A tool for chipless shaping of threads has a working part having an exterior side provided with thread grooves. A clamping shaft having a fastening area is provided and the working part is secured on the fastening area. The working part is a component that is nonpositively secured in an axial direction of the clamping shaft on the fastening area of the clamping shaft. The fastening area of the clamping shaft has a cross-section that is smaller than a cross-section of a remainder of the clamping shaft.
The invention concerns a tool for the chipless shaping of threads, in particular for shaping internal threads, according to the preamble of claim 1.

Tools for chipless shaping of threads are known in which the free end of the clamping shaft is shaped like a working part in the form of a shaping area with thread grooves. The shaping area has a polygonal cross-section. In the area of the corners of the cross-section, there are cylindrical bars of hard and wear-resistant material that are soldered into axially extending grooves of this shaping area. Such tools are difficult to manufacture. In particular, the common profile grinding for producing the thread grooves in the shaping area and in the inserted bars causes difficulties because the grinding wheels adjusted for this purpose will clog easily.

The invention has the object to configure the tool of the aforementioned kind in such a way that it can be produced in a simple and inexpensive way.

This object is solved for the tool of the aforementioned kind with the characterizing features of claim 1.

In the tool according to the invention the working part is a component that is nonpositively secured on the clamping shaft in the axial direction, wherein the component can be a sleeve or a solid head. In this working part, the thread grooves can be produced without problems by means of a grinding wheel. The working part can be attached in a simple way to the clamping shaft, for example, by gluing soldering or by shrink-fitting.

Further features of the invention result from the additional claims, the description, and the drawings.

The invention will be explained in more detail with the aid of the embodiments illustrated in the drawings. It is shown in:

FIG. 1 a side view of the tool according to the present invention for chipless shaping of threads;

FIG. 2 an end view of the tool according to FIG. 1;

FIG. 3
to

FIG. 5 detail views of the shaping area of further embodiments of tools according to the invention.

With the tools described in the following, threads, in particular, internal threads, are produced by chipless shaping. The tool according to FIGS. 1 and 2 has a preferably cylindrical clamping shaft 1 with which the tool is received in a tool receptacle. The clamping shaft 1 is comprised advantageously of steel or a ductile hard metal. The left end 2 of the clamping shaft 1 shown in FIG. 1 has a tapering shape with regard to its cross-section. On this shaft end 2 a sleeve 3 is mounted that can be soldered, glued or shrink-fitted onto the shaft end 2. The sleeve 3 is advantageously comprised of hard metal and has at the free end a lead part 4 whose axial length is smaller than half the length of the sleeve 3. The lead part 4 tapers in the direction toward its free end. The area 5 adjoining the lead part 4 is shaped like a polygon (FIG. 2) and has on its circumference thread grooves that extend in a radial plane. In the embodiment, the area 5 of the sleeve 3 that serves as a guide thread has four axially extending edges 6 to 9 that are positioned at an angular spacing of 90° relative to one another.

In the area between neighboring edges 6 to 9 the wall section of the area 5 is convexly shaped, respectively. In these convex wall sections there are thread grooves (not illustrated) that are preferably grooved into the wall sections.

The sleeve area 5 can also have any other polygonal cross-section. A cross-section of the sleeve area 5 deviating from a polygonal shape is possible also.

The manufacture of the tool is simple because the annular sleeve 3 can be attached without problems on the shaft end 2. The thread grooves can be ground without problems into the sleeve 3. Since the grinding wheel during grinding comes into contact only with the material of the sleeve 3, the risk of clogging of the grinding wheel is minimal.

FIG. 2 shows a variant of the connection between the shaft end 2 and the sleeve 3. In the embodiment according to FIG. 1 the inner wall 10 of the sleeve 3 defines a cylinder envelope. The shaft end 2 extends to the planar end face 11 of the sleeve 3.

