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Composite Floorboards and Method for Constructing Same

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ABSTRACT

A composite wooden laminate floorboard panel (10) comprising a first outer lamination (11), a second outer lamination (12), a plurality of first inner laminations (13, 14) located between the first outer lamination (11) and the second outer lamination (12), and a pair of second inner laminations (13) located between the first outer lamination (14a) and the second outer lamination (14b), wherein the first inner laminations (13) are also located between the second inner laminations (14a and 14b), wherein the first laminations (13) have a grain direction transverse to a grain direction of the second laminations (14).

(FIG 2)

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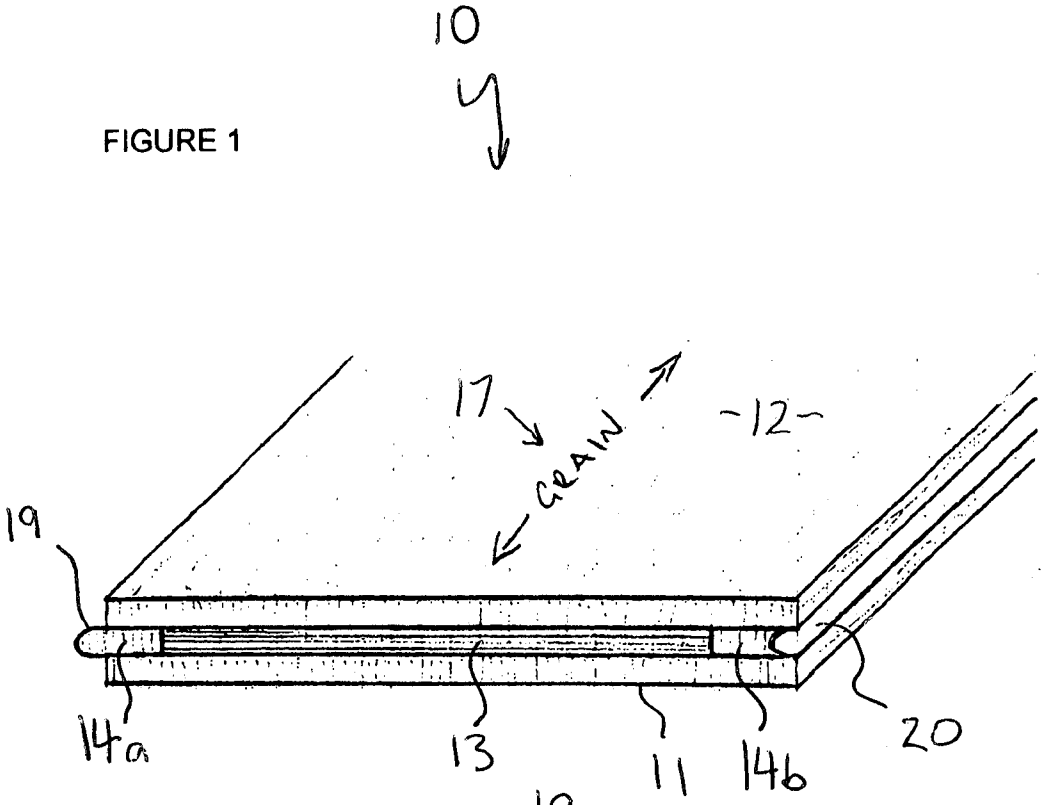

