(12) UK Patent Application (19) GB (11) 2503350 (13) A

(43) Date of A Publication 25.12.2013

(21) Application No: 1310616.6

(22) Date of Filing: 12.06.2013

(30) Priority Data:
(31) 102012210164 (32) 18.06.2012 (33) DE

(71) Applicant(s):
Robert Bosch GmbH
(Incorporated in the Federal Republic of Germany)
Postfach 30 02 20, Wernerstrasse 1,
D-70442 Stuttgart, Germany

(72) Inventor(s):
Urs Karlen
Daniel Grolimund

(74) Agent and/or Address for Service:
A A Thornton & Co
235 High Holborn, LONDON, WC1V 7LE,
United Kingdom

(51) INT CL:
B23D 65/00 (2006.01) ***B23D 61/12*** (2006.01)

(56) Documents Cited:
GB 2050938 A **WO 2013/117352 A1**
JP 2004130450 A

(58) Field of Search:
INT CL **B23D**

(54) Title of the Invention: **Method of manufacturing a saw blade**
Abstract Title: **Saw blade manufactured by attaching teeth and removing tip**

(57) A method of manufacturing a saw blade having saw teeth comprising a tooth carrier 8 and a carbide tooth 9 on a toothed side of the blade, the method comprising connecting the teeth to the tooth carrier by the introduction of heat e.g. brazing or welding and then removing the tip of the saw blade to a predetermined distance a e.g. 1.7mm from the rear face 9a of the front tooth. After removal there may be a straight leading edge 10 of the saw blade forming an angle gamma with a line 5 through the tips of the teeth of 60 to 100 degrees e.g. 90 degrees. The tip may be removed by mechanical e.g. punching or sawing, or thermal processes. The saw tooth may have after-treatment such as grinding such that an angle(alpha, Figure 2) between the face of the tooth and a line perpendicular to the tooth is 3 degrees and the angle (Beta, Figure 3) between the back of the tooth and the tooth line 5 is 10 degrees and smaller than the angle between the leading edge and the line perpendicular to the tooth line. The method provides a larger carrier volume during the first step to avoid damage to the blade by the heat and better cutting-in of the finished saw blade.

