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(54) HARDWOOD FLOORING BOARD

(76) Inventor: **Tryggvi Magnusson**, Wausau, WA (US)

Correspondence Address:
BOYLE FREDRICKSON NEWHOLM STEIN & GRATZ, S.C.
250 E. WISCONSIN AVENUE
SUITE 1030
MILWAUKEE, WI 53202 (US)

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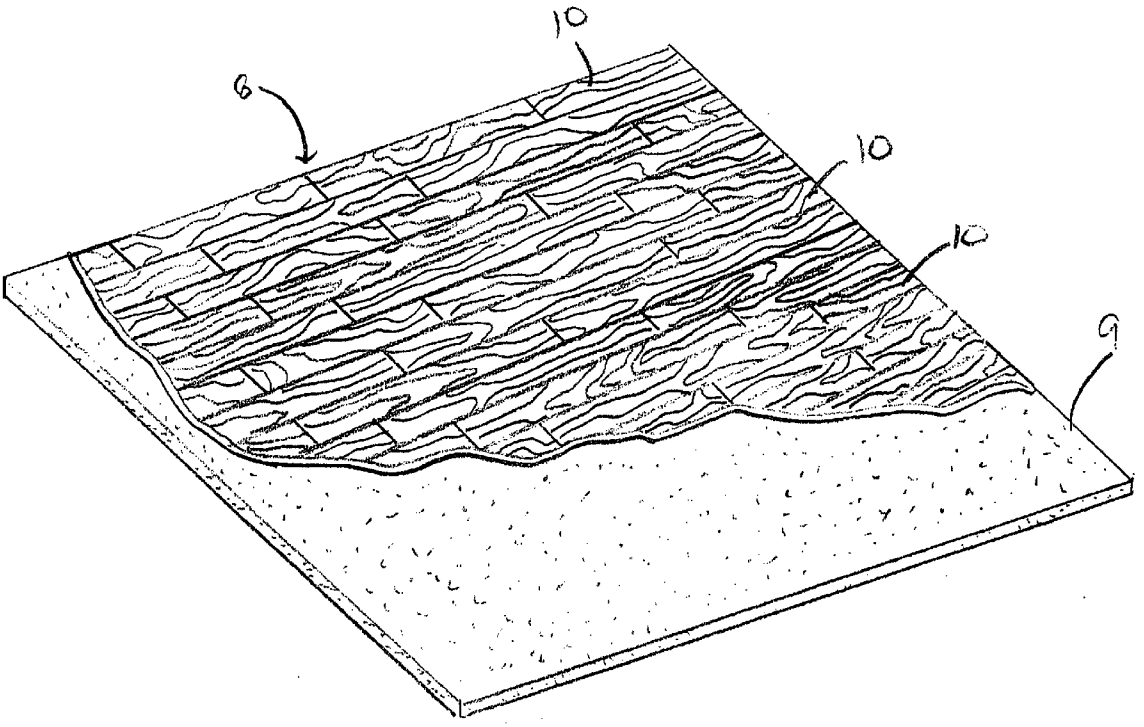
(57) **ABSTRACT**

The present invention is a hardwood flooring board including a middle layer formed from a non-hardwood flooring material and a hardwood material upper layer which is secured to an upper surface of the middle layer that is thick enough to include decorative designs. The middle layer forms between 45% and 75% of the overall material of the board and enables the board to be manufactured to be more dimensionally stable, i.e., wider and longer, than conventional hardwood flooring boards such that the boards can be more uniformly constructed. Also the use of the non-hardwood material in the middle layer greatly increases the dimensional stability and long term performance of the flooring boards, while providing a genuine hardwood appearance to the floor. The board also includes a lower layer that can be formed from either a hardwood material or a non-hardwood material to function as a base for the board. The upper layer is secured to the middle layer by an adhesive that is urged into the openings or cracks in the upper layer during the assembly of the board to prevent the cracks from spreading through the upper layer when the boards are in use.



