June 2, 1959 E. L. FABER 2,888,903

APPARATUS FOR ROTATING SPRAY GUNS TO EVENLY PAINT NON-PLANAR SURFACES

Filed Sept. 8, 1955 2 Sheets-Sheet 1

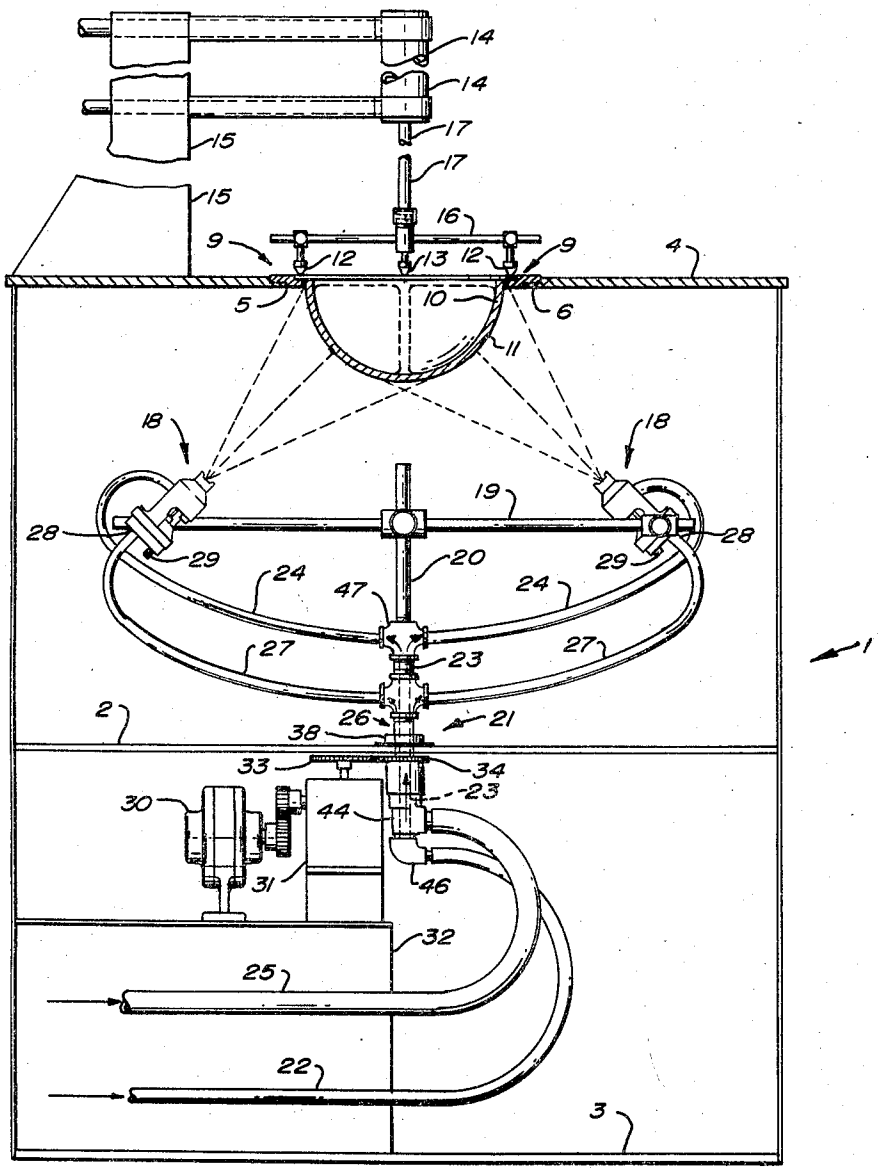


Fig. 1

INVENTOR.
ELMER L. FABER
BY
Marshall, Marshall & Yeasting
ATTORNEYS

June 2, 1959 E. L. FABER 2,888,903

APPARATUS FOR ROTATING SPRAY GUNS TO EVENLY PAINT NON-PLANAR SURFACES

Filed Sept. 8, 1955 2 Sheets-Sheet 2

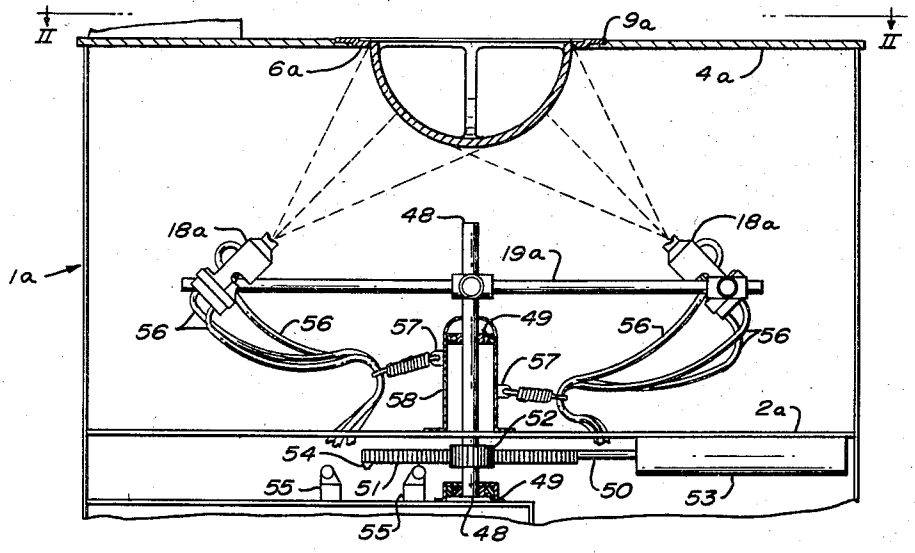


Fig — IV

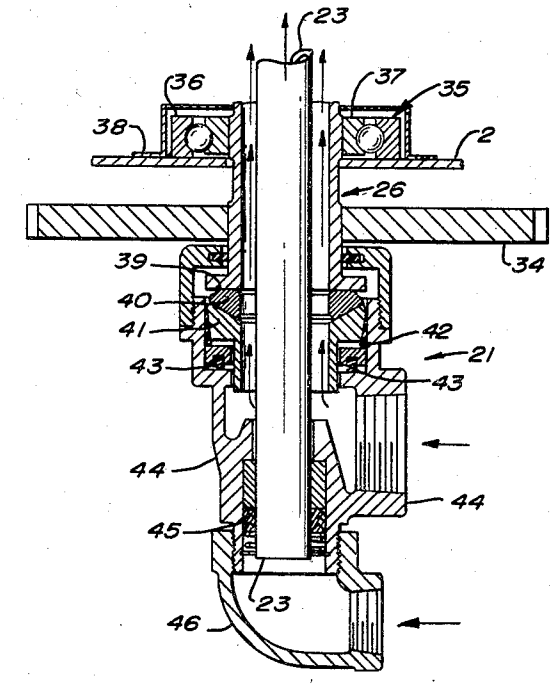


Fig — III

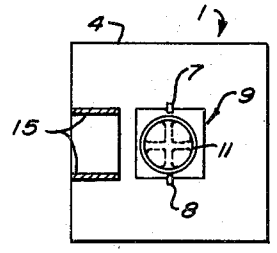


Fig — II

INVENTOR.
ELMER L. FABER
BY
Marshall, Marshall & Yeasting
ATTORNEYS

United States Patent Office 2,888,903 Patented June 2, 1959

2,888,903

APPARATUS FOR ROTATING SPRAY GUNS TO EVENLY PAINT NON-PLANAR SURFACES

Elmer L. Faber, Toledo, Ohio, assignor to Conforming Matrix Corporation, Toledo, Ohio, a corporation of Ohio

Application September 8, 1955, Serial No. 533,179

2 Claims. (Cl. 118—301)

This invention is an improvement in the art of spray painting. It provides a machine having apparatus for rotating spray guns to evenly paint non-planar surfaces. The invention is particularly useful when embodied in machines for painting articles through openings in masks which are shaped to conform accurately to the surfaces of the articles adjacent the openings and which are tightly fitted against such surfaces before spray painting begins.

