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(54) CUTTER AND FLY-WHEEL FOR WOOD CHIPPING MACHINES

(57) The present invention relates to a cutter (1) for chipping machines, the cutter (1) comprises a cutting blade (3) comprising at least one cutting edge (31). The cutter further comprises a mounting structure adapted to removably attach the cutting blade (3) to a wood chipping machine, the mounting structure comprising first and second clamping members (5, 7) adapted to clamp the cutting blade (3) therebetween.

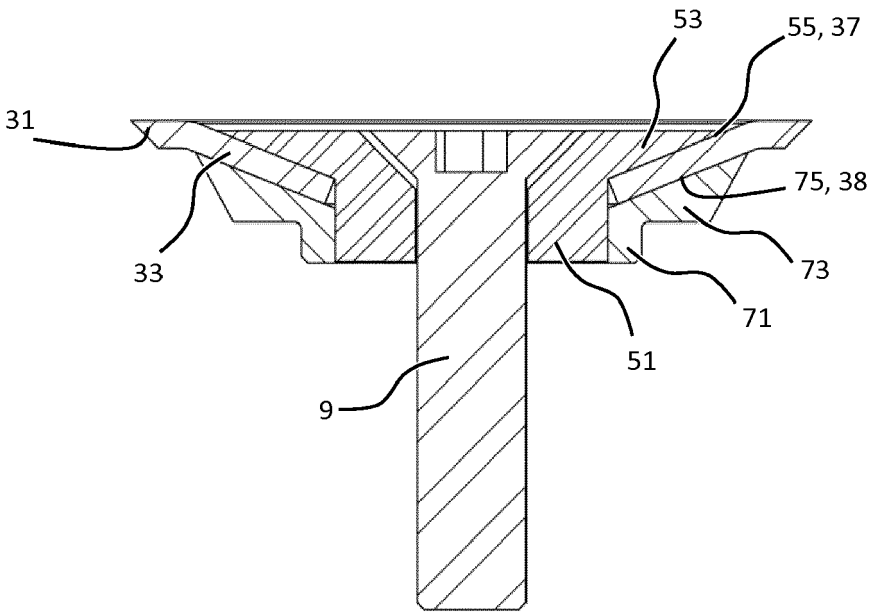

Figure 2

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Description

[0001] The present invention relates to a cutter and fly-wheel for wood chipping machines.

[0002] Wood chippers are used by tree surgeons, contractors and public authorities to clear waste timber and turn it into a particulate material useful for mulching, compost production and possibly, also as a material for making wood-based products such as chipboards.

[0003] Chippers typically include a hopper, a feeding mechanism and the chipper mechanism itself. A tree limb is inserted into the hopper and fed to the chipping machine by the feeding mechanism. The chips exit typically through a chute and can be directed into a truck mounted container or onto the ground.

[0004] The industry standard machine has a feeding mechanism, comprising a roller or rollers provided with teeth to grip the branches, small diameter logs, twigs and the like, and feed the latter through a throat to meet a fly-wheel. The fly-wheel is normally arranged perpendicular to the feeding direction and the wood material meets the fly-wheel generally at a radial position relative to its centre. The fly-wheel is massive, because of the requirement to include a plurality of cutters on one face at a plurality of equidistant radial locations, typically three, each of which has a cutting blade with a cutting edge extending in a substantially radial direction of the fly-wheel. As the fly-wheel spins, the cutting blades chop the wood material into chips, which are then typically pushed through apertures in the fly-wheel and thrown out of the chute via air flow generated by vanes/paddles mounted on the back of the fly-wheel.

[0005] The fly-wheel may rotate at a high speed of the order of hundreds or thousands RPM, and there is considerable noise from the cutter's operation as well as from the driving source. The blade life can be relatively short between each re-sharpening operation or replacement, due to ordinary wear and tear and due to foreign bodies which tend to be fed through the hopper together with the wood material (e.g. stones or grit). In traditional chipping machines comprising straight blades, the chipping machine may run more-or-less continuously for 15 to 30 hours until re-sharpening of the blades is required, and re-sharpening can be limited to a certain number of times.

[0006] In view of the above, new cutters of different sizes and shapes have been developed in the past, exhibiting improved service life and reduced cutting noise. It is, however, a known problem that these cutters are required to fit exactly onto the fly-wheel, and thus have to be manufactured with minimal tolerances. Accordingly, conventional cutters can be difficult and costly in production.

