(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 January 2008 (31.01.2008)

PCT

(10) International Publication Number
WO 2008/011677 A1

(51) International Patent Classification:
B27B 1/00 (2006.01)

(21) International Application Number:
PCT/AU2007/001039

(22) International Filing Date: 27 July 2007 (27.07.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006904084 27 July 2006 (27.07.2006) AU
2007901103 3 March 2007 (03.03.2007) AU

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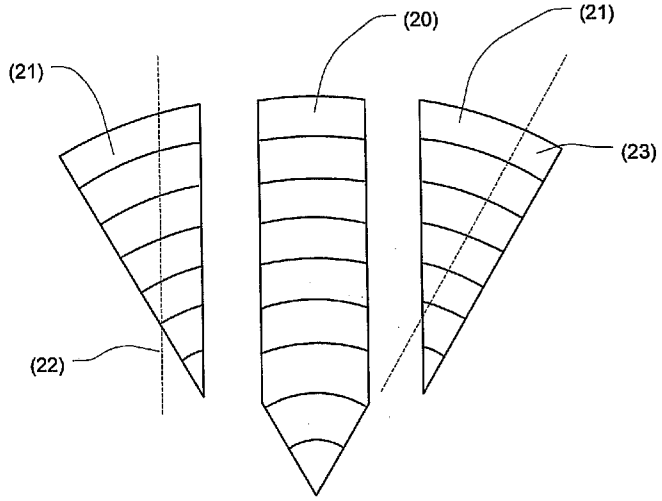
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** MULTIPLE SAW QUARTERSAWING



(57) **Abstract:** A method for producing quartersawn timber sections from log wedge sectors with the wedge sectors having two radial faces with an included angle between the radial faces of less than 180 degrees and a third face that is the outside or natural face of the log, with the quartersawn timber sections produced by the action of making at least two concurrent cuts, with the cuts being made parallel to the plane that divides the two radial faces, and the cuts being made in: I. a wedge sector, or; II. two adjacent wedge sectors formed by sawing a wedge sector along the plane that divides the two radial faces so that at least one cut is made in each adjacent wedge sector, or; III. two adjacent wedge sectors considered to be one for the purpose of this method so that at least one cut is made in each adjacent wedge sector, or; IV. two part wedge sectors formed by sawing a wedge sector paralel to the plane that divides the two radial faces so that at least one cut is made in each part wedge sector.

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Multiple Saw Quartersawing.

Introduction to the Invention

The invention as described is for a method and devices to facilitate the processing of logs for the production of quartersawn timber. The method provides for less waste, an improvement in timber quality, a reduction in the skill level required for quality timber production and provides for the option of automation of the production of good quality quartersawn timber.

Background of current knowledge and operations

A sawn timber section that is of a rectangular section is classed as quartersawn when the annual growth rings are basically at right angles to the broad face of the section.

A sawn timber section that is of a rectangular section is classed as backsawn when the annual growth rings are basically parallel to the broad face of the section.

A sawn timber section that is of a rectangular section is neither quartersawn nor backsawn and is classed as transitional sawn when the annual growth rings are around 45 degrees to the broad face of the section.

There are a number of reasons why quartersawn timber may be preferred over backsawn or transitional timber. Quartersawn timber shrinks and moves less across the broad face in drying and in use and may have an enhanced appearance. Significantly in many species of timber quartersawn dries better than backsawn with fewer defects occurring during drying that lower the value of the timber, so while the initial recovery or volume of quartersawn may be lower the final volume or value of the finished timber will be higher. Moving into transitional sections from quartersawn can cause a number of problems with an example being the higher distortion of the transitional section during drying.

There are variations of the definition of what is quartersawn or backsawn with, for example, some literature classing quartersawn as being sections with annual growth ring angles being between 90 degrees and 60 degrees.

Timber produced by ordinary processes is generally sawn by making one or two initial cuts and then making subsequent cuts parallel to or at right angles to the initial cuts.

Quartersawing is generally considered more labor intensive and more wasteful than backsawing as there are more straightening cuts required and more turning of the sawn

sections is required during the cutting process to get the growth rings aligned in the best way possible.

Quartersawing is also considered to require a higher skill level than backsawing or plainsawing as it is referred to in some regions.

Quartersawing is generally carried out on larger logs so that boards of a suitable width can be produced. As the core of the tree has to be cut out to produce a quartersawn section the maximum width of a quartersawn section is always restricted by the radius of the log and the amount of good wood between the centre of the log and the outside of the log.

As the logs are generally large the cut sections produced during the breaking down process can be very heavy and difficult to turn manually so for a modern mill mechanical turning assistance is required.

As many different sizes and shapes are produced during the square cutting process and the direction of turning required is inconsistent it is difficult to produce a simple automated process that produces good quality and consistent quartersawn timber.

Description of the Invention

The invention is based on the prior conversion of logs into wedge based sectors.

Radial wedge sectors portions of a log that have two radial faces which meet (or the extensions of which meet) within the confines of the log and are produced by means such as:

(1) sawing to (or close to) a chosen centre of a log a number of times with the log being rotated between cuts to produce elongated wedges of timber with the required angle between the two radial faces formed by the saw cuts or;

(2) sawing a log through a chosen centre so that the log is cut into two portions which are then separated and further processed to produce radial wedge sectors.

The preceding are examples only and the method of how wedge sectors are produced is not necessarily intrinsic to the current invention but the fact that to form, and meet, the definition of a wedge and a timber wedge sector, the two radial faces must meet and form an included angle between the radial faces that is less than 180 degrees. With reference to sectors and geometric shapes that could be rigidly defined it must be realized that in the context of logs they are natural objects with many variations. For the purpose of this invention a sector should be considered as a general shape comprising of two radial faces that may not be on the actual radius of the log. The faces may not, or

the extensions of the faces may not, meet at the centre of the log, and the outside or natural face is not necessarily the shape of the portion of the circumference as is normally defined by a sector and its radii.

If a wedge sector is further broken down with one cut along a radial line basically passing through the apex of the two radial faces then the two resulting pieces would be called wedge sectors but for the purpose of this invention if two cuts were made in a wedge sector basically parallel to the dividing plane and a quartersawn section removed with two sides basically parallel the remaining portions would be called part wedge sectors.

While the basic objective of the invention is the breaking down of logs into wedge sectors and the processing of the wedge sectors by the process and apparatus to be described it is not the intention that this invention could be circumvented or invalidated by the removal or production of parallel sided timber sections produced by cutting parallel to the radial face, or diameter cuts, during the production of the wedge sectors and producing parallel sided sections from timber that was adjacent to the radial face during the action of forming the wedge sectors.

Previous invention specifications by a number of inventors have described various methods for the production of radial wedge sectors and one describes a method and apparatus to the alignment of wedge sectors for further processing and it is not considered necessary to describe them or reference them in detail here.

The core aspect of the current invention relates to the further processing of the produced wedge sectors comprised of sections of timber that have, or had, two radial faces cut along or parallel to a general radius or diameter line and an outside face that is a section, or is adjacent to a section that was, the natural outside or circumference of the log. The prior reference is made as it is not the intention of this invention to be circumvented or invalidated by the cutting or machining of the natural outside section or any other part of the wedge sector to another profile before the processing of the wedge sector according to this invention and any reference to the natural face also means any machined or cut timber adjacent to where the face was prior to the machining or cutting.

A basic aim of the invention is to simplify and quicken the production process for quartersawn timber. As previously stated a large part of ordinary methods of quartersawing involves repeated turning for the correct cuts. Many of these turns can also be irregular and not easy to sequence for maximum efficiency. A primary objective

and outcome for the invention is the increased ease and elimination or reduction of turning during important phases of the production process.

In most milling processes there is a "breaking down" and a "resawing" process. In the ordinary sawing process the breaking down process makes only one or a few cuts parallel and at right angles to each other. Most turning is done in the resawing process. By the current invention most or all of the turning is carried out during the breaking down process, which is easily automated, and turning is minimized during the resawing stage. The method involves the concurrent cutting, by at least two cutting means such as saw blades, along lines parallel to the plane that divides the two radial faces. By two concurrent cutting means it is meant a minimum of two cutting devices such as band, circular or reciprocating saws either cutting:

1. the same wedge sector, or;
2. two adjacent wedge sectors, or;
3. two part wedge sectors.

Description of invention and drawings

Rectangular timber sections are classed as being quartersawn when the annular growth rings are basically at right angles to a broad face. This is illustrated by Figure 1 with the rectangular section (1) and the annular growth ring shown by the curved line (2). In subsequent drawings the growth rings are shown by the curved line without further reference. Figure 2 shows a backsawn board with the annular growth rings basically parallel to the broad faces (3). In a square section of timber the section may have growth rings at right angles to a face but the growth rings would be basically parallel to another face so that the timber could be classed as being either backsawn or quartersawn.

