Sept. 17, 1963 G. D. MINNICK 3,104,181

PAINT SPRAYING MACHINE

Filed Nov. 6, 1961 7 Sheets-Sheet 1

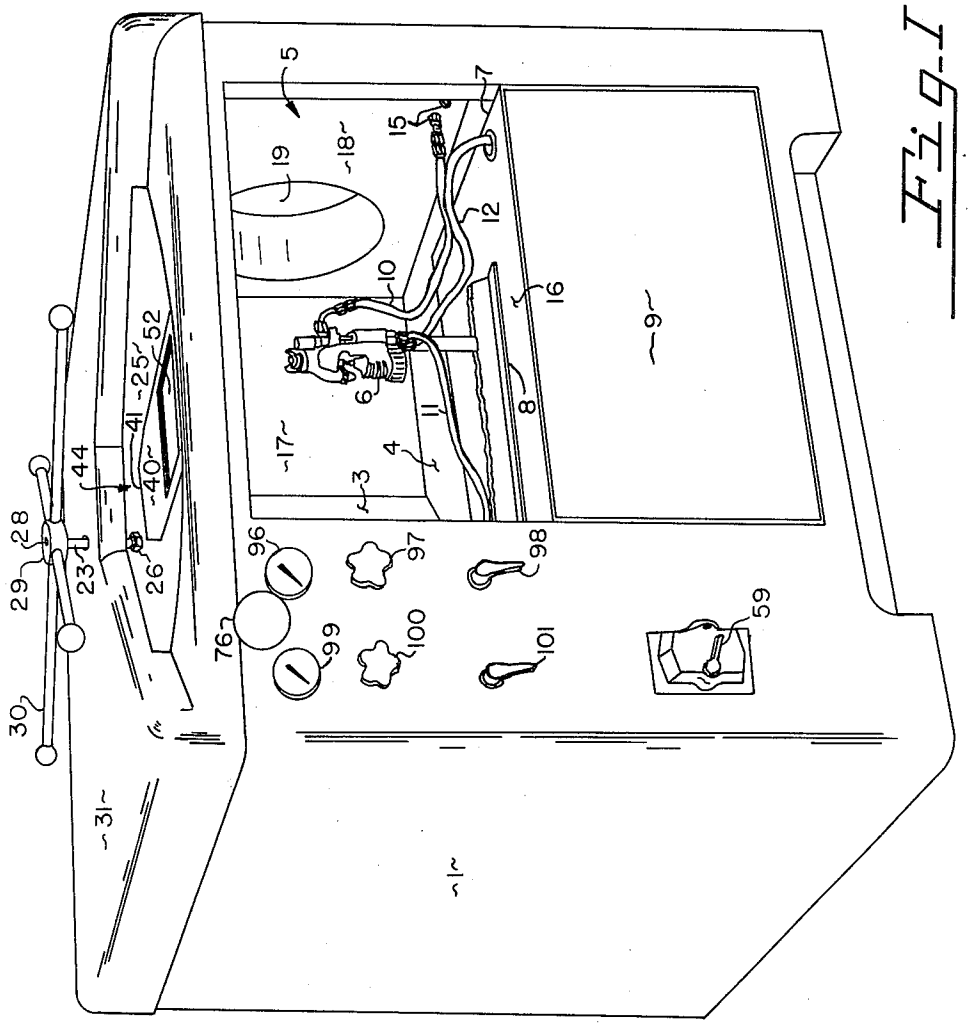


Fig. 1

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Sept. 17, 1963 G. D. MINNICK 3,104,181

PAINT SPRAYING MACHINE

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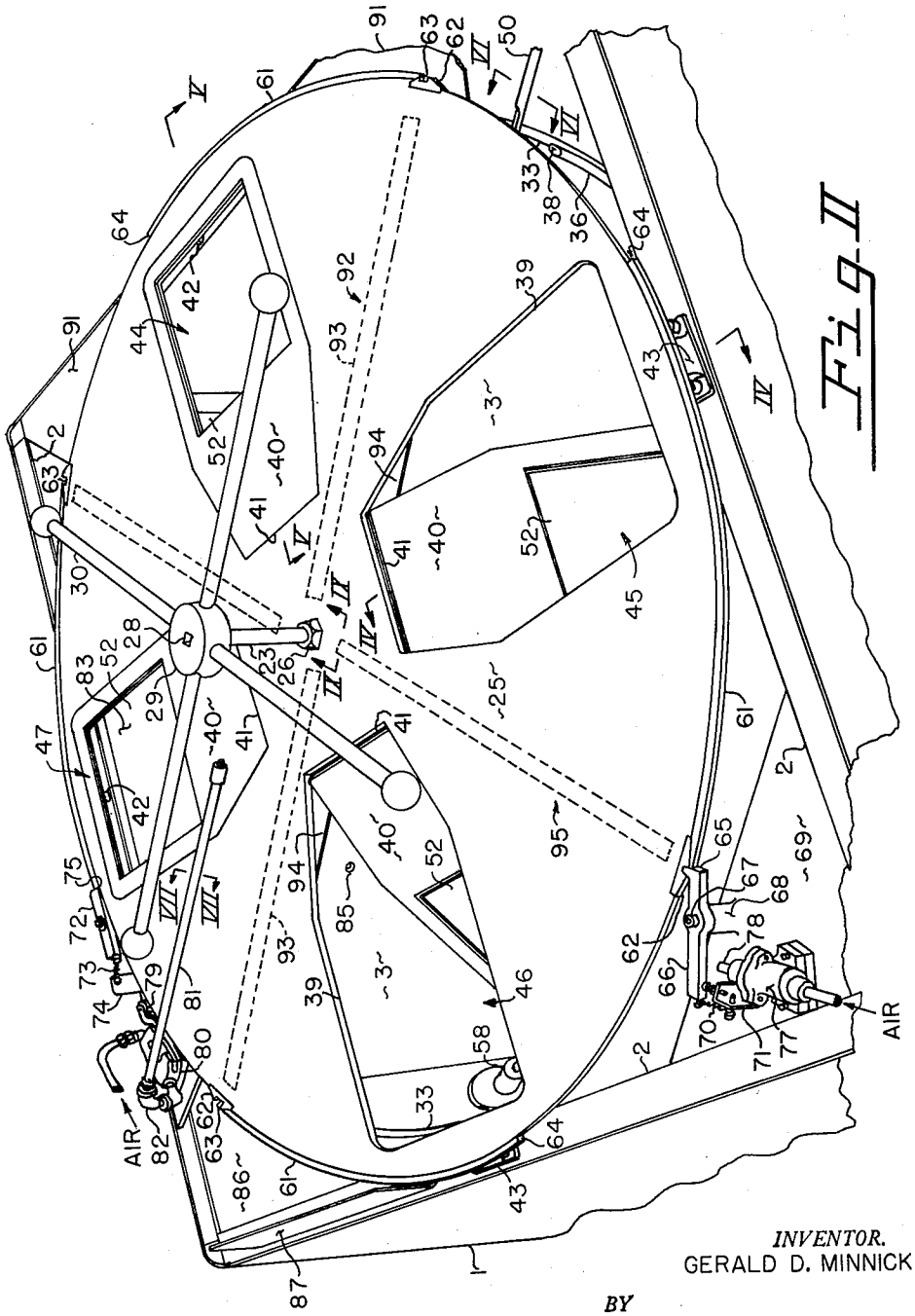


