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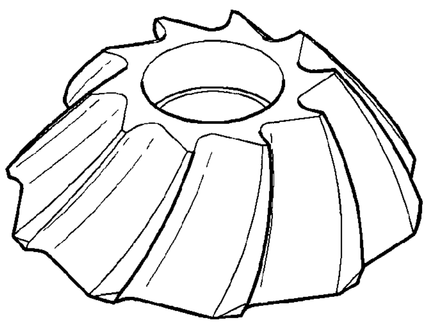
(54) Title: BEVELING CUTTER HAVING HELICAL EDGED BLADES AND DISCHARGE GROOVES

FIG. 1



(57) Abstract: The present invention provides a beveling cutter including: a body with a shaft hole formed through the center; a plurality of 10 cutter blades (20) arranged at predetermined distances on the circumferential surface of the body, each having a radial primary blade (14) with a radial primary relief angle (a) ranging from 5 to 15 degrees and a radial secondary blade (16) with a radial secondary relief angle (b) ranging from 16 to 30 degrees; discharge grooves formed longitudinally between the cutter blades (20) to discharge chips produced in beveling; and a key groove formed at a portion inside the body, in which the helix angle (d) of the cutter blades (20) ranges from 5 to 45 degrees. With the beveling cutter of the present invention, it is possible to smoothly discharge chips produced in beveling and to prevent damage to the cutter blades (20).

WO 2014/007608 A1

2013285686 15 Jun 2017

BEVELING CUTTER HAVING HELICAL EDGED BLADES AND DISCHARGE GROOVES

Technical Field

The present invention relates to a beveling cutter capable of machining a beveled edge on metal using helical shaped cutting blades and discharge grooves which can machine an edge on a metal work piece with more uniformity while eliminating vibration and chattering often experienced when beveling metal with traditional tools.

Background Art

The beveling machines of the related art include a drive unit and a power transmission unit in a main body having the function of a handle with a spindle mounted on a head unit, which spindle is rotated by power from the power transmission unit. The beveling cutter is mounted on the free end of the spindle. A base or guide plate is installed between the spindle and the power transmission unit which serves as a depth guide on one side of the bevel. A cam bearing is attached over the top of the beveling cutter which serves as a depth guide on the opposite side of the bevel.

In beveling machines with such a configuration, the edge of a work piece is aligned with the cutter, the driving unit in the body is driven by an electric or a pneumatic motor, and the driving force rotates the spindle through the power transmission unit. With the rotation of the spindle, the router bit at the free end is rotated and machines a predetermined shape on the work piece.

When the edge of a work piece is machined, however, metal bevelling machines often have a problem when the work piece and the cutter come in contact with each other, the spindle chatters, leaving an imperfect edge and the internal parts of the motor transmission can be damaged from shock due to the chattering.

2013285686 15 Jun 2017

Object of the Invention

It is an object of the present invention to substantially overcome or at least ameliorate one or more of the above disadvantages.

An aspect of the present invention provides a beveling cutter including a body with a shaft hole formed through the center, a plurality of cutter blades arranged at predetermined distances on the circumferential surface of the body, and discharge grooves formed longitudinally between the cutter blades to discharge chips produced in beveling, wherein the cutter blades each have a radial primary blade with a radial primary relief angle ranging from 5 to 15 degrees and a radial secondary blade with a radial secondary relief angle ranging from 16 to 30 degrees, a key groove is formed at a portion inside the body and the helix angle of the cutter blades ranges from 5 to 45 degrees.

As such, it is possible to discharge chips even if long plane chips are produced and to machine an edge uniformly when beveling.

The present invention may provide a bevelling cutter that can machine a metal surface to a uniform shape and finish with uniform roughness when beveling a work piece.

The present invention may also provide a bevelling cutter that can easily discharge chips and scrap originating from the bevelling process without generating flames when discharging.

