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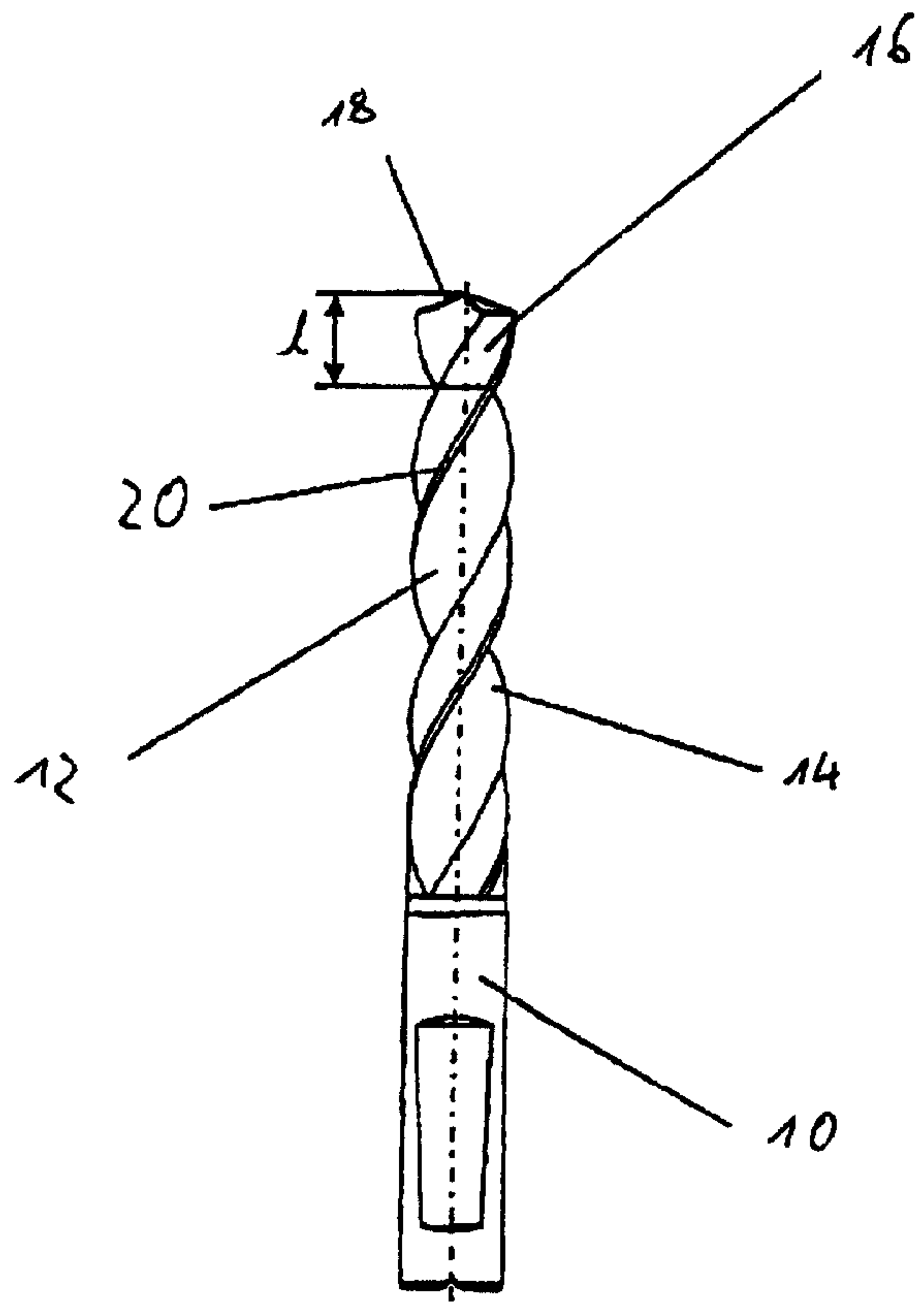
(54) Title: METHOD FOR PRODUCING A CUTTING TOOL AND A CUTTING TOOL



(57) Abrégé/Abstract:
The invention relates to a method for producing a cutting tool with a tip (16), a shaft (10) and a chucking groove area in which chucking chambers (12, 14) are provided. Said cutting tool is coated with a hardening component substantially across its entire surface. The invention is further characterized in that before the cutting tool is coated with the hardening component only the tip (16) is micro-blasted. The inventive cutting tool is especially a full carbide drill.