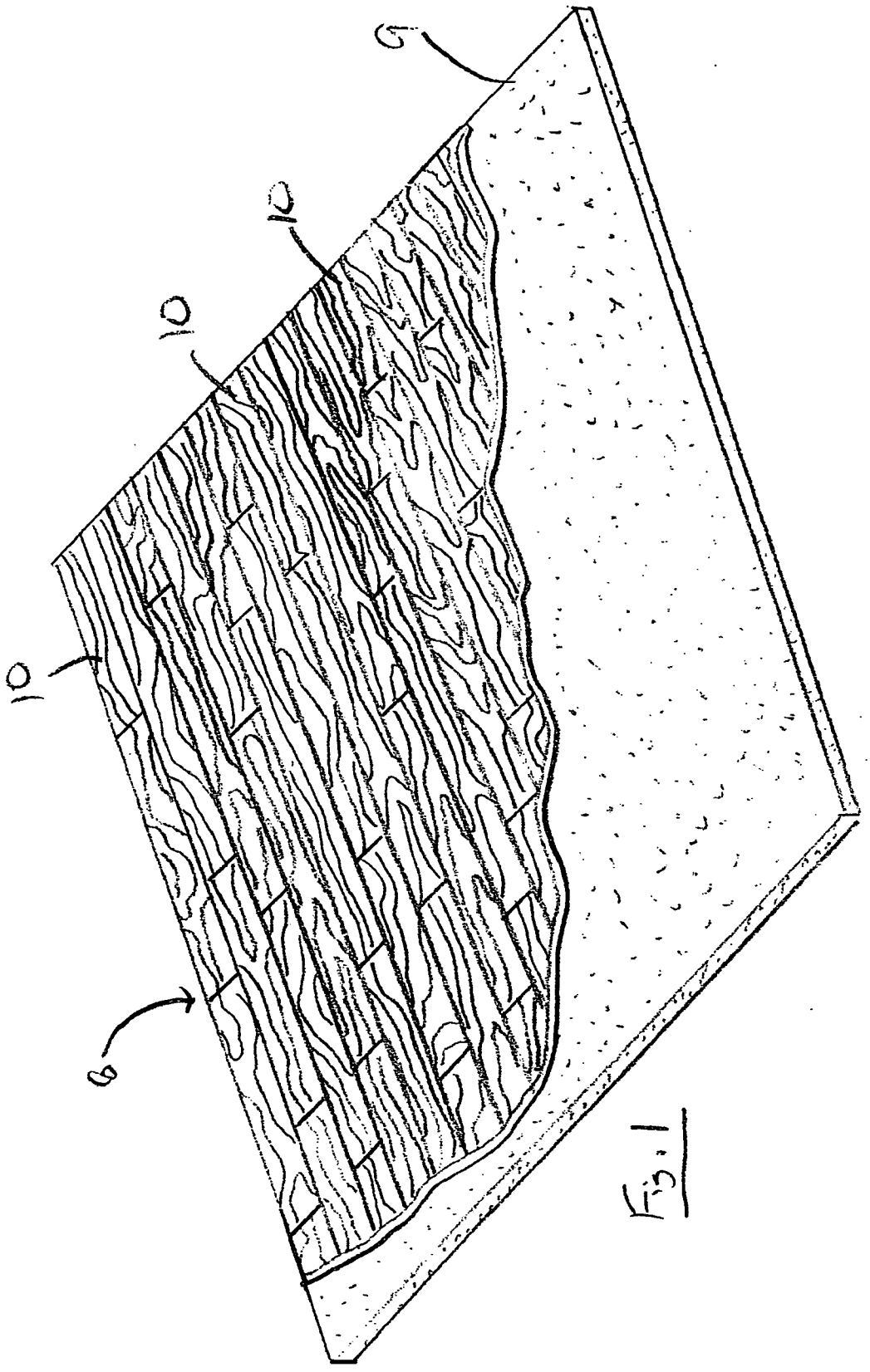


Fig. 1

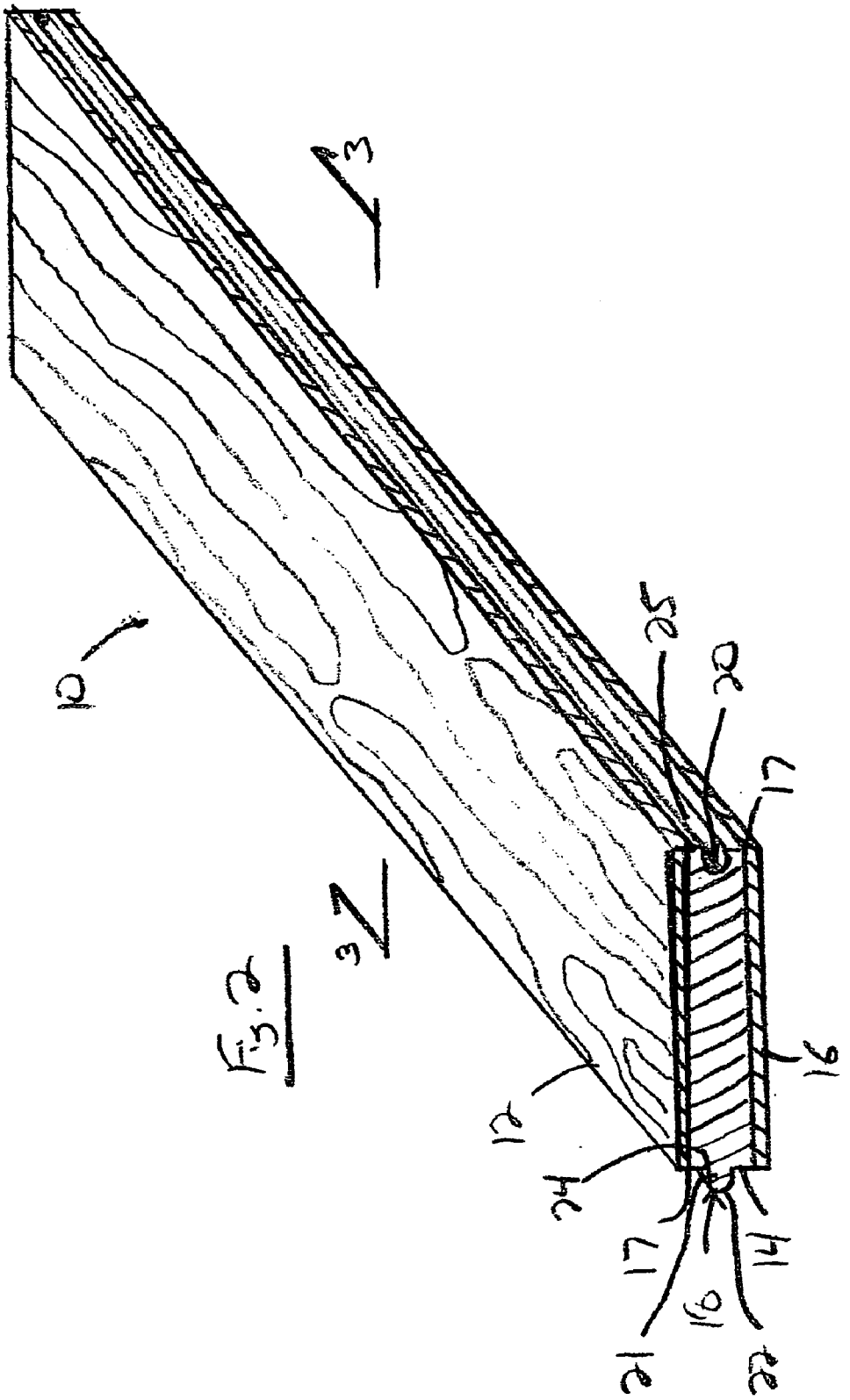


Fig. 2

