Feb. 20, 1968 J. INGLIS 3,369,919

METHOD AND APPARATUS FOR BEAUTIFYING WOOD PANELS

Filed Oct. 15, 1964 3 Sheets-Sheet 1

Fig. 1

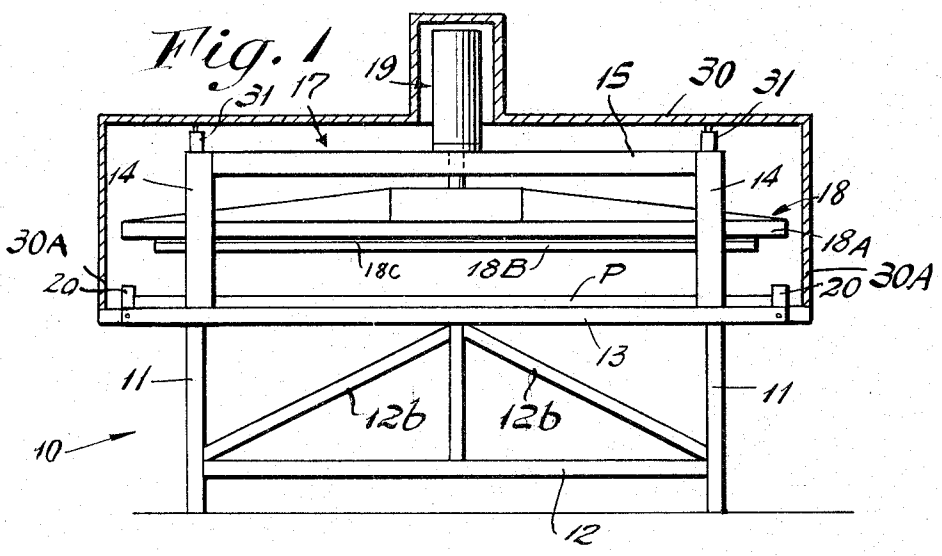


Fig. 2

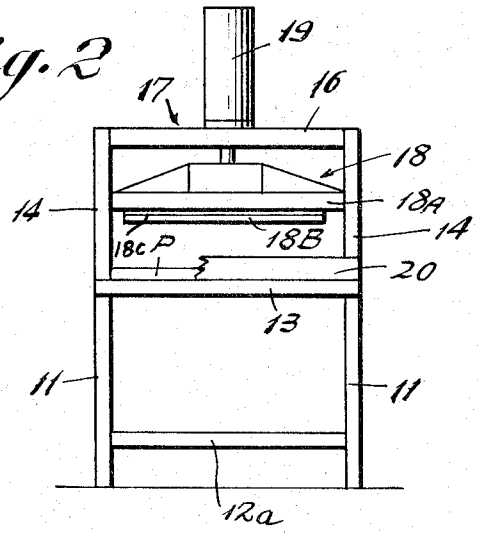
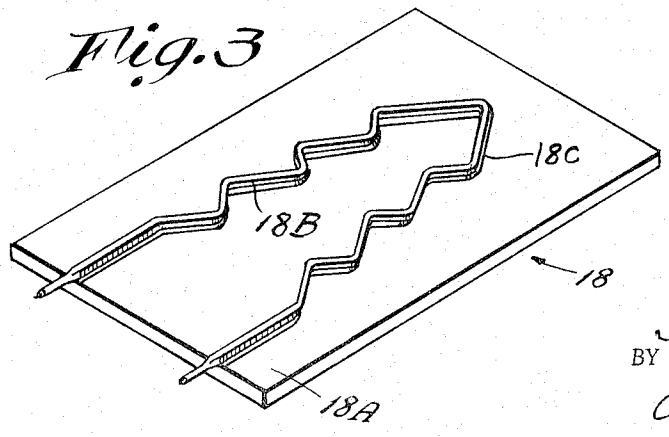


