June 12, 1951 W. C. DENISON, JR 2,556,258

APPARATUS FOR ORNAMENTING CERAMIC WARE

Filed Feb. 8, 1947 2 Sheets-Sheet 1

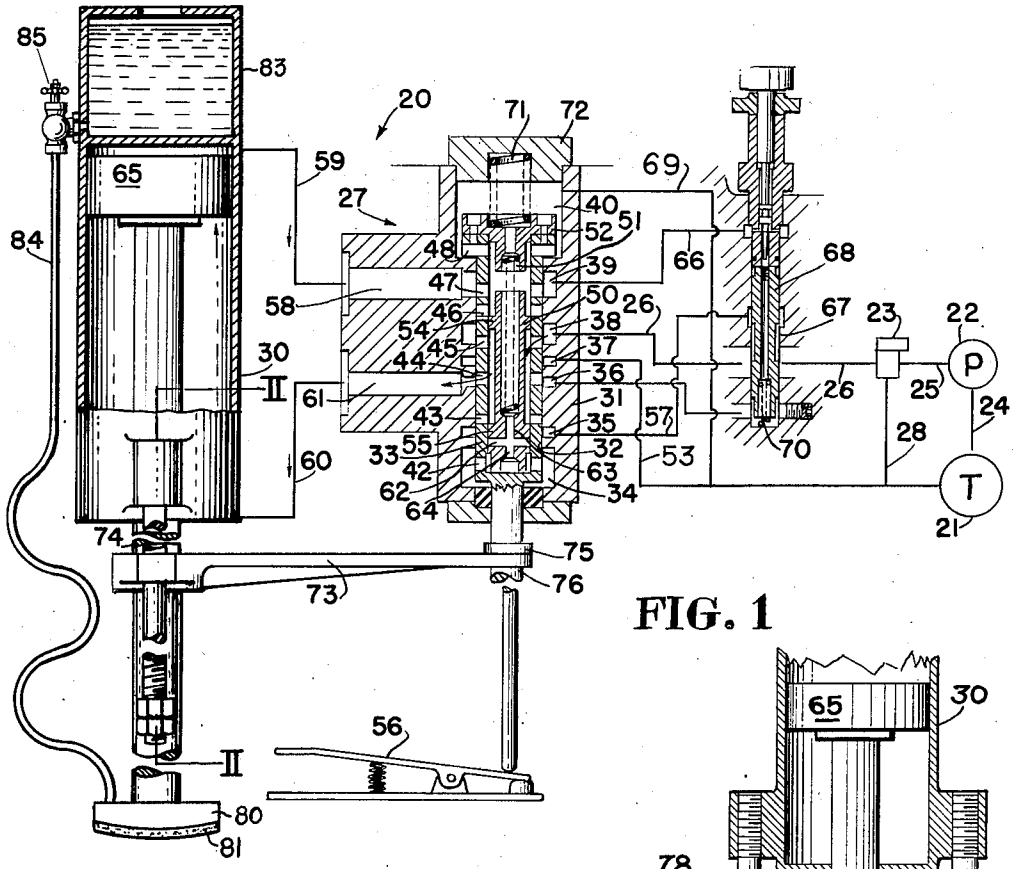

FIG. 1

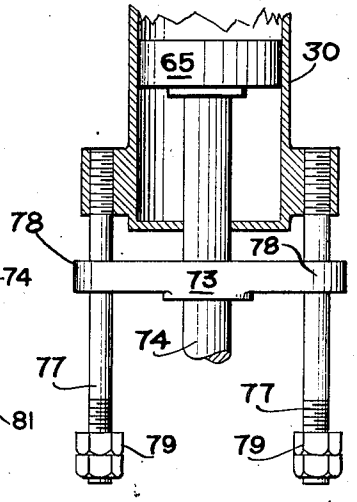

FIG. 2

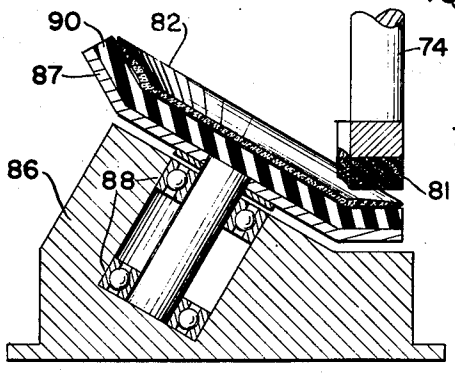

FIG. 3

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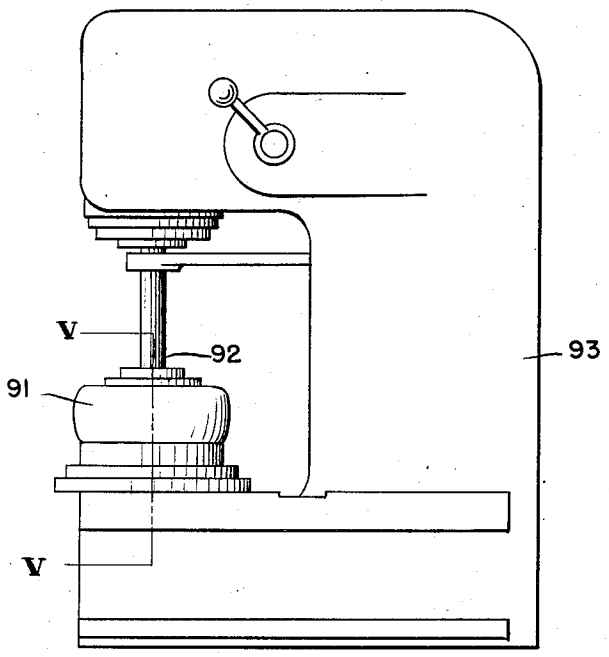

FIG. 4

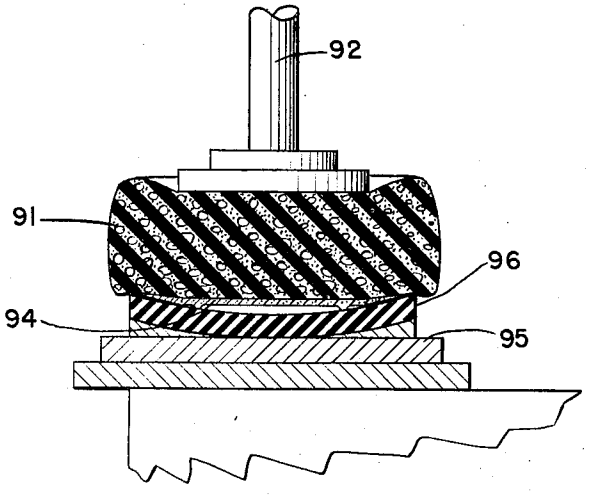

FIG. 5

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APPARATUS FOR ORNAMENTING CERAMIC WARE

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Application February 8, 1947, Serial No. 727,314

2 Claims. (Cl. 41—1)

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This invention relates to the art of decorating ceramic ware and is particularly directed to a method and apparatus for applying design-bearing transfers to pottery, dinnerware, and other ceramic products.

In practicing the method now in general use in the ornamentation of ceramics, and particularly dinnerware, the glazed ware has the surface area to be ornamented coated with an adhesive, thick varnish sometimes being employed. This coated ware is passed through a heated chamber to cause the coating to become tacky. One or more sheets of paper carrying the ceramic transfer are then placed face down on the tacky surfaces and the ware is moved to an operator who smooths the transfers and presses the same into the adhesive. In performing the latter operation, the worker holds the ware in his or her hand and rubs the transfer with a sponge-like pad which is kept moist at all times. If there is more than one area being ornamented the operator must manipulate the ware and rub each transfer. In the rubbing and manipulation of the ware, extreme caution must be exercised to prevent mutilation of the transfer or design. When the rubbing operation has been completed, the ware is placed on a conveyor which passes it through a series of jets of water directed against the ware at various angles. These jets soften the paper portion of the transfer and effect the removal thereof from the ware, leaving the ceramic design adhering to the ware. After a period of drying, the ware is fired to cause the ceramic design to unite with or fuse into the glaze on the ware making the design permanent. In the method described, the step of smoothing the transfer and pressing the same into the adhesive is objectionable because it requires the employment of highly skilled workmen, it consumes considerable time, requires a high degree of handling, and results in the loss of a large percentage of ware due to the misplacement, distortion and/or smudging of the designs.