Fig. II

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PAINT SPRAYING MACHINE

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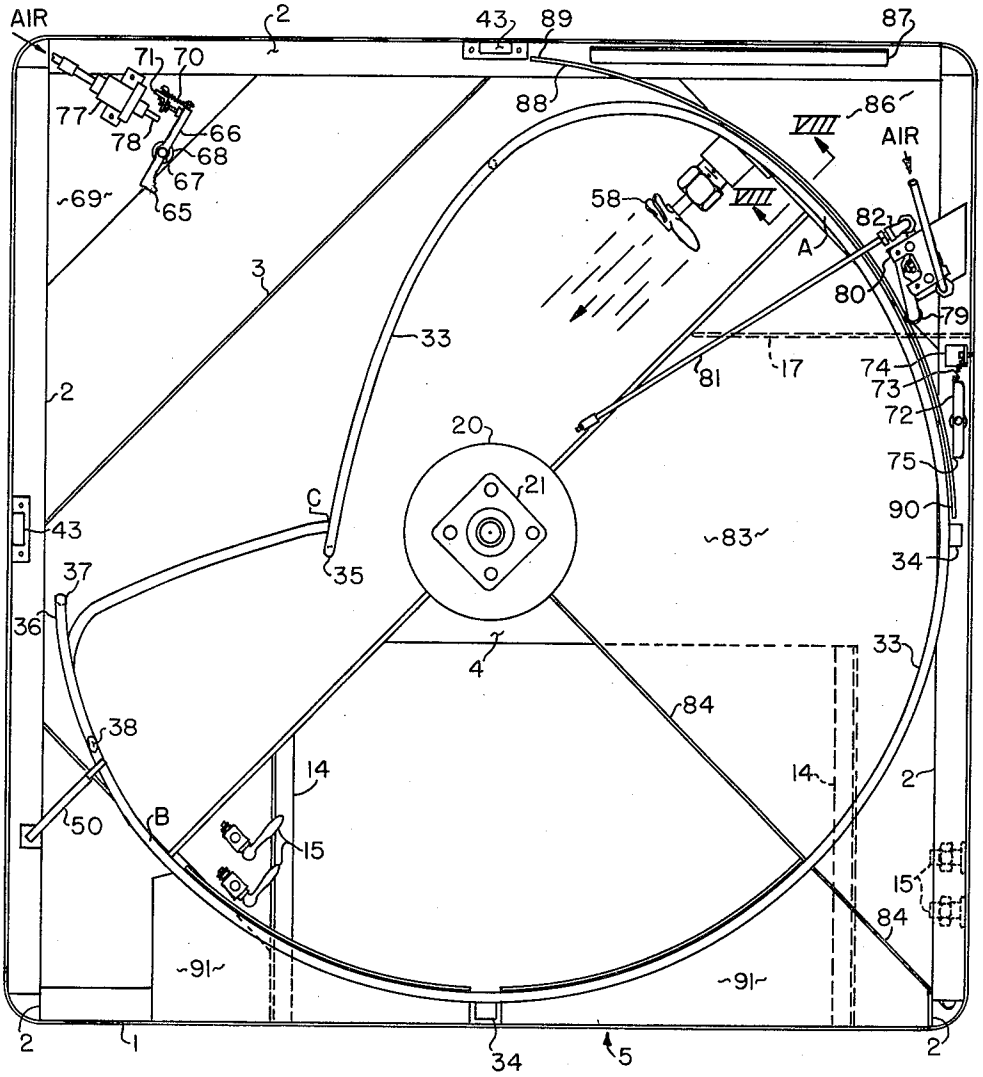