Fig. 3



INVENTOR.
John Inglis
BY
Arthur F. Fattibene
ATTORNEY

Feb. 20, 1968 J. INGLIS 3,369,919

METHOD AND APPARATUS FOR BEAUTIFYING WOOD PANELS

Filed Oct. 15, 1964 3 Sheets-Sheet 2

Fig. 4

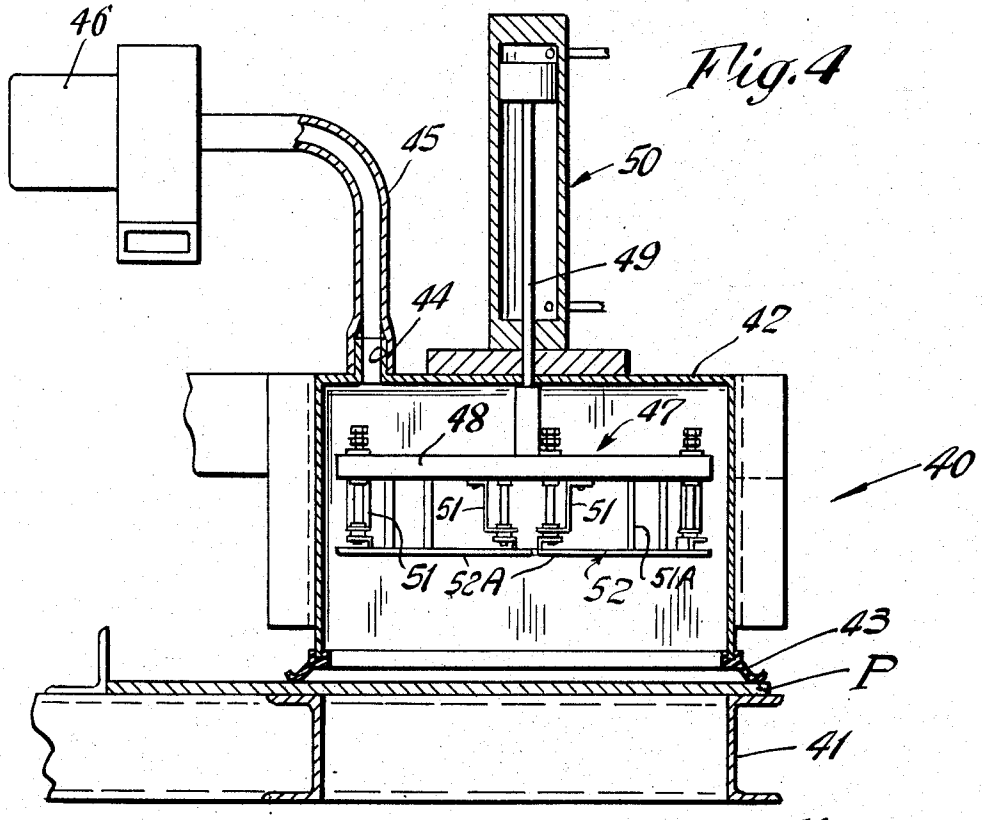


Fig. 7

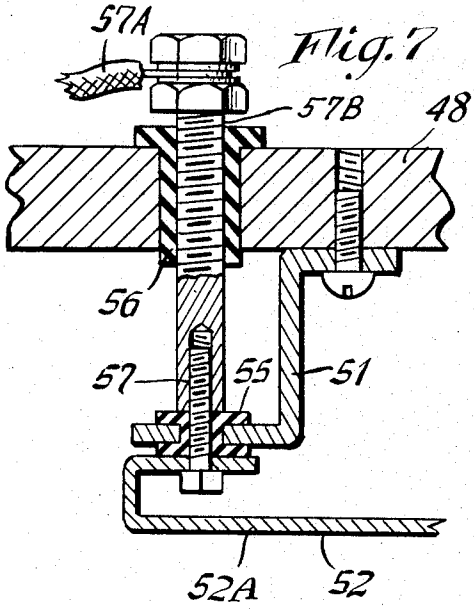
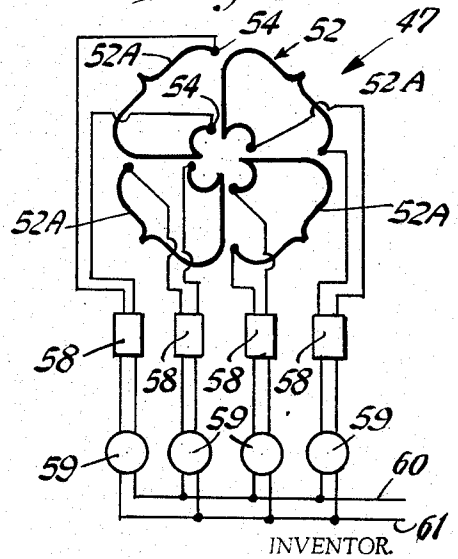


