March 15, 1960 R. B. WAY ET AL 2,928,369

AUTOMATIC PAINTING MACHINE

Filed July 2, 1954 3 Sheets-Sheet 1

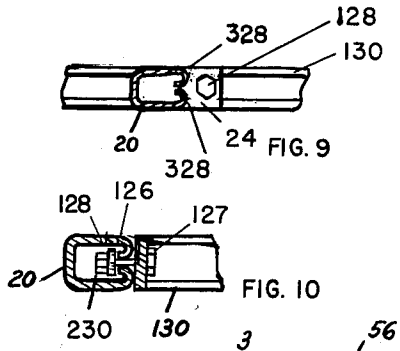


FIG. 9

FIG. 10

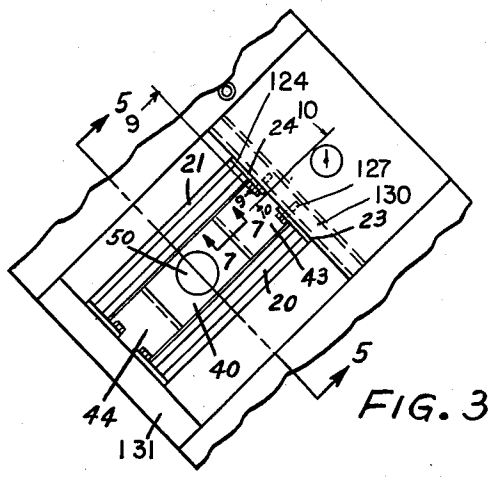


FIG. 3

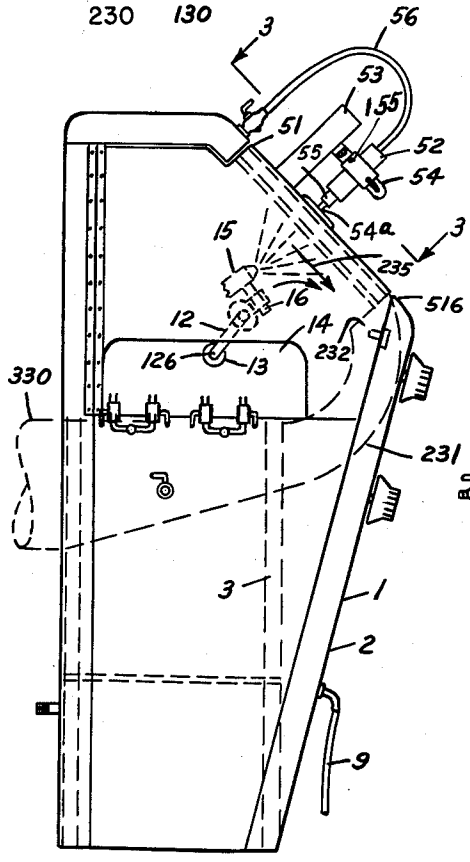


FIG. 2

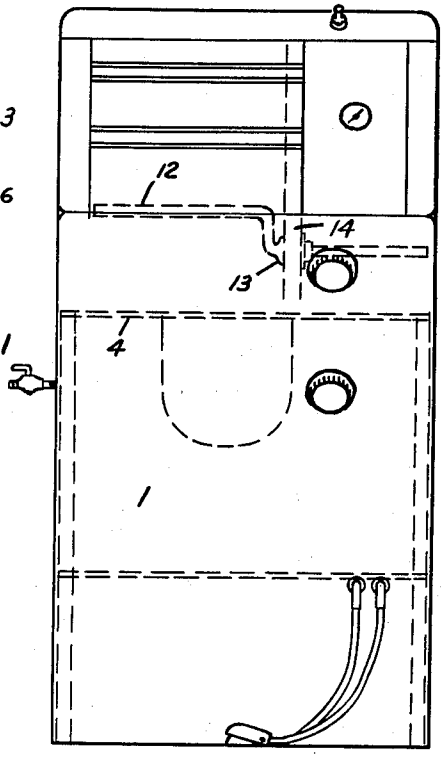


FIG. 1

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AUTOMATIC PAINTING MACHINE

Filed July 2, 1954 3 Sheets-Sheet 2

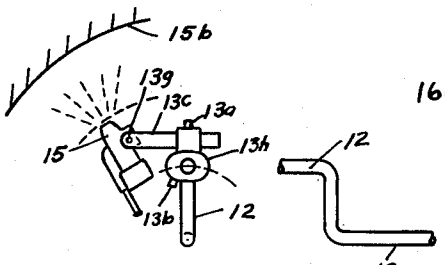


FIG. 11

FIG. 12

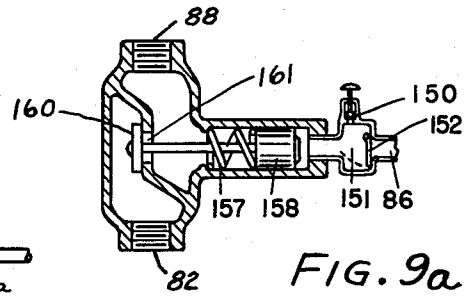


FIG. 9a

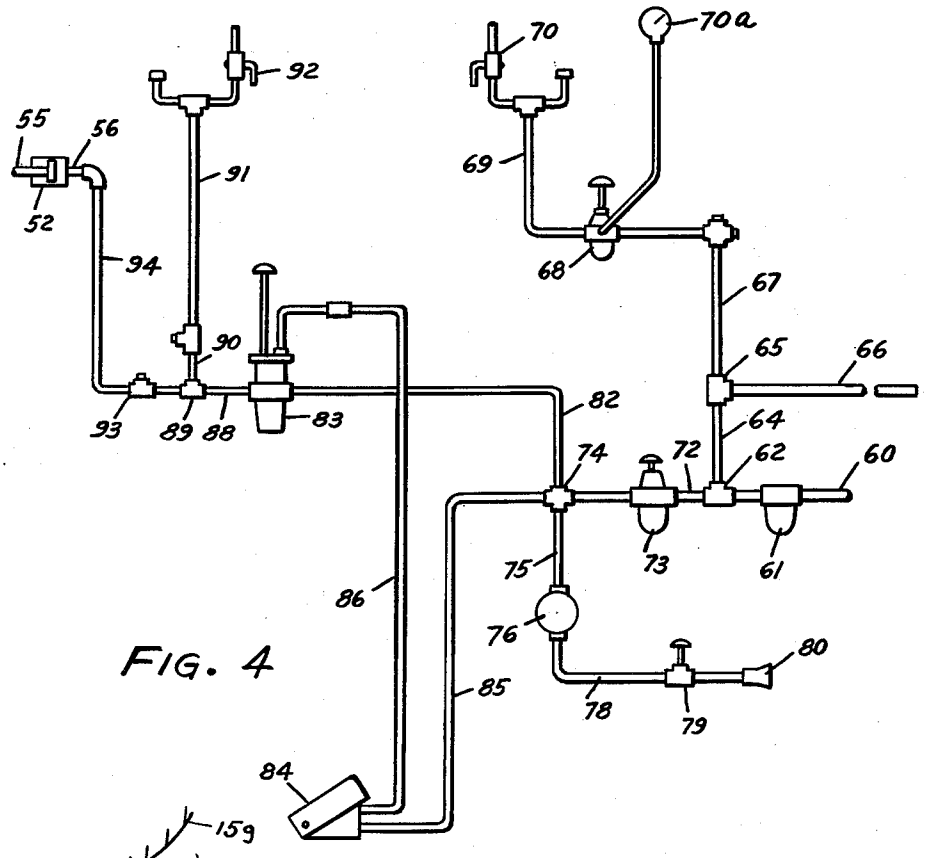


FIG. 4

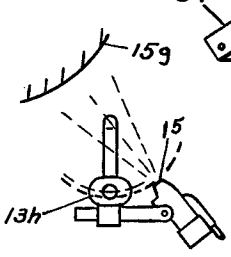


FIG. 13

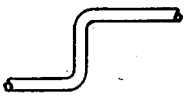


FIG. 14

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AUTOMATIC PAINTING MACHINE

Filed July 2, 1954 3 Sheets-Sheet 3

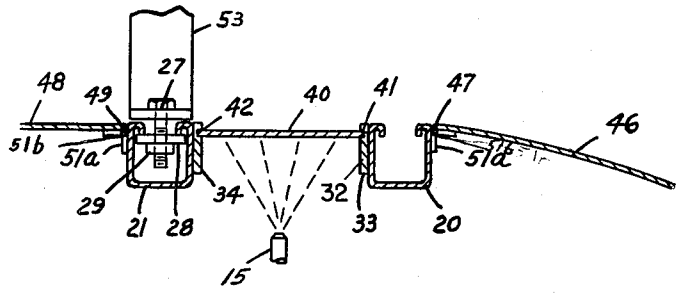


FIG. 5

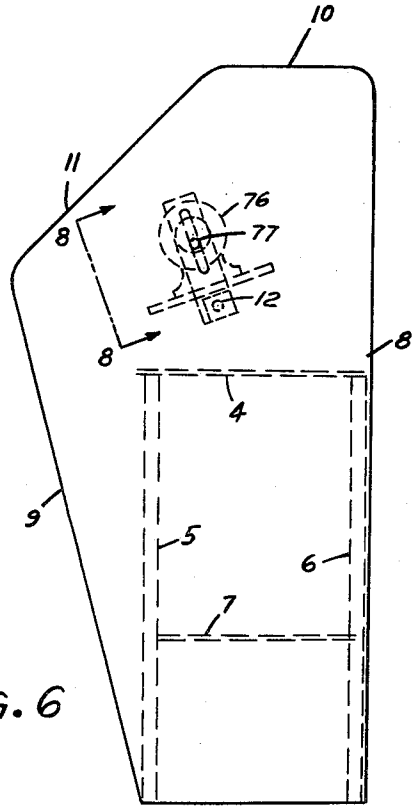


FIG. 6



FIG. 7

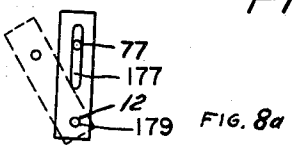


FIG. 8a

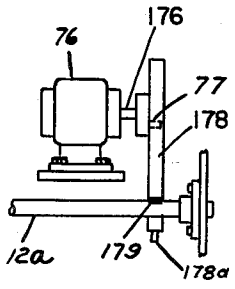


FIG. 9

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AUTOMATIC PAINTING MACHINE

