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ELECTROSTATIC PAINTING SYSTEM

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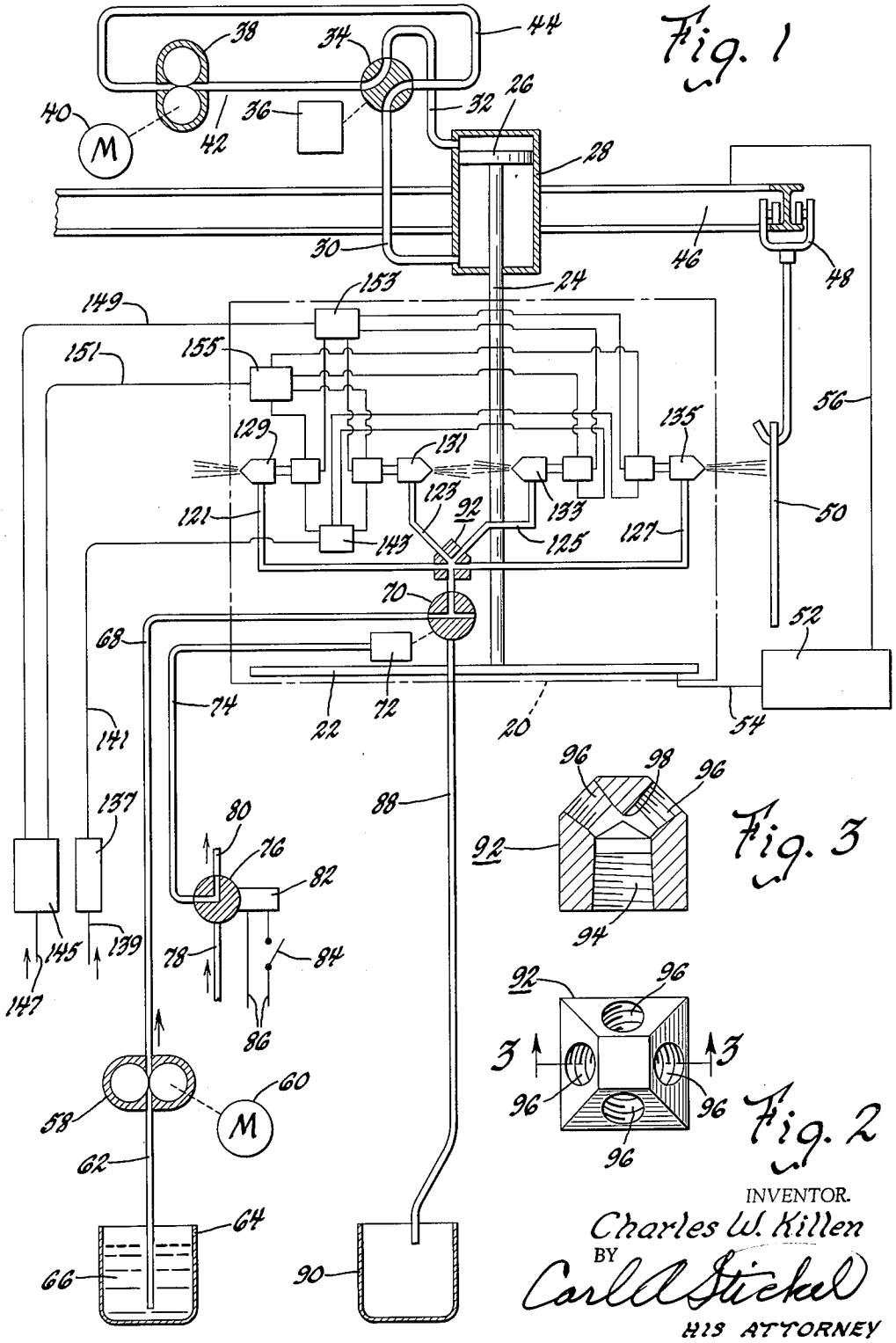

Fig. 1

Fig. 3

Fig. 2

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ELECTROSTATIC PAINTING SYSTEM

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This invention pertains to an electrostatic painting system and especially to a multiple gun coating system which can be easily flushed without substantial loss of paint and readily recharged with another paint selected from as many different colors as desired.

To coat many closely spaced articles upon a conveyor it is desirable to provide three or four spray guns on a reciprocator arranged within a path of the conveyor. With the recommended individual supply and control for each of said guns, such a system becomes excessively complicated if it is desired to use such apparatus for many different colors. It also becomes difficult, expensive and wasteful to flush and recharge such a system with another coating material.

It is an object of this invention to provide a simple, effective, multiple spray gun coating system in which a simple distributor provides for equal distribution of the coating material and which can be easily flushed substantially without loss of paint and also can be readily selectively recharged with as many different colors as desired.