Fig. 8



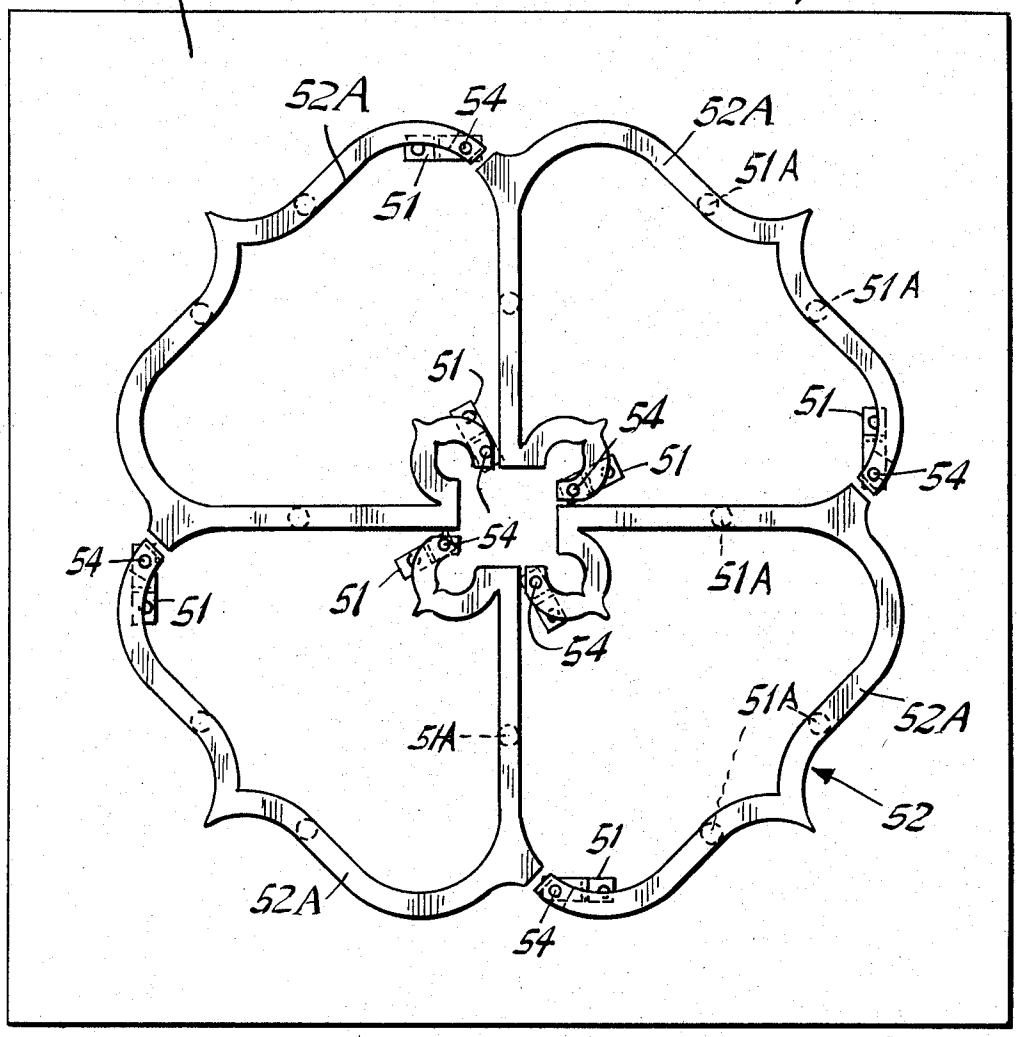
INVENTOR.
John Inglis
BY
Arthur P. Fattibene
ATTORNEY

Feb. 20, 1968 J. INGLIS 3,369,919

METHOD AND APPARATUS FOR BEAUTIFYING WOOD PANELS

Filed Oct. 15, 1964 3 Sheets-Sheet 3

Fig. 5



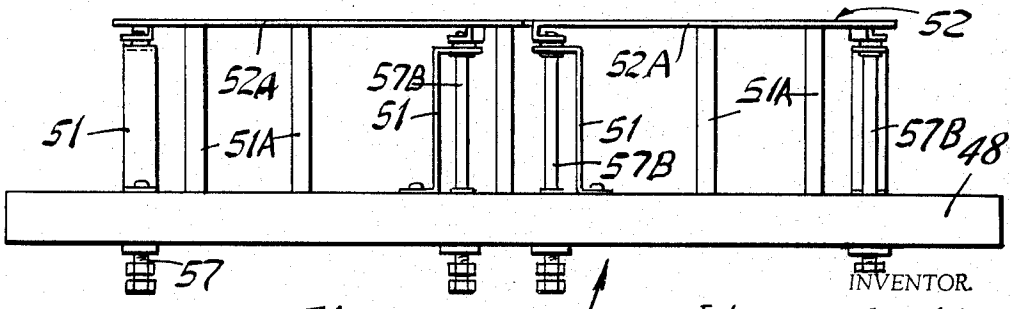


Fig. 6

INVENTOR.
John Inglis
BY
Arthur F. Fattibene
ATTORNEY

United States Patent Office 3,369,919
Patented Feb. 20, 1968

3,369,919

METHOD AND APPARATUS FOR BEAUTIFYING WOOD PANELS

John Inglis, 4177 Park Ave., Fairfield, Conn. 06430

Filed Oct. 15, 1964, Ser. No. 404,038
9 Claims. (Cl. 117—46)

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 shorting 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 thereon 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 as 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 in 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 heated 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 burned into the wood. To minimize the open flaming 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 electrical 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 retort 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 bursting 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 CO_2 to prohibit open flaming.