FIGURE 1

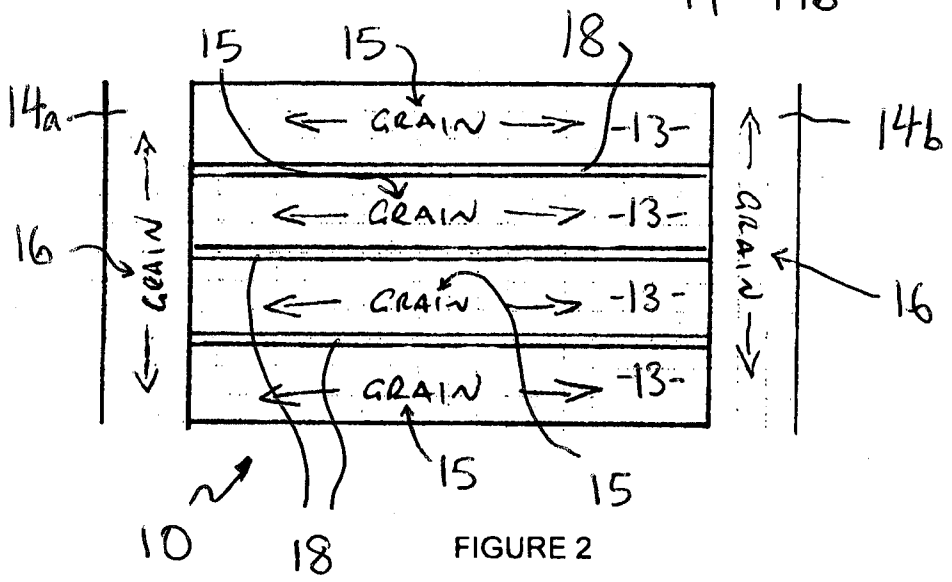

FIGURE 2

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Composite Floorboards and Method for Constructing Same

Field of the Invention

This invention relates to laminates used for producing a composite panel and has particular relevance to the formation of floorboards, composite floorboards and like panels. It also relates to a method for producing a lamination, and a method for producing a laminate panel.

Summary of the Invention

According to the present invention, there is provided a method for producing a wooden lamination, the method comprising the steps of:

cutting the lamination to a size for inclusion in a laminated panel without need for further cutting of the lamination;

drying the lamination; and

applying a force to the lamination so as to substantially de-stress and flatten the lamination.

Preferably, the lamination is cut from wood. For example, the wood is a hardwood or a bamboo.

In the present specification the term *wood* is intended to mean hard fibrous structural tissue from a plant, such as trees and other woody plants, including grasses, such as bamboo, and the term *wooden* with reference to an object is intended to mean the object is made from such *wood*.

Preferably, the drying step is performed in a kiln.

It is preferred that the lamination is dried in a negative pressure environment. For example, the lamination may be dried in a vacuum or a partial vacuum.

It is preferred that the step of applying a force to the lamination includes applying a flattening force to the lamination.

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Preferably, the method also includes the step of impregnating the lamination with a treatment.

According to the present invention, there is provided a lamination produced using the above method.

According to the present invention, there is provided a method for producing a composite wooden floor laminate panel, the method comprising the steps of:

producing a plurality of first inner laminations, a pair of second inner laminations, a first outer lamination, and a second outer lamination; and

laminating the laminations together such that the first inner laminations and the second inner laminations are located between the first outer lamination and the second outer lamination, and such that the first inner laminations are also located between the second inner laminations, wherein the first inner laminations have a grain direction transverse to a grain direction of the second inner laminations.

In an embodiment the grain direction of the first inner laminations are substantially perpendicular to the grain direction of the second inner laminations.

In an embodiment the first inner laminations extend in length transverse to the direction of the lengths of the second inner laminations. Preferably the lengths of the first inner laminations are substantially perpendicular to the lengths of the second inner laminations.

Preferably the grain direction of the first inner laminations are substantially perpendicular to the grain direction of the outer laminations.

Preferably, at least some of the laminations are produced using the above first mentioned method.

Preferably, the first inner laminations are separated from each other by a gap.

Preferably, one of the second inner laminations cooperates with the first outer lamination and the second outer lamination to form a groove of the composite timber laminate panel.

Preferably, one of the second inner laminations cooperates with the first outer lamination and the second outer lamination to form a tongue of the composite timber laminate panel.

Preferably, at least one of the first outer lamination, second outer lamination, and the second inner laminations is of a higher grade than the first inner laminations.