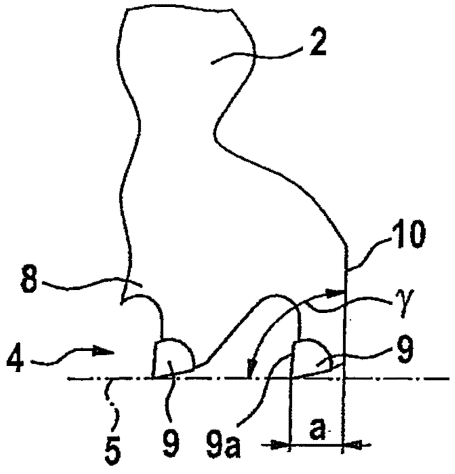

Fig. 4

GB 2503350 A

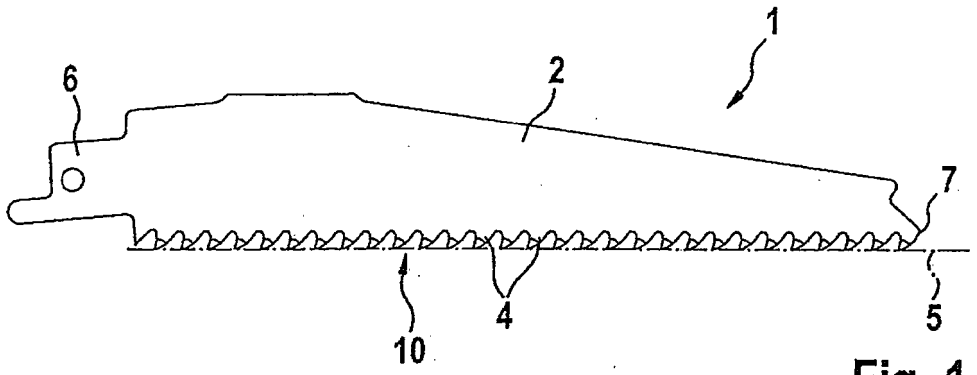

Fig. 1

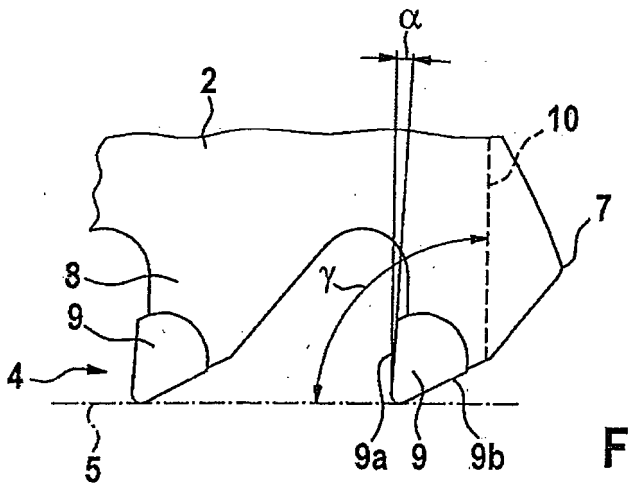

Fig. 2

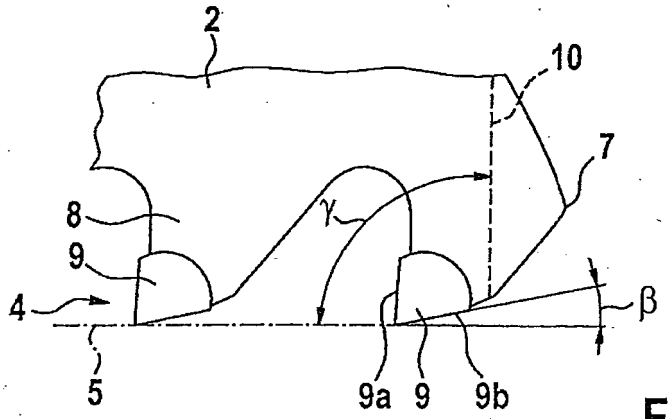

Fig. 3

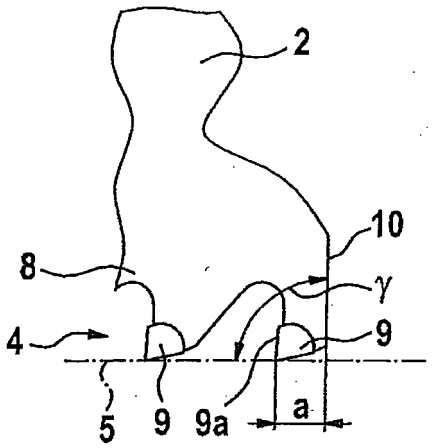

Fig. 4

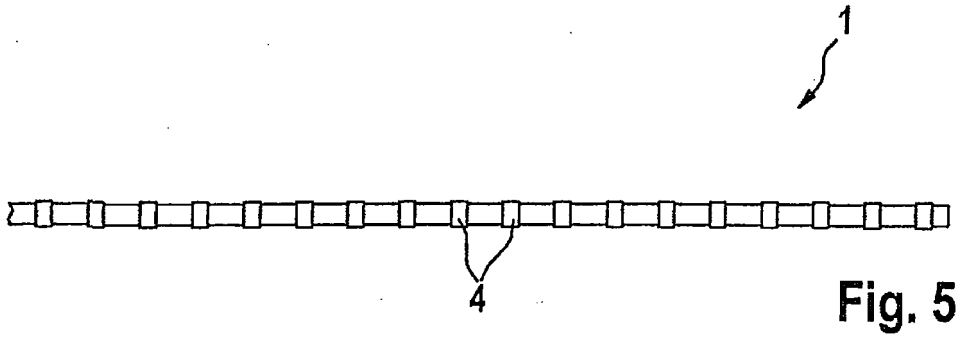

Fig. 5

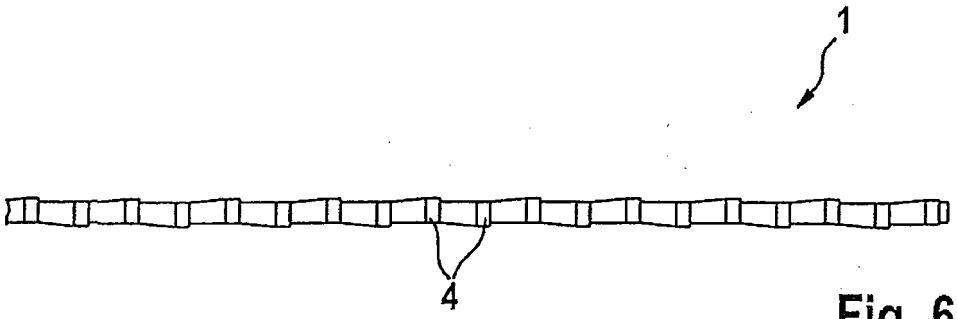

Fig. 6

Description

Title

Method of manufacturing a saw blade

The invention relates to a method of manufacturing a saw blade with saw teeth that consist of carbide, and also to saw blades with saw teeth that consist of carbide.

Prior art

Saw blades, for example compass-saw blades or sabre-saw blades, are known which have a large number of saw teeth which are arranged along a straight or slightly curved toothed side. The saw teeth each consist of a tooth-carrier, which may be constructed in one piece with the saw blade, and also a carbide tooth which is connected to said tooth-carrier by brazing or welding.

When machining materials such as wood, for example, care must be taken to ensure that the saw blades are constructed in such a way that cutting into the material at the start of the sawing operation is possible without any problems.

Disclosure of the invention

The underlying object of the invention is to provide a saw blade which is simple to manufacture and with which it is possible to cut into the material to be machined easily and without any problems.

This object is achieved, according to the invention, by means of the features in Claim 1. The subclaims indicate expedient further developments.

The method according to the invention relates to the manufacture of a saw blade, in particular a straight or at least approximately straight saw blade, with saw teeth which are arranged along a toothed side between a clamping end of the saw blade and a tip of said blade. The saw blade is fastened in a machine tool via the clamping end. The saw blade in question is a compass-saw blade or sabre-saw blade, and the machine tool is preferably a hand-guided machine tool, for example a hack-saw.

The saw teeth on the toothed side extend along a straight line or along only a slight curve, and each consist of a tooth-carrier and a carbide tooth which is connected to said tooth-carrier. The carbide tooth is connected to the tooth-carrier by the introduction of heat, particularly by brazing or welding. The material of the tooth-carrier may differ from that of the carbide tooth. The tooth-carrier may be constructed in one piece with the saw blade, although in principle another possibility is a separate design, for example such that the tooth-carrier is part of a carrier strip which is to be connected to a base member of the saw blade.