[0007] In view of the above, it is an objective of the present invention to provide a new cutter, which can be produced time and cost effectively. Furthermore, it is an object to provide a cutter that is easy to sharpen even if specialist equipment is not available.

[0008] A solution to the aforementioned problem is provided by the cutter of independent claim 1. Accordingly, the new cutter for wood chipping machines comprises a cutting blade with at least one cutting edge and a mounting structure adapted to removably attach the cutting blade to a wood chipping machine. The mounting structure comprises first and second clamping members adapted to clamp the cutting blade therebetween.

[0009] In contrast to conventionally known cutters, the new cutter is not a one-piece but a modular structure, in which only the cutting blade is a wear part that is required to be rotated/re-sharpened/replaced. The cutting blade merely needs to fit into the clamping mechanism of the mounting structure, and therefore does not need to fit the corresponding fly-wheel. Rather, the first and second clamping members of the mounting structures, which are not wear parts, are formed to fit the fly-wheel and do not need to be replaced during normal operation.

[0010] According to another embodiment, the first clamping member of the mounting structure is adapted to contact a first surface of the cutting blade, wherein the second clamping member is adapted to contact a second surface of the cutting blade, the first surface being arranged opposite the second surface. As will be discussed in more detail below, the first and second surfaces can be top and bottom surfaces of the cutting blade in use. The first and second clamping members are preferably used to arrange the cutting blade substantially parallel to a front surface of the fly-wheel.

[0011] In another embodiment, the first clamping member comprises a central opening adapted to receive a fastening bolt. The central opening of the first clamping member can thus be used to align the cutter with the corresponding mounting openings of the fly-wheel. The fastening screw will usually extend through the mounting structure, the cutting blade the fly-wheel and protrude from the back surface of the fly-wheel, secured to the latter by a nut, for example. To this end, the central opening of the first clamping member may have a counterbore on its first end to receive a corresponding countersunk screw.

[0012] According to another embodiment, the first clamping member comprises a stem portion and a frustro-conical portion protruding radially from the stem portion. The stem portion may be adapted as a bearing surface for the cutting blade and the second clamping member as will be described in more detail below. The frustro-conical portion provides for a clamping surface adapted to engage the aforementioned first or upper surface of the cutting blade.

[0013] In another embodiment, the second clamping member comprises a central opening adapted to receive the stem portion of the first clamping member. Accordingly, the central opening of the second clamping member ensures automatic alignment of the first and second clamping members along a common central axis.

[0014] In another aspect of the present invention, the second clamping member comprises a stem portion adapted to be received in a corresponding cavity of a

wood chipping machine and a potentially frustro-conical portion protruding radially from the stem portion. According to this embodiment, it is sufficient to adapt the stem portion of the second clamping member to the corresponding shape of the fly-wheel, while the shape of the first clamping member and the cutting blade can be constructed freely, that is, substantially independent of the corresponding structures of the fly-wheel.

[0015] The frustro-conical portion of the second clamping member provides a bearing surface for the aforementioned second, lower surface of the cutting blade. If both the first and second clamping members comprise radially protruding frustro-conical or annular portions, then it is preferable to construct all of them in such a way that they extend at a substantially identical angle relative to the central axis of the respective clamping member.

[0016] In another embodiment, the cutting blade is adapted to be received between the frustro-conical portions of the first and second clamping members. As such, the cutting blade may have a base portion of substantially constant thickness, which is adapted to be fixed between the first and second clamping members.

[0017] In another embodiment, the cutting blade is substantially disc shaped. That is the cutting blade may have a substantially circular cutting edge extending around an annular base portion. The cutting blade may further comprise a central opening extending through a central part of the base portion and adapted to receive the stem portion of the first clamping member. Disc shaped cutting blades are particularly efficient and cost effective alternatives to conventional straight cutting devices, offering reduction in costly down time and reduced noise levels. The circular cutting edge of the disc shaped cutting blade may have a fully sharpened circumference, although only about one third of the cutting edge is normally in use at any one time. When this edge becomes worn, the clamping member can be slightly loosened to rotate the cutting blade until a new part of the cutting edge faces the cutting direction of the fly-wheel. Accordingly, the circular cutting blade can be used three times longer than conventional straight blades, without removing the blade, meaning less down time and a longer period between sharpenings.

[0018] Alternatively, it is also feasible to construct the cutting blade in any other suitable shape, such as triangular, rectangular, pentagonal or hexagonal shapes.

