AUTOMATED PAINT SPRAY SYSTEM

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ABSTRACT

In a production line system, apparatus is disclosed whereby a succession of production work articles are painted by a spray gun which is coupled selectively by automatic selection and coupling means to different paint supply lines of different colors in accordance with data signals delivered from a computerized data input and storage system.

3 Claims, 4 Drawing Figures
AUTOMATED PAINT SPRAY SYSTEM

FIELD OF THE INVENTION

The present invention pertains to method and apparatus for selectively spraying coating or surface-treatment materials of different characteristics, as for example, different color paints, on to articles as they are transported along a production line.

BACKGROUND OF THE INVENTION

It is known to spray paint articles as they are carried along a production line. For example, automobile bodies are painted by equipment which sprays the vertical flat side of the automobile body with the desired color paint from a distance of approximately three feet. Heretofore, to spray the body with paint of the desired color, a workman manually connects the desired color hose to the moving spray gun while the production belt is in motion. If the workman is able to install the desired color hose onto the spray gun in time, the operation is performed in satisfactory manner, but if the hose is installed a few seconds late, the color intended for the first article may be sprayed onto the following article. Sometimes, a part of an article is missed completely due to the inability of the workman to make a hose connection in time. Because these operations are performed manually, and because a workman may tend to lose interest and to become careless in the performance of repeated routine operation, he may lose time in the painting of the production work, whether it be an automobile, an automatic washer, a refrigerator, or other mass produced item, which will disrupt the timing of the entire production line, or at least a portion thereof.

SUMMARY OF THE INVENTION

A principal purpose of the present invention is to provide an automated surface treatment system for production line work products, and particularly an automated paint spraying system designed for use along a production line such as is used in the manufacture of automobiles, appliances, and other products. Another object is to provide an automated multicolor painting system in which any one of a plurality of different colors may be selected and sprayed upon an item of manufacture as it advances along a production line.

Still another object is to provide a multicolor painting system which is controlled by computer input and storage data, as by a punch card key-punched with holes corresponding to the color of each successive production item to be painted.

Another purpose is to provide a computer controlled spray gun apparatus wherein the painting in different colors of a full day's production may be programmed and accomplished without need of manual operation.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagrammatic representation showing a plurality of paint supply lines of different color paints, and a spray gun coupling means for connecting to any one of the supply lines; FIG. 2 is an elevational view showing one arrangement in accordance with the present invention for automatically moving the connector into desired position for connection to a desired paint supply line in accordance with applied information and control signals; FIG. 3 is an elevational view showing a modified form of the invention wherein individual spray heads are used for each color, with a valve in each color line controlled by the input and/or storage in the computer machine; FIG. 4 illustrates a plurality of punch cards each of which is punched out for a different color operation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 2, there is shown paint spray gun apparatus 10 comprising a spray gun head 17 supported on a movable support rack and connected to one end of a flexible coupling hose 16. At the other end of the coupling hose 16 is a connector 15 supported in a carriage 20. The function of connector 15 is to connect coupling hose 16 to any one of a plurality of tubular supply lines 12 each of which leads back to a supply of different color paint. The tubular lines 12 are supported in a fixed common support rack. Each line 12 terminates at the rack end in a gate valve 14. The gate valves 14 are normally closed by the pressure of the paint liquid in the supply lines. The valves 14 are arranged and supported in aligned manner, and connector 15 is adapted to be moved into position for selective coupling to one of the valves 14 in accordance with control signals supplied to the carriage bar 20.

Connector 15, which is secured to one end of coupling hose 16, is additionally secured by rigid bracket means to one end of a plurality of a solenoid 19 which is fixed mounted upon the carriage bar 20. Carriage bar 20 is vertically and slideably supported between pairs of rollers 21, and is movable up and down as indicated by the arrow 22, in accordance with signals applied to color selector mechanism 25. In this way, connector 15 may be positioned opposite, and aligned with, any one of the valves 14 of any one of the color supply lines 12.

The carriage bar 22 may be slideably movable, in either direction, by means of a toothed rack 23 integrally formed on the bar 20. The toothed rack 23 is in engagement with a drive pinion or gear 24 supported within color selector unit 25. It will be evident that rotation of the drive gear 24 will cause the carriage bar 20 to move up or down, and that the connector 15 may be positioned opposite any one of the valves 14 of the color lines 12.

After the connector 15 is positioned opposite and aligned with the selected valve 14, the solenoid 19 may be activated to move the plunger 18 forward thereby to carry the connector 15 forward into the valve 14 with which it is aligned. This opens the normally closed gate valve 14 so that the paint from the selected line 12 can flow through connector 15 into the coupling hose 16 and to the spray head or gun 17.

Rack drive gear 24 and solenoid 19 are controlled automatically from a computer apparatus 26 which may be operated and controlled by known forms of input data means, as for example, by means of a plurality of punch cards 27. The computer 26 provides electrical impulses to the color selector 25 and to the solenoid 19 to automatically control these devices so that a paint spray 28 of desired color is delivered from the spray gun 17 to the production work 29. The production work 29 may be an automobile body a refrigerator, an automatic washer, or any other of a large number of items which are being produced on a production line basis.

