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(54) **Title**: IMPROVEMENTS IN OR RELATING TO A SAW BLADE

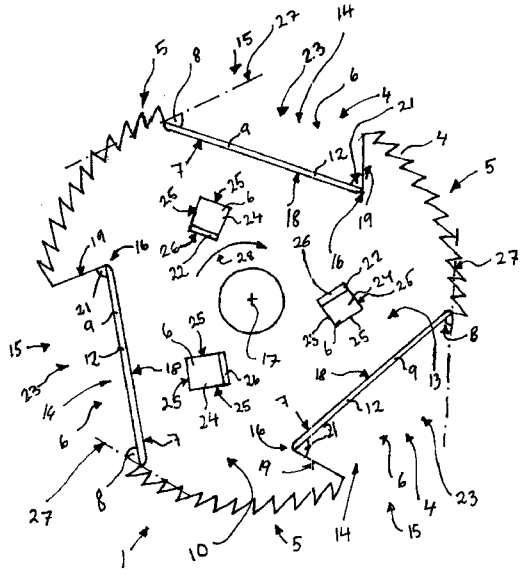

Fig. 1

(57) **Abstract**: The present invention relates to an arrangement for an essentially circular saw blade (1), which has saw teeth (5) and is designed to be used for timber cutting in conjunction with the felling of trees (2) and the removal of vegetation (3) around the tree (2), said saw blade (1) has notch formations (6), at least two of which are angled notches (23,) which are arranged along the periphery (4) at a certain distance from each other and each having its opening (15) where there are no saw teeth (5), said notches together occupy correspondingly at least 30% of the circumference/periphery of the saw blade (1), wherein each angled recess (23) has an angled side (7), angled into the saw blade (1) from the periphery (4), at a maximum angle (8) of approximately 70° from the tangent (27) of the saw blade (1), angled towards the vegetation (3) when the saw blade (1) rotates in a direction of rotation (28), said angled side (7) has at least one edge (9).

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Improvements in or relating to a saw blade

The present invention relates to an arrangement for a circular saw blade, which is used in timber cutting in conjunction with felling of trees and the removal of vegetation around the tree. According to the invention the saw blade has saw teeth and angled notches on its periphery along its circumference. The angled notch has an angled side, which extends radially into the saw blade from the periphery at an angle from the tangent of the saw blade, which is angled towards the vegetation when the saw blade rotates. The angled side has an edge, which cuts the vegetation and the saw teeth saw down the tree in the same saw blade.

In designs of the type in question currently on the market, saw blades are now used which have saw teeth extending along their entire circumference. In timber cutting these saw blades cannot be used for clearing vegetation surrounding trees because this vegetation becomes stuck in the saw teeth and the vegetation is not cut at the same time as the felling of trees, when the saw blade becomes jammed in its saw cut in the tree with surrounding grass and twigs. Special blades are therefore used to remove the vegetation before the cutting of trees. This takes time and costs money, as well as destroying the saw blades, which must be frequently changed and ground. According to document DE 3327895, a saw blade is shown the main purpose of which is to reduce the number of saw tooth grinding operations by ensuring that they are turned in two directions so that they rotate in two directions. The saw blade is not circular and has four large saw teeth which move outside the diameter of the saw blade which is used to cut vegetation. These large saw teeth are not angled obliquely but face in a straight line radially towards the vegetation, which means that vegetation is cut down, bends and is then caused to move into the saw cut of the saw blade. When timber is being sawn, the large saw teeth which project some distance from the diameter of the saw teeth first strike the outer surface of the tree with a considerable force at the beginning of sawing, during which the blade can easily break, skews or stops rotating. The saw teeth cannot operate effectively during sawing if they do not actually reach the tree wood because they operate with a shorter radius than the large

saw teeth. This means that sly and vegetation can only be cut with this saw blade with limited success.

One object of the present invention is to solve the disadvantages associated with the above-mentioned designs by arranging the saw teeth along the periphery of a circular saw which has angled notches, each of which has an angled side with an edge, which faces the vegetation for cutting this around the trees and leaves space for the saw teeth to fell the trees.

