METHOD AND APPARATUS FOR BEAUTIFYING WOOD PANELS

Fig. 1

Fig. 2

Fig. 3

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Fig. 5

Fig. 6

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ABSTRACT OF THE DISCLOSURE

This invention is directed to a method and apparatus for sculpturing a design in the surface of a wood panel or the like. This is attained by utilization of an electric resistor die comprising a plurality of individual die components formed of a highly electrical resistant material which are formed or shaped into a predetermined design to be sculptured into the surface of the panel. The adjacent resistor die components are spaced one from another so as to prevent burning and each is individually energized from a suitable source of electrical energy.

The arrangement is such that the die so formed is moved into contact with the panel to be sculptured under predetermined pressures so that when energized the die effects a charring of the predetermined design directly into the surface of the panel and the pressure applied therein functions to facilitate structural failure of the charred portions of the panel. To prohibit open burning of the panel during a sculpturing operation an enclosure or hood is provided to enclose that portion of the panel to be sculptured from the atmosphere and the oxygen content within the enclosed area being reduced. The depth of the sculptured design is further controlled by providing suitable gauge stops to limit the depth to which the design is charged into the panel.

This invention relates in general to a method and apparatus for beautifying wood panels, and more specifically to a method and apparatus for finishing relatively large sheets of wood panels by burning in the surface thereof a desired design. Heretofore, the finishing of wood panels for interior decorating was attained by either painting, papering and/or laminating a beautifying plane surface onto the wood panel. While the above-mentioned ways of beautifying wood panels produced a pleasing appearance, the resulting design did not have any depth, dimension or sculptured look thereto.

In order to attain depth and a third dimension in the design applied to wood panels for a more appealing effect, efforts have been made to burn an ornamental design directly into the surface of the wood panel. The known methods by which such designs were burnt into wood panels consisted primarily in applying a burner flame directly to the surface of the wood, or evidenced by U.S. Patents 695,417, 1,009,436, 2,113,679 and others. The burning of designs directly onto the surface of wood panels by direct flame contact usually resulted in a non-uniform heating and burning of the wood panel because a burner flame is difficult, if not impossible, to control. With direct flame burning of wood panels, it was virtually impossible to produce any really distinctive relief type designs that had any scope of depth, precision or sharpness. At most, the known methods of the burning designs by direct flame contact in wood panels resulted merely in a charring of the surface of the wood. Usually such flame burning techniques resulted merely emphasizing or more predominantly bringing out the natural grain of the wood as taught by U.S. Patent 1,566,985. Therefore, flame burning has only limited application in beautifying wood surfaces.

An object of this invention is to provide an improved method and apparatus for burning into relatively large wood panels designs of various shapes and forms that are sharp and clear.

Another object is to provide a method and apparatus for the controlled burning of a desired design in a wood panel without causing the same to flame up into open burning.

Another object is to provide an improved method and apparatus of heat-branding wood panels in which the wood structure of a panel is weakened by charring in accordance with a predetermined pattern so that the application of only a small amount of pressure results in the structural failure of the wood to define in the surface thereof an indented design according to said pattern.

Another object is to provide a method and apparatus for burning a desired design in a wood panel in a relatively simple, easy and positive manner, and in which only a minimum of effort is required.

Another object of this invention is to provide an improved hewed die construction by which a suitable design can be burnt directly into a wood panel simply and quickly.