According to the invention there is provided a method for producing a composite wooden floor laminate panel, the method comprising the steps of:

producing a plurality of first inner laminations, a pair of second inner laminations, a first outer lamination, and a second outer lamination; and

laminating the laminations together such that the first inner laminations and the second inner laminations are located between the first outer lamination and the second outer lamination, and such that the first inner laminations are also located between the second inner laminations, wherein the first inner laminations extend in length transverse to the direction of the lengths of the second inner laminations.

According to the present invention, there is provided a composite timber laminate panel produced using one of the above methods.

According to the present invention, there is provided a composite wooden floor laminate panel comprising a first outer lamination, a second outer lamination, a plurality of first inner laminations located between the first outer lamination and the second outer lamination, and a pair of second inner laminations located between the first outer lamination and the second outer lamination, wherein the first inner laminations are also located between the second inner laminations, wherein the first inner laminations have a grain direction transverse to a grain direction of the second inner laminations.

According to the present invention, there is provided a composite timber laminate panel comprising a first outer lamination, a second outer lamination, a plurality of first inner laminations located between the first outer lamination and the second outer lamination, and a pair of second inner laminations located between the first outer lamination and the second outer lamination, wherein the first inner laminations are also located between the second inner laminations, wherein the first inner laminations extend in length transverse to the direction of the lengths of the second inner laminations.

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Preferably the outer laminations are of a higher quality than the inner laminations. Preferably the outer laminations of the lower layer of the laminated panel and the inner laminations are of a lower quality than laminations of an upper layer of the laminate panel.

According to the present invention, there is provided a method for drying wooden laminate panels comprising the steps of:

cutting one or more panels from one a larger piece of wood having a high moisture content, to form one or more panels of a size ready for use in a composite laminate panel without need for substantial size reduction; and

subjecting the, or each, panel to a drying step for a pre-determined residence time to obtain a desirable moisture content, the drying step being conducted at relatively low temperature and high relative humidity.

Preferably the method further comprises: grading the or each panel for quality and layering a plurality of panels together such that an upper layer comprises a higher quality panel, and at least one lower layer comprises a lower quality panel.

In an embodiment the method further comprises sanding the, or each, panel to a predetermined thickness.

Preferably, the method also comprises the step of applying a substantially waterproof seal to the panel.

Preferably, the panels are cut to a thickness of within the range of about 5mm to 18mm.

More preferably, the panels are cut to a thickness of about 7mm.

Preferably the drying step is performed in a kiln.

Preferably the drying step is performed at a dry bulb temperature within the range of about 25°C and 50°C and wet bulb temperature within the range of about 25°C and 50°C, wherein the dry bulb temperature and wet bulb temperature are not required to be equivalent.

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Preferably, the relative humidity within the kiln is maintained at least about 50%.

More preferably, the humidity within the kiln is maintained within the range of about 45% to 85%.

Preferably, the residence time is within the range of 3 days and 10 days.

Preferably, the one or more panels are sanded to a thickness of about 5mm.

More preferably, the one or more panels are all sanded to substantially the same thickness.

Panels are preferably layered by applying a bonding substance to each panel, such that the bonding substance resides between the connecting surfaces of the panels.

According to the present invention, there is provided a composite wooden floor laminate panel formed by one of the methods defined above.

Preferably, the method also comprises the step of applying a substantially waterproof seal to the panel.

Brief Description of the Drawings

In order that the invention may be more fully understood and put into practice, a preferred embodiment thereof will now be described with reference to the accompanying drawings, in which:
Figure 1 is a perspective view of a composite timber laminate panel; and
Figure 2 is a cross-sectional plan view of the composite timber laminate panel depicted in figure 1.

Best Mode(s) for Carrying out the Invention

An example method for drying laminate for the formation of wooden panels and forming composite panels which can be used as floorboards will now be described.

