April 2, 1940. J. A. BOWER 2,195,810

APPARATUS FOR SAND BLASTING CERAMIC WARE

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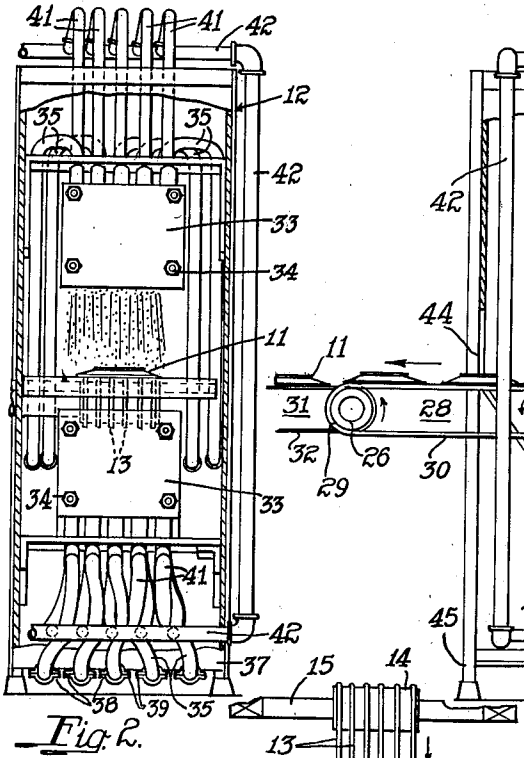

Fig. 2.

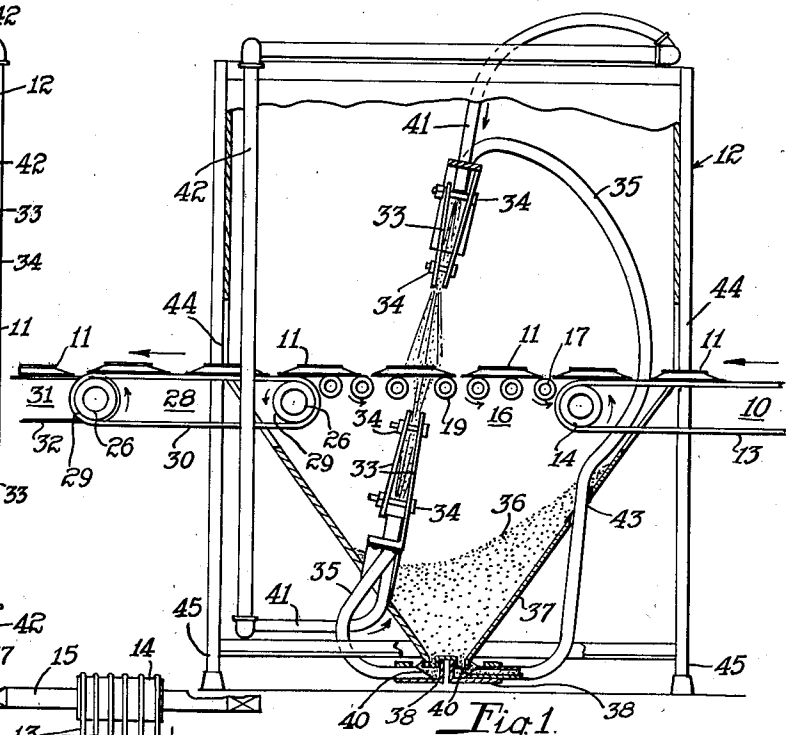

Fig. 1.

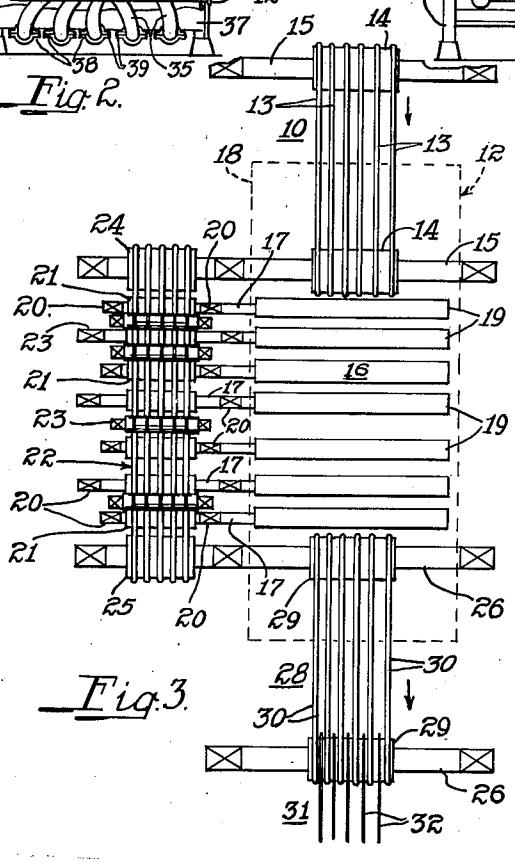

Fig. 3.

