions on both sides of the cutting edge portion connecting with said concave bottom surface (13) adjoin substantially planar areas (16) of the cutting surface (10), and that the laterally facing edges of said planar areas are designed as lateral cutting edges (12) which enable turning also in a direction parallel to the major cutting edge.

AU-AI-23114/88

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

603260

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number: WO 89/ 01375
B23B 27/08	A1	(43) International Publication Date: 23 February 1989 (23.02.89)

(21) International Application Number: PCT/SE88/00399

(22) International Filing Date: 8 August 1988 (08.08.88)

(31) Priority Application Number: 8703085-4

(32) Priority Date: 7 August 1987 (07.08.87)

(33) Priority Country: SE

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(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), SU, US.

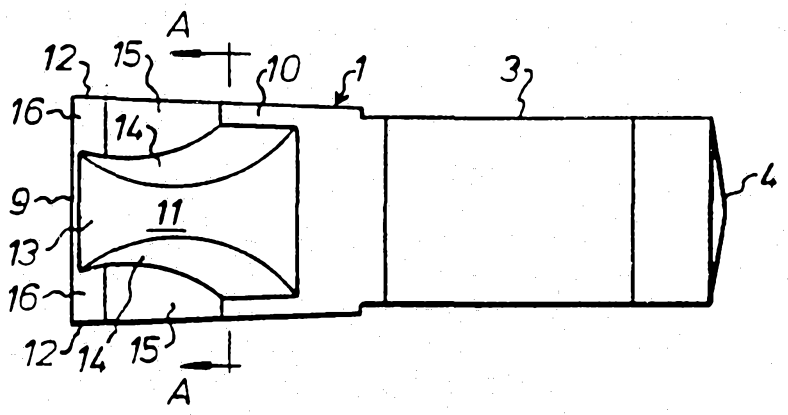
Published
With international search report.
In English translation (filed in Swedish).

amendments made under Section 49 and is correct for printing

A.O.J.P. 27 APR 1989

AUSTRALIAN
- 9 MAR 1989
PATENT OFFICE

(54) Title: ARRANGEMENT IN CUTTING INSERTS, ESPECIALLY FOR TURNING TOOLS



(57) Abstract

A cutting insert, especially for turning tools, comprising an insert body (1) having a transverse front cutting edge portion and a rear portion (3) for mounting on and clamping to an insert holder, a cutting surface (10) which connects with said cutting edge (9) being provided with a central chip-forming recess (11). The novelty of the invention resides in that the chip-forming recess (11) has a concave bottom surface (13) which connects with the transverse cutting edge (9) and with the rest of the cutting surface (10) at a distance from said cutting edge, and that said recess (11) is laterally restricted by inclined, convex sides (14) having a curvature and shape relative to the concave bottom surface (13) such that the bottom surface width at first decreases, as seen in the direction away from the cutting edge and backwards, and then increases again.

ARRANGEMENT IN CUTTING INSERTS, ESPECIALLY FOR TURNING TOOLS

The present invention relates to an arrangement in cutting inserts of the type stated in the preamble of the claim.

In turning with conventional tools, axial turning in lateral direction, facing etc are carried out by means of a cutting insert, and severing and deep radial and axial plunge cutting by means of a recessing tool.

A characteristic feature of cutting inserts and recessing tools is their small extent in axial direction. The small width prevents unnecessary waste of material during severing and facilitates plunge cutting of grooves of smaller width.

Recessing tools frequently cause difficulties, especially with "difficult" materials, in that the chips may wedge in the groove and be carried along, damaging both to the tool and the workpiece.

One object of the invention is to provide a cutting insert designed to improve chip-forming and guiding in a variety of materials of different workability, the chips being guided away from the cutting area and gradually broken up, such that the risk of tool damages or deterioration of quality is reduced.

A conventional tool for axial turning or facing can be of large extent in axial direction and cannot be used for severing or plunge cutting. In normal turning work, it is therefore necessary to use several types of tools. Another object of the invention is to provide a cutting insert which can be used both for radial plunge cutting, severing, axial plunge cutting and for axial turning in lateral direction, facing and copy-turning, i.e. a cutting insert which can operate in all directions in the plane under production conditions.

A still further object is to provide a cutting insert which can also be used for turning of materials which normally require a large positive rake, for example high alloy stainless steel, acidproof steel, heat-resisting steel and non-ferrous metals such as aluminium, copper, brass etc.

The characteristic features of the cutting insert according to the present invention are stated in the appended claims.

A preferred embodiment of the cutting insert according to the invention will be described in detail with reference to the accompanying drawing which shows a greatly enlarged cutting insert. In the drawing, Fig. 1 is a side view of the preferred embodiment of the cutting insert, Fig. 2 is a view from the cutting edge end of the same cutting insert, Fig. 3 is a top plan view of the cutting insert, and Fig. 4 is a cross-sectional view taken along line A-A in Fig. 3.

