

5 The invention relates to a tool according to claim 1 and
a cutting insert according to claim 6, c.f. EP-A-0 095 062.

10 For metal cutting such as engraving, tools of this type
are known from Valenite -M-LC-101 brochures. Moreover, tools
for working the end edges of tubes are known which produce
both an internal chamfer and an external chamfer on the tube
end. Such a tool is known from US 3 563 119, which comprises
a cutting tool in addition to the chamfer cutting edges.
15 However, the above-mentioned publication only discloses a
conventional engraving blade with a chamfering blade
positioned thereon, which latter has on each side two cutting
edges put together to form a V. It does not describe any
cutter carrier with a replaceable carbide cutting insert
which is fastened precisely in position and secured against
20 traction and pressure in order to be able to maintain the
desired cutting depths or the position and construction of
the chamfers desired on page 5.

25 DE 30 44 790 describes a cylindrical cutter, whose
cutting inerts are provided on the bearing face with a recess
in which there engages a spring-loaded tongue or a spring-
loaded lug of the adjacent seat jaw of the cutter carrier.
Such a cutting insert is secured against relatively light
centrifugal forces by the spring-loaded tongue of the cutter
30 carrier; securing in the longitudinal direction upon
relatively strong loading of the cutting insert by traction
is not provided thereby, although it occurs during cutting of
an internal chamfer on the tube end, with relatively high
rotational speeds of the milling cutter or during facing. DE
35 33 13 693 proposes rings as securing elements, which rings
are anchored in the end of the holding pocket and engage in a
locking groove at the end of the cutting insert. This has not
proven viable owing to complicated handling thereof.

40 The cutting tool according to EP-A-0 095 062 comprises an
arc-like ridge on the bearing face of the lower seat jaw and
running perpendicularly to the bearing face and a recess in
the opposing lower bearing face of the cutting insert, in
which recess the ridge engages. This serves merely as an
45 extraction safeguard against relatively strong extraction
forces. The ridge is intended to prevent the cutting insert
from being thrown out if clamping tension is lost or if
pulling forces, especially centrifugal forces with rotating
tools, acting on the cutting insert are too great. Because of
50 its position in the holding pocket the ridge is not suited to
serve as a safeguard against strong extraction forces. The
ridge cannot remove any cutting forces; that purpose is
served by a special insertion limiting stop. Nor can the
ridge remove cutting forces acting laterally on the cutting
55 insert, which forces arise, for example, during chamfering
or longitudinal turning.

EP 0 152 729 A3 describes a cutting tool holder which accommodates a cutting insert self-lockingly in a holding pocket, because the construction of pocket and insert is such that resilient opening of the pocket upon insertion of the
5 insert is strong to start with and less strong thereafter, until an arc-like ridge of the insert in the front area of the prismatic bearing face behind the cutting edge comes to rest two-dimensionally against a sloping end face of the
10 cutter carrier. The cross-sections of the prismatic bearing face of the upper seat jaw and the upper prismatic bearing face of the cutting insert continue beyond the ridge and recess respectively. This construction does not permit satisfactory removal of extraction forces acting principally in the longitudinal direction or of laterally directed
15 cutting forces, as arise during facing and during cutting of an internal chamfer on a tube end wall.

With respect to this prior art the problem on which the invention is based is that of providing a tool, especially
20 for chamfering, engraving, facing and milling, in which, with the aid of structurally simple means, the position of the cutting insert in the cutter carrier can be precisely fixed and secured against tractional and compressive forces in its longitudinal direction as well as against laterally acting
25 forces, the cutting forces being diverted optimally from the cutting insert to the seat jaws of the cutter carrier. Insertion and removal of the cutting insert from the cutter carrier may then be effected labour-savingsly.

30 A tool which solves this problem and a cutting insert for use in such cutting tools are characterized by embodiments in the claims.

The ridge on the lower bearing face and the complementary
35 recess in the cutting insert form, in contrast to the flexible tongue known from DE 30 44 790 or the spring-loaded ring according to DE 33 13 693, a rigid limit stop and, in contrast to the ridge and recess respectively known from EP 95 062 A1 and EP 152 729 A3, a complementary pair of ridge
40 and recess of the bearing faces, such that complete matching results in both directions of the longitudinal and transverse axes and effective securing is achieved in both directions. The position of the recess and the ridge in the front area of the bearing faces is optimal both for clamping by the spring-
45 loadedly swivellable seat jaw and also for removal of the cutting forces from the cutting insert. Through extension of the bearing face in front of the arc-like recess and the corresponding ridge of the cutter carrier a rigid limit stop is formed upon insertion of the cutting insert into its seat,
50 which limit stop ensures precise positioning of the cutting insert with respect to the cutter carrier and further improves removal of the cutting forces, especially if the bearing faces in this area are approximately perpendicular to the resultant cutting forces. Continuation of the cross-
55 section of the prismatic bearing faces beyond the arc-like recess or ridge respectively into the downwardly extended

front area of the lower bearing faces provides the cutting insert with particular stability against lateral thrust forces during cutting.