Robert B. Way and Carl D. Hersey, Erie, Pa.

Application July 2, 1954, Serial No. 440,922

4 Claims. (Cl. 118—301)

This invention relates generally to coating machines and more particularly to machines for coating paints on articles of manufacture wherein certain parts have to be coated and other surfaces have to be protected from paint.

This application is a continuation in part of our applications, Serial No. 408,185, filed Feb. 4, 1954, now Patent No. 2,890,678, and Serial No. 354,208, filed May 11, 1953.

In some applications of spray painting equipment, it is advantageous to locate the paint gun below the work and to spray the paint upward. Some of the paint is inclined to fall back onto the nozzle of the gun and to deposit thereon, thereby interfering with the operation thereof. We solve this problem by disposing the paint mask or stencil in an angular position with the paint gun nozzle disposed at a distance horizontally from any vertical plane drawn through the paint mask or stencil. In painting machines made according to previous designs, various ways were provided for supporting the work on the machine; however, none of the previous machines have provided a universal holding device which would hold a paint mask or stencil for masking the article to be painted and to hold it in an angular position.

It is, accordingly, an object of our invention to overcome the defects in previous painting devices and more particularly to provide an automatic painting machine which is simple in construction, economical to manufacture, and simple and efficient in operation.

Another object of our invention is to provide an automatic painting machine wherein a simple efficient means is provided for supporting various sizes of paint masks or stencils.

A further object of our invention is to provide a supporting means for paint masks or stencils and an air clamping device for clamping articles of manufacture in place in the masks or stencils.

Another object of our invention is to provide a painting machine wherein the stencil or mask support is so disposed relative to the spray paint gun that paint will not fall from the stencil or mask support onto the paint gun.