The cutting insert comprises, in the embodiment shown, a body of so-called cutting alloy or sintered material. The lower side of the cutting insert 1 is formed with a longitudinal ridge 2 to be received in a complementary groove in a recess formed in a cutting insert holder. The rear portion 3 of the cutting insert consists of a projection which is lower than the rest of the cutting insert, and the surface of this projection extending substantially in parallel with the lower side is adapted to form an abutment for a clamping arm mounted on the cutting insert holder and actuated by a screw or the like to keep the cutting insert stable in the groove of the holder, the rear end surface 4 of the cutting insert being engaged with the rear wall of the recess of the holder. The lower portion 5 of the cutting insert, which also comprises the projection 3 has substantially parallel lateral surfaces 6, but at the front portion of the cutting insert, the lateral surfaces 7 diverge upward-

ly such that the lateral surfaces at the main section of the insert body portion ahead of the projection 3 are inclined outwardly, as seen from the underside. Also the front end surface 8 of the cutting insert is inclined outwardly, as seen in the same direction. The major cutting edge 9 of the cutting insert is formed at the upper edge of the front end surface 8 of the insert body at the location where this end surface meets the cutting surface 10. As seen from the major cutting edge 9, the cutting insert also has a rearwardly directed taper to allow clearance.

According to the invention, the cutting surface is formed at its centre portion with a recess 11 which is designed to allow efficient chip forming and chip breaking. On both sides of the recess, the cutting surface parts which are closest to the major cutting edge, have lateral edges designed to form lateral cutting edges 12.

The recess 11 formed in the cutting surface has a concave bottom surface 13 whose front end connects with the centre portion of the major cutting edge 9 and whose rear end connects with the cutting surface 10, and convex surfaces 14 which are outwardly inclined as seen from the bottom, such that the concave bottom surface 13, starting from the end connecting with the major cutting edge, has a width which at first successively decreases and then sucessively increases.

The wall portions defining the recess 11 in the lateral direction are formed with recesses 15 which are also concave and extend perpendicular to the longitudinal direction of the cutting insert and which are shorter and more curved than the bottom 13 of the recess 11.

The recesses 15 which are aligned with one another thus cut away arcuate areas at the sides of the central recess 11.

The front section of the remaining cutting surface is formed of substantially planar areas 16 which connect with the major and lateral cutting edges 9 and 12 and are of small extent in the longitudinal direction of the cutting insert. The front end of the concave bottom 13 is located between said planar areas.

The inclined convex sides 14 of the recess 11 which are cut by the concave lateral recesses 15, are designed such that the upper and lower edges of each side converge adjacent the major cutting edge 9.

The bottom 13 and sides 14 of the central recess 11 extend, at their rear end, beyond the lateral recesses 15 which have a smaller radius than the concave bottom 13 of the central recess 11.

When a chip is cut during severing and slotting, the chip sides will strike and be guided by the areas 16 and the concave lateral recesses 15 and be bent in a smaller radius, while the chip centre extends into the central recess 11 which directly connects with the major cutting edge 9, and is bent in a larger radius, at the same time as a certain compression occurs in the transverse direction of the chip under the action of the convex lateral surfaces 14. The heavy deformation in both longitudinal and transverse direction of the chip, and the transfer of material in the chip caused by the deformation, imply that the chip unwinds from its helical shape and is gradually broken up, simultaneously as the chip width is reduced because of the transverse bending of the chip and the transfer of material towards the centre of the chip, such that the wound-up chip goes clear of the sides of the groove.

In copy-turning and facing operations and in turning in lateral direction, efficient chip flow and break-up are obtained in all the materials mentioned above. Directly cutting is begun, the chips will strike one of the concave surfaces of the lateral

recess 15 formed at the sides of the cutting insert, which means that the chips are guided away from the cutting area and are gradually broken up.

Except that the cutting insert according to the invention gives the desired guiding, forming and breaking of chips during plunge cutting, with no risk that long chips collect adjacent the cutting area, the same cutting insert can be used for severing, copy-turning, lateral turning and facing in axial and axial/radial direction under production conditions, which has not proved possible with prior art cutting inserts.

The invention is not restricted to that described above and shown in the drawing, but can be modified in various ways within the scope of the appended claims.

