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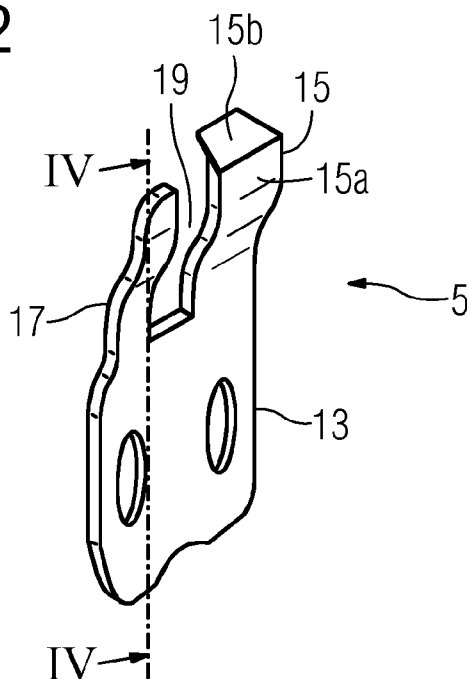
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- (54) Title: CUTTING LINK FOR A SAW CHAIN OF A CHAIN SAW, SAW CHAIN FOR A CHAIN SAW AND CHAIN SAW

FIG 2



(57) Abstract: A cutting link (5) for a saw chain of a chain saw comprises a body portion (13) contacting or engaging a guide bar of the chain saw, a cutter portion (15) protruding outwardly from the body portion (13) and, related to the direction of rotation of the saw chain (1), positioned rearwardly on the body portion (13), and a depth gauge (17) protruding outwardly from the body portion (13) and, related to the direction of rotation of the saw chain (1), positioned forwardly of the cutter portion (15) with lower projection than the cutter portion (15). The cutting link (5) comprises further cutting means (27, 29) arranged at the cutter portion (15) and provided for cutting only fibres (33) or material to be cut, arranged at a level farther away from the guide bar than a top edge (21) of the depth gauge (17), and/or cutting means (27, 29) arranged at a side face or side plate or vertical section (15a) and at a top face or top plate or horizontal section (15b) of the cutter portion (15), and guiding means adapted for maintaining the rotating saw chain (1) within the lateral limitations of a kerf or cutting trench and/or shielding means adapted for shielding the cutting means (29) or portions of the cutter portion (15) arranged at the side face or side plate or vertical section (15a) of the cutter portion (15) at lower distance to the guide bar than a top edge (21) of the depth gauge (17).

Cutting Link for a Saw Chain of a Chain Saw, Saw Chain for a Chain Saw and Chain Saw

The invention relates to the field of a cutting link for a saw
5 chain of chain saw. The invention relates further to a saw chain
for a chain saw comprising a respective cutting link. Still further,
the invention relates to a chain saw comprising a respective
saw chain.

10 Energy consumption of chain saws is influenced by different parameters.
Naturally, cutting activity, namely cutting of the fibres or other material to be cut causes most of the overall energy consumption of the chain saw. In addition, the friction of the individual movable parts against each other comes along with
15 the cutting activity and, beyond that, causes wear.

On the other hand, handheld chain saws are sensitive to weight, since the worker handling the chain saw has to operate this appliance during the workday for any length of time and will be
20 tired out all the more the higher the weight of the saw chain.

It is therefore desirable to reduce the weight of the saw chain. One essential driver of the weight of the chain saw is its energy source which is carried with the handheld equipment. The
25 higher the energy consumption the heavier the energy source for the operation of such appliance. Therefore, it is favourable to reduce the energy consumed by such handheld equipment as chain saws.

30 One parameter which increases the energy consumption caused by the cutting activity unnecessarily is the flexibility and the clearance of the saw chain. When cutting with the chain saw, the saw chain cutting means force a cutting link of the saw chain sideways due to a grinding angle arranged at the cutting link.
35 This drives the cutting means to cut each fibre or any other ma-

terial to be cut more than once by the successive cutting links of the saw chain. Further, this phenomenon widens the cutting trench or kerf. With such unnecessary multiple cutting of fibres more energy is consumed and more wear is incurred compared to
5 ideal cutting.

From US Patent 4,581,968 a saw chain is known which comprises an L-shaped cutting link with a primary cutting edge being on a top plate of the cutting link and a secondary cutting edge that
10 wraps around the corner of the L and at least partially down the side plate of the cutting link. In order to establish a track for the saw chain and to hold the chain in the track a guide portion arranged at a driving link of the saw chain and a depth gauge arranged at the cutting link are close together but sepa-
15 rated at the leading edge and gradually further separate toward the rear to form a shallow V opening between them. Such an arrangement forms a ridge in the kerf thereby causing a some kind of "tracking" of the cutting link in the kerf, however, due to the V-shaped arrangement the saw chain is still exposed to lat-
20 eral instability and has the tendency to tilt because of the force driving the cutting link sideways based on its grinding angle.

It is an object of the present invention to provide a cutting
25 link for a saw chain of a chain saw having cutting properties that lead to particular low energy consumption of the chain saw. A further object of the invention is to design the cutting link of a saw chain so that each fibre or any other material to be cut won't be cut more than once or will be cut at least fewer
30 times than with known or conventional saw chain cutting links.

A cutting link according to the invention comprises a body portion contacting or engaging a guide bar of the chain saw, a cutter portion protruding outwardly from the body portion and, re-
35 lated to the direction of rotation of the saw chain, positioned

rearwardly on the body portion and a depth gauge protruding outwardly from the body portion and, related to the direction of rotation of the saw chain, positioned forwardly of the cutter portion with lower projection than the cutter portion.

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The inventive cutting link further comprises cutting means arranged at the cutter portion and provided for cutting only fibres or material to be cut, arranged at a level farther away from the guide bar than a top edge of the depth gauge. The difference between the levels of cutting means and top edge of the
10 depth gauge defines the cutting depth and, with the cutting means being arranged only within the area of the cutting depth in order to only cut new fibres, namely only such fibres that are arranged above the level of the top edge of the depth gauge
15 (seen from the level of the upper edge of the guide bar), it can be avoided to cut again already cut fibres.

