May 27, 1947. N. H. MAGEOCH 2,421,343

ARTICLE COATING APPARATUS

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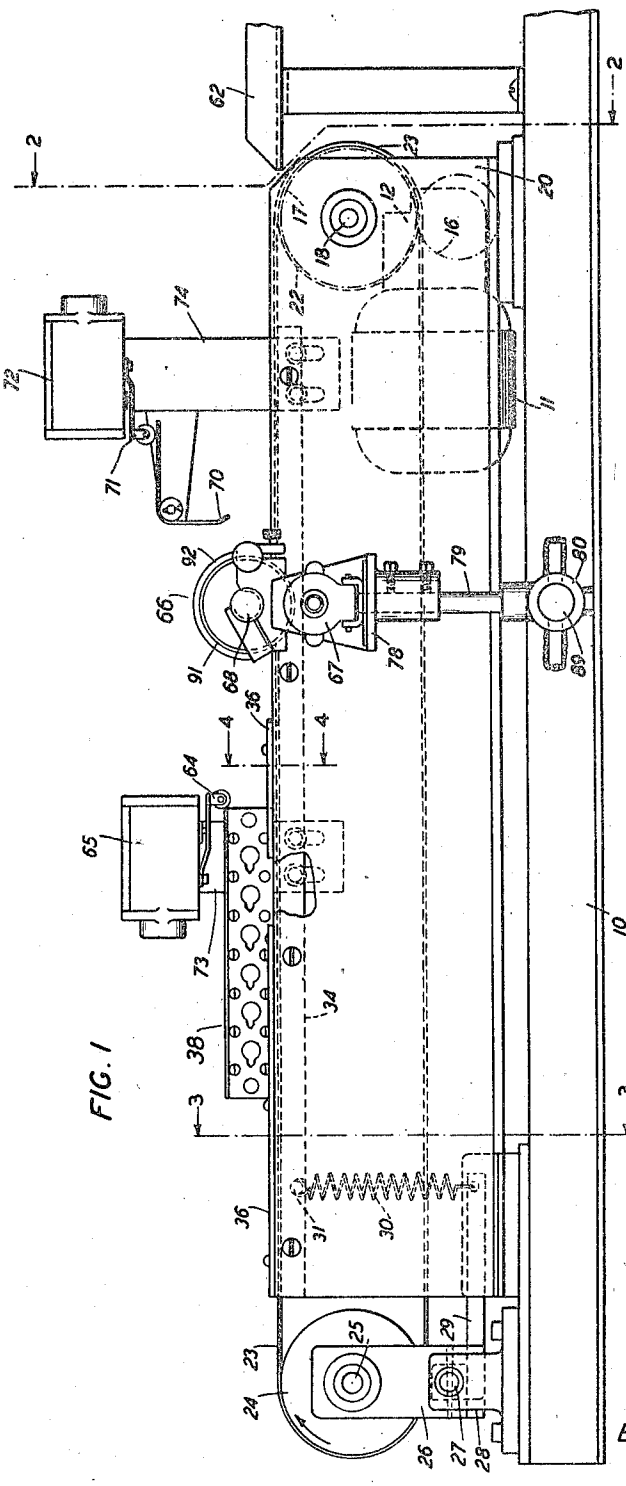