Additionally, the present invention may also provide a beveling cutter that can prevent damage to cutter blades and reduce load in beveling.

The beveling cutter may include: a body with a shaft hole formed through the center; a plurality of cutter blades arranged at predetermined distances on the circumferential surface of the body, each having a radial primary blade with a radial primary relief angle ranging from 5 to 15 degrees and a radial secondary blade with a radial secondary relief angle ranging from 16 to 30 degrees; discharge grooves formed longitudinally between the cutter blades to discharge chips produced in beveling; and a key groove formed at a portion inside the body.

2013285686 15 Jun 2017

Rake angle portions may be formed at an angle ranging from 10 to 20 degrees on a plurality of the cutter blades of the present invention.

Helical shape cutter blades of the present invention may have a core taper angle ranging from 20 to 30 degrees.

Honed portions may be formed by honing a side of the radial primary blades of the present invention at an angle ranging from 1 to 45 degrees to prevent the cutter blades from breaking or chattering.

Effect of the Invention

With a beveling cutter such as that in an embodiment of the present invention, since the radial primary relief angle and the radial secondary relief angle range from 5 to 15 degrees and from 16 to 30 degrees, respectively, there are advantages in that it is possible to reduce load generated in the beveling of a work piece and to prevent machining interference and chattering by ensuring a sufficient gap between the work piece and the radial primary blades.

Additionally, with a beveling cutter such as that according to an embodiment of the present invention, since the horned portion is formed at a side of the radial primary blade, there is the advantage in that it is possible to prevent the cutter blades from breaking and chattering. Further, since the core taper angle of the beveling cutter ranges from 20 to 30 degrees, there is the advantage in that it is possible to increase the stiffness and lifespan of the beveling cutter.

With a beveling cutter such as that according to an embodiment of the present invention, since rake angle portions are formed in the range of angle of 10 to 20 degrees, there is also the advantage in that it is possible to smoothly discharge chips produced in beveling of a work piece, even without specific cutting grooves.

Brief Description of Drawings

Preferred embodiments of the present invention will now be described, by way of examples only, with reference to the accompanying drawings, wherein:

2013285686 15 Jun 2017

FIG. 1 is a perspective view showing a beveling cutter according to an embodiment of the present invention;

FIG. 2 is a view illustrating radial primary and secondary relief angles of a cutter blade that is a main part of the present invention;

FIG. 3 is a view illustrating the core taper of a cutter blade that is a main part of the present invention;

FIG. 4 is a side view illustrating a helix angle of a cutter blade that is a main part of the present invention;

FIG. 5 is a view showing an example of the use of the beveling cutter of the present invention; and

FIG. 6 are views showing other embodiments of the beveling cutter of the present invention.

Best Mode(s) of Carrying Out the Invention

In the following and in line with the embodiments of the present invention, beveling cutters will be described in detail with reference to the accompanying drawings.

FIG. 1 is a perspective view showing a beveling cutter according to an embodiment of the present invention,

FIG. 2 is a view illustrating radial primary and secondary relief angles of a cutter blade that is a main part of the present invention,

FIG. 3 is a view illustrating a core taper of a cutter blade that is a main part of the present invention, and

FIG. 4 is a side view illustrating a helix angle of a cutter blade that is a main part of the present invention.

Beveling cutter 100 in the form of an embodiment of the present invention, as shown in FIGS. 1 to 4 includes a body 10, a plurality of cutter blades 20 arranged at predetermined distances on the circumferential surface of the body 10, discharge grooves 30 formed longitudinally between the cutter blades 20 to discharge chips produced in beveling, and a key groove 40 formed at a portion inside the body 10.

The body 10 of the beveling cutter 100, as shown in FIG. 1, has a shaft hole 5 formed through the center and ten (10) cutter blades 20 arranged at predetermined distances. The key groove 40 is formed at a portion inside the body 10. Though not shown in the figures, it is possible to simply mount the beveling cutter on an electric or a pneumatic air tool by inserting a cutter fixing key into the key groove 40 and tightening a cutter fixing bolt in a bolt hole formed at the center of a rotary shaft to firmly fix the beveling cutter.

