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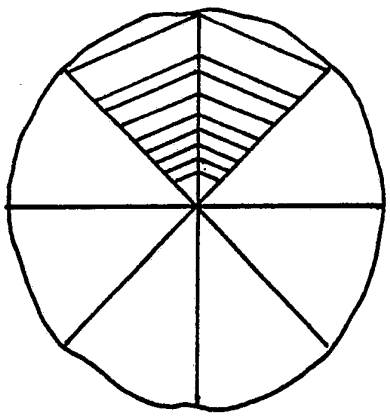

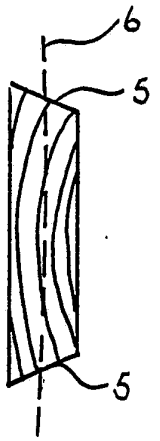

(57) Abstract

A method of resawing elongated radially sawn segments of timber so that backsawn boards are produced. Said wedges are sawn with the desired angle between the radial faces and are resawn so that the growth rings of the tree are basically parallel to the broad backsawn faces. The flared radial edges of the boards indicate the growth ring orientation and therefore the cupping tendency and the direction of bow. This enables a greater degree of consistency in the manufacturing process over conventional methods. Said backsawn boards can be used individually as conventional boards with the mentioned advantages or can be laminated together to make a range of laminates that balance or use the bowing and cupping tendency of backsawn timber.

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BACKSAWN TIMBER PRODUCTION FROM RADIALLY SAWN WEDGES

A method in which radially sawn segments of timber are resawn to produce backsawn timber products.

The method has for its object the production of backsawn timber products with a consistent quality and growth ring orientation, with little waste produced during the production process and with the ability to relieve growth stresses evenly and similarly in each piece of product.

The method involves the resawing of radially sawn wedges of timber so that the cuts made to form the backsawn products are basically tangential to the growth rings of the tree.

Present sawing methods generally produce products which do not have consistent quality and growth ring orientation. Present sawing methods produce high degrees of wastage and have difficulty relieving stress similarly in each piece.

Present sawing methods aim to produce a product which is either quartersawn which has the growth rings of the tree basically at right angles to the broad face or backsawn which basically has the growth rings tangential to the broad face.

Present methods for sawing smaller diameter trees with high growth stresses such as species of *Eucalyptus* generally aim to produce a backsawn product. This involves the cutting of a slab from the side of a log to produce a flat face which would be basically tangential to the growth rings of the tree. This flat face then becomes the "reference" face for further sawing.

More sophisticated sawing systems cut two flat faces simultaneously on either side parallel to one another. This is shown in Figure 1.

Generally further slabs of the desired thickness are cut from the log as at the dotted line (1). These slabs which are backsawn have the stress from the log relieved as bow (2). These slabs are then resawn to the desired width as wide boards would be prone be excessive cupping as in Figure 2 as the timber drys. This cupping effect is due to the different shrinkage rates of timber both parallel and at right angles to the growth rings. Timber generally shrinks twice as much parallel to the growth rings as it does at right angles to the growth rings.

A particular slab cut from the log may be wide enough to cut two boards of the desired width but sawing down the middle causes uneven growth ring aligment and stress relieval and causes a combination of spring and bow as in Figure 3 and becomes what is generally seen as a low quality piece of timber.

To cut a higher quality piece of timber with the stress relieved purely as bow the two edges must be removed as in Figure 4. These edges generally go to waste or low value products. The remaining piece of timber has the growth ring alignment of the "perfectly" backsawn piece of timber and will have a degree of bow as in (3) and will stay "straight" in relation to the broad face if viewed at right angles to the said face as is shown at (4).

A piece of timber of this nature is the aim of backsawn timber production. It is difficult or impossible to produce pieces of timber with this growth ring orientation by conventional means without a high degree of wastage.

The present invention has for its aim a method of producing consistently backsawn boards. The method involves the resawing of radially sawn wedges of timber so that backsawn boards of the desired thickness are produced.