Additionally or alternatively to afore-mentioned cutting means the cutting link according to the invention may further comprise
20 cutting means arranged at a side face or side plate or vertical section of the cutter portion and at a top face or top plate or horizontal section of the cutter portion, and guiding means adapted for maintaining the rotating saw chain within the lateral limitations of a cutting trench or kerf and/or shielding
25 means adapted for shielding the cutting means or portions of the cutter portion arranged at the side face or side plate or vertical section of the cutter portion at lower distance to the guide bar than a top edge of the depth gauge. Such guiding means provide a tracking function for the saw chain within the cutting
30 trench or kerf, thereby acting against the force that moves the cutting link sideways, preventing cutting in a direction or with a component of motion perpendicular to the proper cutting direction. Said shielding means can be designed in a way to protect or shield side cutting means that may be arranged at the cutter
35 portion at a level below the top edge of the depth gauge, thus

preventing cutting activity of such specific side cutting means, which cutting activity would be addressed to already cut fibres. Said shielding means can be also beneficial in such cases where no cutting means are arranged at the level below the top edge of
5 the depth gauge. In this case, an outer side edge of the side face or side plate or vertical section of the cutter portion can be hindered to strike against the side wall of the kerf causing frictional forces due to rough kerf side wall surface.

10 In particular, the cutting means comprise a top and a side cutting edge. The top cutting edge dives into the kerf, thereby causing a continuous driving of the saw chain into the kerf of the lumber, while the side cutting edge functions to cut the wood fibres along the side wall of the kerf. The side cutting
15 edge may be arranged at a side face or side plate or vertical section of the cutter portion only with greater distance to the guide bar than the top edge of the depth gauge.

In order to reduce friction at the kerf side wall having end
20 portions of already cut fibres caused by the movement of the outer edge of the side face, side plate or vertical section not provided with cutting means, said outer edge may be bevelled or rounded. In that, the outer edge can glide more smoothly along the already cut surface of the kerf. Additionally or alterna-
25 tively to the rounded or bevelled outer edge, for the reduction of friction the outer edge or preferably at least the side face, side plate or vertical section of the cutter portion may be surface-treated or surface-coated to increase the anti-friction properties of the cutting link.

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Looking at the alternative or further aspect of the invention where cutting means which are arranged at a side face, side plate or vertical section of the cutter portion at lower distance to the guide bar than a top edge of the depth gauge, these
35 cutting means may be shielded by an outer face of the depth

gauge. Using the depth gauge for the shielding function avoids provision of specific other shielding means. In this case, the depth gauge adopts with the shielding function a second task beside the determination how deep the cutting means will cut.

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A preferred embodiment of the invention provides a specific design of the depth gauge which is not only easily manufacturable but has also a notable effect for guiding the cutting edge to only new fibres. Such embodiment is characterized by a depth gauge protruding outwardly from the body portion of the cutting link with an S- or Z-shaped cross section. Such S- or Z-shape, viewed from front or rear or looked at a vertical cross-section, is composed of a basically vertically arranged lower section, which is mainly part of the body portion of the cutting link, an intermediate range, which is bent off in horizontal or sloped direction with linear or any kind of curved alignment, and a basically upper vertical section, which may be in parallel but offset arrangement to the lower section. In that, also embodiments different from the S- or Z-shape may be possible bearing in mind said offset arrangement of lower and upper sections. With the protruding portion or section, in particular with its outer face, the depth gauge may be supported by or lean on the kerf side wall causing a guidance and tracking function for the saw chain, counteracting against drifting or tilting.

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A particularly further preferred embodiment comprises in addition a cutter portion with a side face or side plate or vertical section similarly or with likewise shaping protruding outwardly from the body portion with an S- or Z-shaped or similar cross section. The shape of the depth gauge may then follow or simulate at least in part the S- or Z-shape (or any similar shape as described above) of the cutter portion. With such flush arrangement of outer faces of the depth gauge and the side face, or side plate or vertical section of the cutter portion, a further increased stabilization of the saw chain with respect to drift-

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ing or tilting disposition is realized. Specifically, the width of the depth gauge is at least approximately the same as that one of the cutter portion, i. e. the width can be identical or the depth gauge can be a little bit thinner or a little bit
5 thicker than the cutter portion.

The depth gauge may be of a flattened design. Alternatively, it may be also bent outwardly from the body portion by turning into an upper segment or section having a non-linear horizontal
10 cross-section. This non-linear cross-section may be arranged at any level above an intermediate range of the depth gauge. In particular, the non-linearity is an S-shape.

The guiding means adapted for maintaining the rotating saw chain
15 within the lateral limitations of a kerf or cutting trench may comprise supporting means arranged at least at the rear of the cutter portion. Such supporting means are aligned with the outer surface of the upper vertical section of the depth gauge and shall support the cutting link against the lateral limitation or
20 side wall of the kerf or cutting trench. Thus, twisting or buckling sideways of the cutting link is avoided or limited to a large extent. Preferably, a side cutting edge of the cutting means is aligned with both the upper vertical section of the depth gauge and with the supporting means. With the depth gauge
25 at the front end and the supporting means at the rear, both of them supporting the cutting link against the lateral limitation or side wall of the kerf or cutting trench, two farthest support locations are defined, so that twisting of the cutting link is reduced in a best possible way.

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The supporting means may be an outer lateral surface of the vertical section of the cutter portion which is completely flush with the outer surface of the upper vertical section of the depth gauge. A preferred embodiment, however, provides support-
35 ing means which comprise a nose or a bulge emerging from the

vertical section of the cutter portion. In addition to that or alternatively, a medium section of the cutter portion arranged ahead of the rear of the cutter portion may comprise at least one indentation or recess at its outer surface. Thereby, the touch area between the cutting link with the lateral limitation or side wall of the kerf or cutting trench, and as a result, frictional force is minimized. The indentation or recess may be manufactured by a grinding process. A more preferred embodiment, however, provides for a cutter portion with at least one indentation or recess which is manufactured during the stamping process, so that no decimation of material thickness is implemented and in order to minimize manufacturing steps.

