Oct. 22, 1940. V. CATINI 2,219,251

PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

Filed June 22, 1937 5 Sheets-Sheet 1

Fig. 1.

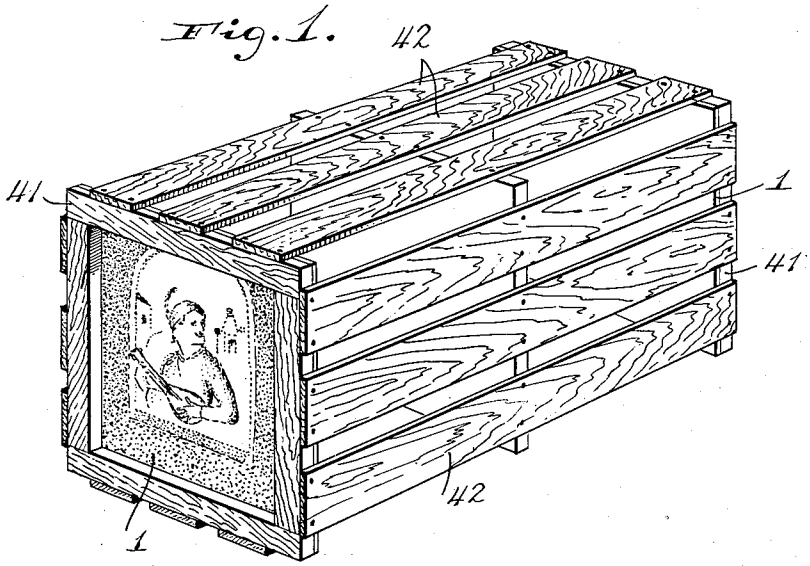


Fig. 2.

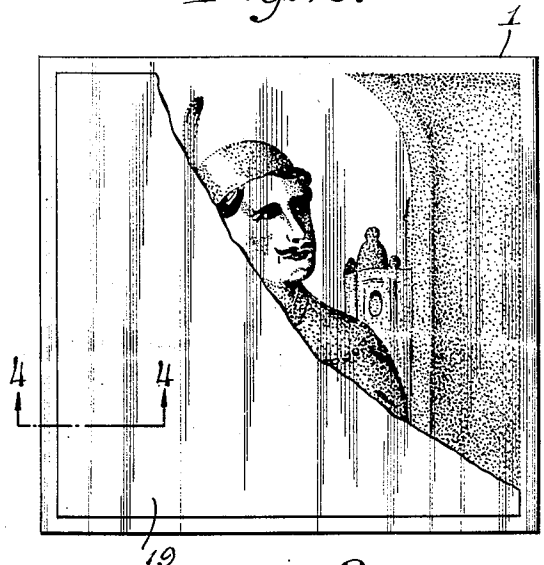


Fig. 3.

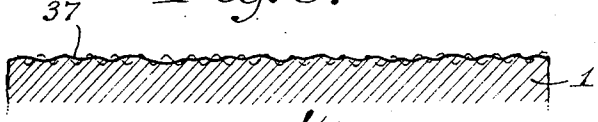


Fig. 4.

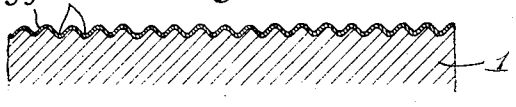


Fig. 15.

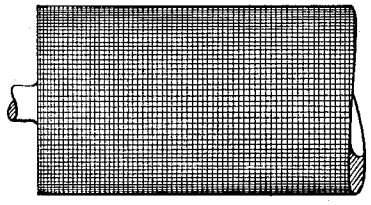
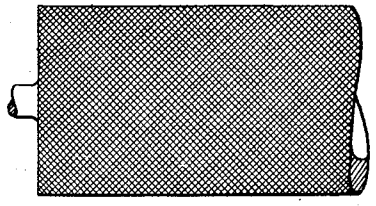


Fig. 16.



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PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

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Fig. 14.

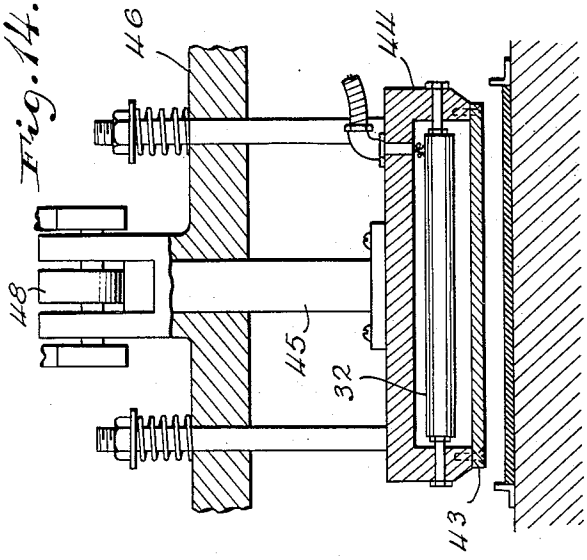


Fig. 13.