The cutter blades 20 are arranged at predetermined distances on the circumferential surface of the body10, as shown in FIG. 2, each of which has a radial primary blade 14 with a radial primary relief angle (a) ranging from 5 to 15 degrees and a radial secondary blade 16 with a radial secondary relief angle (b) ranging from 16 to 30 degrees. The width of the radial primary blade 14 is 0.6 to 0.7mm and the width of the radial secondary blade 16 is 1.9 to 2.0mm. The helix angle (d) of the cutter blades ranges from 5 to 45 degrees.

The radial primary relief angle (a) is selected to an optimal angle, 5 to 15 degrees, to reduce load generated in the beveling of a work piece. Honed portions 12 are formed by honing a side of the radial primary blades 14 at an angle ranging from 1 to 45 degrees to prevent the cutter blades from breaking or chattering. Although the honed portions 12 may be 0.05 to 0.2mm wide, it is preferable to make them 0.1mm wide.

The radial secondary relief angle (b) is selected to an optimal angle, 16 to 30 degrees, to prevent machining interference and chattering by ensuring a sufficient gap between a work piece 60 and the radial primary blade 14 in beveling.

A round portion 22, which has a radius (r) ranging from 0.1 to 3.0, is formed at the end of the cutter blade 20 to prevent damage to the cutter blade and to keep a worker safe.

As shown in FIG. 2, a rake angle portion may be formed on the cutter blades 20, at an appropriate angle in the range of 10 to 20 degrees for smooth discharge of chips (not shown) produced when machining a work piece, with chips smoothly discharged even without specifically forming a cutting groove (not shown) on the cutter blades. In other words, the discharge of chips is induced by forming a cutting groove at a predetermined portion on cutter blades in the related art, whereas the rake angle portion 25 is formed at an appropriate angle (that is, 10 to 20 degrees) herein so that chips produced in machining (beveling) of work piece 60 are smoothly discharged without flying to the cutter blades or the work piece 60.

The cutter blades 20 have a core taper angle (c) ranging from 20 to 30 degrees, as shown in FIG. 3 in the present invention. The core taper angle (c), an important factor for increasing stiffness and lifespan of the cutter blades 20, is preferably set within the range of angle described above (20 to 30 degrees).

Although the embodiment described above is based on a beveling angle of 30 degrees, the beveling angle may be 37.5 degrees and 45 degrees in other embodiments of the present invention, as shown in FIGS. 6 and 7. Other factors, including the helix angle, the radial primary relief angle (a), and the radial secondary relief angle (b) are almost similar to those in the embodiment described above and thus the detailed description is not provided below.

The description below shows how to mount the beveling cutter of the present invention with the configuration described above on a pneumatic air or an electric tool 50 and to bevel a work piece.

The beveling cutter 100 according to an embodiment of the present invention is mounted, as shown in FIG. 5, by fitting a rotary shaft (not shown) of a pneumatic air or an electric tool 50 into the shaft hole 5 at the center of the body 10, aligning the key groove 40 inside the body 10 with a key groove on the rotary shaft, and inserting a key into the key grooves, and is then fastened by fasteners (the parts [key groove, key, and fasteners] for fastening the beveling cutter on the pneumatic air or the electric tool 50, because the beveling cutter is addressed herein).

With the beveling cutter 100 fastened to the pneumatic air or electric tool as shown 50, as described above, when the beveling cutter 100 is brought in contact with the work piece 60 and then power switch 70 is turned on, a drive unit (not shown) operates and rotates the cutter blades 20 of the beveling cutter 100.

When the cutter blades 20 rotate, beveling on the work piece 60 starts.

