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(54) **Eljárás vágópengék előállítására**

METHOD FOR PRODUCING CUTTING BLADES

The invention relates to a method for producing disposable cutting blades with a profiled cross section for a device for chipping wood.

Furthermore, the invention relates to a disposable cutting blade with a profiled cross section for devices for chipping wood, comprising a base body with in the longitudinal direction at least one dimensionally accurate guide path as well as at least one pressure surface opposite the latter and at least one edge region, spaced from the guide path, with a cutting edge.

For a production of high quality oriented strand boards (OSBs), the quality of the raw material, i.e. the chips, is of particular importance. Furthermore, the occurrence of splinter particles should be kept as low as possible during a chip production. From this follow the main requirements for a chipping of the base material wood, specifically uniformity of the chips as regards the thickness and the length of the latter with straight-line cuts.

A constant thickness of the chips and their surface quality can be achieved during the long-term operation of a chipping device by the edge-retaining quality of the blades.

EP 1920875 A2 discloses a method for producing cutting blades with a profiled cross section for chipping wood in particular, and also a knife for this purpose, wherein the knife is produced dimensionally accurate and comprises a base body of high strength and a cutting region with a high hardness. A production of such a cutting knife is in this connection carried out in two steps, wherein in the first step a base body of high strength is produced and in the second step the cutting regions are hardened, tempered and ground dimensionally accurate.

For a required chip length, scoring knives or scoring blades are used, which score the wooden primary material before it is chipped off, whereby the resultant chips have a desired or an approximately equal length.

In the generally disc-shaped working part of a device for chipping wood, cutting blades and scoring knives or scoring blades are in many cases positioned separately on the turning circle with cutting edges directed perpendicularly to one another.

A chip-producing shredding machine with cutting blades and with scoring blades has become known from DE 10 2005 003066 A1, wherein the cutting blade consists of a blade holder and a blade attachment, acting as a scoring blade, and the blade attachment corresponds in a positive engagement to the blade carrier.

During operation of the above devices a varying wear of the cutting blades and scoring blades can occur, whereby either the chip quality decreases or an expensive replacement of the damaged blades has to be carried out.

For the sake of illustration, wood chips that were separated by perfect blades can be seen in Fig. 3, while the effect of worn scoring blades on the chipping cut can be seen in Fig. 4.

In order to increase the efficiency of the operation of a device for chipping wood, it has already been attempted to provide the scoring blades in the form of an integral component in the chip removal tool.

According to EP 1 358 980 A, it is proposed to optimise the production and re-sharpening of two-dimensionally acting blades for chipping machines and thus the production of chips. These blades have a main cutting edge and at least one separating edge, are formed in one piece, and can be produced without any problem in one piece from commercially available standard blades by grinding.

However, such cutting blades, which are not generally available on the market, have serious disadvantages.

An accurate tensioning of the commercially available standard blades for a production of a cutting blade and an exact clamping of the manufactured or re-sharpened blades in the blade holder can only be achieved with great effort, since the blades are held via

friction by means of a clamping plate, and during rotations of the blade ring impacting forces act on each blade, which can displace the latter. Consequently the chip thicknesses may vary.

Commercially available standard blades are rolled products, the deformation direction of which ultimately corresponds to the main edge direction and can unfavourably affect the edge durability.

Furthermore a grinding of a possibly hardened standard blade is unfavourable, since a grinding removal in the thin cutting region of the blade can produce a material heating that leads to a softening of the blade. This applies in particular to separator blades, which thus possibly have a higher wear after brief use.

The object of the present invention is a method for producing disposable reversible cutting blades of the type mentioned in the introduction, which overcomes the previous disadvantages in the prior art, ensures an improved blade quality, enables a highly economical operation of a device for chipping wood, and allows a high quality of the chips to be achieved with minimal waste

This object is achieved in a generic method, in that in a first step a primary material of hardenable steel or of a hardenable alloy in the soft-annealed state and with a worked surface is heated to a temperature above room temperature but below the transformation temperature Ac_1, that is within the region of the cubic space- centred atomic structure of the material, and is rolled, preferably with an overfilled groove, to form a profile blank with in cross section at least one guide path of exact size in the base body and with an increased thickness of at least one edge region, following which in a second step, optionally after an intermediate storage, a metal-removing working of at least one edge region is performed in the longitudinal direction of the profile blank, provided that a cutting edge and scoring edges aligned perpendicular thereto and spaced therefrom are formed and the cutting edge burr is removed, whereupon in a third step the edge regions of the cutting blade are continuously hardened, optionally with an interposed buffer.

