April 21, 1942. N. G. KOPPINGER 2,280,414

SURFACE ORNAMENTING MACHINE AND METHOD

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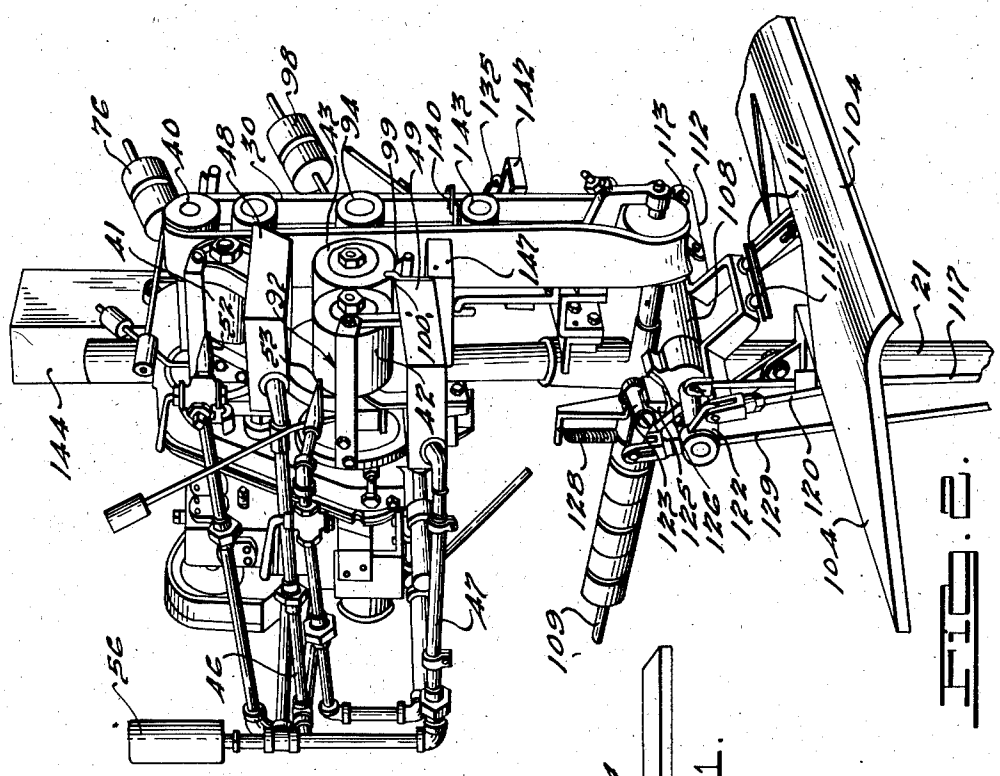

Fig. 2.

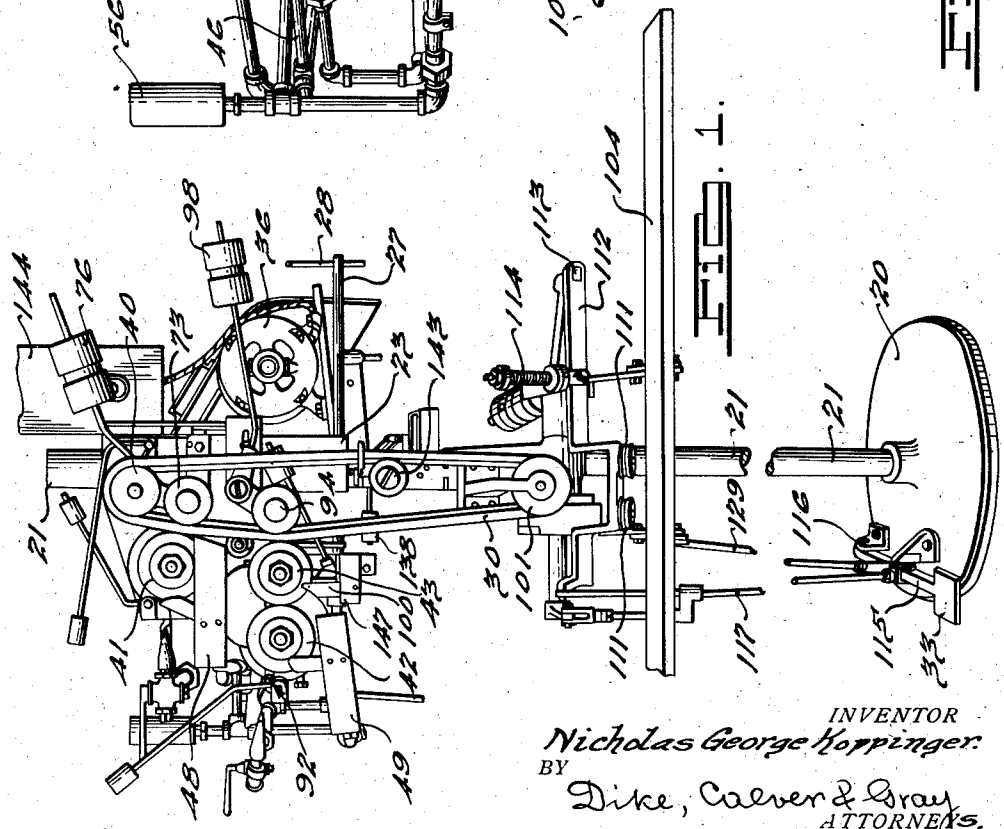

Fig. 1.

INVENTOR
Nicholas George Koppinger.
BY
Dike, Calver & Gray
ATTORNEYS.

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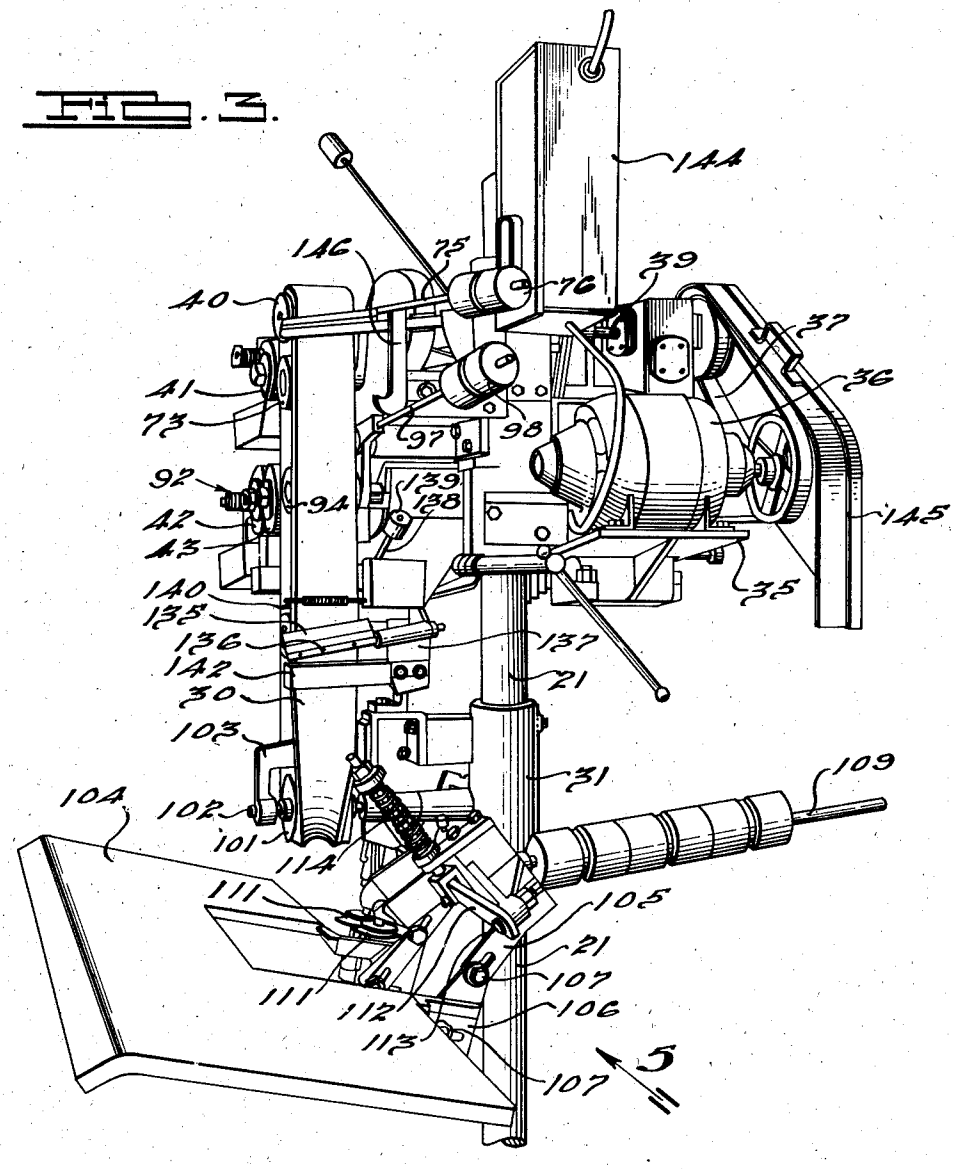
FIG. 3.