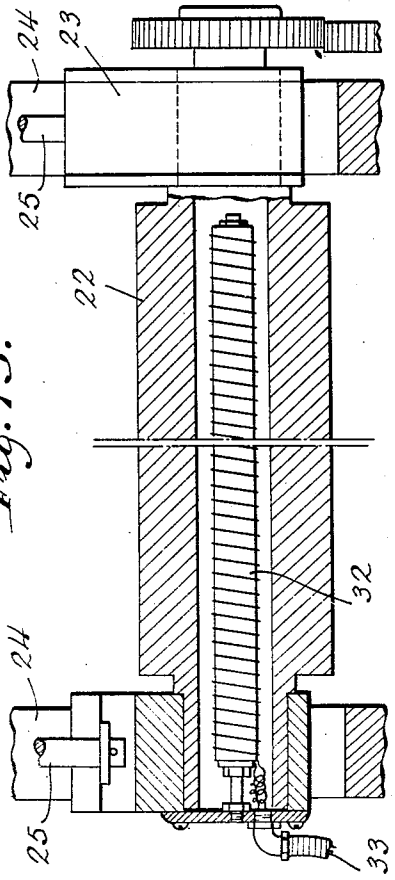


Fig. 5.

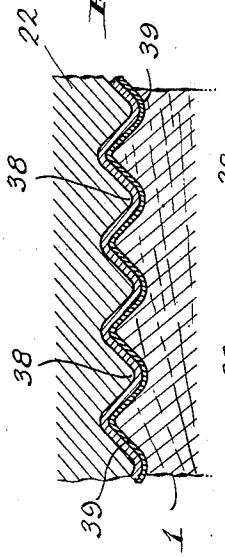
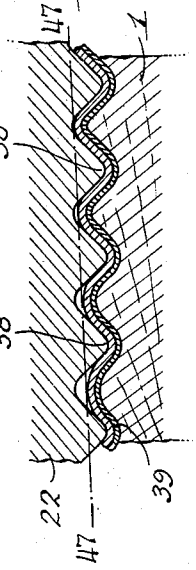


Fig. 6.



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PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

Filed June 22, 1937 5 Sheets-Sheet 3

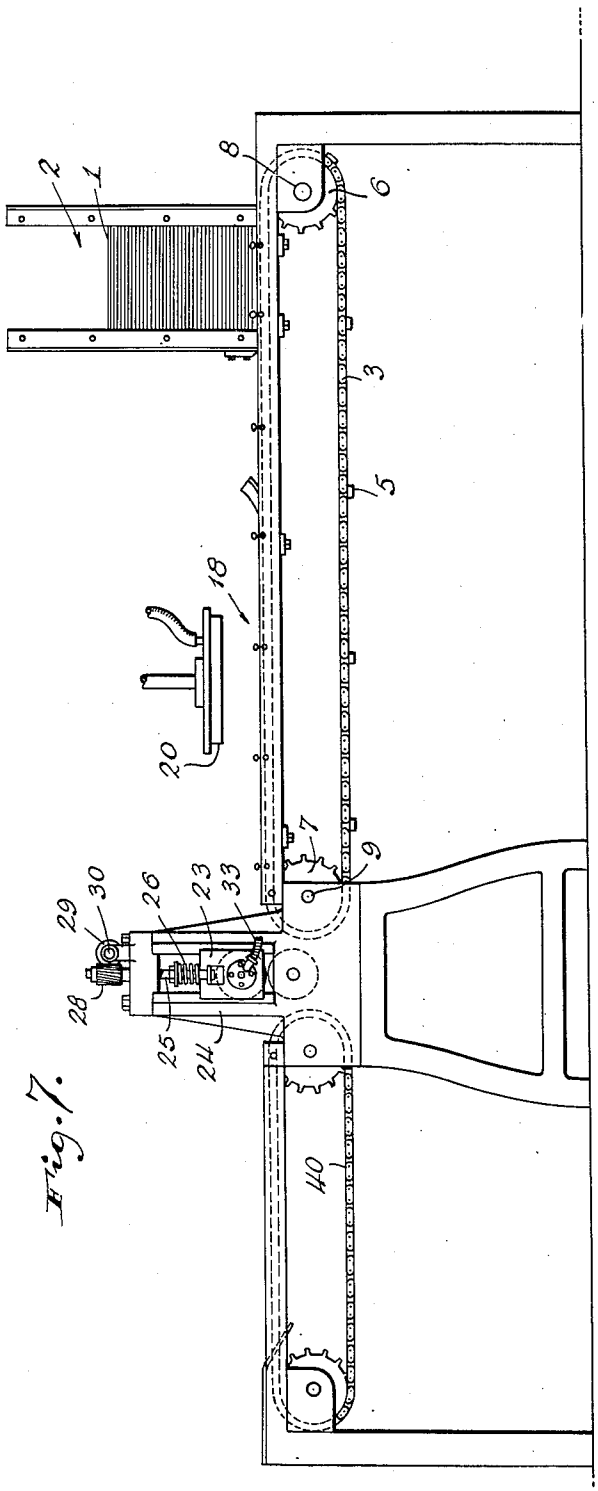


Fig. 7.

