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(54) Title of the Invention: **Wooden electronic tag card and method for manufacturing a wooden electronic tag card**
Abstract Title: **Wooden electronic tag card and method for manufacturing a wooden electronic tag card**

(57) The present invention relates to the field of electronic tag cards, and specifically relates to a wooden electronic tag card and a manufacturing method for a wooden electronic tag card. The electronic tag card sequentially comprises an upper card blank, an inter-blank hot melt adhesive layer, electronic tag paper, a heat-resistant double-sided adhesive layer, and a lower card blank from top to bottom; the top of the lower card blank is provided with a lower press-fitting groove having the same shape and size as the electronic tag paper; the heat-resistant double-sided adhesive layer is provided at the bottom of the lower press-fitting groove; the bottom of the upper card blank is provided with an upper press-fitting groove; the shape of the upper press-fitting groove is the same as that of the electronic tag paper; the inter-blank hot melt adhesive layer is provided on the bottom surface of the upper card blank and the inner wall of the upper press-fitting groove; the upper card blank and the lower card blank both comprise at least two hot-pressing shaped wood sheet layers and an inter-sheet hot melt adhesive layer between adjacent hot-pressing shaped wood sheet layers. The present invention further provides a manufacturing method for the wooden electronic tag card.

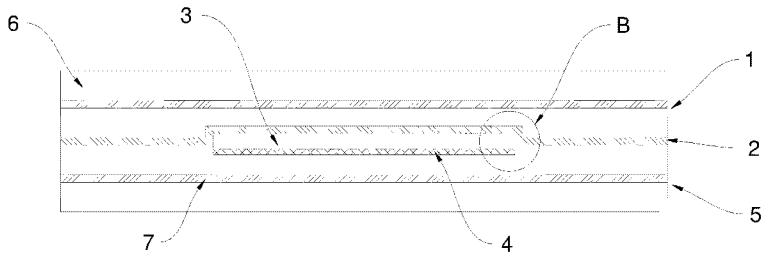

图 2

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DRAWINGS

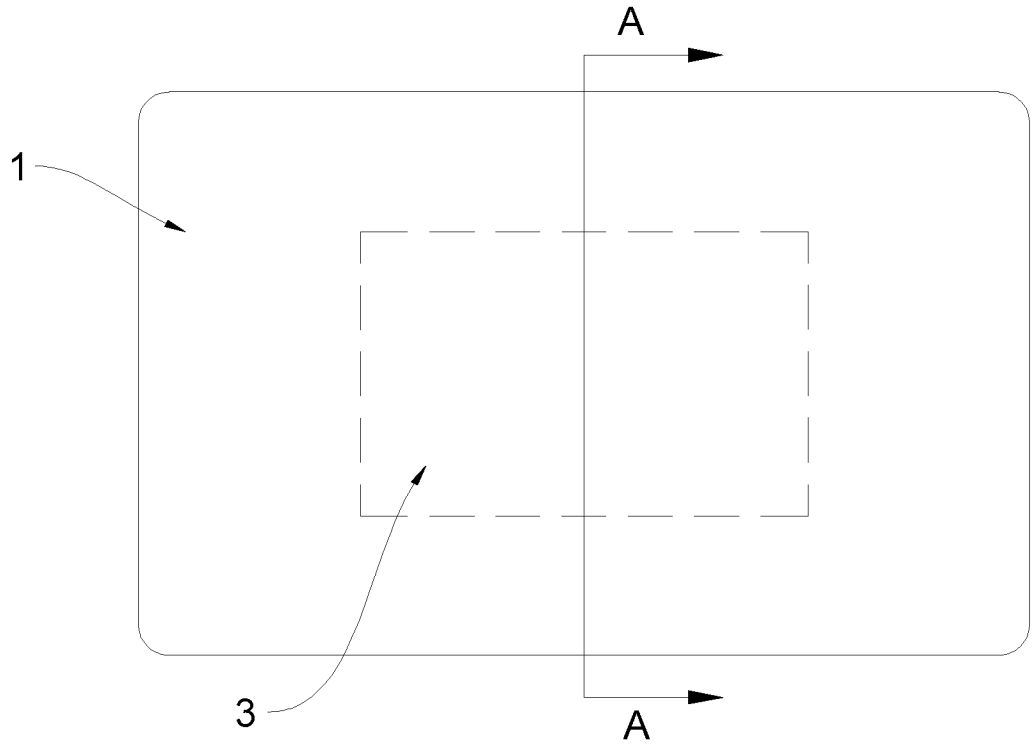

Fig. 1

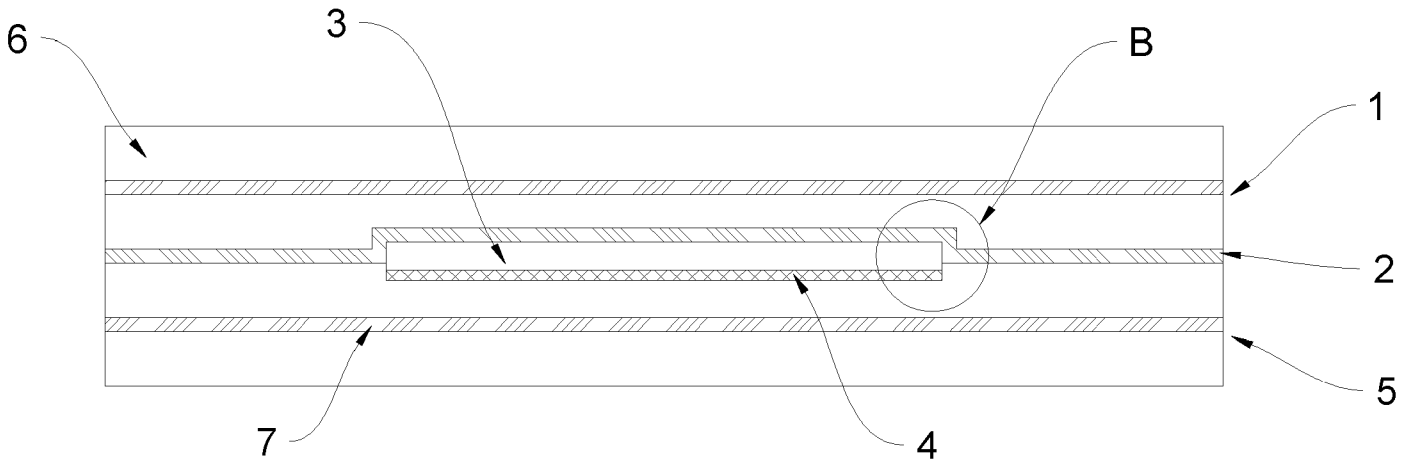

Fig. 2

DRAWINGS

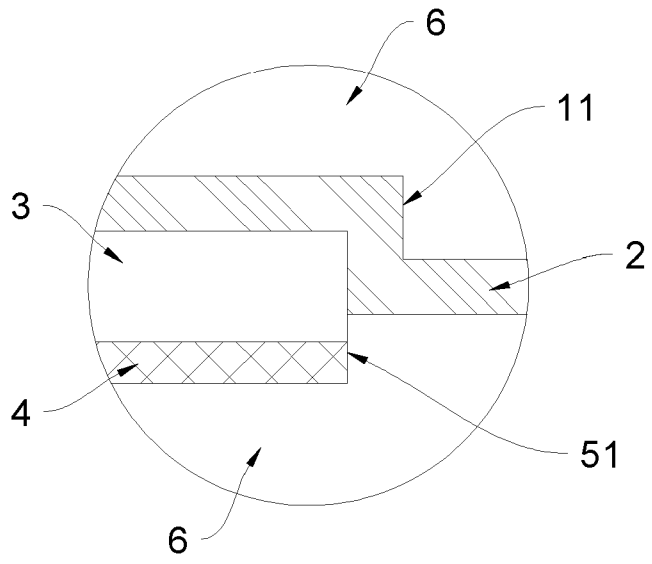

Fig. 3

Wooden Electronic Tag Card and Method for Manufacturing a Wooden Electronic Tag Card

Technical Field

The invention relates to the field of electronic tag cards, in particular to a wooden electronic tag card and a method for manufacturing the wooden electronic tag card.

Background of the Invention

The electronic tags are mostly made of metal foil through an etching process, and can be adhered to various articles after being subjected to lamination processing to form inlays so as to facilitate article management and theft prevention. However, the inlays are still fragile, and need to be attached to a firmer carrier for daily use, so that the electronic tags are often applied to the fields of entrance guard, guest room management and the like in the form of an electronic tag card. The existing electronic tag cards mostly use plastic sheets as carriers, and the inlay are packaged in the carriers and thoroughly isolated from the external environment. Therefore, the card is essentially a plastic sheet embedded with metal, which is non-degradable after being discarded, and is difficult to separate two materials for classification and recycling.