FIG. 1

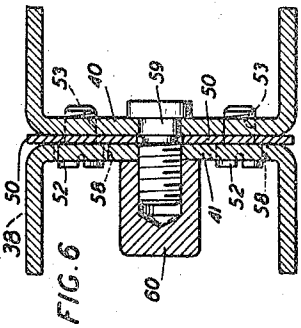


FIG. 6

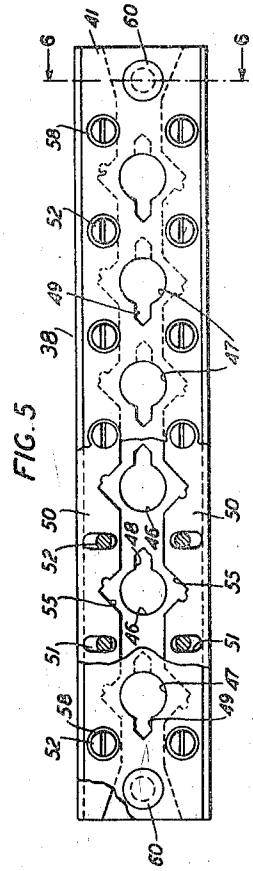


FIG. 5

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FIG. 2

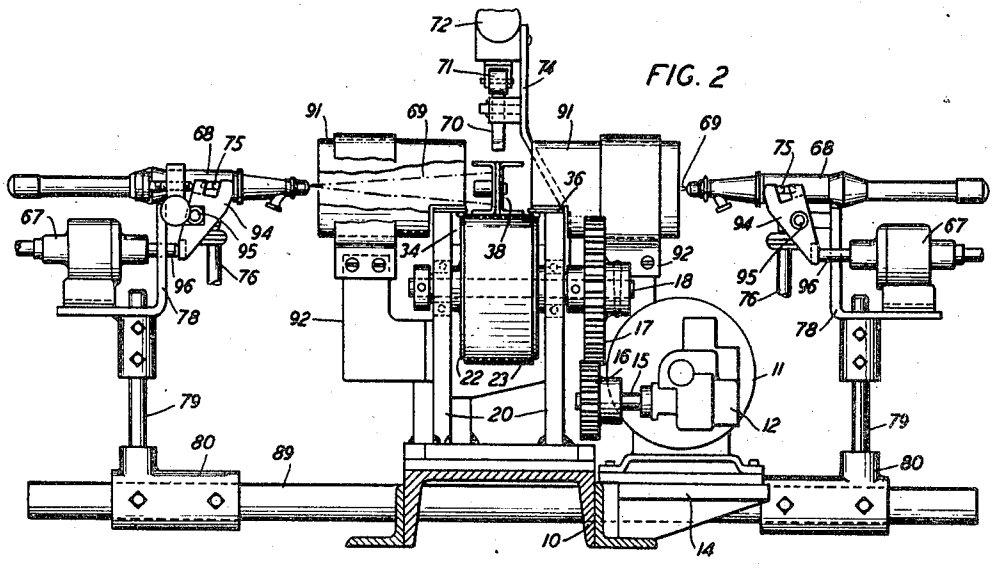


FIG. 4

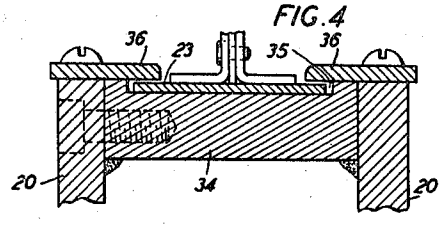


FIG. 3

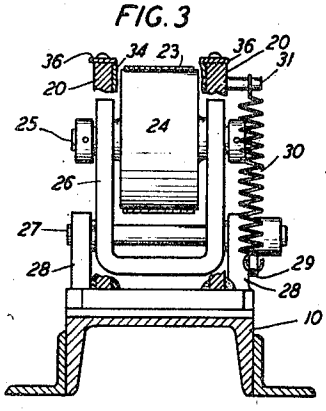


FIG. 7

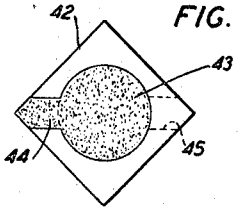
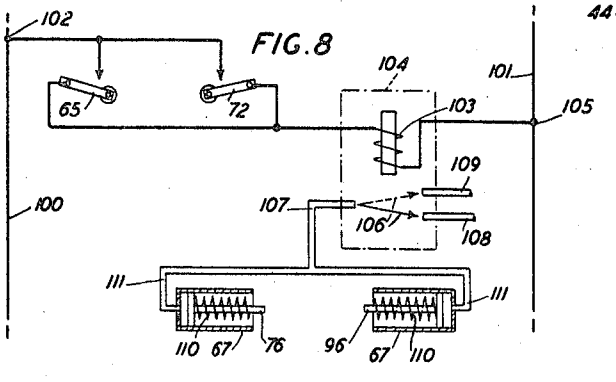


FIG. 8



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Patented May 27, 1947

2,421,343

UNITED STATES PATENT OFFICE

2,421,343

ARTICLE COATING APPARATUS

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Application January 7, 1944, Serial No. 517,353

2 Claims. (Cl. 91—44)

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This invention relates to article coating apparatus, and more particularly to apparatus for coating quartz crystal plates.

In the manufacture of quartz crystal units for use in the communications arts, the quartz crystal plates or wafers are coated with a metallic substance.

An object of the invention is to provide a coating apparatus which is simple in structure and automatically operable for coating opposite sides of articles simultaneously.