5 An exemplary embodiment of the tool according to the invention is shown in the drawings, in which

- Fig. 1 is a side view of the cutter carrier with inserted cutting insert;
- 10 Fig. 2 is a plan view of the upper edge of the cutter carrier with cutting insert;
- Fig. 3 shows a cross-section through the cutting insert;
- 15 Fig. 4 shows insertion of the cutting insert into the holding pocket of the cutter carrier;
- Fig. 5 shows the inserted cutting insert, before the swivellable jaw is clamped against the cutting insert and
- 20 Fig. 6 shows the construction according to the invention of the ridge of the front, lower bearing face and the recess in the cutting insert of the cutter carrier on an enlarged scale with respect to Figures 1 to 5.
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The cutter carrier 1, also known as a knife, has a flat, rectangular cross-section with the upper edge 2, the lower edge 3 and the end edge 4 running at right angles to this edge. Starting from the end edge 4, the holding pocket 6 for the cutting insert S is formed in the cutter carrier. Above the holding pocket 6 the cutter carrier is bevelled to improve chip flow.

35 The holding pocket 6 is defined by the upper seat jaw 7 with the upper prismatic bearing face 11 and the lower seat jaw 8 with the lower prismatic bearing face 12, which lie parallel or approximately parallel opposite each other. The cutting insert S is provided in the known way with corresponding bearing faces 13a (Figure 3), to provide it with the necessary lateral hold in the seat 6.

45 A slit 14 extends from the transverse bore 10 through the cutter carrier at an angle of approximately 45° to the longitudinal axis L of the holder, by which slit 14 the jaw 7 is separated from the rest of the cutter carrier 5 and is only connected with the cutter carrier via the narrow land 9 between the holding pocket and the bore 10. The slit 14 is interrupted by a bore 16 into which a wedge element 17 (eccentric cam, cone or the like) projects which may be adjusted by means of the screw 18 in such a way that the jaw 7 may be adjusted by rotary motion in the direction of the arrow 19 about the middle 20 of the land 9 against the cutting insert S, whereby the latter may be clamped firmly in its seat 6.

The cutting insert S has a pair of cutting edges 21, which may be set at an angle θ of 45° with respect to the longitudinal central plane E of the cutter carrier 1 and are provided for external chamfering. The cutting edges 22 are
 5 arranged on the head of the cutting insert S at an angle to the edge pair 21 and serve to effect internal chamfering and run at an angle β of 120° with respect to the plane E.

The bearing face 12 of the lower seat jaw 8 comprises an
 10 arc-shaped ridge 23 in the front area near the opening of the seat 6. This ridge 23 is constructed symmetrically or approximately symmetrically and comprises an arcuate portion 24 and two straight or approximately straight portions 25, 26 adjacent thereto. The portion 26 merges into an extension 27
 15 which has the same sloping position as the portion 26 and is oriented approximately perpendicularly to the resultant cutting forces during external chamfering. The cross-section of the prismatic bearing face 12, as may be seen at 13 in Figure 1, continues at 28 on the arc-shaped ridge 23 and may
 20 be continued as far as into the extension 27 and 28a.

The cutting insert S comprises a recess 30 corresponding to the arc-shaped ridge 23, the front bearing face 31 of which recess 30 likewise comprises an extension 32 which lies
 25 against the portion 26, 27 of the ridge 23. The cross-section of the prismatic lower bearing face 33 is, as with the bearing face of the cutter carrier, continued beyond the recess 30 - at 13b - as far as into the sloping extension 32 of the bearing face.

30 The construction of the cutting insert 1 and its seat 6 is such that the distance between the edge 5a and the ridge 23 when the jaw 7 is not clamped is the same as or greater than the height b of the cutting insert (Figure 5), such that
 35 the cutting insert may be pushed in the longitudinal direction (arrow R) into the seat 6 when the jaw 7 is in the above-mentioned position, as shown in Figure 4. The extension 32 of the recess 30 in the cutting insert comes to rest against the portion 26 of the ridge 23, whereby the position
 40 of the cutting insert S is determined with respect to the cutter carrier and the cutting insert is clamped firm between the bearing faces 11, 12 by swivelling of the jaw 7 in the direction of the arrow 19. Figure 5 shows that when the jaw 7 is in the unclamped state there is still a small distance
 45 between its bearing face and the adjacent bearing face of the cutting insert.

It may be seen from the above that the ridge 23 and the recess 30 form a rigid stop for the cutting insert in both
 50 the traction direction and the compression direction along the longitudinal axis of the cutting insert, the swivellable jaw 7 remote from the stop being responsible for pressing the cutting insert against the rigid ridge 23. In spite of the rigid ridge 23 and the recess 30, the cutting insert S can be
 55 inserted into the seat 6 without difficulty.

In the same way as with the above-described chamfering tool, the invention can also be used with other tools in which a cutting insert is attached to a narrow cutter carrier and has to be precisely positioned and also secured against temporary traction forces. These circumstances may occur in engraving, cylindrical cutting and facing.