An object of this invention is to provide a method and apparatus for smoothing and embedding the transfers in the adhesive which will reduce the handling, eliminate the rubbing and produce ware decorations of superior quality.

A further object of the invention is to provide a method of decorating ceramic ware in which design-bearing transfers are smoothed and embedded in the adhesive through the use of hydraulic pressure whereby the optimum pressing force will be used at all times and uniform products will be secured.

A still further object of the invention is to provide a method of decorating ceramic ware in which ceramic designs are applied to the ware through the use of a hydraulically actuated resilient pad which is rapidly reciprocated through a short stroke whereby the pad will be repeatedly engaged with the transfer bearing the ceramic design to expel all air between it and the ware and force the transfer against the adhesive.

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Another object is to provide an apparatus for use in smoothing transfers on ceramic ware and forcing the same into tight engagement with an adhesive coating upon the ware which apparatus includes a press having a ram disposed to move in a pressing and retraction stroke of predetermined normal length, the press having control elements operative to cause the ram to perform a series of reciprocations of only a fraction of the length of the normal ram stroke between the pressing and retraction sections of the stroke whereby a resilient pad carried by the ram will be caused to repeatedly engage and press the transfers to more firmly secure the same to the adhesive.

An object also is to provide an apparatus of the type mentioned in the preceding paragraph with a holder for the ware, which holder will permit the pad used to press the transfer, to be moved into engagement with the ware with no tendency to shift laterally with respect to the surface on which the transfer is placed, thus eliminating the danger of tearing the transfer or smudging the ceramic design thereon.

In the drawings:

Fig. 1 is a diagrammatic view illustrating apparatus and the hydraulic circuit therefor, used in carrying out the method forming the subject matter of the invention.

Fig. 2 is a detail vertical sectional view taken through the apparatus on the plane indicated by the line II—II of Fig. 1.

Fig. 3 is a detail vertical sectional view taken through a holder for a ceramic article showing the same in operative relation to a pressing ram forming a part of the apparatus shown in Fig. 1.

Fig. 4 is a side elevational view of a press provided with a modified form of apparatus for carrying out the present invention.

Fig. 5 is a detail vertical sectional view taken on the plane indicated by the line V—V of Fig. 4.

Referring more particularly to the drawing, one form of apparatus which may be used to carry out the present invention has been illustrated diagrammatically in Fig. 1. This apparatus is hydraulically operated and the hydraulic system for such apparatus is indicated generally

in the drawing by the numeral 20. System 20 includes a source of fluid pressure having a fluid reservoir 21, a motor-driven pump 22, and a relief valve 23, the latter being adjustable to secure the desired pressure. A fluid line 24 connects the pump 22 with the tank or reservoir 21 and a second line 25 extends from the pump to the inlet of the relief valve 23. Another line 26 extends from the relief valve to a control valve mechanism indicated generally by the numeral 27. The relief valve 23 may be of any suitable type, an outlet line 28 leading therefrom to conduct fluid directly to the reservoir 21 when the pressure in line 25 exceeds a predetermined maximum.

Valve 27 may be of any suitable type capable of causing the operation of a power cylinder, indicated generally by the numeral 30, in a desired manner. Suitable valves have been disclosed in the copending applications, Serial Nos. 594,963 and 669,657, filed May 21, 1945 and May 14, 1946, now Patents Nos. 2,512,730 and 2,488,109, respectively, in the name of Cecil E. Adams, the valve illustrated herein being similar to that of the last-mentioned application. Valve 27 includes a body 31 having a bore 32 for slidably receiving a sleeve-like spool 33. The body 31 is also provided with a plurality of annular recesses 34 to 40, inclusive, spaced longitudinally of the bore 32. The sleeve 33 is formed to include a plurality of longitudinally spaced groups of laterally extending ports 42 to 48, inclusive, certain of the ports registering with certain grooves in the body in different longitudinal positions of the spool in the bore 32. Fluid line 26 which leads from the source of fluid pressure, is connected with groove 38, this groove being connected with the interior of the sleeve 33 by lateral ports 45.