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(54) Title: METHOD FOR PRODUCING A CUTTING TOOL AND A CUTTING TOOL

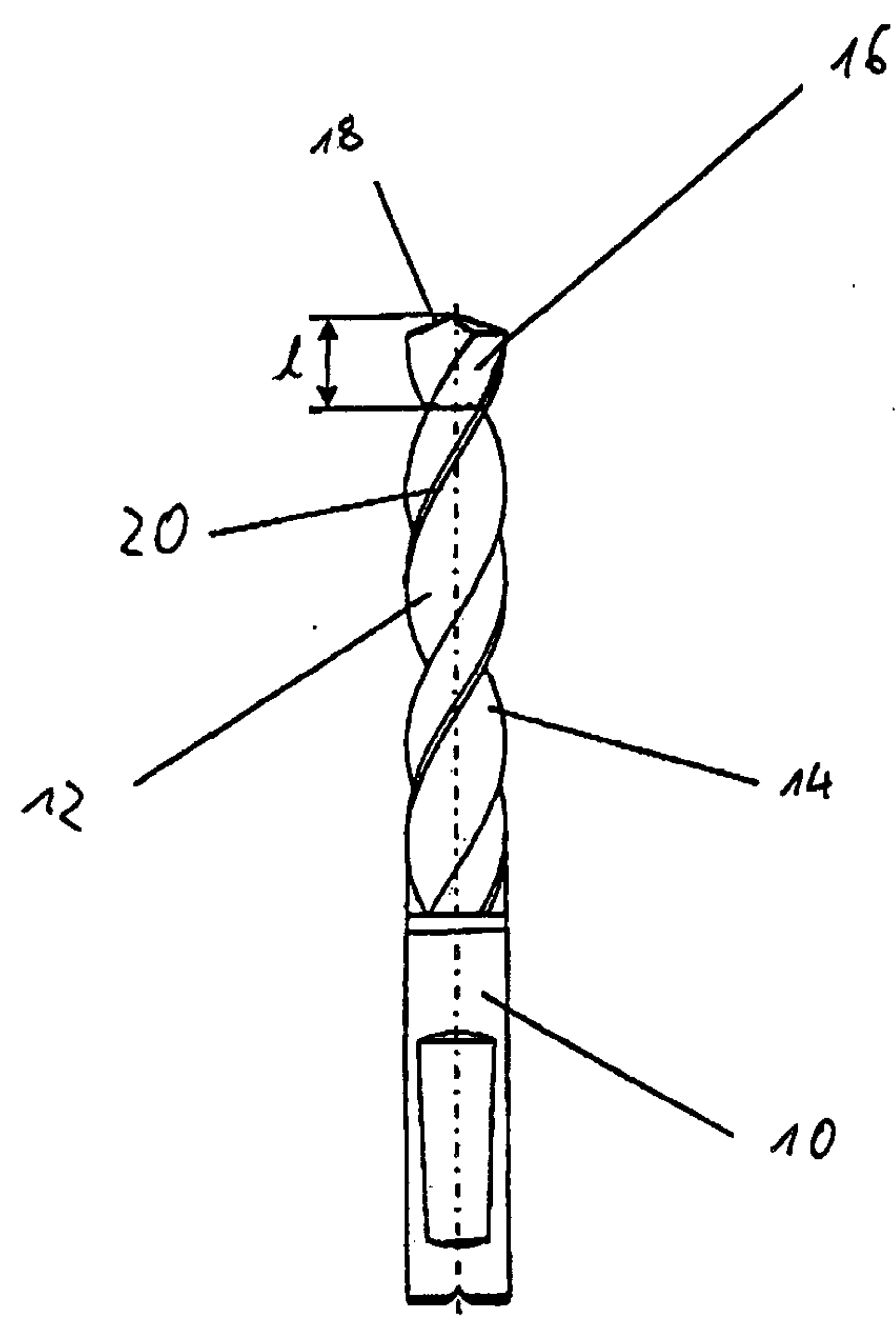
(54) Bezeichnung: VERFAHREN ZUM HERSTELLEN EINES ZERSPANUNGSWERKZEUGS SOWIE ZERSPANUNGSWERKZEUG