The cutting link may be one element of a saw chain of a chain saw in any kind of the above-described embodiments.

Preferably, the chain saw has guiding means comprising a second link different from the cutting link, in particular a driving link, having a guide portion or a bumper protruding outwardly from a body portion, said body portion contacting or engaging the guide bar. The guide portion or bumper complementing and cooperating with the depth gauge, thus avoiding tilting of the cutter link. In particular, the outer faces of the guide portion or bumper and of the depth gauge define the width of the kerf for optimized tracking effect for the saw chain. For a smooth sliding of the second link, at least the front edge, related to the direction of rotation of the saw chain, of the outer face of the bumper may be rounded or bevelled.

A further improvement for the tracking effect can be realized with an upper or top edge of the guide portion or bumper which is spaced apart from the guide bar of the chain saw with at least approximately the same distance as the top or upper edge of the depth gauge. In such case, not only a lateral support provides for the beneficial saw chain tracking, but also a sup-

port towards the kerf base by the top or upper edges of both depth gauge and guide portion or bumper, having the same or similar level, prevents the cutter link from tilting or drifting.

5 In order to further enhance the arrangement of the tracking effect for a well-guided cutter link motion, the outer faces of the guide portion or bumper and the depth gauge correspond with the outer edges of the top cutting edge, respectively, so that the newly cut fibre portion is aligned with the kerf orienta-
10 tion.

All of the different above-described embodiments of the saw chain will result in lower energy consumption of the chain saw equipped with such a saw chain for cutting activities due to a
15 higher cutting efficiency. A further advantage will be less wear on the cutting link, in particular its cutting edges. The user can cut more trees or any lumber with the same energy and petrol amount or battery charge can be saved. The saw chain will last longer between consecutive grindings or filings since the wear
20 will get lower and the saw chain will last longer allowing cutting more wood with each saw chain. The time saved due to reduced grinding and refueling or recharging can be spent on cutting wood, allowing the user to cut more wood per time unit. Also, due to lower energy consumption smaller power units can be
25 used with the effect of making the whole handheld appliance less weighty.

The invention will be described more fully hereinafter with reference to the accompanying drawings, in which

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Fig. 1 is a side view of a portion of a saw chain;

Fig. 2 is a perspective view of a cutting link of the saw chain of Fig. 1 in schematic illustration;

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Fig. 3 is a schematic sketch of a prior art cutting link by view from the rear and of its cutting characteristic;

Fig. 4 is a schematic sketch of the cutting link according to the invention by view from the rear and of its cutting characteristic;

Fig. 5 is a schematic sketch of the cutting link of Fig. 4 and a bumper portion of an abutting drive link;

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Fig. 6 is a schematic sketch of the cutting links of Figs. 3 and 4 with indication of impacting force;

Fig. 7a,b top views of two different embodiments (as schematic sketches) of cutting links similar to Fig. 2;

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Fig. 8a,b views from the rear of the embodiments of Fig. 7a,b (as schematic sketches); and

Fig. 9a,b top views of two different embodiments similar to Fig. 7a,b, but with modified cutter portions.

20

A saw chain 1 of a chain saw as it is indicated by a portion thereof with Fig. 1 comprises pairs of side links interconnected by drive links 3. Cutting links 5 are provided being paired with a tie strap side link 7 which couple of cutting link 5 and tie strap side link 7 are arranged alternately with pairs of tie strap side links 7, so that a saw chain 1 is composed of repeating sequences of: drive link 3 - couple of cutting link 5 and tie strap side link 7 - drive link 3 - pair of tie strap side links 7. Furthermore, also the orientation of the cutting link 5 is alternating by left hand cutting links and right hand cutting links which are consistently also alternately arranged on the opposing sides of the saw chain 1. The drive links 3 have drive tangs 9 that are pivotally connected to the side links by rivets

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11. With such an arrangement a concept is provided for driving the saw chain 1 around a guide bar of the chain saw.

Referring now to Fig. 2, a single cutting link 5 is schematically illustrated. The cutting link 5 comprises a body portion 13 that provides the base for a cutter portion 15 and a depth gauge 17. A limited separation forming a slit or gap 19 is provided between the cutter portion 15 and the depth gauge 17. Such cutting link 5 including afore-mentioned elements is formed out of a single strip of metal. As will be described further down in more detail, both the cutter portion 15 and the depth gauge 17 protrude outwardly from the body portion 13 with an S-shaped cross section in a way that, when looked at the cutting link 5 in a front view, i.e. in its driving direction, depth gauge 17 and cutter portion 15 are fully aligned. However, it is also possible to provide only a partial alignment, i. e. the alignment only concerns an area of the cutter portion 15 (and the related area of the depth gauge 17) which comprises a side cutting edge 21.

20

Figs. 3 and 4 illustrate a comparison between a prior art cutting link 5' and a cutting link 5 according to the invention. Consistently to the perspective view of Fig. 2, the cutting link 5 according to the invention of Fig. 4c) (which illustrates a cross-sectional view as indicated in Fig. 2 by "IV - IV") comprises a depth gauge 17 and a cutter portion 15. Since cutter portion 15 and depth gauge 17 are arranged in a fully aligned orientation, the vertical section 15a of the cutter portion 15 is largely hidden by the cross-section of the depth gauge 17. However, since depth gauge 17 is of smaller height than the cutting link 5, only the protruding upper portion of the vertical section 15a of the cutter portion 15 is visible in Fig. 4c), better seen in Fig. 4d) which is an enlarged partial view of the corner region of the cutter portion 15. The vertical section 15a of the cutter portion 15 comprises an upper vertical section 23

and an S-shaped intermediate range 25 which constitutes a passage from the body portion 13 into the upper vertical section 23.