Fig. III

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PAINT SPRAYING MACHINE

Filed Nov. 6, 1961 7 Sheets-Sheet 4

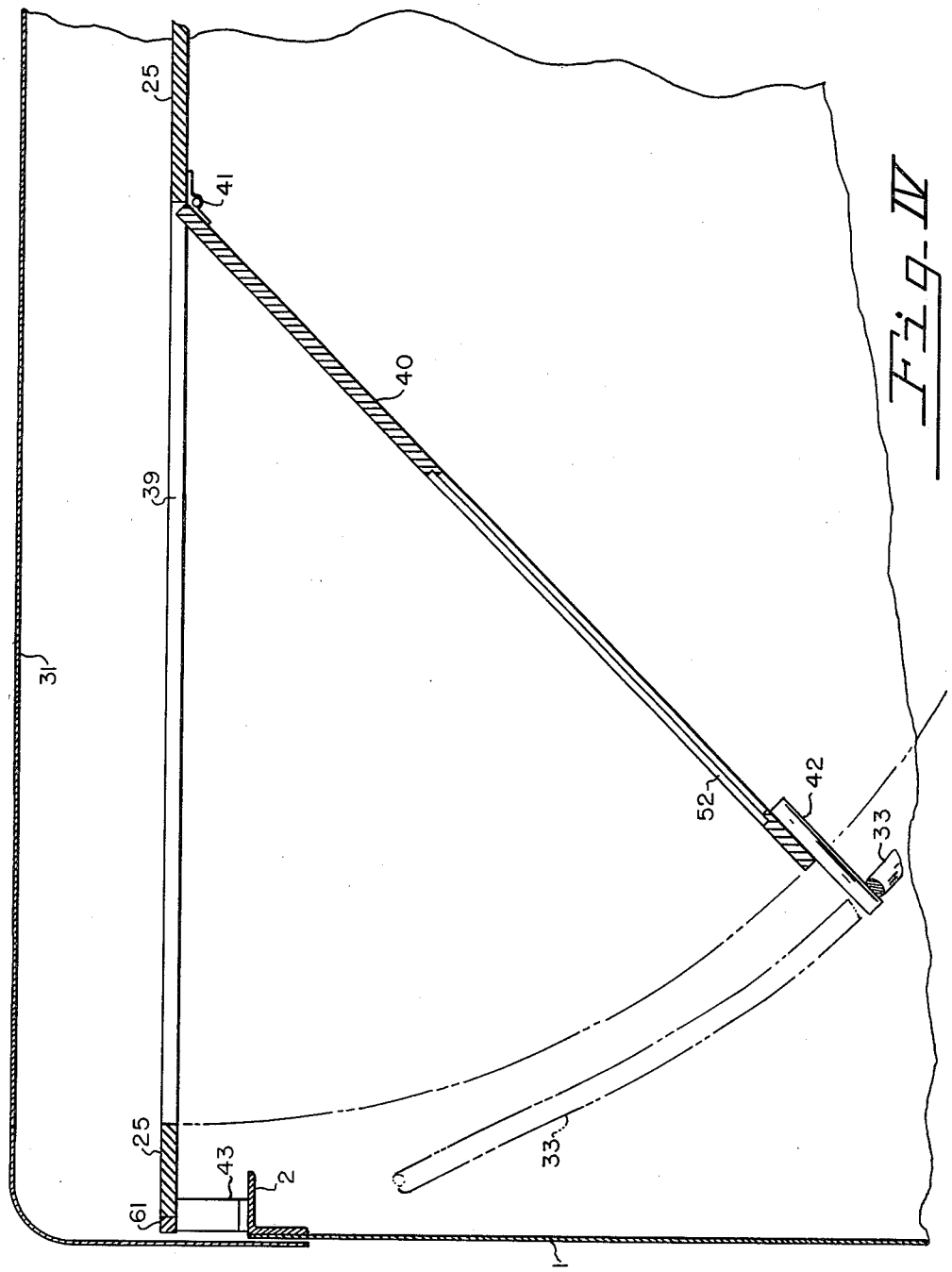


Fig. IV

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PAINT SPRAYING MACHINE

Filed Nov. 6, 1961 7 Sheets-Sheet 5

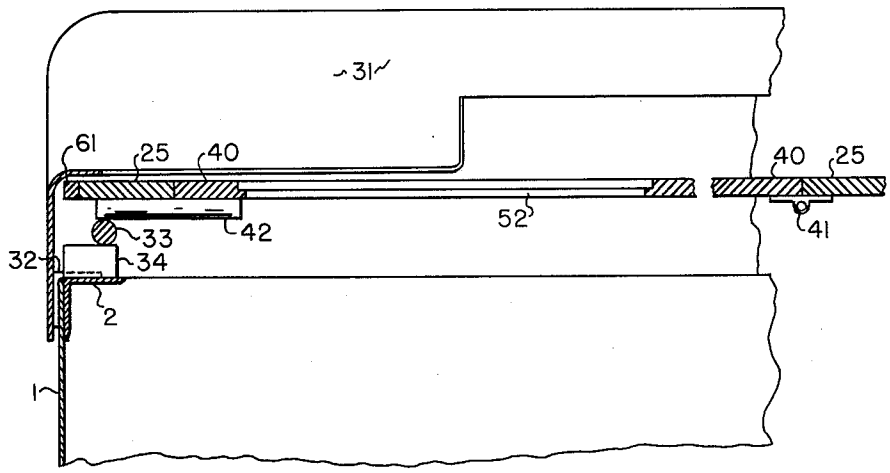


Fig. V

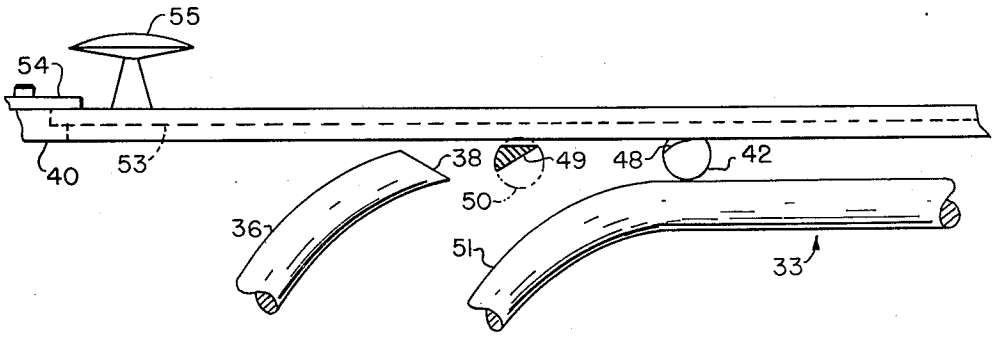


Fig. VI

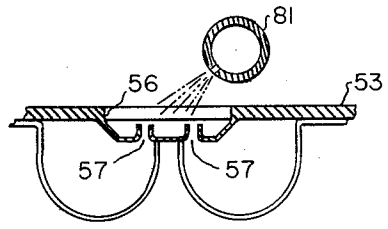


Fig. VII

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PAINT SPRAYING MACHINE

Filed Nov. 6, 1961 7 Sheets-Sheet 6

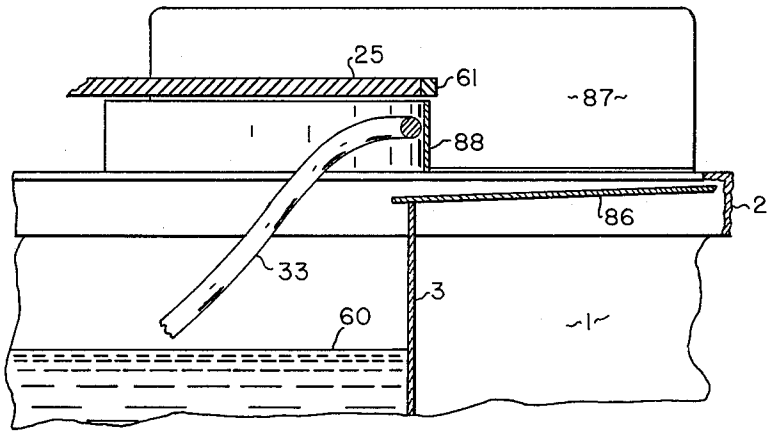


Fig. VIII

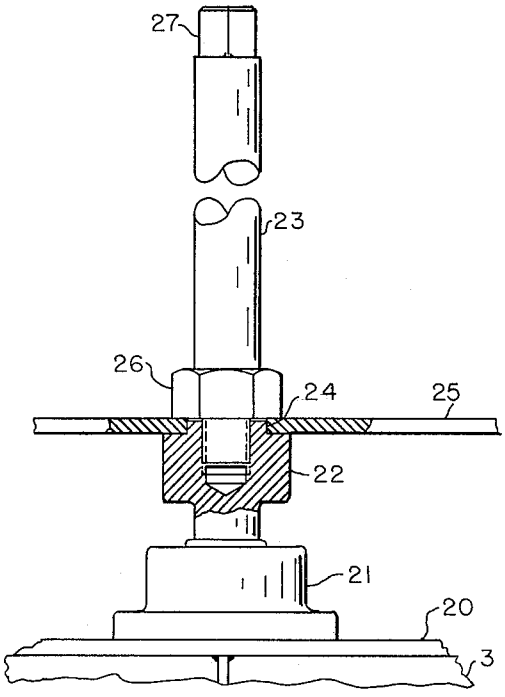


Fig. IX

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PAINT SPRAYING MACHINE

Filed Nov. 6, 1961 7 Sheets-Sheet 7

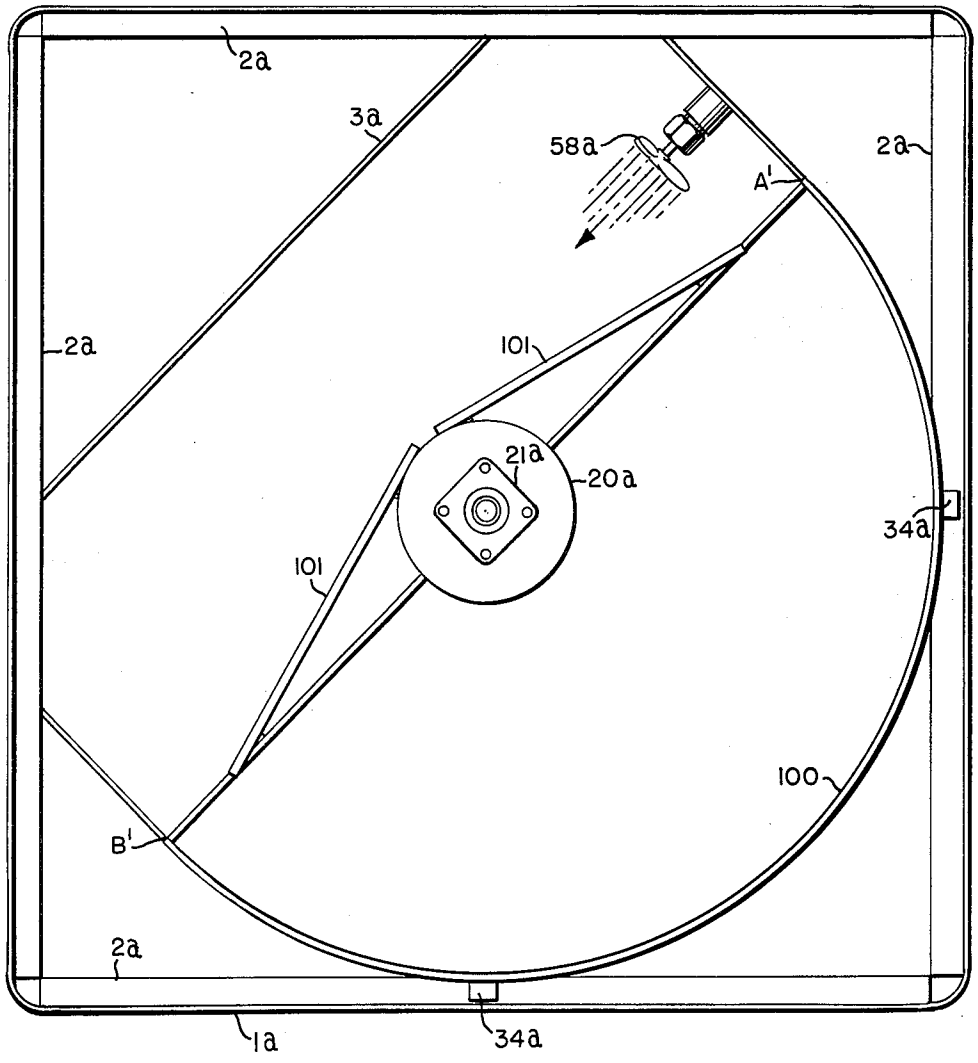


Fig. X

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United States Patent Office 3,104,181 Patented Sept. 17, 1963

3,104,181
PAINT SPRAYING MACHINE

Gerald D. Minnick, Toledo, Ohio, assignor to Conforming Matrix Corporation, Toledo, Ohio, a corporation of Ohio

Filed Nov. 6, 1961, Ser. No. 152,122
8 Claims. (Cl. 118—70)

This invention relates to spray painting machines of the type which paint designs upon 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.

Heretofore, most of such machines have not been provided with means for removing surplus coating compounds from the masks. The masks employed in such machines either had to be cleaned of accumulated paint in an open tank or cleaned in a separate washing machine. Open tank cleaning using volatile solvents may be injurious to the health of machine operators and engenders explosion hazards. It wastes solvent, wastes time, and often damages the masks. Separate washing machine cleaning of the masks consumes time in transferring the masks and allows volatile solvent to escape into the atmosphere every time that the washing machine is opened and closed.

Other ones of the prior machines have not been provided with practicable means for removing surplus coating compounds from the masks. Some of these machines automatically wash the masks after each use and, thus, are not capable of allowing the masks to be used an optimum number of times before they are washed. Using a mask only once before washing results in excessive consumption of solvent and requires a comparatively great number of masks. Other ones of these machines in incorporating means for washing the masks after they were used an optimum number of times became bulky, of great cost, slow in operation, used a large number of masks and wasted cleaning solvent. None of these prior devices combine spray painting apparatus and mask washing equipment in one compact machine which is relatively simple and relatively inexpensive and which efficiently sprays articles through masks and which also efficiently washes the masks after they have been used an optimum number of times.

It is, accordingly, the principal object of this invention to provide a compact, simple, low-cost combination spray painting and mask washing machine of rugged build which paints and washes efficiently and which produces work of the highest quality.

Another object of the invention is to provide a machine for spraying articles through masks, the machine being so organized that the act of an attendant in bringing a clean mask into a painting station automatically moves dirty masks into such positions in washing stations that the entire masks automatically are washed completely.

A further object is to provide a combination spray painting and mask washing machine which minimizes mask-cleaning solvent loss.

Still another object is to provide a combination spray painting and mask washing machine which is so organized that various spray gun units, such as reciprocating or rocking or rotating units, can be substituted one for the other in a matter of minutes.