A shuttle valve spool 50 is disposed for sliding movement in the sleeve 33, this sleeve being urged at all times toward the position shown in Fig. 1 by a coil spring 51, this spring having one end portion arranged in a socket formed in the spool 50 and the other end portion in a similar socket formed in a cap 52 which is suitably secured to the open end of the sleeve 33. When the power cylinder 30 is inactive the sleeve 33 will be in position to cause the lateral ports 44 to register with groove 37 formed in body 31 and fluid introduced to groove 38 through line 26 will flow through ports 45 to the interior of the sleeve 33 and outwardly therefrom through ports 44 to groove 37, this groove being connected by line 53 with reservoir 21. Thus, when the power cylinder is idle, fluid will be returned to the reservoir without causing the pump 22 to operate under a load. It will be noted from Fig. 1 that fluid flowing to the interior of sleeve 33 through ports 45 will be confined between spaced heads 54 and 55 formed on the shuttle spool 50.

When it is desired to cause the power cylinder 30 to operate, sleeve 33 may be elevated through the manipulation of a foot pedal 56 or other suitable device to cause the registration of ports 42 and groove 35. When this registration has been established, registration between ports 46 and groove 39 will also be established while registration between ports 44 and groove 37 will be interrupted. At this time pressure fluid from line 26 will flow through a passage 57, formed in body 31, to groove 35 from which it will flow through ports 42 to the interior of the sleeve 33 at the lower end of the shuttle valve spool 50. This fluid pressure will urge the shuttle valve in an upward direction against the opposition of the

spring 51. When the shuttle valve reaches the upper limit of its travel, ports 44 which then register with groove 38, will be connected by the space between heads 54 and 55 on the shuttle valve with ports 47 registering with groove 39. Fluid introduced under pressure to groove 38 at this time will be directed into groove 39 and will flow through passage 58 to line 59 leading to the upper end of the power cylinder 30. A line 60 leading from the lower end of this cylinder, is connected by passage 61 with groove 36 which, when the parts of the valve are arranged as specified, will be connected by ports 43 with transverse passages 62 formed in head 55 of spool 50.

The passages 62 are connected with longitudinal passages 63 and 64 formed in shuttle valve 50, the former passage leading to the upper end of the shuttle valve and the latter passage leading to the lower end thereof. Passage 63 is slightly restricted so that fluid flow therethrough will be resisted causing a pressure which will be transmitted to the lower end of the shuttle valve through passage 64. This fluid pressure will tend to retain the shuttle valve in its elevated position during forward operation of the power cylinder, this forward operation being caused when fluid under pressure is supplied through line 59. During forward operation, piston 65 moves in a downward direction in cylinder 30 causing fluid beneath the piston to flow outwardly through line 60. As long as this exhaust of fluid is maintained, the back pressure caused by restricted passage 63 will serve to retain shuttle valve 50 in an elevated position in which pressure fluid supplied to valve 27 will be directed to the upper end of the power cylinder.

When shuttle valve 50 is first raised, fluid under pressure supplied to groove 39 will be directed through passage 66 in body 31 to the upper end of a bore 67 in which a spool 68 is disposed for sliding movement. The introduction of this fluid moves the spool into a position wherein the fluid flow from line 26 through passage 57 to groove 35 will be interrupted. Shuttle valve 50, however, will be maintained in its elevated position by the back pressure until piston 65 is interrupted in its forward movement. The system thus far described has been illustrated and described in the above-mentioned co-pending application Serial No. 669,657, of Cecil E. Adams, now Patent No. 2,488,109, issued November 15, 1949, and no claim is made to this system herein.