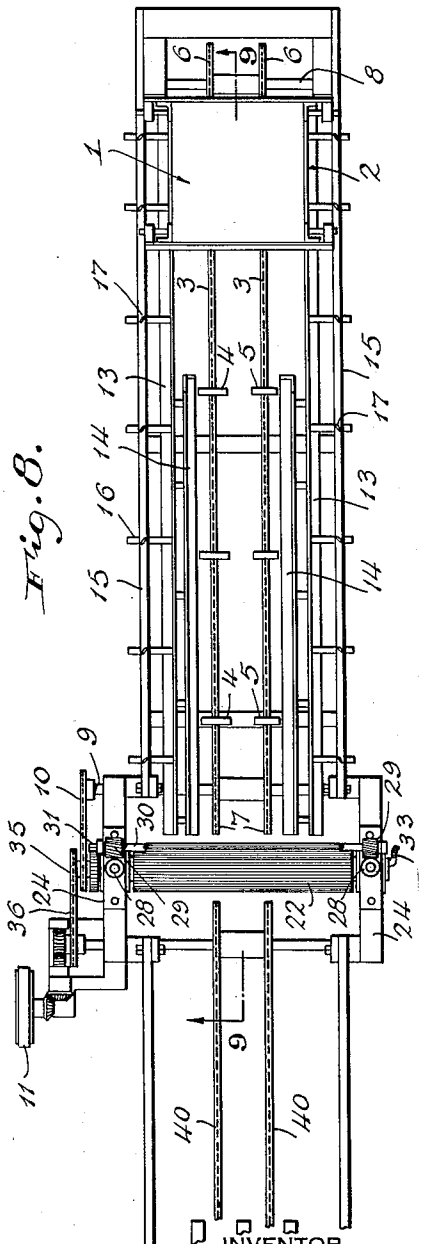


Fig. 8.

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PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

