

A Process for Manufacturing a Cutting Tool which aids the Metal-Cutting Machining Operation of Metal Tools

Description

The invention concerns a process for manufacturing a cutting tool which aids the metal-cutting machining operation of metal tools according to the characterising clause of claim 1, in addition a cutting tool blank according to the characterising clause of claim 6 and a cutting tool according to the characterising clause of claim 9.

Cutting tools for metal cutting machining operations of metal work pieces as well as processes for their manufacture are known. In what follows here starts with cutting tools which have a metallic base, for example a metal plate, and a crystalline wear-resistant coating bonded to the latter. The wear-resistant coating contains diamond crystals (polycrystalline diamond / PCD) and/or cubic boron nitride crystals (CBN). This coating is deposited on the bottom layer preferably consisting of a hard metal and then bonded practically non-detachably to the metallic base in a sintering process. For example, powder coatings of the type mentioned here are known to bond at 1500°C and at 50 to 60kbar with the hard metal substrate.

One lateral face of the metal plate provided with the wear-resistant coating is then ground in order to produce a cutting edge. In the case of cutting tools with more than one cutting edge, a corresponding number of lateral faces are subjected to a grinding process.

In the known process described here, the coated metal plate is either manufactured directly in the form which the future cutting tool is to have. However, also well-known is the manufacture in the process described here of larger metal plates, which are also described as round blanks, and the cutting-off or cutting-out of cutting tools and then subjecting the lateral faces thereby produced to a grinding process in those areas in which the future cutting edge is desired.

This process is relatively costly, and expensive with regard to warehousing.

That is why the aim of the invention is to provide a process of the type mentioned at the beginning and which does not have these disadvantages.

To solve this problem, a process including the steps mentioned in claim 1 is proposed. The process is characterised by, in a first procedural step, a cutting tool blank being produced which does not yet have its final form. It is not yet specifically shaped, particularly in the area in which one or more cutting edges are to be located on the finished cutting tool. So as to be able to use such a cutting tool blank as a cutting tool, it is first necessary in a later second procedural step to produce the particular area mentioned here in the desired form, which is adapted to a particular application case. For instance, an end area (which is at first rectangular) of the cutting tool blank is formed into a triangular shape, or that is to say provided with a point, so as to be able to produce a thread-cutting tool. The shaping of the area of the cutting tool blank provided for the metal-cutting machining operation can be carried out in any suitable way. Only then is the cutting tool blank shaped in this way ground in the area of the future cutting edge.

The cutting tool blank is thus not yet immediately capable of being used for the metal-cutting machining of metal work pieces. At first this appears to be a disadvantage, because now the finished cutting tool can only be produced in a second further procedural step, whereby the area in which the

cutting edge(s) is/are to be located still requires a special machining operation and has to be brought to the desired shape before the cutting edges can be produced through machining of the lateral faces. However, it has turned out that cutting tool blanks of the type mentioned here are produced in large numbers and can be supplied to an in-process stock without additional specification. To produce a specific cutting tool from this stock of non-specific cutting tool blanks, blanks of any type can be taken which are then brought to the desired shape in the final machining operation and are provided with at least one cutting edge by means of a grinding process.

A preferred form of implementing the process is characterised in that the cutting tool blank is brought to its desired shape by a grinding process in the area in which at least one of the cutting edges is to be located. With suitable implementation of the grinding process, machining of this area can be undertaken so that grinding of the lateral faces produced thereby can be carried out to produce at least one cutting edge directly in the shaping operation. It is therefore possible to combine the additional second procedural step with the grinding process for producing a cutting edge and to minimise the required processing time for producing the cutting tool.

Additional forms of implementing the process emerge from the remaining sub-claims.

Furthermore the aim of the invention is to provide a cutting tool blank which is used to manufacture a cutting tool and which is characterised by low-cost production.

To solve this problem, a cutting tool blank is proposed which has the features mentioned in claim 6 and which is characterised in that it has at first a non-specific shape. It is therefore not tailored to a specific way of machining, or that is to say it is not tailored for particular tools. Warehousing of such a non-specific blank does not require any special organisational structure and therefore can be achieved easily and inexpensively.

Additional forms of the cutting tool blank ensue from the remaining sub-claims.

The invention is explained in more detail below with reference to the drawings, which show: in Figure 1 a cutting tool in a top view; in Figure 2 a front view of the cutting tool according to Figure 1, and in Figure 3 a side view of the cutting tool represented in Figure 1.