A further object is to provide a combination spray painting and mask washing machine in which the masks are driven from station to station under the power of an attendant.

Another object is to provide a combination spray painting and mask washing machine which needs a very small number of masks for its operation.

According to the invention, a compact combination spray painting and mask washing machine includes a mask carrier which is mounted to rotate about a vertical axis and which moves four masks in a generally circular path successively into a painting station, a two-section washing station, and a drying station. No drive means other than the act of an attendant in rotating the mask carrier is required to drive and properly locate the masks in the respective stations.

The masks are held in holders that are hinged on the carrier and that are supported at their ends remote from the hinges on cam means. The act of the attendant, after a mask has been used an optimum number of times, in rotating the mask carrier to bring a clean mask from the drying station into the painting station drives a dirty mask into the washing station, the respective hinged mask holder following the cam means to lower the dirty mask into the solvent. The positions of the masks are changed by means of the cam means in the two sections of the washing station to facilitate cleaning both sides of the masks.

The machine also features an arrangement of baffles which keeps loss of solvent to a minimum. An additional feature is in the mounting of the spray guns in special units that can be substituted one for the other in a matter of minutes. This permits the machine to be equipped with guns that are particularly well suited for the particular article to be painted. For example, the guns can be of the reciprocating, rocking, or rotating types.

A preferred embodiment is illustrated in the accompanying drawings.

In the drawings:

FIG. I is a view in perspective of the painting machine of the invention, a front door being removed to reveal interior mechanism;

FIG. II is a view in perspective of the painting machine shown in FIG. I, with its cover removed, as seen from a position to the left of the machine;

FIG. III is a top plan view of the machine as shown in FIG. II with a mask carrier removed to reveal interior details;

FIG. IV is an enlarged vertical sectional view taken along the line IV—IV of FIG. II, the cover which is shown in FIG. I being in place;

FIG. V is a vertical sectional view taken along the line V—V of FIG. II, the cover which is shown in FIG. I being in place;

FIG. VI is a vertical sectional view taken substantially along the line VI—VI of FIG. II, the mask carrier being rotated to show a mask in place on the carrier;

FIG. VII is a vertical sectional view taken along the line VII—VII of FIG. II, the mask carrier being rotated to show a mask in place on the carrier;

FIG. VIII is a vertical sectional view taken along the line VIII—VIII of FIG. III, the mask carrier which is shown in FIG. II being in place;

FIG. IX is a vertical sectional view taken substantially along the line IX—IX of FIG. II; and

FIG. X is a simplified top plan view generally similar to FIG. III showing a modified painting machine.

These specific figures are intended merely to illustrate the invention but not necessarily to limit its scope.

The combination painting and mask washing machine of the invention includes a base or cabinet 1 that supports angle irons 2 (FIGS. II and III) which form its upper side, rear, and front marginal edges. An open-topped solvent tank 3 is suitably mounted within the base 1 at an angle to the sides of the base as shown in FIG. III and at an elevation as shown in FIG. I, the bottom of the tank 3 as seen in FIG. I being about flush with the upper surface of a shelf 4 of a spray gun compartment 5 in the base.