Thanks to the invention a saw blade has now been provided for cutting timber, which can also be used to remove shrubs, growth preventing shrubbery, grass and other vegetation around the trees whilst the trees are being felled, e.g. with a forestry machine with a cutting unit, including the saw blade, or a motor-driven manual implement. According to the invention this is done with a reduced jamming force against the saw blade and hence also with reduced friction, which also reduces the cutting time and energy consumption. According to the invention the saw blade has a number of notches, at least two of which are angled and arranged along the periphery of the saw blade at a certain distance from each other. The angled notches have an opening in the periphery where there are no saw teeth. The angled notches together occupy at least 30% of the circumference of the saw blade along a radius extending to the saw teeth. Each of the angled notches have an angled side which is essentially straight and extends radially into the saw blade from the periphery at a maximum angle of 70°, angled from a line constituting the tangent of the saw blade or equivalent 30° from the radius connecting to the tangent. The angled side has an edge which faces the vegetation when the saw blade rotates in a direction of rotation towards the vegetation in order to cut it off at an oblique angle relative to the vegetation and discharge it from the saw blade very close to the tree during felling. In a preferred embodiment the edge is forward ground as a cutting edge from the underside of the saw blade, which is the side facing downwards during sawing, to its upper side, at an oblique angle of approach, in order to form the edge on the upper side, which extends from the periphery angled radially into the saw blade over a length which corresponds, at the maximum, to the length

of the angled side. The edge then forms a cutting edge which, when the tree is sawn, slices into the cutting surface of the tree, which faces upwards. This creates a space between the saw blade and the cutting surface, which reduces the friction between them, enabling the saw blade to rotate more easily. The oblique angle of approach on the cutting edge causes the saw blade to act as a fan for blowing away the vegetation and dirt, sand and soil from the tree and the cutting surfaces down towards the ground. The angled notches are V-shaped and extend radially into the saw blade in a maximum of one section to the tip of the V, which corresponds to approximately half the radius of the saw blade, viewed towards the lateral surface of the saw blade. The V-shaped notches are arranged with the opening in the V located in the periphery, whilst the tip of the V faces towards the centre of the saw blade. One leg of the V then constitutes the angled side, which is at least twice as long as the other leg of the V, which has an ungrounded edge along essentially its entire length. This provides a long cutting edge which is angled so that the vegetation is cut off at an oblique angle without being trapped in the saw blade.

The method of using the saw blade starts in a step 1 when the saw blade clears vegetation with the cutting edges facing the vegetation around a first tree. The saw blade is then controlled from a forestry machine or a motor-driven manual implement which removes the vegetation from the tree. This is then followed, in a step 2, by the felling of a first tree, which starts, when the saw teeth first begins to saw on the surface of the tree, whereupon, in a step 3, the cutting edges, during further sawing, also begin to slice into the cutting surface, which faces upwards across the longitudinal direction of the tree to create greater space for continued sawing with the saw blade. This means that the saw blade rotates more easily with less friction, even if a little vegetation should become trapped in the saw cut, whereupon the sawing continues and the tree is felled in a step 4, after which the timber felling progresses tree by tree.

The most significant advantages of the invention are therefore the fact that clearing of vegetation and sawing of trees are carried out with the same saw

blade and forestry implement. The cutting edges in the saw blade are angled towards the vegetation and therefore cut this off and remove it from the tree. The angled cutting edge also reduces the friction with the cutting surfaces and therefore also reduces the vibrations and noise emitted from the saw blade, which then saws more efficiently without jamming, heating or become damaged. This saves work time and saw blades and reduces injuries. The saw blade also saws more quickly and efficiently with lower energy consumption in tree trunks than the traditional saw blades, which are unable to clear the vegetation.

The description is described in more detail below by help of a preferred embodiment example with reference to the drawings enclosed, where

Fig. 1 shows a side view of a saw blade viewed towards its lateral surface from below,

Fig. 2 shows a part of a timber felling site, where felling is taking place, and

Fig. 3 shows a vertical section through a part of the saw blade, which has sawn a small distance into the trunk of a tree.