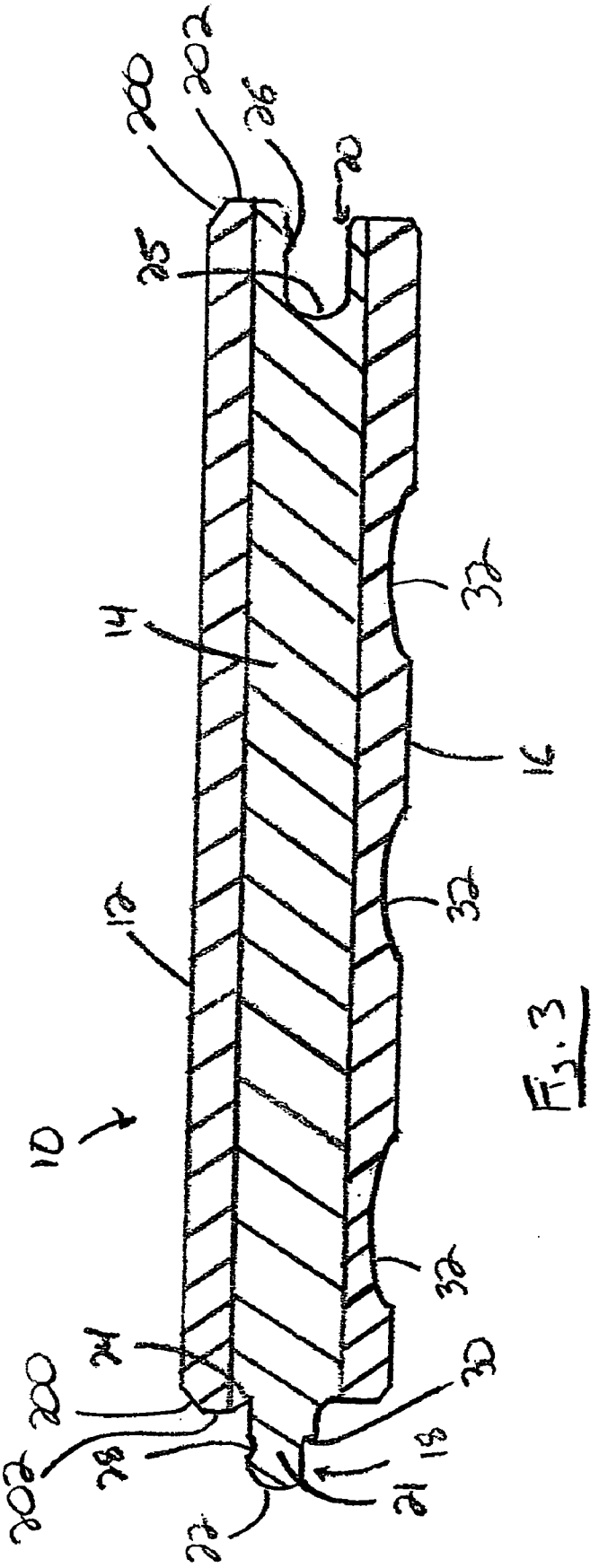


Fig. 3

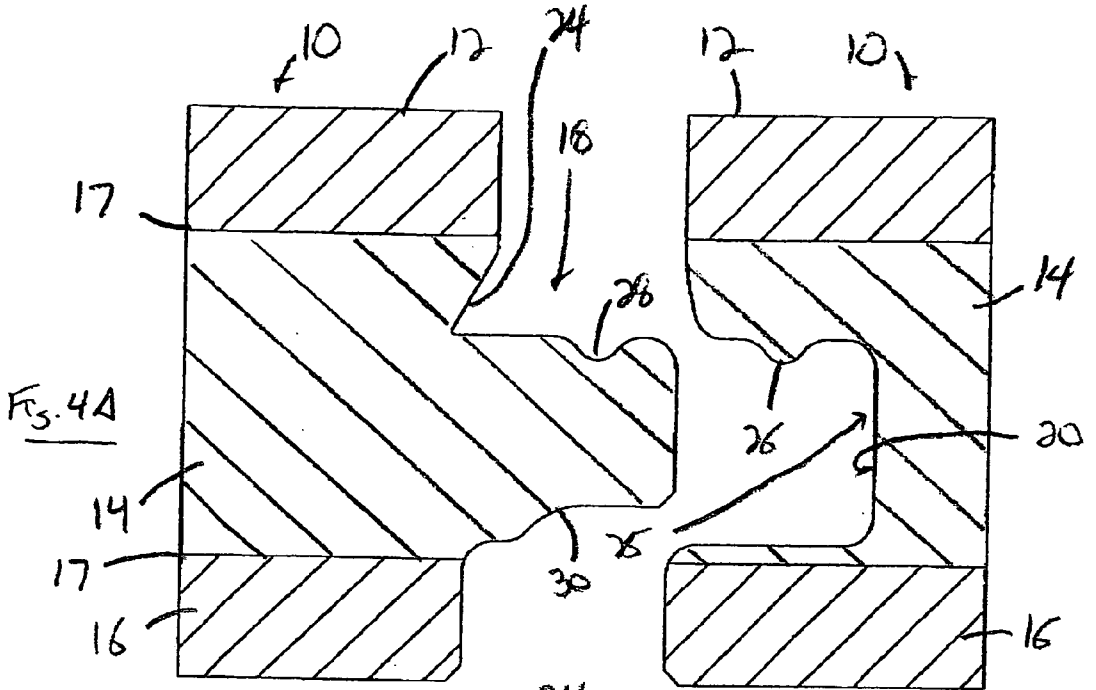

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Fig. 4A