A spray gun 6 within the gun compartment 5, which normally is closed by a door which is not shown, is mounted on a frame 7. As specifically shown, the gun 6 is reciprocable in a track 8 and is reciprocated by means of drive mechanism that is hidden behind a plate 9 secured to the frame 7. Drive mechanism for reciprocating paint spray guns is shown and described in U.S. Patent No. 2,795,206, issued on June 11, 1957, to E. L. Faber. The gun 6 can be given any suitable motion or it can be stationarily mounted to adapt the machine for painting articles of various sizes and shapes. Apparatus for rocking spray guns to evenly paint non-planar surfaces is shown and described in U.S. application Serial No. 507,535, filed May 11, 1955, now abandoned, in the name of H. E. MacArthur. Apparatus for rotating spray guns to evenly paint non-planar surfaces is shown and described in U.S. application Serial No. 533,179, filed September 8, 1955, now U.S. Patent No. 2,888,903, in the name of E. L. Faber. The gun 6 is served by a paint supply line 10, an atomizing air supply line 11, and a trigger air supply line 12 in the usual way. More than one gun may be used if that is desirable.

The frame 7 is readily removable from the base 1 by sliding it in on angle irons 14 (FIG. III) which function as stationary tracks. Couplings 15 mounted on the base 1 serve to detachably connect the gun 6 to sources of paint and air. When the frame 7 is in place, its upper surface 16 is flush with the upper surface of the shelf 4 and together the surface 16 of the frame and the shelf 4 define the lower limits of the gun compartment 5 which has a rear wall 17 and a side wall 18 in which a discharge port 19 is formed. Suitable exhaust equipment filters and discharges fumes through a stack which communicates with the port 19 to maintain an atmosphere free from coating or painting compounds. The base 1 is shown in FIG. III as it appears with the gun 6 uncoupled and the frame 7 removed from the base.

One of the features of the machine is the mounting of the spray gun 6 and the drive means therefor on a readily removable frame so that the gun and its drive means can be substituted by others in a matter of minutes. A gun having one type of motion is uncoupled, the frame 7 removed, another frame 7 with a gun having another type of motion placed in the machine, the new gun coupled, and the machine is ready for action with a gun that is particularly well suited for the particular article to be painted. If the gun is one mounted to move while it is spraying, ordinarily it is moved continuously. For example, the gun 6 is reciprocated continuously in the track 8 and after a spraying cycle is initiated by the machine operator stepping on a foot pedal (not shown) sprays for a timed interval. Means for starting the air blast of the sprayer after such means is actuated by the act of the operator, means for automatically stopping such air blast after a predetermined interval, and means for adjusting the duration of such predetermined interval are shown and described in U.S. Patent No. 2,810,364, issued October 22, 1957, in the names of H. E. MacArthur and E. L. Faber.

The upper edge of the solvent tank 3 at the center of the machine supports a round plate 20, the plate 20 being welded to the tank and supported on angle brackets (not shown) secured to the tank, to which is fixed a bearing housing 21 which contains a bearing that receives for rotation the necked down lower end of a cylinder 22 (FIG. IX) into the upper end of which a vertical shaft 23 is threaded. The upper end of the cylinder 22 is made square and fits into an octagonal hole 24 in the middle of a circularly shaped mask carrier 25, a lock nut 26 keeping the mask carrier 25 on the top of the cylinder 22. A square upper end 27 of the shaft 23 is received in an opening 28 (FIG. II) of a hub 29 from which four handles 30 project horizontally at ninety degree intervals.

The mask carrier 25 is assembled to be rotatable about the vertical axis of the shaft 23 by first threading the shaft 23 into the square upper end of the cylinder 22, indexing keyways (not shown) in the shaft and cylinder serving to locate the square upper end 27 of the shaft 23 relative to the square upper end of the cylinder 22 and to receive a key for maintaining the relative positions of the shaft and the cylinder. The square upper end of the cylinder 22 then is received in the octagonal hole in the mask carrier 25, one position of the square end of the cylinder 22 in the octagonal hole 24 locating the handles 30 relative to the mask carrier 25 as shown in FIG. II and a second position of the square end of the cylinder 22 in the octagonal hole 24 locating the handles 30 in positions forty-five degrees offset from their positions shown in FIG. II. The nut 26 then is turned on the shaft 23 to insure that the shaft 23, mask carrier 25, and cylinder 22 stay together as a unit. The necked down lower end of the cylinder 22 is received for rotation in the bearing in the housing 21, the cylinder 22 extending down into such bearing a distance determined by means hereinafter described. This locates the mask carrier 25 on the base 1 as shown in FIG. II; however, at this point in the assembly the handles 30 are not yet on the shaft 23 as shown in FIG. IX. Then a cover 31 is placed over the machine as shown in FIG. I with the shaft 23 extending through an opening in the cover, and the hub 29 is assembled on the square upper end 27 of the shaft 23 to locate the handles 30 in a horizontal position above the cover 31 as also shown in FIG. I. This rotatably mounts the mask carrier 25 in a horizontal position and connects the handles 30 to the mask carrier 25 so that they move as one. The front of the cover 31 is so formed as to allow access to that part of the mask carrier 25 which happens to be located at the front of the machine as illustrated in FIG. I. The cover 31 is provided with a pair of angle brackets 32 spaced along its front edge and a like pair on its rear edge. Each one of the front angle brackets 32 one of which is shown in FIG. V rests upon the angle iron 2 that forms the front marginal upper edge of the base 1, the rear angle brackets which are not shown resting upon the angle iron 2 that forms the rear marginal upper edge of the base 1.

A continuous rigid cam track 33 is secured as by welding to blocks 34 fixed to the front and right hand angle irons 2 as viewed in FIG. III and to the bottom of the solvent tank 3 at 35. From about point A (FIG. III) clockwise around to about point B, the cam track 33 is in a substantially horizontal plane. From about point B, the cam track 33 dips smoothly into the solvent tank 3 to about point C where it is close to the bottom of the solvent tank but not so close that the part of the mask carrier 25 which follows the cam track 33 as hereinafter described touches the bottom of the solvent tank, and then rises from about point C in a smooth curve to about point A. A short-sectioned cam track 36 is spaced a matter of an inch or two from the continuous cam track 33; it is welded to the bottom of the solvent tank 3 at 37 and extends from such weld point in juxtaposition with the continuous cam track 33 to its upper end 38. Suitable brackets (not shown) secured to the base 1 rigidly support the upper end 38 of the cam track 36.

The mask carrier 25 is provided with four equally spaced openings 39 each of which receives a mask holder 40 which is so hinged at 41 that it is free to pivot downwardly under the influence of gravity as illustrated in FIGS. II and IV. Each of the mask holders 40 at its front edge, i.e., its edge remote from its hinge 41, is provided with a finger 42 on its lower side as shown in FIGS. IV and V. When the mask carrier 25 is assembled to be rotatable about the vertical axis of the shaft 23 as hereinbefore described, it is supported for sliding on the continuous cam track 33 from point A (FIG. III)

clockwise around to point B, those of the fingers 42 which happen to be at such section of the cam track 33 resting upon the cam track as shown in FIG. V. As also shown in FIG. V, the fingers 42 so limit upward pivotal movement of the mask holders 40 that in their upper positions the top surfaces of the mask holders are flush with the top surface of the mask carrier 25. The rest of the mask carrier 25, i.e., from point B clockwise around to point A, is supported on a pair of lubricated shoes 43 secured to the upper surfaces of the angle irons 2, those of the fingers 42 which happen to be at such section of the cam track 33 following the cam track 33 into the solvent tank 3 as shown in FIG. II so that the outer edge of the mask carrier 25 itself bears on the shoes 43 as shown in FIG. IV. The supporting of the mask carrier 25 to be slidable on the continuous cam track 33 and on the shoes 43 holds it in a substantially horizontal plane from which it cannot be tipped and limits the distance that the necked down lower end of the cylinder 22 (FIG. IX) can extend down into the bearing housing 21.