The wood is a renewable natural materials that is convenient to process and degradable. As a card substrate material, it will not affect the working frequency of the electronic tag, and the material itself has natural textures, so that excessive decoration is not required. However, different from the electronic tag card with plastic carrier, wood sheets processed from wood generally have the problems of poor flatness and easy deformation, the bonding firmness between the wood sheets and between

the wood sheet and the inlay can seriously affect the product quality, and certain types of glue will also affect the working frequency of the electronic tag and even cause the electronic tag to fail to work normally.

Technical problems

The first object of the present invention is to provide a wooden electronic tag card with stable quality and reliable performance.

The second object of the present invention is to provide a method for manufacturing a wooden electronic tag card capable of ensuring the product performance and quality stability.

Technical solutions

In order to achieve the above-mentioned first object, the present invention provides a wooden electronic tag card, comprising an upper card blank, an inter-blank hot-melt adhesive layer, an inlay, a heat-resistant double-sided adhesive layer and a lower card blank from top to bottom in sequence, characterized in that:

a top of the lower card blank is provided with a lower pressing groove which has same shape and size as the inlay, the heat-resistant double-sided adhesive layer is arranged at a bottom of the lower pressing groove, a bottom of the upper card blank is provided with an upper pressing groove, the upper pressing groove has a shape same as that of the inlay, the inter-blank hot-melt adhesive layer is arranged on a bottom surface of the upper card blank and an inner wall of the upper pressing groove, a bottom surface of the inlay is attached to the heat-resistant double-sided adhesive layer, and each of a top surface of the inlay and a top surface of the lower card blank is attached to the inter-blank hot-melt adhesive layer.

Preferably, each of the upper card blank and the lower card blank comprises at least two hot-pressing shaped wood sheet layers and an inter-sheet hot-melt adhesive layer arranged between adjacent hot-pressing shaped wood sheet layers, and the upper pressing groove and the lower

pressing groove are arranged on surfaces of the hot-pressing shaped wood sheet layers.

Preferably, the upper pressing groove has an end face area larger than an area of the inlay.

In a further solution, the upper card blank, the lower card blank and the inlay are same in shape, the upper card blank and the lower card blank are same in size, and the inlay is located at centers of the upper card blank and the lower card blank.

In a still further solution, a length ratio of the upper card blank to the inlay is not less than 2.

In a further solution, wood grain extending directions of adjacent hot-pressing shaped wood sheet layers in the upper card blank and the lower card blank are perpendicular to each other.