5 The enlarged partial view of Fig. 4d) discloses also in better detail the arrangement of cutting edges 27, 29 at the cutter portion 15. A first cutting edge which is a top cutting edge 27 is arranged at an upper horizontal section 15b of the cutter portion 15. A second cutting edge which is a side cutting edge
10 29 is arranged at the vertical section 15a of the cutter portion 15. Top and side cutting edges 27, 29 abut in the corner region of the cutter portion 15.

Due to the fact that the vertical section 15a of the cutter portion 15 is largely hidden by the depth gauge 17 both in Fig. 4c) and in Fig. 4c), neither of these drawings illustrate the full length of the side cutting edge 29 which extends to the area of crossover into the S-shaped intermediate range 25 of the vertical section 15a of the cutter portion 15.

20

Referring now to Fig. 3 illustrating the prior art cutting link 5', the distinction thereof from the inventive cutting link 5 according to Figs. 2 and 4 is made clear. Fig. 3 has to be understood as a cross-sectional view along the lines of Fig. 2.
25 While prior art cutting link 5' also comprises a cutter portion 15' similarly shaped as that one of the inventive cutting link 5, the depth gauge 17' of Fig. 3 is designed uprightly without any outward protrusion. This design results in a non-alignment of depth gauge 17' and cutter portion 15'. Thus, side cutting
30 edge 29 is visible in Fig. 3.

As illustrated by the schematic sketch of Fig. 6 showing the comparison of inventive and prior art cutting links, the prior art cutting link 5' is impacted by a force F directed sideways
35 which force F results from the (not shown) grinding angle of the

top cutting edge 27. Thus, the prior art cutting link 5' will be forced to move sideways while the cutting link 5 according to the invention will be prevented from moving to the side since being stopped from such movement by the outwardly protruding
5 depth gauge 17 supporting against the cutting trench.

The different cutting characteristics between prior art cutting link 5' and cutting link 5 according to the invention are better illustrated by Figs. 3a), 3b) and 4a), 4b), respectively. Fig.
10 3a) shows a first cutting act followed by a second cutting act pursuant to Fig. 3b). The first cutting act providing a cutting trench as partly indicated by Fig. 3a). Due to twisting saw chain 1 caused by the force F as indicated by Fig. 6, not only new fibres 31 in the direction of sawing as intended will be cut
15 by a twisted cutting link 5' executing said second cutting act, but fibres 33 that have been already cut during the first cutting act will be cut a second time, see dashed lines in Fig. 3b). This repeated cutting of fibres 33 causes increased energy consumption.

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In distinction to above-describe prior art cutting, the cutting process with the cutting link 5 according to the invention avoids repeated cutting of already cut fibres 33. Driven both by shielded lower portion of side cutting edge 29 which due to the
25 shielding cannot cut already cut fibres 33 and by the supporting effect of outwardly protruded depth gauge 17, no twisting of cutting links 5 will occur and the first cutting act according to Fig. 4a) is followed by a second cutting act according to Fig. 4b), cutting new fibres 31 only, see dashed lines in Fig.
30 4b).

Fig. 5 is a cross-sectional view as indicated in Fig. 1 by "V - V" and again shows the cutting link 5 according to Fig. 4c). In addition to this cutting link 5, a cross-sectional view of a
35 drive link 3 is illustrated. This drive link 3 is connected with

the cutting link 5 by a rivet 11 and both links a partially overlapping as can be seen from Fig. 1.

The drive link 3 comprises a bumper 35 as a top portion thereof
5 which bumper 35 is of the same height as the adjacent depth gauge 17 of the cutting link 5. Thus, an additional anti-twist effect is achieved, since both top edges 21,37 of depth gauge 17 and bumper 35 are supported by the bottom of the cutting trench when sliding on it during the cutting process. In addition, both
10 said top edges 21,37 are arranged in such a distance from each other that the outer faces of the bumper 35 and of the depth gauge 17 essentially correspond with the outer edges 27a,27b of the top cutting edge 27. This distance also defines the width of the cutting trench and the outer faces of the bumper 35 and of
15 the depth gauge 17 are also laterally supported by the cutting trench.

With Figs. 7a and 7b (top views) and Figs. 8a and 8b (related rear views) two embodiments of cutting links 5 are illustrated
20 which differ from each other in the design of their depth gauges 17. While the embodiment of Figs. 7b, 8b provides a flat-shape depth gauge 17, manufactured by a mere bending of a flat raw material, the embodiment of Figs. 7a, 8a shows a cutting link 5 with an S-shaped or waved cross-section of the upper vertical
25 section 23 of the depth gauge 17 which turns from a flat intermediate range upwards into the S-shape or wave form which is most distinct at the top edge 21 of the depth gauge 17. The S-shape or wave form is designed such that the rear edge 39 of the depth gauge 17 facing the cutter portion 15 is aligned with the
30 outer face of the cutter portion 15.

With the embodiment of Figs. 7a, 8a further reduction of friction can be realized since the contact area between upper vertical section 23 of the depth gauge 17 and the respective side
35 wall of the kerf or cutting trench is reduced. Naturally, any

other design of the upper vertical section 23 than the described S-shape or wave form may be considered as long as in similar way a reduction of its contact area with the side wall of the kerf or cutting trench will be realized.

5

Figs. 9a,b illustrate further two embodiments which are modified versus the embodiments of Figs. 7a,b in the design of their cutter portion 15. In order to further reduce the dimension of the touch area between the cutting link 5 with the lateral surface
10 or side wall of the kerf or cutting trench, the cutter portion 15 has an indentation 43 in a medium section between the side cutting edge 29 arranged at the front edge of the cutter portion 15 and the rear of the cutter portion 15. With such indentation, directly beginning behind the side cutting edge 29, the rear is
15 shaped or comprises a bulge 41 which is designed to be aligned with the outer surface of the upper vertical section 23 of the depth gauge 17. As can be seen from Figs. 9a,b, the indentation may comprise a long planar portion slightly angled towards a center line of the saw chain and it may then turn into a curved
20 section which subsequently turns into the bulge 41 which is also curved. With the embodiments of Figs. 9a,b, only very small touch areas between cutting link 5 and lateral surface of the kerf or cutting trench are provided, as being indicated by the dashed lines. The embodiment of Fig. 9a illustrates a most opti-
25 mized design with respect to minimized frictional forces, however, already the embodiment of Fig. 9b is a beneficial solution in this respect.