(57) Abstract

The invention relates to a method for producing a cutting tool with a tip (16), a shaft (10) and a chucking groove area in which chucking chambers (12, 14) are provided. Said cutting tool is coated with a hardening component substantially across its entire surface. The invention is further characterized in that before the cutting tool is coated with the hardening component only the tip (16) is micro-blasted. The inventive cutting tool is especially a full carbide drill.

(57) Zusammenfassung

Ein Verfahren zum Herstellen eines Zerspanungswerkzeugs, das eine Spitze (16), einen Schaft (10) sowie einen Spannutbereich aufweist, in welchem Spankammern (12, 14) gebildet sind, wobei das Zerspanungswerkzeug im wesentlichen vollständig mit einem Hartstoff beschichtet wird, ist dadurch gekennzeichnet, daß vor dem Beschichten des Zerspanungswerkzeugs mit dem Hartstoff lediglich die Spitze (16) mikrogestrahlt wird. Das Zerspanungswerkzeug kann insbesondere ein Bohrer aus Vollhartmetall sein.



Method for Producing a Cutting Tool and a Cutting Tool

The invention relates to a method of making a cutting tool comprising a tip, a shank and a flute area having chip spaces formed therein, the cutting tool being substantially completely coated with a hard material. The invention further relates to a cutting tool which can be made by using such a method.

This cutting tool may for example be a milling cutter, a reamer, a drill or a tapping drill. In the following description reference is made to a drill, more particularly a solid carbide drill.

The drill is coated with the hard material so as to increase tool life. For this purpose, the coating is applied to the entire cutting edge area of the drill, i.e. to the drill tip and the chip space area of the tool. The hard material coating will then result in the desired wear resistance of the drill.

In addition to the wear resistance of the drill, it is also relevant for its performance how well the chips formed by the cutting work done at the drill tip can be removed through the chip spaces. For a good chip flow, the chip spaces must be as smooth as possible. This requirement is met if the hard material coating is applied to the polished surface of the drill. In this case the coating also exhibits very low roughness, so that the desired chip flow is obtained.

It has been found, however, that the hard material coating does not always adhere to the drill to the extent as desired if the polished surface of the drill is coated directly. However, it has been possible to obtain a distinct improvement in adhesion by microblasting the polished surface of the drill before coating. The microblasting leads to a slight plastic deformation of the border zone of the drill, which increases the internal compressive stresses. At the same time microblasting causes a distinct reduction in the internal stress gradient in the border zone of the drill processed in this manner. Another effect is that the microtopography is heavily changed. This change provides for that a subsequently applied carbide coating shows an improved adhesion to the surface of the drill. This results in the hard material coating exhibiting improved wear characteristics (see article "Einfluß der Substratbearbeitung auf das Verschleißverhalten von beschichteten Hartmetallwerkzeugen" [the influence of substrate processing on wear characteristics of coated carbide tools] by Prof. Dr.-Ing. H.K. Tönshoff, Dipl.-Ing. A. Mohlfeld and Dipl.Phys. H. Seegers, institute for product engineering and cutting machine tools at the University of Hanover, Germany).

However, a disadvantage resides in that the microblasted surface has an increased roughness, so that the coated surface, too, has a roughness greater than that in the case of drills where the hard material coating is applied directly to the polished surface. The consequence is thus a higher coefficient of friction, resulting in poorer chip flow in the chip spaces.

The present invention overcomes this disadvantage by microblasting merely the tip before coating the cutting tool, for example the drill, with the hard material. In this way, good adhesiveness of the coating in the areas where required may be combined with a smooth surface of the tool and, thus, good chip flow in those areas where this is required. The entire cutting work is performed in the area of the tip, so that proper adhesiveness of the coating at this location is of major importance. Chip flow is of subordinate significance in the area of the tip. In the area of the chip spaces, on the other hand, the stresses occurring are much lower than at the tip, so that at this location the adhesiveness of the hard material coating on the surface which has not been subjected to this finishing treatment is sufficient. In the area of the chip spaces, however, a low coefficient of friction is of particular importance, which is ensured by applying the coating to the tool surface which is not microblasted and is therefore smooth, with the result that the desired low coefficient of friction is obtained.