Referring to figures 1 and 2, a composite wooden laminate floor panel 10 includes a first outer lamination 11, a second outer lamination 12, a plurality of first inner laminations 13, and a pair of second inner laminations 14.

The laminations 11, 12, 13, 14 are laminated together such that a length of each of the first inner laminations 13 is substantially perpendicular to a length of the second inner laminations 14. The lengths of the first inner laminations 13 are also substantially perpendicular to a length of the first outer lamination 11, and a length of the second outer lamination 12. Typically a wood grain of the laminations are substantially parallel to the lengths of the laminations 11, 12, 13, or 14. Alternatively or additionally, the laminations 11, 12, 13, 14 are laminated together such that a wood grain direction of each of the first inner laminations 13 is substantially perpendicular to a wood grain direction of the second inner laminations 14, a wood grain direction of the first outer lamination 11, and a wood grain direction of the second outer lamination 12. The wood grain direction of each of the first inner laminations 13 is indicated by the arrows 15. The wood grain direction of the second inner laminations 14 is indicated by the arrows 16. The wood grain direction of the first outer lamination 11 and the second outer lamination 12 is indicated by the arrows 17.

The laminations 11, 12, 13, 14 are secured together with a suitable securing means. For example, the laminations 11, 12, 13, 14 may be secured together with a suitable adhesive such as wood glue.

The laminations 11, 12, 13, 14 are produced by cutting them from one or more larger pieces of green wood (e.g. a timber log or billet or a length of bamboo) having a high moisture content. In particular, the laminations 11, 12, 13, 14 are cut from a larger piece of wood which is green instead of dry.

The laminations 11, 12, 13, 14 are then dried in a kiln to reduce their moisture content. Preferably, the pressure environment inside the kiln during the drying process is a negative pressure environment so that the laminations 11, 12, 13, 14 are dried in a vacuum or a partial vacuum. It has been found that negative pressure or vacuum drying

uses less energy than non-vacuum drying. In addition, it has been found to cause less deterioration of the material that is being dried, and also enables a high quality final flattened lamination to be produced. The use of negative pressure in the drying process allows the moisture in the laminations 11, 12, 13, 14 to be more rapidly and efficiently removed compared to using traditional drying methods which rely on diffusion of water molecules naturally through the wood being dried.

The drying step is performed at relatively low temperatures comparative to dry bulb and wet bulb temperatures (measurement of these two parameters allows calculation of the relative humidity within the kiln). The dry bulb temperature is within the range of about 25°C and 50°C and wet bulb temperature within the range of about 25°C and 50°C, although the dry bulb temperature and wet bulb temperature are not required to be equivalent. The relative humidity within the kiln is maintained at, at least about 50%, for example within the range of 45% and 85%. This prevents the panels from drying too rapidly and minimises the, occurrence of fibre cell collapse, resulting in a maximum recovery of timber and less waste.

The residence time of the laminates within the kiln is substantially reduced, being within the range of about 3 to 10 days, for example about 3 to 4 days.

As the laminations 11, 12, 13, 14 are dried, they are weighted and conditioned to de-stress and flatten them. This involves applying a specified amount of downward force to the laminations 11, 12, 13, 14 as they are dried in the kiln. The downward force along with the kilning conditions removes the inherent stresses that are within the laminations 11, 12, 13, 14 that, if not removed, could contribute to failure of the panel 10. If the weighting and conditioning process is not used, it would not be possible to de-stress and flatten the green laminations 11, 12, 13, 14 as they are drying. This allows the green laminations 11, 12, 13, 14 to be kept very flat.

It will be understood by a person skilled in the art that the desired moisture content will be dependent on the target market and the climate in the region.

During the conditioning process, the laminations 11, 12, 13, 14 can be impregnated with different types of treatments. Steam can be used with various treatments (e.g. anti-fungal

etc.) so that the steam treatment molecules are absorbed into each of the laminations 11, 12, 13, 14 of the panel 10 instead of just on the surface of the panel 10. The steam combined with the heat of the drying process elasticises the laminations 11, 12, 13, 14. In other embodiments, the usage of steam in combination with heat to elasticise the laminations may be omitted.