With the design of the embodiments according to Figs. 9a,b also
30 the cutter grinding process later on when the saw chain is in use may comprise additional grinding steps. Due to the slightly angled lateral surface of the cutter portion 15 resulting from the indentation 43, the side cutting edge 29 is gradually moving inwardly and alignment with the outer surface of the depth gauge
35 17 and the bulge 41 is lost. In order to keep this alignment or

flush arrangement, at least one of depth gauge 17 or bulge 41, preferably both of them, is adjusted to the changed position of the side cutting edge 29 by grinding its or their outer surfaces, so that finally flush arrangement is re-established.

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Incidentally, the enlarged illustrations of Figs. 7a and 7b also show the inclination of the top cutting edge 27 causing the force F driving the cutting link 5 sideways while performing its cutting activities.

10

It is to be noted that the invention is not only applicable to the saw chains and their cutting links as generally and particularly described above. E. g., while the specific embodiments as illustrated with the description and figures seem to indicate
15 applicability to square cornered full-chisel cutting links, the invention can be applied also to semi-chisel cutting links.

List of reference numerals

1	saw chain
3	drive link
5 5, 5'	cutting link
7	tie strap side link
9	drive tang
11	rivet
13	body portion
10 15, 15'	cutter portion
15a	vertical section
15b	horizontal section
17, 17'	depth gauge
19	gap
15 21	top edge of depth gauge
23	upper vertical section
25	intermediate range
27	top cutting edge
27a, b	outer edges of top cutting edge
20 29	side cutting edge
31	new fibres
33	already cut fibres
35	bumper
37	upper edge of bumper
25 39	rear edge
41	bulge
43	indentation
F	force

Claims

1. A cutting link for a saw chain of a chain saw comprising
- a body portion (13) contacting or engaging a guide bar
5 of the chain saw,
 - a cutter portion (15) protruding outwardly from the
body portion (13) and, related to the direction of ro-
tation of the saw chain (1), positioned rearwardly on
the body portion (13), and
 - 10 - a depth gauge (17) protruding outwardly from the body
portion (13) and, related to the direction of rotation
of the saw chain (1), positioned forwardly of the cut-
ter portion (15) with lower projection than the cutter
portion (15);
 - 15 the cutting link (5) further comprising
 - cutting means (27, 29) arranged at the cutter portion
(15) and provided for cutting only fibres (33) or mate-
rial to be cut, arranged at a level farther away from
the guide bar than a top edge (21) of the depth gauge
20 (17), and/or
 - cutting means (27, 29) arranged at a side face or side
plate or vertical section (15a) of the cutter portion
(15) and at a top face or top plate or horizontal sec-
tion (15b) of the cutter portion (15), and guiding
25 means adapted for maintaining the rotating saw chain
(1) within the lateral limitations of a kerf or cutting
trench and/or shielding means adapted for shielding the
cutting means (29) or portions of the cutter portion
(15) arranged at the side face or side plate or verti-
30 cal section (15a) of the cutter portion (15) at lower
distance to the guide bar than a top edge (21) of the
depth gauge (17).
2. The cutting link of claim 1, wherein the cutting means com-
35 prise a top (27) and a side (29) cutting edge, the side cut-

ting edge (29) preferably being arranged at a side face or side plate or vertical section (15a) of the cutter portion (15) only with greater distance to the guide bar than a top edge (21) of the depth gauge (17).

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3. The cutting link of claim 2, wherein the section of the side face or side plate or vertical section (15a) of the cutter portion (15) with lower distance to the guide bar than the top edge (21) of the depth gauge (17) comprises a rounded
10 outer edge or is bevelled.

4. The cutting link of any of claims 1 to 3, wherein cutting means (29) arranged at a side face or side plate or vertical section (15a) of the cutter portion (15) at lower distance
15 to the guide bar than a top edge (21) of the depth gauge (17) are shielded by an outer edge or outer face of the depth gauge (17).

5. The cutting link of claim 4, wherein the depth gauge (17) protruding outwardly from the body portion (13) with an S-
20 or Z-shaped cross section.

6. The cutting link of claim 5, wherein the cutter portion (15) comprises a side face or side plate or vertical section
25 (15a) protruding outwardly from the body portion (13) with an S- or Z-shaped cross section, the shape of the depth gauge (17) preferably following or simulating at least in part the S- or Z-shape of the cutter portion (15).

30 7. The cutting link of any of claims 4 to 6, wherein the depth gauge (17) is bent outwardly from the body portion (13) by turning into an upper segment with non-linear horizontal cross-section.

8. The cutting link of any of claims 1 to 7, wherein the guiding means adapted for maintaining the rotating saw chain (1) within the lateral limitation of a kerf or cutting trench comprise supporting means (41) arranged at least at the rear of the cutter portion (15), being aligned with the outer surface of a upper vertical section (23) of the depth gauge (17) and supporting the cutting link (5) against the lateral limitation of the kerf or cutting trench in order to limit twisting or buckling sideways of the cutting link (5), a side cutting edge (29) of the cutting means preferably being aligned with both the upper vertical section (23) of the depth gauge (17) and the supporting means (41).
9. The cutting link of claim 8, wherein the supporting means (41) comprise a nose or bulge (41) emerging from the vertical section (15a) of the cutter portion (15) and/or wherein a medium section arranged ahead of the rear of the cutter portion (15) comprises at its outer surface at least one indentation (43) or recess.
10. A saw chain for a chain saw provided with a cutting link according to any of claims 1 to 9, wherein the guiding means preferably comprise a second link different from the cutting link (5), in particular a drive link (3), having a guide portion or a bumper (35) protruding outwardly from a body portion, said body portion contacting or engaging the guide bar, the outer faces of the guide portion or the bumper (35) and of the depth gauge (17) in particular essentially defining the width of the kerf or cutting trench.
11. The saw chain of claim 10, wherein the front edge, related to the direction of rotation of the saw chain (1), of the outer face of the guide portion or of the bumper (35) is rounded or bevelled.