Filed June 22, 1937 5 Sheets-Sheet 4

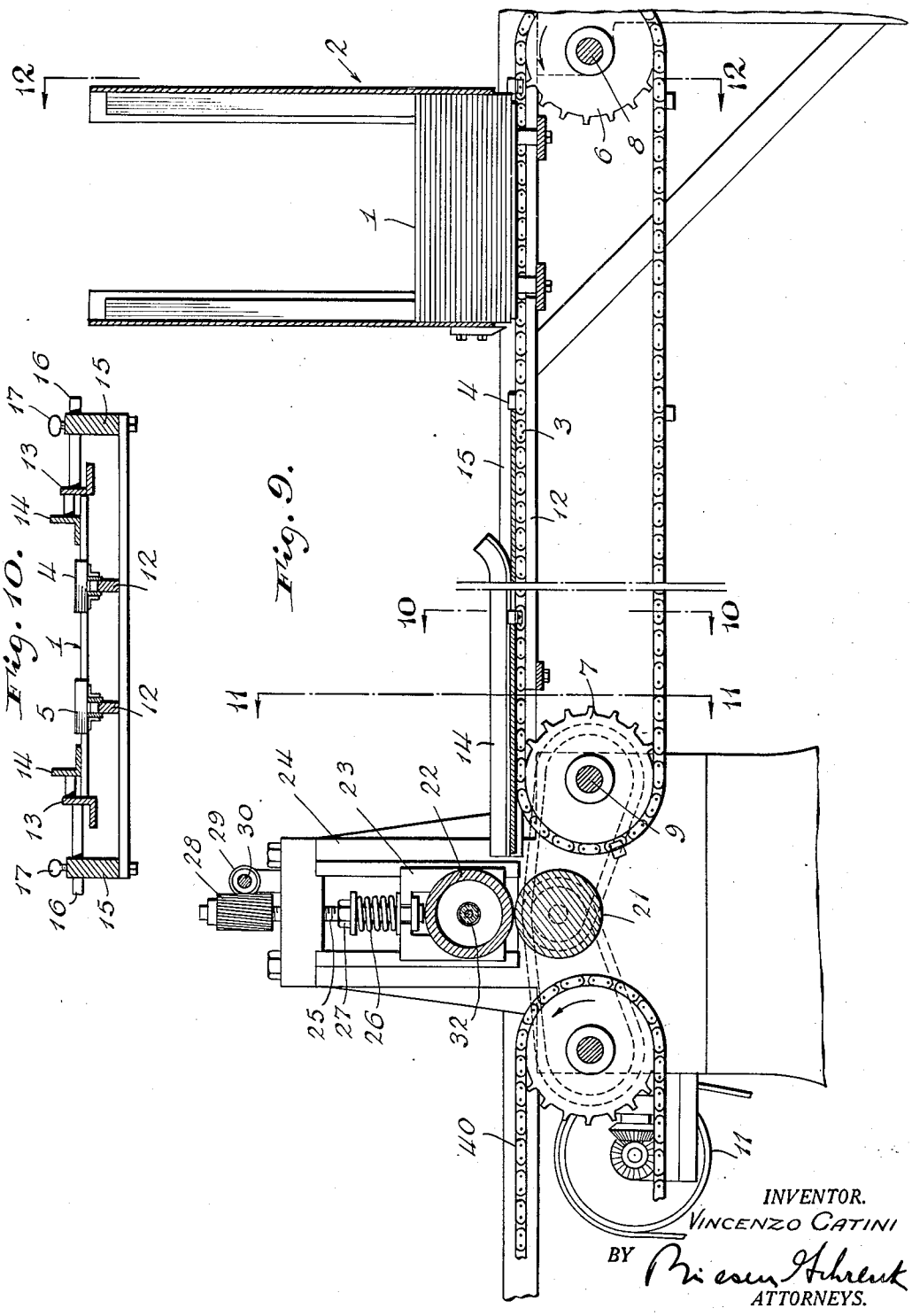


Fig. 9.

Fig. 10.

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PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

Filed June 22, 1937 5 Sheets-Sheet 5

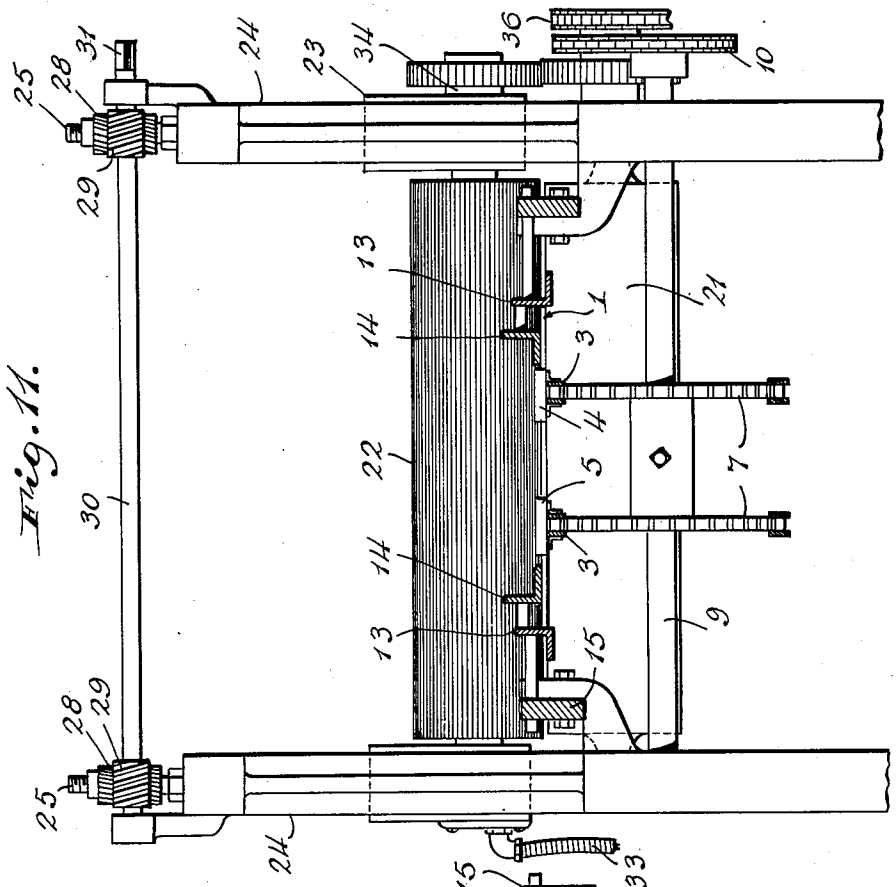


Fig. 11.

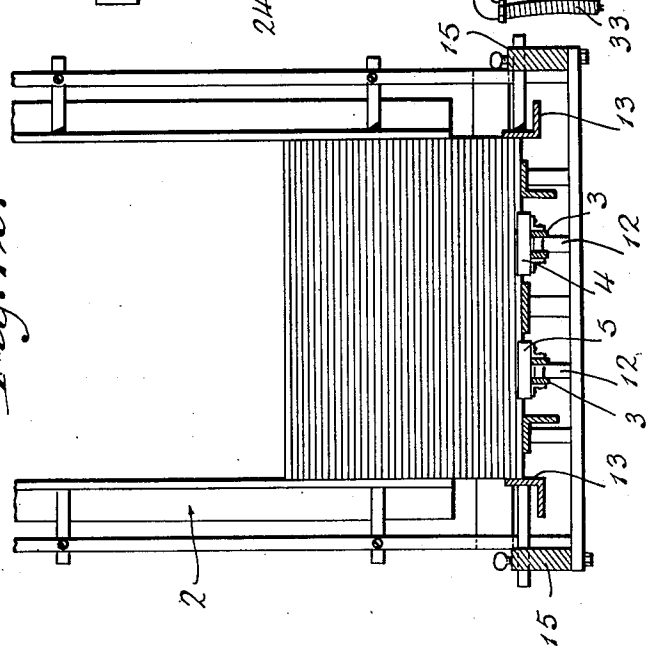


Fig. 12.