In a further solution, each of the hot-pressing shaped wood sheet layers has a thickness from 0.3mm to 0.4 mm.

In a further solution, each of the inter-sheet hot-melt adhesive layer and the inter-blank hot-melt adhesive layer is a TPU hot-melt adhesive film layer.

In a further solution, the heat-resistant double-sided adhesive layer is a PET double-sided adhesive layer.

In order to achieve the above-mentioned second objective, the present invention provides a method for manufacturing a wooden electronic tag card, comprising the following steps: a. performing hot-pressing treatment on raw wood sheets for 10min under pressure condition of 0.1MPa and temperature condition of 115℃-125℃, and then performing cold-pressing treatment to obtain shaped sheets; b. adhering an inlay to a plurality of preset positions on a surface of one of the shaped sheets by means of heat-resistant double-sided adhesive film to obtain a tag carrying sheet, laying a hot-melt adhesive film on a surface of the tag carrying sheet, covering another one of the shaped sheets, performing hot pressing

treatment for 10min under pressure condition of 0.1MPa and temperature condition of 110℃-120℃, and performing cold pressing treatment to obtain an intermediate blank, wherein the heat-resistant double-sided adhesive film and the inlay have same shape and size; c. sequentially superposing hot-melt adhesive films and the shaped sheets on both sides of the intermediate blank, performing hot pressing treatment for 10min under pressure condition of 0.1MPa and temperature condition of 110℃-120℃, and then performing cold pressing treatment to obtain a card blank to be cut; d. cutting the card blank to be cut into wooden electronic tag cards according to a preset size.

In a further solution, the cold pressing treatment in the steps a, b and c is performed under pressure condition of 0.1MPa and refrigeration power of 10HP, and treatment time of the cold pressing treatment is 25 min.

In a further solution, two of the shaped sheets in the intermediate blank have wood grain extending directions parallel to each other, and two of the shaped sheets on an outermost side of the card blank to be cut have wood grain extending directions perpendicular to wood grain extending directions of adjacent shaped sheets.

In a further solution, the inlay and the wooden electronic tag card are same in shape, and the inlay is located at the center of the wooden electronic tag card.

In a still further solution, a length ratio of the wooden electronic tag card to the inlay is not less than 2.

In a further solution, the shaped sheet had a thickness from 0.3mm to 0.4 mm.

In a further solution, the hot-melt adhesive film is a TPU hot-melt adhesive film.

In a further solution, the heat-resistant double-sided adhesive film is a PET double-sided adhesive film.

In a further solution, the raw wood sheets are linden wood sheets, bamboo wood sheets, beech wood sheets, cherry wood sheets, sapelli wood sheets or black walnut wood sheets.

Advantageous effects

The hot-pressing shaped wood sheets in the card blank of the wooden electronic tag card are subjected to hot pressing treatment and are fully dehumidified and leveled, the shape of the material is more regular, and the durability is improved. The hot-pressing shaped wood sheets are arranged in a stacking mode according to the rule that the wood grains of the adjacent wood sheets are crossed, and the wooden card blanks with regular shapes and reliable strength can be obtained after hot-pressing bonding through hot-melt adhesive. All types of woods possess certain plastic deformation ability, and the thickness of the inlay is far less than the thickness of hot-pressing shaped wood sheet, thereby two hot-pressing shaped wood sheet in the middle of the wooden electronic tag card can spontaneously produce local deformation during the hot-pressing bonding process and form upper pressing groove and lower pressing groove on the outside of the inlay, so that the card can obtain the accommodating cavity that corresponds with inlay in the process of hot-pressing bonding process, while the similar accommodating cavity on the conventional plastics card substrate needs to be obtained through separate processing step, therefore the preparation technology of wooden electronic tag card is simpler.

The manufacturing of the wooden electronic tag card involves multiple hot-pressing processes, so that the bonding firmness among different layers of the card and the overall structural strength of the card are relatively high and the quality is relatively stable, and the card also has better durability. The substrate of heat-resisting double-sided adhesive film and the hot-melt adhesive are usually plastic material, and both types of adhesives do not contain solvents, have uniform thickness, stable properties, and are easy to die-cut processing. Besides, the two types of

adhesives have little impact on the working frequency of the electronic tag, using these two types of adhesives as the adhesive layer of the wooden card can control the impact of the carrier on the working frequency of the electronic tag to a very low level.

And the opposite sides of the upper card blank and the lower card blank are directly bonded on the periphery of the inlay, the shape of the inlay is set to be the same as that of the upper card blank and the lower card blank, and the inlay is placed in the middle of the upper card blank and the lower card blank, so that the direct bonding strength of the upper card blank and the lower card blank on the periphery of the inlay can be maintained at the same level.

In addition, the length ratio of the upper card blank to the inlay is not less than 2, so that a larger direct bonding area can be ensured between the upper card blank and the lower card blank, which helps to improve the overall structural strength of the card.

In addition, the wood sheets are generally more resistant to bending along the wood grain extending directions, and the structural strength of the card blanks can be effectively enhanced by arranging the card blanks according to the rule that the wood grains of the adjacent hot-pressing shaped wood sheet layers are perpendicular to each other.

The thickness of the hot-pressing shaped wood sheet layer directly affects the structural strength of the card blanks, the thickness of the electronic tag card is generally within the range of 1mm to 2mm, and the thickness of the wood sheet layer is controlled to be in the range of 0.3mm to 0.4mm to provide the card blank with better structural strength.

The TPU hot-melt adhesive film has good elasticity and flexibility, strong bonding fastness and waterproofness, and good stability at normal temperature and lower temperature, and is suitable for bonding wood.