12. The saw chain of claim 10 or 11, wherein an upper edge (37) of the bumper (35) is spaced apart from the guide bar with at least approximately the same distance as the top edge (21) of the depth gauge (17).
- 5 13. The saw chain of any of claims 10 to 12, wherein the outer faces of the guide portion or the bumper (35) and the depth gauge (17) correspond with the outer edges (27a, 27b) of the top cutting edge (27).
- 10 14. The saw chain of any of claims 1 to 13, wherein the width of the depth gauge (17) is at least approximately the same of the cutter portion (15).
- 15 15. A chain saw provided with a a cutting link (5) according to any of claims 1 to 9 and/or with a saw chain (1) according to any of claims 10 to 14.

FIG 1

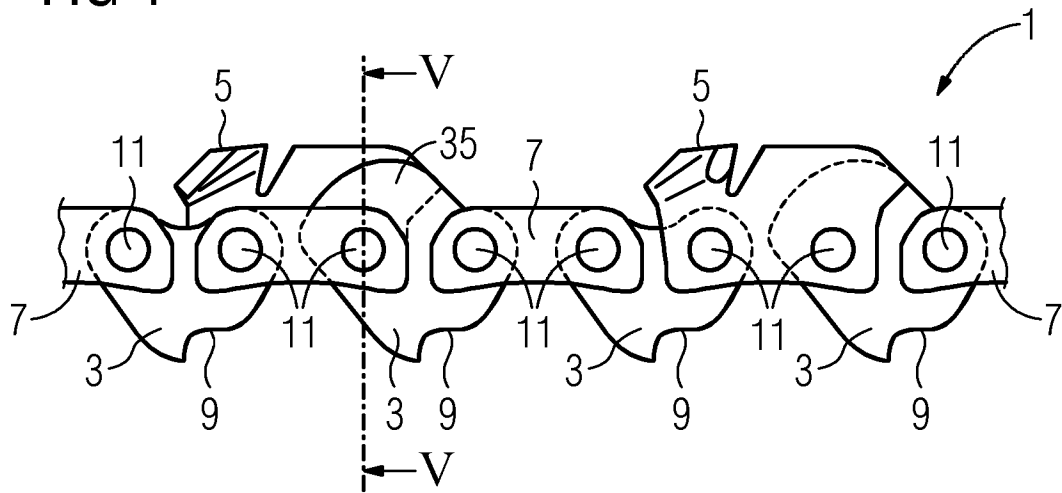


FIG 2

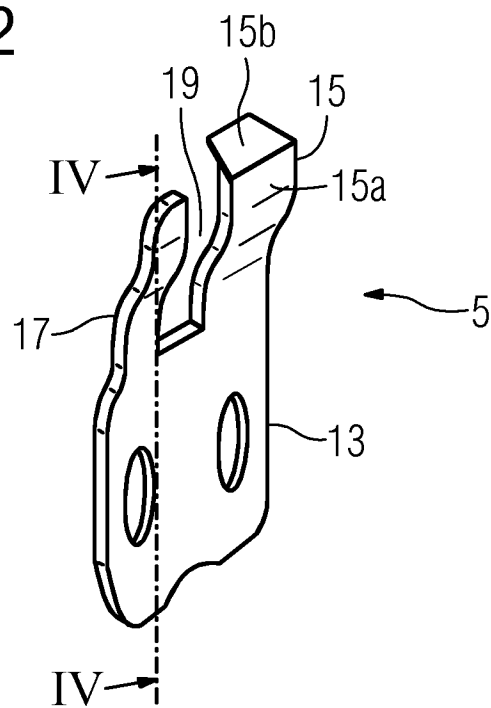


FIG 3a

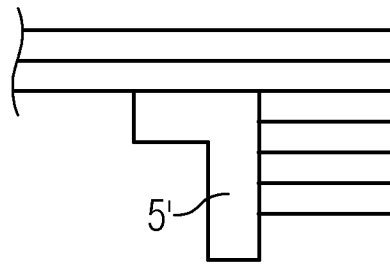


FIG 3b

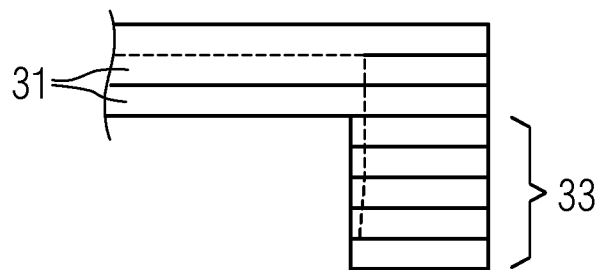


FIG 3c