The mask carrier 25 is manually rotated, the machine operator grasping the handles 30 from a position in front of the machine as seen in FIG. I. The mask holder 40 which can be seen in FIG. I is in a painting station 44, the next mask holder clockwise around the machine is in a first section 45 (FIG. II) of a washing station, the next mask holder is in a second section 46 of the washing station, and the next mask holder is in a drying station 47. During clockwise rotation of the mask carrier 25, the fingers 42 on the ends of the hinged mask holders 40 follow the continuous cam track 33 to automatically position the mask holders horizontally in the drying and painting stations and to automatically dip the mask holders into the solvent tank 3 in the washing station as shown in FIG. II.

The free end of each of the fingers 42 on the mask holders 24 has a cam surface 48 (FIG. VI) which is contacted by the sharp edge 49 of a finger 50 stationarily secured to the left hand angle iron 2 as viewed in FIG. III during rotation of the mask carrier 25. This cams the mask holders 40 downwardly to break them away from excess paint that might hold them to the mask carrier 25 and insures that the mask holders 40 start down the slope 51 (FIG. VI) on the cam track 33 leading into the solvent tank 3. The cam track 33 is spaced far enough above the bottom of the solvent tank that the free ends of the fingers 42 on the mask holders 40 cannot drag on the bottom of the tank. In case the machine operator turns the mask carrier 25 violently, movement of the mask holders 40 in an upwardly direction from the cam track 33 at the slope 51 is limited by the track 36 closely spaced therefrom. This insures that the mask holders 40 are always positioned in the washing station as shown in FIG. II with their fingers 42 held by gravity against the cam track 33 as shown in FIG. IV.

Each of the mask holders 40 has a relieved edged opening 52, i.e., an opening with a lip, for receiving a mask 53 (FIGS. VI and VII) and a clip 54 (FIG. VI) adapted to releasably fasten the mask in the opening, there being a handle 55 on the mask for its convenient handling. A mask 53 is shown in vertical section in FIG. VII; it has a matrix portion 56 formed, for example, electrolytically, to fit accurately the face of an article to be coated or decorated, and has a pattern cut away to permit the application of sprayed coating through openings 57 to one or more areas on the article corresponding to the cut away pattern. The spray gun 6 (FIG. I) is so oriented as to direct its blast through the outouts 57 in the matrix portion 56 of that one of the masks 53 which happens to be located in the painting station 44 at the front of the machine, the machine operator standing in front of the machine and holding the article being sprayed tightly against the mask while the spraying takes place.

Another one of the features of the machine is the organization which permits the act of the machine operator in bringing a clean mask from the drying station 47 into the painting station 44 to automatically move dirty masks into such positions in the washing station that the entire masks automatically are washed completely. A motor-driven impeller 58, mounted on a side of the solvent tank 3, which is run continuously while the machine is in operation and which is turned on and off by means of a switch 59 (FIG. I) creates a stream in the solvent 60 (FIG. VIII) within the tank 3 in the direction indicated by the arrow in FIG. III. Each of the masks 53 while it is located in the first section 45 of the washing station is positioned as indicated in FIG. II with its back generally to the oncoming stream. However, each of the masks 53 while it is located in the second section 46 of the washing station is positioned as indicated in FIG. II with its front generally to the oncoming stream. This facilitates cleaning and insures that both sides of each of the masks are washed completely. Furthermore, such repositioning of the masks is done automitically, the fingers 42 on the mask holders 40 following the slope 51 of the cam track 33 into the solvent tank 3 and then inwardly toward the center of the machine to point C (FIG. III) and then outwardly away from the center of the machine and up the slope to point A. In the stopped position of the mask carrier 25, two of the masks 53 are immersed in the solvent at any one time, their stay in the solvent being long enough even in the shortest painting cycle to completely free them of paint. The simple immersion of the masks in the solvent results in an efficient washing cycle, the machine producing work of the highest quality by means of the perfectly clean masks. The automatic positioning of the masks in the washing station results in a great savings in time as compared to the time lost in an ordinary system wherein the machine operator removes a dirty mask from a prior painting machine and takes it to a separate washing machine. Only a minimum number of masks (four) are needed for the operation of the machine. This helps in keeping the cost low.

Four equally spaced apart cams 61 are secured to the peripheral edge of the mask carrier 25 and each includes a front curved portion 62 that contains a notch 63 and a rear flat abutment surface 64. In the operating position of the mask carrier 25, an indexing finger 65 on the end of a lever 66 that is fulcrumed intermediate its ends at 67 is received in that one of the notches 63 which happens to be intermediate the sections 45 and 46 of the washing station. The fulcrum for the lever 66 is supported atop a post 68 secured to a plate 69 that is welded to two of the channel irons 2 in a position such that the upper surface of the plate and the upper surfaces of the channel irons are about flush. A coil spring 70 between a stationary bracket 71 on the plate 69 and the end of the lever 66 remote from the indexing finger 65 on the lever urges the indexing finger 65 continuously in a counterclockwise direction about the pivot 67 as viewed in FIG. II. Also, in the operating position of the mask carrier 25, an anti-backup pawl 72 pivotally mounted on one of the angle irons 2 at the drying station 47 engages that one of the rear flat abutment surfaces 64 which happens to be at the drying station. The pawl 72 is so urged by a coil spring 73 connecting a stationary bracket 74 on the angle iron 2 and the pawl that its abutment engaging tip 75 is continuously biased toward the mask carrier 25. Engagement of the tip 75 with the abutment surface 64 of the cam 61 prevents backward motion, i.e., counterclockwise movement as viewed in FIG. II, of the mask carrier 25.

When the operator desires to exchange a clean mask 53 for a dirty one, he presses a release button 76 on the front of the base 1. This admits compressed air to a pneumatic cylinder 77 secured to the plate 69, whereupon the cylinder's piston rod 78 is extended to drive the lever 66 clockwise about the fulcrum 67 withdrawing the indexing finger 65 in opposition to the spring 70 from the notch 63. An ordinary return spring within the cylinder 77 returns the piston rod 78 to its retracted position upon release of the

air pressure. The operator then grasps one of the handles **30** and turns the mask carrier **25** until the spring biased indexing finger **65** catches in the next notch **63**. This indexes the mask carrier **25** for a turn of ninety degrees and properly locates the masks **53** in the respective painting, washing, and drying stations with the anti-backup pawl **72** in position to prevent inadvertent movement of the mask carrier **25** in the wrong direction. As the mask carrier **25** is turned, the tip **75** of the pawl **72** drags along the cam **61** until it falls in place behind it when the mask carrier **25** is indexed by the indexing finger **65** riding up the front curved portion **62** of the cam **61** and catching in the notch **63**.

Also, as the mask carrier **25** is turned, a spring biased cam following roller **79** rides up the front curved portion **62** of the cam **61** and rolls along the full length of the cam. While the cam following roller **79** contacts one of the cams **61** it causes a normally closed valve **80** to be held open. The open valve **80** permits compressed air to flow from a suitable source to a perforated blow-off pipe **81** which emits a blast of air upon the mask **53** that passes closely underneath it as illustrated in FIG. VII. The pipe **81** is pivotally mounted by means of an elbow **82** on the valve **80** so that the pipe **81** can be swung out of the way for removal of the mask carrier **25** from the base **1**. The air blast blows pockets of excess solvent from the masks **53**, the masks air drying in the drying station **47**. The number of times that each of the masks **53** is used depends on variables such as the shape of the articles to be painted and the characteristics of the painting compounds. The optimum number is determined by trial and error at the beginning of a run of work and thereafter the operator changes the mask every time that it has been used the predetermined number of times.