The geometry of conventional milling means it is difficult or impossible to produce only quartersawn (or backsawn) material from a log without a high degree of wastage. In conventional milling a relatively high percentage of timber targeted to be quartersawn ends up being backsawn or partly backsawn and vice versa.

Figure 3 is a copy of a conventional or ordinary quartersawing pattern for a log around 600 mm diameter or 24 inches taken from NK Wallis' Australian Timber Handbook Published 1970. While this is now a relatively old illustration it is similar to the quartersawing patterns used in most Australian hardwood mills and in other countries. Analysis of this drawing confirms the large number of turns of the heavy sections needed

in achieving this pattern and that a number of resultant sections contain transitional type growth ring orientation.

A quartersawing pattern shown in Figure 4 is copied from a recent timber industry research report and is similar to the pattern given by Wallace. This figure illustrates the problem with the sections (4) and (5) showing typical boards containing sections that are a mixture of, or are between, quartersawn and backsawn and that would be classed as transitional sawn sections. Transitional boards can lead to significant problems with uneven stress release during cutting, distortion during use and drying and increased problems such as internal checking which can significantly devalue dried timber. This is a problem in both small logs and large logs where the square cutting leaves a high percentage of the log in areas such as (6) of the log where the growth rings end up being at around 45 degrees to the broad faces and when cutting parallel or square to initial cuts it is not possible to produce quartersawn timber.

The present invention could apply to any wedge with any angle between the radial face. While they could range from say 120 degree wedges the greatest advantage is likely to be in acute angled wedges as the more acute angled a wedge sector is, the closer to quartersawn all the boards will be. This is an objective of the invention. For the sawing of wider wedges, say over 60 degrees, this process allows for the additional sawing of part wedge sectors to make the growth rings of the sawn sections closer to 90 degrees by sawing parallel to the radial faces.

The current invention provides for the practical and expeditious means of converting radial wedges into quartersawn timber sections with at least two parallel faces.

Figure 5 shows an end view of a radial wedge sector with two radial faces (10), and the apex formed by the planes of the radial faces (11) which in practice may not actually be there due to defect or other cause, and the natural or bark edge or face of the wedge (12) and a broken line showing the plane that divides the two radial faces (13). The natural or bark face or timber adjacent to the natural face (14) could be machined or cut prior or subsequent to any operations or actions taken in production according to the method without affecting the intent or basis of the invention and any machined or cut area is still called the natural face for purposes of definition. Similarly the timber adjacent to the radial faces could be cut or machined.

A wedge sector is shown in Figure 6 with dotted lines (15) representing the minimum two concurrent cuts basically parallel to the dividing plane according to the process. Figure 7 showing multiple dotted lines such as (16) representing cuts on an end section view.

While not shown, a cut line could be made on the plane that divides the two radial faces and pass through the apex if required. In some circumstances it may be expeditious to cut on the dividing plane to initially divide the wedge sector into two wedge sectors and then concurrently cut the two resultant wedge sectors. In relations to the term parallel and dividing plane and the like in practice there may be slight variation from the exactness of these terms but the terms are used to define the general intention and in relation to any variation of say a number of degrees for no valid purpose it is not the intention that this variation would invalidate or change the intent of this specification.

An example of a quartersawn section (20) produced according to one embodiment of the process is shown in Figure 8. These parts of the wedge sector are referred to as sections and have two parallel faces, a face that is the natural face or is a face that adjoined timber removed from adjacent to the natural face, and sections or a section of radial faces depending on where the section is sawn from. The remaining two part wedge sectors (21) are shown. These part wedge sectors could be further processed along the cut lines parallel to the dividing plane of the original wedge sector (22) or could be processed to sections by cutting parallel to the radial faces of the original wedge sector as is shown by line (23). In narrow wedge sectors, say 60 degrees between the radial faces or less, this is unlikely to be necessary as the sections are still likely to be acceptably quartersawn or the growth rings relatively close to 90 degrees but in wider wedges sectors, say over 60 degrees between the radial faces it may be desirable or necessary to cut parallel to the radial faces once the required number of sections have been cut parallel to the dividing plane. For the purpose of this invention any wedge sector sawn into two parts by cutting parallel to the dividing plane but not on the dividing plane will produce two part wedge segments as is shown in Figure 9 with both (24) and (25) being classed as part wedge segments.

A complete cutting pattern example for both radial according to the current method (26) and ordinary (27) quartersawing is given in Figure 10 with the pattern for ordinary quartersawing based on Wallis (Figure 3). The two figures demonstrate the potential for higher efficiency from the radial pattern. While the ordinary pattern shows a less efficient pattern or way of cutting, many ordinary Australian quartersawing mills achieve significantly less recovery than the potential indicated by the pattern with some achieving only just over 30% of sawn timber from the log. It is likely that in addition to wastage caused by defect the low recovery is contributed to by the inefficiency of the patterns near the periphery of the log where it is uneconomic to handle and maximize recovery

when the product recovered will be lower grade and lower value transitional or backsawn sections which are difficult and costly to dry and provide for low returns.

A view of alternate cutting means positioning according to the method is shown in Figure 11 by way of example of possible cutting configurations with (31) representing a view of the natural face of a wedge sector and the dark lines (32) showing the possible position of cutting means with dotted lines (33) showing the cuts with two cutting means being shown operating adjacent each other along the cutting direction of the wedge sector, multiple means adjacent to each other, multiple means in pairs along the length of the wedge sector and one central saw creating two wedge sectors followed by two cutting means. Such indicative drawings are not intended to restrict the method to the placement of cutting means as shown.

There are many potential combinations of cuttings means possible and ways of carrying out of the method of the invention such as transferring the cutting means past a wedge sector that is held near or on the radial face dividing plane, or vice versa, and cutting from the outside of the wedge sector to produce two part wedge sectors on the first pass and working from the outside in towards the dividing plane to produce sections. By way of example two of the preferred embodiments are described in the following.

Description of one preferred embodiment and the associated drawings

A preferred embodiment of the invention involves two cutting means that can be adjusted relative to each other to the required distance apart so that sections of the required thickness can be cut. The wedge sector would travel relative to the cutting means and once a complete pass of the sawing means had been made and a section produced along with two part wedge sectors, the section would be removed and the two part wedge sectors returned past the cutting means on a non sawing return pass. (By way of example in the variation of embodiments this embodiment could be adapted to cut on the return pass.) The two part wedge sectors would then be resawn by the two cutting means producing two sections that are removed after the one pass and another two smaller part wedge sectors. The process is repeated until the required end result is produced.

This embodiment of the process and means to facilitate the embodiment are herby described with reference to the accompanying drawings.

In Figure 12 the position of the two cutting means is shown by hatched sections (34), the section is shown (35) and the part wedge sections (36). Once the cut is finished and the

separation is complete the section can be removed, in this case in the direction shown by arrow (37). An example of cylindrical guide and reference rollers (38) are shown.

To facilitate sawing by maintaining separation during the cutting process, control of all timber parts, removal of sections and return of part wedge sectors the following devices have been devised. The described devices can be applicable to various aspects or differing embodiments of the invention as applicable.

A pair of conical rollers (41) is shown in Figure 13 that rotates around their axis (42). They reference and contact a wedge sector (43) on the radial faces (44). To facilitate contact because of wedge sector curvature caused by growth stress or other reasons a pressure wheel or wheels may contact the natural face of the wedge sector. These wheels could be driven to move the wedge sector. The conical rollers may be driven to facilitate movement of the timber or may be freewheeling.

Two outfeed conical rollers, Figure 14, are shown fitted with discs (45). The discs are generally placed in line with, and follow, the sawing means. The discs stop rubbing or interference with the back of the cutting means and restrain the part wedge sectors and facilitate their return for further processing. Part of the conical roller can be left protruding past the disc as shown at (46).

The means for this embodiment for removal of the section or sections is shown by Figure 15 where a conical protrusion which supports the section by supporting and contacting the section's radial face have been moved apart with the conical roller in the direction of the arrows (47) to allow the section to fall away in the direction of arrow (48) and the part wedge sectors (49) remain restrained and held by the conical rollers and the fitted discs. On certain sawing passes two separated sections would each be supported by their radial faces and two sections would be allowed to fall away at the one time by the separation of the devices.

The outfeed conical rollers can be mounted in adjustable banks to follow the saw lines or provide clearance from the saw means on the return pass. In this preferred embodiment the infeed rollers can be adjusted in and out with the outfeed rollers and the saw means would be in line with the outfeed discs however it may be beneficial to move the saw means out of line for the return pass of the part wedge sectors.