Chips (not shown) that are produced by the beveling surfaces of the cutter blades 20 are discharged through the discharge grooves 30 in beveling work piece 60. Further, the cutter blades 20 are generally coated, so that the chips are easily discharged without damaging the surfaces of the cutter blades 20.

Since the cutter blades 20 have the honed portion 12 on a side of the radial primary blade 14, the cutter blades 20 can be prevented from breaking and the surface roughness of work piece 60 can be improved in beveling work piece 60. Further, small particles are sintered in the honed portion 12, so that beveling can be implemented by the cutter blades with very sharp lines even in high-speed rotation while the lifespan of the cutter blades 20 can be considerably increased and high-quality surfaces can be achieved.

Since the radial primary blade 14 has a radial primary relief angle (a) ranging from 5 to 15 degrees, the load generated in beveling can be reduced. Further, since the radial secondary relief angle (b) of the radial secondary blade 16 connected with the radial primary blade 14 ranges from 16 to 30 degrees, a sufficient gap is ensured between work piece 60 and radial primary blade 14 in beveling and thus machining interference and chattering can be prevented.

Industrial Applicability

The beveling cutter of the present invention is available for various types of beveling including paint edge, weld edge, architectural edge, saddle, countersink, interior edge, straight edges and on automated edge machines. The beveling cutter of the present invention is available for all types of metal work including on carbon and stainless steel, on aluminum, iron, on nonferrous and on most exotic metals.

Explanations of Letters or Numerals

12: Honed Portion

20: Cutter Blade

30: Discharge Groove

a: Radial Primary Relief Angle

c: Core Taper Angle

16: Radial Secondary Blade

25: Rake Angle Portion

40: Key Groove

b: Radial Secondary Relief Angle

d. Helical Angle

CLAIMS

1. A beveling cutter including a body with a shaft hole formed through the center, a plurality of cutter blades arranged at predetermined distances on the circumferential surface of the body, and discharge grooves formed longitudinally between the cutter blades to discharge chips produced in beveling, wherein the cutter blades each have a radial primary blade with a radial primary relief angle ranging from 5 to 15 degrees and a radial secondary blade with a radial secondary relief angle ranging from 16 to 30 degrees, a key groove is formed at a portion inside the body and the helix angle of the cutter blades ranges from 5 to 45 degrees.

2. The beveling cutter of claim 1, wherein the width of the radial primary blade ranges from 0.6 to 0.7 mm and the width of the radial secondary blade ranges from 1.9 to 2.0 mm.

3. The beveling cutter according to any one of the preceding claims, wherein a rake angle portion is formed at an angle ranging from 10 to 20 degrees on the cutter blades.

4. The beveling cutter according to any one of the preceding claims, wherein the cutter blades have a core taper angle ranging from 20 to 30 degrees.

5. The beveling cutter according to any one of the preceding claims, wherein honed portions are formed by honing a side of the radial primary blades at an angle ranging from 1 to 45 degrees to prevent the cutter blades from breaking or chattering.