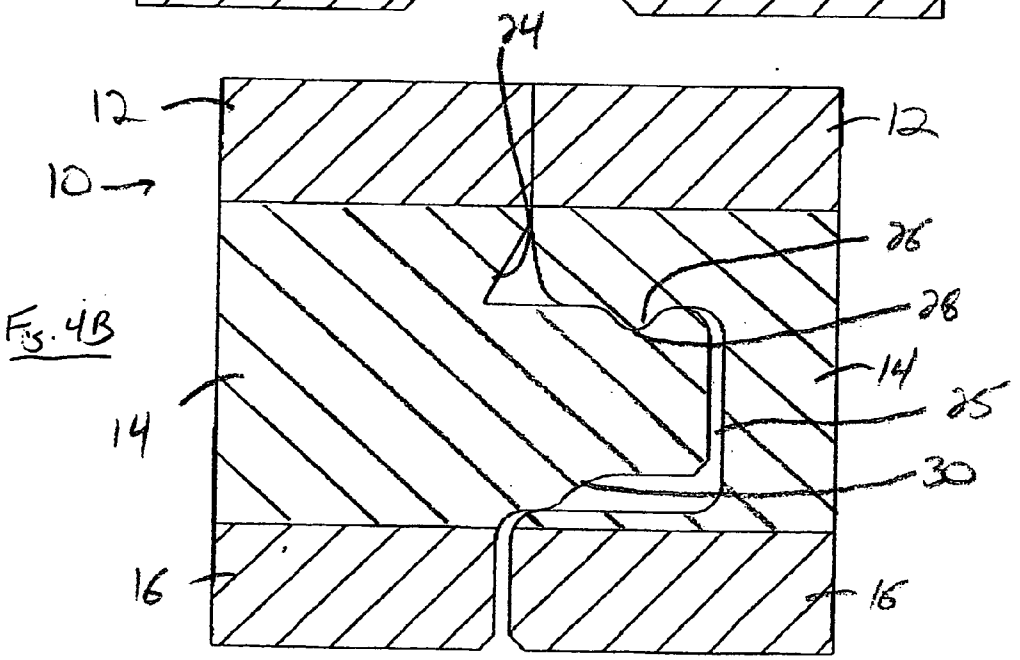
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Fig. 4B