When the piston ceases to move in the forward direction, the back pressure shuttle valve 50 will be dissipated through the passages in the shuttle valve and spring 51 will cause this shuttle valve to return to its lowered position. At this time groove 39 will be connected with groove 40 through ports 46, the interior of spool 33, and ports 48, groove 40 being in turn connected by a line 69 with reservoir 21. When spool 50 is lowered ports 44 will be connected with ports 43 by the space between heads 54 and 55 on the shuttle valve and ports 43 will be in registration with groove 36, thus fluid pressure introduced to valve 27 will be directed from this valve through line 60 to the under side of piston 65. This fluid pressure will cause the piston to move in an upward direction and expel fluid from the upper end of the power cylinder through line 59 to groove 39 as previously mentioned. This groove is then in communication with reservoir 21 and fluid from the upper end of the power cylinder will be directed to the reservoir. At this time also bore 67 will be connected

with the reservoir so that a spring 70 beneath spool 68 will cause this spool to move upwardly and dispel fluid from the upper end of the bore 67. When the spool moves a sufficient distance communication will again be established between line 26 and groove 35 through passage 57 permitting fluid under pressure to again be supplied to the under side of the shuttle valve 50 and the cycle of operation of the power cylinder will then be repeated. By controlling the flow of fluid from the upper end of bore 67, the distance travelled by the piston 65 in an upward direction may be regulated. The purpose of this regulation will be set forth later. It will be seen from the foregoing that through the manipulation of valve 27 piston 65 may be caused to move downward in cylinder 30 then reciprocate through a portion of the normal stroke thereof at the lower end of the stroke. When it is desired to return the piston to an elevated or starting position, pedal 56 is released and spool 33 permitted to return to its lowered position under the influence of a spring 71 disposed between member 52 and cover 72 for body 31. At this time fluid under pressure from the power source will be supplied to the lower end of the power cylinder and piston 65 will move in an upward direction until an arm 73 secured to a ram 74, depending from the under side of piston 65, engages a collar 75 on a shipper rod 76 projecting from the lower end of spool 33 and moves this shipper rod and spool in an upward direction to interrupt communication between ports 44 and groove 36. In so moving ports 44 will be registered with groove 37 so that fluid under pressure supplied to valve 27 will be directed to reservoir 21 as above set forth. When this condition obtains, piston 65 will be maintained in its elevated position.

To adapt the mechanism and the hydraulic system just described to the method forming the subject matter of this invention, the power cylinder is provided with mechanism illustrated in Fig. 2 to limit the travel of the ram 74 in a forward direction. This mechanism includes a pair of rods 77 which project through openings formed in ears 78 on arm 73. The outer ends of the rods 77 are threaded to adjustably receive stop members 79 which are engaged by the ears as the ram 74 moves in a forward direction. When these ears engage the stops 79 further movement of piston 65 is interrupted and the back pressure existing under the shuttle valve will be dissipated as previously described. The direction of movement of the piston will then be reversed and if the pedal 56 is maintained in the proper position, short reciprocatory movement will be imparted to the piston 65.

Ram 74 has its lower end provided with a foot 80 to which is secured a resilient pad 81 formed of sponge rubber, or the like, which pad is provided for engaging and pressing the transfers on ceramic ware, such ware being supported beneath the lower end of the ram with the transfer receiving portion in registration therewith. The foot 80 has its lower surface shaped to fit the portion of the ware to be operated upon, in the present instance, the under side of the foot being curved to conform to the rim of a dish indicated generally by the numeral 82. In the event any other portion of the ware is to be operated upon, the surface of the foot to engage such ware will be suitably formed. In performing the method, it is desirable to keep the resilient pad 81 moist at all times, this result may be secured by any

suitable means, that shown comprising a tank 83 disposed in an elevated position and a conduit 84 extending from the tank to the foot 80. Suitable flow-controlling means 85 may be provided in the conduit to prevent excessive flow of the lubricant. The conduit 84 is flexible and a suitable amount of slack is provided therein to permit the movement of the ram toward and from the ware.