Traditionally, in the manufacturing of premium flooring substrates or wood of a high grade, only the highest grade wood can be harvested from a log or from a length of bamboo. However, with the three layer construction of the panel 10, it is possible to use more of the wood than would traditionally be used. If a laminate is not graded as being of a high face grade, the laminate can be utilised in parts of the panel 10 such as the inner laminations 13 where the appearance of the material is of no consequence but where structural ability or strength is important. This enables the percentage of the green wood that is used in the construction of the panel 10 to be very high, and at the same time enables the production of a panel 10 that is a premium standard product. Thus, lower grade green wood can be used to produce high grade products.

In addition to the three layer construction of the panel 10, the process of cutting green laminations also assists in achieving up to approximately 98% recovery of green wood from which the laminations are cut. This makes the process of constructing the panels 10 a highly efficient one at least from the standpoint of the percentage of raw wood material that is used.

If the laminations 11, 12, 13, 14 were cut from a dry piece of wood, it would be very difficult if not impossible to achieve such results, and would take substantially longer to dry the wood. This is because, traditionally, when large sections of wood are kiln dried, a lot of waste is created.

By cutting the wood into the laminations 11, 12, 13, 14 that are laminated together to form the panel 10, rather than forming the panel 10 from a single piece of wood as is traditionally done for floor boards etc., the inherent stresses in the laminations 11, 12, 13, 14 are overpowered, and the traditional kilning process issue of a large amount of waste is overcome.

Cutting the wood into the laminations 11, 12, 13, 14 also enables more exact control of the moisture content within the processed wood. The outside of wood always dries faster than its inside. However, by cutting thinner sections such as the laminations 11, 12, 13, 14, it is possible to better control the moisture content of the panel 10, which may be a floor panel or board, so that it is the same or substantially the same throughout the panel 10. The panel 10 has the same or substantially the same moisture content throughout and the same or substantially same de-stressed component (i.e. laminations 11, 12, 13, 14) throughout, so that essentially the whole structure/panel 10 is more stable than it would otherwise be.

If required, the panels are then directed to a sanding step where they are sanded to a uniform thickness of 5mm +/- 0.1 mm, and are then visually graded for quality. The higher quality panels are utilised for the upper surface of a composite laminate floorboard, whilst the lower quality panels form the core and lower surfaces. The panels are thus bonded together using methods known in the art.

All the waste/imperfect wood from which the various laminations are cut is turned into the small section laminations (i.e. first inner laminations 13) that are laid across the face of the board/panel 10 (i.e. cross engineering). This allows odd sized, low grade material to be used as part of the structure of the board/panel 10. By using the same material throughout, this gives the board/panel 10 better structural integrity. The first inner laminations 13 may be separated from each other by small expansion gaps 18 to assist in the event of the laminations 13 expanding due to high moisture.

The small section second inner laminations 14 are positioned along either side of the floor board/panel 10 to lock the centre of the panel 10 away from variations in the environment. The second inner laminations 14 cooperate with the first outer lamination 11 and the second outer lamination 12 to form a tongue 19 (from lamination 14a) and a groove 20 (from lamination 14b) of the panel 10. The tongue 19 and groove 20 can function better than the tongue and groove of a traditional panel.

Finally the composite panels are machined to refine the edges and surfaces, before a finishing coat is applied. The finishing coat is substantially waterproof and minimised moisture loss or absorption by the panels.

The use of laminations in the construction of the panel 10 allows a very high utilization of wood in the laminations. An imperfection can be cut out or broken down into smaller sections such as the laminations 11, 12, 13, 14, so as to have a negligible effect.