A further object of our invention is to provide a combined clamping device for articles of manufacture and a means to support a paint gun in combination therewith, said means being movable to oscillate the paint gun during the painting operation.

A further object of the invention is to provide a novel mask supporting device in combination with a spray painting machine.

Another object of the invention is to provide a painting machine wherein a forced air exhaust draws ventilating air transversely of the paint gun spray, thereby preventing excess paint from depositing on the gun nozzle.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed

out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is a front view of our novel machine;

Fig. 2 is a side view of the paint machine shown in Fig. 1;

Fig. 3 is a view taken on line 3—3 of Fig. 2;

Fig. 4 is a piping diagram showing the various elements in the control circuit of our painting machine;

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a side view of our novel painting machine;

Fig. 7 is a view taken on line 7—7 of Fig. 1;

Fig. 8 is an enlarged view of our paint gun oscillating mechanism;

Fig. 8*a* is a detailed view of the arm showing the position through which it moves;

Fig. 9 is a cross sectional view taken on line 9—9 of Fig. 3;

Fig. 9*a* is a cross sectional view of the timer valve used in the support shown in Fig. 4;

Fig. 10 is a view taken on line 10—10 of Fig. 3; and

Figs. 11, 12, 13, and 14 show the paint gun adjusted to various positions.

Now with more specific reference to the drawings, we show a paint machine 1 having a frame 3 inside the case 2. A shelf 4 is provided intermediate the height of the machine 1 for supporting the painting mechanism. Downwardly extending frame leg members 5 and 6 support the shelf 4 and a cross brace 7 is attached between the leg members 5 and 6. The case is made up of the back panel 8, the upwardly and forwardly extending front panel 9, the generally horizontal top 10, and the upwardly and rearwardly sloping mask supporting portion 11. A shaft 12*a* is pivoted in bearings 13 on support members 14 as shown and paint gun 15 is supported on the crank 12 by a bracket 16. The arm 178 is oscillated by air motor 76. The rotation of the air actuated motor 76 rotates shaft 176 having cam 77 thereon which engages slot 177 in arm 178. This imparts rotary oscillation to shaft 12*a* which is attached to arm 178 at 179 and attached to crank 12 at 12*b*. This causes the paint gun 15 to oscillate with crank 12 in an arcuate path having its center in the bearing 13, distributes the paint spray over an evenly distributed area, and simulates the movement of the hand of an experienced painter.

Across the front portion of the case 2, the two channel members 20 and 21 extend. The channel members 20 and 21 are slidably supported on the upwardly and rearwardly extending channel members 130 and 131 and clamped thereto. The transverse members 20 and 21 are generally channel shaped in cross section and have inwardly turned ends 328. Plates 23 and 24 are attached to the ends of the channel members 20 and 21. The plates 23 and 24 are clamped to the members 130 and 131 by the bolts 127 which extend through holes in the plates 23 and 24 and extend between the ends 328 into the channels 130 and 131 at 126 and have a washer 128 and a nut 230 which squeezes the washer 128 to the upwardly extending member 30 to clamp the member 21 firmly to the members 130 and 131. Plate like members 33 and 34 are welded to opposed edges of channels 20 and 21 and slots 41 and 42 are formed in members 33 and 34. A paint mask or stencil support 40 is slid into the slots 41 and 42 in the members 33 and 34 and is supported thereby. Sheets of material 43 and 44 may be slid into the slots 41 and 42 at either end of the mask 40 to prevent paint spray from passing around the edges

of the mask 40. The panel 46 is hingedly connected to the channel member 20 at 47 and the panel 48 is hinged to the channel 21 at 49. The panels 46 and 48 swing upwardly and are urged into engagement with the underside of the supporting portion 11 at 51 and 51*b* by springs 51*a* which extend around pivots 47 and 49 and the ends thereof urge the panels 46 and 48 upward to prevent paint fumes from escaping around the edges of the paint mask 40. The hinged panels 46 and 48 make it possible by loosening the bolts 127 to move the channels 20 and 21 further apart from or nearer to each other in order to provide for a wider paint mask if it is necessary to replace the stencil or mask support 40 with a mask of a different size or to provide for a narrower mask wherein the two channel members 20 and 21 will be moved closer together. The panels 46 and 48 will be made wide enough to fill the opening, regardless of how narrow the paint mask or stencil support 40 may be. The paint mask or stencil supporting device 40 will have a masking section 50 contoured to accommodate the shape of the article of manufacture to be painted and portions will be cut out in the depressed member 50 to conform to the areas of the article of manufacture which are to be coated with paint in a manner conventional in forming paint masks and which is familiar to those skilled in the art.