As can be seen in Figures 1-3, a saw blade 1 is shown here which has saw teeth 5 in three locations and three notch formations 6 in the form of angled notches 23, which are arranged on periphery 4 of the saw blade 1. Each angled notch 23 has an opening 15 on the periphery 4 where vegetation is to penetrate during the rotation of the saw blade 1. Each angled notch 23 also has an angled side 7, which extends into the saw blade 1 from the periphery 4 at an angle 8 of approx. 45°, viewed from tangent 27 of the saw blade 1, angled toward vegetation 3, when saw blade 1 rotates in a direction of rotation 28. The angled side 7 has an edge 9, which is ground as a cutting edge 12 from the underside 10 of the saw blade 1 to its upper side 11 at an oblique angle of working constituting the edge 9 on the upper side 11 in the form of said cutting edge 12, which, whilst sawing into a tree 2, slices into

the cutting surface 20 of the tree 2. Alternatively the angled side 7 may be designed with saw teeth not illustrated in the drawings. The angled notch 23 has the shape of a V-shaped recess 14, where the opening 15 corresponds to the opening of the V, whilst the tip 16 of the V faces towards the centre 17 of the saw blade 1. One leg 18 of the V consists of the angled side 7, which is much longer than the other leg 19 of the V, said legs converge at the tip 16 at a nose angle 21, which is an acute angle of approx. 60°. This provides space for more saw teeth 5 along the periphery and the opening 15 will be shorter in that case if the nose angle 21 had been greater than 90°. This also ensures that the cutting edge 12 will be longer and cuts over a larger cutting surface 20 in the tree 2 and cut the vegetation 3 even better. According to a variant of the invention the cutting edge 12 can be supplemented by three notch formations 6 comprising rectangular, square or rounded hollow openings 24 made through lateral surface 13 of the saw blade and arranged between the V-shaped recesses 14 and the centre 17. The hollow openings 24 have edge sides 25 along their circumference. An edge side 25 consists of a ground edge side 22, which is also ground from underside 10 to upper side 11 having the oblique angle of approach, carried out in the same way, just as in the case of the cutting edge 12, called here edge side cutting edge 26, which may also have an upward fold of approx. 1-2 mm above lateral surface 13 on upper side 11, which is at least 10 mm long so that cutting surface 20 can be further planed to improve the properties provided by cutting edge 12 and further reduce the jamming effect in saw blade 1.The saw blade 1 has in most cases set saw teeth 5, i.e. they are slightly folded up to their tips, approx. 1-2 mm, where they connect to the saw blade 1, in each direction, viewed from the lateral surface 13 for every other saw tooth 5, making it possible to mill and plane the cutting surfaces 20, which are faced upwards and downwards during sawing and to reduce the jamming effect. The cutting edges 12 and the edge side cutting edges 26 then contribute to ensure that the slightly folded saw teeth 5 are not pressed back, thus enabling saw blade 1 to operate with a very small jamming effect for a long time without having to set it over and over again, which means that such a saw blade need hardly ever be changed. The angled notches 23 or the hollow openings 24 are evenly distributed along the lateral surface 13 of the saw blade 1 with the same distance between the notch

formations 6, both radially and peripherally in order to provide the saw blade 1 with a balanced rotation and therefore reduce vibrations, the friction and disturbing noise emission, which bother personnel during forestry work and hence reduce the number of injuries. Figure 1 shows a saw blade 1 which has three angled notches 23 with cutting edges 12 and three hollow openings 24 with edge side cutting edges 26, which is well suited for this saw blade 1, which has a standard diameter of 18-23 cm to provide the saw blade 1 with an optimum function and balanced rotation, since more notches 6 in such a saw blade 1 gives too few saw teeth 5, which cut vegetation 3 less effectively. In this case two notches 6 are too few, which means that the jamming effect will then be too high.