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Patented Oct. 22, 1940

2,219,251

UNITED STATES PATENT OFFICE

2,219,251

PROCESS FOR DECORATING WOODEN SURFACES, CANVAS, AND THE LIKE

Vincenzo Catini, New York, N. Y., assignor, by mesne assignments, to Kamket Corporation, New York, N. Y., a corporation of New York

Application June 22, 1937, Serial No. 149,566

3 Claims. (Cl. 41—33)

This invention relates to a process and machine for transferring pictures, fanciful designs, decorations, trade-marks and the like, upon sheet materials, and the product of such process. The types of sheet material in connection with which this invention is particularly useful are sheet materials which are represented by wood, pasteboard, cardboard, wallboard and other like fibrous sheet materials, canvas, silk, leather and rubber, all of which normally retain their characteristic of continuous sheet materials, but by reason of their structural characteristics can be physically deformed quite readily by mechanical pressure applied to their surfaces, resulting, in the case of such materials as wood, leather or rubber, which have substantial thickness, in deformation taking place in the surface of the sheet material and, in the case of canvas, silk and thin sheets of leather, deformation taking place through the full thickness thereof. The foregoing examples of sheet materials, to which this invention is applicable, are given by way of example, but the invention is intended for use in connection with all sheet materials having like characteristics. The aforementioned sheet materials, when treated according to this invention, may be used, for example, in connection with the following commercial articles: Wood, in the manufacture of toys and ends for crates in which fruits are packed; pasteboard and cardboard, for packing boxes; wallboard, for its specific uses; leather, for brief cases; canvas, for bags or containers for packing sugar, flour and the like, and archery targets, and silk for automatic, endless advertising devices. Many other specific uses will occur to those engaged in the commercial industries and the foregoing illustrations are given by way of example.

The object of the invention is to decorate the surfaces of such sheet materials with multi-colored designs, plain designs or designs of half tone character, decorations or pictures, or such other forms or of such other character as to which the invention is adaptable. In the industry relating to the application of designs, pictures and the like to wooden boards, bases or board surfaces, it has been suggested heretofore to specially treat the surfaces of such wooden boards, surfaces or bases, by planing to make smooth, or by applying a special preliminary coating to the surfaces prior to applying the decorative design or picture thereon, in order to provide a surface which is sufficiently uniform to take the imprint fully and completely, without void or blank spaces, and without running of the colors. In some industries these earlier suggestions have not been found practical. Thus, for instance, in connection with the decoration of the ends of boxes, of the crate type, in which citrus fruits are packed for transportation, it has not been found practical to apply designs or pictures, particularly half tone and multi-colored, directly thereto, and the general practice has been to utilize paper labels bearing the pictures or designs printed thereon, then attaching said paper labels to the crate ends by gluing. The ends of such crates are generally made of low grade wooden boards, the surfaces of which are not of sufficient uniformity or smoothness to readily take a printed impression. In some types of crates, such boards are quite thin, of the order of $\frac{5}{32}$ of an inch and tend to warp in many directions. Other types of such crate ends are of substantial thickness, of the order of $\frac{7}{16}$ of an inch, the thickness insuring somewhat against warping. Both types of board, however, are rough upon the surface, when considered as a surface for taking printing, and therefore are not adaptable for direct printing or transfer of designs or pictures without first treating such surfaces in special manners.

The invention is illustrated in connection with the decoration of the ends of citrus fruit crates, usually formed of two wooden end sections, joined together by wooden slats forming the sides of the crates. Such a crate is illustrated in Fig. 1 of the drawings, showing one of the crate ends made of a wooden panel, to the outer surface of which the decorative matter is directly applied by the utilization of this invention. The decorative matter upon this panel represents a mandolin player against a background representing a street. The matter represented in the finished picture, is in a multiplicity of colors executed in a fanciful manner. In the commercial production of this particular design, the border of the picture is in purple, the buildings in the background are yellowish, against a blue sky; the mandolin player's cap is red and purple, the feather, on the cap, yellow with a red tip, the coat green, with a red sash over the right shoulder, the body of the mandolin yellow, and the facial features represented by flesh color, red cheeks, black mustache and black hair.

In the accompanying drawings, Fig. 1 is a perspective view of a fruit crate in connection with which this invention is illustrated; Fig. 2 is an enlargement of the crate end or end panel of Fig. 1, illustrating a section of the transfer medium in association therewith, part of the trans-