For engraving and chamfering the cutting insert S may comprise, in addition to the edge pairs 21, 22, a central projection 34 acting as an awl, which comprises engraving edges 35, 36 and 37. Such an awl is shown by a broken line in Figure 2.

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CLAIMS

1. A tool for metal cutting, particularly for chamfering, engraving, facing and milling, consisting of a narrow cutter carrier and of replaceable carbide cutting inserts having the following features:

- a) the cutter carrier (1) has a holding pocket (6) for the cutting inserts (S), said pocket comprising upper and lower seat jaws (7, 8) having substantially parallel prismatic upper and lower bearing faces (11, 12) for the cutting insert (S) which includes complementary bearing faces (33) opposite to the bearing faces (11, 12);
- b) one seat jaw (7) is resiliently pivotably moveable about a narrow land (9) by means of a slit (14) extending in the cutter carrier (1) until close to the rear end of the holding pocket (6);
- c) the resiliently pivotably moveable seat jaw (7) is capable of being urged against the cutting insert (S);
- d) the bearing face (12) of the lower seat jaw (8) includes a ridge (23) which extends transversely across the bearing face and is of arc-like shape in the longitudinal direction, and the cutting insert (S) has a complementary recess (30), opposite the ridge (23), in the lower bearing face (33);

characterized in that

- e) the ridge (23) of arc-like shape is of longitudinally symmetric or substantially symmetric configuration and has an arcuate middle section (24) as well as two straight or substantially straight sections (25, 26) adjacent thereto, and is arranged in the front region close to the mouth of the holding pocket (6) in the lower seat jaw (8), and the recess (30) of the cutting insert (S) is of complementary form corresponding to the ridge (23) and is arranged in the front region of the cutting insert,
- f) the cross-sections of the prismatic bearing face of the lower seat jaw (8) and of the prismatic bearing face (33) of the cutting insert (S) are continued to extend respectively beyond the ridge (23) and the recess (30), and
- g) within the slit (14) of the cutting insert (S), a wedge element (17, 18) is adjustably retained in such a way that the upper seat jaw (7) is capable of being pivoted away from the lower seat jaw (8) in order to facilitate



the insertion of the cutting insert into the holding pocket (6) and of being adjusted towards the cutting insert, after the insertion thereof, into a clamping position in which the ridge (23) is entirely engaged in the recess (30).

2. A tool according to claim 1, characterized in that on the front side of the ridge (23), the lower bearing face (12) of the seat jaw (8) is extended (27) beyond the alignment of the prismatic lower bearing face (12), and the lower bearing face (33) of the cutting insert (S) projects correspondingly downward (32) in the front region of the recess (30).

3. A tool according to claim 1 or claim 2, characterized in that the bearing face (27) in front of the ridge (23) and the bearing face (32) in front of the recess (30) terminate in straight sloping faces.

4. A tool according to claim 3, characterized in that the sloping faces (27, 32) are substantially normally disposed in respect of the resultant cutting force.

5. A tool according to any one of claims 1 to 4, characterized in that in the open position of the pivotably moveable seat jaw (7) the distance (a) between the apex of the ridge (23) of the lower bearing face (12) and the upper bearing face (11) on the holding pocket (6) is equal to or greater than the height (b) of the cutting insert (S).

6. A cutting insert to be exclusively used in cutting tools according to any one of claims 1 to 5, comprising substantially parallel, prismatic upper and lower bearing faces (33) for securing in the holding pocket (6) of a cutter carrier (1) and a transversely oriented, longitudinally arc-like recess (30) extending across the bearing face in the front region of the lower bearing face (33) for engagement in a matching ridge (23) in the lower bearing face (12) of the holding pocket of the cutter carrier, characterized in that

a) the arc-like recess (30) of the cutting insert (S) is longitudinally symmetrically or substantially symmetrically complementary to the arc-like ridge (23) of the holding pocket and includes an arcute middle section as well as two straight or substantially straight flanks, adjacent thereto and oppositely arranged in a roof-like configuration, intended to engage with the two flanks (25, 26) of the middle section (24) of the ridge (23), and

b) the cross-section of the lower prismatic bearing face (33) continues to extend beyond the recess (30).

7. A cutting insert according to claim 6, characterized in that in front of the recess (30), the lower bearing face (32) extends downward beyond the alignment of the lower prismatic bearing face (33).



8. A cutting insert according to either one of claims 6 and 7, characterized in that the extended lower bearing face (32) terminates in front of the recess (30) in a straight sloping face.

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9. A cutting insert according to claim 8, characterized in that the sloping face (32) is substantially normally disposed in respect of the resultant cutting force.

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10. A cutting insert according to claim 6 for carrying out an inner or outer chamfer on the end edges of tubes, characterized in that the insert has on its front end an angularly arranged front pair of cutting edges (21) and an angularly arranged rear pair of cutting edges (22) for making

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inner and outer chamfers, said pairs each being symmetrical in respect of the longitudinal central plane (E) and forming an acute angle, and in that the two pairs of cutting edges (21, 22) are relieved with respect to the longitudinal central plane and starting from the tip.