

The invention relates to a cutting tool, having the features of the preamble of Claim 1. Cutting tools of this type are, for example, turning tools or milling cutters. In their design according to the invention, they serve, in particular, to cut off the ends of workpieces.

Cutting tools are intended to guarantee a surface which is as flat as possible at the end face of the cut-off part or of the workpiece separated from the cut-off part. The cutting edge angle κ of the cutting edge serves to prevent residues of material, for example in the form of a residual slug, remaining on one of the two end faces formed by the cut. However, the cutting edge angle κ produces a resultant cutting force F_p , which acts on the cutting edge or on the cutting tool. Said force causes the tool to drift from its central position approximately in the longitudinal direction of the cutting edge. Instead of leading to the desired flat end face, this can lead to a rather bulging or depressed surface shape at that point.

A cutting tool of the type mentioned at the beginning has already been disclosed from EP-A-0,245,225, having a face shape which favours the chip formation in the cutting groove in the sense of a simpler, safer chip removal, in which the resultant cutting forces acting in the direction of the leading cutting edge corner are compensated by the fact that the cutting edge and the adjacent face or face regions provided with different tool orthogonal rakes rise in the direction of the trailing cutting edge corner. A force component F_p' is thus produced, which acts in the direction of the trailing cutting edge corner during the cutting operation.

The invention is based on the object of providing a cutting tool of the type mentioned at the beginning with a modified compensation of the resultant cutting force. This object is achieved by the characterizing part of Claim 1. In particular, this solution is based on the features of Claim 2.

As a result, the cutting edge, which is not

continuously straight, can substantially maintain a horizontal position located approximately in the horizontal plane defined by the axis of the workpiece. The compensation force counteracting the resultant cutting force acting in the direction of the leading cutting edge corner is produced due to the fact that the chip running off substantially contacts only the counter-flank face adjacent to the trailing cutting edge corner and thus reduces the compensation force F_p' which counteracts the resultant cutting force F_p .

The compensation force F_p' which counteracts the resultant cutting force F_p can also be assisted by the characterizing feature of Claim 11.

The cutting edge of the tool according to the invention is distinguished by a positive tool orthogonal rake. The cutting edge can be bevelled in the usual manner over its entire length.

The subject-matter of the invention is described in greater detail with reference to an example illustrated in the figures, in which:

- Figure 1 shows a perspective plan view of the front end, on the cutting edge side, of a cutting body intended for a cutting tool,
- Figure 2 shows a front view in the direction of the arrow II of the cutting region of the cutting body according to Figure 1,
- Figure 3 shows a vertical plan view substantially of the face of the tool or cutting body according to the invention,
- Figure 4 shows a diagrammatic front view of the cutting edge approximately in the direction of the arrow II of Figure 1 with a diagrammatically indicated sectional illustration of the cut chip running off and its guidance by the face of the cutting edge,
- Figure 5 shows a perspective plan view diagonally from the rear, approximately at the height of the chip former, of the face and of the cutting

edge.

The flank 2 of the cutting edge, denoted in total by 3, of the cutting body 1 encloses an angle $\gamma \approx 90^\circ$ with the vertical longitudinal centre-plane 6 of the tool running in the cutting feed direction 5 to form a cutting edge angle κ lying in the plane of the face 4 of the cutting edge 3.

Between its end regions 9, 10 on both sides, adjoining the leading cutting edge corner 7 in the cutting feed direction 5 and adjoining the trailing cutting edge corner 8 in the cutting feed direction, the cutting edge 3 has a hollowed-out central region 11 with a central-region cutting edge 14 which is substantially parallel to the two end-region cutting edges 12, 13.

The connecting cutting edges 15, 16 between the end-region cutting edges 12, 13 and the central-region cutting edge 14 form a flank angle δ which closes towards the central-region cutting edge 14. In this case, the connecting cutting edge 15 facing the leading cutting edge corner 7 forms a tool cutting edge inclination α with the adjacent end-region cutting edge 12, which inclination is greater than the tool cutting edge counter-inclination β between the other connecting cutting edge 16 and the trailing end-region cutting edge 13 in the cutting direction 5. The tool cutting edge inclination α is dimensioned such that the chip 17 running off (Fig. 4) has no substantial contact with the flank face 18 inclined at the tool cutting edge inclination α , whereas the tool cutting edge counter-inclination β (Figure 2) is dimensioned such that the chip 17 running off maintains contact with the counter-flank face 19.

The flank angle δ formed by the two connecting cutting edges 15, 16 is an obtuse angle. The difference between the tool cutting edge inclination α and the tool cutting edge counter-inclination β is approximately $7^\circ - 13^\circ$, in particular about 10° . The tool cutting edge inclination α is approximately 40° and the tool cutting edge counter-inclination β is approximately 30° . The two

end-region cutting edges 12, 13 are in each case approximately 15 % - 30 %, in particular 18 % - 21 %, of the cutting width.

The cross-sectional shape of the overall face 4 corresponds substantially to the shape of the cutting edge 3. This means in practice that the shape of the cutting edge 3 in the running-off direction of the chip, that is to say counter to the cutting feed direction 5, continues over the entire face 4. In the running-off direction of the chip, the face 4 merges into a chip shaping step 20. The transition from the face 4 into the chip shaping step 20 extends upwards approximately in a circular arc segment-like manner. The two end-region cutting edges 12, 13 and the central-region cutting edge 14 form more than 50 %, in particular more than 70 %, of the cutting width.