The advantages achieved with the invention are substantially based on the fact that, in the first process step, the preliminary material is virtually cold formed and strengthened to a hardness of at least 30 HRC.

The expression "cold formed" denotes a deformation at a temperature below the Ac_1 point of the alloy.

The profile blank is in this connection provided with mating surfaces, which ensure an exact positioning of the blade.

A rolling with a free spreading, optionally in an overfilled groove, produces a material flow to the edge regions, which has an advantageous effect on an achieved cutting edge quality and scoring edge quality or and durability.

According to the invention a machining operation of the edge regions of the blank is performed by milling. On the one hand during a milling, even with an economically high chip removal, the temperature of the edge is not increased above the rolling temperature of the primary material, so that no change occurs in the deformation structure in the blank, and on the other hand, there is no change in the milling shape over long-term operation, whereby a high precision of the worked surfaces is ensured.

Furthermore, it is important to remove the cutting edge burr in order to create optimal conditions for achieving the best cutting edge quality.

In a hardening after an induction heating with subsequent forced cooling and optionally with an annealing of the hardened structure during the pass of the cutting blade, the hardness penetration depth is to be at least 1.5 mm, but below 2.5 mm, in order to achieve a material hardness in the edge region of at least 58 HRC combined with high toughness, and in the transition to the work hardened part of the blade the toughness increases further and a danger of the blade breaking away under extreme operating conditions is minimised.

The cutting blades are advantageously produced according to the invention in the form of multiple lengths in the three respective steps continuously from the primary material until after a hardening of the blades, and following this a separation into individual blades is performed. This production method ensures a consistently superior level of quality and a high economic efficiency of the blades according to the invention.

Furthermore the object of the invention is to provide a disposable cutting blade for chipping wood, which can be positioned in a custom-fit manner in a device for this purpose, has cutting edges and also scoring edges in a single-piece shape, and has optimal use characteristics with a long service life, in particular with identical wear of the cutting edge and scoring edge profiles.

This object is achieved in that a disposable cutting blade with a profiled cross section comprises a base body with at least one dimensionally accurate guide path in a longitudinal direction as well as at least one pressure surface opposite the latter and at least one edge region, spaced from the guide path, with a cutting edge, wherein scoring edges spaced apart in the longitudinal direction project perpendicularly from the cutting edge with a blade angle β of 8 - 25°, which scoring edges have a wedge angle α of 25 - 33° measured perpendicularly to the free surface of the cutting edge, and the cutting edge regions and scoring edge regions have a hardness of at least 58 to 63 HRC up to a depth of at least 1.5 mm, wherein the cutting blade, the cutting edge and the scoring edges are formed in one piece.

According to a preferred embodiment, it is envisaged according to the invention that the blade shape is produced in a metal-removing manner from a roll-hardened profile blank with a hardness of at least 30 HRC by milling the edge regions. Owing to a material hardness of the base body of greater than 30 HRC a desired stability of the blade is achieved in practical chipping use, wherein a metal removal can be economically performed by milling.

If furthermore the scoring edge in its longitudinal extension is formed perpendicular or lagging to the cutting edge in the direction of the flank, the type of wood to be chipped

or the wood quality can respectively be taken into account for the production of high-grade chips.

For an advantageous chip separation, but also for a decreased cutting load, it can be envisaged that the scoring edge projects away from the cutting edge or is formed projecting from the free surface at a distance of up to 0.8 mm from the cutting edge.

Advantageously, according to the invention the cutting blades are formed from a cold work steel with a composition according to the steel-iron list, number classes 20 to 23, or from a high speed steel according to number class 33, so that by means of a suitable material selection a highly economical use for a chipping operation is possible depending on the wood property.

If advantageously the surface in the cutting region of the cutting blade is at least partially coated, a particularly long service life of the same can be achieved in heavy use. Among others, the CVD and PVD processes are envisaged as coating methods, wherein the surface layers can be formed from pure metal, from carbide, oxide, nitride or mixed forms thereof, of chromium and titanium in particular.

A disposable blade, which represents only one embodiment of the invention, is illustrated in the drawings in Fig. 1, Fig. 2 and is described hereinafter.