In accordance with this invention, the above objects and other features and advantages are attained by the method of firmly supporting a panel or sheet of wood so as to have at least one surface thereof exposed to a heated die structure which is adapted to be moved between operative and inoperative positions. Preferably the shape and area of the die structure is substantially coextensive with the area and shape of the panel or sheet of wood to be beautified. According to this invention, the die structure comprises a rigid backing member to which an electrically heated design element is connected with means disposed therebetween to both thermally and electrically insulate one from the other. The design element may be formed simply of an electrically heated element or resistor or of a plurality of such elements arranged to define a given design. In accordance with this invention the resistor elements are bent or formed into the shape of the design desired and the resistor so shaped secured in place to the die backing member. The respective design elements are formed of an electrically conductive material which are suitably connected to a source of electric power. The design of the die is formed on a wood panel by bringing the die element into direct contact with the wood panel and applying an electric current to the design element to energize or heat the same. When the design element is thus energized, the heat produced will effect a burning or charring of the design directly into the wood. Gauge stop means are provided to limit the depth to which the design is burnt into the wood. To minimize the open flame of the wood panel, means are provided to control and/or prohibit the same.

The feature of this invention resides in the provision of method and an apparatus for practicing the same that is both relatively simple and positive in operation. Another feature resides in the provision wherein the design of any given configuration or shape may be burnt into the surface of a wood panel so as to give a panel so finished a truly hand carved, sculptured, or three-dimensional look.

Still another feature resides in the provision of a novel die component in which the burning of a wood panel is attained by electrically heating the design element of the die only.

Still another feature of the invention resides in the provision wherein the heating element comprises an electric resistor which may be utilized either singularly or in combination with other like or similar resistors to define a predetermined pattern or design.
Still another feature resides in the provision of forming a given design on the surface of a wood panel by retor burning and applied pressure.

Other features and advantages will become more readily apparent when considered in view of the drawings and specifications in which:

FIG. 1 is a front elevation view of the apparatus for beautifying wood panels in accordance with this invention;

FIG. 2 is an end view of the apparatus of FIG. 1 with the hood removed;

FIG. 3 is a perspective view of the die structure of this invention;

FIG. 4 is a side sectional view of a modified form of the invention;

FIG. 5 is a plan view of a modified design element;

FIG. 6 is an end view of the design element of FIG. 5;

FIG. 7 is an enlarged detail of the mounting means for the design element;

FIG. 8 illustrates diagrammatically the electrical connection of the design components of FIG. 5.

In accordance with this invention the method of beautifying a wood panel by forming a design indented in the surface thereof comprises the steps of moving an electrically energized die element or resistor into direct contact with the surface of a panel and applying pressure thereon as the element or resistor burns or chars the design into the panel. To prohibit the wood panel from burning into flame, the charring or burning is done in an enclosure from which the oxygen is removed either by a vacuum pump or is consumed upon the initial burning of the design. If desired the charring may be accomplished by charging the enclosure with an inert gas, such as CO₂ to prohibit open flame burning.

When energized, the electrically heated die element or resistor will burn the design thereof directly into the surface of the given panel. In accordance with this invention, the area of the die structure may be substantially coextensive to the area of the sheet or wood panel. Thus the design can be readily applied to the entire area of the wood panel in a single operation. However, if desired, a die structure smaller in area than the panel to be printed may be utilized in which case the design of the die may be repeated. In the operation of the method, the depth to which the design is burnt can be controlled by suitable limit stops. After the design has been formed, the die structure is deenergized and removed from the surface of the panel. If necessary, a subsequent brushing operation may be performed to remove excessive char from the indented design. Thereafter the burning operation may be repeated if a design of greater depth or indentation is required, or the panel may be finished by applying a suitable coating of paint, lacquer or other finish.

Also, it has been discovered that covering the surface of the panel so burned with a plastic coating provides a clean, smooth appealing surface which can be effectively utilized for decorator's wall or floor covering.

While the above method may be performed by hand, in accordance with this invention, it is preferred that the method be automatically performed by the apparatus disclosed in the drawings. Referring to the drawings, the apparatus for beautifying a surface in a wood panel with a three dimensional or sculptured design of FIGS. 1 to 3 comprises a frame structure 10 which includes rectangularly disposed leg members 11 which are stabilized by interconnecting longitudinally extending bracing members 12 and transversely extending bracing member 12a. Intermediate bracings 12b may be provided if necessary. Supported on the leg members 11 is a table surface 13 on which a wood panel P is adapted to be firmly supported in position. As shown in FIG. 1. Extending upwardly from the table surface of the frame are opposed upright stanchions 14 interconnected by transversely and longitudinally extending bracing members 15 and 16, respectively to define with stanchions 14 and upper frame structure 17.