The PET double-sided adhesive film has good dimensional stability, thermal stability and chemical stability, good bonding firmness and

durability, and is easy for die-cutting process, and can resist the high temperature of 100℃ to 120℃ for a long time and can even withstand short-term high temperature of 140℃ to 200℃.

In the manufacturing method of the present invention, the short-term high-temperature hot-pressing treatment in the step a can play a role in quickly dehumidifying and leveling raw wood sheets, but can also cause the increase of internal stress and deformation range of material, and show the defects of size shrinkage, brittleness, easy cracking and the like, so that the strength and toughness of the wood sheets are weakened. The following cold pressing treatment can effectively reduce the internal stress and the deformation range of the material, so that the strength and the toughness of the wood sheet can be greatly recovered and the wood sheet becomes a shaped sheet with better processing performance. Because the pressure in the hot-pressing and leveling process is relatively small, the thickness of the raw wood sheets can be basically recovered to the previous level after the cold pressing treatment with lower pressure, and therefore the raw wood sheets and the shaped sheets can be regarded as having the same thickness.

The physical properties of the wood are greatly affected by the temperature, so the heating temperature in the hot-pressing bonding process in the steps b and c should not be higher than the heating temperature in the hot-pressing leveling process in the step a, and the further damage to the strength and the toughness of the wood in the manufacturing process may be avoided. In addition, the cold pressing process after the hot-pressing bonding can recover the strength and toughness of the shaped sheet lost during the hot-pressing bonding process in addition to bonding the various layers of the card, thereby improving the adhesion strength between the layers of the card and the structural strength of the card, and the thickness of the shaped sheet is hardly changed after two hot-pressing bonding and cold-press bonding treatments.

In addition, various types of wood have certain plastic deformation capacity, the thickness of the inlay is far smaller than the thickness of the shaped sheets, the shaped sheets on both sides of the inlay can spontaneously produce local deformation and form corresponding grooves during the hot-pressing bonding process of the tag carrying card blank and the wooden blank, so that the card can obtain an accommodating cavity that corresponds with the inlay during the hot-pressing bonding process, and the tag carrying card blank and the surface of the wooden blank bonded with the tag carrying card blank can be kept flat. The similar accommodating cavities on the conventional plastic card substrate need to be obtained through additional machining steps, therefore the manufacturing process of the wooden electronic tag card is simpler.

The substrate of heat-resisting double-sided adhesive film and the hot-melt adhesive are usually plastic material, and both types of adhesives do not contain solvents, have uniform thickness, stable properties, and are easy to die-cut processing. Besides, the two types of adhesives have little impact on the working frequency of the electronic tag, using these two types of adhesives as the adhesive layer of the wooden card can control the impact of the carrier on the working frequency of the electronic tag to a very low level.

In addition, both the hot pressing and the cold pressing during the manufacturing process adopt the pressure condition of 0.1MPa, and the pressure value is relatively low, so that excessive deformation of the material can be avoided. Longer cold pressing time and higher refrigeration power help to restore the strength and toughness of the wood.

In the wooden electronic tag card, the two shaped sheets on both sides of the inlay are directly adhered to each other at the periphery of the inlay, so that the shape of the inlay is set to be the same as that of the wooden electronic tag card and the two shaped sheets positioned in the middle of the wooden electronic tag card, so that the direct bonding firmness of the

shaped sheets on both sides of the inlay on the periphery of the inlay is maintained at the same level.

The thickness of the shaped sheet directly affects the structural strength of the card blank, the thickness of the electronic tag card is generally 1mm to 2mm, and the thickness of the sheet layer is controlled to be in the range of 0.3mm to 0.4mm, so that the wooden electronic tag card comprising 4 layers of sheets is ideal in terms of overall thickness and overall structural strength.

Because the TPU hot-melt adhesive film has good elasticity and flexibility, strong bonding fastness and waterproofness, and good stability at normal temperature and lower temperature, and is suitable for bonding wood. Models with an operating temperature of about 100°C are available for specific implementation.

The PET double-sided adhesive film has good dimensional stability, thermal stability and chemical stability, good bonding firmness and durability, and is easy for die-cutting process, and can resist the high temperature of 100℃ to 120℃ for a long time and can even withstand short-term high temperature of 140℃ to 200℃.

In addition, benefit from the reliable manufacturing process and bonding materials, the raw wood sheets in the wooden electronic tag card have a wide selection of materials, which can basically cover representative woods with different price levels.

Brief Description of the Drawings

Fig. 1 is a top view of an embodiment of the wooden electronic tag card of the present invention.

Fig. 2 is a sectional view taken along the line A-A in Fig. 1.

Fig. 3 is an enlarged structural view at B in Fig. 2.

The invention is further described with reference to the following figures and embodiments.

Embodiments of the Invention

Referring to Figs. 1 to 3, the wooden electronic tag card provided by the present invention comprises an upper card blank 1, an inter-blank hot-melt adhesive layer 2, an inlay 3, a heat-resistant double-sided adhesive layer 4 and a lower card blank 5 from top to bottom in sequence.

The top of the lower card blank 5 is provided with a lower pressing groove 51 with the same shape and size as the inlay 3, the heat-resistant double-sided adhesive layer 4 is arranged at the bottom of the lower pressing groove 51, the bottom of the upper card blank 1 is provided with an upper pressing groove 11, the shape of the upper pressing groove 11 is the same as that of the inlay 3, the end surface area of the upper pressing groove 11 is larger than that of the inlay 3, the inter-blank hot-melt adhesive layer 2 is arranged on the bottom surface of the upper card blank 1 and the inner wall of the upper pressing groove 11, the bottom surface of the inlay 3 is attached to the heat-resistant double-sided adhesive layer 4, the top surface of the inlay 3 and the top surface of the lower card blank 5 are both attached to the inter-blank hot-melt adhesive layer 2, the upper card blank 1 and the lower card blank 5 both comprise at least two hot-pressing shaped wood sheet layers 6 and an inter-sheet hot-melt adhesive layer 7 arranged between the adjacent hot-pressing shaped wood sheet layers 6, and the upper pressing groove 11 and the lower pressing groove 51 are both arranged on the surfaces of the hot-pressing shaped wood sheet layers 6.