The corner radius R_1 of the leading cutting edge corner 7 in the cutting feed direction 5 is greater than the counter-corner radius R_2 on the trailing cutting edge corner 8 (Figure 3).

The tool orthogonal rake between the face 4 and the flank 2 is an acute angle. The cutting edge 3 or its individual components (end-region cutting edges 12, 13; central-region cutting edge 14 and connecting cutting edges 15, 16) are rounded, and the transitions between them are rounded. The depth dimension 21 of the central-region cutting edge 14 relative to the end-region cutting edges 12, 13 is between about 6 % and 9 % of the cutting width, 9 % being assigned to the smallest and 6 % to the greatest cutting widths. The cutting widths are generally within a range between about 2 and about 6 mm. The cutting edge angle κ can be between 1° and 15° . In the exemplary embodiment on which the other dimensions are based, a cutting edge angle of about 6° has been selected.

List of reference numerals

	1	cutting body
	2	flank
	3	cutting edge
5	4	face
	5	cutting feed direction
	6	longitudinal centre-plane of the tool
	7	leading cutting edge corner
	8	trailing cutting edge corner
10	9	end region
	10	end region
	11	central region
	12	end-region cutting edge
	13	end-region cutting edge
15	14	central-region cutting edge
	15	connecting cutting edge
	16	connecting cutting edge
	17	chip
	18	flank face
20	19	counter-flank face
	20	depth dimension

Patent claims

1. Cutting tool, in particular cutting body (1) of a hard cutting material for fixing releasably on a holder, in which the flank (2) of the cutting edge (3) encloses an angle (γ) $\neq 90^\circ$ with the vertical longitudinal centre-plane (6) of the tool running in the cutting feed direction (5) to form a cutting edge angle (κ) lying in the plane of the face (4) of the cutting edge (1), and the cutting edge (3) and the adjacent face (4) have a hollowed-out central region (11) between their end regions (9,10) on both sides, characterized in that the central region (11) has a central-region cutting edge (14) which is substantially parallel to the two end-region cutting edges (12,13), and in that the connecting cutting edges (15,16) between the end-region cutting edges (12,13) and the central-region cutting edge (14) and the flank faces (18,19) of the connecting cutting edges (15,16) form a flank angle (δ) which closes towards the cutting body (1), the connecting cutting edge (15) facing the leading end-region cutting edge (12) in the cutting feed direction (5) forming a tool cutting edge inclination (α) with the end-region cutting edge (12), which inclination is greater than the tool cutting edge counter-inclination (β) between the other connecting cutting edge (16) and the trailing end-region cutting edge (13) in the cutting feed direction (5).

2. Cutting tool according to Claim 1, characterized by a size of the tool cutting edge inclination (α) such that the chip (17) running off has no substantial contact with the flank face (18) inclined at the tool cutting edge inclination (α), whereas the tool cutting edge counter-inclination (β) is dimensioned such that the chip (17) running off maintains contact with the counter-flank face (19).

3. Cutting tool according to Claim 1 or 2, characterized in that the flank angle (δ) is an obtuse angle.

4. Cutting tool according to one of Claims 1 to 3, characterized in that the difference between the tool



cutting edge inclination (α) and the tool cutting edge counter-inclination (β) is approximately $7^\circ - 13^\circ$, in particular about 10° .

5. Cutting tool according to Claim 4, characterized in that the tool cutting edge inclination (α) is approximately 40° and the tool cutting edge counter-inclination (β) is approximately 30° .

6. Cutting tool according to one or more of the preceding claims, characterized by an approximately identical length of the two end-region cutting edges (12,13) of in each case approximately 15 % - 30 %, in particular of approximately 18 % - 21 %, of the cutting width.

7. Cutting tool according to one or more of the preceding claims, characterized in that the cross-sectional shape of the overall face (4) corresponds substantially to the shape of the cutting edge (3).

8. Cutting tool according to one or more of the preceding claims, characterized in that, in the running-off direction of the chip, the face (4) merges into a chip shaping step (20).

9. Cutting tool according to Claim 8, characterized by a circular arc segment-like transition of the face (4) into the chip shaping step (20).

10. Cutting tool according to one or more of the preceding claims, characterized in that the end-region cutting edges (12,13) and the central-region cutting edge (14) form more than 50 %, in particular more than 70 %, of the cutting width.

11. Cutting tool according to one or more of the preceding claims, characterized in that the corner radius R_1 of the leading cutting edge corner (7) in the cutting feed direction is greater than the counter-corner radius R_2 of the trailing cutting edge corner (8).

12. Cutting tool according to one or more of the preceding claims, characterized by a positive tool orthogonal rake of the cutting edge (3).

13. Cutting tool according to one or more of the preceding claims, characterized by a rounding of the



cutting edge over its entire length and a rounding of the transitions between its regions (12-16).

14. Cutting tool according to one or more of the preceding claims, characterized by a depth dimension (20)
5 of the central-region cutting edge (14) relative to the end-region cutting edges (12,13) of about 6 % - 9 % of the cutting width, 9 % being assigned to the smallest and 6 % to the greatest cutting widths.

15. Cutting tool according to one or more of the
10 preceding claims, characterized in that the cutting edge angle (κ) is about 6°.