The stress of the log is relieved in the end product as bow and is consistent in relation to the flared edges and growth ring orientation. As the stress of the tree is contained in the narrow face of the backsawn piece of timber it is comparatively weak and can be easily taken out during seasoning or use.

A suitable sawing pattern is illustrated in Figure 5. The said boards have consistent growth ring orientation in relation to their flared edges (5). They appear straight when viewed along the plane parallel to the longitudinal axis and which is at right angles to the broad backsawn faces.

The cupping tendency of each piece is consistently away from the heart of the tree and is consistent in relation to the flared edges. The direction of cupping tendency is shown by dotted line (6). The effect of the said cupping tendency is minimised in each piece as the width of the broad face is narrow when the growth ring are tight and have a correspondingly bigger radius when the boards are wider.

The said boards are produced by sawing elongated wedged-shaped elements of timber which have been produced by sawing a log from the outside to the central core of the log along planes which radially extend from the longitudinal axis, or the decided longitudinal axis of the log. The angle between these planes can be varied to make a wedge-shaped element with the desired angle between the radial faces.

Figure 6 shows a wedge before resawing with radial quartersawn faces (7) and a potential tangential backsawn face at dotted line (8).

Resawing of wedges produced by the said method takes place so that the resawn pieces of timber produced are backsawn so that the growth rings of the tree are basically tangential to the two broad resawn faces and so that the growth rings of the tree are basically at right angles to the two narrow flared radial faces of the original wedges.

Resawing can take place on the plane shown by dotted line (8) that is at right angles to the plane that bisects the angle formed by the two radial faces and shown by the dotted line (9).

Figure 7 shows a resawn backsawn board with two narrow quartersawn faces (10) which were once essentially the radii of the tree and with two broad backsawn faces, one of which (11) was closest to the outside of the tree and the other (12) which was closest to the centre of the tree.

The resawn backsawn boards can be used in a variety of ways. Said backsawn boards can have both flared edges removed or machined to the desired prolife as at dotted lines (13) to produce conventional backsawn boards or backsawn boards machined with the desired profile.

Said backsawn boards can have one flared edge removed as at (13) for making a bevelled architrave or the like. An advantage can be gained from the orientation of the bevel as any cupping tendency would tend to be into the wall.

Said backsawn boards offer consistent backsawn faces which enhance the appearance of many species of timber making them suitable for panelling or featuring walling.

Said backsawn boards can be used to make a paling type fence with improved characteristics. A shiplap method can be used as in Figure 8 with the bevelled edges orientated so that they improve the appearance of the fence and so that backsawn faces that were closest to the outside edges of the tree when the said board was cut are facing each other and so that the cupping tendencies of the wood will tend to keep the overlapping join tight.

Said backsawn boards can be used as decking with either the flared edges up as in Figure 9 or alternating up and down (Figure 10) so that adjacent flared faces are parallel to one another and which could be used to give an even appearance. Decking with flared edges upward would be useful when a wide surface is required and when clearance is wanted for falling objects such as sheep pen flooring.

The said resawn boards can be connected together flared edge to flared edge to make a composite member with their backsawn faces parallel to one another. Alternate resawn boards are inverted from their relative position in the radial wedges so that their narrow flared radial faces are parallel to one another when the backsawn faces are parallel to one another. This is illustrated in Figure 11. Connection in this way gives automatic growth ring orientation to compensate for the cupping tendency of backsawn boards as shown by dotted line (14). This growth ring orientation which gives the end grain of the composite member a generally wavelike appearance is the desired objective of conventionally produced backsawn laminates but is hard to achieve to a consistent standard.

Consecutive sized segments such as at (15) can be used to make composite members with evenly spaced joins as at (16) or uneven as at (17).

If laminates are made up of consecutive resawn boards mirror images can be worked into the faces. If consecutive wedges are used from a tree this image can be continued across the composite laminate. This applies to subsequently mentioned laminates.