Advantageous further developments of the invention will be apparent from the subclaims.

The invention will be described below with reference to the accompanying single Figure, which shows a cutting tool in accordance with the invention.

As an example of a cutting tool in accordance with the invention a drill will now be described. The method according to the invention and the structure of the tool according to the invention may however be applied to any other cutting tools as desired, for example milling cutters, reamers, tapping drills and the like.

The drill comprises a shank 10 and a flute area having two chip spaces 12, 14 formed therein. At the front end a drill tip 16 is formed which covers the area of the main cutting edge 18 of the drill and, starting from the chisel edge of the drill, an area having a length 1 of approximately twice the diameter of the drill.

The drill is a solid carbide drill. It thus comprises a binding metal as substrate, for example cobalt, nickel and/or iron, with a hard material bound therein, for example tungsten carbide, titanium carbide, tantalum carbide and/or boron nitride.

The drill has a polished surface in the area of the chip spaces 12, 14 and in the area of the drill tip 16. At first, this drill is cleaned and dried. The drill tip 16 is subsequently microblasted. The material preferably used therefor is corundum 500 (average grain size of between 5 and 50μm) at a jet pressure of from .5 to 5 bars. The drill tin is blasted until a uniformly matt surface is obtained. The drill is then cleaned using a method as known in the art.

Finally, at least the cutting edge area of the drill, i.e the area of the chip spaces 12, 14 and the drill tip 16, is provided with a hard material PVD coating. Basically, any hard material can be used which, firstly, can be applied using PVD methods and, secondly, is compatible with the carbide used as substrate. Suitable materials for the hard material coating are, for example, titanium aluminum nitride, titanium nitride, boron carbonitride or titanium carbonitride.

The microblasting results in an increase in surface roughness. Measurements at the land 20 of the drill have shown a roughness R_z in accordance with DIN 4768 and DIN 4768 T1 (German Industrial Standards) of between .7 and .8 μm in the areas which had not been microblasted. In the area of the microblasted drill tip 16 the result was a roughness R_z of between .9 and 1.0 μm at the land 20. These values are the same both before and after coating the drill with the hard material PVD coating.

Claims

1. A method of making a cutting tool comprising a tip (16), a shank (10) and a flute area having chip spaces (12, 14) formed therein, the cutting tool being substantially completely coated with a hard material,

characterized by microblasting merely the tip (16) before coating the cutting tool with the hard material.

2. The method as claimed in claim 1, characterized in that the step of microblasting the tip (16) covers an area of approximately twice the diameter of the cutting tool, starting from the front end of the cutting tool.

3. The method as claimed in either of claims 1 and 2, characterized in that the coating of the cutting tool is performed as a PVD coating.

4. The method as claimed in any of claims 1 to 3, characterized in that Al_2O_3 having an average grain size of between about $5 \mu m$ and $50 \mu m$ is used as the blasting medium for the microblasting.

5. A cutting tool comprising a tip (16), a shank (10) and a flute area having chip spaces (12, 14) formed therein, the tip (16) being microblasted and the cutting tool being substantially completely coated with a hard material.

6. The cutting tool as claimed in claim 5, characterized in that it is a solid carbide tool.

7. The cutting tool as claimed in claim 6, characterized in that cobalt, nickel and/or iron is used as binding metal and tungsten carbide, titanium carbide, tantalum carbide and/or boron nitride is used as hard material bound therein.

8. The cutting tool as claimed in any of claims 5 to 7, characterized in that its surface in the non-microblasted areas is by at least R_z .2 μm finer than in microblasted areas.

9. The cutting tool as claimed in claim 8, characterized in that it has a roughness R_z of between .7 and .8 μm in the non-microblasted areas and a roughness R_z of between .9 and 1.0 μm in the microblasted areas.