With this and other objects in view, the invention comprises a spray unit actuable to spray a coating material in a given path, transporting articles in a path traversing the path of the coating material, and means under the control of the articles to control the spray unit.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a front elevational view of the apparatus;

Fig. 2 is a vertical sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view taken substantially along the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary sectional view taken along the line 4—4 of Fig. 1;

Fig. 5 is a side elevational view of one of the masks;

Fig. 6 is an enlarged vertical sectional view taken along the line 6—6 of Fig. 5;

Fig. 7 is a top plan view of one of the articles after it has received the coatings of material upon each side thereof, and

Fig. 8 is a wiring diagram illustrating the control circuit.

Referring now to the drawings, attention is first directed to Figs. 1 and 2, which illustrate a base 10 supporting a motor 11 and a speed reducing unit 12 through the aid of a bracket 14. An output shaft 15 of the unit 12 has a gear 16 mounted thereon which drives a gear 17, the latter being fixedly mounted upon a shaft 18. The shaft 18 is journalled in bearings, supported in vertical members 20 mounted on the base 10, and has a drum 22 mounted thereon. The drum 22 drives an endless conveyor belt 23, which is supported also by a drum 24, the latter being mounted upon a shaft 25. The shaft 25 is rotatably supported by a U-shaped cradle 26 which in turn is mounted upon a rocker shaft 27, as illustrated in Figs. 1 and 3. The rocker shaft 27 is supported by brackets 28 mounted upon the base 10 and has a

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lever 29 fixed to an outer end thereof. A spring 30, having one end supported by a pin 31 and the other end connected to the lever 29, normally urges the lever counterclockwise (Fig. 1) to apply a constant tension on the belt 23. The vertical members 20 extend to positions short of the drum 24 and a lateral table member 34 is disposed between the upper ends of the vertical members 20 and secured thereto, as illustrated in Fig. 4. The upper surface of the table member 34 is recessed, as at 35, to receive the belt 23. Longitudinal guides 36 are mounted upon the vertical members 20, as shown in Figs. 1 and 4, and extend over the recessed portion 35 short distances to centrally locate the mask illustrated in Fig. 5 upon the conveyor belt.

Referring now to the mask indicated generally at 38 (Figs. 1, 3 and 5), C-shaped or channel members 40 and 41 are provided to hold articles 42 (Fig. 7) therebetween and to mask out or cover all portions thereof except those to be coated. The article 42 in the present instance is a quartz crystal plate, the central part of which, upon each side, is to be provided with a coating 43 of the desired contour, such as that shown, with integral legs 44 and 45 on opposite sides extending in opposite directions. Thus, in the present instance, the members 40 and 41 are provided in circular apertures 46 and 47, respectively, with lateral extensions 48 and 49 of the contours desired for forming the leg portions 44 and 45. Spacers or locating elements 50 have elongated apertures 51 therein and, through the aid of screws 52 receivable in the apertures and threadedly receivable in apertures 53 of the member 40, the elements are adjustably secured in place on the central portion of the member 40. V-shaped notches 55 are formed in the elements 50 at equally spaced positions, to receive opposing corners of articles 42 and thus accurately locate the articles with respect to the apertures 46 and 47. Through the adjustable feature made possible through the elongate apertures 51, articles varying in size may be received and accurately located with respect to the coating receiving apertures 46 and 47. The member 41 is provided with a plurality of apertures 58 to receive the heads of the screws 52 when the members 40 and 41 are assembled as illustrated in Fig. 6. Threaded members 59, carried by the member 40 at the ends thereof, are adapted to receive clamping nuts 60 for securing the members 40 and 41 together, completing the mask 38 and adapting it to receive a plurality of articles and to cover all portions of the articles except those to be coated.

As illustrated in Figs. 1, 2, and 4, the mask 38 or article supporting unit, as it may be termed, is adapted to ride upon the belt 23 in a vertical position resting upon one pair of legs of the members 40 and 41 and to be carried by the belt toward a receiving platform 62 (Fig. 1) supported by the base 10. During this travel of the mask, a roller carrying arm 64 of a switch 65 is actuated prior to arriving at a coating or spraying position indicated generally at 66. When the switch 65 is actuated, circuits hereinafter described are completed to cause actuation of pneumatic cylinders 67 (Fig. 2) to operate spraying units 68 to cause opposing sprays 69 of coating material to be directed to the path of the mask. Beyond the coating position 66 (Fig. 1), an actuating lever 70 is positioned in the path of the mask to be actuated thereby, to cause actuation of a roller carrying arm 71 of a switch 72. The switch 72 serves to maintain actuation of the pneumatic cylinders 67 to keep in action the spraying units 68 until the mask has passed the coating position 66. The switches 65 and 72 are mounted upon suitable brackets 73 and 74, which in turn are secured to the adjacent vertical member 20.