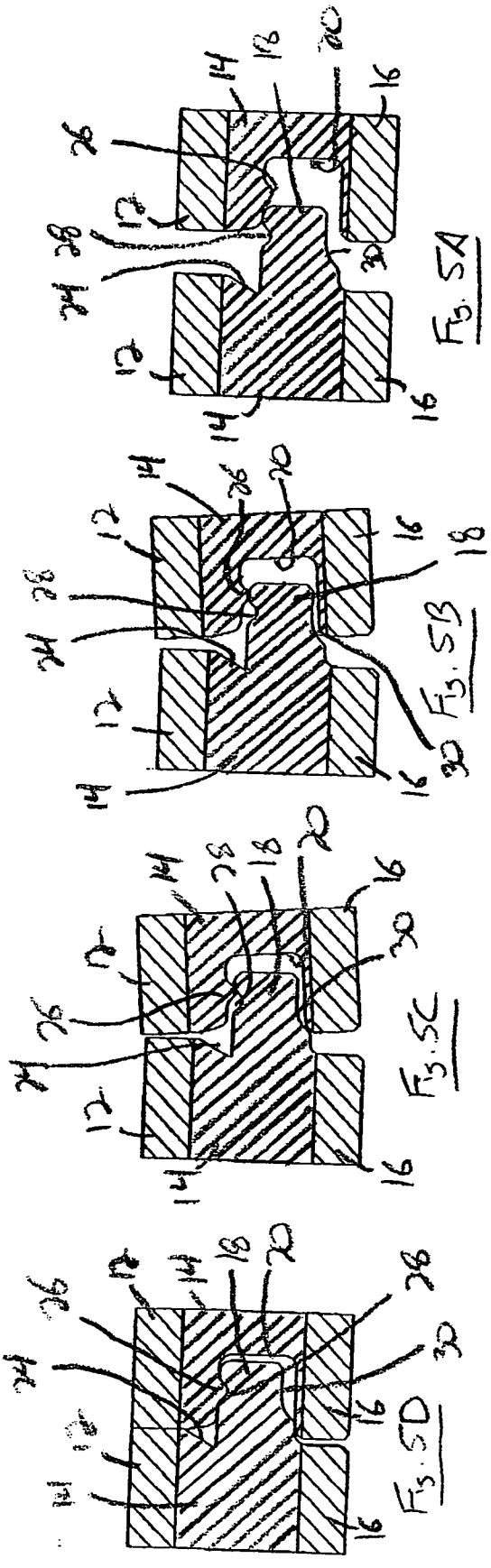

Fig. 5A

Fig. 5B

Fig. 5C

Fig. 5D

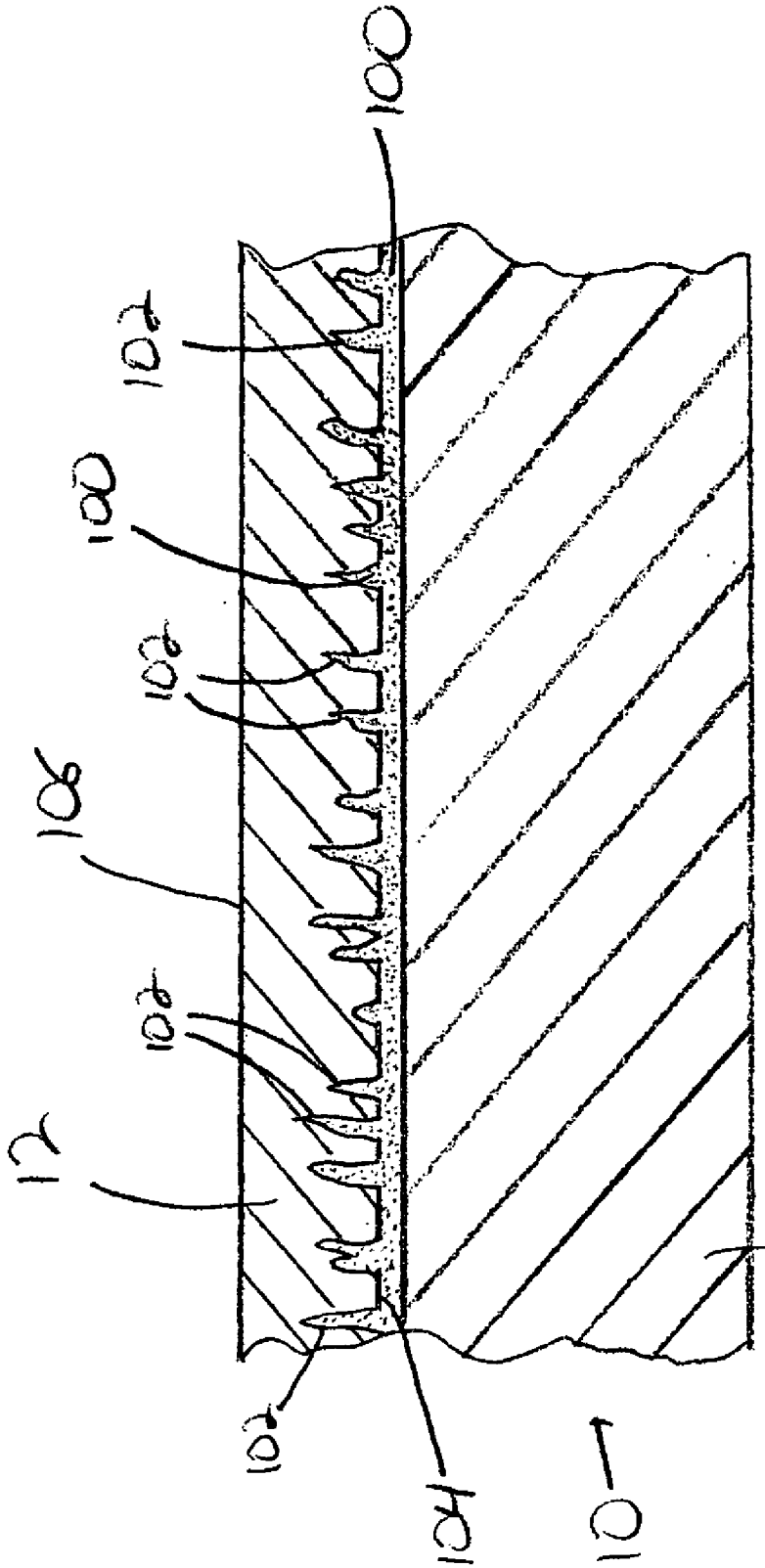

Fig. 6

HARDWOOD FLOORING BOARD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 10/863,696 for an Improved Hardwood Flooring Board filed on Jun. 8, 2004, that claims priority from U.S. Provisional Patent Application Ser. No. 60/563,638, filed on Apr. 20, 2004, the entirety of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to flooring surfaces, more specifically to a flooring surface made of individual flooring boards secured to one another to form the flooring surface.

BACKGROUND OF THE INVENTION

[0003] In a large number of commercial and residential buildings, hardwood flooring surfaces are utilized to provide an aesthetically pleasing appearance to the interior of the building. In most instances, the flooring surface is formed from a number of flooring boards or planks engaged with one another to form the flooring surface. These boards are usually formed entirely of the desired hardwood, with each board being formed into the desired shape to facilitate the use of the boards to form the flooring surface.

[0004] However, while these hardwood flooring surfaces provide the desired appearance to the interior of the building, the natural characteristics of traditional solid wood flooring often create challenges during installation and can develop later effecting the long term performance of the floor.

[0005] To reduce these problems, a number of different types of flooring boards have been developed that are formed from non-hardwood materials that give the appearance of a hardwood. While these boards are faster to install and can be less expensive, the quality of the hardwood appearance is often unsatisfactory, and long term performance is poor, as normal wear and tear can often damage the hardwood-appearing surface of the boards, exposing the non-hardwood material forming the board.

[0006] Therefore, it is desirable to develop a flooring board that is made of wood, yet is easy to install with a special profile and construction that insures long term performance. Further, the board should be able to be maintained in a manner similar to that of a hardwood surface and offer all the aesthetic features of a traditional solid wood floor.

[0007] Furthermore, with regard to the veneer layers applied to flooring boards of this type, the veneer layers are constructed from sheets of a hardwood material that are cut in a known manner to form the thin veneers from the hardwood material. In this process, the veneer is usually formed with cracks or gaps in one surface of the veneer, with the other surface being a smooth surface that forms the exposed surface of the flooring board. While these cracks initially do not mar the appearance of the veneer after it is used to form the flooring board, due to fluctuating humidity levels after installation, the cracks can propagate completely through the veneer layer and can break the smooth surface of the veneer, detrimentally effecting the appearance of the hardwood flooring board.

[0008] Therefore, it is also desirable to develop a hardwood flooring board in which the cracks initially present in any veneer layer used to form the exposed, aesthetically pleasing surface of the flooring board are treated to prevent the cracks from propagating through the veneer layer and affecting the overall appearance of the board.