The following list of reference numerals will facilitate the allocation of the parts.

1	Disposable cutting blade
2	Base body
21	Guide path
22	Pressure surface
3	Edge region
31	Cutting edges
311	Free surface
32	Scoring edges
α	Wedge angle of the scoring edge
β	Wedge angle of the cutting edge

Fig. 1 shows a cross section of an embodiment of a disposable cutting blade 1 with a base body 2 and two edge regions 3, thus in the form of a reversible cutting blade.

In a first step a base body 2 with a guide path 21 and an opposite pressure surface 22 is formed in the groove for example from a round blank material (not shown) by cold rolling, wherein owing to a material flow as a result of a free spreading of the blank material in the rolling groove edge regions 3 are formed.

In the second step of a production of a disposable cutting blade, a forming of cutting edges 31 with a wedge angle β of 26° to 34° and a shaping of scoring edges 32 projecting away from the free surfaces 311 is carried out by a milling of the edge regions 3 in places.

Fig. 2 shows a plan view of the disposable reversible cutting blade 1 illustrated in cross section in Fig. 1.

Edge regions 3 project away in a transverse direction from the base body 2 with a pressure surface 22, in which edge regions cutting edges 31 are formed. Perpendicular to the cutting edges 31, scoring edges 32 with a wedge angle α of 25° to 33° project from the free surfaces 331. The side faces forming the scoring edge 32 can be configured straight or curved.

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ELJÁRÁS VÁGÓPENGÉK ELŐÁLLÍTÁSÁRA

SZABADALMI IGÉNYPONTOK

1. Eljárás fa forgácsolására szolgáló berendezéshez való profilozott keresztmetszetű eldobható vágópengék (1) előállítására, **azzal jellemezve**, hogy első lépésben kilágyított állapotú edzhető acélból vagy edzhető ötvözetből lévő és megmunkált felületű kiindulási anyagot a szobahőmérséklet fölötti, de az Ac_1 átalakulási hőmérséklet alatti, tehát az anyag térközpontos köbös atomszerkezetű tartományába eső hőmérsékletre felmelegítünk, és az alaptestben (2) legalább egy, keresztmetszetben méretpontos vezetőúttal ellátott és legalább egy élterületen megnövelt vastagságú profilos nyersdarabbá hengerlünk előnyösen túltöltött kaliberrel, majd második lépésben – adott esetben átmeneti tárolás után – legalább egy élterületnek (3) a profilos nyersdarab hosszirányú forgácsoló megmunkálása következik azzal a munkatervvel, hogy alakítsunk ki egy vágóélet (31) és arra merőleges helyzetű, távközre lévő irdalóéleket (32), és fenjük le a vágóélsorját, és ezt követően harmadik lépésben – adott esetben egy puffert közbeiktatva – a vágópenge élterületeit (3) folyamatos módon edzzük.

2. Az 1. igénypont szerinti eljárás, **azzal jellemezve**, hogy profilos nyersdarab kaliberhengerléséhez kiindulási anyagként kerek keresztmetszetű rudat vagy huzalt használunk fel, és hogy annak gyors felmelegítése elektromos indukcióval történik.

3. Az 1. vagy 2. igénypont szerinti eljárás, **azzal jellemezve**, hogy a második lépésben a profilos nyersdarab élterületének (3) marással történő megmunkálása után, amivel kialakítottuk a penge szabad felülettel (311) rendelkező legalább egy vágóélét (31) és attól távközre kiálló irdalóéleit (32), a szabad felülettel átellenes forgácsolófelületi területről szerszámmal, főleg kerámiaszerszámmal lefenjük a marási sorját.

4. Az 1–3. igénypont egyike szerinti eljárás, **azzal jellemezve**, hogy a profilos nyersdarabnak a marómegmunkálás, illetve a második lépés alatti különböző és/vagy szakaszos előtolásába és a vágóélek edzése alatti, illetve a vágópenge előállításának harmadik lépése alatti folyamatos előtolásba beiktatunk egy pufferszerkezetet, ami kiegyenlíti az előtolási különbségeket.