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Nicholas George Koppinger.
BY
Dike, Calver & Gray
ATTORNEYS.

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FIG. 4.

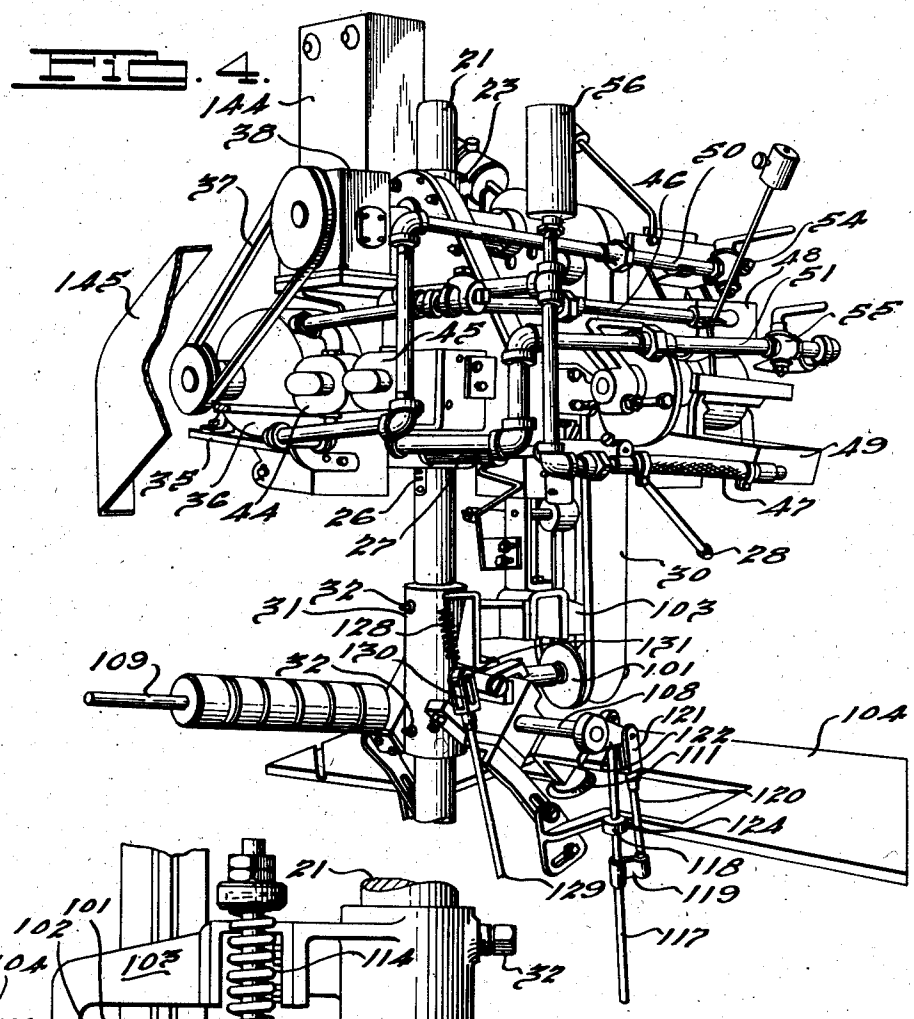
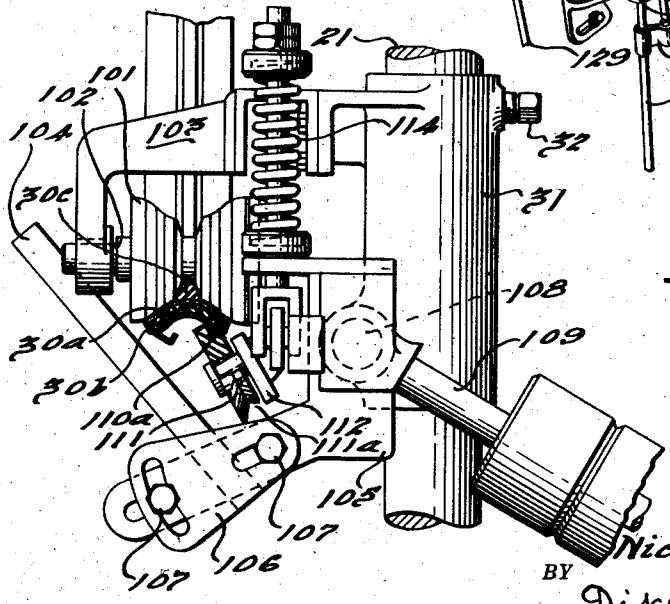


FIG. 5.



INVENTOR
Nicholas George Koppinger.
BY
Dike, Calver & Gray
ATTORNEYS

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FIG. 6.