Such non-planar surfaces are usually quite small and may require an extremely smooth and evenly applied coat of paint. Heretofore, spray painting machines have not been equipped to rotate spray guns about centers of curvature of such articles for the purpose of applying such extremely smooth and evenly applied coats of paint.

Surfaces to be coated are not necessarily curved smoothly about the axis of rotation of the spray guns, but may have protuberances or depressions the sides of which will be coated more effectively because of the fact that the spray is applied from the rotating guns. While the apparatus is particularly effective for coating non-planar surfaces, the rotating movement of the guns does not preclude but rather enhances their effectiveness for coating flat surfaces.

It is, therefore, an object of this invention to provide, in a spray painting machine, means for rotating a sprayer for painting non-planar surfaces.

Another object of the invention is to provide, in a spray painting machine, a composite conduit rotatable on its own axis for rotating a sprayer and for supplying the sprayer with paint and air, whereby the sprayer directs a spray substantially normally upon non-planar surfaces.

A further object of the invention is to provide, in a spray painting machine, a sprayer support rotatable on its own axis for rocking a sprayer and means for rotating the sprayer support, whereby the sprayer directs a spray substantially normally for painting non-planar surfaces.

Still another object of the invention is to provide, in a spray painting machine, a sprayer support rotatable on its own axis for rotating a sprayer directed to spray a non-planar surface positioned axially of the sprayer support, the sprayer being so oriented as to direct a spray progressing around a conical path impinging nearly normally upon all parts of the surface being painted.

More specific objects and advantages are apparent from the following description of preferred embodiments of the invention.

According to the invention, an improved spray painting machine includes a cabinet having an opening therein, a mask holder surrounding the opening, a sprayer so located within the cabinet as to direct a spray through a mask held by the holder, and means for rotating the sprayer for painting non-planar surfaces.

Preferred embodiments of the invention are illustrated in the accompanying drawings:

In the drawings:

Figure I is a side elevational view, partly in section, of a spray painting machine having apparatuts for rotating sprayers, a side panel being removed to show the apparatus.

Figure II is a reduced plan view of the cabinet and mask holder of the spray painting machine illustrated in Figure I.

Figure III is an enlarged vertical sectional view showing the interior of a rotatable composite conduit that is employed in the form of the machine illustrated in Figure I.

Figure IV is a more or less diagrammatic side elevational view, partly in section, of a spray painting machine incorporating another embodiment of the apparatus for rotating sprayers, a side panel being removed to show the apparatus.

These specific figures and the accompanying description are intended merely to illustrate the invention and not to limit its scope.

The mechanism of the invention as illustrated in Figures I–III is supported in a cabinet **1** having removable side panels secured to horizontal frame members **2** and **3**, the panels being removed to show the mechanism. The frame member **2** preferably is a shelf which not only functions as a support for parts of the mechanism but also shields the parts which lie below it from deposits of paint.

The cabinet **1** has a roof **4** with an opening **5** therein and a mask holding portion **6** surrounding the opening **5**. The roof **4** is equipped with clips **7** and **8** adapted to releasably fasten a mask **9** to the mask holding portion **6** in such position that the mask overlies the opening **5** in the roof **4**. The mask **9** has a matrix portion **10** formed to fit accurately the face of a non-planar surfaced or convexly curved article **11** to be coated or decorated. The mask **9** may partially cover the convexly curved surface of the article **11** and have a pattern cut away, as shown in phantom in Fig. I, to permit the application of sprayed coating to one or more areas on the article corresponding to the cut away pattern.

The article **11** is held in place on the mask **9** by means of outer fingers **12** and a center finger **13** forced against the article by the operation of the piston of an air cylinder **14** carried by a frame **15** mounted upon the roof **4** of the cabinet **1**. The outer fingers **12** are horizontally adjustable along a rod **16** and the rod **16** is vertically and pivotally adjustable along and about a piston rod **17** of the air cylinder **14**. Normally, the rod **16** is pivoted ninety degrees from its position shown in Figure I to keep the front of the machine clear. The rod **16** is shown in Figure I in abnormal position for purposes of clear illustration.