Said backsawn boards can be connected to make a range of balanced laminates such as in Figure 12. Flared edges and growth rings can be connected so that they are facing opposite ways to make a laminate that balances both the cupping tendency as at (18) and the bow as at (19). Composite members made in this way basically have the backsawn faces which were closest to the outside of the tree adjoining and/or the backsawn faces that were closest to the centre of the tree adjoining. Laminates can be edged or machined to the desired prolife as at (20) to make a laminate with square edges or with the desired profile.

Said balanced laminates or said resawn boards can be connected to one another backsawn face to backsawn face as in Figure 13 to make a composite laminate with quarter sawn or the edge of the growth rings exposed as at face (21). Laminates could be edged to make a flat face as at dotted line (22).

Said balanced laminates can be connected togther so that the convex shape formed by the flared quartersawn edges of one pair of said balanced laminates fit into and connect with the concave shape formed by another pair of said balanced laminates as in Figure 14.

A variation on the balanced laminates could be produced by offsetting the backsawn faces relative to one another. A variation on the balanced laminate can be produced by aligning said resawn boards of the desired width so that the flared edges are all facing in the same direction as in Figure 15 and so that the backsawn faces that were closest to the outside of the tree are adoining the face that were closest to the centre of the tree. A laminate such as this could use the tension of the resawn boards to give additional strenth to the composite member. The bow of the resawn boards could be used to give a member a natural pre-camber.

Said composite members can be connected by gluing, nailing or other suitable mechanical fastening systems.

Said backsawn boards can be produced by single sawcuts either by band or circular saw along the tangential cuts. Once a reference cut has been made wedges can be resawn or a conventional sawbench by holding the tangential face up against the gauge and by repeatedly slicing off boards of the required thickness. Multiple cuts can be made by bandsaws at the desired spacings set behind one another.

Said backsawn boards would generally be resawn by placing the wedges in a holding and referencing device which carried or referenced both of the radial faces. These could be wheels with suitable angles, flat rollers suitably angled, coned rollers, slides or fixed angles. Figure 16 shows how angled coned rollers (23) could reference the radial sawn wedge (24) and how pressure can be applied by suitable device such as a pressurized roller in the direction of arrow (25) to ensure faces stayed in contact with the said coned rollers which would allow relative movement between the holding and referencing device and the radial wedge to be sawn. More than one holding and referencing device can be placed next to one another as at Figure 17 so that a single bandsaw blade (26) could cut more than one wedge at a time. Holding and referencing devices which are fixed in relation to the

wedge can be used to cut out the spring out of a segment by cutting along a straight plane while rollers or the like which allow relative movement of the wedge can be used to follow the curve in the segment caused by the spring.

Said boards can be produced by one or more saws mounted on spindles (Figure 18) on either side (27) of the holding and referencing device and the radial segment to be resaw. Cuts would be made to the desired depth so that boards were separated from the adjoining wedge or board. Saws could be synchronized so that the tip of the saws cleared or could be offset behind one another so that their cutting arcs did not coincide.

Previous multiple cutting techniques could produce the total of the required cuts in one lineal motion of the radial segment of timber.

The depth of cut required by each saw decreases as the width of the wedge diminishes towards its apex. Using a coned spacer or spacers that increase in diameter as the width of the wedge diminishes as in Figure 18 will allow the use of thinner gauged and smaller kerfed saws which can minimise the amount of potentially usable timber turned into sawdust. Parts of cones or spacers could be planning or machining cutters or hoggers to machine the radial edge to a desired profile on the same pass as the sawing cuts.

Spindles of the said sawing device can be angled the desired amount away from the plane that bisects the angle formed by the two radial faces of the segment being cut as is shown by the dotted line (29). The planes made by the saw blades are not parallel and the cuts made by the saws produce a board which is basically convex on the face that was closest to the outside of the tree and is concave on the face that was closest to the centre of the tree. This is illustrated in Figure 19. The natural cupping tendency of the wood (30) can be used during seasoning to straighten the

wood diminishing or removing the convex and concave faces of the unseasoned backsawn boards.