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 of 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 **12***a*. Intermediate bracings **12***b* 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 horizontal position as is 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 wood panel. 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 therewith.

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 and the die 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 structure, 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 flaming of 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 **30A** of the hood **30** defines a seal with the marginal edge portions of the table on which the panel is placed. In the illustrated form of FIG. 1 the volume or space encolsed by the hood is such that the oxygen content therein is totally consumed upon the initiation of the burning of the design in the panel **P**. In this manner a retort type burning is effected and the design is printed to a desired depth without open flaming of the wood panel. In this manner accurate and controlled charring or burning of the design in the wood panel is effected.

If desired the oxygen under the hood, in the operative position thereof can be positively moved prior to the initiation of the burning of the design by removing the air from beneath the hood by vacuum or suction pump suitably connected to the hood, as will be hereinafter described. In this manner flaming is more positively prohibited during the charring or burning operation.

FIGS. 4 through 8 illustrate a modified form of the invention. In this form of the invention the apparatus **40** comprises a suitable frame support **41** upon which the wood panel P is supported. Mounted above the frame **41** and the panel P supported thereon is a suitable enclosure or hood **42** which is adapted to enclose the area of the panel P which is to be subjected to burning or charring during the forming of the indented design on the panel. As shown, the lower peripheral edges of the hood **42** are circumscribed by a suitable sealing strip **43** capable of forming an air tight seal with either the surface of the panel or frame, depending on the size of the panel to be printed by charring.

Suitable means, e.g., piston and cylinder assembly (not shown) may be provided, if desired, to effect the raising and lowering of the hood **42** to facilitate the positioning and/or removal of the panel from the table top.

In the illustrated embodiment of FIG. 4 the hood **42** is provided with a nipple **44** opening to the interior thereof. Accordingly, a flexible conduit **45** connected to the intake end of a suction or vacuum pump **46** is connected to the nipple **44**. Thus as will be hereinafter described, the air within the enclosure of the hood may be removed by operation of the pump **46**.

Mounted for verticle movement within the hood **42** is a die structure **47** by which a suitable design is charred or burned into the wood. In this form of the invention the die **47** comprises a base **48** carried on the end of a piston rod **49** of a piston and cylinder assembly **50** mounted on the hood or machine frame. Connected to the undersurface of the base **48** by suitable spacer elements **51** and **51A** is the die structure **52** of the element.

In this form of the invention the die structure **52** is comprised of several distinct spaced die components **52A**. As best seen in FIGS. 5 and 8, each die component **52A** is similarly shaped and arranged to define an integrated design pattern. The illustrated design is that of an ornate four leaf clover made of artistically tooled steel ribbon or the like. Accordingly, the element **52A** defining each of the respective clover leaves are spaced from the base by a Z-shaped spacer **51**. Also each terminal end of the respective clover leaf is provided with an electrical terminal **54** which is connected in circuit to a source of power and a means to control the current flow therethrough.

As best seen in FIGS. 8 and 7, the electrical terminals **54** are electrically and thermally insulated from both the base **48** and the spacer supports **51** by suitable non-conducting heat resistant, bushings **55** and **56**. Thus as seen in FIG. 7, the fastening means **57** which secure the element **52A** to the spacers **51** and the base **48** are formed of an electrically conducting material that extends through 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** of the clover 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 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 element **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 thereto.

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 thereon under 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 scrapped 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 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 for fabricating the resistor elements is Toffit C.

From the above description it will be apparent that the method and apparatuses of this invention are relatively simple and effective in operation. While the instant 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 eenergizing 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 component being formed of an electrical conducting material,
(b) means defining an electrical terminal connected to the respective end portions of each die component,
(e) means connecting the respective terminals of said die components in series in an electrical circuit,
(d) and said components being spaced one from the other to prohibit shorting therebetween.

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 thereto.

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.

References Cited

UNITED STATES PATENTS

400,085	3/1889	Himmel	101—32
445,648	2/1891	Cannell	101—31
1,078,490	11/1913	Fenlason	101—27
1,369,934	3/1921	Onstad	101—27
1,566,985	12/1925	Shuler	117—147
1,625,009	4/1927	Whited	101—31
1,758,336	5/1930	Schmid	117—46
1,937,195	11/1933	Freeman et al.	101—27
2,248,207	7/1941	Tedder	101—31
2,574,375	11/1951	Chapman	101—46

MURRAY KATZ, *Primary Examiner.*