fer medium being removed to show the finished impression; Fig. 3 is a many-times enlarged cross-sectional view of part of the surface of a wooden base, illustrating the normal surface condition thereof and the relation of the impression device or roll in association therewith; Fig. 4 is an enlarged cross-sectional view of the wooden base, illustrating the general contour of the finished product indicated generally by the dotted lines 4—4 of Fig. 2; Fig. 5 is an enlarged cross-sectional view (similar to Fig. 4), showing the relation of the wooden base board, transfer medium, and the impression device; Fig. 6 is a view similar to Fig. 5, showing the relation of the impression device, the transfer medium, and the wooden base board, illustrating a section of board, warped, or of uneven surface contour; Fig. 7 is a side elevation of a machine adapted for use in connection with this invention; Fig. 8 is a top plan view of the machine; Fig. 9 is an enlarged longitudinal section on the line 9—9 of Fig. 8; Fig. 10 is a cross-section on the line 10—10 of Fig. 9; Fig. 11 is a cross-section on the line 11—11 of Fig. 9; Fig. 12 is a cross-section on the line 12—12 of Fig. 9; Fig. 13 is a detailed cross-section of the impression device and the associated parts; Fig. 14 is an alternative form of impression device; Figs. 15 and 16 show modifications of the surface configuration of the impression device.

Inasmuch as the invention will be best understood by the complete cycle of operation, it is explained in detail in connection with the machine illustrated in the drawings, which may be conveniently utilized to practice the invention and produce the product thereof.

The matter to be decorated, as illustrated in the drawings, relates to the crate ends 1 in the form of a panel, as shown in Fig. 1, each consisting of a section of board approximately twelve inches square and about $\frac{3}{32}$ of an inch thick, which crate ends 1 are stacked in a suitable hopper 2, from which they are withdrawn, one by one, from the bottom of the stack, by a suitable feeding and transferring device. This feeding and transferring device consists of a pair of endless feed chains 3, provided with a series of spaced feed bars 4—4, arranged in aligned pairs, adapted, in the course of the feed of the endless chains, to engage an edge of the terminal panel in the hopper 2 and carry it along with the chain feed. The feed chains 3 are supported and fed by suitable sprockets 6—6 at the hopper end of the chain feed, and 7—7 at the opposite end, driven at a uniform speed. The sprockets 6—6 are supported by the shaft 8 and the sprockets 7—7 are supported by the shaft 9, driven by the chain 10 having suitable connection with the main drive pulley 11. The chains are supported against sagging by the fixed rails 12—12 upon which they slide, and the crate end panels 1, in the forward feed motion thereof, are engaged by the side guides 13—13 in order to keep them aligned and are engaged by the guide shoes 14—14 in order to exert pressure upon the panels, tending to flatten them out, such thin panels, as heretofore explained, having a tendency to warp. The forward end of the shoes 14 are turned upwardly, as shown in Fig. 9, in order to permit ready introduction of the panels therebeneath and gradually exert flattening pressure thereon. The end guides 13—13 and the shoes 14—14 carried thereby are adjustable on the side rails 15 of the machine by sliding the arms 16 in a recess in the side rails 15 and adjustment of the set screw 17 for the purpose of accommodating blanks of different width. Each panel, while engaged by the side guides 13 and the pressure shoes 14, pass a station 18 at which a transfer sheet 19 is laid face down upon the top surface of the panel 1. The transfer sheet may be laid upon the board either by hand or by a suitable suction feed 20, transferring the blanks, one by one, from a suitable stack of transfer sheets (not shown) to each panel passing at the station 18 and depositing the same upon the panel. Such transfer mechanism may be of any suitable organization as is well known in the art of transferring sheets from a stack, one by one, to a distant place or to a spaced object. Such transfer sheets, consisting of a paper base carrying upon the surface thereof a multi-colored picture capable of being transferred by the application of heat and pressure from said paper base to a surface intended to be decorated by the matter represented on the paper base, are well known in the art. Each panel, with its superposed transfer sheet resting thereon, is then transferred to an impression device which simultaneously subjects the assembled transfer sheet and the panel to pressure, forcing the transfer sheet into or below the normal surface of the panel in a series of closely related undulations and, inasmuch as heat is simultaneously applied to the transfer sheet, the picture or representation thereof is transferred to the panel, all as will be more clearly described hereinafter. In the drawings, different forms of impression devices are illustrated. It has been found that the invention may be most satisfactorily carried out with the type of impression device involving a roller and a companion supporting roll, both of which are positively driven. Each panel, with its superposed transfer sheet resting thereon, is carried between the lower supporting roll 21 and the upper impression roll 22. The upper impression roll 22 has a special surface configuration, and is preferably a hollow steel roll, having engraved on its surface a multiplicity of closely related high and low lines or areas. Such high and low lines or areas may be either in the form of parallel corrugations running lengthwise of the roll, as is illustrated in Fig. 11, or the high and low areas may be laid out in directions crossing each other, as illustrated in Figs. 15 and 16; Fig. 15 showing the high and low areas running both lengthwise of the cylinder and circumferentially thereof at right angles, whereas in Fig. 16 the lines of the high and low areas run diagonally of the roll in both directions. The type of surface configuration of the roll results in a different surface effect upon the sheet material to which the decorative matter is applied, which will be readily understood. For most purposes, the corrugated roll, shown in Fig. 11, is sufficient. A corrugated roll, such as is shown in Fig. 11, is made up of fine and closely related hills and dales, in which the hills, representing the high lines of the surface, number preferably about seventy-five to the linear inch with a corresponding number of dales or low areas. The number of hills and dales to the inch is optional, but to get the best effects there should be a great many hills and dales per linear inch, as will be apparent from the continuation of this description.