Connected to the upper frame structure 17 for movement between operative and inoperative position is a die means 18. As shown, the die means 18 is moved between operative and nonoperative position by a suitable piston and cylinder assembly 19.

According to this invention, the die means 18 comprises a backing element 18A which is substantially coextensive in area to that of the panel P. Connected to the die backing member 18A is the design element 18B. In accordance with this invention, it is preferred that the die element 18B comprises an electrical resistor which is shaped to determine the design to be formed in the surface of the panel P. In accordance with this invention, suitable means are utilized to electrically and thermally insulate the design element 18B from the backing surface 18A of the die structure. As shown, a strip of suitable electrical and thermal insulating material 18C may be utilized to insulate the design element 18B from the backing member 18A. In this manner, the transfer of heat from the heating element 18B to the backing member 18A is prohibited. Since the heat of the design element 18B, when energized is not dissipated to the backing member 18A, more of the heat is made available to burn or char the design into the surface of the wood when the die is brought into contact with the wood panel. As is shown, the die structure 18 is guided between operative and inoperative position by the upright stanchion 14. If desired, suitable gauge stops 20 may be positioned on the table adjacent the periphery of the wood panel. In operation, when the die structure 18 is moved into operative position on top of the panel P, the design element 18B is energized and heated, it will burn the design thereof into the wood under pressure. As the design element is burning its way into the panel P, the die structure moves downwardly until it strikes stops 20, and thus prohibits further downward movement of the die. In this manner the depth of the design is determined. If desired, the gauge stops can be made adjustable to vary the gauge depth of varying designs. It will be understood that the above apparatus can be automatically operated by suitable control means. That is, the piston and cylinder assembly 19 actuating the die structure 18 and the electrical controls which energize the design die element 18B may be so regulated that as soon as the die structure is moved into operative position on top of the wood panel, a switch (not shown) is actuated to energize the resistors 18B of the design element. The heat generated will cause the die element 18B to burn its way into the wood panels to a prescribed depth as determined by the gauge stops 20. One of the gauge stops 20 may be provided with a switch for deenergizing the design element 18B on contact with the die structure 18 when the depth of the design has been reached. Upon the heating element being deenergized, the piston and cylinder assembly is operated to retract the die means 18 to raised inoperative position. In this manner it will be apparent that the design is formed to the prescribed depth into the wood panel in one operation. The wood panel can then be removed, and the next succeeding panel to be designed positioned in place upon the frame 10 and the operation repeated. To insure proper positioning of the respective panels on the table surface of the frame suitable locating and locking means (not shown) may also be provided.

A means is provided to prohibit open flame burning the wood panel, as the design is being burned thereinto. As shown in FIG. 1 the means comprises an enclosure 30 which is constructed and arranged to enclose the area of the panel P on which the resistor heater element 18 is operating.

Accordingly, the enclosure 30 comprises a hood which is reciprocally mounted for movement between an operative and inoperative position. Suitable means may be
provided for effecting the movement of the closure. As shown, a plurality of piston and cylinder assemblies 31 mounted on the frame 14 are provided to effect the necessary movement.

The arrangement is such that in the operative position the lower edge portion 36A of the hood 36 defines a seal with the closing member. The portion 36A is provided with a plurality of cutouts or openings 36B which are spaced at regular intervals and are adapted to engage with the respective bushings 55 and 56. With the leads or electrical conductor 57A connected to the terminal pins 57B, thus formed at the terminal points 54 of the respective elements, the latter is connected in circuit with a suitable source of electrical power by which each is energized.