Boards can be sorted to width by virtues of their position in relation to the part of the tree that was the outside and the part that was the inside. Increasing width from the inside allows the sorting into groups. These groups of backsawn boards can be of similar width and length, the number of which depends on the angle between the radial faces and how many wedges were cut from the log. Boards after being resawn can be conveyed in their wedge group and can have the backsawn boards removed consecutively either starting from the part that was closest to the outside of the tree or from the part that was closest to the centre of the tree or from both sides simultaneously.

A suitable device to follow the saws and to carry the cut backsawn boards is illustrated in Figure 20. A cone or basically conical device with the angle of the radial face of the wedge and which can rotate around the axis shown by dotted line (31) can be used or can be fitted with flanges (32) to fit into the space left by the saw kerf. These flanges can have a tapered edge to provide clearance and guidance for the saw cut. Multiples of these can be used to carry the said boards. Flanges can be increased in thickness to increase separation between boards which can facilitate sorting and transfer and the like. Some or all of the said carrying devices can be power driven.

Rollers or holding devices of diminishing width such as in Figure 21 may facilitate this sorting, either allowing boards to be dropped or swept or lifted as applicable.

Radially sawn segments of a log may be wider than the required width as in Figure 22. Resawning a said backsawn board as shown be dotted lines (33) would lead to the problems associated with growth stresses and growth ring aligment as is related to Figure 3.

The part of the wedge closest to the outside of the tree and may already have had the required amount of the wedge removed can be resawn along one or more planes which are essentially a radii focused on the point formed on the apex of the planes of the two radial faces. These could be as shown by the dotted lines (34). Resawning then takes place in the desired and previously explained manner using the radial faces as the reference edges.

Large logs with damaged, defective or hollow centres can be efficiently sawn by a similar process, the only difference from sawing a solid log being that, as in the previous method, the radial faces do not come to a physical apex. Dotted line (35) in Figure 16 shows how a truncated radial wedge with no physical apex can sit and be referenced in the said holding device.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method and resulting product in which an elongated wedge-shaped segment of timber with two radial faces which has been produced by sawing a log from the outside to the centre along planes which radially extend from the longitudinal axis and which have the required angle between them to produce the said wedge-shaped segment with the desired angle between the radial faces is resawn to produce backsawn boards.

2. A method and product according to Claim 1 in which the said backsawn boards are produced by sawing basically at right angles to the plane that bisects the angle formed by the two radial faces.

3. A product according to Claims 1 and 2 that retains the flared radial edges.

4. A method according to Claims 1 to 3 in which the flared edges are used to ascertain growth ring orientation.

5. A method and product according to Claim One so that the said backsawn board can be machined to the shape of an architrave or the like and so that the flared edges are used efficiently where possible and so that the cupping tendency is in the desired direction.

6. A method according to Claim 1 in which said backsawn boards are connected together or held facing each other by mechanical means so that the faces which were closest to the outside of the tree face each other and so that the cupping tendency of the said boards tend to tighten against the mechanical fasteners and tend to improve or retain the tightness of the touching faces.

7. A method according to Claim 1 in which flared edges of the said backsawn boards are consistently faced in the desired direction to increase their desired surface area.

8. A method according to Claim 1 in which said backsawn boards are consecutively inverted in relation to the flared edges and are arranged so that both backsawn faces are parallel and on the same plane as an adjacent backsawn face and so that adjacent flared edges are parallel and so that the growth rings would generally form a wave pattern when viewed from the ends of the said backsawn boards.

9. A method according to Claim 8 in which the said flared parallel faces are connected to one another.

10. A method and product according to Claim 1 in which two or more of the said backsawn boards are connected together to produce a composite member in which said backsawn boards are connected together so that either the backsawn faces that were closest to the outside of the tree are adjoining or so that the said backsawn faces that were closest to the centre of the tree are adjoining.

11. A method and product according to Claim 10 in which said composite members are connnectd together with further said composite members by the edges that are or were the radial faces.