[0009] Also, in order to enhance the appearance of the flooring board and the flooring surface formed by the board, certain decorative features (i.e., a beveled edge, scraping, or embossing) can be added to the hardwood decorative surfaces of the boards during the production and milling process. However, due to the fact that traditional solid hardwood boards need to be sanded on the job site after installation and prior to finishing, any decorative enhancement that was added to the hardwood surface during the production and milling process would be eliminated or significantly altered during this sanding process.

[0010] Thus, it is further desirable to develop a laminate hardwood flooring board that has the ability to incorporate designs on the exposed surface of the board in order to enhance the appearance of the board in manner that would not be eliminated or altered after installation.

SUMMARY OF THE INVENTION

[0011] According to a primary aspect of the present invention, an improved hardwood flooring is constructed with upper and lower layers formed of a conventional flooring material and a central or middle layer formed of an alternative non-hardwood flooring material. The board includes a hardwood layer forming the upper layer of the board to give the board the appearance of a conventional hardwood flooring surface when the boards are assembled to form the flooring surface. This enables the boards to be sanded when damaged similarly to a hardwood only board in order to maintain the hardwood appearance of the board.

[0012] However, the use of the alternative flooring material as the middle layer or core of the board greatly increases the dimensional stability of the board. In addition, the raw material cost for the non-hardwood material forming the middle layer costs less than that of the hardwood forming the upper layer. Further, the types of non-hardwood materials that can be used to form the middle layer can be chosen to enhance various properties of the board, such as the dimensional stability, longer average board length and a specially milled connection between each board that significantly minimizes any future visible contraction of each board.

[0013] According to another aspect of the present invention, the upper layer or veneer layer of the board is secured to the middle layer by a suitable adhesive in a process which urges the adhesive into the cracks present on an inner surface of the veneer layer. By urging the adhesive into the cracks, the adhesive effectively prevents the spread or propagation of the cracks in the veneer layer such that these cracks will not detrimentally affect the appearance of the veneer layer by spreading completely through the veneer layer due to any changes in the environmental conditions surrounding the boards.

[0014] According to still another aspect of the present invention, the high-strength construction enables the board to be sanded and precisely milled after it is formed, and prior to installation, such that once the boards is installed they

require only a light screening (i.e., sanding with 120 grit sandpaper) that lightly abrades the surface of the board so that the wood readily accepts a finish. Also, because the board does not require significant sanding after installation, the board may be formed with a wide range of decorative features (i.e., a beveled edge, scraping, or embossing) that enhance the appearance of the boards and the resulting flooring surface formed by the boards.

[0015] Other aspects, features and advantages of the present invention will be made apparent from the following detailed description taken together with the drawing and figure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The drawings illustrate the best most currently contemplated of practicing the present invention.

[0017] In the drawings:

[0018] **FIG. 1** is an isometric view of a flooring surface constructed using boards formed according to the present invention;

[0019] **FIG. 2** is an isometric view of a flooring board constructed according to the present invention;

[0020] **FIG. 3** is a cross-sectional view along line **3-3** of **FIG. 2**;

[0021] **FIGS. 4A-4B** are partially broken away cross-sectional views of the boards of **FIG. 3** in connected and disconnected configurations;

[0022] **FIGS. 5A-5D** are partially broken away cross-sectional views illustrating the connection of the boards of **FIGS. 4A-4B**; and

[0023] **FIG. 6** is a partially broken away cross-sectional view of a flooring board having a veneer surface secured to the board using the adhesive and method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0024] With reference now to the drawing figures in which like reference numerals designate like parts throughout the disclosure, a flooring surface is shown generally at **8** in **FIG. 1**. The surface is formed over a support surface **9**, such as a concrete slab, from a number of flooring boards **10** constructed according the present invention.

[0025] Looking now at **FIGS. 2-3**, each board **10** is between 0.10 inches and 1.00 inches, and preferably about 0.75 inches in thickness, and includes an upper layer **12**, a core or middle layer **14** and a lower layer **16**. The upper layer **12** and the lower layer **16** can be attached to opposites sides of the middle layer **14** in any conventional manner, such as by using an adhesive or mechanical fasteners, in conjunction with heat and/or pressure, so as long as the upper layer **12** and lower layer **16** are prevented from delaminating or otherwise becoming detached from the middle layer **14** during the installation and use of the boards **10**.

[0026] The upper layer **12** is formed of a conventional hardwood material in order to provide the desired aesthetic appearance to the flooring surface **8** constructed using the boards **10**. Any particular hardwood material can be used for upper layer **12**, depending upon the desired appearance for the flooring surface **8**. The upper layer **12** has a thickness of between about two (2) mm and about five (5) mm. This allows the upper layer **12** to be sanded approximately 3-5 times before the layer **12** is worn completely through. Thus, any gouging, scratching or refinishing of the upper layer **12** can be done similarly to a conventional hardwood flooring board without exposing the middle layer **14**, as occurs with the prior art engineered non-hardwood flooring boards. Also, due to the use of a hardwood material to form the upper layer **12**, the board **10** can have a face grade from the National Oak Flooring Manufacturers Association similar to the boards formed entirely of the hardwood.

[0027] The lower layer **16** can also be formed from a hardwood material similar to the upper layer **12**, or can be formed from a non-hardwood material that has certain selected properties, e.g., water resistance or rigidity, as a base for the board **10**. The material forming the lower layer **16** is capable of being secured to the support surface **9** by any suitable means, such as an adhesive, when the boards **10** are attached "in flex," or a mechanical fastener, e.g., a nail or screw, to hold the boards **10** thereon to form the flooring surface **8**. The lower layer **16** also has a thickness comparable to the upper layer **12**, preferably between about two (2) mm and about five (5) mm.