[0019] According to another embodiment, the mounting structure further comprises a fastening member adapted to be received in a central opening of the first clamping member. The fastening member may be a fastening screw such as a counterbore screw adapted to extend through a central counterbore of the first clamping member. The fastening screw may either be screwed directly into the fly-wheel or extend through the fly-wheel and be fastened to the fly-wheel by means of a fastening nut.

[0020] In another embodiment, the first and second clamping members are of a first material, which is different from a second material of the cutting blade. In particular, the first and second clamping members may be made from steel while the cutting blade is made from hardened steel. This material choice is based on the fact that only the cutting blade is subject to increased wear during normal use, thus it is sufficient to only construct the cutting blade from the more expensive material, such as hardened steel. The first and second clamping members can be made from any other suitable material that exhibits sufficient tensile strength to withstand the forces created upon impact of the cutting blades on the wood material.

[0021] The present invention further relates to a fly-wheel for chipping machines, the fly-wheel comprising a rotor disc and a plurality of cutters as described hereinbefore, said cutters being removably attached to the rotor disc.

[0022] The present invention further relates to a chipping machine comprising said fly-wheel.

[0023] In the following, an exemplary embodiment of the cutter according to the present invention will be described in detail. The figures show:-

FIGURE 1 is an exploded view of a first embodiment of the cutter according to the present invention;

FIGURE 2 is a cross-section of the cutter according to the first embodiment of Figure 1 in an assembled state;

FIGURE 3a is a side view of the first clamping member according to first embodiment shown in Figure 1;

FIGURE 3b is a cross-section of the second clamping member of the first embodiment shown in Figure 1; and

FIGURE 3c is a side view of the cutting blade of the first embodiment shown in Figure 1.

[0024] As can be derived from Figures 1 and 2, the new cutter for wood chipping machines is a multi-part cutter assembly. The cutter 1 comprises a cutting blade 3. The cutting blade 3 is constructed as a disc shaped cutting blade and has a substantially circular cutting edge 31 extending circumferentially around an annular base portion 33. As will be described in more detail below, the annular blade portion 33 extends at an angle with respect to its central axis D, which corresponds to angles of the clamping members. The cutting blade 3 further comprises a central opening 35 extending through the central part of the base portion 33.

[0025] The cutter 1 further comprises a first clamping member 5. The first clamping member 5, which is better shown in Figure 3a, comprises a generally annular shaped stem portion 51 and a frustro-conical portion 53 projecting radially therefrom. The frustro-conical portion 53 has an inclined side edge, which is constructed as a

contact surface 55 for engaging the base portion 33 of the cutting blade. A central opening 57 extends through the first clamping member 5 along the central axis B of the first clamping member 5. A first end of the central opening 57, at the frustro-conical portion 53 of the first clamping member 5 has a countersunk bore 58, as can be derived from Figure 3a.

[0026] The cutter 1 also comprises a second clamping member 7. The second clamping member 7 comprises a stem portion 71 and a generally frustro-conical or bowl shaped portion 73 protruding radially from the stem portion 71. The bowl shaped portion 73 defines an inclined contact surface, at a top end surface. The contact surface 75 is adapted to engage the base portion 33 of the cutting blade 3 in close contact. The second clamping member 7 further comprises a central opening 77 extending through the stem portion 71.

[0027] The cutter assembly further comprises a fastening member 9, which is depicted as a countersunk pin in Figures 1 and 2. Of course, the fastening member 9 may also be constructed as a fastening screw and is used to secure the cutter to a fly-wheel of the chopping machine.

[0028] With reference to Figure 2, it can be seen that the stem portion 51 of the first clamping member has an outer diameter fitted to the diameter of the central openings 35 and 77 of the cutting blade 3 and the second clamping member 7. Accordingly, the cutting blade 3 and the second clamping member 7 can be aligned with the first clamping member 5 by simply slipping them over the outer diameter of stem portion 51. Once the cutting blade 3 and the second clamping member 7 are slipped over stem portion 51, the body portion 33 of cutting blade 3 is clamped between the first clamping member 5 and the second clamping member 7. In more detail, the first contact surface 55 of the first clamping member 5, engages a first, upper contact surface 37 of the body portion 33, while the contact surface 75 of the second clamping member 7 engages a second, lower contact surface 38 of the body portion 33. To facilitate easy alignment of the contacting surfaces 55, 75, 37, 38, the body portion 33 has a constant thickness. As such, the first contact surface 37 and the second contact surface 38 are inclined at identical angles, which correspond to angles of inclination of the contact surfaces 55 and 75 of the first and second clamping members 5, 7 respectively.