The hot-pressing shaped wood sheet layers 6 in the upper card blank 1 and the lower card blank 5 are subjected to hot pressing treatment and are fully dehumidified and leveled, the shape of the material is more regular, and the durability is improved. The hot-pressing shaped wood sheet layers

are arranged in a layered mode according to the rule that the wood grains of the adjacent wood sheets are crossed, and the wooden card blanks with regular shapes and reliable strength can be obtained after hot-pressing bonding through hot-melt adhesive.

Various types of wood have certain plastic deformation ability, and the thickness of inlay 3 is far less than the thickness of hot-pressing shaped wood sheet layer 6, thereby two hot-pressing shaped wood sheets 6 in the middle of the wooden electronic tag card can spontaneously produce local deformation during the hot-pressing bonding process, thereby forming an upper pressing groove 11 and a lower pressing groove 51 on the outside of the inlay 3, so that the card can obtain an accommodating cavity that corresponds with the inlay 3 during the hot-pressing bonding process, while the similar accommodating cavities on conventional plastic card substrate need to be obtained through separate processing step, therefore the manufacturing process of wooden electronic tag card is simpler.

The bonding firmness between different layers and the overall card structural strength of the wooden electronic tag card are relatively high and the quality is relatively stable, and the card also possesses better durability. The substrate of the heat-resisting double-sided adhesive film and the hot-melt adhesive are usually plastic material, and both types of adhesives do not contain the solvent, have uniform thickness, stable properties, and are easy to die-cut processing. Besides, the two types of adhesives have little impact on the working frequency of the electronic tag, using these two types of adhesives as the adhesive layer of the wooden card can control the impact of the carrier on the working frequency of the electronic tag to a very low level.

During the specific implementation, the hot-pressing shaped wood sheet layer 6 can be made of basswood, beech, cherry, sapele, black walnut, bamboo and other materials, that is, wood of different types and prices can be used for making wooden electronic tag cards as long as certain

processing conditions are met, and in addition, the inlay 3 is made of Dry Inlay type products. The wooden electronic tag card in the present embodiment can be used as hotel key cards or company or residence access cards, and the application range of the wooden electronic tag cards is almost the same as that of the plastic carrier electronic tag cards.

The shapes of the upper card blank 1, the lower card blank 5 and the inlay 3 are the same, the sizes of the upper card blank 1 and the lower card blank 5 are the same, the inlay 3 is positioned at the centers of the upper card blank 1 and the lower card blank 5, and the length ratio of the upper card blank 1 to the inlay 3 is not less than 2.

The opposite sides of the upper card blank 1 and the lower card blank 5 are directly bonded on the periphery of the inlay 3, the shape of the inlay 3 is set to be the same as that of the upper card blank 1 and the lower card blank 5, and the inlay 3 is placed in the middle of the upper card blank 1 and the lower card blank 5, so that the direct bonding strength of the upper card blank 1 and the lower card blank 5 on the periphery of the inlay 3 can be maintained at the same level. The length ratio of the upper card blank 1 to the inlay 3 is not less than 2, so that a larger direct bonding area can be ensured between the upper card blank 1 and the lower card blank 5, which helps to improve the overall structural strength of the card.

The wood grain extending directions of the adjacent hot-pressing shaped wood sheet layers 6 in the upper card blank 1 and the lower card blank 5 are perpendicular to each other, generally, the wood sheets are more resistant to bending along the wood grain extending directions, and the structural strength of the upper card blank 1 and the lower card blank 5 can be effectively enhanced by arranging the upper card blank 1 and the lower card blank 5 according to the rule that the wood grains of the adjacent hot-pressing shaped wood sheet layers 6 are perpendicular to each other.

The thickness of each hot-pressing shaped wood sheet layer 6 is within the range of 0.3mm to 0.4mm, the thickness of the hot-pressing shaped wood sheet layer 6 directly affects the structural strength of the card blanks, the thickness of the electronic tag card is generally within the range of 1mm to 2mm, and the thickness of the wood sheet layer is controlled to be in the range of 0.3mm to 0.4mm to provide the card blank with better structural strength.

The inter-sheet hot-melt adhesive layer and the inter-blank hot-melt adhesive layer are both TPU hot-melt adhesive film layers, and the heat-resistant double-sided adhesive layer is a PET double-sided adhesive layer.

The TPU hot-melt adhesive film has good elasticity and flexibility, strong bonding fastness and waterproofness, and good stability at normal temperature and lower temperature, and is suitable for bonding wood. The PET double-sided adhesive film has good dimensional stability, thermal stability and chemical stability, good bonding firmness and durability, and is easy for die-cutting process, and can resist the high temperature of 100℃ to 120℃ for a long time and can even withstand short-term high temperature of 140℃ to 200℃.

In the embodiment, Dry Inlay type inlay 3 with the working frequency of 14.4MHz is used, a basswood sheet is used for manufacturing the hot-pressing shaped wood sheet layer 6, a PET double-sided adhesive layer is used as a heat-resistant double-sided adhesive layer 4, a TPU hot-melt adhesive film is used as the inter-sheet hot-melt adhesive layer 7 and the inter-blank hot-melt adhesive layer 2, the working frequency of a finished wooden electronic tag card is 14.2MHz to 14.4MHz measured by a frequency spectrum measuring instrument, the maximum frequency deviation is only 0.2MHz, within the allowable deviation range of 0.5MHz, and the normal use of the card is hardly affected.