12. A method according to Claim 1 in which said backsawn boards are connected to one another by the backsawn faces so that a backsawn face which was closest to the outside of the tree is adjoining a backsawn face which was closest to the centre of the tree.

13. A method according to Claims 1 and 2 in which the said radially sawn segments of timber are placed in a matching triangular holding device so that the radial faces of the said segment are the reference points for at least one cut that is made tangential to the growth rings according to Claims 1 and 2 so that the said tangential cut can be used as a reference face for the further production of the said backsawn boards.

14. A method according to Claim 13 in which the said triangular holding and referencing device allows for relative movement between the said device and the radially sawn segment to be cut.

15 A method according to Claim 13 and 14 in which multiple cuts are made in one lineal motion to produce the said backsawn boards.

16. A device for making the cuts of Claims 13 to 15 in which at least two sets of circular saws with the desired numbers of saws and with the desired separation are arranged in the desired manner so that they cut from either side of the wedge to a depth necessary to separate the said backsawn boards.

17. A device according to Claim 16 in which the spindles of the said sets of circular saws are basically parallel to the plane that bisects the angle formed by the two radial faces of the wedge being cut so that the plane of the cuts produced by the sets of saws are parallel.

18. A device for sawing backsawn boards according to Claim 16 in which the spindles of the said sets of circular saws are not parallel to the plane that bisects the angle formed by the two radial faces of the wedge being sawn and so that the planes of the cuts produced from either side of the said wedge are not parallel and so that the side of the backsawn board which was closest to the outside of the tree has a basic convex shape and so the side of the backsawn board that was closest to the centre of the tree has a basic concave shape so that the natural cupping tendency of the board during seasoning will tend to make the said backsawn faces straight.

19. A method in relation to Claim 16 in which the said sets of circular saws mounted on an individual spindle have spacers of the desired thickness between the said saws which basically increase in diameter the desired amount as the width of the wedge decreases towards the apex of the radial faces.

20. A method according to Claim 19 in which the said spaces are replaced with suitable cutting, machining or hogging devices to produce the required profile on the radial face of the backsawn boards.

21. A sawing device according to Claims 13 to 15 in which one or more bandsaws at the required separation are used to make the required cuts to produce the said backsawn boards.

22. A sawing device according to Claim 21 in which the holding and referencing devices of Claims 13 and 14 are placed next to each other so that more than one radially sawn wedge can be cut with one bandsaw blade.

23. A method in which radial sawn wedges which have been resawn are sorted into said boards of different width by virtue of their relative position in relation to the part of the tree that was closest to the outside and the part of the tree that was the closest to the centre of the log.

24. A method according to Claim 1 in which the outer part of a wedge that has had the desired amount removed for resawing and which is considered too wide for the desired purposes is resawn radially along the desired number of radii that extend from the apex of the planes of the two said radial faces and which are resawn to produce backsawn boards so that the cuts are at right angles to the plane that bisects the two new radial faces that had been produced by the resawing along the desired radial lines.

25. A method according to Claim 24 in which radially sawn segments of timber with no physical apex to the said radial faces are resawn to produce the said backsawn boards.

26. A method according to Claim 25 in which a hollow or defective log with no physical centre is radially sawn and then resawn by the claimed method.

27. A device according to Claim 14 in which coned rollers that match the angle of the radial faces hold, support, reference or move radially sawn segments of timber.

28. A method and device according to Claim 27 in which said coned rollers are fitted with flanges to fit into the spaces made by the saws in and after the said backsawing process.