When the rim of a dish or other similar article of ware is to be ornamented, a holder of the type illustrated in Fig. 3 may be employed; this holder includes base 86 and an adaptor disk 87 supported for rotation in bearings 88 carried by the base. The bearings are disposed in a tilted position so that the rim of the article of ware will be arranged substantially at right angles to the direction of movement of the ram. The disk has a resilient liner 90 in which the article of ware is positioned to protect such ware from breakage, the liner illustrated being slightly cupped to conform to and locate the article of ware. The disk is mounted for rotation as illustrated when more than one area on the rim of the ware is to be decorated. If only one area is to be so treated a stationary disk could be employed. Such disk would also be used when the center of the bottom of the dish is decorated. By using a journalled disk and means thereon for locating the dish the latter can be quickly manipulated by the operator to bring one or more areas of the rim into registration with the pressing apparatus. When the apparatus is being set up for a particular operation the stops 79 are so adjusted that the ram will move toward the work until the pad 81 has engaged the ware and been compressed thereagainst. When the stops are so set and the relief valve 23 properly adjusted any desired pressing force may be secured. When the ram moves toward the work and the ears 78 engage the stop 79 further movement of the ram toward the work will be interrupted as above set forth. The operator may retain pedal 56 depressed causing the piston 65 and ram 74 to reciprocate through short strokes until the transfer has been properly smoothed against the adhesive on the ware, the pedal may then be released to cause the ram to return to its elevated or starting position. After a suitable training period, the operator will learn the length of time and number of reciprocations necessary to secure the desired results. If the valve mechanism disclosed in application Serial No. 594,963 is employed, the number of strokes or reciprocations of the ram and pad will be automatically controlled and all that the operator need do is press the operating pedal to initiate the operation.

The apparatus may be modified in many ways, for example, the resilient pad 91 which is attached to the ram 92 of a press 93 may be made of a size sufficient to completely cover the article of ceramic ware, as shown in Figs. 4 and 5. This pad 91 may be of any suitable material, such as sponge rubber, and of the necessary thickness to give the desired results. The article of ware 94 is placed in the concave recess of a holder 95 which is provided with a resilient lining 96 and located in registration with the pad 91.

When a pad of the type shown in Figs. 4 and 5 is employed, a plurality of transfers may be smoothed and embedded in the adhesive on an article of ware at the same time. This pad may also be employed when an "all over" pattern is applied to ware.

The press 93 contains the hydraulic circuit

shown in Fig. 1 and is operated in the manner above described, that is, the ram 92 is caused to advance toward the ware and after exerting a predetermined pressure thereon or moving a predetermined distance toward the ware so that the pad 91 will be engaged and compressed thereagainst, the ram will rapidly reciprocate to execute a series of pressing impulses on the transfer. These pressing impulses force air from between the transfer and the ware and embed the ceramic design firmly in the adhesive on the ware.

With this method and apparatus set forth, the period of time required to perform this pressing operation will be reduced to a minimum since it is merely necessary to cause the pad to move far enough in a reverse stroke to release the pressure applied to the transfer by the successive pressing engagements or impulses. In some instances, it may only be necessary to move the ram a sufficient distance away from the ware to permit the sponge to partly expand, in others it may be necessary to move the ram a distance sufficient to disengage the pad from the transfer.

From the foregoing it will be apparent that the method of pressing design-bearing transfers into engagement with articles of ceramic ware has been provided which will decrease the handling of the ware and produce uniform results; the time necessary in producing the decorations will also be decreased.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow:

I claim:

1. Apparatus for ornamenting ceramic ware comprising a hydraulic cylinder; a piston disposed for sliding movement therein; a ram projecting from said piston; a compressible pad carried by the outer end of said ram; a source of fluid pressure; and valve means between said pressure source and said hydraulic cylinder, said valve means being operative to cause said ram to move said pad into compressive engagement with the article to be ornamented and thereafter reciprocated a plurality of times through a distance which is shorter than the maximum extent said pad is compressed.

2. Apparatus for ornamenting ceramic ware comprising a hydraulic cylinder; a piston disposed for sliding movement therein; a ram projecting from said piston; a compressible pad carried by the outer end of said ram; a source of fluid pressure; and valve means between said pressure source and said hydraulic cylinder, said valve means having a reversing valve; and means for automatically actuating said valve means after the pad on the ram has been compressed against the article to be ornamented to repeatedly reverse the direction of fluid flow to the cylinder to impart reciprocatory impulses to the pad without completely decompressing the same.

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