In the method according to the invention, the carbide teeth are connected, in a first step, to the tooth-carriers by the introduction of heat. In a subsequent, second step, the tip of the saw blade, which is located at the front, is

removed by suitable mechanical, and optionally also thermal, measures, to a point where the distance between said tip of the saw blade and the face of the foremost saw tooth does not exceed a predetermined limiting value. Said limiting value is preferably at most 2 mm, for example 1.7 mm.

This procedure for manufacturing the saw blade has various advantages. During the introduction of heat in the first step for the purpose of connecting the carbide teeth to the tooth-carrier, a minimum carrier volume of said tooth-carrier is present, which guarantees that no damage to the latter occurs as a result of the introduction of heat. Use may be made of saw blades with a tip which protrudes relatively far forward axially and which has sufficient carrier volume for absorbing the heat used in connecting the foremost carbide tooth to the tooth-carrier.

This ensures that neither the tooth-carrier nor the saw blade is damaged by the introduction of heat.

The subsequent machining of the tip of the saw blade in the second step, and the shortening of the distance from the tip of the saw blade to the face of the front saw tooth - the face of the tooth faces away from the tip of the saw tooth - significantly improve the cutting-in behaviour of the saw blade into the material to be machined. What is achieved as a result of the relatively small distance between the face of that saw tooth which is located furthest forward and the tip of the blade is a relatively narrow design which improves the penetration of the saw

tooth located at the front, without significantly impairing the strength.

The removal of the tip of the saw blade in the second step of the manufacturing process is preferably carried out mechanically, for example by punching or sawing. In this connection, it may be expedient to carry out the removing operation in such a way as to produce a straight leading edge, which is located axially at the front, on the saw blade. In principle, however, leading edges of curved design are also possible.