The impression roll 22 is mounted in the vertical blocks 23, which are adjustably arranged in the end frames 24. The blocks 23 are hung from the ends of the screw-threaded rods 25, which also carry the compression springs 26 and the nuts 27, the nuts being adjustable on the rods 25 in order to increase or decrease tension against

the blocks 23. In order to effect a refined adjustment of the impression roll 22 with respect to the lower or supporting feed roll 21, the upper ends of the rods 25 are provided with worm gears 28 which engage the worms 29 carried on a shaft 30, the end 31 of the shaft being squared to accommodate an adjusting tool to rotate the worms 29 and thereby adjust the blocks 23 and the roll 22 carried thereby, upwardly or downwardly, as desired, in order to change the gap between the impression roll 22 and the supporting roll 21. The impression roll 22, in order to assist in effecting the transfer of the picture from the transfer sheet, should be heated and this is preferably done by means of an electric heating unit 32 connected by means of the cable 33 to a suitable source of current. The supporting roll 21 and the impression roll 22 are driven from the main drive pulley 11, the shaft of the supporting roll 21 having connection therewith through the sprocket 35 and the chain 36, and the shaft 34 carrying the impression roll 22 being provided with a gear engaging a corresponding gear on the shaft of the supporting roll 21, whereby the rate of feed of the supporting roll 21 and the impression roll 22 are synchronized. In order to increase the traction of the supporting roll 21, it preferably is provided with corrugations on its surface. The panels with the superposed transfer sheets are fed end foremost between the impression roll 22 and supporting roll 21, the under roll 21 supporting the under side of the panel and the hill and dale surface of the impression roll progressively engaging the exposed surface of the transfer sheet, as both rolls are driven, to feed the panel and the transfer sheet therebetween. The pressure exerted upon the impression roll causes the high lines or hills thereof to become embedded in the top surface of the panels and simultaneously force the underlying portion of the transfer sheet downwardly into the depressions or dales in the top surface of the panel. Inasmuch as the roll 22 is heated, such heat and the applied pressure loosens the transferable design upon the transfer sheet and progressively causes a deposit thereof upon the panel. The transfer of the design from the transfer sheet to the panel takes place progressively as the panel and the transfer sheet pass between the rolls 21 and 22 until the whole of the transfer sheet has been acted upon by the heated roll 22 and its design or decoration transferred to the panel. The effect of the engagement of the surface of the roll 22 upon the panel cannot be minutely illustrated, primarily because of the minuteness of the action of the high lines with the roll 22. An approximate illustration of what occurs is shown enlarged in Figs. 3, 4, 5 and 6. In Fig. 3, the panel 1 has its normally irregular surface illustrated by the waving line 37 and the high lines or hills 38 are shown embedded in the surface of the panel. The transferred coloring matter representing the design is illustrated at 39 in Fig. 4. In Fig. 5, the panel 1 is illustrated with the transfer sheet 19 forced into and against the surface thereof by the hills 38 of the impression roll 22. In Fig. 6, the same action is illustrated as in Fig. 5, excepting that this enlargement shows a portion of the panel which is irregularly shaped, the actual contour, of the portion of the panel there illustrated, being represented by the line 47 and the effect of the high lines of the impression roll tending to embed themselves to a substantial depth in spite of the irregular surface of the portion of the panel illustrated in Fig. 6.

It is preferred to space the two rolls 21 and 22 a slight distance apart to permit the entry of the panel and the superposed transfer sheet, but the clearance and the amount of pressure upon the transfer roll must be regulated by testing a number of specimens and changing the adjustment to obtain the desired complete transfer of the picture or design to the panel. The surface temperature of the impression roll 22 must also be ascertained by such preliminary test and in some instances it is necessary to maintain the surface temperature of the roll 22 at approximately 450° F. The depth of the dales on the impression roll 22 may approximate $^{10}/_{1000}$ of an inch and satisfactory results are obtained with approximately seventy-five hills to each linear inch. The number of hills to the inch and the depth of the dales, may be varied, but satisfactory results are obtained by the specifications before enumerated.

After the panel and the transfer sheet have passed completely through the rolls 21 and 22, the transfer sheet is removed from the surface of the panel and the panel is then completely decorated.

In the drawings, the machine is shown provided with a mechanism for carrying the panels and the transfer sheets away from the rolls 21, 22, and this mechanism consists of a pair of parallel endless chains 40 on which the panels and the superposed transfer sheets are deposited and, by the continued travel of the endless chains 40, the panels are carried to a suitable delivery point.