FIG. 2 shows a variant in which the inner wall 10 of the sleeve 3 is of a polygonal shape. In this way, between the shaft end 2 and the sleeve 3, in the direction of rotation of the tool, a positive locking connection is achieved. In this embodiment, the inner wall 10 of the sleeve 3 and accordingly also the outer wall of the shaft end 2 have three axially extending edges 12 to 14 that are positioned at an angular spacing of 120° to one another. In the area between the edges 12 to 14 the wall sections are convexly shaped. The edges 12 and 13 are positioned angularly staggered relative to the edges 6, 7, 9 of the sleeve 3 while the edge 14 of the inner wall 10 is positioned in the same plane as the edges 6 and 8 of the sleeve 3. For obtaining a positive connection with the shaft end 2, the inner wall 10 of the sleeve 3 can also have any other cross-section that deviates from a circular shape. In other respects, the tool according to FIG. 2 is designed identical to the embodiment of FIG. 1.

FIG. 3 shows an embodiment in which the shaft end 2 has a stepped outer contour. The shaft section 15 adjoining the clamping shaft 1 has a smaller cross-sectional surface area than the part of the cylindrical clamping shaft 1 positioned outside of the sleeve 3. The shaft section 16 adjoining the shaft section 15 is longer than the shaft section 15 in this embodiment and has, in turn, a smaller cross-section than the shaft section 15. Across the axial length the shaft sections 15 and 16 each have a constant cross-section. The shaft sections 15, 16 can be designed cylindrically as in the embodiment of FIG. 1 but can also have a polygonal shape in accordance with the embodiment of FIG. 2. It is also possible to design the two shaft sections 15 and 16 differently with regard to their cross-sectional shape. The stepped contour of the shaft end 2 increases the stability of the sleeve 3 in the lead part 4.

As in the preceding embodiments, the sleeve 3 is seated on the radial annular step 17 that is provided at the transition from the clamping shaft 1 to the shaft section 15. The inner wall 10 of the sleeve 3 is matched to the contour of the shaft sections 15, 16. As in the preceding embodiments, the sleeve 3 can be attached to the shaft sections 15, 16 by soldering, gluing or shrink-fitting. The shaft section 16 extends to the end face 11 of the lead part 4 so that the sleeve 3 is seated safely on the shaft sections 15, 16. In accordance with the preceding embodiments, the sleeve 3 with its shaping area 5 that is provided with the thread grooves projects radially past the clamping shaft 1 so that a proper chipless manufacture of the thread is ensured.
In the embodiment according to FIG. 4 the shaft end 2 is designed so as to taper continuously in the direction toward its free end. The shaft end 2 can be designed to taper conically. The tapering of the shaft end 2 can also be provided, for example, in case of a polygonal design or a different shape that deviates in cross-section from a circular shape. By means of this configuration of the shaft end 2 the stability of the sleeve 3 in the area of the lead part 4 is increased also. The inner wall 10 of the sleeve 3 is matched to the contour of the shaft end 2 so that a safe connection between the shaft end 2 and the sleeve 3 is ensured.

The sleeve 3 projects radially past the clamping shaft 1. In other respects, it is embodied identical to the preceding embodiments.

FIG. 5 shows the possibility that instead of a sleeve a solid head 18 is to be used that is provided with the lead part 4 and the area 5 that is provided with the thread grooves. With regard to the outer shape, the solid head 18 is embodied in the same way as the sleeve 3. The solid head 18 has in one end face 19 a blind bore into which the shaft end 2 projects. The blind bore 20 extends in an exemplary way only to about half the axial length of the area 5 of the solid head 18 where the thread grooves are. The shaft end 2 can have a cylindrical, a polygonal or any other suitable outer contour. The inner wall 10 of the blind bore 20 has a matching shape. The solid head 18 is comprised advantageously of hard metal and is attached to the shaft end 2 by soldering, gluing or shrink-fitting. The blind bore 20 has in the illustrated embodiment a constant cross-section across its axial length. It is also possible that the blind bore 20 is designed such that its cross-section decreases axially inwardly, preferably continuously.