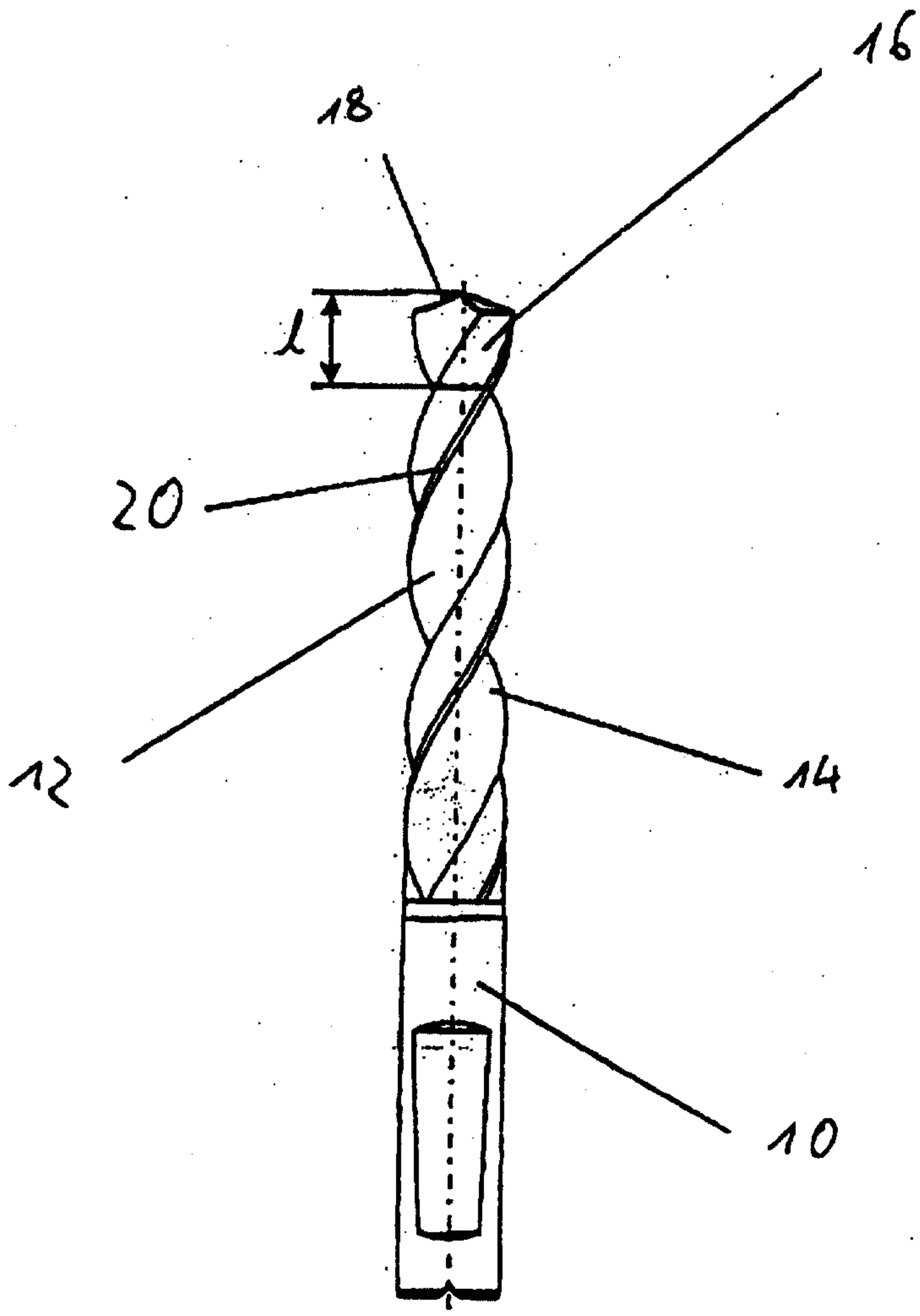
10. The cutting tool as claimed in any of claims 5 to 9, characterized in that it is a drill.

11. The cutting tool as claimed in any of claims 5 to 9, characterized in that it is a tapping drill.

12. The cutting tool as claimed in any of claims 5 to 9, characterized in that it is a milling cutter.

13. The cutting tool as claimed in any of claims 5 to 9, characterized in that it is a reamer.

14. The cutting tool as claimed in any of claims 5 to 13, characterized in that the hard material used as coating is boron carbonitride, titanium carbonitride, titanium aluminum nitride and/or titanium nitride.