[0028] The middle layer **14** is formed of an alternative, non-hardwood flooring material that provides a stable core for the board **10**. The non-hardwood material used in the middle layer **14** can be any suitable generally rigid and non-compressible material, but is preferably a material such as High Density Fiber Board, Medium Density Fiber Board, plywood, chipboard, Orientated Strand Board, a cheaper wood or wood composite material, or the like, in comparison to the materials utilized to form the upper layer **12** and the lower layer **16**. This non-hardwood material can be selected and used to form the middle layer **14** to create boards **10** that are more dimensionally stable such as by orienting the non-hardwood material in a direction perpendicular to the length of the board **10** and the grain of the hardwood forming the upper layer **12**. This enables the boards **10** to be made longer and wider than conventional flooring boards which results in fewer boards **10** being required to form the flooring surface **8**. Also, the non-hardwood material forming the middle layer **14** can be formed or milled very precisely prior to assembly into the board **10**, which results in uniform boards **10** with tight tolerances than can easily by engaged with one another to form the flooring surface **8**.

[0029] To accomplish this, the middle layer **14** is preferably formed to have a thickness of between about six (6) mm and fifteen (15) mm. Thus, the middle layer **14** forms between about 40% and about 75% of the total material of the board **10**, more preferably between 45% and 65% of the total board material, and most preferably about 55% of the total board material.

[0030] In a particularly preferred embodiment, the upper layer **12** and middle layer **14** are secured to one another, with or without the bottom layer **16**, in a process where the middle layer **14** and upper layer **12** are adhered to one another utilizing a suitable adhesive **100**, as best shown in **FIG. 6**. The adhesive **100** is spread on either the upper layer **12** or middle layer **14**, with the upper layer **12** and middle layer **14** subsequently being pressed together in a known

manner. During the compression of the upper layer **12** and the middle layer **14**, the adhesive **100** is cured, such as by heating, UV light, or by mixing of a catalyst into the adhesive prior to application to the layers **12** and **14**, to securely adhere the layers **12** and **14** to one another to form the board **10**. Also, if a bottom layer **16** is present, the bottom layer **16** can be secured to the middle layer **14** in the same manner as the upper layer **12**, and at the same time as the upper layer **12**, or in a completely different manner subsequent to the compression of the upper layer **12** to the middle layer **14**.

[**0031**] Prior to the adhesive completely curing, the adhesive **100** is forced by the compression of the upper layer **12** and middle layer **14** against one another into gaps or cracks **102** present in a lower surface **104** of the upper layer **12** in order to more securely adhere the upper layer **12** to the middle layer **14**. The presence of the adhesive **100** in the cracks **102** also serves to prevent the spread or propagation of the cracks **102** from the lower surface **104** through the entire upper layer **12**. As such, the cracks **102** will not detrimentally affect the appearance of the exposed upper surface **106** of the upper layer **12**.

[**0032**] To enhance the direction of the adhesive **100** into the cracks **102** during compression, the middle layer **14** is formed of a non-oriented fiberboard, in a preferred embodiment that prevents the adhesive **100** from being compressed or flowing into the board forming the middle layer **14**, consequently urging the adhesive **100** upwardly into the cracks **102**. More preferably, this non-oriented fiberboard has a high density at least long the side positioned adjacent the upper layer **12**, i.e., greater than 790 kg/m^3, and preferably greater than 850 kg/m^3, to enable the middle layer **14** to more easily urge the adhesive **100** into the cracks **102** in the upper layer **12**. To further facilitate the adhesive **100** flowing into the cracks **102**, an adhesive having a viscosity of between twenty-five (25) poise and forty (40) poise is utilized, with an adhesive having a viscosity of about thirty (30) poise being especially preferred. In a particularly preferred embodiment for the adhesive **100**, the adhesive **100** takes the form of a urea formaldehyde resin that is catalyst curable, such as the urea formaldehyde resin sold under the trade name SYNTEKO 1203 by Casco Products AB of Stockholm, Sweden.

[**0033**] The compression force utilized to secure the upper layer **12** and middle layer **14** to one another must be high enough to direct the adhesive **100** into the cracks **102** without damaging the upper surface **106** of the upper layer **12**. Preferably, this force exerted on the layers **12** and **14** is greater than two hundred (200) psi in order to ensure that the adhesive **100** is urged into the cracks **102** within the upper layer **12**. The elevated pressure applied to the layers **12** and **14** works in a synergistic fashion with the non-oriented high density construction of the middle layer **14** to urge the adhesive **100** into the upper layer **12** while also forming a secure bond between the upper layer **12** and a middle layer **14**.

[**0034**] Looking now at **FIGS. 3-5D** in order to enable the boards **10** to be secured to one another to form the flooring surface **8**, the middle layer **14** also includes a tongue **18** and a groove **20** positioned on and extending along opposite sides of the board **10**. The tongue **18** is preferably formed integrally with the middle layer **14**, but may be formed of a separate, more rigid or more flexible material that is secured to the board **10**, if desired. The tongue **18** can have any suitable shape but preferably has a base portion **21** extending outwardly from the middle layer **14** that has a rounded end **22** disposed opposite the middle layer **14**. A notch or recess **24** is formed on one side of the base portion **21** adjacent the upper layer **12** to facilitate the engagement of the tongue **18** within the groove **20** and to allow a certain amount of expansion of the tongue **18** due to the changing moisture content of the board **10**.

[**0035**] The groove **20** is shaped to be complimentary to the tongue **18** and preferably defines an interior space **28** slightly greater than the size of the tongue **18** to accommodate the normal expansion and contraction of the tongue **18** based on the changing moisture content of the board **10**. The tongue **18** can be secured within the groove **20** simply by using a friction fit between them, or an adhesive (not shown) or other suitable means to permanently hold the tongue **18** in engagement with the groove **20**. The groove **20** can be milled out of the middle layer **14** during the formation of the middle layer **14**, similarly to the tongue **18**.