The following describes a method for manufacturing a wooden electronic tag card.

The inlay used in the following embodiments and comparative examples is the same batch of Dry Inlay type product without an adhesive backing and with the working frequency of 14.4MHz, the PET double-sided adhesive film is used as an adhesive layer between the inlay and the wood blank, so that sufficient adhesive strength can be ensured. The PET double-sided adhesive film contains a plastic substrate, and the PET double-sided adhesive film is bonded with the Dry Inlay to form a composite plastic layer with higher strength, so that the processing performance is better, and the stability of the product quality is improved. Moreover, it would have been readily conceivable that the inlay may also be a customized Wet Inlay type product, and the adhesive backing and the plastic coating layer of the inlay both meet the process requirements of a wooden electronic tag card, which is helpful for simplifying the manufacturing process but has relatively high cost.

The first embodiment of manufacturing method of wooden electronic tag card

The embodiment provides a manufacturing method of a wooden electronic tag card, which comprises the following steps:

a. Cutting basswood sheets with the thickness of 0.3mm to 0.4mm into two pieces of raw wood sheets with transverse wood grains and two pieces of raw wood sheets with longitudinal wood grains by a laser cutting machine, wherein the size of the raw wood sheets is 382mm×180mm; hot pressing the raw wood sheets for 10 minutes under the pressure condition of 0.1MPa and the temperature condition of 120℃ with a hot press, and cold pressing the raw wood sheets for 25min under the pressure condition of 0.1MPa and the cooling power of 10HP by a cold press to obtain the shaped sheet.

b. Marking a plurality of preset sites on the surface of a piece of shaped sheet with longitudinal wood grains, arranging PET double-sided adhesive film at the preset sites, then adhering inlay with the same shape and size as the PET double-sided adhesive film on the PET double-sided adhesive film to obtain a tag carrying sheet, laying a TPU hot-melt adhesive film on the surface of the tag carrying sheet, covering another piece of shaped sheet with longitudinal wood grains, then performing hot pressing treatment for 10min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 115℃, and then performing cold pressing treatment for 25min by a cold press under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain an intermediate blank.

c. And sequentially superposing a TPU hot-melt adhesive film and a shaped sheet with transverse wood grains on two sides of the intermediate blank, performing hot pressing treatment for 10min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 115℃, and performing cold pressing treatment for 25min by a cold press under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain a card blank to be cut.

d. And drawing cutting lines on the surface of the card blank to be cut according to a preset size specification, and then cutting the card blank to be cut by a laser cutting machine to obtain 12 wooden electronic tag cards.

The second embodiment of manufacturing method of wooden electronic tag card

The present embodiment provides a method for manufacturing a wooden electronic tag card, which is substantially the same as the manufacturing method in the first embodiment, except that: in the step a, beech wood sheets are taken as raw wood sheets, and the hot-pressing treatment is performed at a temperature of 125℃; in the steps b and c, the hot-pressing treatment is performed at a temperature of 120℃.

The third embodiment of manufacturing method of wooden electronic tag card

The present embodiment provides a method for manufacturing a wooden electronic tag card, which is substantially the same as the manufacturing method in the first embodiment, except that: in the step a, cherry wood sheets are used as raw wood sheets, and the hot pressing treatment is performed at a temperature of 115℃; in the steps b and c, the hot-pressing treatment is performed at a temperature of 110℃.

The fourth embodiment of manufacturing method of wooden electronic tag card

The present embodiment provides a method for manufacturing a wooden electronic tag card, which is substantially the same as the manufacturing method in the first embodiment, except that: in the step a, bamboo wood sheets are used as raw wood sheets, and the hot pressing treatment is performed at a temperature of 122℃; in the steps b and c, the hot-pressing treatment is performed at a temperature of 118℃.

Cherry wood belongs to the middle and low hardness level in the wood, beech wood is high-hardness wood, basswood is moderate in hardness, and bamboo wood belongs to the category of hardwood. The wooden electronic tag cards manufactured in the first to fourth embodiments have flat surfaces, have characteristic wood grains of corresponding raw wood sheets, have no protrusions in the middle, and have no defects of glue failure and cracks on the whole card. The working frequency of the card detected by a frequency spectrum measuring instrument is within the range from 14.2MHz to 14.4MHz, and compared with the working frequency of the inlay before packaging, the maximum deviation is only 0.2MHz and is within the allowable deviation range of 0.5MHz, so that the normal use of the card will not be affected.

The first comparative example

The comparative example provides a manufacturing method of a wooden electronic tag card, which comprises the following steps:

a. Cutting bamboo wood sheets with the thickness of 0.3mm to 0.4mm into two pieces of raw wood sheets with transverse wood grains and two pieces of raw wood sheets with longitudinal wood grains by a laser cutting machine, wherein the size of the raw wood sheets is 382mm× 180mm, performing hot pressing treatment on the raw wood sheets for 10min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 120℃, and performing cold pressing treatment on the raw wood sheets for 25min by a cold pressing machine under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain the shaped sheets.

b. Marking a plurality of preset sites on the surface of a piece of shaped sheet with longitudinal wood grains, adhering an inlay to the shaped sheet by using Deli glue stick to obtain a tag carrying sheet, uniformly coating the Titebond II Wood Glue on the surface of the tag carrying sheet, covering another piece of shaped sheet with longitudinal wood grains, and performing hot pressing treatment for 35min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 80℃ to obtain an intermediate blank.

c. And uniformly coating the Titebond II Wood Glue on two sides of the intermediate blank, then superposing one shaped sheet with transverse wood grains respectively, and then performing hot pressing treatment for 35min under the pressure condition of 0.1MPa and the temperature condition of 80℃ by a hot press to obtain a card blank to be cut.

d. And drawing cutting lines on the surface of the card blank to be cut according to a preset size specification, and then cutting the card blank to be cut by a laser cutting machine to obtain 12 wooden electronic tag cards.