The article **11** is given an evenly applied coat of paint by sprays emitted from a pair of sprayers **18** so located within the cabinet **1** as to direct the sprays through the mask **9**. The sprayers **18** are horizontally and pivotally adjustably mounted on a sprayer support **19** which in turn is vertically adjustable along an extension **20** fixed atop a composite conduit **21** rotatable on its own axis. When the composite conduit **21** is revolved, the sprayers **18** each direct a spray onto the convex surface of the article **11** positioned axially of the composite conduit **21**, the spray progressing around a conical path and impinging nearly normally upon all parts of the convex surface, as indicated by the broken lines in Figure I. The nearly normal impingement of the spray produces an extremely smooth and evenly applied coat of paint.

The composite conduit **21** in addition to rotating the sprayers **18** also functions to supply the sprayers with paint and air. A paint supply line **22** carries paint from a source outside of the machine under pressure of preferably from two to ten pounds per square inch to an inside conduit **23** extending upwardly through the composite conduit **21**. The paint flows from the top of the inside

conduit 23 through lines 24 to the sprayers 18. An air supply line 25 carries air from a source outside of the machine under pressure of preferably from sixty to seventy-five pounds per square inch to an outside conduit 26 extending upwardly and around the inside conduit 23. The air flows from the top of the outside conduit 26 through lines 27 to the usual atomizing air inlet 28 in each of the sprayers 18. The air is divided inside the sprayers 18, part being used for the usual trigger air and part being used for the usual atomizing air. The air pressure within the sprayers 18 closes a normally open exhaust valve 29 threaded into the usual trigger air inlet in each of the sprayers, which valves 29 open when the air pressure falls after the air has been cut off at the end of a spraying cycle. Opening of the exhaust valves 29 causes the sprays to cut off sharply. The mechanism of the sprayers itself is not shown, since it is not part of the invention. Likewise, no control mechanism is shown for turning on and off the paint supply to the sprayers and the air supply to the sprayers and to the air cylinder 14, since any suitable manual or automatic controls may be used and such are not part of the invention.

The composite conduit 21 is rotated or revolved by means of power supplied from an air motor 30 gear connected to a gear reducer 31 which is gear connected in turn to the composite conduit. The air motor 30 and the gear reducer 31 are mounted on a stand 32 supported from the frame member 3 and are shielded from deposits of paint by the frame member 2 which is in the form of a shelf.

The gear connection between the gear reducer 31 and the composite conduit 21 includes a gear 33 on the reducer cooperating with a gear 34 fixed around the upper part of the outside conduit 26, as shown in enlarged detail in Figure III. The upper part of the outside conduit 26 is rotatably supported by a ball bearing mounting 35 having an outer race 36 fixed to the top of the frame member 2 and an inner race 37 fixed around the upper part of the outside conduit. The bearing mounting 35 is shielded from deposits of paint by a shield 38 attached to the frame member 2.

When the upper part of the outside conduit 26 is turned by its gear 34, it turns in the bearing mounting 35 and a bearing section 39 of the outside conduit turns on the flat face of a carbon seal 40 flexing on a ball sphere 41 pressure sealed by an expansion thrust member 42. The ball sphere 41 is resiliently supported by springs 43 supported in turn by a lower non-rotating part 44 of the outside conduit 26. The bottom of the inside conduit 23 turns in spring loaded packing 45 and receives paint under pressure from a threaded fitting 46 attached to the bottom of the non-rotating part 44 of the outside conduit 26. The top of the inside conduit 23 terminates in a T-fitting 47 atop which the extension 20 is fixed. The directions of the flows of paint and air through their respective conduits are indicated by the arrows shown in Figures I and III.

Another embodiment of the apparatus for rotating sprayers is illustrated in Figure IV. No rotatable composite conduit is used in this modification, a sprayer support 19*a* being vertically adjustable along a shaft 48 rotatably mounted in suitably supported bearings 49. An article held in a mask 9*a* supported by a mask holding portion 6*a* of a roof 4*a* of a cabinet 1*a* is given an evenly applied coat of paint by spray emitted from a pair of ordinary sprayers 18*a* so located within the cabinet 1*a* as to direct the sprays through the mask 9*a*. The sprayers 18*a* are horizontally and pivotally adjustably mounted on the sprayer support 19*a*. When the shaft 48 is rotated or rocked, the sprayers 18*a* each direct a spray onto the convex surface of an article positioned axially of the shaft 48, the spray progressing around a conical path and impinging nearly normally upon all parts of the convex surface, as indicated by the broken lines in Figure IV.