Claims

1. An arrangement for an essentially circular saw blade (1), which has saw teeth (5) and is designed to be used for timber cutting in conjunction with the felling of trees (2) and the removal of vegetation (3) around the tree (2), characterized in that the saw blade (1) has notch formations (6), at least two of which are angled notches (23), which are arranged along the periphery (4) of the saw blade (1) at a certain distance from each other and each having its opening (15) where there are no saw teeth (5), which together occupy correspondingly at least 30% of the circumference/periphery of the saw blade (1) at the same time as each angled notch (23) has an angled side (7), which is angled into the saw blade (1) from the periphery (4) at a maximum angle (8) of 70° from the tangent (27) of the saw blade (1), angled toward the vegetation (3) when the saw blade (1) rotates in a direction of rotation (28), said angled side (7) has at least one edge (9) which is ground as a cutting edge (12) from the underside (10) of the saw blade (1), viewed during sawing, to its upper side (11), with the edge (9) forming an oblique angle of working on the upper side (11), which extends from the periphery (4) into the saw blade (1), wherein the edge (9) forms a cutting edge (12) which, whilst the tree (2) is being sawn, slices into the cutting surface (20) of the tree (2), said surface faces upwards and said angled notches (23) are V-shaped, viewed towards the lateral surface (13) of the saw blade (1) and extend into the saw blade (1) with a certain distance from the periphery (4) to the tip (16) of the V, said V-shaped notches (14) are arranged with the opening (15) in the V on the periphery (4), whilst the tip (16) of the V faces into the saw blade (1), where the centre of the saw blade is arranged, said one leg (18) of the V being the angled side (7) which is at least twice as long as the other leg (19) of the V.

2. An arrangement according to claim 1, characterized in that the legs (18, 19) converge at the tip (16) at a nose angle (21) which is an acute angle, preferably less than approximately 70°, which means

that on the periphery (4) the saw teeth (5) will be longer between the V-shaped notches (14) at the same time as space is provided for more saw teeth (5), and in that the cutting edge (12) will also be even longer and will cut over a larger cutting surface (20).

3. An arrangement according to claim 1, characterized in that the cutting edge (12) is supplemented by at least two notch formations (6) in the form of hollow openings (24), which are rectangular/square or rounded and made through the lateral surface (13) of the saw blade and arranged between the V-shaped notches (14) and the centre (17), having edge sides (25) along their circumference, at least one edge side (25) of which consists of a ground edge side (22), which is also ground from the underside (10) to the upper side (11) at a working angle like the cutting edge (12), called the edge side cutting edge (26), which is intended to plane the cutting surface (20) and to cut towards the direction of rotation (28).

4. An arrangement according to claim 3, characterized in that the angled notches (23) or holes (24) are evenly distributed along the lateral surface (13) of the saw blade (1) with the same distance between each other both radially and peripherally to provide the saw blade (1) with a balanced rotation.

5. An arrangement according to claim 2 or 3, characterized in that the saw blade (1) has three angled notches (23) which each have their own cutting edge (12), and three hollow openings (24), each with their own edge side cutting edge (26), said saw blade (1) has a standard diameter of 18-23 cm.

6. An arrangement according to claim 3, characterized in that the saw blade (1) has set saw teeth (5), i.e. in that they are slightly folded as far as their tips, approx. 1-2 mm from the lateral surface (13) in each direction, preferably every other saw tooth (5), in order to mill/plane the cutting surfaces (20), facing upwards and downwards

during sawing, said set saw teeth (5) and edge side cutting edges (26) ensure that the cutting edges (12) are not pressed back, whilst the saw blade (1) is able to operate with very little jamming effect for a long time without the need for carrying out setting.

7. A method for using a saw blade (1) according to any one of the preceding claims, characterized in that in a step 1 the saw blade (1) clears vegetation (3) with the cutting edges (12), which face towards the vegetation (3) around a first tree (2), controlled from a forestry machine or a motor-driven manual implement, which removes the vegetation (3) from the tree, whereupon, in conjunction with this in a stage 2, felling of a first tree (2) starts when saw teeth (5) first begin to saw superficially in the tree (2), after which, in a step 3, the cutting edges (12), during further sawing, also begin to slice into the cutting surface (20) together with the edge side cutting edges (26) to create greater space for the continued sawing of the saw blade (1), which enables the saw blade (1) to rotate more easily with less friction, whereupon the sawing continues and the tree (2) is felled in a step 4, after which the timber felling progresses tree (2) by tree (2).