The circuitry in which each of the respective elements 52A to 52E of the cover leaf pattern is connected is best seen in FIG. 8. As shown, each of the electrical terminals 54 of the respective elements 52A is connected in series with a respective step down voltage transformer 58 which functions as a low voltage, high current supply for the respective ribbons or elements. Each transformer in turn is controlled by a rheostat 59 connected in circuit therewith. Each rheostat 59 in turn is connected across the supply lines 60, 61.

Thus as seen in FIG. 8, each element 52A is slightly spaced one from the other so that the respective terminals 54 are connected in series in their respective circuits. The arrangement is such that when each can be energized to the same degree so that an overall uniform design may be formed. If desired, variations can also be attained by proper control or adjustment of the respective rheostats 59 which control the current supply to the respective elements 52A.

Intermediate spacers 51A are provided to render the elements 52A more rigid to insure uniform burning or charring. Spacers 51A are formed of a ceramic so as not to conduct or draw any heat from the element, or cause cold spots on the element at their points of connection thereon.

In operation, the apparatus of FIGS. 4 to 8 operate in a manner similar to that hereinbefore described. The panel P is placed on the frame 41 and the hood 42 is lowered to effectively seal off the area to be charred or burned. The air within the hood is then evacuated by pump 46 so as to reduce the oxygen content within the hood. The design element 47 is then energized and lowered onto the panel and held in place thereunder by pressure. The energized element thus chars or burns its way into the panel according to the shape of the element 52. Accordingly, the charring weakens the wood structure, and the applied pressure on the element induces the structural failure of the wood which permits the design element to sink in and form the indented design in the surface of the panel.

Upon completion of the charring or burning of the design, the wood panel P may be brushed or scraped to remove the char, and the operation repeated, if greater indentation is required. The panel upon completion of the burning operation and after cleaning may then be the finished in any of the well known techniques e.g. painting, etc.

As an alternate arrangement the need for the vacuum pump 46 can be dispensed with, if the volume of the hood is such that the oxygen content therein can be consumed by the charring process above described. In either event, the absence of sufficient oxygen to support combustion during the charring or burning operation prohibits the flaming up of the wood panel. Thus, the shape and appearance of the finish design is rendered more definitive and appealing.

The respective design elements 18B and 52 are preferably made of an electrically conductive highly resistant material so as to retain the heat that becomes red hot, or white hot, as may be required. A suitable material 65 for fabricating the resistor elements is Toffit C.

From the above description it will be apparent that the method and apparatus of this invention are relatively simple and effective in operation. The invention has been disclosed with reference to a particular method and apparatus for efficiently performing the same, it is to be appreciated that the invention is not to be taken as limited to all of the details thereof as modifications and variations thereof may be made without departing from the spirit or scope of the invention.
What is claimed is:

1. The method of forming decorative sculptured wood panels comprising the steps of:
   (a) firmly supporting a wood panel to expose a surface portion thereof,
   (b) enclosing an area of said panel off from the atmosphere, reducing the oxygen content of the atmosphere surrounding the enclosed area of the panel,
   (c) positioning an electrically heated die means formed of separately wired components to define a given design configuration onto the surface of said panel within the enclosed area thereof,
   (d) energizing each of said separately wired die components to heat the same to weaken the structure of said panel in accordance to said design by charring in the reduced atmosphere of the enclosed area,
   (e) applying pressure on said energized die means during said charring step whereby said structure results in the structural failure of said panel in the charred area to permit said die to sink into the surface of said panel to form an indented design therein in accordance to said configuration,
   (f) controlling the depth said design is indented in said panel,
   (g) brushing the char from said indented design upon completion of the charring operation, and
   (h) finishing said panel with a suitable finish.