Figure 1 shows in a top view a cutting tool 1 which has an essentially rectangular basic shape. One of the longitudinal faces, here the top longitudinal face 3, is provided with elevations 5 and depressions 7 which by way of example are both formed here in essentially triangular form and by that are used to provide toothing which facilitates the secure fixing of the cutting tool 1 in a tool. By means of the same type of formation of elevations 5 and depressions 7 provided here over the course of the longitudinal face 3, it is possible to clamp the cutting tool 1 in different positions in a tool and consequently to ensure dressing of the cutting tool. If therefore the cutting tool is blunt, it can be dressed so that it is fitted once more in the tool and therefore can be used again.

The cutting tool 1 is manufactured from a cutting tool blank 9, which has essentially the external profile of the cutting tool 1, but which in the area 11 (in which the cutting edges 13 and 15 of the cutting tool 1 are located) is at first basically formed in a rectangular shape. This is clearly shown in Figure 1 by a dashed line.

In the example of implementation of the cutting tool 1 represented here, the cutting edges 13 and 15 in the area 11 are arranged symmetrically to an imaginary centre line 17 and each forms an

angle of approx. 30° by way of example with the centre line. A dotted line 19 indicates that a continuous cutting edge 13', which here purely by way of example forms an angle of approx. 40° with the centre line 17, can also be provided extending over the entire height h of the cutting tool 1. Obviously it is possible for this cutting edge 13' to also extend in a mirror image to the centre line.

5 From the explanations represented here, it is readily apparent that an essentially rectangular area 11 of a cutting tool blank 9 can be shaped in such a way that cutting edges matched to specific ways of metal-cutting machining are produced.

Figure 2 shows a front view of the cutting tool 1, that is a view of the area 11.

10 This representation clearly shows that the cutting tool 1 has a metallic base, in this case a metal plate 21, preferably a hard metal plate, on which a layer of hard material, namely a powder coating 23, is sintered practically non-detachably and which contains diamond crystals and/or cubic boron nitride crystals or similar. This coating is especially hard, wear-resistant and robust and is represented in stippled form for clarity.

15 In the implementation example of the cutting tool 1 depicted here, on the lower side 25 opposite the powder coating 23 is provided a rake 27 which aids the defined locating of the cutting tool 1 on the tool.

20 The lateral face 29 located at the bottom in Figure 2 is inclined with respect to an imaginary centre plane E. Here it tapers away from the surface 31 of the powder coating 23 to the centre plane E at an acute angle of 6° for example. The upper surface 33, which corresponds to the longitudinal face 3 (Figure 1), runs parallel to the centre plane E.

Apparent in the top view are the front faces 35 and 37 located in the area 11, the said front faces 35 and 37 being subjected to a grinding process to create the cutting edges 13 and 15. The representation according to Figure 2 shows that the front faces 35 and 37 intersect in the area of the centre plane E, and therefore are formed symmetrically.

25 The side view according to Figure 3 shows the uppermost longitudinal face 3 of the cutting tool 1 in Figure 1. In Figures 1 and 2, the elements mentioned of the cutting tool 1 are provided here with the same reference number, so that the description refers to both Figures 1 and 2.

30 It can be seen from the representation according to Figure 3 that the longitudinal face 3 is provided with elevations 5 and depressions 7, which extend over the entire thickness d of the cutting tool 1 and run essentially parallel to the rear face 39 of the cutting tool 1.

Here it is also clear that the cutting tool 1 comprises a base 21 and a powder coating 23, likewise shown here in stippled form.

A dashed line here also indicates that in the area 11 of the cutting tool, 1 parts of a cutting tool blank 9 have been removed in order to now form cutting edges in this area.

35 The process for manufacturing a cutting tool 1, which aids the metal-cutting machining operation of metal work pieces, is gone into below.

In a first procedural step, a powder coating containing diamond crystals and/or cubic boron nitride crystals or similar is applied to a base 21, namely a metal plate, preferably a hard metal plate. The powder coating is sinter-fused onto the base 21 in a sintering process, for example at

temperatures of 1500°C and at a pressure of 50 to 60kbar, which results in a non-detachable bonding.

The coated metal plate can have from the outset the shape of the cutting tool blank 9 described in Figures 1 and 3. However, it is also possible to cut off or cut out cutting tool blanks 9 of the type mentioned here from a larger coated metal plate. The cutting process can be achieved by an erosion
5 process, preferably by wire electrical discharge machining, by which the elevations 5 and depressions 7 can be provided in the area of the longitudinal face 3.