[0029] The angles of inclination, alpha, beta, gamma of the contact surfaces 55, 75, 37 and 38 can be derived from Figures 3a to 3c. All of the contact surfaces 55, 75, 37, 38 have the same inclination and extend at an α, β or γ of 10 to 30, more preferably 20 to 25 degrees with respect to a horizontal axis shown in Figures 3a to 3c. In other words, the contact surfaces 55, 75, 37, 38 are all inclined at the same angle of 60 to 80 degrees, more preferably 65 to 70 degrees with respect to the central axis B, C or D respectively.

[0030] The circular cutting edge 31 of the cutting blade 3 preferably extends at an angle δ of 40 to 50 degrees with respect to the horizontal axis in Figure 3c, and thus also with respect to the central axis D of the cutting blade 3.

[0031] The cutting blade 3, the first clamping member 5 and the second clamping member 7 are produced from steel, preferably steel alloys. Whilst the first and second clamping members 5 and 7 may be produced from any conventional steel, comprising significant tensile strength and impact resistance, such as EN19T, it is preferred to produce the cutting blade 3 from hardened steel, such as 27NNCRB5-2. This is because only the cutting edge 31 comes into contact with the wood material during normal use. The new, thinner cutting blade 3 can be resharpened easily, even without specialist sharpening tools. To this end, the cutting blade 3 can be dismounted from the first and second clamping members 5 and 7 and sharpened with any conventional sharpener. If the entire edge 31 of the cutting blade 3 is worn off and re-sharpening is no longer a possibility, the cutting blade 3 can be replaced, while the mounting structure, consisting of the first and second clamping members 5 and 7, remains intact and does not need changing. The tolerances required for the cutting blade to fit into the mounting structure are significantly easier to manufacture than tolerances required by the stem portion 71 of the second clamping member, which need to fit exactly into corresponding cavities of the fly-wheel (not shown). Accordingly, the new multi-part cutter 1 is significantly more cost effective in production and thus can reduce costs by up to 60%.

Claims

1. A cutter for wood chipping machines, the cutter comprising:

   • a cutting blade comprising at least one cutting edge;
   • a mounting structure adapted to removably attach the cutting blade to a wood chipping machine, the mounting structure comprising first and second clamping members adapted to clamp the cutting blade therebetween.

2. The cutter of claim 1, wherein the first clamping member of the mounting structure is adapted to contact a first surface of the cutting blade, wherein the second clamping member is adapted to contact a second surface of the cutting blade, the first surface being arranged opposite the second surface.

3. The cutter of claim 1 or 2, wherein the first clamping member comprises a central opening adapted to receive a fastening screw.

4. The cutter of any of claims 1 to 3, wherein the first clamping member comprises a stem portion and a frusto-conical portion protruding radially from the

stem portion.

5. The cutter of claim 4, wherein the second clamping member comprises a central opening adapted to receive the stem portion of the first clamping member.

6. The cutter of claim 4 or 5, wherein the cutting blade comprises a central opening adapted to receive the stem portion of the first clamping member.

7. The cutter of any of claims 1 to 6, wherein the second clamping member comprises a stem portion adapted to be received in a corresponding cavity of a wood chipping machine and a substantially frusto-conical portion protruding radially from the stem portion.

8. The cutter of claim 4 in combination with claim 7, wherein the cutting blade is adapted to be received between the frusto-conical portions of the first and second clamping members.

9. The cutter of any of claims 1 to 8, wherein the cutting blade is substantially disc shaped.

10. The cutter of claim 9, wherein the cutting blade comprises a circular cutting edge.

11. The cutter of any of claims 1 to 10, wherein the mounting structure further comprises a fastening member, adapted to be received in a central opening of the first clamping member.

12. The cutter of any of claims 1 to 11, wherein the first and second clamping members are of a first material, which is different from a second material of the cutting blade.

13. The cutter of claim 12, wherein the first and second clamping members are made from steel and/or wherein the cutting blade is made from hardened steel.

14. A flywheel for wood chipping machines, the flywheel comprising a rotor disc and a plurality of cutters according to any of claims 1 to 13, the cutters being removably attached to the rotor disc.