In the case of a straight leading edge, the angle between said leading edge and the tooth line that runs through the tips of the teeth advantageously lies within an angular range of between 60° and 100°. According to a preferred embodiment, the angle is 90°, so that the straight leading edge extends perpendicularly to the tooth line.

Both the face and the back of the saw tooth may be subjected to after-treatment by grinding, for example in order to set a desired angular orientation. Thus it may be expedient for the angle between the face of the tooth and a line perpendicular to the tooth line to be greater than 0°, for example 3°. The angle between the back of the tooth and the tooth line is, for example, at least 10°, this angle preferably being smaller than the angle between the leading edge and the line perpendicular to the tooth line.

The saw teeth may optionally be set, although non-set saw teeth on the saw blade are optionally also possible.

In another aspect, the invention relates to a saw blade, particularly a saw blade for a machine tool, with saw teeth which are arranged along a toothed side and which each consist of a tooth-carrier and a carbide tooth connected to the latter and are arranged on the toothed side between a clamping end of the saw blade and a tip of the saw blade, wherein the method of manufacturing said saw blade comprises the method according to the invention which has been described above.

Further advantages and expedient embodiments can be inferred from the other claims, the description of the figures and the drawings, in which:

Fig. 1 shows a saw blade for a sabre saw, with saw teeth along a straight toothed side;

Fig. 2 shows the front-end region of the saw blade in an enlarged representation;

Fig. 3 shows the front-end region of a saw blade in another embodiment;

Fig. 4 shows the front-end region of a saw blade in yet another embodiment;

Fig. 5 shows a view from below of a saw blade with non-set saw teeth; and

Fig. 6 shows a view from below of a saw blade with set saw teeth.

In the figures, components which are identical are provided with the same reference symbols.

Represented in Fig. 1 is a saw blade 1 for a hack-saw designed as a sabre saw. The saw blade 1 has a blade-carrier 2 with a large number of saw teeth 4 which are arranged on said blade-carrier 2 along a toothed side 3. The tooth line 5 through the tips of the saw teeth 4 is of straight construction, although slightly curved tooth lines are also possible. Axially, the saw teeth 4 extend between a rear clamping end 6, via which the saw blade is clamped in the machine tool, and the tip 7 of the saw blade which is located at the front.

As can be inferred from Figures 2 to 4, each saw tooth 4 consists of a tooth-carrier 8 and a carbide tooth 9 which is connected to the latter. Said tooth-carrier 8 is preferably designed in one piece with the blade-carrier 2 and forms the base section of the saw tooth 4, the tip of which is formed by the carbide tooth 9. Said carbide tooth 9 is connected to the tooth-carrier 8 by the introduction of heat, in particular by brazing or welding. The blade-carrier 2 and the tooth-carrier 8 preferably consist of a different material from the carbide tooth 9.

The manufacturing process for manufacturing the saw blade 1 comprises two manufacturing steps which succeed one another in terms of time and are carried out with the blade-carrier

2 which already exists, including the tooth-carriers 8, as the starting point. In the first step, these manufacturing steps comprise the attachment of the carbide tooth 9 to the associated tooth-carrier 8 in each case by the introduction of heat and, in a second, subsequent step, the removal of the original tip 7 of the saw blade until a straight leading edge 10, which is represented by a broken line in Figures 2 and 3, is obtained.

This procedure has the advantage that, during the introduction of heat for the purpose of connecting the carbide teeth 9 to the tooth-carrier 8 in the front-end region of the saw blade, a larger carrier volume is available in the region of that region which is located at the front, immediately adjacent to the tip of the saw blade, for the purpose of absorbing heat. After the connection of the carbide teeth 9 to the tooth-carrier 8 has taken place, the tip 7 of the saw blade can be removed in order to reduce the distance *a* (Fig. 4) between the face 9a of the front saw tooth 9 and the leading edge 10 to a defined dimension. In this case, the face 9a of the tooth faces away from the tip of the saw blade or leading edge 10. Because of the small axial extension *a* in the region of the foremost saw tooth 4, cutting-in, at the start of the workpiece-machining operation, into the material with the tip of the saw blade is made easier. This permits better machining of wood, for example.