The solid head 18 projects radially past the clamping shaft 1 and rests with its end face 19 on the annular section 17 of the clamping shaft 1.

FIG. 2 shows in an exemplary manner the possibility to provide the tool with an inner cooling medium supply 21. It is in the form of at least one cooling medium bore that extends axially through the clamping shaft 1 as well as the shaft end 2 and the shaft sections 15, 16 and opens at the face 11 of the lead part 4.

At the transition from the cylindrical clamping shaft 2 to the shaft end 2 reduced with regard to its cross-sectional surface area or the shaft sections 15, 16, there is advantageously a transitional bevel, a transitional radius or a comparable contour in order to reduce the notching effect in this area. Between the shaft sections 15, 16 there is also advantageously such a transitional bevel, transitional radius and the like.

The described tools can be produced in a very simple and inexpensive way. By means of the tools highly loadable threads can be produced without a chipping process. By means of the thread grooves provided in the area 5 of the sleeve 3 or the solid head 18, the thread in the tool is produced by an embossing process. With the described configuration of the tools, the high loads that occur in the chipless thread production as a result of material displacement in the work-piece are reliably absorbed. The radially oriented pressure forces occurring during manufacture are diverted from the sleeve 3 or the solid head 18 into the shaft end 2 or the shaft sections 15, 16 and from there into the clamping shaft 1.

What is claimed is:
1-21. (canceled)
22. A tool for chipless shaping of threads, the tool comprising:
a working part having an exterior side provided with thread grooves;
a clamping shaft having a fastening area on which the working part is secured;
wherein the working part is a component that is nonpositively secured in an axial direction of the clamping shaft on said fastening area of the clamping shaft.
23. The tool according to claim 22, wherein said fastening area of the clamping shaft has a cross-section that is smaller than a cross-section of a remainder of the clamping shaft.
24. The tool according to claim 23 wherein said fastening area of the clamping shaft extends up to a free end of the working part.
25. The tool according to claim 22, wherein the working part is a sleeve that is attached to said fastening area in a circumferential direction of the clamping shaft nonpositively; positively; or nonpositively and positively.
26. The tool according to claim 22, wherein the working part is a solid head that has a blind bore for receiving said fastening area of the clamping shaft.
27. The tool according to claim 22, wherein said fastening area of the clamping shaft has a round cross-section.
28. The tool according to claim 22, wherein said fastening area of the clamping shaft has a non-round cross-section.
29. The tool according to claim 28, wherein said fastening area of the clamping shaft has a polygonal shape.
30. The tool according to claim 29 wherein the working part has a larger cross-section than the clamping shaft at least in an area of the thread grooves.
31. The tool according to claim 29, wherein the clamping shaft has a transition where said fastening area passes into a remainder of the clamping shaft and said transition is a bevel or a rounded portion.
32. The tool according to claim 22, wherein said fastening area of the clamping shaft has a stepped configuration.
33. The tool according to claim 22, wherein said fastening area has a tapering cross-section.
34. The tool according to claim 22, wherein the area of the working part provided with the thread grooves has a polygonal shape.
35. The tool according to claim 22, wherein the working part comprises a lead part.
36. The tool according to claim 22, wherein the working part is soldered onto said fastening area.
37. The tool according to claim 22, wherein the working part is glued onto said fastening area.
38. The tool according to claim 22, wherein the working part is shrink-fitted onto said fastening area.
39. The tool according to claim 22, wherein the working part consists of hard metal.
40. The tool according to claim 22, wherein the clamping shaft is provided with at least one inner cooling medium supply.
41. The tool according to claim 22, wherein the cooling medium supply opens at an end face of the clamping shaft.
42. The tool according to claim 22, wherein the working part rests against an annular section of the clamping shaft.
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