Devices for alignment and timber driving means can take a number of embodiments that may be normal to timber operations such as a toothed driving and pressure wheel contacting the natural face. Devices for alignment and driving means may be particular to an embodiment or the method of the invention and such devices include a pair of

alignment discs Figure 16 (51) that can contact face to face or be separated by a small or required distance. These devices can be used on the infeed to align and centre the part wedge sectors (52), and in certain circumstances two wedge sectors, in relation to the cutting means (53) to ensure two even thickness sections are produced. The part wedge sectors can be different sizes as shown, caused by uneven and natural variation the natural face of the wedge. The double discs as shown are capable of being fitted with smaller diameter toothed drive and pressure wheels (54) so that the one means both guides and drives when uses in conjunction with rollers exampled (55). These devices would be mounted on means to enable the contour of the natural face to be followed and to cater for different size part wedge sectors and wedge sectors and to be moved out of the way when a full wedge sector is being cut and the centre alignment device is not required for the alignment and driving of the part wedge sectors. A simple means would be a pivot arm with bearing means supporting shafts (56) and providing drive means such as a driven chain for drive sprockets (57). A similar device, used singularly, can be used to follow cuts and separate and drive individual sections and part wedge sectors.

As many of the alignment and pressure wheels can be used as is required to effectively align, drive and restrain the wedge sectors, sections and part wedge sectors.

As an alternative in this embodiment a wedge sector could be sawn as so described, the section removed, but instead of the part wedge sectors returning past the sawing devices, the part wedge sectors could travel on to another device and be sawn according to this described embodiment. This would have the basic advantage of the current embodiment which is full flexibility for choosing and varying thickness of sections but would have the added advantage of being quicker as wedge sectors and part wedge sectors can be sawn concurrently.

In expeditious utilization of the current twin saw embodiment it may be beneficial to feed two wedge sectors to the initial pass of the saws with an example being the twin saw being set to receive and process 60 degree wedge sectors could be fed two 30 degree wedge sectors to match the infeed rollers, be aligned by the prior mentioned alignment discs and produce two sections on the first pass. For the purpose of the current method these two wedges are considered as one and where the two separate wedges meet to be processed as if one, then, the meeting faces are considered to be the plane that divides the two radial faces, so as to meet the definitions and requirements for analysis purposes. Devices can be fitted to lift and shift the part wedge sectors, or part wedge

sectors can be reloaded to the device, so that the dividing plane sawn faces can contact the support rollers for sawing parallel to the radial faces if required or the cuts can be made by another device or by an attachment to the current device.

Description of another preferred embodiment and the associated drawings

An alternative preferred embodiment involves the alignment of more than two cutting means adjacent to each other. The primary objective of this would be to carry out the majority of the cutting operations in one pass of the sawing station. This could take the form of cutting with such an apparatus as is commonly known as a quad bandsaw where four cutting blades operate in a small area. One pass of a wedge sector relative to four bands would produce five lengths of timber- three sections and two part wedge sectors. In certain wedge sector sizes and section widths this could be sufficient to convert the bulk of the timber in the wedge sectors. If required part wedge sectors could be transferred to subsequent processing apparatus. Other examples of multiple adjacent sawing means would be cutting means such as multiple blades in a device as is known as a frame saw which utilizes a reciprocating action to cut timber and has a similar small kerf like a bandsaw. Another method would be the mounting of multiple circular saw blades onto a common shaft or shafts to provide the required cutting means.

This embodiment of the process and means to facilitate the embodiment are herby described with reference to the accompanying drawings.

A stylized representation of the alternate preferred embodiment, Figure 17, shows circular saws (61) on common shafts set up to cut from the top and bottom of a wedge sector (62). Saws are offset and the cuts overlap so that complete cuts are made through the wedge sectors. Blades can be fixed on the shafts separated by spacers and may be guided by saw guides or not. Shafts can be splined and splined floating saws can be mounted on the shafts. These types of saws are required to be guided. Positioning the guides positions the blades and determines the thickness of the cut sections. The advantage of this type of system, as opposed to a single shaft and set of saw blades, which could be used, is that smaller and narrower blades or blades with smaller kerf can be used for a deeper cut thereby reducing wastage. While this method is shown relating to this embodiment, two sets of saws used in a similar manner could be applied in the previous embodiment exampled with saws on separate shafts so they can be adjusted in and out.

Spacer discs with a number of variations as exampled in Figure 18 can be used to follow the saw blades and hold the sections separate by travelling in the space left by the cuts. This can facilitate transport of the cut sections and part wedge sectors and can eliminate or minimize cutting at the back of the saw blade on the side of the sections as they pass. To facilitate transport the discs can be driven. An alternative to the spacers shown could be discs mounted on splined shafts like the saw blades with extensions of the saw blade guides, or independent guides, used to position the discs to follow the saw blades and ensure they enter the cuts. Similarly the splined shafts can be driven to facilitate transport of section.

As previously described discs could have associated drive and pressure wheels attached and be able to follow the contour of the natural face. Because of the multiple cuts that may occur an a small area the support and drive means would have to be suitably narrow to accommodate narrow sections. A cross section of one suitable means is pictured in Figure 19 with the disc (71) adjacent to a drive and pressure wheel (72) that will contact the natural face on one side of the disc and a drive sprocket (73) driven by chain on the other side with thin pivot arms (74) supporting an axle (75) with the drive wheel, disc and sprocket enclosing a bush or bearing (76). Multiple devices as shown in Figure 20 could be used to facilitate cutting of the wedge sectors. This type of pressure feed can be particularly useful for safe cutting and for the holding down of sprung sections of timber during the cutting process.

After cutting sections can be released all at once by means such as cylindrical rollers being swung out. This will allow all sections to fall away from the device at one time.

Special rollers and movements for rollers can be constructed so that individual sections can be released at different release stations based on section size or position to facilitate sorting and stacking or further processing.

The prior embodiments as described are not intended to be restrictive of the invention and there are a wide number of ways and combinations of ways that the invention method and end result of producing quartersawn sections of timber can be achieved.

Subsequent to production, sections and part wedge sectors can be further processed. They can be dried and further cut or machined or cut and machined and then dried or used in their green or unseasoned state. Seasoning and machining of timber produced according to the method to new and usable profiles is, in a general way, referred to as valued adding to the timber.

Sections can also be resawn parallel to the dividing plane to produce further sections. Figure 21 shows a section (81) with a dotted line (82) where resawing could take place although any number of sections could be produced. A suitable device for this operation would be a horizontal thin kerf band saw operating after the section had been produced according to the current method.

A normal operation of further processing in a sawmill is the use of an edging device or a multi rip saw. These will cut wide sections to narrower sections such as two or more rectangular boards if required and will also cut off the outside or natural edge of a section and also defective wood from near the middle of the tree or log. They are also used to straighten sprung or curved sections of timber common to quartersaw timber where in a rectangular section growth stresses cause the face of the timber closest to the heart of the tree to become convex along its length and the face farthest from the tree, concave along its length. In industry it is common to apply lasers or scanners to timber sections to facilitate straightening and optimization of timber recovered.

In Figure 22 a section cut according to the invention is shown with a section of bark or natural face (83), two parallel faces (84) and a section of radial face (85).

Figure 23 shows one option for resawing where the radial face section is sawn to form a separate triangular section (86) for use for making any practical object and such items as quad or picture framing or joinery timber or laminating stock and a standard rectangular quartersawn section (87). According to the method the triangular section is essentially a part wedge sector. This can be separated either subsequent to or prior to drying or seasoning.

Figure 24 shows another option for resawing where the radial face section remains as part of the section so that the radial face section can be used as part of a product and there by maximize production of that product. Examples shown of this embodiment are the tongue of tongue and groove flooring (88) and the bevel on a skirting board (89).

Figure 25 shows part wedge sectors produced from the outside of a wedge sector with a radial face (91), a face parallel to the dividing plane of the wedge sector of which it was a part (92) and a natural or bark edge face (93). These can be processed for any practical use and profile. Dependent on size these (95) can be cut for the same purpose as the radial face section (86). Alternatively they can be cut as shown at (96) at the required angle to the radial face to follow the natural face timber and potentially produce a larger section.