Engineered floorboards are traditionally made from materials (e.g. pine, birch, etc.) that are less expensive. Each lamination, including the inner laminations 13, of the panel 10 is made from the same material or type of wood, and all or most of the log from which the laminations are cut is used. Instead of wasting turning lower grade wood, it is used to make the laminations 13 whose appearance is not important but whose strength is. Higher grade/premium wood is used for the laminations that will function as the face or faces of the panel 10. Using the same type of material for all of the laminations makes the board/panel 10 more stable and also ensure that the whole board/panel 10 has the same insect resistance throughout for the particular wood that the laminations of the panel 10 are made from.

Boards/panels such as the panel 10 that are produced using the above-described process can be larger and wider than solid conventional floor boards/panels whilst remaining flat and stable.

The process of producing the panel 10 means that there are six faces (i.e. the two main faces of the first outer lamination 11, the two main faces of the second outer lamination 12, and the two main faces of the lamination that includes the first inner laminations 13 and the second inner laminations 14) to choose from for use as the surface or face of the floor board/panel, and provides the opportunity for the other/remaining five faces to be of a lower quality than the floor board/panel face while still enabling a premium product to be produced.

It will be appreciated by those skilled in the art that variations and modifications to the invention described herein will be apparent without departing from the spirit and scope thereof. The variations and modifications as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein set forth.

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Throughout the specification and claims, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Throughout the specification and claims, unless the context requires otherwise, the term "substantially" or "about" will be understood to not be limited to the value for the range qualified by the terms.

It will be clearly understood that, if a prior art publication is referred to herein, that reference does not constitute an admission that the publication forms part of the common general knowledge in the art in Australia or in any other country.

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CLAIMS:

1. A composite wooden laminate floorboard panel comprising a first outer lamination, a second outer lamination, a plurality of first inner laminations located between the first outer lamination and the second outer lamination, and a pair of second inner laminations located between the first outer lamination and the second outer lamination, wherein the first inner laminations are also located between the second inner laminations, wherein the first inner laminations have a grain direction transverse to a grain direction of the second inner laminations.

2. A panel according to claim 1, wherein the first inner laminations extend in length transverse to the direction of the lengths of the second inner laminations.

3. A panel according to claim 1 or 2, wherein the inner laminations are of a lower quality than laminations of an upper layer of the laminate panel.

4. A panel according to any of claims 1 to 3, wherein the outer laminations have a grain direction substantially perpendicular to a grain direction of hidden inner laminations.

5. A method for producing a composite wooden laminate floorboard panel, the method comprising the steps of:

producing a plurality of first inner laminations, a pair of second inner laminations, a first outer lamination, and a second outer lamination; and

laminating the laminations together such that the first inner laminations and the second inner laminations are located between the first outer lamination and the second outer lamination, and such that the first inner laminations are also located between the second inner laminations, wherein the first inner laminations have a grain direction transverse to a grain direction of the second inner laminations;

wherein the laminations are each produced by:

cutting the lamination from a larger piece of wood having a high moisture content, wherein the lamination is of a size for inclusion in a laminated panel without need for further cutting of the lamination;

drying the lamination; and

applying a force to the lamination so as to substantially de-stress and flatten the lamination.

6. A method according to claim 5, wherein the first inner laminations are arranged to extend in length transverse to the direction of the lengths of the second inner laminations.

7. A method according to claims 5 or 6, wherein the produced laminations are graded, with lower quality laminations used in the inner laminates and higher quality laminations used in an upper layer of the laminated panel.