These and other objects are attained in the form shown in the drawings in which four spray guns together with a two-way paint valve are arranged upon a reciprocator which operates within a path of a conveyor upon which the pieces to be coated or painted normally are placed in a relatively close quarter. The spray guns are electrostatically charged so that the paint will be attracted to the pieces upon the conveyor. A single flexible paint conduit extends from a paint pump to a distributor upon the reciprocator. This distributor is symmetrically arranged so as to equally distribute the paint supply to the spray guns. The pump is provided with a controlled speed drive and its flexible inlet may be used for pumping any color from the selected paint supply container containing paint of the selected color.

For flushing, the selected paint supply container may be replaced by one containing a flushing liquid. A flexible hose extending from the three-way valve on the reciprocator to a waste recovery container is provided for conveying undesired paint and flushing liquid to the waste recovery container prior to changing to a different color. A single oscillating air control supplies oscillating air through a two pipe distribution system to each of the spray guns on the reciprocator. A skip spray air control is also connected through a distribution system on the reciprocator to each of the spray guns so as to stop the spraying of coating material whenever necessary such as a stoppage of the conveyor or an absence of pieces to be painted. The paint distributor includes a block having a centrally located inlet and four diverging outlets symmetrically arranged relative to each other and the inlet and extending at an angle from their junction with the inlet so that the paint is evenly divided between the spray guns.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a diagrammatic view of an electrostatic painting system embodying one form of my invention;

FIGURE 2 is a top view of the distributor block for distributing the paint upon the reciprocator to the four spray guns; and

FIGURE 3 is a sectional view taken along the line 3–3 of FIGURE 2.

Referring now to the drawings, there is shown a dot and dash outline 20 which indicates the parts which are reciprocated by the reciprocator which includes a platform 22 connected by the piston rod 24 to the piston 26 within the cylinder 28. The piston 26 is operated by hydraulic liquid received alternately from the upper and lower pipes 30 and 32 connecting with the reversing valve 34 which is periodically reversed by a reversing control 36. A hydraulic pump 38 driven by an electric motor 40 pumps the hydraulic liquid through the pipe 42 to the reversing valve 34. The reversing valve 34 connects the inlet and discharge pipes 44 (connecting respectively with the inlet and the outlet of the pump 38) alternately with the pipes 30 and 32 connecting respectively with the bottom and the top of the cylinder 28. The reciprocating mechanism is merely shown diagrammatically as a part of the system. A more complete form of a reciprocator is shown in the Gauthier et al. Patent 2,878,058 issued March 17, 1959.

The reciprocator indicated by the dot and dash outline is located within the path of a monorail conveyor 46 having a carrier 48 provided with a hook for supporting the individual pieces 50 to be sprayed with paint or other coating material. A high voltage source 52 is connected by a conductor 54 to the platform 22 which applies an electrostatic charge of high voltage to each of the spray guns. A second conductor 56 connects the other terminal of the high voltage source 52 to the monorail conveyor 46 so as to apply an opposite charge to the pieces 50 to be painted.

According to my invention, a paint pump 58 is driven by a controlled speed drive motor 60. The inlet of this pump 58 is connected by a flexible hose 62 extending substantially to the bottom of the paint container 64. The paint container 64 may contain paint 66 or a flushing liquid. Because the inlet hose 62 is flexible, commercial containers of any type or size containing any different color of paint desired may be substituted without difficulty for the paint container 64. Thus, another container containing any sort of coating or flushing liquid may be substituted for the container 64 or its contents.

The discharge of the pump 58 connects directly to a flexible hose 68. The flexible hose 68 connects to the two-way valve 70 mounted on the platform 22. The two-way valve 70 is operated by a flexible casing such as a bellows 72 connected by a flexible air hose or tubing 74 to the two-way solenoid operated air valve 76. This air valve 76 is fed with a supply of air under pressure through the supply conduit 78. The air valve 76 is also provided with a discharge air conduit 80. The solenoid operating coil 82 of the valve 76 is connected through the control switch 84 to the supply conductors 86. The two-way valve 70 is provided with a downwardly extending waste discharge outlet normally closed which connects to a flexible hose 88 extending into a waste recovery container 90. The normally open upwardly extending second outlet of the valve 70 connects to the inlet of a symmetrical distributor 92 shown in detail in FIGURES 2 and 3. This distributor 92 has a centrally located inlet 94 and four symmetrically located outlets 96 having their axes located in two vertical planes perpendicular to each other. These outlets 96 divert symmetrically at the same angle 45° from the inlet 94. A symmetrical dividing wall 98 in the shape of an inverted square pyramid between the outlets 96 divides the flow of paint from the inlet 94 equally to

the outlets 96 which are symmetrically located in the four 45° identical faces on the top of the distributor 92. The outlets 96 connect through the flexible tubes or hoses 121, 123, 125 and 127 of uniform size and equal length with the spray guns 129, 131, 133 and 135. These hoses 121–127 and the guns 129–135 are all mounted on the platform 22 for reciprocation with the piston rod 24. The distributor 92 as well as the valve 70 and its operating bellows 72 are likewise mounted on the platform 22.