6. The beveling cutter of claim 5, wherein the width of the honed portions ranges from 0.05 to 0.2 mm.

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2013285686 15 Jun 2017

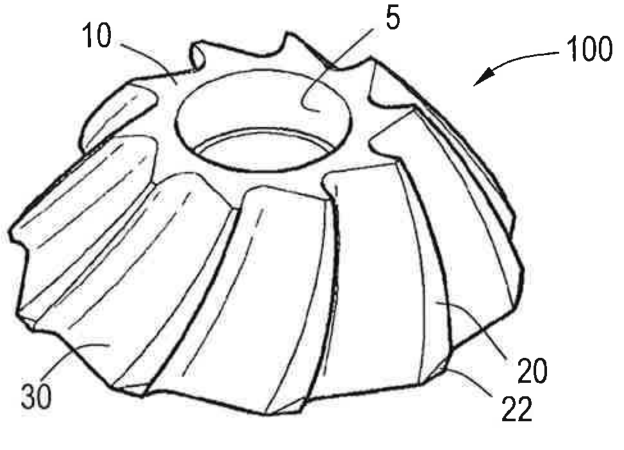

Fig.1

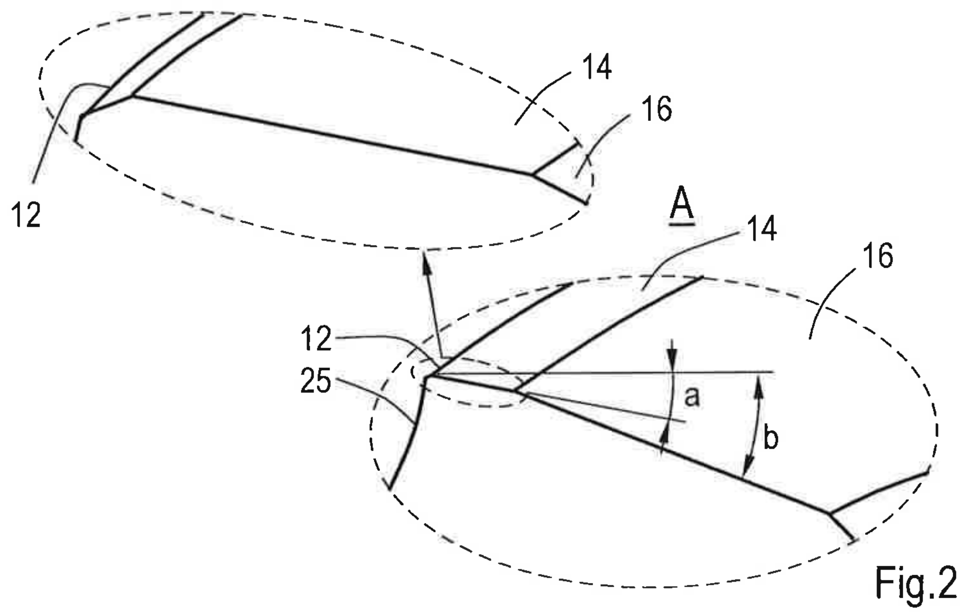

Fig.2

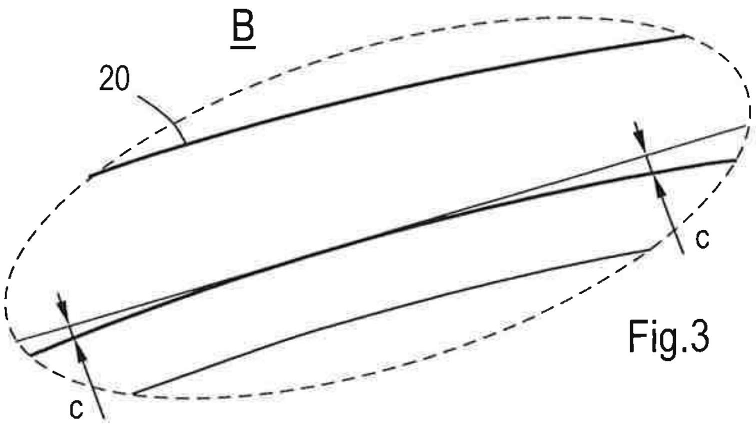

Fig.3

2013285686 15 Jun 2017

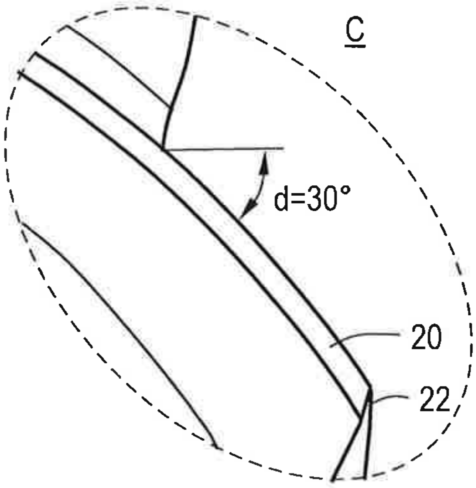

Fig.4

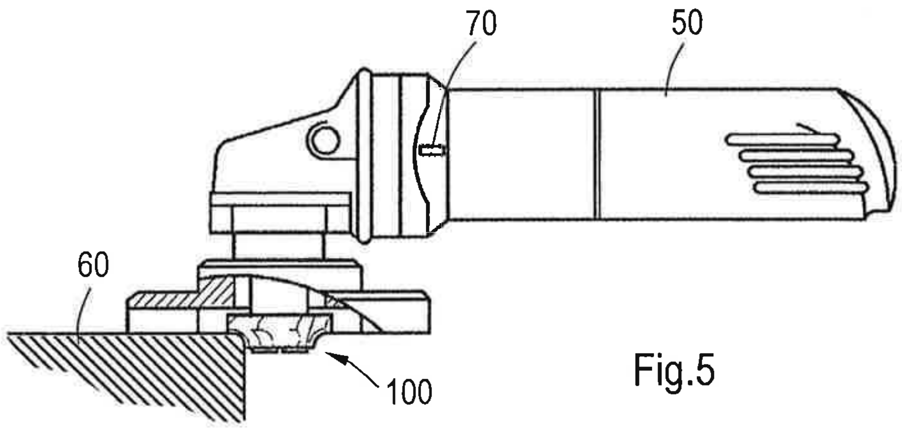

Fig.5

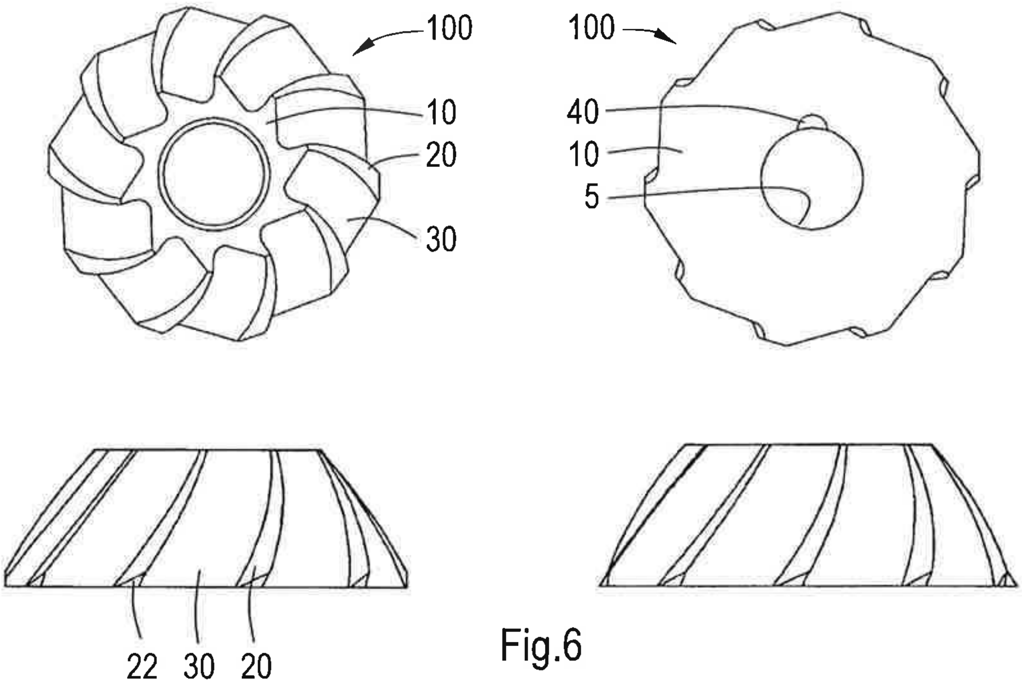

Fig.6