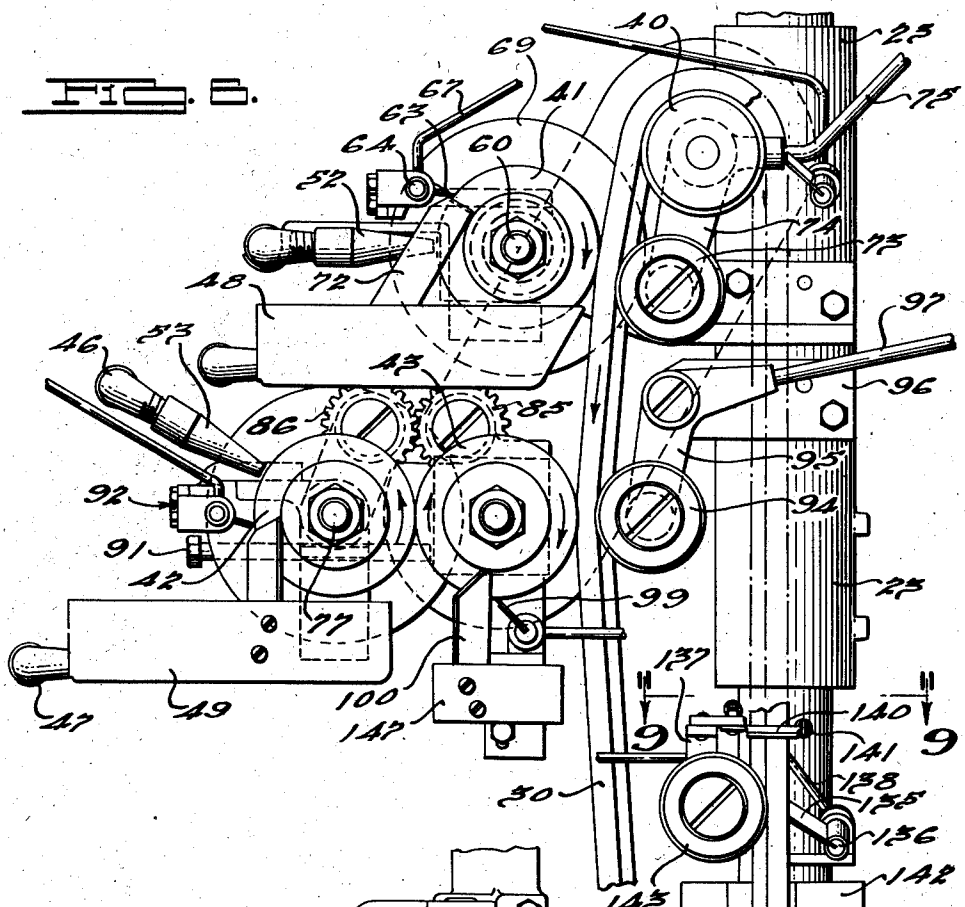
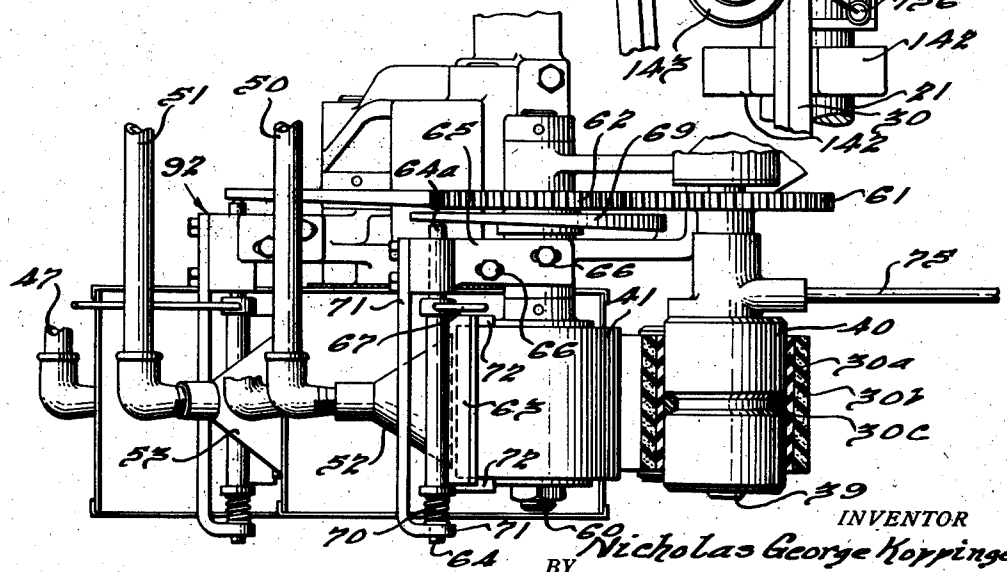


FIG. 7.



INVENTOR
Nicholas George Koppinger
BY
Dike, Calver & Gray
ATTORNEYS.

April 21, 1942. N. G. KOPPINGER 2,280,414

SURFACE ORNAMENTING MACHINE AND METHOD

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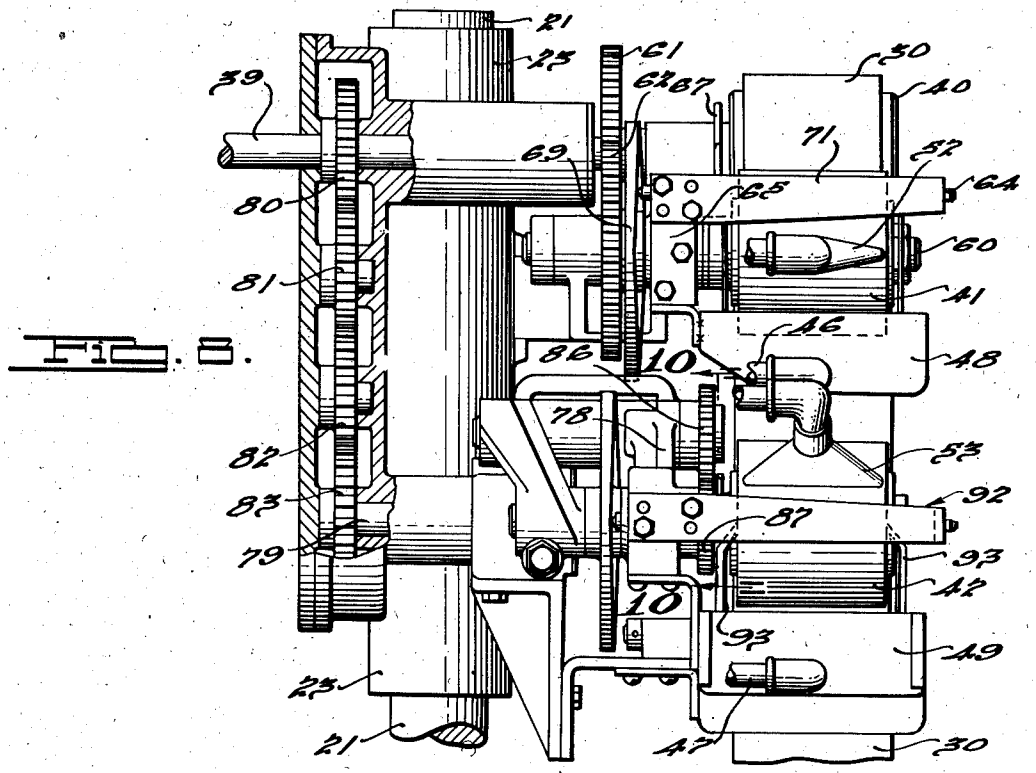

Fig. 8.

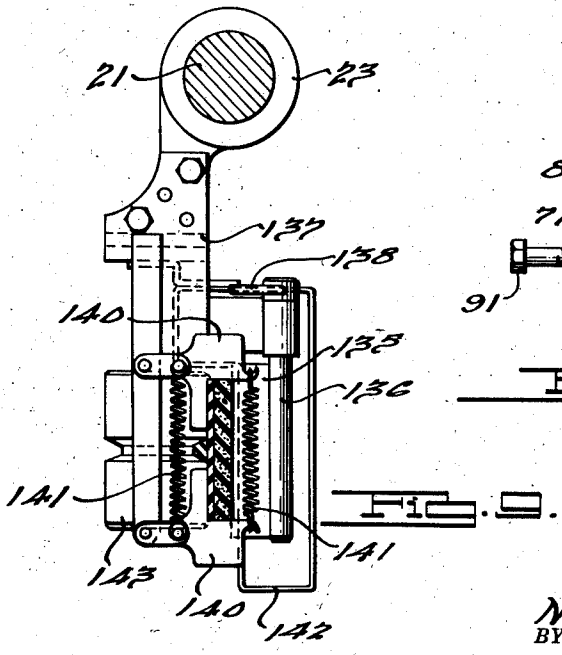

Fig. 9.

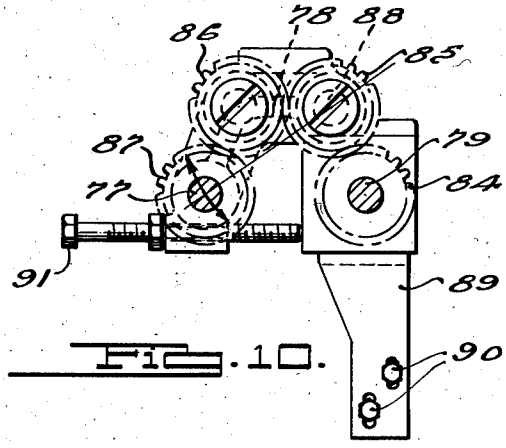

Fig. 10.