The above manufacturing method uses glue stick and wood glue respectively to realize the bonding between the inlay and the wood sheets

and the bonding between the wood sheets, and the two glue materials can only bear lower heating temperature, so that the solvent needs to be removed through longer treatment time to realize the curing of the glue layer. In addition, the lower heating temperature has little impact on the strength and the toughness of the wood sheets, so that the cold pressing operation is not required to be introduced.

The working frequency of the finished card detected by a frequency spectrum measuring instrument is in the range of 12.6MHz to 13.4MHz, and compared with the working frequency of the inlay before packaging, it exceeds the allowable deviation range of 0.5MHz, which indicates that the impact of the conventional liquid or semi-solid solvent-containing adhesive on the working frequency of the wooden electronic tag card is large, and the manufactured card can not meet the quality requirement of electronic tag card products. The surface flatness of the finished card is generally poor, and the middle part of the card slightly protrudes, this is because the hot pressing temperature is too low to cause sufficient deformation of the shaped sheets. In addition, individual cards have obvious defects of glue leakage.

The second comparative example

a. Cutting beech wood sheets with the thickness of 0.3mm to 0.4mm into two pieces of raw wood sheets with transverse wood grains and two pieces of raw wood sheets with longitudinal wood grains by a laser cutting machine, wherein the size of the raw wood sheets is 382mm×180mm, performing hot pressing treatment on the raw wood sheets for 10min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 120℃, and then performing cold pressing treatment on the raw wood sheets for 25min by a cold press under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain the shaped sheets.

b. Marking a plurality of preset sites on the surface of a piece of shaped sheet with longitudinal wood grains, adhering an inlay to the

shaped sheet by using M&G AWG-type liquid adhesive to obtain a tag carrying sheet, laying an EVA hot-melt adhesive film on the surface of the tag carrying sheet, covering another piece of shaped sheet with longitudinal wood grains, performing hot pressing treatment for 30min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 120℃, and performing cold pressing treatment for 30min by a cold press under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain an intermediate blank.

c. And sequentially superposing an EVA hot-melt adhesive film and a shaped sheet with transverse wood grains on two sides of the intermediate blank, performing hot pressing treatment for 30min by a hot press under the pressure condition of 0.1MPa and the temperature condition of 120℃, and performing cold pressing treatment for 30min by a cold press under the pressure condition of 0.1MPa and the refrigeration power of 10HP to obtain a card blank to be cut.

d. And drawing cutting lines on the surface of the card blank to be cut according to a preset size specification, and then cutting the card blank to be cut by a laser cutting machine to obtain 12 wooden electronic tag cards.

The above manufacturing method uses liquid glue and hot-melt adhesive film respectively to realize the bonding between the inlay and the wood sheets and the bonding between the wood sheets, and the hot pressing process adjusts the hot pressing and cold pressing process parameters according to the characteristics of the two adhesive materials so as to ensure the firm bonding between the layers of the card. The prepared card has a smooth surface and no glue leakage defect, the working frequency is within the range of 12.9MHz to 13.7MHz detected by a frequency spectrum measuring instrument, and compared with the working frequency of the inlay before packaging, it exceeds the allowable deviation range of 0.5MHz, which indicates that the combination of the conventional solvent-containing glue and the specific hot-melt adhesive film has great

impact on the working frequency of the wooden electronic tag card, and the prepared card can not meet the quality requirement of electronic tag card products.

In summary, the wooden electronic tag card is convenient to process and manufacture, high in strength and durable, and the carrier part of the card is degradable, so that the wooden electronic tag card is environment-friendly.

Industrial applicability

The wooden electronic tag card provided by the invention can replace the existing electronic tag card using plastic as a carrier, and is environment-friendly because the wooden electronic tag card is convenient to process and manufacture, high in strength and durable, and the carrier part of the card is degradable.

In the manufacturing method of the wooden electronic tag card, the shaping of the wood sheets and the curing of the adhesive layers are realized through the operations of first hot pressing and then cold pressing, the strength and toughness of wood and the firm bonding of each layer of the card can be ensured, the manufacturing process is relatively simple, the impact of the two types of adhesive materials on the working frequency of the card product is extremely small, and the normal use of the card product can be ensured.

CLAIMS

1. A wooden electronic tag card, comprising an upper card blank, an inter-blank hot-melt adhesive layer, an inlay, a heat-resistant double-sided adhesive layer and a lower card blank from top to bottom in sequence, characterized in that:

a top of the lower card blank is provided with a lower pressing groove which has same shape and size as the inlay, the heat-resistant double-sided adhesive layer is arranged at a bottom of the lower pressing groove, a bottom of the upper card blank is provided with an upper pressing groove, the upper pressing groove has a shape same as that of the inlay, the inter-blank hot-melt adhesive layer is arranged on a bottom surface of the upper card blank and an inner wall of the upper pressing groove, a bottom surface of the inlay is attached to the heat-resistant double-sided adhesive layer, and each of a top surface of the inlay and a top surface of the lower card blank is attached to the inter-blank hot-melt adhesive layer;

each of the upper card blank and the lower card blank comprises at least two hot-pressing shaped wood sheet layers and an inter-sheet hot-melt adhesive layer arranged between adjacent hot-pressing shaped wood sheet layers, and the upper pressing groove and the lower pressing groove are arranged on surfaces of the hot-pressing shaped wood sheet layers.