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CLAIMS

1. An arrangement in a cutting insert, especially for turning tools, comprising an insert body (1) having a substantially transverse front portion provided with a cutting edge, and a rear portion (3) to be mounted on and clamped to an insert holder, a cutting surface (10) which connects with said cutting edge (9) being formed with a central chip-forming recess (11), wherein said chip--forming recess (11) has a concave bottom surface (13) which is arcuately curved about an axis extending substantially in parallel with said cutting edge and whose front end connects with the centre portion of the transverse cutting edge (9) and whose rear end connects with the rest of the cutting surface (10) spaced from said cutting edge, c h a r a c t e r i s e d in that said recess (11) is laterally restricted by inclined, convex sides or walls (14) having such a curvature and shape relative to the concave bottom surface (13) that the upper and lower edges of each side substantially converge adjacent the bottom surface end connecting with said cutting edge (9) while the lower edge of each side defines the bottom surface in lateral direction, so that the bottom surface width at first decreases, as seen in the direction away from said cutting edge and backwards, and then increases again, and in that the cutting edge portions on both sides of the cutting edge portion connecting with said concave bottom surface (13) adjoin substantially planar areas (16) of the cutting surface (10), and that the laterally facing edges of said planar areas are designed as lateral cutting edges (12) which enable turning also in a direction parallel to the major cutting edge.

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2. The arrangement as claimed in claim 1, c h a r a c t e r i s e d in that the portions on both sides of the central recess (11) are formed with transverse recess (15) which are arcuately curved about an axis substantially in parallel with said cutting edge (9) and have a larger curvature than said bottom surface (13) of the central recess, and which connect forwardly with the substantially planar areas (16) along the cutting edge on both sides of the central recess (11) and connect backwardly with the remaining cutting surface closer to the cutting edge than the rear end of said bottom surface of the central recess does.

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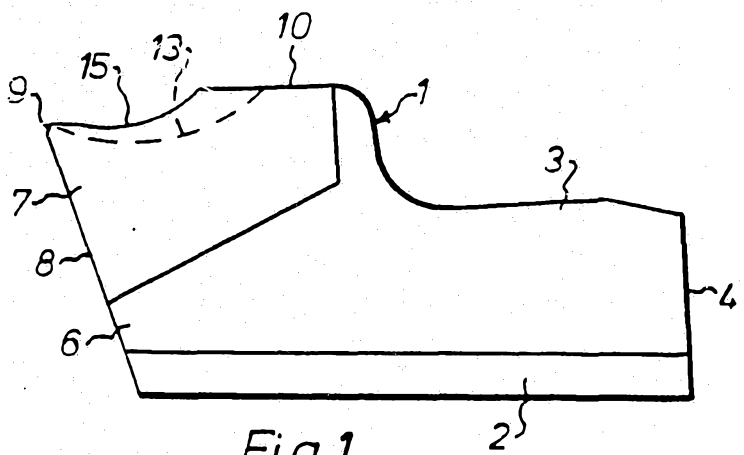

Fig.1

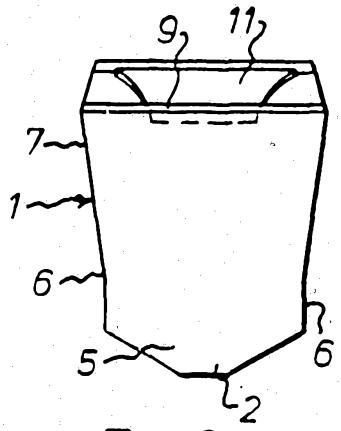

Fig.2

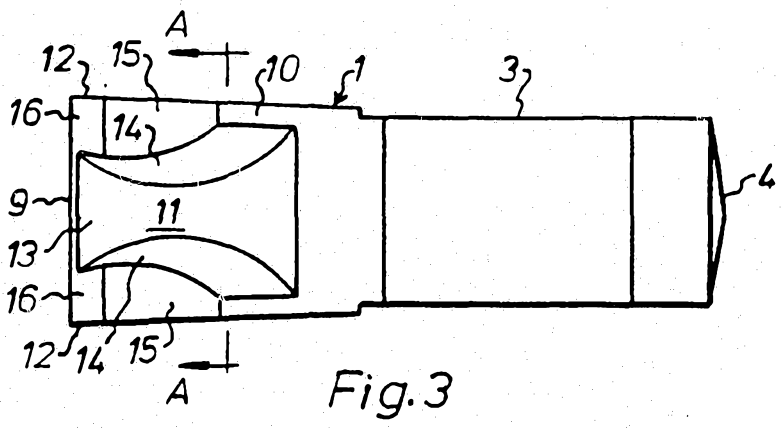

Fig.3

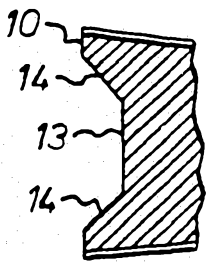

Fig.4

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00399

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

B 23 B 27/08

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	B 23 B 27/00-/08, 27/16
US Cl	407:115-118

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	EP, A1, 0 222 951 (CABAREX, SOCIETE ANONYME) 27 May 1987 See col. 3, line 44- col. 4, line 4; fig. 1d & FR, 2561960	1
Y	EP, A2, 0 245 225 (SECO TOOLS AB) 11 November 1987 See fig. 2, 5 and 6 & SE, 452273	1

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1988-10-10	1988 -10- 26
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Petter Sörsdahl

Form PCT/ISA/210 (second sheet) (January 1985)