INVENTOR
Nicholas George Koppinger.
BY Dike, Calver & Gray
ATTORNEYS

April 21, 1942. N. G. KOPPINGER 2,280,414

SURFACE ORNAMENTING MACHINE AND METHOD

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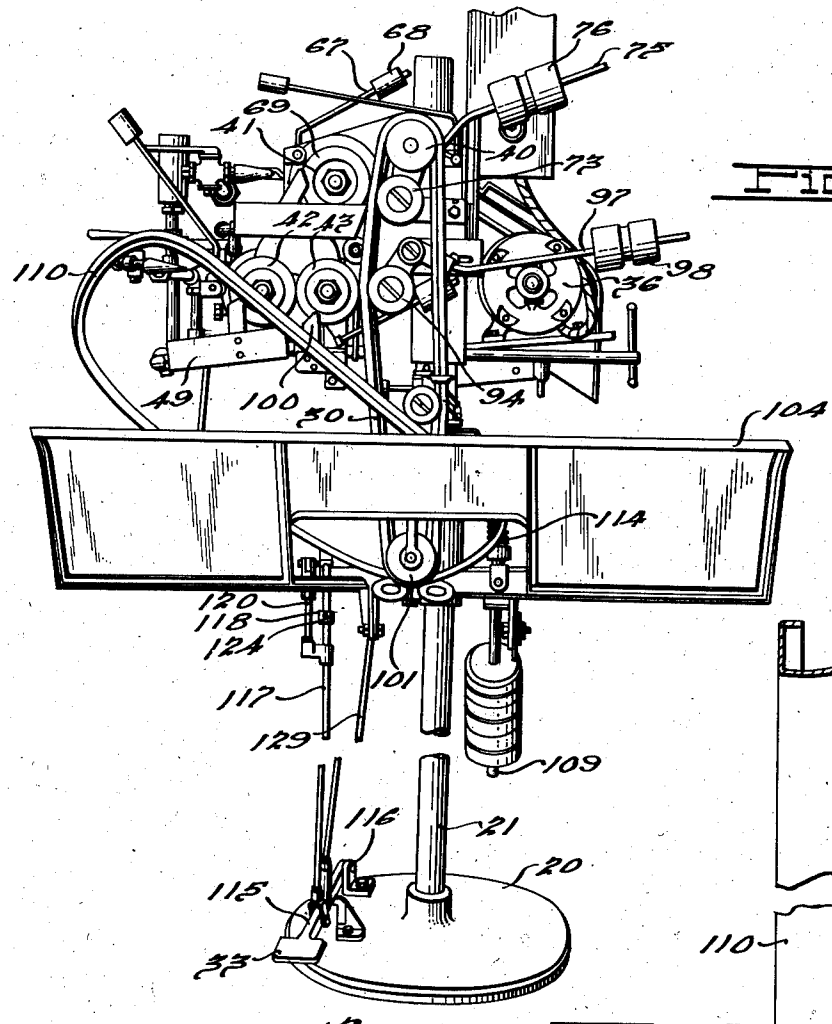

FIG. 11.

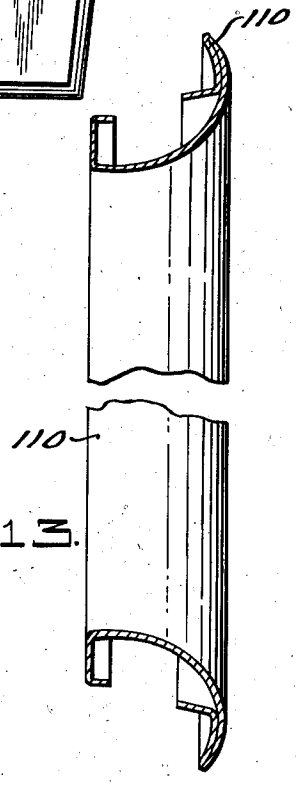

FIG. 13.

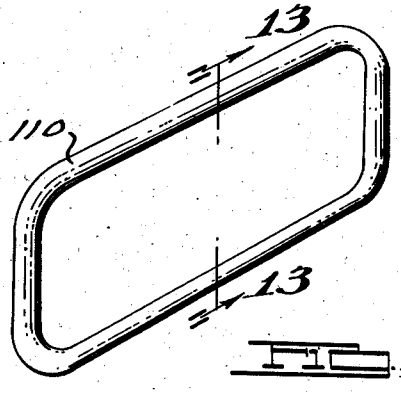

FIG. 12.

INVENTOR
Nicholas George Koppinger.
BY
Dike, Calver & Gray
ATTORNEYS.

Patented Apr. 21, 1942

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UNITED STATES PATENT OFFICE

2,280,414

SURFACE ORNAMENTING MACHINE AND METHOD

Nicholas G. Koppinger, St. Clair Shores, Mich., assignor to Briggs Manufacturing Company, Detroit, Mich., a corporation of Michigan

Application August 16, 1939, Serial No. 290,508

16 Claims. (Cl. 101—175)

This invention relates to surface ornamenting or decorating machines and methods, and more particularly to machines and methods for applying surface ornamentations such as a wood grain finish to articles or workpieces including curved surfaces such, for instance, as metal moldings for windows of motor vehicle bodies. The present application is a continuation-in-part of my copending application Serial No. 285,373 filed July 19, 1939.

One of the objects of the present invention is to provide a surface ornamenting or decorating machine which can apply or print a desired design or ornamentation to a curved surface without distorting or smearing such design, particularly in places where the curvature of the surface changes at an increased rate, such, for instance, as in corners.

Another object of the present invention is to provide an improved surface ornamenting machine of the character specified in the preceding paragraph, which can apply to a workpiece two or more distinct designs in one operation without distorting either of said designs; previously, two or more separate machines and two or more operations were necessary.

A further object of the invention is to provide an improved surface ornamenting machine which can apply to a workpiece two separate designs of different colors or tones in a single operation and without mixing the inks of such designs.

A still further object of the invention is to provide an improved surface ornamenting machine having a gelatin composition transfer belt and an inking or design roller therefor, improved means being provided for removing the excess ink from said design roller.

A still further object of the invention is to provide a surface ornamenting machine having a pigment receiving belt, improved means being provided for cleaning the ink which may be left on the belt after the transfer of the portion of the ink to the workpiece.

It is an added object of the present invention to provide an improved surface decorating machine of the foregoing character, which machine is relatively simple in construction, safe and dependable in operation, has high production capacity, and is relatively inexpensive to manufacture and service.

A still further object of the invention is to provide an improved method of decorating surfaces, particularly curved surfaces, with multiple-tone designs.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a front perspective view of the machine embodying the present invention.

Fig. 2 is a perspective view of the machine with the exception of the base thereof, the observer looking at the left front corner of the machine.

Fig. 3 is a view similar in part to Fig. 2, the observer looking at the right-hand side of the machine.

Fig. 4 is a view similar in part to Fig. 2, the observer looking on the rear left-hand corner of the machine.

Fig. 5 is a view partly in section showing the form pulley and the parts adjacent thereo, the observer looking as indicated by the arrow 5 in Fig. 3.

Fig. 6 is a side view showing the arrangements of the inking rollers as well as the pigment receiving roller and the driving connection therebetween.

Fig. 7 is a top view of a portion of the structure shown in Fig. 6.

Fig. 8 is a front view of the structure shown in Fig. 6.

Fig. 9 is a fragmentary view partly in section taken in the direction of the arrows on the section plane passing through the line 9—9 of Fig. 6.