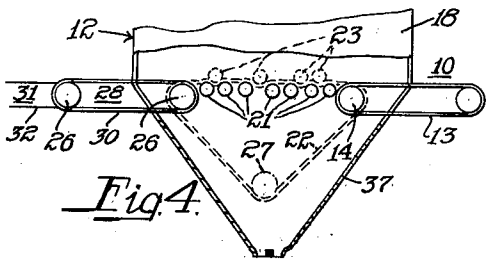

Fig. 4.

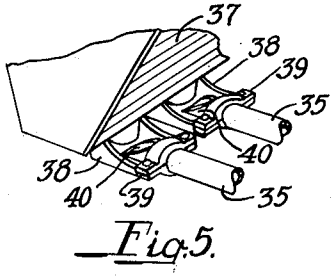

Fig. 5.

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APPARATUS FOR SAND BLASTING CERAMIC WARE

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2 Claims. (Cl. 51—14)

My present invention relates to the handling and treatment of ceramic ware and pottery such as dinnerware and more particularly to a procedure and an apparatus whereby such ware can be sand blasted to prepare the surface thereof for enameling or other surface finishing operations.

In making ceramic ware, such as plates and dishes, it has been customary to sand blast both sides thereof to remove particles or impurities adhering to the surface and to prepare the surfaces for finishing operations such as spraying them with glaze or enamel in a conventional booth. The sand blasting operation as hitherto carried out has been found to be far from satisfactory and in fact often did more harm than good to the ware. This was in part due to the fact that there was insufficient control over the sand blasting and hence the force with which the sand impinged upon the ware surfaces was either too great or too little. Too great force not only removed adhering particles but damaged the ware itself and too little force failed to secure proper preparatory conditioning. Again, the use of auxiliary means, such as pins, carried by the conveyor for suspending the ware in a special position above the conveyor has been found to be difficult and not susceptible of control. Therefore, while sand blasting has been used for many years and is recognized as a desirable and even a necessary step in making ceramic ware or the like nevertheless the industry has not been able to produce the desired results which the sand blast is intended to achieve.

It is, accordingly, one of the objects of my present invention to produce a procedure and an apparatus whereby ceramic ware can be prepared for finishing operations by means of a sand blast without the hitherto unavoidable defects and disadvantages thereof.

Another object of my invention resides in a procedure and an apparatus whereby ceramic ware can be sand blasted without damage to the ware and while maintaining the sand blast under control, at the same time greatly reducing maintenance thereof.

Another object resides in means for continuously sand blasting a series of ceramic ware articles without interrupting the general procedure ordinarily employed in making such ware and in carrying out the sand blasting automatically with new and hitherto unattainable efficiency and results.

A further object of my invention resides in means whereby ware can be continuously subjected to a controlled sand blast disposed close to the ware while the ware is supported directly on a series of spaced rolls and wherein the sand blast is applied simultaneously to both sides of the ware in substantially vertical position and alignment.

Other and further objects and advantages reside in the various combinations, subcombinations and details of apparatus and procedure hereinafter described and claimed and in such other features as will either be understood by those skilled in this art or will be apparent or pointed out hereinafter.

In the accompanying drawing wherein I have illustrated one form of the present invention and wherein like numerals designate corresponding parts throughout the various views:

Figure 1 is a side elevational view with parts broken away and in section of an apparatus for sand blasting ceramic ware in accordance with the present invention.

Fig. 2 is an end elevational view partly in section of the apparatus of Figure 1.

Fig. 3 is a plan view, partly diagrammatic, of the apparatus of Figures 1 and 2.

Fig. 4 is a fragmentary elevation partly in section and with parts broken away of the apparatus of Figure 1; and

Fig. 5 is a fragmentary perspective view of the sand boxes and hose connections of Fig. 1 on a larger scale.