The area 11 of the cutting tool blank is non-specifically shaped, that is it is not especially tailored to the future application of the cutting tool 1. In the example of implementation of a cutting tool
10 blank 9 represented here, provision is made that the latter is formed in basically a rectangular shape in the area 11.

A cutting tool blank 9 of this type can be stored with no exceptional expenditure, since it is not assigned to particular tools.

The area 11 of the cutting tool blank 9 can be brought to a particular shape as and when
15 required, so that the cutting tool can be used as a chisel, a lathe tool for right-hand or left-hand rotation, a thread-cutting tool (see Figure 1) or even for a drill and/or reamer.

The area 11 of the cutting tool blank 9 can be brought to the desired form in a cutting and/or grinding process. In this way, lateral faces can be formed of which at least one can be subjected to a grinding process to produce at least one cutting edge.

What is clear is that due to the plain basic form of the cutting tool blank 9, its manufacture can
20 be carried out very simply. This applies of course especially when a particular form of a longitudinal edge, in this case the longitudinal edge 3, is dispensed with. The manufacture of the blank is therefore possible particularly rapidly and inexpensively. Holding in storage of such a "neutral" blank is, as has been said, is likewise feasible at low cost. Finally, it is evident that the machining of the
25 cutting tool blank 9 in the area 11 is particularly simple. The procedural step for producing a cutting tool 1 therefore is likewise practicable in a rapid and inexpensive manner. The shaping of the cutting tool blank in the area 11 can be carried out by a cutting and /or grinding process. In the latter process it is particularly advantageous that the desired cutting edge can also be produced in the manufacture of the desired shape, so that the additional expenditure to produce the finished cutting tool 1 from the
30 cutting tool blank 9 can be reduced to a minimum.

From what has been said above, it is evident that the cutting tool 1 can be used universally, since practically any cutting edge geometry can be produced in the area 11 of a cutting tool blank 9. As well, the blank 9 can be formed so generally that it can find application in any tools and in various ways of metal-cutting machining operations. In order to make universal production feasible, the
35 elevations 5 and depressions 7 represented in Figure 1 can be provided as well on other lateral faces of the cutting tool 1. In the end, such forms also can be dispensed with completely, so as to ensure the universal application of the cutting tool blank 9.

Finally, it should be noted that the cutting tool 1 can be fitted directly into a tool. It is also possible to solder the cutting tool 1 onto a base support and then to clamp the latter in a tool.



Claims

1. A process for manufacturing a cutting tool which aids the metal-cutting machining operation of metal tools, with the following steps: applying a powder coating containing diamond crystals and/or cubic boron nitride or similar onto a metal plate, preferably a hard metal plate, sinter-fusing the powder coating onto the metal plate, grinding at least one lateral face of the coated metal plate to produce at least one cutting edge, characterised in that, in a first procedural step, a cutting tool blank is produced without a cutting edge, in a later second procedural step, the cutting tool blank is brought to a desired form, adapted to the application case, in the area in which the cutting tool(s) are to be located, and in that the grinding process is carried out in this area to produce at least one cutting edge.
2. A process according to claim 1, characterised in that the cutting tool blank is cut out from the coated metal plate or cut off from the latter.
3. A process according to claim 2, characterised in that the cutting process is carried out in the way of an erosion process, preferably by wire electrical discharge machining.
4. A process according to any one of claims 1 to 3, characterised in that the area, in which the cutting edge(s) is/are to be located, is brought to its desired form by a cutting and/or grinding process.
5. A process according to any one of the preceding claims, characterised in that the metal plate is provided with a continuous powder coating.
6. A cutting tool blank for the production of a cutting tool which aids the metal-cutting machining operation of metal tools, characterised in that, in the area in which the cutting edge(s) is/are to be located, a cutting tool blank has a non-specific form with regard to metal-cutting machining.
7. A cutting tool blank according to claim 7, characterised in that it is subjected to a cutting and/or grinding process in order to form lateral faces, of which at least one can be ground to produce at least one cutting edge.
8. A cutting tool blank according to claim 7, characterised by at least one surface (longitudinal face (3)) provided with elevations (5) and depressions (7).
9. A cutting tool for metal-cutting machining operations of metal work pieces, manufactured in a process according to any one of claims 1 to 5, characterised in that the cutting edge(s) is/are formed in such a way that it/they can be used as chisel, a lathe tool, a thread-cutting tool, as a cutting tool for a drill and/or reamer.

This Sheet Has Been Replaced