The spraying units 68 (Fig. 2) may be of any desired commercially known type actuable through the aid of triggers 75. The coating material may be supplied thereto through their supply line 76 in any suitable manner (not shown). Further details of the units 68 are not believed necessary for a clear understanding of the invention. These units are supported by brackets 78, which in turn support the pneumatic cylinders 67. The brackets 78 are mounted upon vertical members or rods 79, the latter being supported by brackets 80 adjustably secured to a laterally extending rod 89 carried by the base 10 (Figs. 1 and 2). Cylindrical elements 91, supported by brackets 92 fixedly mounted upon their respective vertical members 20, serve as shields for the sprays 69 of coating material. The connection between the pneumatic cylinders 67 and the triggers 75 of the spraying units 68 are yoke-type levers 94 pivotally supported at 95 upon the brackets 78 and formed to be engaged by plungers or cores 96 of the pneumatic cylinders.

Attention is now directed to Fig. 8, which illustrates the electrical circuit controlled by the switches 65 and 72 and the compressed air circuits for the pneumatic cylinders 67. Supply lines 100 and 101 for the necessary electrical energy are illustrated. When the switch 65 is closed by the mask 38 travelling on the conveyor belt 23 (Fig. 1), a circuit is completed from line 100 at connection 102 through switch 65, a winding 103, of an electromagnetically operable valve 104, to line 101 at connection 105. The valve 104 is of the three-way type normally in exhaust position, as indicated by the actuable or arrow portion 106 in solid lines extending from the air line 107 to the exhaust line 108. When energized, connection will be made between the line 107 and a compressed air supply 109 as indicated by the actuable portion 106 in dotted lines. The pistons in the cylinders 67 carrying the plungers 96 are normally returned by springs 110. The cylinders are connected to the air line 107 by air lines 111. Thus the pneumatic cylinders 67 for operating the spraying units are caused to be actuated by the article supporting unit or mask prior to its reaching the spraying position. The closing of the switch 72 maintains the magnetic valve 104 energized until after the mask passes the spraying position.

Considering now the operation of the apparatus, let it be assumed that a plurality of masks or article supporting units as illustrated in Figs. 5 and 6 be filled with articles 42 as shown in Fig. 7, except free of the coating material illustrated therein. The masks 38, as soon as they are filled with articles and closed, may be disposed upon the conveyor belt 23, which is constantly driven through the aid of the motor 11, the speed reducing unit 12, and the gears 16 and 17 (Fig. 2). The apparatus requires no further attention by the operator, as it is completely under the control of the units or masks supporting the articles. As the mask actuates the switch 65, the circuit is completed to energize the magnetic valve, to cause actuation of the pneumatic cylinders 67, to set in operation the spraying units 68. This operation continues through the actuation of the switch 72. If the masks or units should be closely positioned on the conveyor belt 23, there will be continuous operation of the spraying units.

As the masks with the articles pass the spraying position, the coating material 69 is directed toward both sides of the masks and the portions of the articles exposed through the apertures 46 and 47, and their lateral extensions 48 and 49 are coated with the material 69. This completes the formation of the coated portions 43 upon both sides of the article with their leg portions 44 and 45 upon their respective sides. In passing from the conveyor belt 23, the articles are moved upon the platform 62 and from here they may pass through a drying oven, if so desired, to hasten the drying of the coated material. After the articles have been coated, they may be readily removed from the mask by first removing the clamping nuts 60, lifting the member 41 free of the member 40, which may at this time rest upon its leg portions. The articles may then be dropped or otherwise removed from the member 40 from between the spacing elements 50 such as by inverting the member 40 over a suitable support or container. After this, the mask may be reloaded with another supply of articles, closed, and again placed upon the conveyor belt 23.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this as defined by the appended claims.

What is claimed is:

1. An apparatus for coating articles comprising a spray unit actuable to spray a coating material in a given path, electrically operable means to actuate the unit, means to convey articles in a path traversing the path of the coating material, means actuable by articles prior to reaching the path of the material to cause operation of the electrical means, and means disposed beyond the spray unit and actuable by each article to maintain the operation of the electrical means until each article has passed completely beyond the path of the material.

2. An apparatus for coating articles comprising a spray unit actuable to spray a coating material in a given path, electrically operable means to actuate the unit, a conveyor movable in a path at an angle relative to the path of the coating material to convey articles successively through the latter path, means actuable by arti-

cles prior to reaching the path of the material to cause operation of the electrical means, and means disposed beyond the spray unit and actuable by each article to maintain the operation of the electrical means until each article has passed completely beyond the path of the material.

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