The finished panel consists of a surface broken up with minute high and low lines corresponding to the hill and dale arrangement of the surface of the roll 22. The design is physically transferred, by the operations aforementioned, to the surface of the panel, following generally the peculiar contour given that surface by such operations. The ink or coloring matter of the design actually follows the applied hill and dale contour of the panel surface, the ink or coloring matter being deposited upon the slopes connecting the dales and hills made by the surface of the roll 22 upon the surface of the panel. The transfer of the picture or design, to the eye, is complete, and the irregular impression made upon the surface of the panel giving the visual impression of a surface finish much like that of velvet or silk. Although the thinner type of panels, of the order of $^{5}/_{32}$ of an inch, are, in their normal condition, badly warped, the pressure of the two rolls during the transfer of the picture or design, straightens out such board sufficiently to effect the complete transfer of the picture. In many places the normal surfaces of such panels are rough, but, nevertheless, such rough surfaces will, by the operation of this invention, have the appropriate part of the design transferred thereto.

The panels, with the picture or design transferred thereto, are then utilized as crate ends, a suitable frame 41 being built around the panels and the cross slats 42 being nailed thereon. The type of impression roll shown in the main figures has all of the hills and dales running parallel in the lengthwise direction of the roll, but, as heretofore explained, the surface of the roll may be formed with hills and dales running both lengthwise and circumferentially of the roll, as shown in Fig. 15, or diagonally in two directions, as illustrated in Fig. 16, the transfer of the picture in the latter instance being effected equally as well, but the surface effect on the panel being somewhat different. It is preferred to avoid the use of hills having sharp edges, inasmuch as there would be a tendency with sharp-edged hills to split the material comprising the base to which the transfer is made and therefore it is pre-

ferred to round off the top of the hills as illustrated in Figs. 5 and 6.

The best results are obtainable by the utilization of rolls for effecting transfer of the picture or design upon the surface of the sheet material, but in some instances it might be advantageous to utilize a platen in place of the rolls and moving the platen in a reciprocating motion. Such an arrangement is illustrated in Fig. 14, in which the impression element 43 is flat and has the hill and dale arrangement formed on the under side thereof. This platen is carried by a hollow head 44 having the heating element 32 carried in the hollow space. The head 44 is carried by the shaft 45 which reciprocates in the plate 46, the head 44 being depressed by a suitable cam 48, or the platen may be depressed by use of a hydraulic piston.

This invention may also be utilized in connection with decorating fabrics and silk, but inasmuch as these materials have no substantial thickness, it is necessary, when subjecting them to pressure, that a suitable base of wood, cardboard or other material having substantial thickness, be used as a backing. In such instances, each section of canvas or silk or other fabric is first laid upon a suitable wooden or cardboard base, for instance of the character of the crate ends 1, and the transfer sheet then laid over the canvas or silk section and the three units thus assembled are passed simultaneously between the rollers 21 and 22. The roller 22 will force the transfer sheet and the underlying canvas or silk section into the wooden base, thereby causing the canvas or silk section to take up the impression from the transfer sheet by reason of the applied pressure and heat. After the assembled units have passed out of the sphere of pressure, the transfer sheet and the canvas or silk section may then be stripped from the wooden base and the canvas or silk section with the decorative matter applied thereto may then be made into any suitable article, for instance a bag, an archery target, or an endless sheet for advertising devices.

In place of the electric heating unit 32, for heating the impression device, other suitable forms of heating mediums may be used, such as gas or steam.

The use of this invention is not limited to treating short sections of sheet material, but may be utilized in connection with treating continuous webs forming the base of the decorated sheets, by feeding such continuous web beneath the impression device 22, with transfer sheets lying thereupon, or by feeding a continuous web of transfer sheets, superposed upon the continuous web base.

I claim:

1. The method of decorating materials, consisting of superposing a transfer sheet upon the surface of the material to be decorated, forcing an impression device, having a series of closely related hills and dales upon its surface, against the transfer sheet and such material, so that the hills on the impression device break up the surface of such material and the hills are embedded in such material, permanently deforming the same, simultaneously embedding the transfer sheet underlying the hills into the material being decorated and applying heat to the transfer sheet to release decorative matter contained thereon and transfer it to the material to be decorated.

2. The method of decorating fibrous materials having substantial thickness and capable of being permanently deformed, consisting of superposing a transfer sheet upon the surface of the material to be decorated, forcing an impression device, having a series of fine and closely related hills and dales upon its surface, against the transfer sheet and such material, so that the hills are embedded in such material and break up the surface of such material and permanently deform the same to correspond to said hills, simultaneously embedding the transfer sheet underlying the hills into the material being decorated and applying heat to the transfer sheet to release decorative matter contained thereon and transfer it to the material to be decorated.

3. The method of decorating fibrous materials with a multi-colored picture or the like, which consists in superposing a transfer sheet, carrying such multi-colored picture or the like, with the picture against a surface of the material to be decorated, forcing an impression device having a series of fine and closely related hills and dales against the transfer sheet and the fibrous material; embedding the hills and the portions of the transfer sheet underlying the hills into the fibrous material, simultaneously breaking up the fibrous material contacting said hills and permanently deforming the same, applying heat to the transfer sheet to release decorative matter contained thereon and transfer it to the hills and dales of the material being decorated to form a substantially continuous reproduction of said picture.

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