What is claimed is:

1. A method for producing quartersawn timber sections from log wedge sectors with the wedge sectors having two radial faces with an included angle between the radial faces of less than 180 degrees and a third face that is the outside or natural face of the log, with the quartersawn timber sections produced by the action of making at least two concurrent cuts, with the cuts being made parallel to the plane that divides the two radial faces, and the cuts being made in:
    I. a wedge sector, or;
    II. two adjacent wedge sectors formed by sawing a wedge sector along the plane that divides the two radial faces so that at least one cut is made in each adjacent wedge sector, or;
    III. two adjacent wedge sectors considered to be one for the purpose of this method so that at least one cut is made in each adjacent wedge sector, or;
    IV. two part wedge sectors formed by sawing a wedge sector parallel to the plane that divides the two radial faces so that at least one cut is made in each part wedge sector.
2. A method according to Claim 1 in which the radial or natural faces have been machined or cut prior to the making of the production actions detailed.
3. A method according to Claim 1 in which one or more parallel sided sections are produced from timber that was adjacent to a radial face prior to the making of the production actions detailed.
4. A device to carry out the method of Claim 1 that incorporates conical rollers that contact the radial faces.
5. A device to carry out the method of Claim 1 that incorporates cylindrical rollers that contact the radial faces.
6. A device to carry out the method of Claim 1 that incorporates circular saws to make the cuts.
7. A device to carry out the method of Claim 1 that incorporates band saws to make the cuts.
8. A device to carry out the method of Claim 1 that incorporates frame or reciprocating saws to make the cuts.
9. A device to facilitate the carrying out the method of Claim 1 that incorporates conical rollers that contact sections of radial faces and that are fitted with discs that

can be positioned in line with the saws so that the discs fit into the cuts made by the saws.

10. A device to facilitate the carrying out the method of Claim 1 that incorporates conical rollers that contact sections of radial faces and that are fitted with discs that can be positioned in line with the saws so that the discs fit into the cuts made by the saws and the disc and the conical rollers support the part wedge sectors and the conical rollers contact and support the radial face of a section so that when the conical rollers are moved apart the section or sections fall away but the part wedge sectors remain supported by the disc and roller.
11. A device to facilitate the carrying out the method of Claim 1 that incorporates discs that can be positioned in line with the saws so that the discs fit into the cuts made by the saws.
12. A device to facilitate the carrying out the method of Claim 1 that incorporates drive and pressure wheels mounted next to the discs and of a smaller diameter than the discs so that when the discs fit into the cuts made by the saws the drive wheels contact the natural faces of the section or part wedge sectors.
13. A device to facilitate the carrying out the method of Claim 1 that incorporates discs to align adjacent wedge sectors and part wedge sectors so that the wedge sectors and part wedge sectors are in the required position for cutting with the said aligning discs being capable of being fitted with smaller diameter driving and pressure wheels to contact the natural faces of the sectors.
14. Product produced by the carrying out of the method of Claim 1.
15. Product produced by the further processing of sections produced by the carrying out of the method of Claim 1.
16. Product produced by the further processing of part wedge sectors produced by the carrying out of the method of Claim 1.
17. The process of value adding the product produced by the carrying out of the method and produced by the further processing of sections and part wedge sectors produced by the method according to of Claim 1.
18. Utilization of product according to Claims 14, 15 and 16.

Figure 1

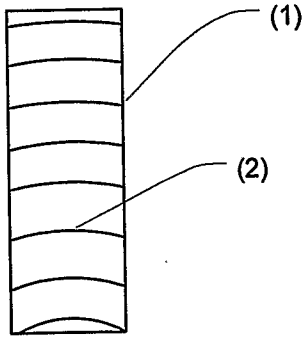
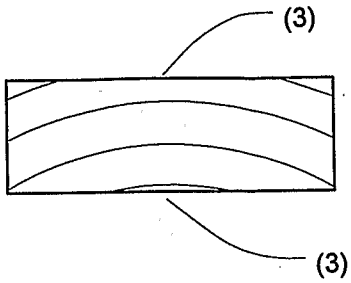


Figure 2



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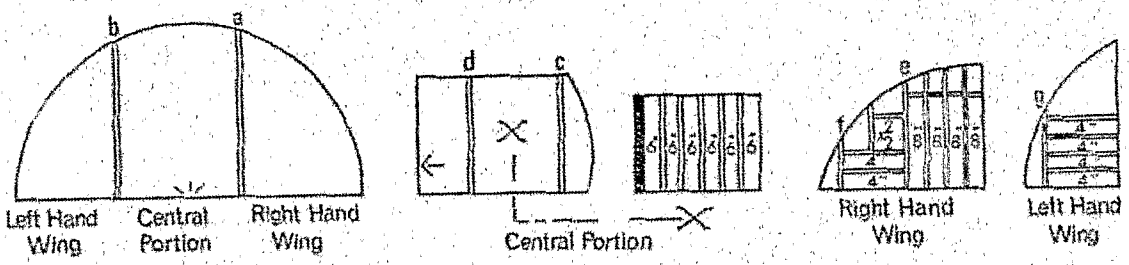
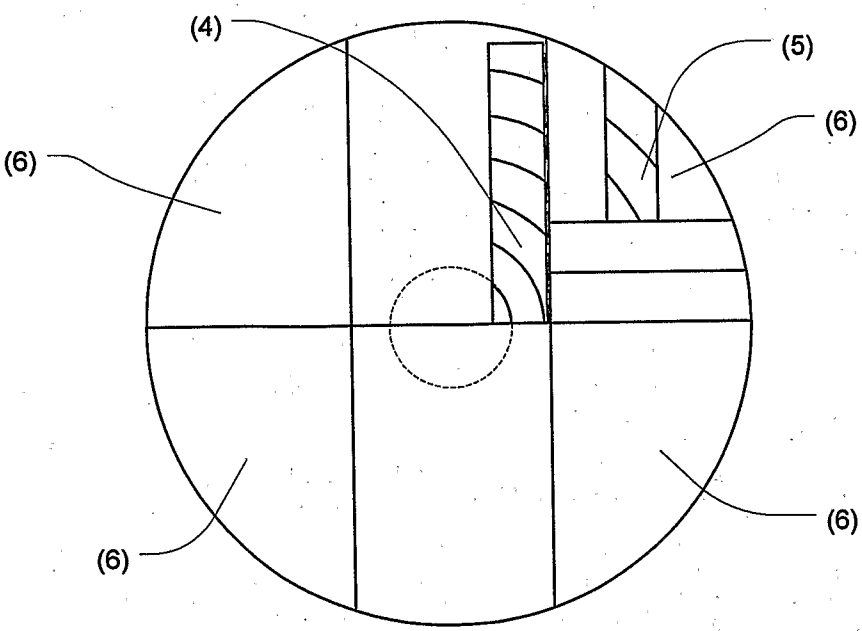


Figure 8. Cutting a 24-inch log on the breast-bench.

45

Figure 4



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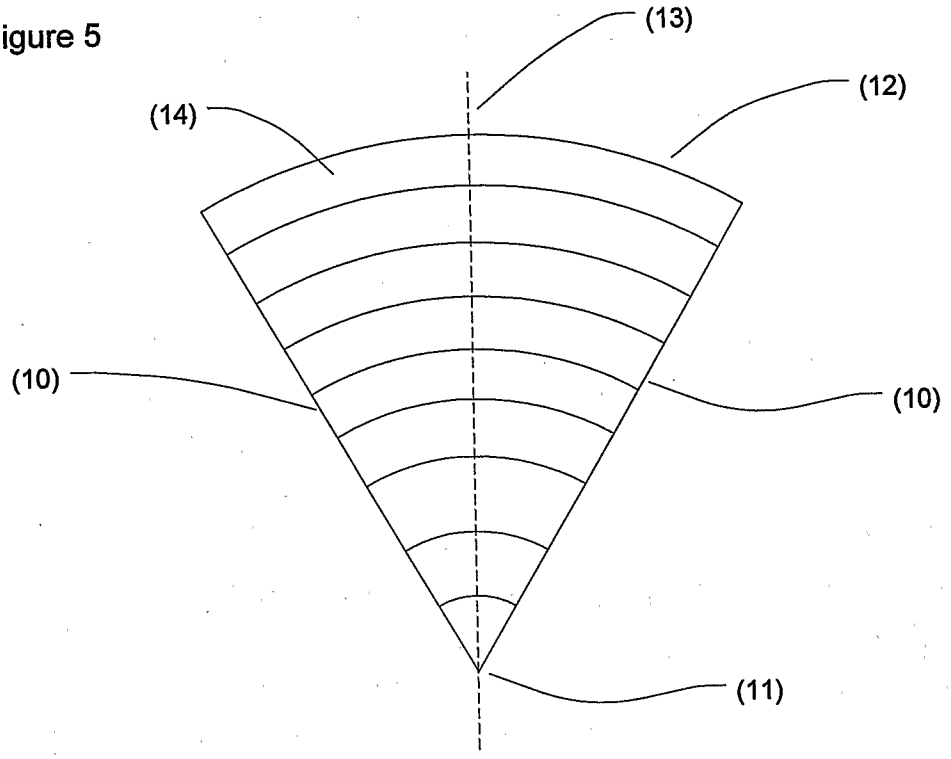