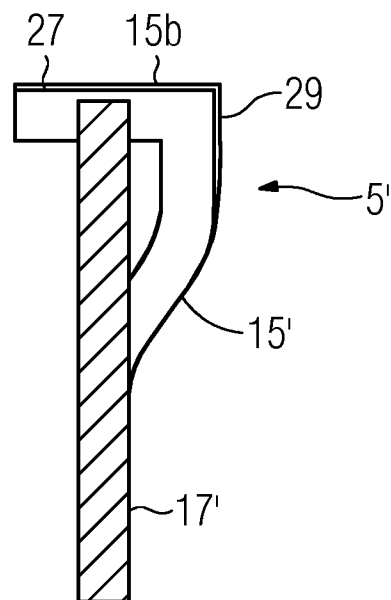


FIG 4a

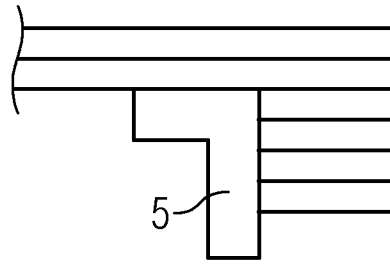


FIG 4b



FIG 4c

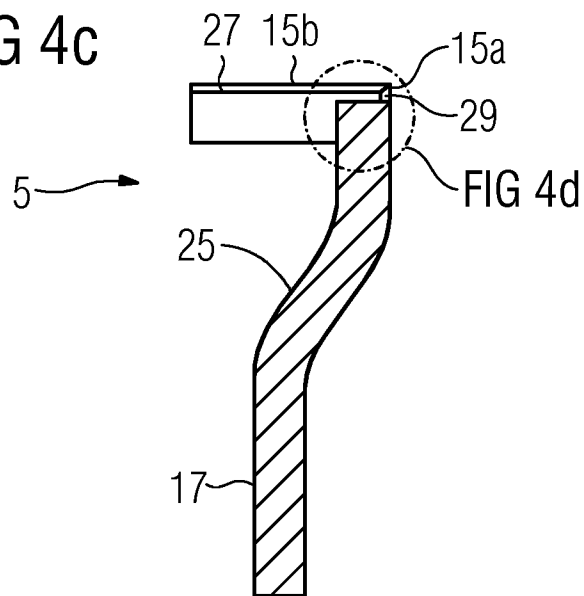


FIG 4d

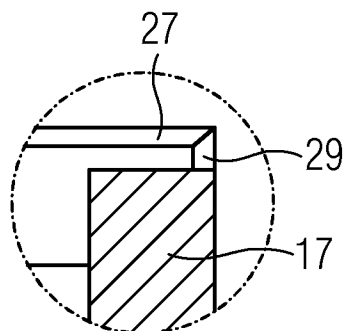


FIG 5

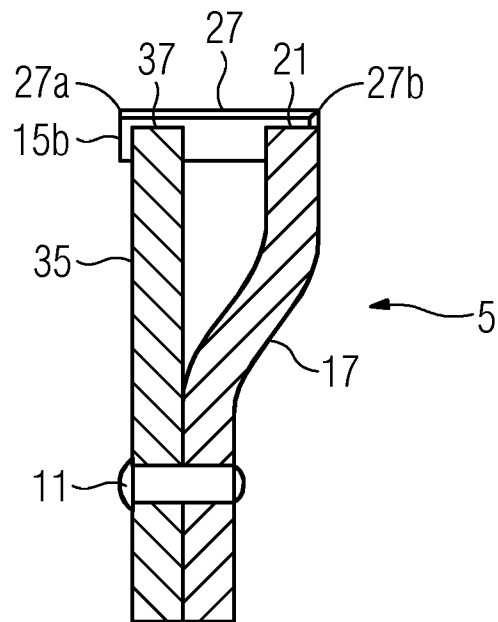


FIG 6

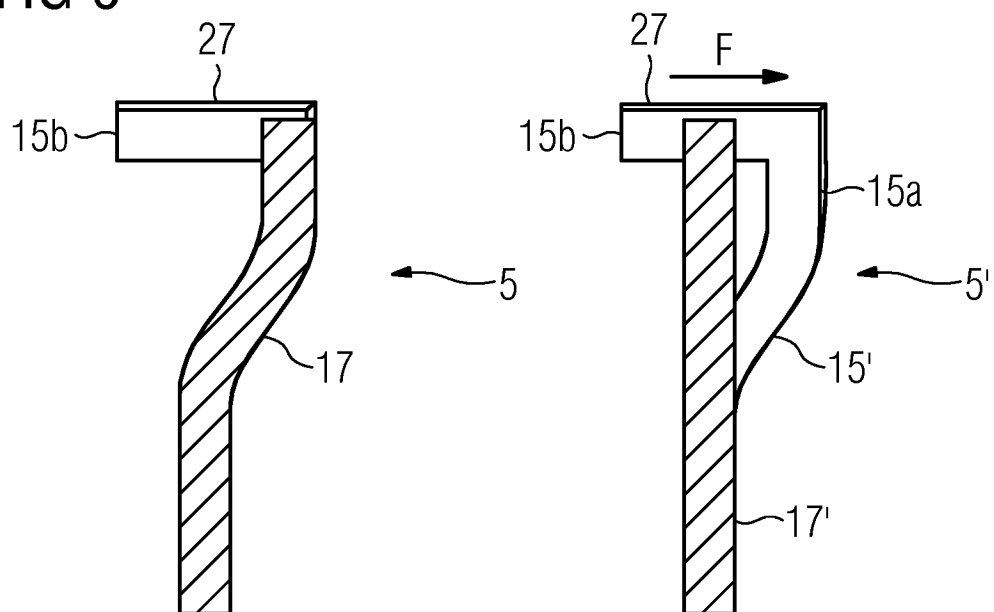


FIG 7a

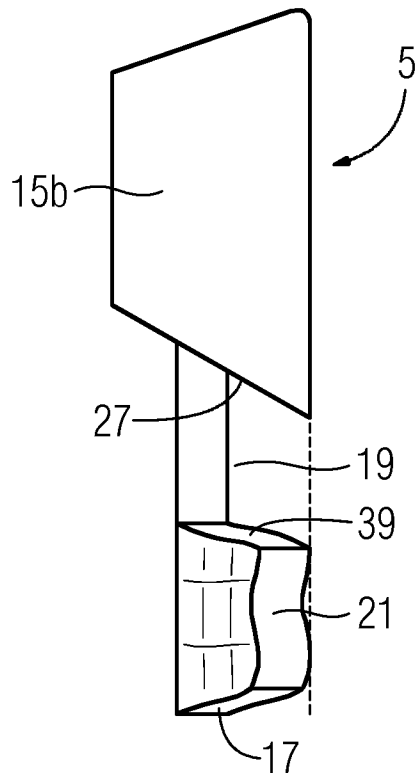


FIG 7b

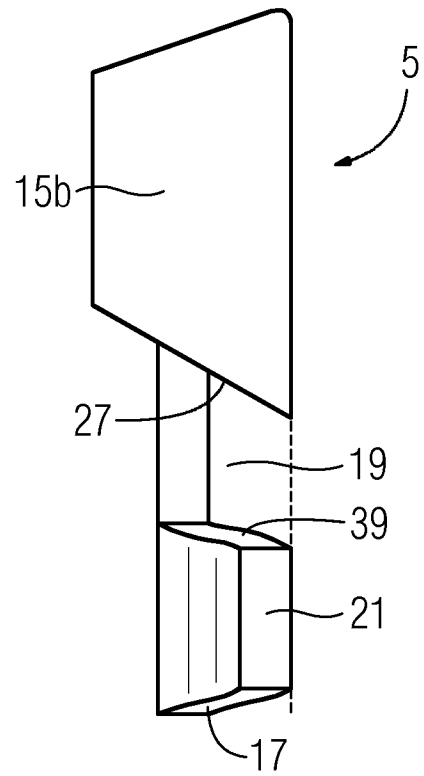


FIG 8a

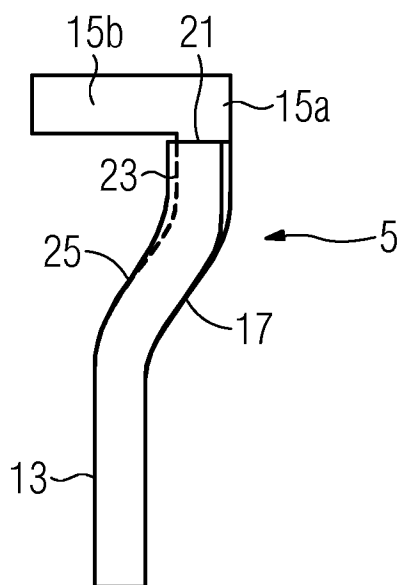


FIG 8b

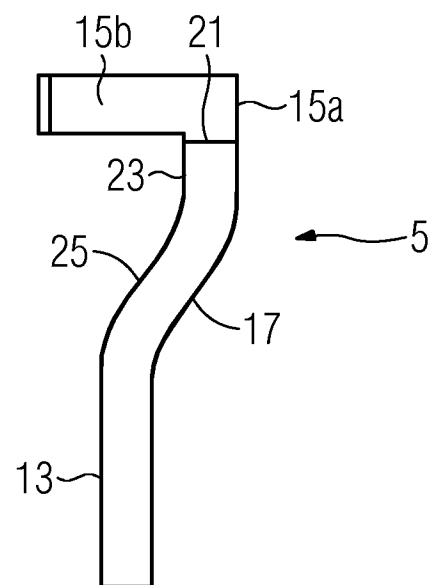


FIG 9a

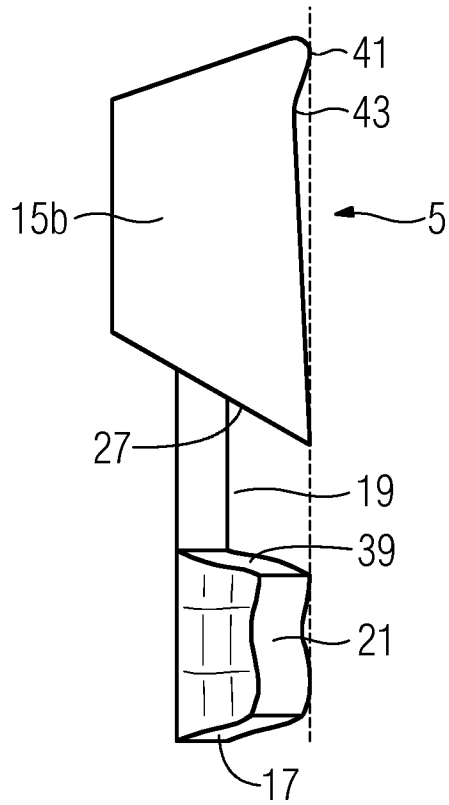
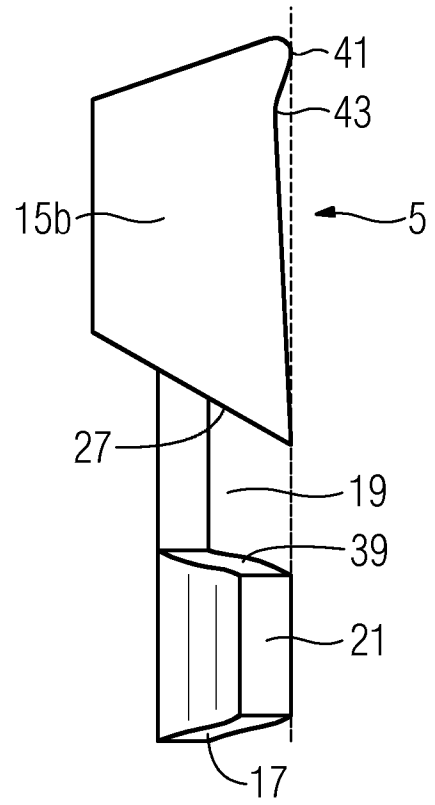


FIG 9b



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/051481

A. CLASSIFICATION OF SUBJECT MATTER
INV. B27B33/14
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B27B B27F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2 658 537 A (ACKLEY RICHARD E) 10 November 1953 (1953-11-10) the whole document in particular: column 3, line 26 - line 56 column 3, line 72 - column 4, line 11 figure 4 -----	1-6,8, 10-15 7,9
X A	US 5 974 933 A (BURROWS JAMES O [US] ET AL) 2 November 1999 (1999-11-02) the whole document in particular: column 6, line 50 - column 7, line 67 figures 4,8-14 ----- -/--	1-8, 10-15 9



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

15 September 2015

Date of mailing of the international search report

23/09/2015

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

Authorized officer

Rijks, Mark

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/051481

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	the whole document	7,9
A	----- EP 0 865 886 A2 (BLOUNT INC [US]) 23 September 1998 (1998-09-23) column 6, line 25 - line 30 column 11, line 1 - column 12, line 14 figures 3,9-12 -----	7

INTERNATIONAL SEARCH REPORT

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International application No

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