A skip spray air control 137 is provided for the guns. It is supplied with air under pressure from the supply conduit 139 and delivers the air through a flexible hose 141 through a distributor 143 which has individual conduit connections with each of the guns 129–135. There is also provided an oscillating air control 145 supplied with air under pressure from the conduit 147 which delivers oscillating air alternately through the flexible hoses 149 and 151 to the distributors 153 and 155. Each of these distributors 153 and 155 are provided with separate flexible hose connections with each of the spray guns 129–135, all of which are mounted upon the platform 22. Preferably the spray guns are the Gyromat ULP type manufactured by the Gyromat Corporation of Fairfield, Connecticut. However, other spray guns such as are illustrated, for example, in the Pattison Patent 2,281,169 issued April 28, 1942, may be used if desired.

In operation, a paint supply is provided by placing a container such as the container 64 substantially filled with the desired type and color of paint 66 in a position receiving the flexible hose 62 which preferably extends substantially to the bottom of the container 64. The controlled speed drive motor 60 is set to drive the pump 58 at such a speed as to pump paint at the selected pressure from the flexible conduit 62 through the conduit 68 and the two-way valve 70 to the distributor 92. The distributor 92 mounted on the platform 22 then through individual identical flexible tubes 121 to 127 equally distribute the flow of paint or other coating material to each of the spray guns 129–135. The conveyor 46 moves the articles 50 to be painted in a path near the reciprocating spray guns 129 to 135 so that the articles 50 are sprayed with the coating material 66 from the container 64. If there is any reason for quickly stopping the paint spraying, the skip spray air control 137 may be used for this purpose. The oscillating air supply through the hoses 149 and 151 assures a fine and substantially uniform spray from each of the guns.

Should it be desired to change to another color, the solenoid valve 76 is operated so as to supply air through the flexible hose 74 to the valve actuator 72 to operate the two-way valve 70 to the waste discharge position in which paint in the conduit 68 is discharged through the flexible hose 88 into the waste recovery container. At the same time a container containing a flushing liquid is substituted for the paint container 64 and its contents 66 and the flexible hose 62 is placed in this particular container and kept for further use. The controlled speed drive motor 61 is operated to pump flushing liquid through the hoses 62, 68 and 88 including the two-way valve 70 to carry the paint whose use is being discontinued into the waste recovery container 90. Since only a single set of hoses is involved in this operation, only a small amount of paint need be flushed into the waste recovery container.

After the flushing completed, another container with a different color paint or coating material is substituted for the container 64 and the flexible hose 62 is placed in this particular container so that the newly selected paint is pumped by the pump 58. The pump 58 pumps the new paint into the conduit 68 while the remainder of the flushing liquid is being discharged through the hose 88. When the line or hose 68 is filled with the newly selected paint, the two-way valve 70 is

operated by operating the switch 84 to the normal position delivering the new paint to the distributor 92 from which the newly selected paint is supplied through the individual tubes 121–127 to the spray guns 129–135. This will force the small amount of the previously used paint from the distributing conduits 121–127 and from the spray guns 129–135. As soon as the newly selected paint appears in the discharge of the spray guns, painting of the articles 50 on the conveyor can be resumed. With this arrangement the change in paint from one color to another can be readily made without any appreciable loss of paint and time.

The paint delivered to the waste recovery container 90 can be recovered and used in various ways after suitable treatment. With this system there is no limitation on the number of colors which may be used. The complications involved in providing for such a selection of colors is kept at a minimum. The color selected may be used directly out of the container in which it is supplied. This makes it practical to use a wide variety of colors so that individual choice can be provided without any appreciable penalty.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve.

2. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet and a flexible conduit extending from said inlet of said pump to a supply container adapted to contain coating material or a solvent.

3. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve having a flexible portion extending to a removable waste discharge container.

4. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns,

a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said ditributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve, and means for applying an electrostatic charge to said spray guns.

5. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve, air supply means having two air conduits extending to said assembly, said assembly being provided with an air distributor connected to each of said air conduits, and separate air conduits extending from each of said air distributors to each of said guns.

6. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump

having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve, a spray air control including an air conduit extending to said assembly, said assembly being provided with an air distributor connected to said air conduit.

7. In a coating system for moving articles, an assembly provided with a plurality of spray guns for spraying coating material upon said articles, means for reciprocating said assembly including said spray guns, a two-way coating control valve mounted upon said assembly having an inlet and a plurality of outlets, a distributor connected to one of the outlets of said two-way valve, said distributor having separate outlets and connecting conduits for each of said guns, a coating material supply pump having a pump outlet and a conduit connecting said pump outlet and the inlet of said two-way valve, said pump having an inlet adapted to be connected to a supply of coating material, and a waste discharge conduit connected to another of the outlets of said two-way valve, said distributor having a centrally located inlet and a plurality of symmetrically positioned outlets positioned symmetrically relative to said inlet to provide equal flow of coating material to said guns.

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