Fig.1

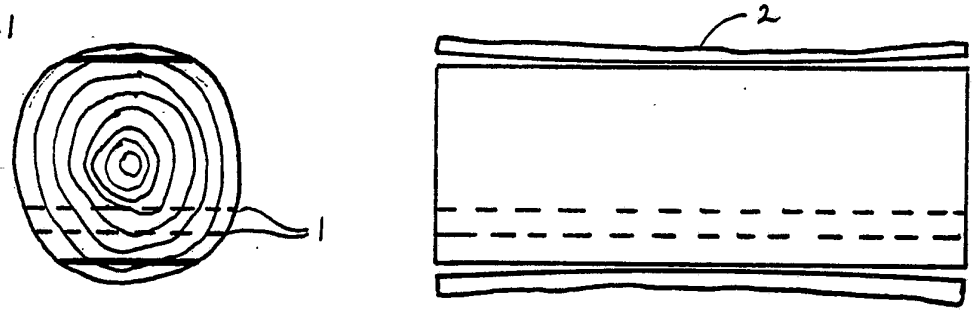


Fig.2

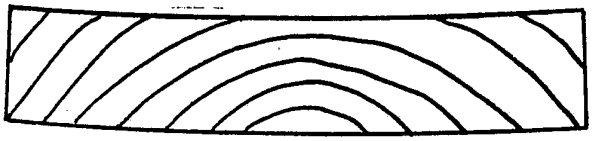


Fig.3

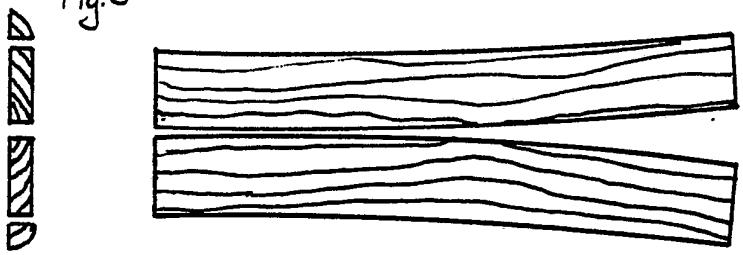


Fig.4

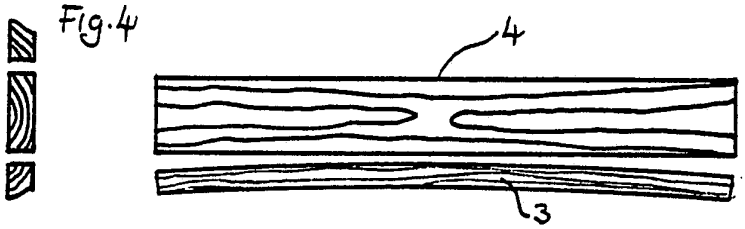
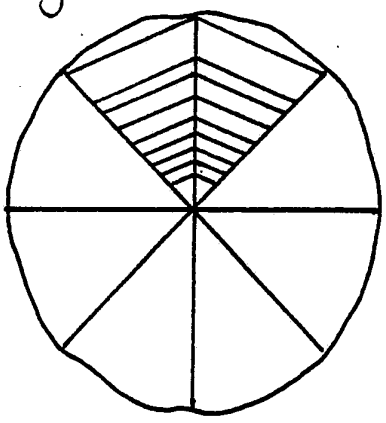