[**0036**] The side of the board **10** including either the tongue **18** or the groove **20** can be formed such that the upper layer **12** extends outwardly further than the lower layer **16** to enable the boards **10** to be joined to form a surface **8** with a minimum of space between the upper layers **12** on adjacent boards **10**.

[**0037**] In one particularly preferred embodiment shown best in FIGS. **3**, **4A-4B** and **5A-5D**, the groove **20** includes one of a connecting rib **26** or connecting notch **28** integrally formed therein. The rib **26** or notch **28** is engageable with an opposed rib **26** or notch **28** formed on the tongue **18**. The engagement of the rib **26** with the notch **28** secures the tongue **18** in engagement with the groove **20** without using any materials other than the boards **10** themselves, thus reducing the complexity of forming the surface **8** using the boards **10**. To properly engage the notch **28** with the rib **26**, the tongue **18** is formed with a recessed portion **30** that enables the tongue **18** and notch **28** to be inserted beneath the rib **26** and then engaged with one another to secure the boards **10** to each other as illustrated in **FIGS. 5A-5D**. The engagement of the rib **26** with the notch **28** maintains the positioning of the adjacent boards **10** with one another, such that the boards **10** present a continuous flooring surface **8** as the individual boards **10** take on and lose moisture due to the changing environmental conditions.

[**0038**] Also, in order to enable the boards **10** to be more easily attached to the support surface, the lower layer **16** may include one or more recesses **32** within which an adhesive or other fastening means to be utilized can be positioned to enable the board **10** to be positioned flush on the support surface **9** when secured to the support surface **9**. In situations where mechanical fasteners (not shown) such as nails or screws are used, the fastener on occasion creates splinters when breaking through the bottom layer **16**, the recesses **32** is designated to facilitate these splinters. More particularly, the recesses **32** enable the board **10**, and specifically the lower layer **16**, to flex under the force of the fastener being engaged with the board **10** and the support surface **9**.

[**0039**] As stated previously, the construction of the board **10** allows it to be precisely sanded and milled to form highly

uniform boards **10**, such that the tongue **18** and the groove **20** can be very accurately formed to ensure the proper engagement of the boards **10** with one another when forming a flooring surface **8**. This also allows the board **10** to be formed with various decorative features on the exposed surfaces of the board **10**. Virtually any desired decorative design or feature can be formed on the board **10**, and more particularly on the upper surface **106** of the upper layer **12**, to enhance the appearance of the finished board **10**. For example, as best shown in **FIG. 3**, the board **10** includes a pair of bevels **200** formed along each longitudinal side **202** of the upper surface **14**. However, the bevels **200** can be formed along each edge of the upper layer, if desired. The bevels **200** are preferably formed at a forty-five degree (45°) angle with regard to the upper surface **106**, but can be formed to have any desired angle or slope, and are formed on the board **10** in any conventional manner, such as by contacting the sides **202** of the upper layer **14** with a grinding wheel or other suitable device.

[**0040**] The bevels **200** are formed on the upper surface **106** of the upper layer **12** after the board **10** has been sanded and milled into the appropriate shape, so that the board **10** is ready to be installed without any further sanding. The boards **10**, due to their precise and uniform construction, only need to be lightly screened after installation in order to promote the penetration of the selected stain (not shown) into the boards **10**. Thus, the bevels **200** remain clear and distinct after installation of the boards **10**.

[**0041**] Various alternatives are contemplated as being within the scope of the following claims, particularly pointing out and distinctly claiming a subject matter regarded as the invention.

In the claims:

1-21. (canceled)

21. A flooring board comprising:

a) a first layer formed of a first material having an upper surface and a lower surface, the lower surface including a number of openings extending into the upper layer generally perpendicular to the lower surface;

b) a second layer formed of a non-hardwood material; and

c) an adhesive joining the lower surface of the first layer to the second layer, the adhesive extending from the lower surface into the openings in the upper surface.

22. The board of claim 21 wherein the openings in the lower surface of the first layer are cracks created during the formation of the first layer.

23. The board of claim 21 wherein the first material is a hardwood material.

24. The board of claim 21 wherein the non-hardwood material is a non-oriented fiberboard.

25. The board of claim 24 wherein the second layer has a density of at least 790 kg/m^3.

26. The board of claim 21 wherein the adhesive has a viscosity of between about 25 poise and about 40 poise.

27. The board of claim 21 wherein the adhesive is an urea formaldehyde adhesive.

28. A method of forming a hardwood flooring board, the method comprising the steps of:

a) providing a first layer formed of a hardwood material and having a number of openings on one surface of the first layer, and a second layer formed of a non-hardwood material;

b) applying an adhesive to one of the first layer or the second layer; and

c) pressing the first layer and the second layer against one another to urge the adhesive into the openings in the first layer.

29. The method of claim 28 wherein the step of pressing the first layer and the second layer against one another compression pressing the first layer against the second layer of a pressure of at least 200 psi.

30. A flooring board comprising:

a) an upper layer formed of a hardwood material and having a thickness greater than 2 mm; and

b) a middle layer formed of a non-hardwood material and secured to the upper layer, wherein the upper layer includes at least one decorative design opposite the middle layer.

31. The board of claim 30 wherein the at least one decorative design is a bevel disposed in at least one side of the upper layer.

32. The board of claim 30 further comprising a lower layer secured to the middle layer opposite the upper layer.

33. The board of claim 32 wherein the lower layer includes at least one channel adapted to receive a fastener that secures the board directed to a support surface.

34. The board of claim 30 wherein the upper layer includes a number of openings extending into the upper layer from a lower surface, and further comprising an adhesive extending from the middle layer into the openings in the upper layer.

35. The board of claim 34 wherein the middle layer has a density of at least 790 kg/m^3.

36. The board of claim 30 wherein the upper layer has a thickness of between about 2 mm and about 5 mm.

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