Referring now to the drawing, a conveyor 10 is shown as bringing ware 11 in an inverted position into the booth 12 wherein it is to be sand blasted. The conveyor 10 is preferably made up of a plurality of spaced narrow rubber belts 13 which fit into recesses or grooves in the pulleys 14 mounted centrally on shafts 15. The conveyor 10 transports ware in the direction of the arrow of Fig. 1 from a preceding operation which is usually a ware molding or forming operation and which is frequently carried out in sand molds, and hence the ware contains adhering particles of sand. The ware, however, usually also has excess ceramic material in some spots and may also have surface dirt, lint or other impurities which would interfere with the application of the glaze to the ware.

To prepare the ware for glazing or enameling or for the application of design it is transferred from the conveyor 10 to a series of rotating rubber covered rolls or shafts designated as a whole by the numeral 16. These consist of shafts 17 extending through the back wall 18 of booth 12 and carrying rubber tubes or coverings 19 on

their forward ends to prevent chipping, scratching or otherwise damaging the ware and these are rotated in a counter-clockwise direction as viewed in Figure 1. It will be noted that there are seven such shafts projecting through the back wall of the booth and that two of them—the third and fourth from the left in Fig. 1—are spaced further apart than the others. Shafts 17 are provided with suitable bearings as diagrammatically shown at 20.

As shown more clearly in Fig. 3, each shaft 17 has a pulley 21 near its rear end by means of which the shafts are driven. Over each of pulleys 21 a belt 22 passes which, like conveyor 10, is made up of a series of spaced, narrow rubber belts either of round or of V-shaped section. The belt 22 is maintained in snug contact with all of the pulleys 21 by means of the four rolls 23 which, as shown in Fig. 4, cause said belt 22 to be pressed into engagement with the seven pulleys 21. The rubber belt 22 beyond the pulleys 21 passes over pulleys 24, 25 on the rear of shafts 15, 23 and then over an idler roll 27 which maintains the proper tension in the belt. As will be understood best from Fig. 3, pulley 14 on shaft 15 lies within booth 12 and pulley 24 on shaft 15 lies behind the booth.

After the ware 11 has traveled through the booth 12 it is again transferred to a conveyor designated by the numeral 28 which is of the same type and construction as the conveyor 10 first described and comprises two pulleys 29 mounted on shafts 26 and provided with a number of surface grooves or recesses for the reception of rubber belts 30 which pass therearound. From conveyor 28 the ware is transferred to another conveyor 31 fragmentarily shown in Figs. 1 and 3 and which is made up of wire cables 32 also passing around one pulley 29 but in grooves provided between the grooves for the rubber belts 30, as will be seen from the lower portion of Fig. 3. It is this last conveyor, namely conveyor 31, which is the only one which is directly driven, all other conveyors as well as the shafts described being driven from the wire cable conveyor 31, as will be clear from the structure so far illustrated and described.

As the ware passes through the booth on the rolls 16 it is subjected to a controlled sand blast. As will be understood from Figure 1 in particular the sand is simultaneously projected against the top and bottom of the inverted ware, the sand blast from below passing between the space between the third and fourth rolls 16 hereinabove referred to, and it will be noted that the sand blast is projected against the ware substantially vertically and from points relatively close to the ware. Each blast of sand is projected from between two metal plates 33 which are connected together by bolt and nut assemblies 34 in such form as to provide a chamber between the plates which tapers toward its discharge end. Sand is aspirated to the inlet side of this tapered chamber through a number of hoses or conduits 35, the other end of each of which communicates with a source of sand 36 within the hopper 37.

As will be apparent, a series of sand boxes 38 is provided along the bottom of the hopper 37 on each side thereof (five being shown in Fig. 2, although any other suitable number may be utilized depending upon the size and space requirements and limitations), and one end of each hose or conduit 35 is secured thereto by couplings 39 and it will be noted that this end of the hose or conduit is beveled off at an angle at 40 so that the sand—continuously tending to drop down through the hopper into the sand boxes as it does—will tend to form conical piles of sand and thus cause continuous feeding of sand to the tubes. As already pointed out the sand is caused to pass through the tubes 35 and between the plates 33 by aspiration which is produced by having the hoses or tubes 35 connected into or merging with air lines 41 wherein compressed air or air under forced draft or pressure is being passed in the direction of the arrows shown in Fig. 1. The air is supplied from the manifolds or supply lines 42. Thus the air blast causes aspiration of sand in the manner of an injector and thus enables sand to be impinged against the upper and lower surfaces of the ware, as shown.