5. Profilozott keresztmetszetű eldobható vágópenge (1) fa forgácsolására szolgáló berendezésekhez, amely vágópenge magában foglal egy alaptestet (2), ami el van látva hosszirányban legalább egy méretpontos vezetőúttal (21), valamint azzal átellenes helyzetű leg-

alább egy nyomófelülettel (22) és legalább egy, a vezetőúttól (21) távközre lévő, vágóéllel (31) rendelkező élterülettel (3), **azzal jellemezve**, hogy a 26°–34°-os ékszöggel (β) rendelkező vágóéltől (31) arra merőlegesen, hosszirányban távközre irdalóélek (32) állnak ki, amik a vágóél (31) szabad felületétől (311) merőlegesen mérve 25°–33°-os ékszöget (α) zárnak be, és a vágóél- és irdalóél-területek legalább 1,5 mm mélységig legalább 58–63 közötti HRC keménységgel rendelkeznek, továbbá a vágópenge (1) a vágóélet (31) és az irdalóéleket (32) egydarabos formában képezi.

6. Az 5. igénypont szerinti vágópenge (1),

azzal jellemezve, hogy a pengeforma hengerlési keménységű, legalább 30 HRC keménységgel rendelkező profilos nyersdarabból az élterületek (3) marásával forgácsolva van előállítva.

7. Az 5. vagy 6. igénypont szerinti vágópenge (1),

azzal jellemezve, hogy az irdalóél (32) a vágóél (31) felé mutató hosszkiterjedésében a szabad felület (311) irányában függőlegesen vagy hátramaradóan van kialakítva.

8. Az 5–7. igénypont egyike szerinti vágópenge,

azzal jellemezve, hogy az irdalóél (32) a vágóéltől (31) áll ki, vagy a vágóéltől (31) legfeljebb 0,8 mm távközre a szabad felületből (311) kiállóan van kialakítva.

9. Az 5–8. igénypont egyike szerinti vágópenge, amely 20–23. számosztályú acél-vas lista szerinti összetételű hidegmunka-acélból vagy 33. számosztály szerinti gyorsforgácsoló acélból van kialakítva.

10. Az 5–9. igénypont egyike szerinti vágópenge,

azzal jellemezve, hogy a pengeanyag vas alapú nem kilágyuló ötvözet, és a vágóterületen a felület legalábbis részben bevonattal van ellátva.

A meghatalmazott:

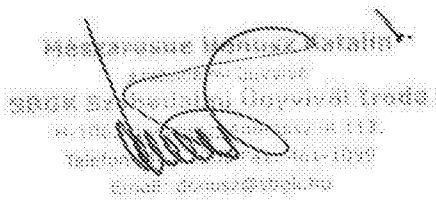

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Fig. 1

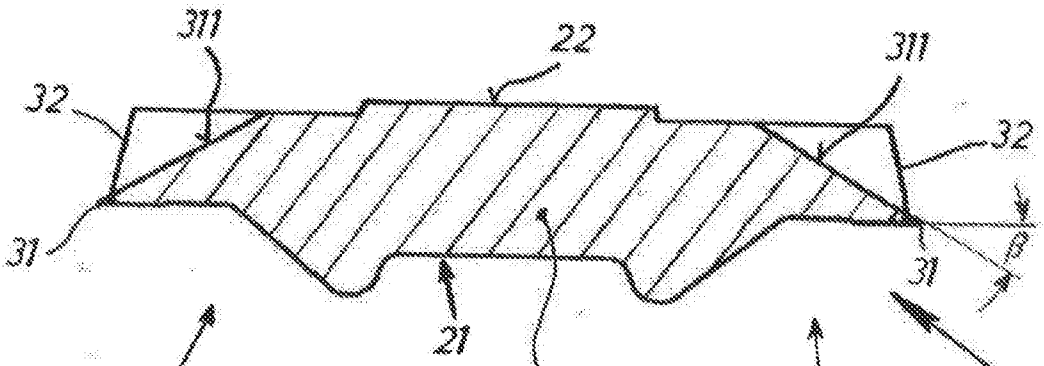
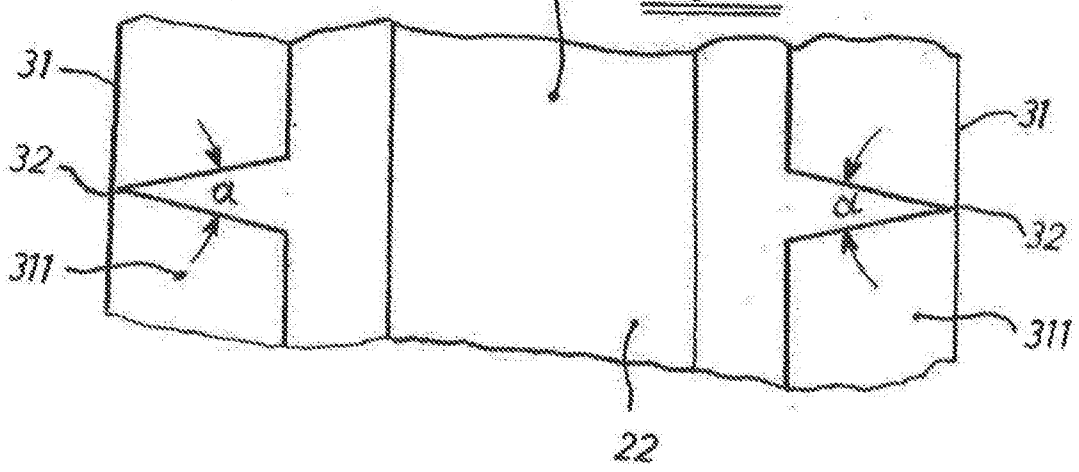