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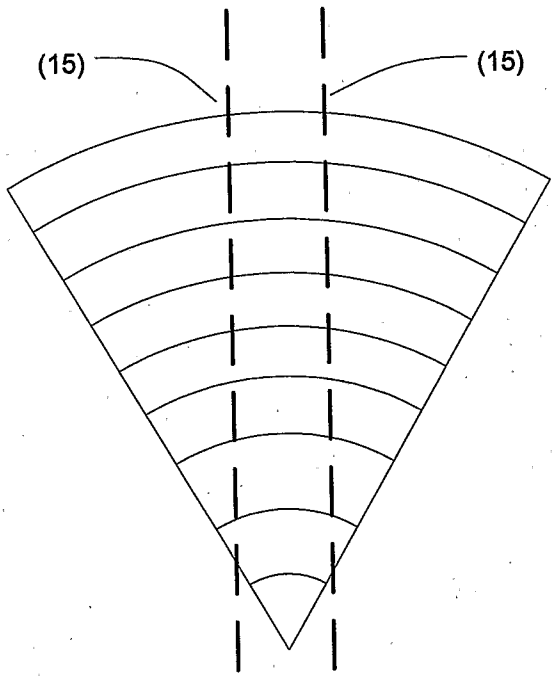

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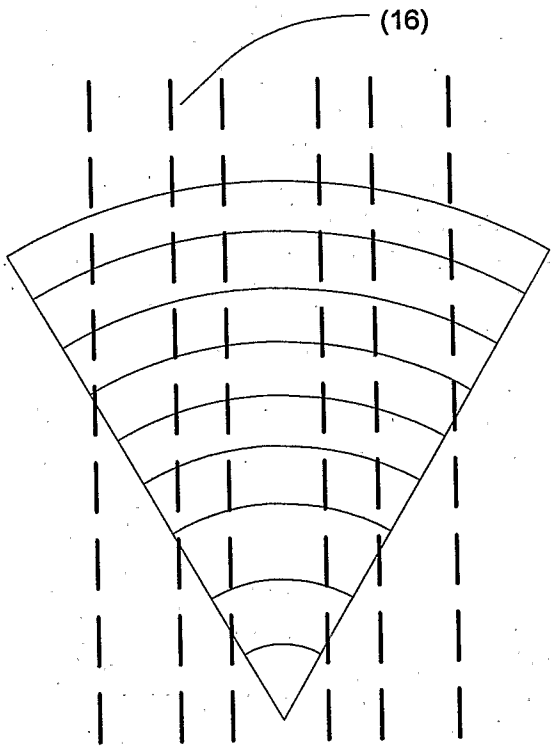

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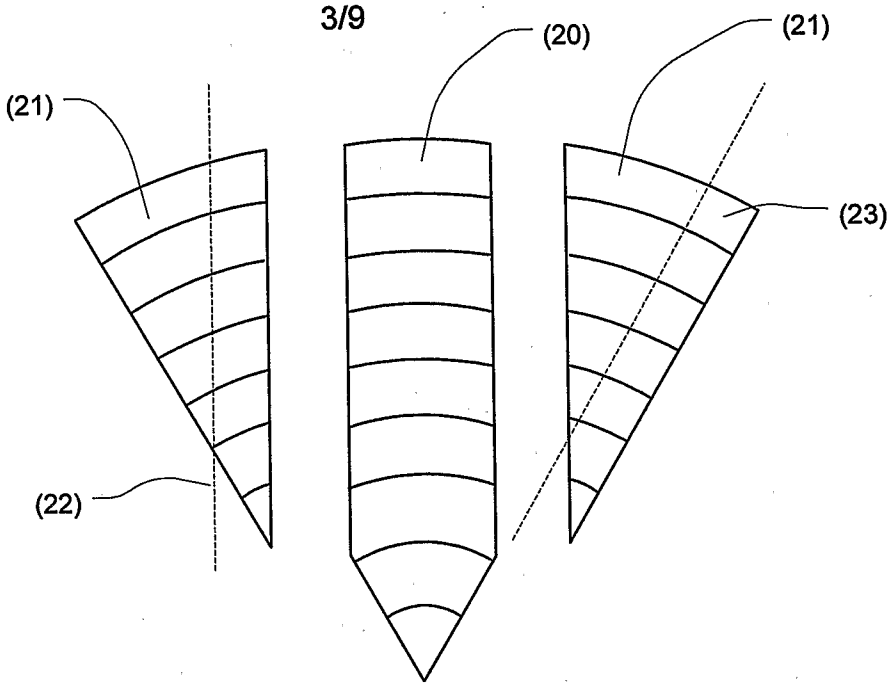

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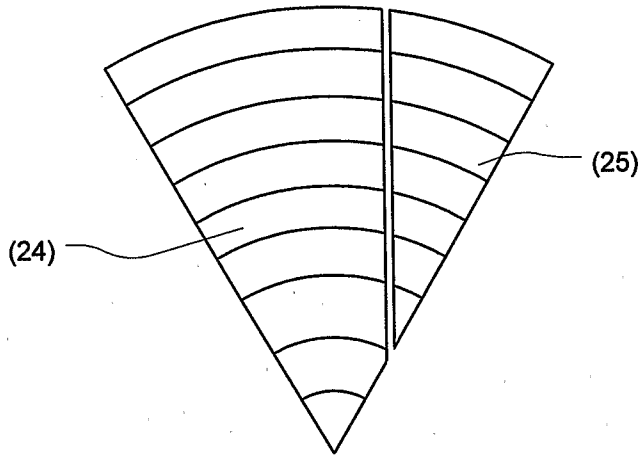

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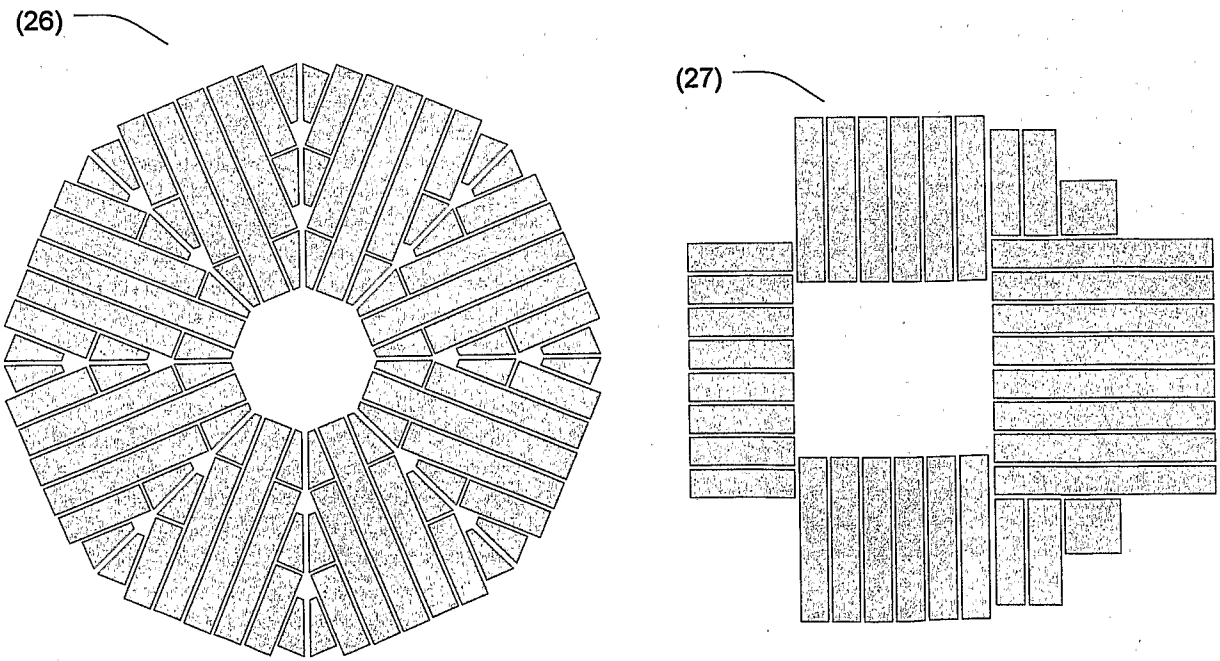