When the carriage bar 20 is driven up or down by actuation of drive gear 24, the carriage bar 20 may be stopped in proper position to place connector 15 opposite the desired color line valve 14 by any suitable known means. For example, limit switches may be provided, one for each position of valves 14. Such limit switches would ordinarily be out of the path of travel of carriage bar 20, but a selected limit switch corresponding to the desired color would be moved automatically, in response to an electrical signal, into the path of the carriage bar 20, or into the path of a projection on carriage bar 20, so as to be contacted by bar 20 or its projection when bar 20 reached the desired position, thereby to shut off the drive to the drive gear 24. The plunger 18 of solenoid 19 would then be moved forward in response to a control signal which would either energize or de-energize the winding of solenoid 19. For example, the plunger 18 may be spring-loaded to the forward position, so that it would move forward to its projected position upon de-energization of solenoid 19. A timer or timing mechanism would then be actuated by a control signal from the computer mechanism to control the time period of the paint spray treatment. At the expiration of the selected time period, the plunger 18 would be retracted, and the carriage bar 20 moved to the next desired position, as controlled by signals from the computer mechanism. It is contemplated that a substantial number of punch cards would be
punched and inserted into the input end of the computer mechanism for automatic feeding to a reading station where the cards are read and electrical signals generated to control the sequence of color paint spray operations for a full day's production. Provision would, of course, be made, for flushing the spray gun means to prevent a preceding color from contaminating a following color.

Modified Design

Referring now to FIG. 3 of the drawing, there is shown a modified design wherein individual spray heads 31 are used for each individual color paint supply line or hose 32. This eliminates different colors mixing within one spray gun means and the need to flush out the gun when changing colors.

It will be noted that all spray heads 31 are supported in aligned manner along a single vertical line so to permit the production items 44 to closely follow one another on the production line without danger of a wrong color being sprayed on the next subsequent work as it advances along the production belt.

In the form of the invention illustrated in FIG. 3, the supply lines 32 containing the different color paints may comprise flexible hoses so that they may be moved along with the carriage bar 33 as it is moved up and down, as indicated by the arrow 34. However, in the design of FIG. 3, the purpose of moving the carriage bar 33 up and down is not to align the spray gun head with a particular supply hose, but rather to move the spray head relative to the work.

As in the embodiment of FIG. 2, the carriage bar 33 in FIG. 3 is provided with a toothed rack 35 that is engaged by a drive mechanism 37 under the control of the computer mechanism 39. The end of each paint line or hose 32 is attached to and supported on carriage bar 33, and the terminal end of each hose 32 is connected to a different one of the spray heads 31. Each of the paint lines or hoses 32 is provided with its own vertically operated valve 38 which may be controlled from the computer mechanism 39. The computer mechanism 39 may be controlled by input data contained on punch cards 40.

The computer mechanism 39 includes impulse stations 41 which are arranged to be activated according to punched-out holes 42 in data punch cards 40. Thus, in the example illustrated in FIG. 3 of the drawing, the punch card A, is provided with a punched-out hole 42 for activating one of the impulse stations 41 which in turn activates one of the valves 38, as for example, the valve 38 in the black color line. Another punched-out hole 43 in card 40 serves to actuate the travel mechanism 37 to move the carriage bar 33 up and/or down to cause the active spray head 31 to travel in a vertical direction alongside of and between the upper and lower limits of the work piece 44.

Various modifications may be made within the scope of our invention as defined in the claims appended hereto.

What we claim is:

1. Automated equipment for applying fluid treatment to production-line work products, said equipment comprising:
   a. a plurality of fluid supply lines;
   b. support means for supporting the discharge ends of said fluid supply lines aligned along a common path;
   c. common spray gun means;
   d. connector means adapted, when actuated, to connect said common spray gun means to the discharge end of one of said supply lines;
   e. a source of electrical control signals,
   f. input data means for controlling said control signals;
   g. carriage means for carrying said connector means along said common path to and from selected positions, said carriage means including:
      g-1. a carriage bar having a toothed rack at one end thereof;
      g-2. means for supporting said carriage bar in front of said aligned discharge ends of said fluid supply line;
      g-3. gear drive means in engagement with said toothed rack for moving said carriage bar in its lengthwise direction to carry said connector means to a position for connection to a selected one of said fluid supply lines in accordance with applied control signals;
   h. actuator means for actuating said connector means;
   i. first circuit means connecting said source of electrical control signals to said carriage means for controlling the movement of said connector means along said common path and
   j. second circuit means for connecting said source of electrical control signals to said actuator means for actuating said connector means for operatively connecting said connector means successively and in selected sequence to selected ones of said fluid supply lines.

2. Apparatus according to claim 1 characterized in that said actuator means for said connector means includes solenoid means for moving said connector means into and out of engagement with the discharge ends of said fluid supply lines in accordance with applied control signals.

3. Apparatus according to claim 2 characterized in that said input data means for controlling said control signals includes punched card data means.