2. An apparatus for decorative sculpturing of wooden panels comprising:
   (a) a frame adapted for supporting thereon a panel to be sculptured,
   (b) means defining an enclosure adapted to enclose a portion of the panel to be worked on from the atmosphere and means reducing the oxygen content of the enclosed area,
   (c) an electric heating die means having a design configuration defined by a plurality of die components movably mounted within said enclosure for movement toward and away from said panel,
   (d) means for individually energizing each of said die components in the reduced atmosphere,
   (e) means for moving said die components into contact with the surface of said panel within said enclosure whereby said heat die components effects charring of said panel in accordance to said design, and
   (f) means for applying pressure on said die components as said die effects the charring of said panel to facilitate structural failure of the panel in the charred area.

3. The invention as described in claim 2 wherein said die means includes:
   (a) a base, and
   (b) said die components being formed of a highly electrically resistant material,
   (c) means for thermally and electrically insulating each of said die components from said base,
   (d) and an electric circuit for energizing each of said die components to effect charring of said panel when brought into contact therewith.

4. The invention as defined in claim 3 wherein said circuit includes:
   (a) a step down voltage transformer connected in series with said die element to provide a low voltage high current supply,
   (b) and a rheostat connected in circuit therewith to vary the current supply to said die element.

5. The invention as defined in claim 3 wherein said die element comprises:
   (a) a plurality of artistically shaped die components arrayed to define a given design configuration, said die components being formed of an electrical conducting material,
   (b) means defining an electrical terminal connected to the respective end portions of each die component,

6. The invention as defined in claim 5 and including means connected in circuit with each of said respective die components to individually control the current supply directed thereinto.

7. An apparatus for the decorative sculpturing of relatively large areas of wooden panels and the like comprising:
   a frame for supporting thereon a panel to be sculptured,
   means defining a hood enclosure adapted to enclose the portions of the panel to be sculptured from the atmosphere,
   means for evacuating air from the hood enclosure to reduce the oxygen content within said enclosure to prohibit flame-up of the panel during a charring operation,
   a heating die means movably mounted on said frame within said hood enclosure for movement toward and away from said panel,
   said die means including a plurality of artistically shaped die components arrayed to define a given design configuration,
   each of said die components being formed of an electrical resistance material,
   means defining an electrical terminal on the respective end portions of each die component,
   a source of electrical energy operatively connected to each die component,
   means connecting the respective terminals of said die components into an electric circuit with said source,
   said adjacent die components being slightly spaced from one another to prohibit shorting therebetween,
   a stepped-down transformer connected in series with each of said electrical components,
   and a rheostat control connected in circuit with each of said transformers to regulate current flow through each of said die components independently of one another,
   and means for moving said heated die means into engagement with the surface of said panel when heated and for exerting a predetermined pressure thereon whereby said heat and pressure result in structural failure of the panel to permit the die means to sink into the panel and form an identical sculptured design therein as said hood enclosure encloses said sculptured portion from the atmosphere.

8. The invention as defined in claim 7 wherein said die means includes:
   a backing member, and means for thermally and electrically insulating each of said die components from said backing member,
   said latter means including a spacer supporting said die component in spaced relationship to said backing member,
   means for electrically insulating said die component from said spacer,
   fastener means connecting said die component to said spacer,
   a terminal pin connected in electrical contact with said die component at a terminal point, and an electrical conductor connected to said terminal pin for conducting electric current through said die component.

9. A method of forming decorative wooden panels comprising the steps of:
   firmly supporting a wood panel,
   enclosing off an area of the panel to be worked on from the atmosphere,
   positioning a die having a plurality of individually wired components to define a design configuration which is...
to be formed on said wood panel within the enclosed area,
applying a predetermined pressure on said die positioned on said panel,
electrically energizing each of said die components whereby said energized die in contact with said wood panel chars the design thereof into said wood panel, and the pressure applied thereon resulting in structural failure of the panel in the charred design area, removing the air from within said enclosed area to reduce the oxygen content thereof so as to prohibit flame-up of said panel during the charring operation, brushing the char from the panel after completion of said charring operation and finishing said panel to give a desired finish thereto.

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