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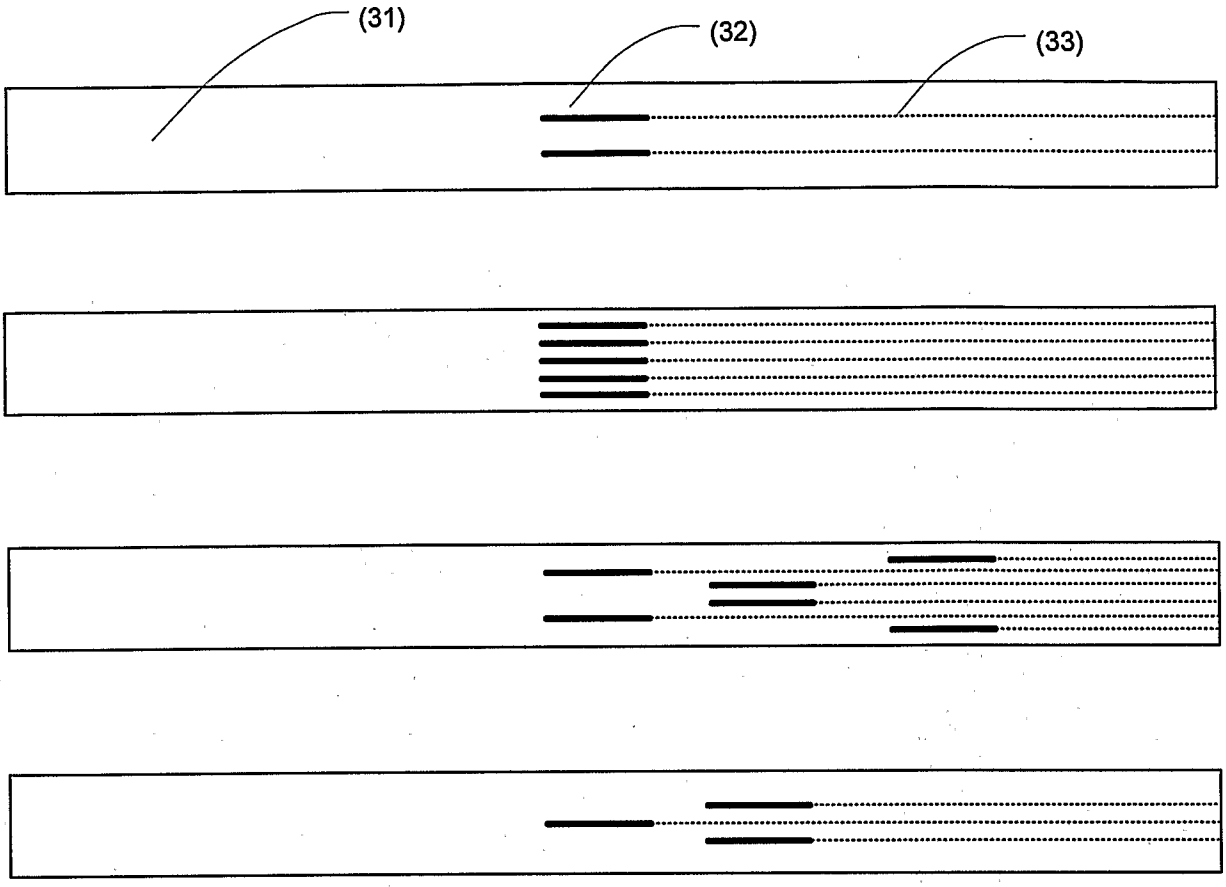

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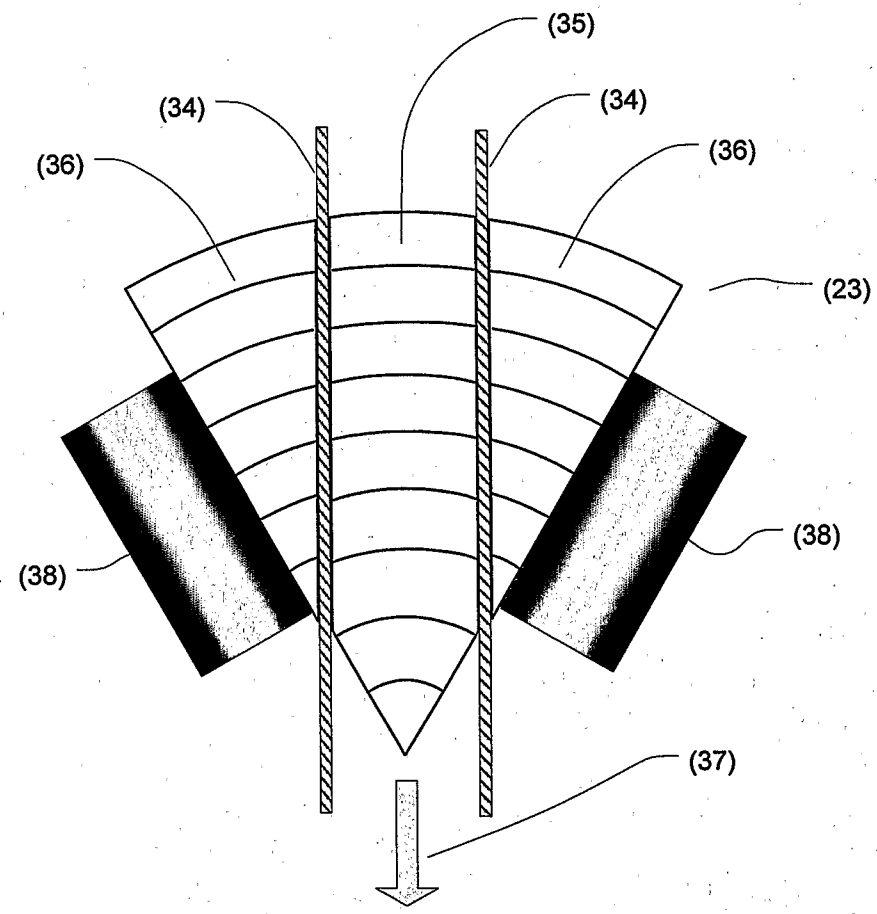

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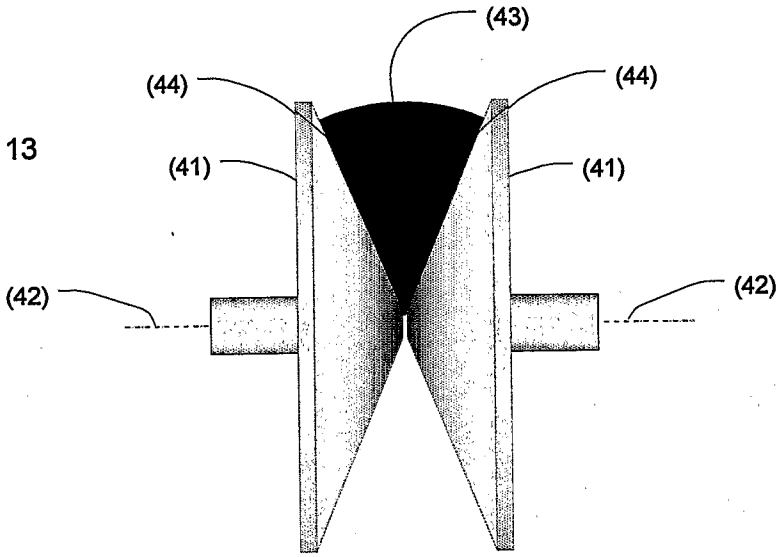

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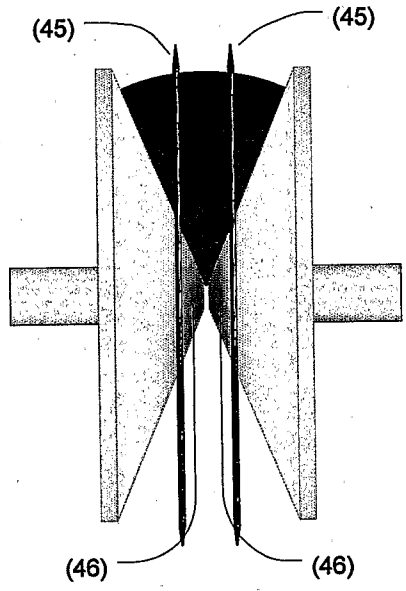