Fig.5



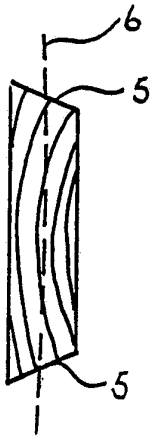


Fig.6

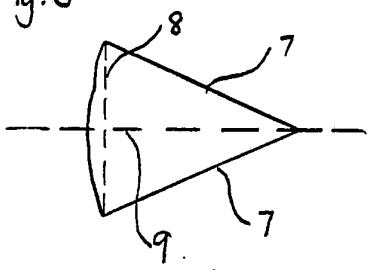


Fig.7

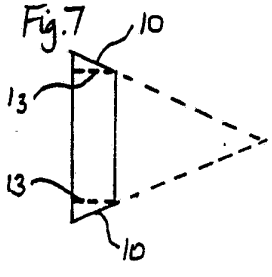


Fig. 8

Fig. 9

Fig. 10

Fig 11

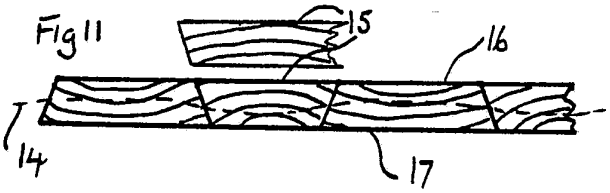


Fig. 12

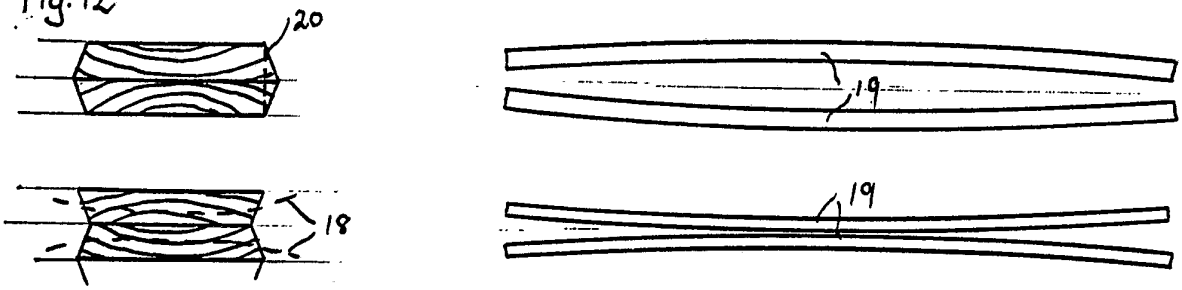


Fig 13

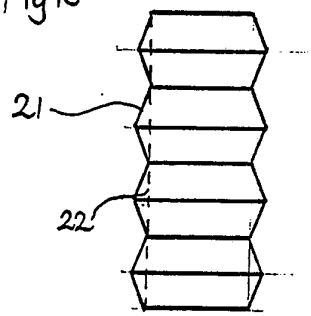


Fig. 15

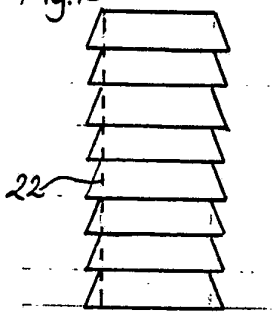


Fig. 14

Fig. 16

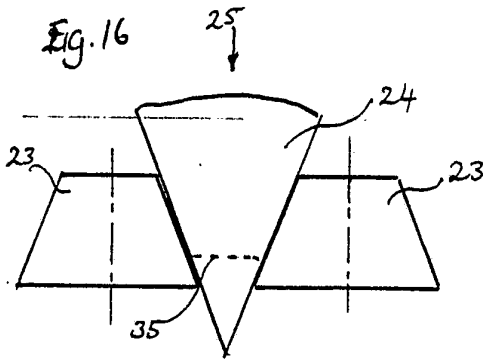


Fig. 17

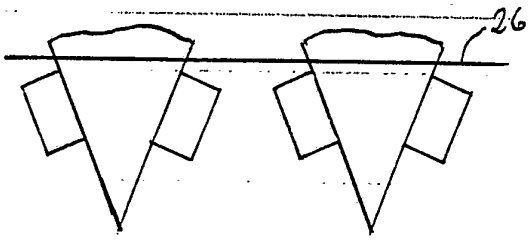


Fig18

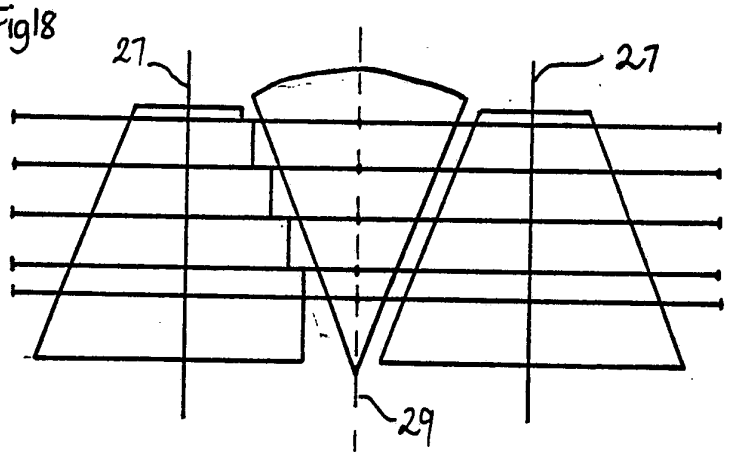


Fig 19

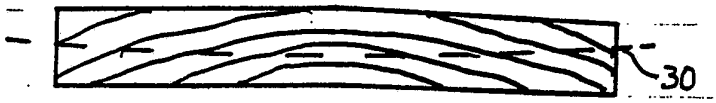


Fig.20

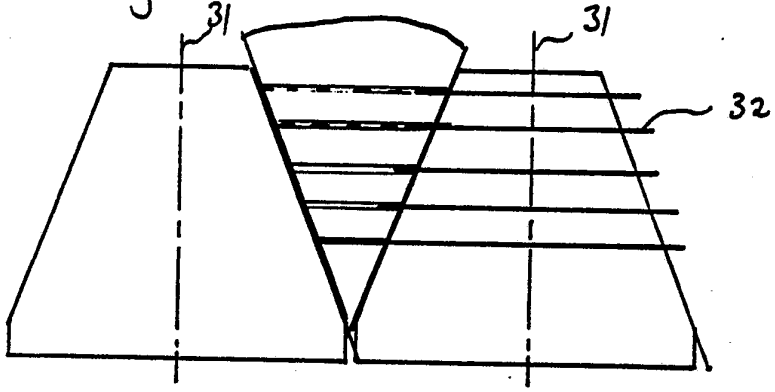


Fig.21

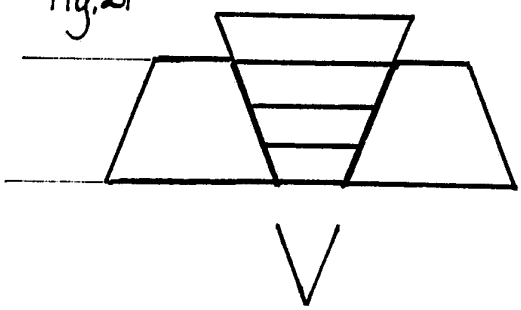
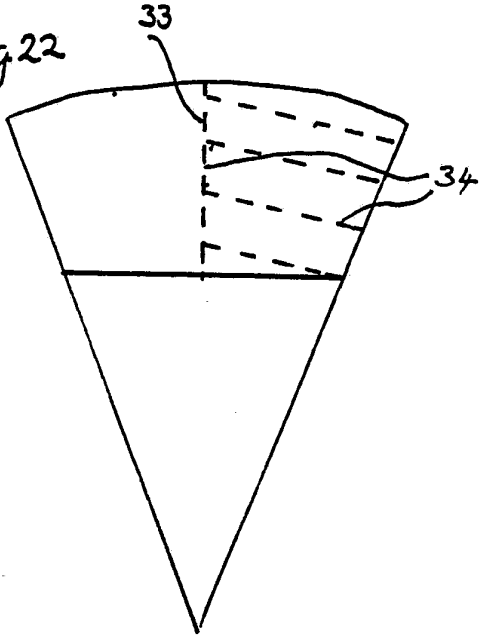


Fig.22



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU92/00461

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.[5] B27B 1/00, B27L 7/00

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: B27B 1/00, B27L 7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	AU,A, 60861/90 (KNORR) 14 February 1991 (14.02.91) whole document	1
A	DE,A, 852899 (ROBMANN) 20 October 1952 (20.10.52) figure 1	1

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means
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"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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 December 1992 (21.12.92)	30 DEC. 1992 (30.12.92)
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929	Authorized officer ABID ALI Telephone No. (06) 2832607