It has been pointed out above that an important feature of the present invention resides in the control of the sand blasting operation or step. This control is provided in a number of different ways. First of all, the force of the air blast can be controlled and this directly affects the force with which the sand impinges against the ware surfaces. Second, the distance of the plates 33 from the ware can be varied, thus further serving to affect the control in that the further the plates are from the ware the less vigorous is the blasting operation and vice versa, and of course this distance may be correlated with the force of the air blast in order to produce the correct net resultant action upon the ware. It is also possible to change the angle at which the air and sand blast strikes the ware and this may be used as a further control if desired, although I have found that an angle of approximately 90 degrees to the ware, as shown in Figure 1, is the best for all ordinary purposes. The spacing between plates 33 may also be adjusted so that the outlet velocity of the sand can be reduced or so that the volume of sand may be increased at the same or lower discharge pressure. By separately valving the air inlets 41 it is further clear that a different force may be used on one side of the ware than on the other and I have found that satisfactory operation is secured when the pressure on the top of the ware is equal to or greater than that on the under side of the ware. This also prevents the ware from leaving the rolls.

As shown in Figure 1, one sand tube 35 passes through the hopper 37 via the aperture 43 and then around within the booth 12 to the upper plates 33 and while I have found that this is a desirable arrangement it is not intended to constitute a limitation upon this invention as other specific arrangements may be resorted to. The booth 12 is provided with suitable windows or openings 44 for passage of the ware and conveyors and the booth is preferably supported on legs 45 which constitute a part of the framework which supports the hopper and the other parts shown.

Thus in the production of glazed or enameled ware or other or similar ceramic or vitreous articles, the same are subjected to a sand blasting operation subsequent to the molding or forming operation and prior to the spraying or glazing operation. This sand blasting is carried out simultaneously upon both sides of the ware under controlled conditions such as to produce the optimum results and eliminate damage hitherto frequently done to ware by sand blasting. The sand blasting is under control which can be varied for different types or sizes of ware or articles and is preferably carried out at an angle of approximately 90 degrees to the ware generally with somewhat more force from above than from

below. The upward and downward force of the sand blasts may be equal in which event the weight of the ware or article prevents it from leaving the rolls. The booth serves to confine the sand to prevent undesirable losses and to eliminate health hazards.

The above is intended as illustrative or exemplary rather than limitative or restrictive and it is therefore within the purview of my invention to vary the details thereof without departing from the scope or principles as described above or set forth in the appended claims. Substitutions, modifications, additions and omissions within the foregoing description are deemed to be a part of my present invention. While the invention has been particularly described in connection with the sand blasting of ceramic ware preparatory to glazing or enameling the same, it is not to be understood as restricted solely thereto. It may be applied to other uses where metal or non-metal surfaces are to be sand blasted for cleaning, polishing or similar or analogous uses such as in sand blasting sheet metal or metal sheets prior to enameling, pickling or otherwise further treating the same.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Apparatus for sand blasting ceramic ware preparatory to glazing the same which comprises a booth-like enclosure having an opening in each of its end walls, a series of stationary, rotatable, rubber-covered, spaced rolls projecting into the enclosure and disposed along the rear wall thereof, means external of said enclosure for driving the series of rolls at the same speed, a delivery conveyor operating through one of the enclosure openings and terminating in ware transfer relationship wtih one terminal roll of said series of rolls, a discharge conveyor operating through the other enclosure opening and disposed in ware receiving relationship with the other terminal roll of said series of rolls, a hopper below the rolls in the lower part of the enclosure, a pair of spaced and converging metal plates disposed above and below said series of rolls in opposed relation to each other and conduit means connecting the chamber formed between each pair of plates with said hopper and with a source of air under pressure.

2. Apparatus for sand blasting ceramic ware preparatory to glazing the same which comprises a booth-like enclosure having an opening in each of its end walls, a series of stationary, rotatable, rubber-covered, spaced rolls projecting into the enclosure and disposed along the rear wall thereof, means external of said enclosure for driving the series of rolls at the same speed, a delivery conveyor operating through one of the enclosure openings and terminating in ware transfer relationship with one terminal roll of said series of rolls, a discharge conveyor operating through the other enclosure opening and disposed in ware receiving relationship with the other terminal roll of said series of rolls, a hopper below the rolls in the lower part of the enclosure, a pair of spaced and converging metal plates disposed above and below said series of rolls in opposed relation to each other and conduit means connecting the chamber formed between each pair of plates with said hopper and with a source of air under pressure, said hopper being provided with sand boxes with which said conduit means communicate and said conduit means including a plurality of flexible hoses adapted to deliver a relatively large total amount of sand into the divergent ends of the chambers aforesaid.

JAMES A. BOWER.