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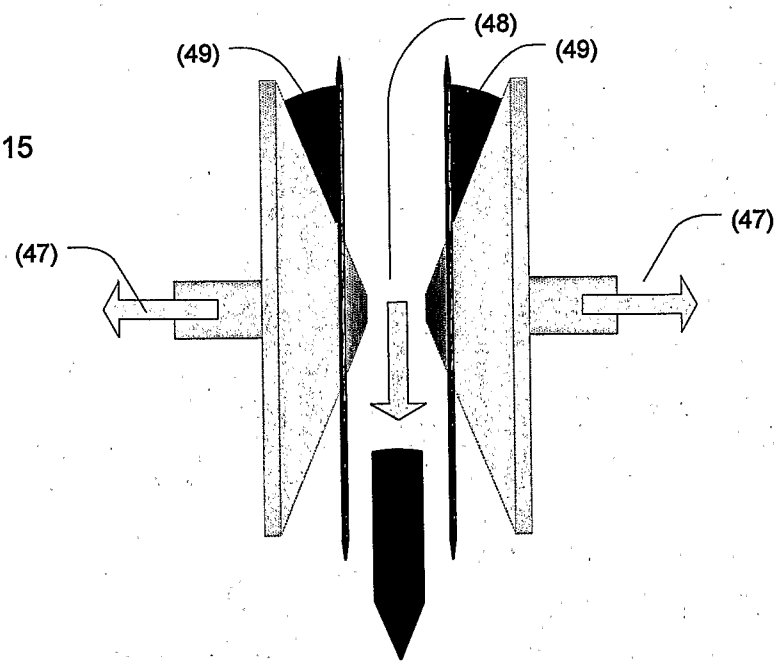

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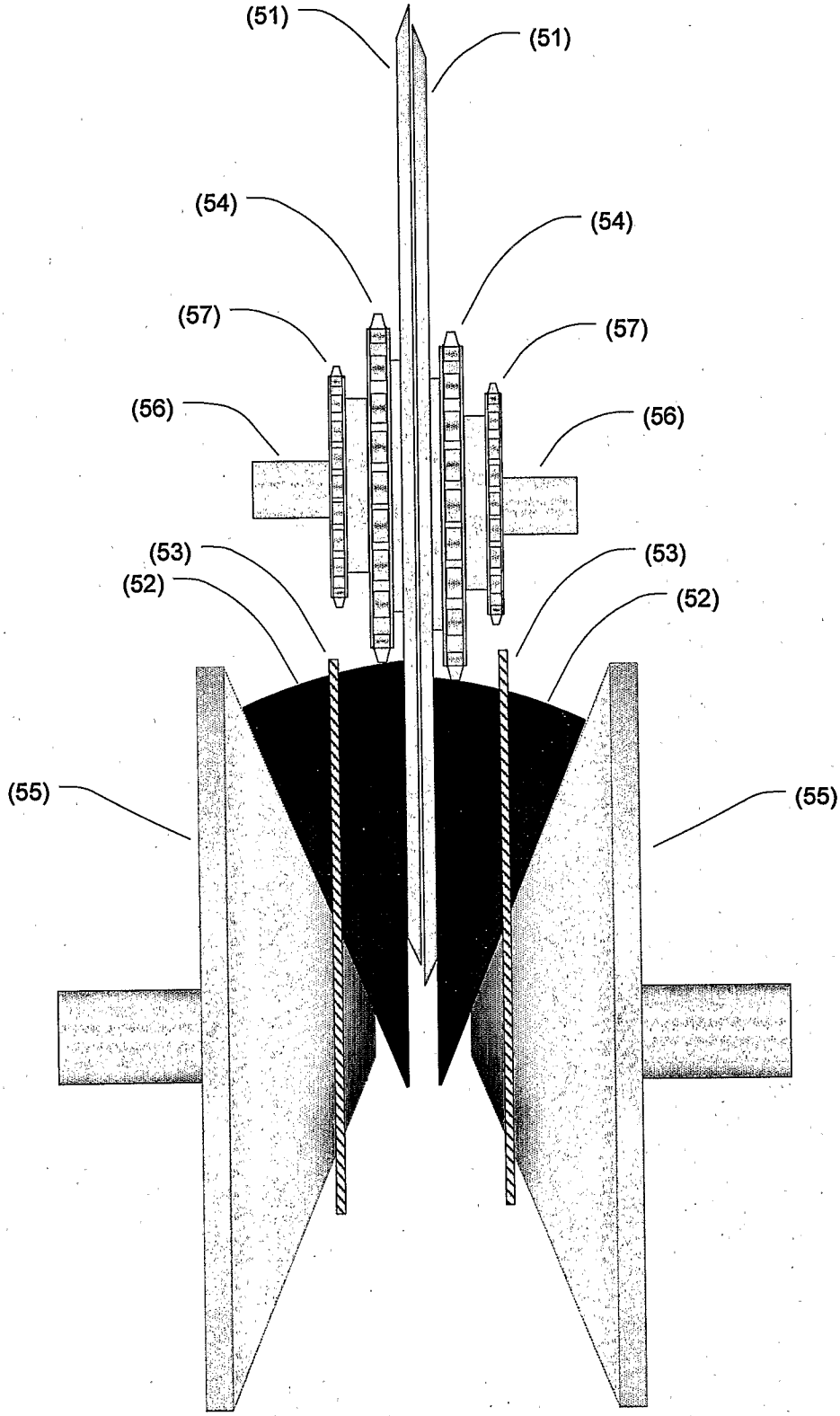

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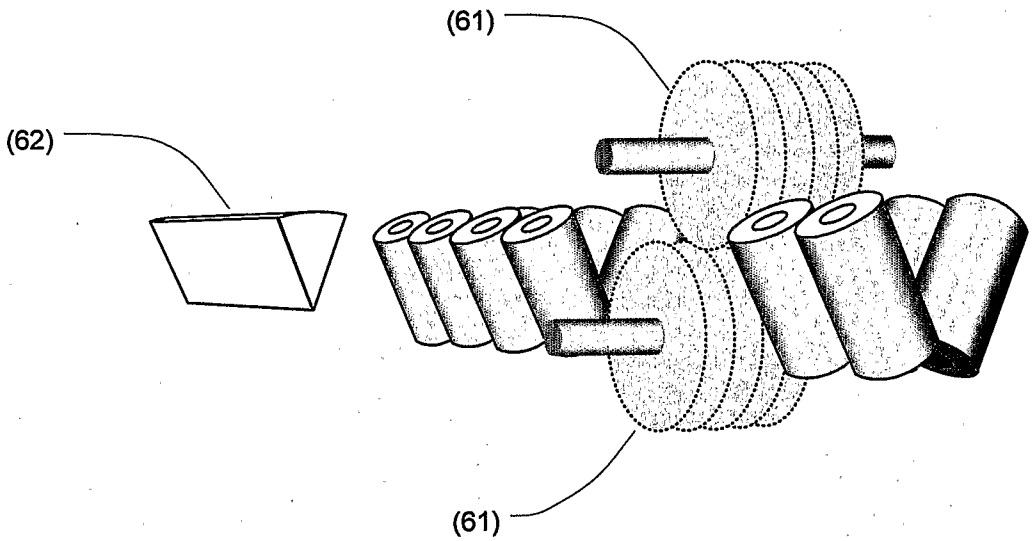
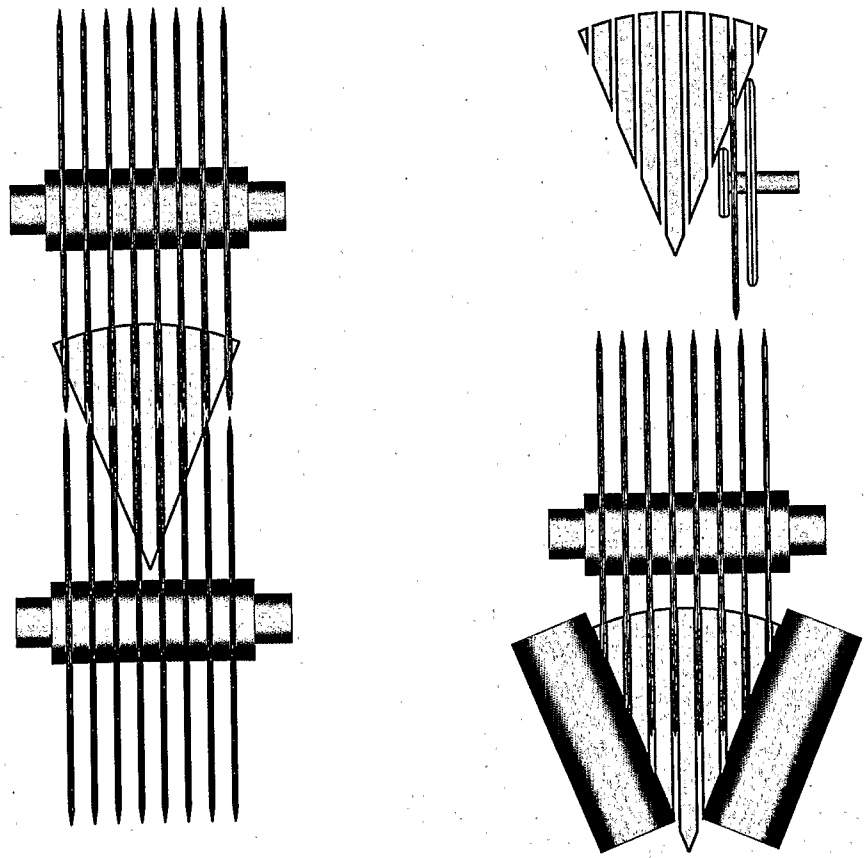