An air cylinder 52 is mounted on the support 53 by means of the bracket 54 and clamped therearound by means of clamping strap 155. An article engaging member 54*a* is attached to the piston rod 55 on the air cylinder 52 and the article engaging member 54*a* is forced into engagement with the article being painted by air pressure on the cylinder 52.

The air control circuit for operating the machine is shown in Fig. 4. Air is supplied to the pipe 60 which flows through the filter 61 and to the T 62. From the T 62, the air flows through the pipe 64 to the T 65 where a portion thereof flows to the paint tanks through the pipe 66 to apply a pressure to the top of the paint in a manner conventional in the operation of pressure actuated paint tanks. Air also flows through the pipe 67 through the pressure regulator 68 and is supplied to the paint guns through the pipe 69 and through the cock 70 to the paint guns, thereby applying atomized air thereto. The pressure of the air can be indicated on a gauge 70*a*. Therefore, pressure at all times is applied to the paint guns as atomizing air for the paint guns through the pipe 69 and to supply pressure to the paint tanks to force the paint therefrom to the guns through the pipe 66.

Air also flows from the pipe 60 to the pipe 72 and oiler 73 to the four-way connection 74, then to the pipe 75 to the air motor 76 which is connected to oscillate the paint guns 15 by means of cam 77. The speed of the air motor 76 is controlled by the air escaping therefrom through the pipe 78 and through the throttling valve 79 and thence outwardly to atmospheric pressure through the muffler 80. That is, the adjustment of the throttling valve 79 determines the velocity of the flow of air and, therefore, the speed of the gun oscillating motor.

Air at regulated pressure also flows from four-way connection 74 through the pipe 82 to the timer valve 83. The timer valve 83 is controlled by means of air from the foot valve 84 which controls the flow of air from the pipe 85 through the foot valve 84 to the pipe 86 to control the control chamber 151 of timer valve 83. When the timer valve 83 is actuated, air will flow from the pipe 82 to the pipe 88 and through the pipe 91 to the cock 92 to actuate the paint gun 15. Air will also flow through the T 89, through the flow control 93, and then to the pipe 94 to actuate the air cylinder 52 which receives air through the pipe 56, to drive the article engaging member 54*a* into engagement with the work. The duct 330 is connected to a forced air evacuating exhaust system and the duct 330 curves inwardly and upwardly at 231 terminating in an inlet 232 which draws air in a path perpendicular to the direction of the spray from gun 15. The direction of flow of the exhaust air will be generally in the direction of arrows 235.

In operation, the pressure connection of a paint tank is connected to the pipe 66. The atomizing air connection of a paint gun will be connected to the cock 70 and the cock 92 will be connected to the gun fitting for operating the gun 15. A source of the compressed air will be connected to pipe 60. The operator will load the article to be painted in the mask 40 at 50 and operate the foot valve 84. The foot valve 84 will allow air to enter through the pipe 86 to the timer valve 83. The piston 158 of the timer valve 83 will open valve 160 and allow air to flow through the pipe 88 to cause the air cylinder 52 to extend its piston and, thereby, clamp the article to be painted in place in the mask 40 at 50. At the same time, air will flow through the timer valve 83 to the pipe 91 to the cock 92 to actuate the paint gun 15, causing it to spray paint on the portions of the article which lie under the cut out portions of the mask 40. During all this time, the paint gun 15 is being oscillated continuously at a predetermined speed by air motor 76. The foot valve 84 is closed and actuating air trapped in chamber 151 by check valve 152 is bled out through bleeder valve 150 and has allowed the timer valve 83 to be closed by spring 157, forcing piston 158 to the closed position shown. Thus, the actuating air to the gun 15 will be shut off by valve member 160 closing aperture 161. This will shut off the gun 15 and since cylinder 52 is supplied air from the timer valve 83, the piston of cylinder 52 will retract, removing the force exerted by the member 54*a* on the article, releasing the article. The article can be then removed and replaced by a second article.