15. A wood chipping machine comprising the flywheel of claim 14.

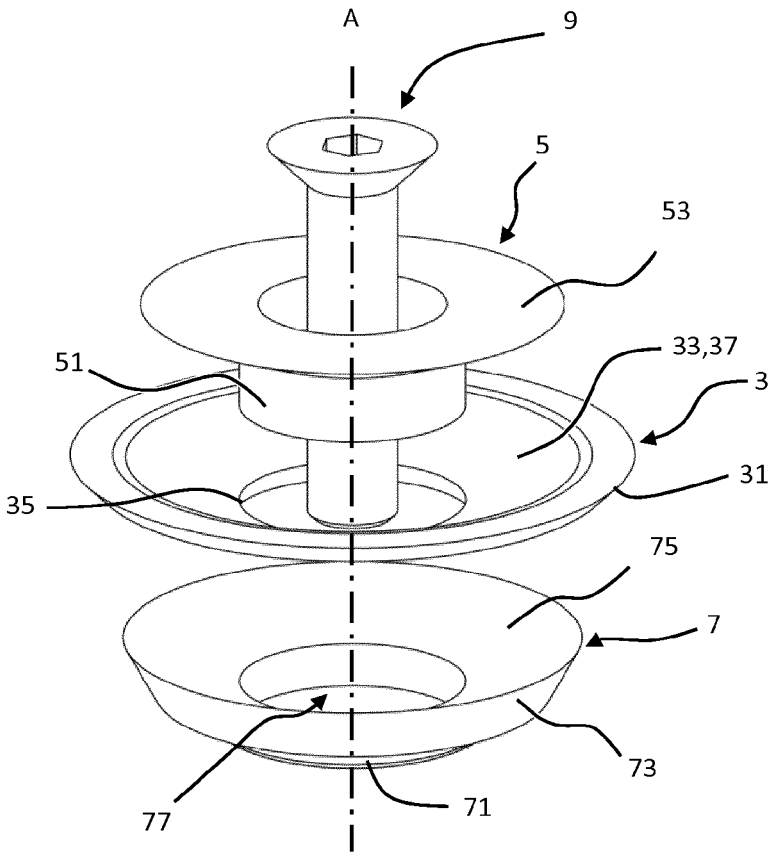

Figure 1

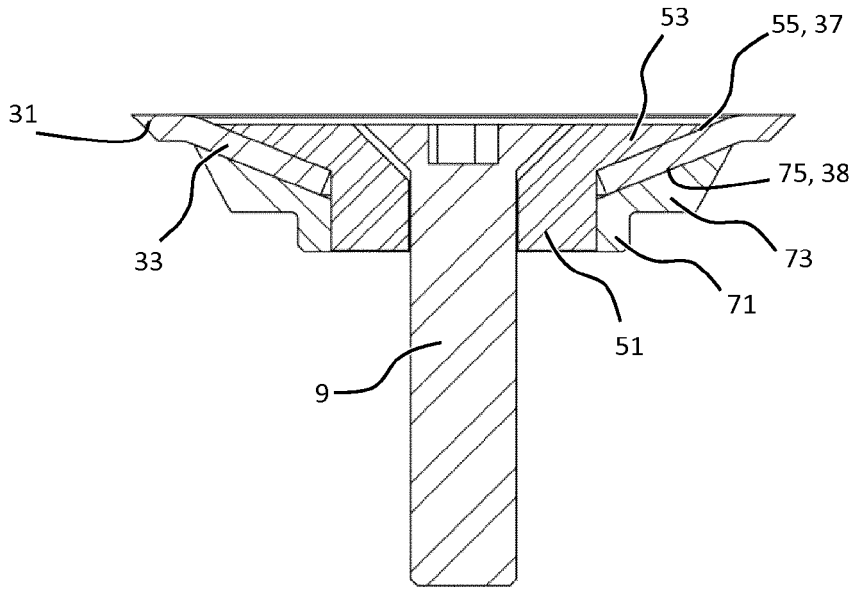

Figure 2

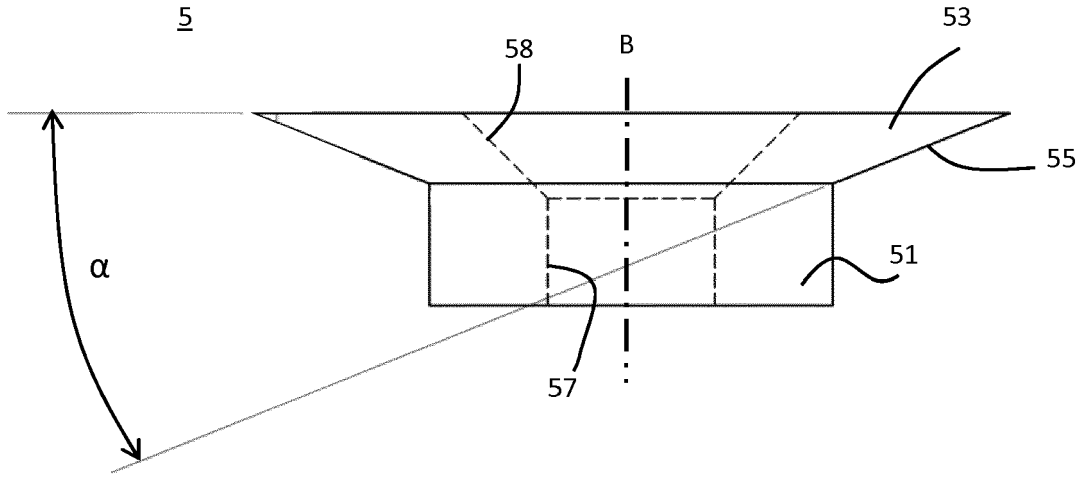

Figure 3a

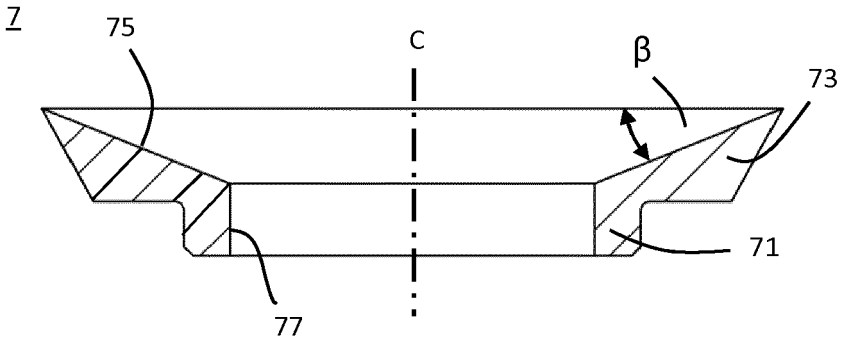

Figure 3b

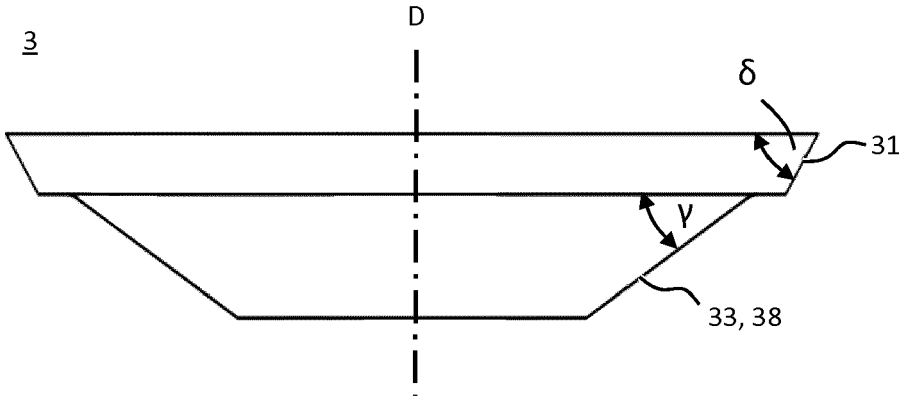

Figure 3c

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 9581

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 4 736 781 A (MOREY NORVAL K [US] ET AL) 12 April 1988 (1988-04-12) * abstract * * column 8, line 10 - line 54 * * figures * -----	1-8, 12-15 9,10	INV. B27L11/00
X	EP 0 807 500 A2 (MAIER ZERKLEINERUNGSTECH GMBH [DE]) 19 November 1997 (1997-11-19) * abstract * * column 1, line 3 - line 10 * * column 1, line 42 - line 46 * * page 2, line 56 - page 3, line 1 * -----	1,11,15	
X Y	US 6 257 511 B1 (TURNER ANTHONY L [GB]) 10 July 2001 (2001-07-10) * abstract * * column 4, line 27 - line 36 * * figure 6 * -----	1,7,8,15 9,10	

TECHNICAL FIELDS SEARCHED (IPC)

B27L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 January 2018	Hamel, Pascal

CATEGORY OF CITED DOCUMENTS

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02-01-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4736781 A	12-04-1988	CA 1304655 C	07-07-1992
		EP 0258007 A2	02-03-1988
		US 4736781 A	12-04-1988
EP 0807500 A2	19-11-1997	AT 194792 T	15-08-2000
		DE 19619345 A1	20-11-1997
		EP 0807500 A2	19-11-1997
US 6257511 B1	10-07-2001	NONE	

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