The shaft 48 is rocked by means of a pneumatically operated piston rod 50 operatively attached thereto through a rack 51 cooperating with a pinion 52 fixed to the shaft. The piston rod 50 may be reciprocated within its air cylinder 53 by means of conventional automatic reciprocation valves and a cam 54 carried by the rack 51 may be used to actuate switches 55 to trigger the sprayers 18*a*. The length of the stroke of the reciprocating piston rod 50 can be varied causing the pinion 52 to be turned any number of degrees short of the number which will cause excessive twisting of flexible lines 56 supplying the sprayers 18*a* with paint and air. The flexible lines 56 are spring connected at 57 to a shield 58 protecting the mechanism below it from deposits of paint. A supporting frame member 2*a* of the cabinet 1*a* functions as a further shield for the parts which lie below it from deposits of paint.

The sprayers 18*a* may be caused to rotate 360 degrees in one direction and then 360 degrees in the other direction or they may be caused to rock only 180 degrees in one direction and then 180 degrees in the other direction with the sprayers, controlled by the switches 55, shut off on the return trip if so desired. A travel of 180 degrees using two sprayers is very satisfactory, since the convex surface of the article 11*a* can be completely covered with paint and still the flexible lines 56 are not appreciably twisted. The article 11*a* may be held in place upon the mask 9*a* by fingers similar to the fingers 12 and 13 shown in Figure I, the operation and mounting of which have been hereinbefore described.

It is to be understood that the foregoing description and the accompanying drawings are exemplary only and that the invention is susceptible to variation and modification within the spirit and scope of the subjoined claims.

Having described the invention, I claim:

1. In a spray painting machine for painting portions of objects having non-planar surfaces, an upper work supporting member having an opening, a closed cabinet including said member as the top thereof, a stationary mask in paint tight relationship to said upper member, said mask conforming to the non-planar surfaces of said objects and having an open portion in registry with said opening, a finger above said opening, means to advance said finger toward said opening to engage objects to be painted to maintain said objects in tight engagement with said conforming mask, a sprayer support in said cabinet rotatable about an axis passing through said opening, a sprayer mounted on said support and radially spaced from said axis, said sprayer being oriented to direct a spray through the open portion of said mask, and means for rotating said support and said sprayer about said axis.

2. In a spray painting machine for painting portions of objects having non-planar surfaces, an upper work supporting member having an opening, a closed cabinet including said member as the top thereof, a stationary mask in paint tight relationship to said upper member, said mask conforming to the non-planar surfaces of said objects and having an open portion in registry with said opening, a pair of adjustably spaced fingers above said opening, means to force said fingers against objects to be painted to maintain said objects in tight engagement with said conforming mask, a sprayer support rotatable about an axis passing through said opening, a sprayer support bar for spacing a sprayer radially from said axis and adjustably mounted for positioning along said support within a range of separations from said opening, a sprayer adjustably mounted on said support bar for positioning along said bar in a range of radially spaced positions from said axis, means for pivoting said sprayer on said bar radially of said support and toward the open portion of said mask, and means for rotating said support.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

1,313,670	Burdick	Aug. 19, 1919
1,932,215	Johnson et al.	Oct. 24, 1933
1,953,376	Uden	Apr. 3, 1934
2,373,604	Schweitzer	Apr. 10, 1945
2,397,482	Griffin	Apr. 2, 1946
2,485,912	Neal	Oct. 25, 1949
2,672,121	Peeps	Mar. 16, 1954
2,695,592	Szczepanski	Nov. 30, 1954
2,696,449	Ericks et al.	Dec. 7, 1954
2,700,929	Williams	Feb. 1, 1955
2,725,035	Way et al.	Nov. 29, 1955