The tip of the saw blade is designed as a straight leading edge, as is represented by means of a broken line 10 in Figures 2 and 3 and a solid line in Fig. 4. The angle γ

between the leading edge 10 and the tooth line 5 preferably lies within an angular range of between 60° and 100°, in particular at 90°.

The face 9a of the tooth may assume an angle α, in relation to a line perpendicular to the tooth line 5, which is greater than 0° but smaller than 15° and is, for example, 3°, so that the face 9a of the tooth is slightly inclined towards the front leading edge 10. The back 9b of the tooth may, as can be inferred from Fig. 3, assume an angle β of, for example, 10° in relation to the tooth line 5, under which circumstances said angle β opens towards the front leading edge 10 and the back 9b of the tooth lies above the tooth line 5.

According to Fig. 5, the saw teeth 4 on the toothed side are oriented in a straight line and without being set. According to Fig. 6, on the other hand, the saw teeth 4 are set.

Claims

1. Method of manufacturing a saw blade with saw teeth (4) which are arranged along a toothed side (3) and each consist of a tooth-carrier (8) and a carbide tooth (9) connected to said tooth-carrier (8) and which are arranged, on the toothed side (3), between a clamping end (6) of the saw blade (1) and a tip (7) of said saw blade, characterised in that, in a first step, the carbide teeth (9) are connected to the tooth-carrier (8) by the introduction of heat and, in a second step, the tip (7) of the saw blade is removed to a point where the distance (*a*) between that face (9a) of the front saw tooth (4) which faces away from the tip (7) of the saw blade and said tip (7) of the saw blade does not exceed a predetermined limiting value.

2. Method according to Claim 1, characterised in that the distance (*a*) is, at most, 2 mm, in particular 1.7 mm.

3. Method according to Claim 1 or 2, characterised in that the tip (7) of the saw blade is removed in such a way that a straight leading edge (10) is constructed on the saw blade (1) after the removing operation.

4. Method according to Claim 3, characterised in that the angle (γ) between the straight leading edge (10) on the saw blade (1) and the tooth line (5) through the tips of the teeth lies within an angular range of between 60° and 100°.

5. Method according to Claim 4, characterised in that the angle (γ) is 90°.

6. Method according to one of Claims 3 to 5, characterised in that the angle (β) between the back (9b) of the tooth and the tooth line (5) is smaller than the angle between the leading edge (10) and the line perpendicular to the tooth line (5).

7. Method according to one of Claims 1 to 6, characterised in that the saw teeth (4) are machined in such a way that the angle (β) between the back (9b) of the tooth and the tooth line (5) is at least 10°.

8. Method according to one of Claims 1 to 7, characterised in that the saw teeth (4) are machined in such a way that the angle (α) between the face (9a) of the tooth and a line perpendicular to the tooth line (5) is greater than 0°.

9. Method according to one of Claims 1 to 6, characterised in that the saw teeth (4) are set.

10. Method according to one of Claims 1 to 9, characterised in that the saw teeth (4) are ground.

11. Saw blade, particularly a saw blade for a machine tool, with saw teeth (4) which are arranged along a toothed side (3) and each consist of a tooth-carrier (8) and a carbide tooth (9) connected to said tooth-carrier (8) and which are arranged, on the toothed

side (3), between a clamping end (6) of the saw blade (1) and a tip (7) of said saw blade, which saw blade is manufactured by a method according to one of the preceding claims.

12. A method of manufacturing a saw blade as herein described with reference to the accompanying drawings.

13. A saw blade as herein described with reference to the accompanying drawings.

Application No: GB1310616.6 **Examiner:** Sally Vinall

Claims searched: 1-13 **Date of search:** 24 September 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,E	11	WO2013/117352 A1 BOSCH GMBH ROBERT, See Figures and English language abstract
X	11	JP2004130450 A AMADA CO LTD, See whole document
X	11	GB2050938 A ROSS, See whole document

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B23D

The following online and other databases have been used in the preparation of this search report

International Classification:

Subclass	Subgroup	Valid From
B23D	0065/00	01/01/2006
B23D	0061/12	01/01/2006