8. A composite wooden laminate floorboard panel formed by the method according to any of claims 5 to 7.

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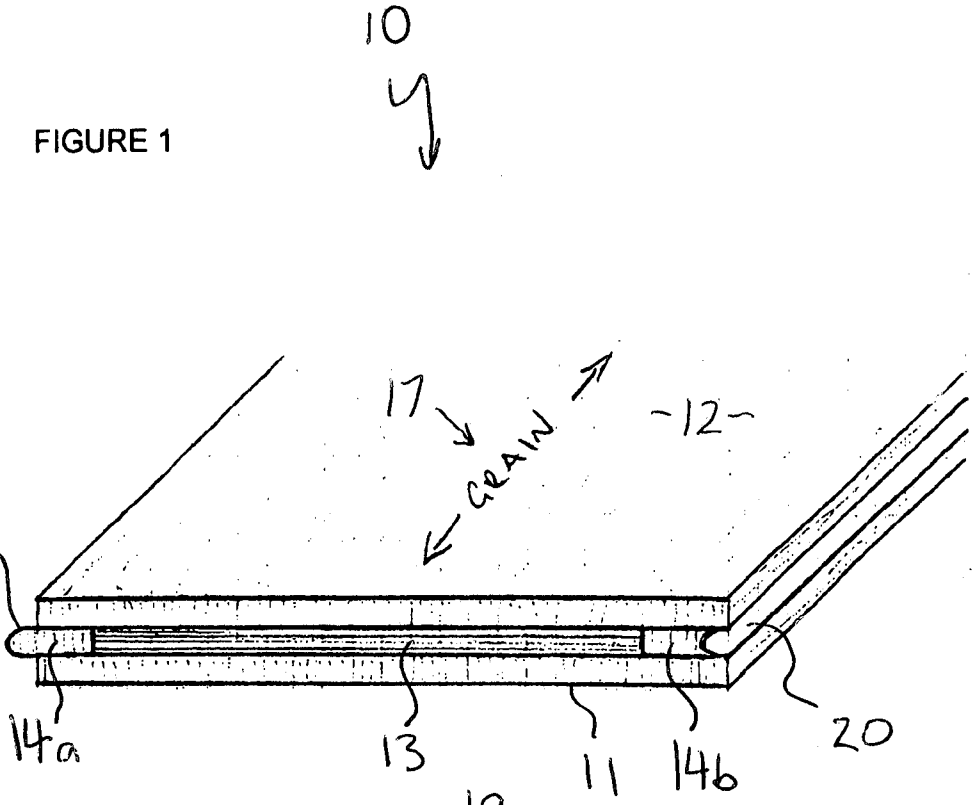

FIGURE 1

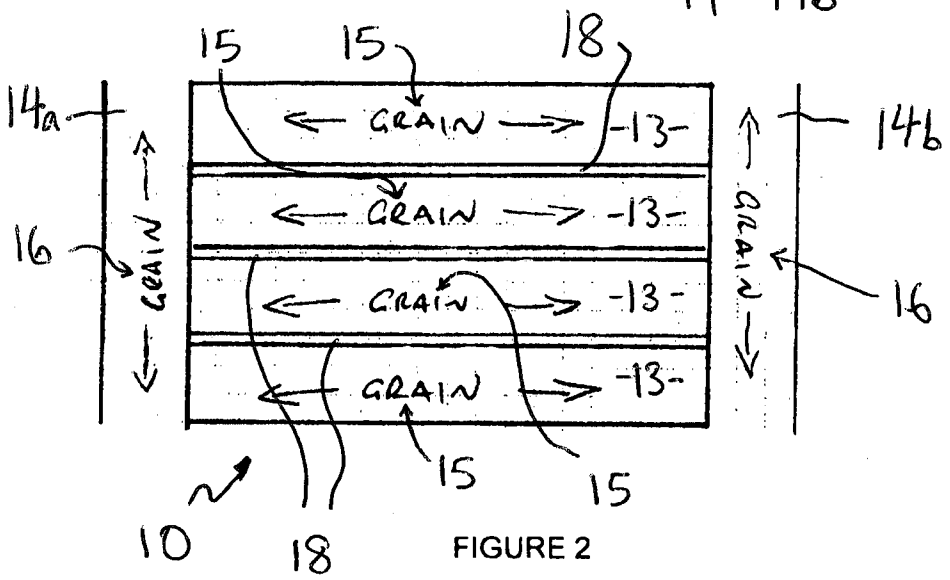

FIGURE 2