The paint gun 15 is attached to the crank 12 by means of bracket 13*h* which may have a set screw 13*b* or other form of clamp locking the bracket 13*h* to the crank 12 against the rotation thereon. The shaft 13*c* slides into a bore in bracket 13*h* and is locked thereto against rotation by means of set screw 13*a* or any equivalent clamping means. The gun 15 is locked to the shaft 13*c* by means of bolt 13*g*. By loosening screws 13*a* and 13*b* and bolt 13*g*, the gun 15 can be rotated to and locked in any position on crank 12. For example, it can be rotated to the position shown in Fig. 11 between the center of the shaft 12*a* and the article 15*b* to be painted so that the gun 15 moves in a convex path, thereby being suitable to paint a concave surface such as surface 15*b*. The gun 15 can be moved to a position where the center of the shaft 12*a* is between the nozzle of the gun 15 and the article 15*g*. The surface of the article to be painted is represented by 15*g* and 15*b*. They could also represent the surface of a paint mask covering a part to be painted with apertures therein. At this position, the gun nozzle will move in a concave path. This movement generally parallels the surface to be painted and, therefore, results in a uniform paint job. The guns 15 can be moved to and locked in any desired position relative to the work to be painted by adjusting bracket 13*h*. By loosening screw 178*a*, the arm 178 can be rotated on shaft 12*a* to bring the crank 12 to a different relative position relative to the article to be painted.

In the foregoing specification, we have set forth the invention in its preferred practical forms but we are aware that the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention is which an exclusive property or privilege is claimed are defined as follows:

1. In a spray painting machine, in combination, a mask holder, means for supporting said mask holder, a mask having an open portion held by said holder, said mask conforming to uniformly curved surfaces upon which designs are to be painted, a sprayer for painting

said uniformly curved surfaces and oriented to direct a spray toward the open portion of the mask held by the holder, and means for moving the sprayer along an arcuate path the center of curvature of which path is generally along the center of curvature of the uniformly curved surface being painted, whereby the spray moves to and fro over a sector and impinges nearly normally upon all parts of the uniformly curved surface being painted.

2. In a spray painting machine, in combination, a mask holder, means for supporting said mask holder, a mask having an open portion held by said holder, said mask being shaped to conform to concave surfaces upon which designs are to be painted, a sprayer so located as to direct a spray through the open portion of the mask held by the holder, and means for oscillating the sprayer for painting such concave surfaces, the means for oscillating comprising a rockingly mounted arm supporting the sprayer, the rocking point of the arm being located behind the sprayer, whereby the sprayer moves in a concavely curved path.

3. In a spray painting machine, in combination, a mask holder, means for supporting said mask holder, a mask having an open portion held by said holder, said mask being shaped to conform to concave surfaces upon which designs are to be painted, a sprayer so located as to direct a spray through the open portion of the mask held by the holder, a rockingly mounted arm supporting the sprayer and oscillating the sprayer for painting such concave surfaces, the rocking point of the arm being located behind the sprayer, whereby the sprayer moves in a concavely curved path, and means for driving the arm comprising an eccentric member and a driver connected to the arm and following the eccentric member.

4. In a spray painting machine, in combination, a mask holder, means for supporting said mask holder, a mask having an open portion and held by said holder, said mask being shaped to conform to surfaces upon which designs are to be painted, a sprayer, means for oscillating the sprayer for painting surfaces exposed through said mask open portion, the means for oscillating comprising a rockingly mounted arm and a support for orienting the sprayer in a position to direct a spray toward the open portion of the mask, held by the holder and for adjustably mounting the sprayer to locate it on said arm with its point of emission of spray in a range of positions from a first position behind to a second position ahead of the rocking point of the arm, whereby the sprayer moves to carry the point of emission of spray in a convexly curved path when in said first position and in a concavely curved path when in said second position.

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