Fig. 10 is a fragmentary view taken in the direction of the arrows from the line 10—10 of Fig. 8.

Fig. 11 is a perspective front view of the machine, the workpiece supporting table being shown in its raised position and the workpiece being arranged in its operative position between the transfer belt and the guide rollers.

Fig. 12 is a perspective view of a workpiece for which the machine described herein is particularly adapted.

Fig. 13 is a transverse sectional view of the workpiece, the section being taken on the transverse vertical plane passing perpendicularly to the workpiece through the line 13—13 of Fig. 12.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways.

Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the drawings there is shown, by way of example, a surface decorating or ornamenting machine embodying the present invention. The machine illustrated in the drawings and hereinafter described is constructed especially for applying surface ornamentation to automobile window moldings, which ornamentation is usually in the form of a wood graining finish. It will be understood, however, that the machines embodying the present invention are not limited to the above use and may be successfully used for applying ornamentations to other articles or workpieces, particularly those having curved or irregular surfaces.

The machine herein described is of the two-tone or two-design type. It is intended for use in cases when the finish to be applied to the workpiece is of two-color character or when the design being of substantially one color cannot be for some reason applied to the transfer belt with the aid of a single design or inking roller. Attempts have been made to apply designs of two different colors directly to a single transfer belt with the aid of two engraved design or inking rollers. However, such attempts did not prove successful because of mixing of the inks of different colors and spoiling the entire artistic effect of the finish.

In accordance with the present invention the first design is applied to the transfer belt with the aid of an engraved metal design roller. The second design provided on the second metal design roller is not transferred directly to the transfer belt over the first ink but is first transferred to an intermediate roller having a smooth pigment receiving surface. Intermediate rollers made of substantially the same material as the transfer belts prove to give very satisfactory results. The intermediate roller is arranged to be in contact with a transfer belt and to transfer to said belt the dyeing pigment which the surface of the roller absorbs from the second design or inking roller. With the aid of such a construction mixing of the inks is entirely eliminated and the resulting ornamentation comes out just as it was intended, clear-cut and definite.

Referring to the drawings the machine illustrated therein comprises generally a base 20 which may be of a circular form, in which base there is affixed an upstanding standard 21 serving as a main frame or skeleton on which the entire machine is built up. The operative mechanisms of the machine may be divided structurally into three parts in accordance with the way in which they are connected to the standard 21; the upper portion which includes the drive, the transfer belt, the design rollers therefor, the ink supplying means and the associated mechanisms; the lower portion which includes the workpiece supporting and contacting means, namely, the form pulley, the guide rollers and the supporting table; the third part includes the pedal and connections thereof with the mechanisms of the lower portion.

The upper portion of the machine comprises a sleeve 23 fitted on the standard 21, which sleeve is split for a portion of its length and it may be drawn together at said split portion to grasp the standard 21, this being effected with the aid of a screw 24 provided with a handle 25 for easier operation. The standard 21 is provided with a rack 26 cooperating with a gear (not shown) carried by a member 27 provided with a handle 28. When it is desired to raise or lower the upper portion of the machine as may be necessary for removal of the transfer belt 30, the handle 28 is taken hold of and the screw 24 is loosened. In this way the upper sleeve 23 is made free to move up and down on the standard 21, and such motion thereof may be effected by rotating the handle 28 in the corresponding direction. For steadying the sleeve 23 on the standard 21 the screw 24 is tightened by rotating the handle 25.

The mechanisms comprised by the lower portion of the machine are assembled on the sleeve 31 which is similar in its operative purport to the sleeve 23, the difference being in the fact that the sleeve 31 is provided with positioning screws 32 and has no rack-and-gear means for raising and lowering the entire lower portion, provision of which is not necessary, since the lower portion is positioned permanently for a definite type of work and the height of the operator. Changing the position of the lower portion would require changing the length of the rods connecting the mechanisms mounted on said lower portion with the pedal 33.

The upper portion of the machine also includes a pulley for driving the transfer belt, means for driving said pulley, an inking or design roller for transferring the dyeing pigment of a predetermined pattern directly to the transfer belt, an intermediate roller adapted to transfer dyeing pigment to the transfer belt over the ink transferred to said belt by the first design roller, a second design roller for transferring dyeing pigment to said intermediate roller, means for supplying ink to both of said design rollers, and scraper means for removing the excess ink from the design rollers, as well as scraper means for cleaning the transfer belt. The upper portion of the machine also carries means for driving the design rollers, the intermediate roller and the ink supplying means. The lower portion includes a form pulley over which the transfer belt passes being driven by said driving pulley; the form pulley generally conforms to the cross sectional shape of the workpiece; the lower portion further includes a swinging table for supporting the molding or workpiece in its operative position; guide rollers for guiding the workpiece during the printing or ornamenting operation and maintaining the contact between the workpiece and the transfer belt; and finally means for locking the swinging table in the supporting position. The swinging table and the mechanisms operatively connected therewith are operated with the aid of the pedal 33 mounted on the base 20, which pedal is connected with said swinging table and the mechanisms connected therewith with the aid of suitable rods.

Referring to the drawings, there is provided on the upper sleeve 23 a horizontally extending platform 35 on which there is mounted an electric motor 36 drivingly connected by means of a belt 37 with a speed reducing box 38 of any suitable construction. On the structural continuation of a shaft 39 of the speed reducing box 38 there is mounted a driving pulley 40. The shaft 39 is connected by means of trains of gears with the shafts of the first design roller 41, second design roller 42 and intermediate roller 43, see Fig. 8. In order to prevent distortion of the image or design transferred by the design rollers 41 and

42 to the transfer belt 30 and the intermediate roller 43 which also transfers the design received to the transfer belt 30, it is important to have the design rollers 41 and 42, the intermediate roller 43 and the belt 30 operate at the same surface speed, that is without slippage between their surfaces. The above may be effected in a plurality of ways. I prefer to have the driving pulley 40 and the first design roller 41 operate at the same rotative speed. In order to prevent slippage of the belt 30 at the first design roller 41, the respective sizes of the driving pulley and the first design roller 41 should be properly selected. I prefer to have a design roller which has a radius equal substantially to the sum of the radius of the driving pulley plus the thickness of the transfer belt. A small correction for the above geometric calculation may be necessary in order to provide for the slight compression of the transfer belt between the first design roller 41 and a pressure roller pressing the belt against said design roller, as well as for the slight stretching of the relatively heavy belt 30 due to the centrifugal force of operation. I also prefer to have the second design roller 42 and the intermediate roller 43 of the same diameters and to operate at the same rotative speed which may be effected by providing gear ratios of one-to-one between said rollers, or any equal gear ratios between the shaft 39 and the shafts of said rollers respectively, if separate gear trains are used as in the present instance.

The design rollers 41 and 42 are in the form of cylinders on the outside surface whereof there is provided the desired pattern or design. I prefer to use copper cylinders having a pattern or image provided on the surfaces thereof by the well known photoengraving process extensively used in the art of printing. In this case a wooden board of the corresponding size is first finished to show its grain and is thereupon photographed for the purpose of producing the images on the design rollers which if applied one after the other will produce the final design. In order to prevent rapid wearing out of the engraved copper surfaces of the design surfaces, they may be chromium plated to provide better wearing surfaces. The images or designs on the rollers 41 and 42 are produced by minute depressions or indentations retaining the printing ink. When a relatively soft transfer belt comes in contact with the surfaces of the design rollers, the ink retained in said depressions is transferred onto the pigment receiving surface of the belt. When, in turn, the surface of the transfer belt comes in contact with the surface of the workpiece, the dyeing pigment is transferred from the transfer belt onto the surface of the workpiece.

Means for supplying ink to the design rollers 41 and 42 comprise in the present embodiment of the invention two independent systems, since inks of two different colors may be used. Each of said systems comprises a pump of any desired type preferably a rotary pump such as shown at 44 and 45, suitably driven from the motor 36. The intake sides of the pumps 44 and 45 are connected by means of pipes 46 and 47, each composed of a plurality of sections to produce proper turns, with the reservoirs 48 and 49 which serve both as the overflow and the supply reservoirs. The discharge sides of the pumps 44 and 45 are provided with pipe connections 50 and 51 having discharge nozzles 52 and 53 adapted to discharge the ink in thin wide streams onto the surfaces of the rotating design rollers 41 and 42, respectively. Plug valves 54 and 55 are provided in the discharge pipes 50 and 51 with the aid of which it is possible to regulate within the desired limits the amount of ink delivered to each design roller. 56 is a priming tank for the pump 45, while 57 indicates a plug enabling the intake pipe 46 to be cleaned.

The first design roller 41 is adapted to bear directly against the pigment receiving surface of the transfer belt 30. It is mounted on a shaft 60 driven from the shaft 39 with a train of gears including meshing gears 61 and 62, see particularly Figs. 7 and 8. The ink delivered by the discharge nozzle 52 covers the surface of the design roller 41 completely and being of a certain density it forms on the surface of the inking roller a layer of considerable thickness. Therefore means are provided to scrape off the excess ink from the surface of the roller and to leave the ink only in the above mentioned depressions or indentations. In the present embodiment of the invention the scraping means are in the form of a thin scraper blade 63 secured in a shaft 64 mounted in a bracket 65. The bracket 65 is secured to an extension of the sleeve 23 with the aid of screws 66 passing through elongated holes, see Fig. 7, in order to permit adjustment of the bracket 65 and, consequently, of the scraper blade 63. It can be clearly seen from an examination of Figs. 6 and 7 that the adjustments permitted by the elongated holes enable changing the angle at which the blade 63 contacts the design roller 41. A rod 67 is secured to the shaft 64 and carries at its end a weight 68 which can be adjustably moved along said rod 67, thus changing the pressure which the blade 63 exerts on the design roller 41.

In order to prevent uneven wear of the scraper and the design roller, the scraper is made horizontally reciprocating. Means effecting reciprocations of the scraper 63 are exemplified in the present embodiment of the invention by a cam plate 69 mounted for rotation with the roller 41 and bearing on the follower end 64*a* of the shaft 64. A spring 70 retained in place by a bracket 71 is adapted to press the follower end 64*a* against the cam plate 69 to ensure the proper operation of the above described cam and follower means. Side scrapers 72 are provided to scrape the ends of the design roller 41. The scrapers 72 are secured to the reservoir 48 and are provided with bent ends to ensure proper contact with the ends of the roller 41. The ink scraped by the scrapers 63 and 72 is returned to the reservoir 48.

As the roller 41 rotates, the scraper 63 scrapes off the ink from the surface thereof leaving ink only in the indentations. By virtue of the provision of the adjustable bracket 65 permitting changing the angle at which the scraper blade 63 contacts the surface of the design roller, it is possible to vary the quantity of ink which is left on the design roller 41. This arrangement permits varying the quantity of ink which is available for transfer to the transfer belt 30, thereby making the design transferred to the workpiece either heavier or lighter as the circumstances may require. The same ends may be attained by adjustments of the weight 68, as mentioned.

A pressure roller 73 is mounted on one end of the bell crank 74 which, in turn, is rotatably mounted on the shaft 39 of the driving pulley 40. To the second end of the bell crank 74 there is secured a rod 75 carrying at its end an adjustable weight 76. It will be clear from an exami-

nation of the drawings and particularly of Figs. 6 and 11, that action of the weight 76 causes the pressure roller 73 to press the transfer belt 30 against the design roller 41, thereby ensuring a proper pressure contact between the transfer belt and the design roller. The degree of pressure exerted by the pressure roller on the transfer belt 30 determines the quantity of ink which is transferred from the inking roller to the transfer belt, and therefore adjustments of the weight 76 may be resorted to in order to vary additionally or to control the character of the design which is printed by the transfer belt on the workpiece. The greater the pressure of the pressure roller 73 on the belt 30, the more ink is transferred to the belt 30 and therefrom to the workpiece, and consequently the heavier is the design printed.

The second design roller 42 is mounted below the first design roller 40 and somewhat farther away from the belt 30 in order to provide room for the intermediate roller 43. The design roller 42 is secured to a shaft 77 journalled in an angular bracket 78, see Fig. 10, which bracket is fixed to a suitable structural extension anchored on the sleeve 23.

The shaft 77 is drivingly connected to the shaft 39 with the aid of two trains of gears. The first train of gears connects the shaft 39 with the shaft 79 of the intermediate roller 43. This train includes gears 80, 81, 82 and 83, best shown in Fig. 8. The second train of gears connects drivingly the shaft of the intermediate roller 79 with the shaft 77 of the design roller 41, and it includes gears 84, 85, 86 and 87. Gears 84 and 87 are mounted on the shafts 79 and 77, respectively. The idler gear 86 is mounted on a stud carried by the bracket 78, while the idler gear 85 is mounted on a stud 88 supported by a bracket 89 secured to the suitable extension of the sleeve 23 with the aid of screws 90. The bracket 78 rotates around the center of the stud 88 as indicated in Figs. 6 and 8, and therefore the shaft 77 and the roller 42 carried thereby may move within predetermined limits toward and away from the intermediate roller 42, which provides for frequent variation in the sizes of intermediate rollers. The adjusting movements of the roller 42 are effected with the aid of adjustment screws 91 passing through a threaded extension of the bracket 78 and bearing against a structural portion rigid with the intermediate roller 43, see Fig. 10.

The second design roller 42 is provided with a surface scraper generally indicated by the numeral 92 and end scrapers 93, the construction of which is substantially similar to that of the above described scrapers of the first design roller 41, for which reason no detailed description of said scrapers is deemed necessary.

The intermediate roller 43 has a smooth pigment receiving surface and may be made of the same material or surface characteristics as the transfer belt 30, which belt it is adapted to contact as best seen in Fig. 6. A pressure roller 94 mounted beneath the pressure roller 73 is adapted to exert pressure on the transfer belt 30, pressing the same toward the intermediate roller 43 and thus ensuring proper pressure contact. The pressure roller 94 is mounted on a bell crank 95 hingedly secured on a bracket 96 which bracket is secured to the sleeve 23. A rod 97 secured to the bell crank 95 is provided with an adjustment weight 98.

The intermediate roller 43 is provided with a surface scraper 99 and two end scrapers 100 located to scrape off the ink from the portions which had come in contact with the transfer belt and are about to come in contact with the second design roller 42. In the present embodiment of the invention considering the direction of the rotation of the design roller 42, said scrapers are located underneath the roller 43, as is best shown in Fig. 6.

The belt 30 is of a type generally used in printing work. It may comprise a base 30a made of a material capable of sustaining the upper layer 30b made from a suitable material such as a mixture of glue and gelatin to provide a smooth pigment receiving surface. To the base 30a there is secured a V-type belt extension 30c which increases the strength of the belt and serves as a guide therefor preventing slipping off of the belt from the pulleys. Suitable grooves are provided in the pulleys to receive the extension 30c as can be seen in Figs. 5 and 7.

After the first design roller 41 prints the first design on the belt 30, the belt brings this printed design in contact with the intermediate roller 43. The second design roller prints the second design, usually with an ink of different color, on the intermediate roller 43. The intermediate roller 43 being in contact with the transfer belt 30, the design printed on said roller 43 is transferred to the belt 30 over the design printed by the first design roller 41, and both designs printed one over the other are continuously carried toward the workpiece and are transferred thereto as is described below in detail. When the intermediate roller 43 contacts the transfer belt 30, the printing operation is mutual, that is, while the second design is being transferred to the belt 30 some of the first design is printed on the roller 43. Since the intermediate roller 43 has a smooth surface, provision of the scrapers 99 and 100 cleans this roller completely before it again comes in contact with the second design roller, the scraped off ink being collected in the waste tank 147 (see Fig. 6). If the intermediate roller is eliminated and the metal design roller is caused to be in contact with the transfer belt, it would not be possible to clean or scrape off the first design which would be printed on the second design roller and mixing of the inks would occur. This would result because of the presence of the engraving indentations on the metal design roller and impossibility of removing the ink therefrom with the aid of a metal scraper.

The lower portion of the machine is mounted on the sleeve 31 as mentioned. Said lower portion comprises a form pulley generally indicated by the numeral 101, mounted on a shaft 102 floatingly journalled in a bracket 103 secured to the sleeve 31. The pulley 101 is of a laminated construction. It comprises a plurality of disks as best shown in Fig. 5, and is shaped to the general form of the cross section of the workpiece. The disks forming the pulley 101 may rotate independently of each other and adjust themselves automatically to the surface speed of the belt. By virtue of such a construction distortion of designs and smearing thereof on the workpiece due to slippage are substantially eliminated. The belt 30 connects the driving pulley 40 and the form pulley 101. The tension of said belt is adjusted with the aid of the gear-and-rack means 26 and 27 operated with the aid of the handle 28 to change the elevation of the upper portion of the machine. The same means are re-

sorted to in order to permit removal of the belt for repairs or inspection.

A swinging table 104 is secured to the bracket 105 through the adjustment plates 106, see Figs. 3 and 4, with the aid of which the position of said swinging table with relation to the form pulley may be varied by loosening the screws 107, moving the table a predetermined distance and retightening said screws. The brackets 105 are secured to a shaft 108 journalled in a suitable extension of the sleeve 31. To the brackets 105 there is secured an arm 109 on the end of which there is provided an adjustable weight which may be adjustably moved along said arm and fixed in a desired position by means of a suitable set screw. The weight is heavier than the table and therefore it always tends to maintain the table 104 in its raised or upper position, external means being provided for bringing the table 104 into its lower position.

In operating the machine the workpiece or molding 110 is first laid flat on the table, whereupon the table is swung into the position in which the molding comes within less than one-half of an inch from the transfer belt 30, and is locked in such position with the aid of special means described in detail below. Through this distance of less than one-half of an inch hereinafter termed "the clearance," the workpiece travels substantially perpendicular to the surface of the transfer belt and therefore when it comes into contact with said belt, no slippage of the mating surfaces occurs, thus giving a quick and reliable contact for producing a clear undistorted image which is printed on the workpiece by the belt. The actual contact between the workpiece 110 and the transfer belt 30 is effected with the aid of guide rollers 111 which are provided with grooves 111*a* receiving the edge 110*a* of the workpiece 110 moving along said rollers 111.

Means for operating the guide rollers 111 are exemplified by a bar 112 which is best shown in Figs. 1 and 2. The bar 112 is hingedly mounted at 113 to the bracket 105 and it moves with said bracket as the same rotates around the shaft 108. A compression spring 114 always tends to keep the bar 112, and consequently the rollers 111 carried thereby, in their raised position. Resistance of the spring 114 may be adjustably varied with the aid of a suitable nut-and-screw means, see Fig. 5.

Means are provided whereby the bar 112 and the rollers 111 can travel through the clearance distance independently of the bracket 105 and consequently the swinging table 104. The bar 112 is connected to the pedal bar 115 hinged to the base 20 as at 116, by means of a rod 117. This connection is of a positive character and therefore as soon as the operator steps on the pedal 33 the bar 112 and the rollers 111 begin to move down through the clearance space, also moving the workpiece away from the transfer belt 30. As soon as the rollers 111 are removed from the transfer belt for the clearance distance, a collar 118 secured to the rod 117 engages a bracket 119 through which the bar 117 slides freely. The bracket 119 is connected by means of an adjustable rod 120 and a cross head 121 with a crank 122 secured to the shaft 108 with which the table 104 is adapted to swing. When the collar 118 engages the bracket 119, further pressure on the pedal 33 causes rotation of the crank 122 and consequently swinging of the table 104 downward against the resistance of the weight counterbalancing the table 104. When the table 104 is thus brought into its lowermost position, the operator moves the pedal 33 slightly to the right in order to cause the pedal bar 115 to get under the hook 123, thus locking the table 104 in its lowermost position. It will now be understood in view of the foregoing that position of the collar 118 on the rod 117 determines the clearance distance and the same may be varied by moving said collar and fixing the same with the aid of a set screw 124 in a desired position on said rod 117.

The rollers 111 and the bar 112 carrying the same are so arranged with respect to the swinging table 104 that when a workpiece is laid flat on said table the edge 110*a* of the workpiece is received in the grooves 111*a* of the rollers 111. Loading of the workpiece is extremely easy when the table is in its lower position, the workpiece being simply picked up from a pile and put on said table 104 so as to engage the guide rollers 111 by its edge 110*a*. Thereupon the operator presses the pedal, moving the same slightly to the left for unlocking it from under the hook 123 and, by gradually releasing the pressure on the pedal 33, he permits the weight to move the table 104 into its upper position.

Means are provided for locking the swinging table 104 in its raised position. Said means are exemplified by a bell crank 127 having a hook 127*a* cooperating with a tooth 126 to lock the same to a stop 125, see Fig. 2. To the opposite end of the bell crank 27 there is connected a spring 128 anchored on a member rigid with the sleeve 31, which spring tends to raise the straight end of the bell crank 127, to lower its hooked end and to lock the tooth 126 as explained.

Means are provided for unlocking the tooth 126 by raising the hooked end 127*a* of the bell crank 127 when the guide rollers 111 reach the end of the clearance distance. Said means are exemplified by rod 129 one end of which is connected to the pedal bar 115, while its other end is provided with a head having an elongated slot 130 which is engaged by a pin 131 carried by the bell crank 127. The length of the slot 130 is determined by the length of the clearance distance. The length of the rod 129 is so selected that when the table 104 is in its raised position, the pin 131 is at the lower end of the slot 130. Therefore when the operator applies pressure to the foot pedal 33, the rod 129 can move together with the bar 112 and rollers 111 bringing the workpiece flat on the table 104 without affecting the position of the bell crank 127 or unlocking the table 104. When, however, the workpiece is brought with the aid of the guide rollers 111 onto the supporting table 104, the pin 131 reaches the upper end of the slot 130, and the further downward movement of the pedal 33 causes raising of the hooked end 127*a* of the bell crank 127 and unlocking of the tooth 126, thereby permitting the table to be brought into its lower position by further application of pressure on the pedal 33 against the resistance of the weight counterbalancing the table 104.

Fig. 11 illustrates the workpiece 110 in its operative position in contact with the transfer belt 30, the table 104 being shown in its raised position. It will be understood that when the machine is running and the belt 30 continuously contacts the workpiece 110 which runs with its edge 110*a* engaging the grooves 111*a* of the guiding rollers 111, motion of the belt itself is suffi-

cient to move the workpiece around, thus effecting continuous printing of the design on the surface of the workpiece. Because of the low friction of the workpiece on the guide rollers, the operator has only to support the workpiece to guide the same and to press the pedal for bringing the workpiece onto the table or breaking the contact between the transfer belt and the workpiece. When the printing operation is completed, the operator lowers the table by applying pressure on the pedal 33. When the pedal is locked in its lowermost position, the finished workpiece is removed from the machine and a new one inserted in the manner described above.

Means are also provided to clean the transfer belt 30 by removing the ink which may be left thereon after the printing. In the present embodiment of the invention said means are exemplified by a surface scraper 135 mounted on a shaft 136 journalled in a bracket 137 secured to the bracket 103, see Figs. 3, 6 and 9. A rod 138 and a weight 139 are provided, just as in cases of other surface scrapers employed in this machine, for the purpose of effecting desired pressure on the scraped surface. For cleaning the sides of the belt 30, side scrapers 140 are provided, said scrapers being hinged to their support mounted on the bracket 137, as shown in Fig 9, and pressed against the surface of the belt 30 with the aid of springs 141. The ink scraped off by the above described means is collected in a waste tank 142. A support roller 143 is provided against the scraper 135 on the opposite side of the belt 30.

The machine is provided with a switch box 144 for proper control of the motor 36, which box is connected with a power line in any suitable manner, preferably by an overhead connection. A safety cover 145 is provided for the belt 37.

In order to permit convenient removal of the belt 30, hook supports such as support 146 (see Fig. 4) may be provided for the rods of the pressure rollers in order to withdraw said rollers from contact with the belt. Similar supports may be provided for any weight carrying rod, if desired.

Although a two-tone or two-color machine is described by way of example in the present instance, it will now be clear in view of the foregoing that more than two designs or color patterns may be printed on a single workpiece in one operation with the use of machines embodying the present invention. For constructing machines printing more than two designs it would only be necessary to provide the desired number of sub-assemblies including design and intermediate rollers, thus providing multiple color machines operating substantially the same as the above described machine. It will be understood that the term design appearing in the claims is intended to be used in a generic sense to refer to a pattern regardless of the color or to a predetermined color regardless of the pattern and that the terms "two-color" and "two-design" are, unless otherwise stated, used interchangeably. Thus, where the phraseology first and second designs is utilized this is construed to mean either two similar patterns in different colors or two different patterns in similar or different colors.

I claim:

1. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said belt, a second design roller adapted to transfer dyeing pigment of a second design, and an intermediate member adapted to receive the pigment from said second roller and to transfer it to said belt.

2. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said belt, a second design roller adapted to transfer dyeing pigment of a second design, and an intermediate member adapted to receive the pigment from said second roller and to transfer it to said belt, said intermediate member being of substantially the same material or surface characteristic as said belt.

3. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said belt, a second design roller adapted to transfer dyeing pigment of a second design, and an intermediate pigment receiving roller adapted to receive dyeing pigment from said second design roller and to transfer it to said belt.

4. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer the dyeing pigment to the surface of a workpiece, a design roller adapted to transfer ink of the first design or color to said pigment receiving belt, a pigment receiving member adapted to receive ink of the second design or color and to transfer it by contact to said belt over said first design, and a second design roller adapted to transfer ink of the second design or color to said pigment receiving member.

5. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer by contact the received dyeing pigment to the surface of a workpiece, a design roller operatively mounted adjacent said belt and adapted to transfer thereto the ink of the first design, a pigment receiving roller adapted to contact said belt and to transfer thereto ink of the second design over the ink of said first design, a second design roller mounted to contact said pigment receiving roller and to transfer thereunto the ink of the second design, and means for effecting predetermined yielding pressures between said transfer belt and said first design roller and said belt and pigment receiving roller.

6. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer by contact the received dyeing pigment to the surface of a workpiece, a design roller operatively mounted adjacent said belt and adapted to transfer thereto the ink of the first design, a pigment receiving roller adapted to contact said belt and to transfer thereto ink of the second design over the ink of the first design, a second design roller mounted to contact said pigment receiving roller and to transfer thereonto the ink of the second design, and pressure rollers mounted to contact said belt from the opposite side against said first design roller and said pigment receiving roller, respectively, to exert predetermined yielding pressures thereon.

7. In a surface ornamenting machine, an endless pigment receiving belt adapted to transfer by contact the received dyeing pigment to the surface of a workpiece, a design roller operatively mounted adjacent said belt and adapted to transfer thereto the ink of the first design, a pigment receiving roller adapted to contact said belt and

to transfer thereto ink of the second design over the ink of said first design, a second design roller mounted to contact said pigment receiving roller and to transfer thereonto the ink of the second design, pressure rollers mounted to contact said belt from the opposite side against said first design roller and said pigment receiving roller, respectively, and adjustable weights for regulating the yieldable pressure to be exerted by said pressure rollers on said belt and to control thereby the character of the respective designs transferred to said belt.

8. In a surface ornamenting machine, a pigment receiving belt adapted to transfer by contact the received dyeing pigment to the surface of a workpiece, a design roller, a pigment receiving roller adapted to contact said belt, and a second design roller adapted to ink said pigment receiving roller, separate means for supplying inks to said design rollers, adjustable means for independently varying the amount of ink actually transferred to said design rollers, and means for removing the ink from said pigment receiving roller, said means being arranged between the portions of said roller contacting first said belt and thereupon said design roller.

9. In a surface ornamenting machine, a pigment receiving belt adapted to transfer by contact the received dyeing pigment to the surface of a workpiece, a design roller, a pigment receiving roller adapted to contact said belt, and a second design roller adapted to ink said pigment receiving roller, separate means for supplying inks to said design rollers, adjustable means for independently varying the amount of ink actually transferred to said design rollers, scraper means for removing the ink from the pigment receiving roller, said scraper means being located to scrape the ink from portions around the periphery of said pigment receiving roller after said portions successively contact said belt but before a particular portion comes in contact with said second design roller.

10. In a surface ornamenting machine, an ink receiving belt having a smooth surface and adapted to transfer by contact the received ink to the surface to be decorated; a first roller having an engraved surface and adapted to transfer ink from its engraved surface directly to the smooth surface of said belt; an intermediate roller having a smooth ink receiving surface, said intermediate roller adapted to engage the surface of said belt and to transfer thereon to the received ink; and a second roller having an engraved surface and adapted to transfer by contact ink to the surface of said intermediate roller.

11. In a surface ornamenting machine, a movable pigment receiving member adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said member, a second design roller adapted to transfer dyeing pigment of a second design, and an intermediate member adapted to receive the pigment from said second roller and to transfer it to said member.

12. In a surface ornamenting machine, a movable pigment receiving member adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said member, a second design roller adapted to transfer dyeing pigment of a second design, an intermediate member adapted to receive the pigment from said second roller and to transfer it to said member, and means for relatively varying the pressures between said pigment receiving member, said first inking roller and said intermediate member.

13. In a method of decorating a surface with a multiple-tone design, the steps of printing the design of the first tone directly on a pigment receiving member, printing the designs of each succeeding tone on a separate pigment receiving member, transferring said succeeding designs on said first pigment receiving member one after another over said first design, and thereupon transferring all of said design to the surface to be decorated by bringing the same into contact with said first member.

14. In a method of decorating a surface with a two-tone design, the steps of printing the design of the first tone directly on a pigment receiving member, printing the design of the second tone on a second pigment receiving member, transferring by contact said second design from said second pigment receiving member to said first pigment receiving member over said first design, and thereupon transferring both of said designs to the surface to be decorated.

15. In a method of decorating a curved surface with a two-tone design, the steps of printing the design of the first tone directly on a soft pigment receiving member, printing the design of the second tone on a smooth surface pigment receiving member, transferring by contact said second design from said second pigment receiving member to said first pigment receiving member over said first design, and thereupon transferring both of said designs to the surface to be decorated by bringing said surface into contact with said soft member.

16. In a surface ornamenting machine, an endless pigment receiving member adapted to transfer the pigment to the surface of a workpiece, a design roller adapted to transfer dyeing pigment of one design to said member, a second design roller adapted to transfer dyeing pigment of a second design, and an intermediate pigment receiving roller adapted to receive dyeing pigment from said second design roller and to transfer it to said pigment receiving member.

NICHOLAS G. KOPPINGER.