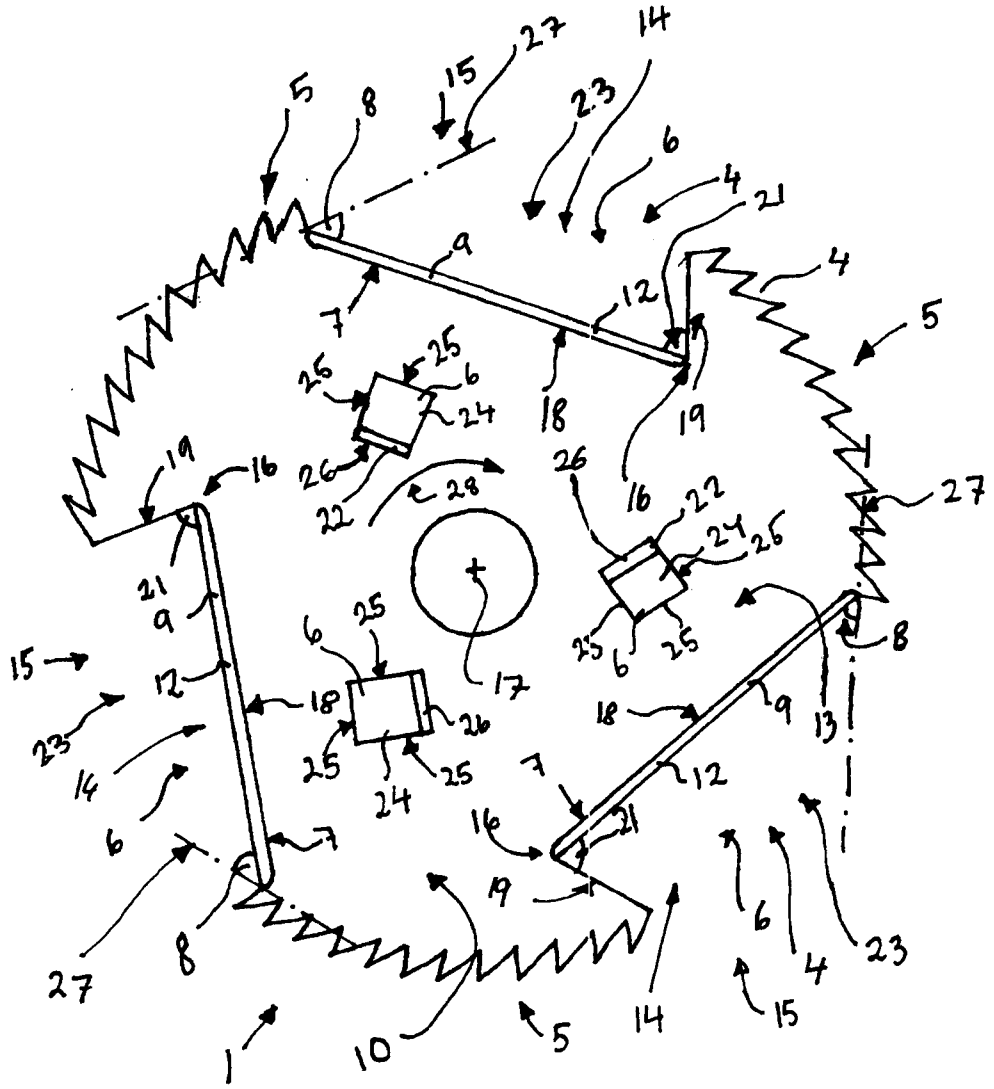

Fig. 1

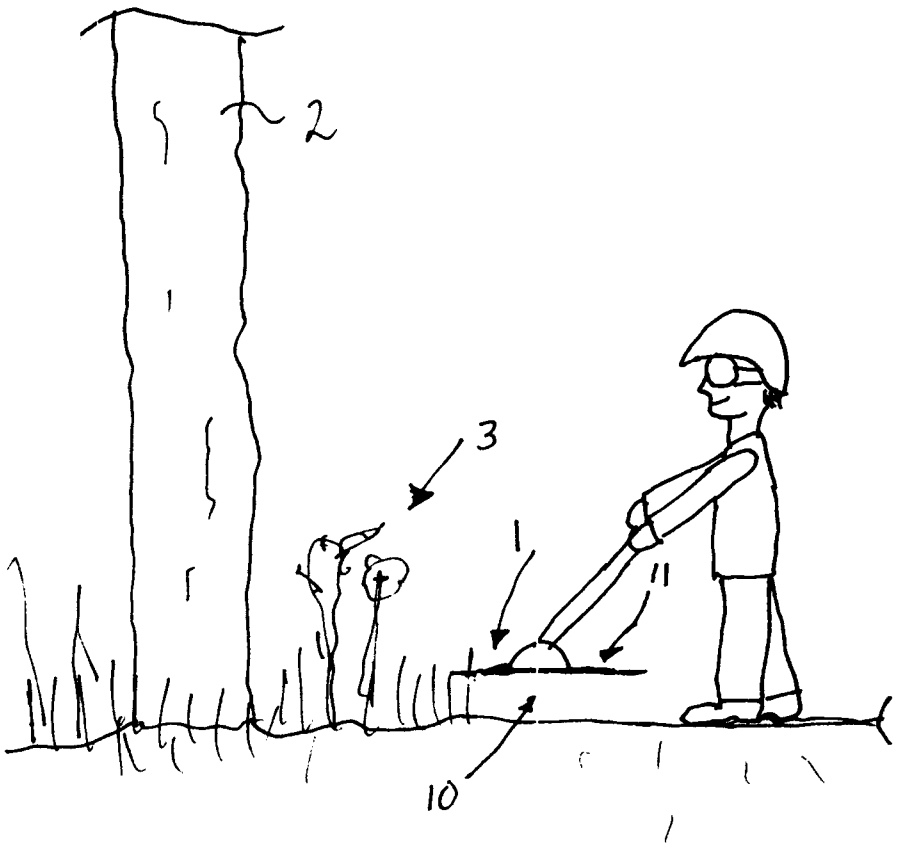

Fig. 2

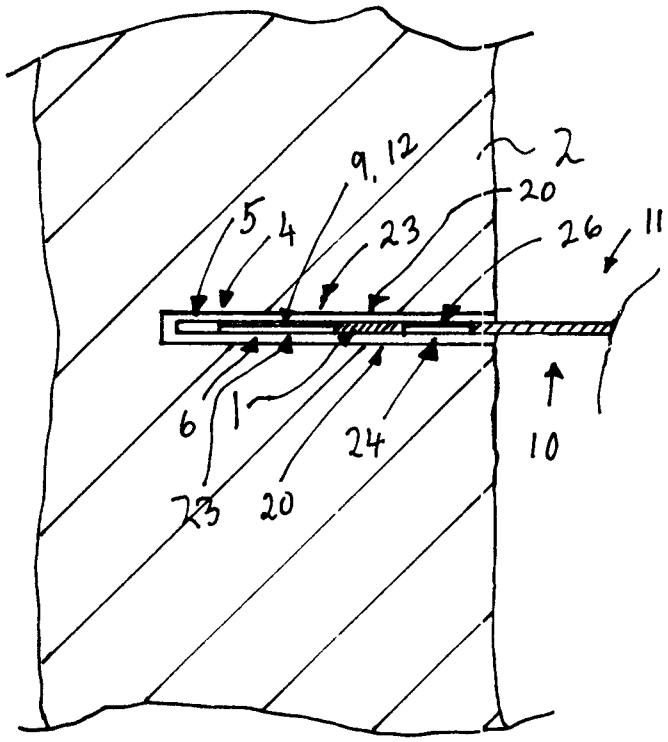

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
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)

IPC: B23D, B27B, A01D

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 200980251 Y (..), 28 November 2007 (28.11.2007), figures 1-2, abstract ---	1-7
A	DE 2534200 A1 (RICHARD JANSEN), 17 February 1977 (17.02.1977), figures 1-2, claim 1 ---	1-7
A	US 20090223342 A1 (HUMPF), 10 Sept 2009 (10.09.2009), figures 1-5, abstract ---	1-7
A	US 3700016 A (STROBEL), 24 October 1972 (24.10.1972), figures 1-4, abstract ---	1-7

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
2 May 2011	06-05-2011
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Fredrik Strand / JA A Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE 102006021136 A1 (LEITZ GMBH & CO. KG), 8 November 2007 (08.11.2007), figures 1-5, abstract -- --------	1-7

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Cited literature, if any, will be enclosed in paper form.

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