2. The wooden electronic tag card according to claim 1, wherein:

the upper card blank, the lower card blank and the inlay are same in shape, the upper card blank and the lower card blank are same in size, and the inlay is located at centers of the upper card blank and the lower card blank.

3. The wooden electronic tag card according to claim 2, wherein:

a length ratio of the upper card blank to the inlay is not less than 2.

CLAIMS

4. The wooden electronic tag card according to any one of claims 1 to 3, wherein:

wood grain extending directions of adjacent hot-pressing shaped wood sheet layers in the upper card blank and the lower card blank are perpendicular to each other.

5. The wooden electronic tag card according to any one of claims 1 to 4, wherein:

each of the hot-pressing shaped wood sheet layers has a thickness from 0.3mm to 0.4 mm.

6. The wooden electronic tag card according to any one of claims 1 to 5, wherein:

each of the inter-sheet hot-melt adhesive layer and the inter-blank hot-melt adhesive layer is a TPU hot-melt adhesive film layer.

7. The wooden electronic tag card according to any one of claims 1 to 6, wherein:

the heat-resistant double-sided adhesive layer is a PET double-sided adhesive layer.

8. The wooden electronic tag card according to any one of claims 1 to 7, wherein:

the upper pressing groove has an end face area larger than an area of the inlay.

9. A method for manufacturing a wooden electronic tag card, comprising the following steps:

a. performing hot-pressing treatment on raw wood sheets for 10min under pressure condition of 0.1MPa and temperature condition of 115℃

-125℃, and then performing cold-pressing treatment to obtain shaped sheets;

b. adhering an inlay to a plurality of preset positions on a surface of one of the shaped sheets by means of heat-resistant double-sided adhesive film to obtain a tag carrying sheet, laying a hot-melt adhesive film on a surface of the tag carrying sheet, covering another one of the shaped sheets, performing hot pressing treatment for 10min under pressure condition of 0.1MPa and temperature condition of 110℃-120℃, and performing cold pressing treatment to obtain an intermediate blank, wherein the heat-resistant double-sided adhesive film and the inlay have same shape and size;

c. sequentially superposing hot-melt adhesive films and the shaped sheets on both sides of the intermediate blank, performing hot pressing treatment for 10min under pressure condition of 0.1MPa and temperature condition of 110℃-120℃, and then performing cold pressing treatment to obtain a card blank to be cut;

d. cutting the card blank to be cut into wooden electronic tag cards according to a preset size.

10. The method for manufacturing a wooden electronic tag card according to claim 9, wherein:

the cold pressing treatment in the steps a, b and c is performed under pressure condition of 0.1MPa and refrigeration power of 10HP, and treatment time of the cold pressing treatment is 25 min.

11. The method for manufacturing a wooden electronic tag card according to claim 9 or 10, wherein:

two of the shaped sheets in the intermediate blank have wood grain extending directions parallel to each other, and two of the shaped sheets on an outermost side of the card blank to be cut have wood grain extending

directions perpendicular to wood grain extending directions of adjacent shaped sheets.

12. The method for manufacturing a wooden electronic tag card according to any one of claims 9 to 11, wherein:

the inlay and the wooden electronic tag card are same in shape, and the inlay is located at the center of the wooden electronic tag card.

13. The method for manufacturing a wooden electronic tag card according to claim 12, wherein:

a length ratio of the wooden electronic tag card to the inlay is not less than 2.

14. The method for manufacturing a wooden electronic tag card according to any one of claims 9 to 13, wherein:

the shaped sheet had a thickness from 0.3mm to 0.4 mm.

15. The method for manufacturing a wooden electronic tag card according to any one of claims 9 to 14, wherein:

the hot-melt adhesive film is a TPU hot-melt adhesive film.

16. The method for manufacturing a wooden electronic tag card according to any one of claims 9 to 15, wherein:

the heat-resistant double-sided adhesive film is a PET double-sided adhesive film.

17. The method for manufacturing a wooden electronic tag card according to any one of claims 9 to 16, wherein:

the raw wood sheets are linden wood sheets, bamboo wood sheets, beech wood sheets, cherry wood sheets, sapelli wood sheets or black walnut wood sheets.

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/126011

A. CLASSIFICATION OF SUBJECT MATTER

G06K 19/077(2006.01)i

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)

G06K

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)

CNABS; CNTXT; VEN; USTXT; WOTXT; EPTXT; CNKI: 木质, 木料, 木材, 木板, 木片 , 电子标签, 卡, 胶, 热压, wood, electronic tag, card, adhesive, hot pressing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 110472719 A (GLOBAL CARD SYSTEMS COMPANY LIMITED) 19 November 2019 (2019-11-19) entire document	1-17
A	CN 108171307 A (SHENZHEN LICHENG SMARTCARD CO., LTD.) 15 June 2018 (2018-06-15) description, paragraphs 1-14, 17-25 and figures 1-2	1-17
A	CN 107030832 A (LINYI YOUYOU WOOD INDUSTRY CO., LTD.) 11 August 2017 (2017-08-11) description, paragraphs 1-18	1-17
A	CN 106203603 A (YIN, Xiangfeng) 07 December 2016 (2016-12-07) entire document	1-17
A	US 2007114621 A1 (GENERAL ELECTRIC COMPANY) 24 May 2007 (2007-05-24) entire document	1-17

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"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
"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
24 April 2020	**08 May 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/126011

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 110472719 A	19 November 2019	None	
CN 108171307 A	15 June 2018	CN 207586978 U	06 July 2018
CN 107030832 A	11 August 2017	None	
CN 106203603 A	07 December 2016	None	
US 2007114621 A1	24 May 2007	US 7998546 B2	16 August 2011