No drive means other than the act of the operator in rotating the mask carrier **25** is required to drive and properly locate the masks in the respective stations. Such act, after a mask has been used an optimum number of times, rotates the mask carrier ninety degrees, whereupon it automatically is stopped in an indexed position by the finger **65** catching in one of the notches **63**, to bring a clean mask from the drying station **47** and drives a dirty mask into the first section **45** of the washing station, the respective hinged mask holder following the continuous cam track **33** to immerse the dirty mask in the solvent. While the masks **53** are positioned in the respective stations, the operating roller **79** of the air valve **80** rests on the edge of the mask carrier **25** between a pair of cams **61** as shown in FIG. II so that while the mask carrier is stopped in its indexed position no air blast is emitted from the perforated pipe **81**.

Another one of the features of the painting machine is in an arrangement of baffles and drip pans which keeps loss of solvent **60** to a minimum. Unacceptable high loss of solvent from prior combination spray painting and mask washing machines is reason enough in itself for the relative non-success of such prior machines. A drip pan **83** (FIG. III) which has a turned up edge **84** is secured as by welding to the base **1** underneath the right hand angle iron **2** as viewed in FIG. III and to a side of the solvent tank **3**. The pan **83** is tilted toward the tank **3** so that solvent which drops into it from the masks **53** is returned to the tank **3** through holes **85** in the side of the tank, one of such holes being shown in FIG. II. A drip plate **86** is secured as by welding between the ends of the two angle irons **2** at the upper right hand corner of the base **1** as viewed in FIG. III. As shown in FIG. VIII, the drip plate **86** rests upon the upper edge of the solvent tank **3** and slants toward it to return solvent blown upon it by the blow-off pipe **81** to the tank. A splash guard **87** (FIGS. III and VIII) atop the rear one of the angle irons **2** returns droplets of solvent blown upon it by the blow-off pipe **81** some directly to the tank **3** and some indirectly by way of the drip plate **86**. A second splash guard **88** which is welded at **89** to the top of an angle iron **2** and at **90** to the top of another angle iron **2** extends in a curve underneath and closely adjacent the periphery of the mask carrier **25** in the effective area of the blow-off; it has a function similar to splash guard **87**. Shields **91** at the front of the machine help confine paint spray to the spray gun compartment **5**.

In order to prevent the draft that is created by the exhaust equipment through the port **19** (FIG. I) from wastefully pulling vapor from the volatile solvent out of the tank **3**, a system of baffles is provided. This draft, however, aids in the air drying of the masks in the drying station **47**. When the mask carrier **25** is in its stopped indexed position as shown in FIG. II, a first baffle **92** that is formed from a pair of angle irons **93** secured diametrically to the under side of the mask carrier **25** has its lower edge **94** very closely spaced from the upper edge of the solvent tank **3**. This very close spacing which can be seen in FIG. II prevents significant solvent vapor flow over such edge of the tank into the spray gun compartment **5** where it would be drawn out of the exhaust port **19**. In such position of the mask carrier **25**, a second baffle **95** which is identically the same as the first baffle **92** and which is secured diametrically to the under side of the mask carrier **25** at right angles to the first baffle **92** is so positioned that upon a one-quarter revolution of the mask carrier **25** the second baffle **95** is substituted in place of the first baffle **92**. Hence, whenever the mask carrier **25** is in its stopped indexed position, one or the other of the baffles **92** and **95** is closely juxtaposed to the upper edge of the solvent tank adjacent the gun compartment **5**.

The supporting of the mask carrier **25** to be slidable on the continuous cam track **33** and on the shoes **43** holds it in a substantially horizontal plane from which it cannot be tipped and limits the distance that the necked down lower end of the cylinder **22** (FIG. IX) can extend down into the bearing housing **21**. The bearing in the bearing housing **21** may be an ordinary self aligning bearing with an inner and an outer race. Alternatively, instead of allowing the entire weight of the mask carrier **25** to be supported on the continuous cam track **33** and on the shoes **43**, such necked down lower end of the cylinder **22** may be formed with a shoulder which is supported by the top of the inner race, a part of the lower end of the cylinder **22** extending as hereinbefore described down into the bearing. In this arrangement, the inner race supports much of the load and, therefore, the mask carrier **25** can be slid on the continuous cam track **33** and on the shoes **43** with little effort.

In operation, the presure with which the atomizing air is supplied to the gun **6** is indicated on an atomizing air pressure gauge **96** located on the front of the machine, a knob **97** being manipulated to regulate the pressure of the atomizing air and a lever **98** being manipulated to turn such air on and off, and the pressure with which the machine air, for example, the trigger air for the gun **6** and the lock air for the cylinder **77**, is supplied is indicated on a gauge **99** also located on the front of the machine, a knob **100** being manipulated to regulate the pressure of the machine air and a lever **101** being manipulated to turn such air on and off. The gun **6** is reciprocated continuously in the track **8** and after a spraying cycle is initiated by the machine operator sprays for the timed interval through the cutouts **57** in the matrix portion **56** of that one of the masks **53** which happens to be located in the painting station **44**, the operator standing in front of the machine and holding the article to be painted tightly against the mask. After the mask **53** in the painting station becomes fouled with excess paint, the operator unlocks the mask carrier **25** by manipulating the button **76**, grasps one of the handles **30** and rotates the mask carrier one-quarter revolution until it automatically is stopped in an indexed position by the finger **65** catching in one of the notches **63**. This brings a clean

mask from the drying station **47** and drives a dirty mask into the first section **45** of the washing station, the respective hinged mask holder following the continuous cam track **33** to immerse the dirty mask in the solvent in the tank **3**. The machine then is ready for another series of painting cycles.

A modification of the painting machine is shown in FIG. X. Reference numerals in FIG. X which are similar to those in FIGS. I–IX refer to parts that are alike in structure and in function.

The painting machine shown in FIG. X includes a cabinet **1***a* supporting angle irons **2***a* which form its upper side, rear and front marginal edges. An open-topped solvent tank **3***a* is suitably mounted within the cabinet **1***a* and supports a round plate **20***a* to which is fixed a bearing housing **21***a*. The painting machine includes simplified cam means substituted for the continuous cam track **33** shown in FIG. III. Such simplified cam means functions in the same manner as the continuous cam track **33** and includes a cam track **100** extending horizontally in an arc from point A′ to point B′ and secured as by welding to blocks **34***a* fixed to the front and right hand angle irons **2***a*. Cam track **100** structurally and functionally is like that horizontal part of the cam track **33** which extends from point A to point B (FIG. III). The simplified cam means also includes two bars or rods **101** attached to the plate **20***a* and to the tank **3***a* as shown in FIG. X. Bars **101** have superior simplicity compared to that part of the cam track **33** (FIG. III) which dips into the tank **3**.

During rotation of the mask carrier, the hinged mask holders at the cam track **100** follow the cam track positioning such mask holders horizontally in the drying and painting stations. When a mask holder reaches point B′, its right hand edge as viewed in FIG. II (see lower hinged mask holder **40** in FIG. II) runs along the left hand bar **101** as viewed in FIG. X dipping the mask holder into the solvent tank **3***a* and shortly thereafter the opposite edge of the mask holder engages the other bar **101** which cams the mask holder upwardly back onto the horizontal cam track **100** at point A′. In operation, the hinged mask holders are positioned in the several stations in the machine by the cam means shown in FIG. X, i.e., by the cam track **100** and bars **101**, in the same manner as they are positioned in the several stations in the machine by the continuous cam track **33** shown in FIG. III.