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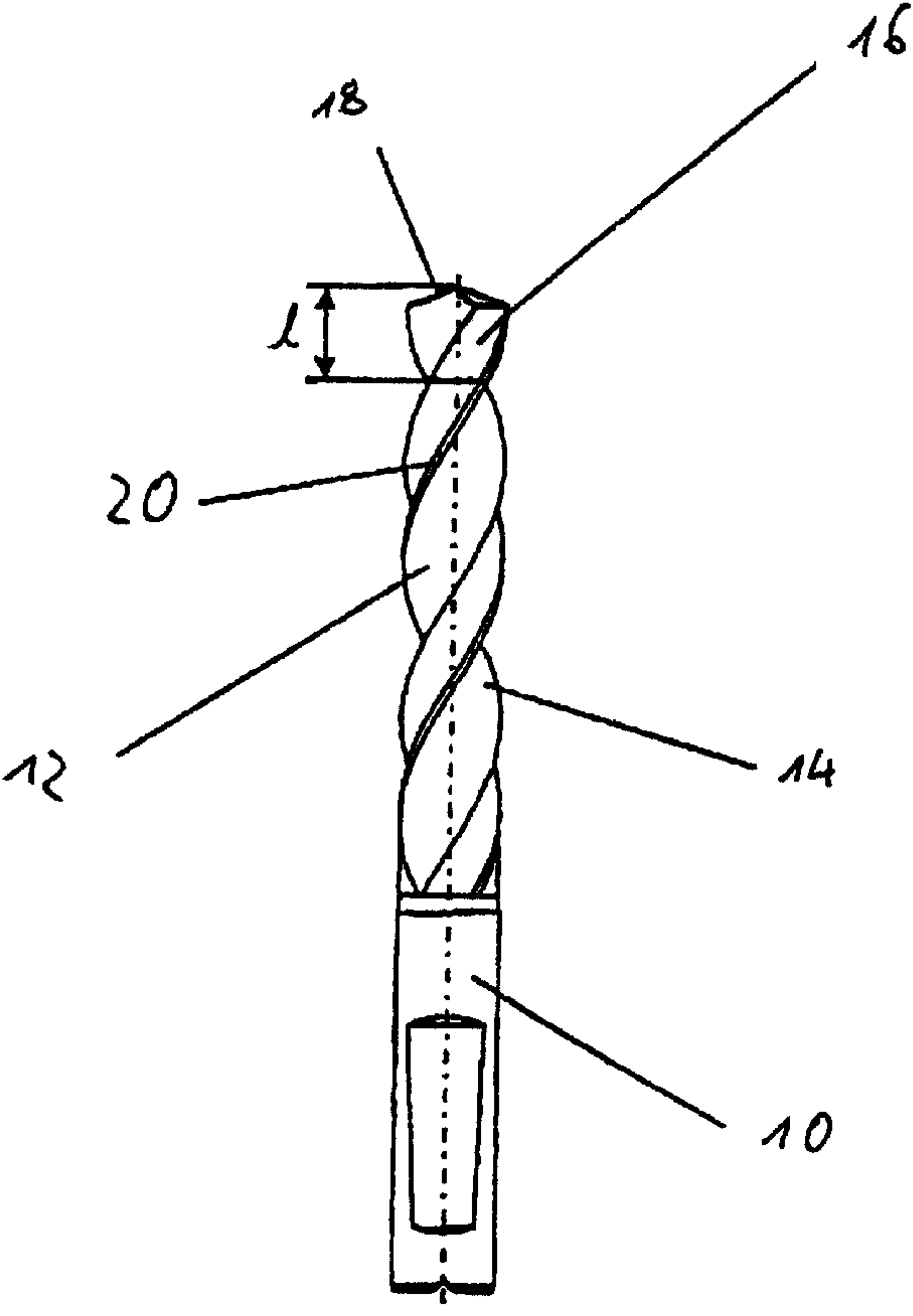
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