Figure 8

Figure 18



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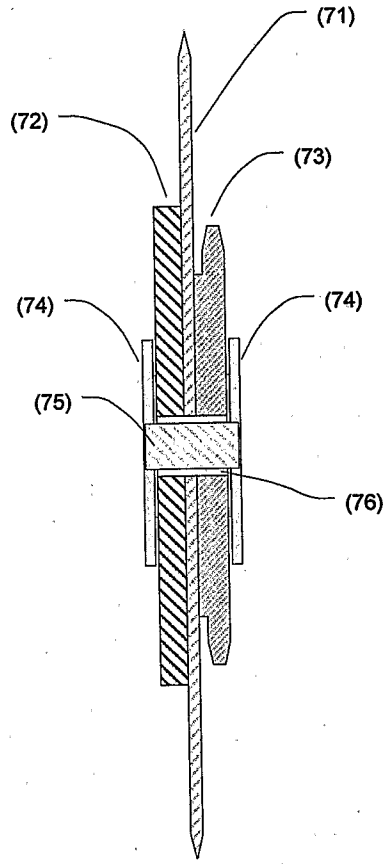

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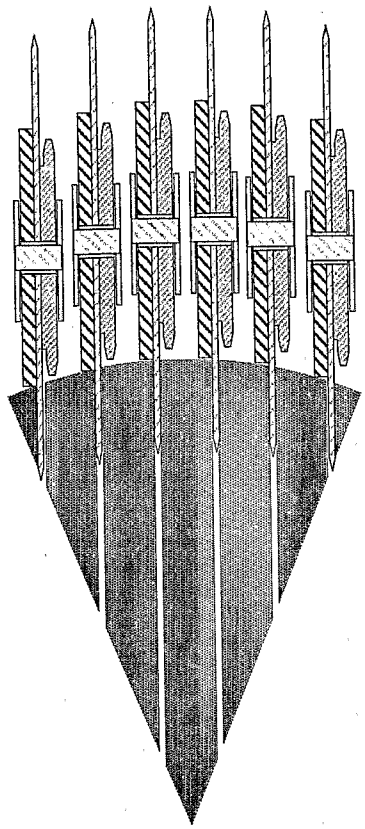

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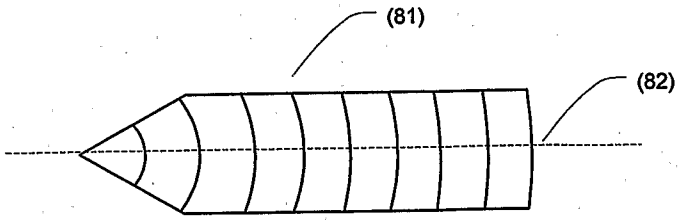

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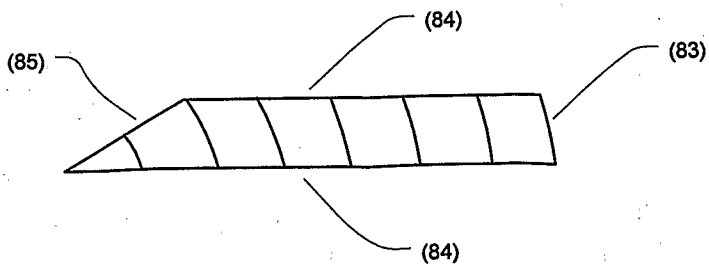

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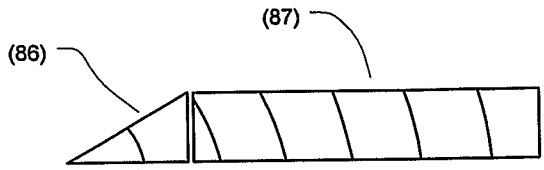

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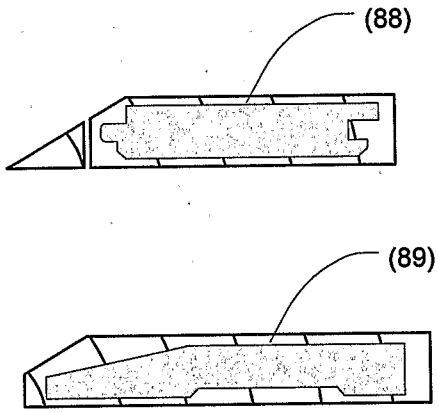

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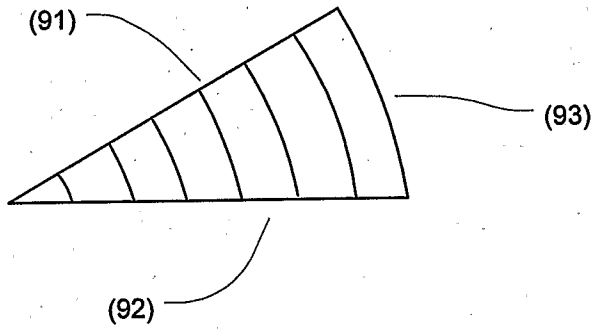

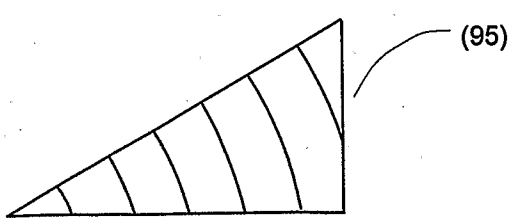

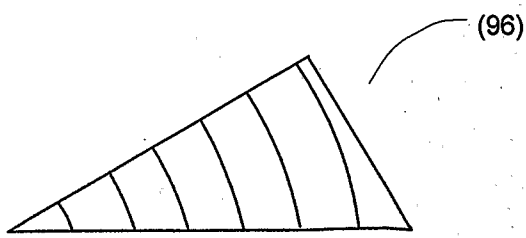

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/001039

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***B27B 1/00*** (2006.01)

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)

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)
DWPI - IPC B27B001/- & Keywords (QUARTER+ OR WEDGE+ OR SECTION+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No. 2004-580893/56 , Class P63, WO 2004067238 A1(ESTERER GMBH & CO W D) 12 AUGUST 2004 See Abstract & Figs.	1-18
A	Derwent Abstract Accession No. 2004-437954/41 , Class P63, RU 2228835 C1 (FOREST POWER MECHN INST) 20 MAY 2004 See Abstract & Figs.	1-18
A	Derwent Abstract Accession No. 97-240303/22 , Class P63, JP09076209 A (YS ENG KK) 25 MARCH 1997 See Abstract & Figs.	1-18
A	Derwent Abstract Accession No. 93-1000740/12, Class P63, WO 9304826 A1 (KNOERR A) 18 MARCH 1993 See Abstract & Figs.	1-18

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

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 November 2007	26 NOV 2007
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **BANDULA RAJAPAKSE** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : (02) 6283 2120

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/001039

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No. 93-388789/49 , Class P63 , GB 2267864 A (MARTIN R) 22 DECEMBER 1993 See Abstract & Figs	1-18
A	Derwent Abstract Accession No. 92-349018/42 , Class P63 , WO 9216339 A1 (WIKLUND M) 01 OCTOBER 1992 See Abstract & Figs.	1-18
A	Derwent Abstract Accession No. 95-245030/32 , Class P63 , SE 9303910 A (HAMMARSROEM L) 26 MAY 1995 See Abstract & Figs.	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2007/001039

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	2004067238	EP	1592538	RU	2005127096		
NO	200443795441						
RU	2228835						
NO	9724030322						
JP	9076209						
NO	93100074012						
WO	9304826	AU	25020/92	AU	25429/92	US	5560409
		WO	9304827				
NO	9338878949						
GB	2267864	EP	0575161				
NO	9234901842						
WO	9216339	AU	13710/92	CA	2105868	EP	0684898
		FI	934080	SE	9100830	US	6286571
NO	9524503032						
SE	9303910						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX