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APPARATUS FOR DECORATING CONCAVE AND CONVEX SURFACES

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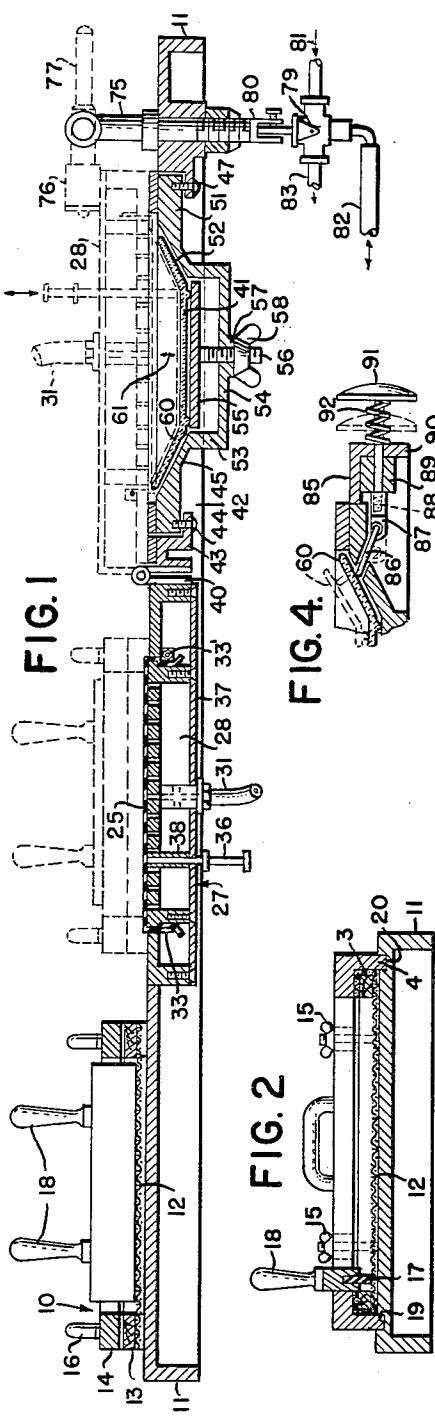


FIG. 1

FIG. 4.

FIG. 2

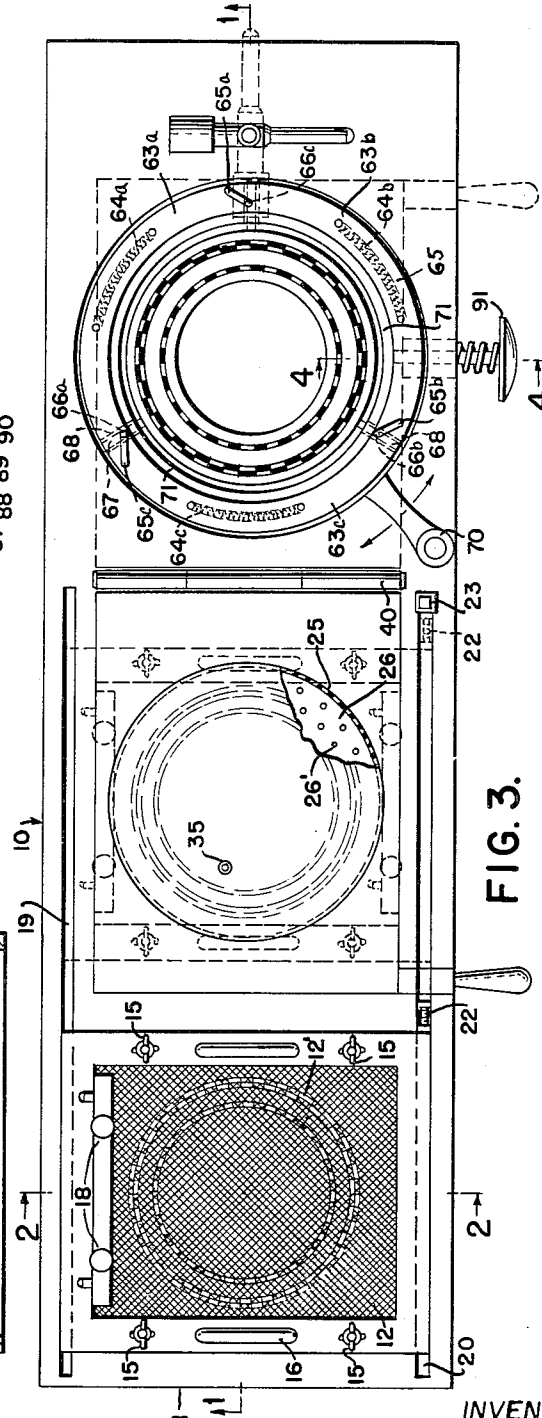


FIG. 3.

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APPARATUS FOR DECORATING CONCAVE AND CONVEX SURFACES

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3 Claims. (Cl. 101—41)

This invention relates to an apparatus for decorating or printing on concave or convex surfaces, particularly of articles found in the ceramics industry.

One object of this invention is to provide an apparatus, and a method of operating such apparatus, whereby a selected pattern or impression may be impressed on a transfer member such as a normally flat sheet of rubber-like material, and for then transferring the imprint or impression from that sheet of material onto the concave or convex surface of the article that is to be decorated.

In accordance with the method of this invention the picture or impression that is to be ultimately impressed on the ceramic article, is first impressed on the flat rubber-like sheet and that sheet is then pressed against the article by compressed air pressure which insures complete and continuous contact of the rubber sheet against the ceramic article in such manner as to transfer the impression from the sheet to the article completely and regularly.

The apparatus as employed to practice the decorating method is shown in the accompanying drawings, in which:

Fig. 1 is a front view, partially in elevation and partially in section of the printing or decorating apparatus taken on the line 1—1 of Fig. 3;

Fig. 2 is a vertical section through the printing screen frame and the supporting table taken on the line 2—2 of Fig. 3;

Fig. 3 is a top plan view of the entire table of Fig. 1; and

Fig. 4 is a sectional view taken at the line 4—4 of Fig. 3; showing a removing device for raising an imprinted article to permit its easy removal from a recess on the table.

As shown in the drawings, a rigid base or table 10 is provided with three working stations or sections. At the first section, at the lefthand end 11 of the table there is a silk screen having an imprint of the design which is to be put on a transverse sheet 25 of rubber material that is located at the middle section on the table. The rubber sheet 25 is mounted on a pivotal support that is then turned over to overlay the third section at the righthand end of the table so the impression from the rubber-like sheet may be pressed down on the ceramic article such as a plate, for example, to transfer the design to that plate.

As shown in the drawing, a silk screen 12 is supported in a matrix frame 13, which in turn is supported from a rigid frame 14 which may be of metal to hold the matrix carrying frame 13 in proper position on the table 10. The silk screen 12 bears a pattern or design 12' which is to be reproduced upon a ceramic article.

The matrix frame 13 is supported from and secured to the top frame 14 by suitable means permitting quick connection and quick release such as bolts and wing nuts 15. The two frames 13 and 14 are considered together as a printing carriage, and may be readily moved by means of two handles 16 secured to the two sides of the top frame 14. A squeegee 17, which is provided thus

with two handles or levers 18, serves to distribute the paint over the silk screen 12 in order to make an imprint or impression through the silk screen onto a surface beneath the screen.

The position at which the printing frame is illustrated in Fig. 1 may be considered to be the auxiliary non-operating station of the frame, to which it is moved out of the way between impressions. When the impression is to be made on the rubber sheet 25, the combination printing frame is moved to the middle of the table to imprint the design on the rubber sheet through the silk screen 12, and the printing carriage 13—14 is then returned to its non-operating position as it is illustrated in Fig. 1.

In order to guide the printing carriage back and forth in its movements, the table 10 is provided with two slots or guideways 19 and 20 that serve to keep the printing carriage in proper alignment on the table. In order to control the proper position of the printing carriage longitudinally on the table an adjustable positioning bolt 22 is mounted on and secured to the righthand side of the printing carriage 13—14 and the bolt is then adjusted to engage a stationary stop member 23 disposed in fixed position along the front edge of the table 10 adjacent the righthand limit of the middle section so that the silk screen 12 will be properly positioned over the rubber sheet 25. When the printing carriage with the silk screen matrix is shifted to operating position at the middle of the table, the two guide slots 19 and 20 and the stop 23 serve to position the silk screen properly above a rubber transfer sheet 25 on to which the design from the silk screen is to be impressed.

The rubber sheet 25 which receives the imprint or impression of the design from the silk screen then serves as the transfer and transporting medium to carry the imprint design over to the article to be decorated. The sheet 25 is of rubber or similar non-absorbent material that is resilient and flexible. For the purpose of illustration the rubber sheet 25 is shown in this application as being mounted on a circular disc plate 26 perforated with a large number of small openings 26', to serve as air passages, but otherwise too small to affect the outline of the imprint or impression that is placed on the rubber sheet.

The perforated disc 26 is mounted on a hollow metallic block 27 with a hollow chamber 28 in communication with the air passages in the disc 26. During the printing operation compressed air is fed into the hollow chamber 28 and passes through the perforations in the disc 26 to put pressure on the rubber sheet 25 and presses it against the article onto which a design or imprint on the rubber sheet is to be transferred. A conduit 31 is supported on the hollow block 27 to communicate with the chamber 28 to supply the compressed air to that chamber from some suitable external source.

The rubber sheet 25 is held on and fitted to the circular disc 26 by means of a clamping ring 33, the ends of which are close enough to be suitably tightened, as for example by the screw and nut connection 33'.

The rubber sheet 25 is provided with a small reinforced opening 35 which serves as an exhaust opening or exit for any air that would be trapped between the rubber sheet and the article onto which the design or imprint is to be transferred. To permit the trapped air to move out past the block 27, a floating tubular element 36 of relatively light weight material is connected to the rubber sheet opening 35. The tubular element 36 extends through the outer wall 37 of the block 27 and moves through a conduit 38 connected between the wall 37 and the upper surface of the disc plate 26 in order to isolate the conduit 38 and all of the evacuated air, from the compressed air in the chamber 28 of block 27.

After the silk screen printing carriage 13—14 has been moved to the central or middle section of the table and the design screened on to the rubber sheet 25, the silk screen carriage is then returned to its non-operating position, shown in Fig. 1, and the transfer frame consisting of the block 27 and the rubber sheet 25 is now ready to be moved to its operating position above the ceramic article to be imprinted. Proper alignment is essential, of course, between the imprinted rubber sheet and the ceramic article to be imprinted, and such proper alignment is assured by the provision of a hinge 40 around which the sheet supporting block 27 is turned to be placed in superposed position over the table section on which the ceramic article is supported. The manner in which the block 27 is thus superposed above the ceramic article is shown in dotted outline in Fig. 1.

The ceramic article on which the design from the rubber sheet is to be transferred is placed in an appropriate recess 41 in a table section 42 at the righthand end of the table.

The righthand table section 42 for supporting the ceramic articles to be painted may be provided as shown in Fig. 1 with an open frame 43 having an inwardly extending bottom flange 44 that serves as a seat or support for a centering support device 45, of appropriate shape to serve as a seat for the ceramic article that is to be decorated or printed.

The centering support device 45 is arranged to be easily anchored to and disconnected from the supporting frame 43 by any simple means, indicated here as the bolts 47. A different centering device may be used, of course, for each different type or size of ceramic article in order that proper positioning may be easily and quickly accomplished.

The centering device 45 that is illustrated in Figs. 1 and 3 and partially in Fig. 4 shows a form suitable for supporting a ceramic article of dinner-plate shape, and it comprises a dinner plate support 51, an inclined annular seating portion 52, a depending platform cylinder guide portion 53 with a bottom closing wall 54 and an adjustable platform 55, provided with a threaded bolt 56 that fits into a threaded opening 57 in the bottom wall 54 to permit the platform 55 to be adjustably positioned to a desired elevation, and then anchored in that position at that elevation by a locking thumb screw 58 threaded on to the threaded bolt 56.

By means of the platform 55 the ceramic article or dinner plate 60 is supported at the desired elevation so the printed rubber sheet 25 may be placed above the article and will have to move through a minimum distance 61 between the normal position of the sheet 25 superposed above the ceramic article, and the surface of the article 60 when it is properly supported on the platform 55.

In order to properly retain the ceramic article, such as the plate 60, so it will be symmetrically positioned upon a vertical axis through the center of the centering device 45, a retaining mechanism generally indicated at 63 is employed, shown here as comprising three arcuate-shaped plates or segments 63–*a*, 63–*b*, and 63–*c*, each subtending approximately 120 degrees of arc, and all disposed to lie in a flat horizontal plane on the top surface of the frame support 51. Normally, the arcuate segments 63–*a*, 63–*b* and 63–*c* of the retaining device are biased to their respective outermost radial positions by individual biasing springs 64–*a*, 64–*b* and 64–*c* respectively.

The retaining mechanism has an annular ring 65 which is provided with three biased slots 65–*a*, 65–*b* and 65–*c*, each slot as shown in Fig. 3 particularly, accommodating a bolt or pin, identified as 66–*a*, 66–*b* and 66–*c* for the respective arcuate segments. Each pin extends down into and is secured to a radially moving movable finger 67 that is seated in a radially directed slot 68 in the segments.

When the ring 65 is operated by its handle 70 the three arcuate segments of the ring move the associated pins 66–*a*, 66–*b* and 66–*c* radially inward or outward to move the associated fingers 67 in corresponding radially inward or outward directions. When those fingers 67 are moved radially inward toward the center of the centering device 45, the fingers engage the peripheral edge of the ceramic plate that is to be printed and move that plate to a symmetrically centered position on the supporting platform 55.

The relative dimensions of the centering ring are such as to provide space on the inner edge for an auxiliary centering ring 71 to provide additional support for the radially extending fingers 67. The inner diameter of the auxiliary ring 71 is, of course, sufficiently larger than the diameter of the dinner plate that is to be printed so as to permit free relative movement of the dinner plate in its adjustment to the central position.

After the dinner plate 60 has been inserted, it is centered on its supporting platform 55, the block 27 may be lowered into position to cover the dinner plate, and the block 27 is then locked in position while the impression from the rubber sheet is transferred to the dinner plate 60. The locking device for the block 27 is shown mounted on a post 75 and provided with a locking roller 76 and an operating handle 77. The post 75 is anchored to the table 10 by a threaded bolt 79, in such manner as to permit the limited arcuate movement of the handle 77 and the locking roller 76 that is necessary to release block 27. The movement of the locking handle 77 and consequent turning of the supporting post 75 is utilized to operate a control valve 79 by means of an operating stem 80 to permit compressed air from a source 81 to enter a conduit 82 that supplies the compressed air to the conduit 31 that is fixedly mounted on the block 27 to feed the compressed air into the chamber 28 behind and under the air openings 26' in the disc 26 directly beneath the rubber sheet 25. The compressed air thereupon forces the rubber sheet 25 downward against the ceramic plate 60 and thereby transfers the imprinted design from the rubber sheet on to the surface of the ceramic plate 60.

After the transfer of the impression or design, the locking handle 77 is moved to shift the locking roller 76 away from the block to release the block 27 and at the same time, the turning of the supporting post 75 rotates the valve stem 80 to shut off the compressed air from source 81 into the conduit 82 and at the same time connects the conduit 82 at the valve 79 to a passage in the valve that opens into outside space through a discharge pipe 83 to release and exhaust the compressed air from the chamber 28 of the block 27 and the air accumulated under pressure behind the rubber sheet 26.

While the compressed air was being fed to the chamber 28 of the block in order to press the rubber sheet downward against the ceramic plate, the air that was trapped in the space between the sheet and the cavity in the ceramic plate 60 was permitted to move out from that space through the floating conduit 36 that is attached at one end to the rubber sheet at the outlet opening 35 shown in Fig. 3. Conversely, after the transfer operation when the compressed air is released from behind the rubber sheet, and the rubber sheet tends to restore itself to its original flat condition, the conduit 36 permits outside air to return to the space between the dinner plate 60 and the rubber sheet to eliminate any vacuum condition in that space.

The black and rubber sheet are now pivoted away from superposed position back to normal print receiving position, and the printed plate 60 may now be removed for a subsequent firing operation.

In order to provide access to the edge or under surface of the plate to permit its ready and easy removal from the cavity in which it rests, during the printing operation, an ejector mechanism 85 is provided as shown in Fig. 4.

The ejector 85 comprises a short rod 86 that is disposed to project through an opening in the inclined seating portion 52 of the dinner plate support 51. Normally the front end of the rod 86 is beneath the top inclined surface in order to be out of the way of the ceramic article that is to be positioned for printing. The back end of the rod 86 is pivotally supported on a block 87 attached to a rod or shaft 88 supported in a bearing 89. The bearing 89 is supported on an ejector frame 90 through which the outer end of the shaft 88 extends and supports a pressure button 91. A biasing compression spring 92 rests against the frame 90 and against the button 91 in such a manner as to push the button 91 outward to keep the rod 86 normally in retracted position. Pressure on the button 91 moves the shaft 88 and its block 87 inward to cause the rod 86 to strike the under surface of the dinner plate 60 and raise the plate 60 upward sufficiently to permit an operator's fingers to enter underneath the plate 60 and raise it out of its supporting cavity.

Various modifications may be made in the specific details of construction that are shown, without departing from the spirit and scope of the invention as disclosed and defined in the appended claims.

I claim:

1. An apparatus for decorating ceramic articles comprising an elongated table, a design transfer member set in said table and hinged on one side thereto, said design transfer member including a hollow metallic block having an opening in one side, a perforated disc placed in the opening, a resilient, non-absorbent sheet having a small opening covering said disc, a tubular element connected to the opening in the resilient sheet and passing through and out of said hollow block, a conduit communicating with said hollow block, means for imprinting a design onto said resilient sheet, and an article supporting member set in said table adjacent to the hinged side of said hollow block, said article supporting member including an inclined annular seating portion, a vertically adjustable platform disposed within said annular seating portion, a ring resting on said annular seating portion, a plurality of biased slots in said ring, a plurality of arcuate segments disposed above said ring, a radially extending slot in each of said arcuate segments, a plurality of fingers, each of which is movably mounted in one of said radial slots, pins extending upwardly from each of said fingers, each of said pins being disposed within one of the biased slots in said ring and means for turning said ring whereby said fingers will be moved radially inwardly to center an article on said supporting member.

2. An apparatus for decorating ceramic articles as defined in claim 1 having an article ejector mechanism including a supporting member provided with a bearing, a shaft passing through said bearing and having a button on one end, a compression spring disposed between said supporting member and said button, and a rod pivotally attached to the second end of said shaft and extending into an opening in the inclined portion of said annular seating portion.

3. An apparatus for decorating ceramic articles as defined in claim 1 having a locking and control device including a vertically disposed rotatable turning post, a horizontally disposed member attached to the upper end of said vertically disposed post, said horizontally disposed member having on the one end a handle portion and on the second end and rotatable thereon a cylindrical member, and a stem depending from said vertically disposed post and adapted to operate an air control valve.

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