Various modifications may be made in specific details of construction without departing from the spirit and scope of the invention.

This application is a continuation-in-part of application Ser. No. 780,824, filed December 16, 1958, in the name of Gerald D. Minnick.

Having described the invention, I claim:

1. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station, a washing station and a drying station, the stations being located along a generally circular path, a solvent tank in the washing station, an apertured article and mask carrier mounted to rotate about a generally vertical axis in a substantially horizontal plane to present its apertures successively to the stations, the article and mask carrier being located above the solvent tank, a continuous fixed cam track which extends between the stations and that is located below the article and mask carrier and that dips into the solvent tank, mask holders having free ends and ends mounted to pivot about generally horizontal axes within the apertures in the article and mask carrier, each of the mask holders having an opening therein which registers with the respective aperture in the article and mask carrier, means for mounting a selected mask upon each of the mask holders over its opening, and a spray gun so located in the painting station as to direct a spray through the masks so mounted over the openings in the mask holders while they are in the painting station, the free ends of mask holders being supported directly upon the cam track and following the cam track from station to station during rotation of the article and mask carrier, the mask holders pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, the masks drying in the drying station.

2. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station at a first level, a washing station at a different level and a drying station, a solvent tank in the washing station, a continuous fixed cam track defining a path, a portion of which is in the solvent tank, extending through the stations, rotatable means having pivotable members having free ends directly supported upon the cam track to follow the cam track on rotation of the rotatable means into the solvent tank and through the stations for carrying masks along the path, the masks being washed while they are in the solvent tank, the pivotable members pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, and an air blast sprayer so located in the painting station as to direct a spray through the masks while they are in the painting station, the masks drying in the drying station.

3. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station at a first level, a washing station at a different level comprising a first and a second section and a drying station, a solvent tank in the sections of the washing station, means for creating a stream in solvent in the tank, a continuous fixed cam track defining a path, a portion of which is in the solvent tank, extending through the stations, rotatable means having pivotable members having free ends directly supported upon the cam track to follow the cam track into the solvent tank in a direction opposite to said stream and through the stations for carrying masks along the path, the cam track being so formed that one side of each mask generally faces the oncoming stream in the first section of the solvent tank and the other side of each mask generally faces the oncoming stream in the second section of the solvent tank to free both sides of the masks of coating compound, the pivotable members pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, and an air blast sprayer so located in the painting station as to direct a spray through the masks while they are in the painting station, the masks drying in the drying station.

4. A combination spray painting and stencil-mask washing machine comprising, in combination, a cabinet, a spray gun compartment in the cabinet, means defining a painting station in the cabinet above the compartment, means defining a washing station comprising an open-topped solvent tank in the cabinet at a level below the painting station, impeller means for creating a stream in solvent in the tank, means defining a drying station, the stations being located along a generally circular path, an apertured mask carrier mounted to rotate about a generally vertical axis in a substantially horizontal plane which is above the solvent tank to present its apertures successively to the stations, the vertical axis being centrally disposed in the cabinet, a continuous fixed cam track

secured within the cabinet which extends between the stations and that is located below the mask carrier and that dips into the solvent tank, mask holders having free ends and ends mounted to pivot about generally horizontal axes within the apertures in the mask carrier, each of the mask holders having an opening therein which registers with the respective aperture in the mask carrier, means for mounting a selected mask upon each of the mask holders over its opening, and a spray gun so located within the compartment as to direct a spray through the masks so mounted over the openings in the mask holders while they are in the painting station, the free ends of the mask holders being held directly on the cam track under the influence of gravity and following the cam track from station to station and through the solvent tank against said stream during rotation of the mask carrier to carry the masks successively into the stations, the mask holders pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, the masks drying in the drying station.

5. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station, a washing station and a drying station, the stations being located along a generally circular path, a solvent tank in the washing station, an apertured article and mask carrier mounted to rotate about a generally vertical axis in a substantially horizontal plane to present its apertures successively to the stations, the article and mask carrier being located above the solvent tank, cam means at the stations located below the article and mask carrier, mask holders mounted to pivot about generally horizontal axes within the apertures in the article and mask carrier, each of the mask holders having an opening therein which registers with the respective aperture in the article and mask carrier, means for mounting a selected mask upon each of the mask holders over its opening, and a spray gun so located in the painting station as to direct a spray through the masks so mounted over the openings in the mask holders while they are in the painting station, the mask holders being supported upon the cam means and following the cam means from station to station during rotation of the article and mask carrier, the mask holders pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, the masks drying in the drying station.

6. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station at a first level, a washing station at a different level and a drying station, a solvent tank in the washing station, cam means defining a path, a portion of which is in the solvent tank, extending through the stations, rotatable means having pivotable members supported upon the cam means to follow the cam means on rotation of the rotatable means into the solvent tank and through the stations for carrying masks along the path, the masks being washed while they are in the solvent tank, the pivotable members pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, and an air blast sprayer so located in the painting station as to direct a spray through the masks while they are in the painting station, the masks drying in the drying station.

7. In a machine for spray painting designs upon articles through accurately fitting masks, in combination, means defining a painting station at a first level, a washing station at a different level comprising a first and a second section and a drying station, a solvent tank in the sections of the washing station, means for creating a stream in solvent in the tank, cam means defining a path, a portion of which is in the solvent tank, extending through the stations, rotatable means having pivotable members supported upon the cam means to follow the cam means into the solvent tank in a direction opposite to said stream and through the stations for carrying masks along the path, the cam means being so formed that one side of each mask generally faces the oncoming stream in the first section of the solvent tank and the other side of each mask generally faces the oncoming stream in the second section of the solvent tank to free both sides of the masks of coating compound, the pivotable members pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, and an air blast sprayer so located in the painting station as to direct a spray through the masks while they are in the painting station, the masks drying in the drying station.

8. A combination spray painting and stencil-mask washing machine comprising, in combination, a cabinet, a spray gun compartment in the cabinet, means defining a painting station in the cabinet above the compartment, means defining a washing station comprising an open-topped solvent tank in the cabinet at a level below the painting station, impeller means for creating a stream in solvent in the tank, means defining a drying station, the stations being located along a generally circular path, an apertured mask carrier mounted to rotate about a generally vertical axis in a substantially horizontal plane which is above the solvent tank to present its apertures successively to the stations, the vertical axis being centrally disposed in the cabinet, cam means within the cabinet at the stations and located below the mask carrier, mask holders mounted to pivot about generally horizontal axes within the apertures in the mask carrier, each of the mask holders having an opening therein which registers within the respective aperture in the mask carrier, means for mounting a selected mask upon each of the mask holders over its opening, and a spray gun so located within the compartment as to direct a spray through the masks so mounted over the openings in the mask holders while they are in the painting station, the mask holders being held on the cam means under the influence of gravity and following the cam means from station to station and through the solvent tank against said stream during rotation of the mask carrier to carry the masks successively into the stations, the mask holders pivoting from a generally horizontal position at the painting station toward a vertical position at the washing station to dip the masks into the solvent tank while the masks are at the washing station and pivoting from such position at the washing station to said generally horizontal position upon return to said painting station, the masks drying in the drying station.

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