Fig. 2



2/2

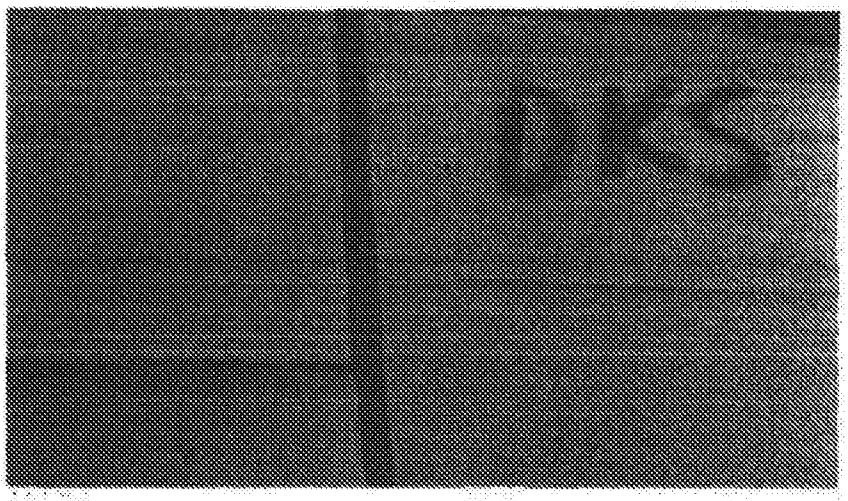


Fig. 3

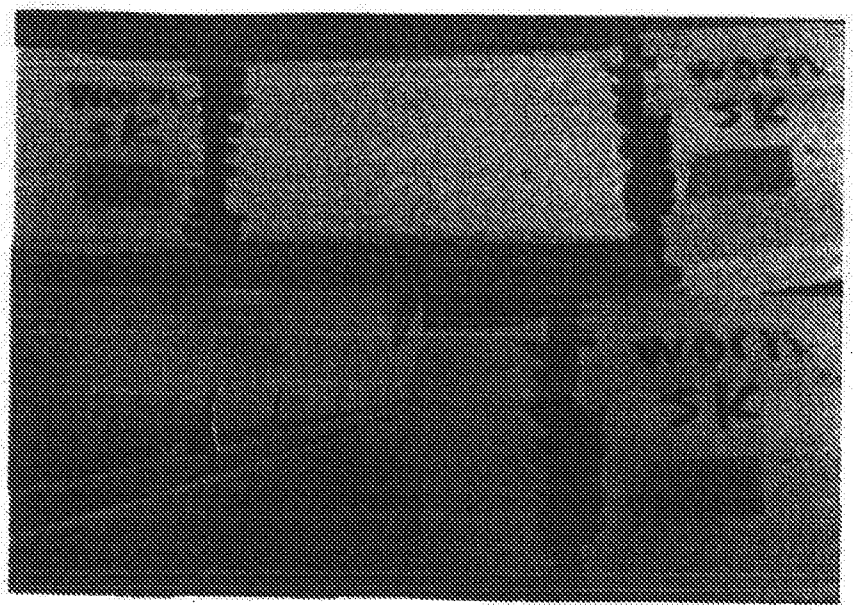


Fig. 4