United States Patent

Carbonetti, Jr. et al.

[15] **3,674,207**

[45] **July 4, 1972**

[54] AUTOMATED PAINT SPRAY SYSTEM

[72] Inventors: **Emidio J. Carbonetti, Jr.**, 658 Ruskin Lane, Yeadon, Pa. 19050; **Lewis Conover**, 1146 Taylor Drive, Folcroft, Pa. 19032

[22] Filed: **Nov. 6, 1970**

[21] Appl. No.: **87,536**

[52] **U.S. Cl.**.....**239/69**, 239/305, 239/397, 239/588, 118/7, 118/323

[51] **Int. Cl.**.....**B05b 13/00**

[58] **Field of Search**.....118/2, 7, 8, 9, 323; 239/69, 239/184, 186, 304, 305, 391, 397, 442, 444, 588

[56] **References Cited**

UNITED STATES PATENTS

2,257,004	9/1941	Fleming	239/305 X
3,274,860	9/1966	Gauthier et al.	239/186 X
3,477,870	11/1969	Boretti et al.	118/2 X
3,084,870	4/1963	Hagadorn	239/305
3,135,467	6/1964	Greenman	239/304

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—John J. Love
Attorney—Paul & Paul

[57] **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

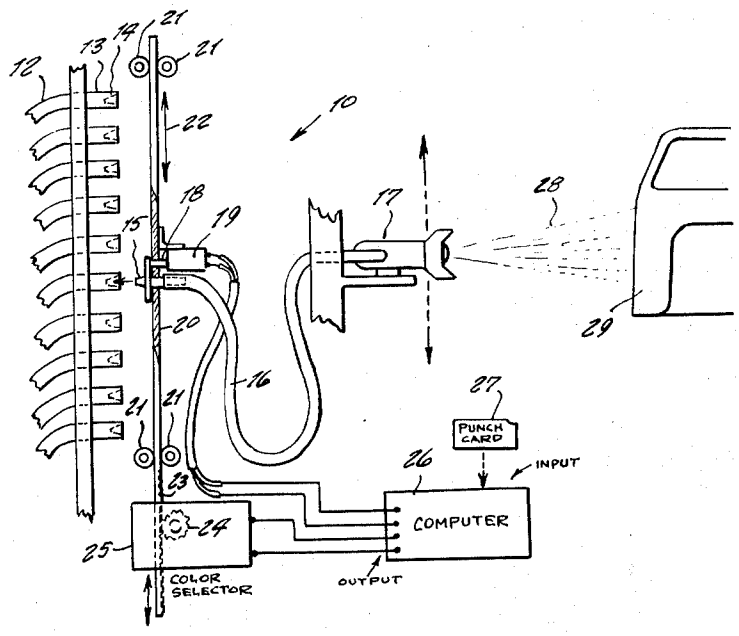


Fig. 1

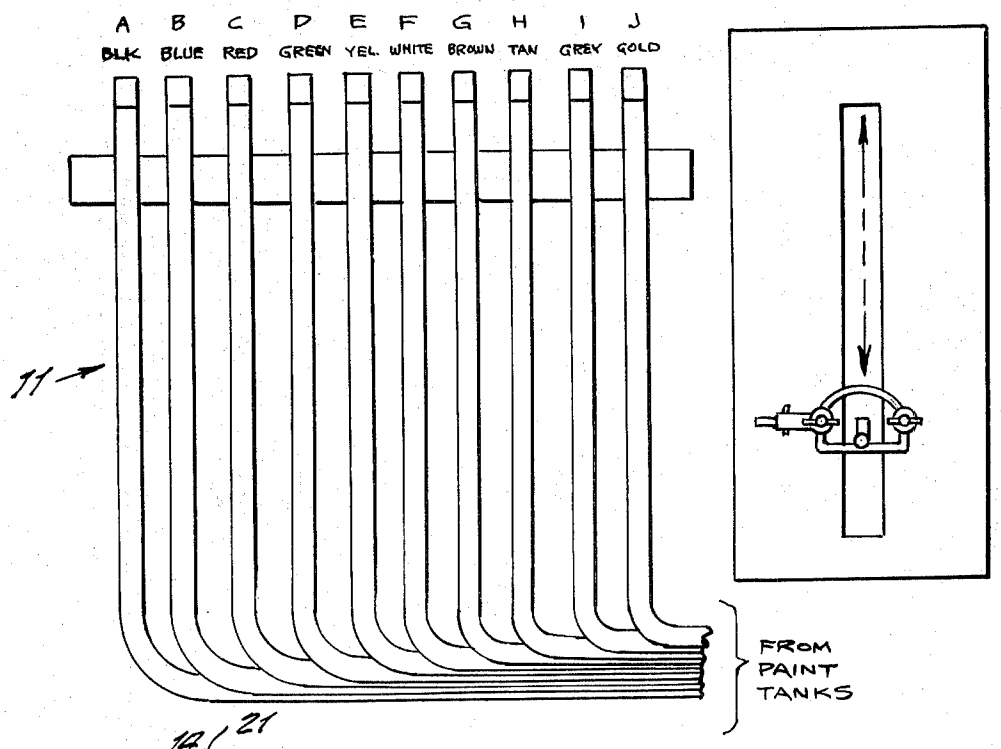
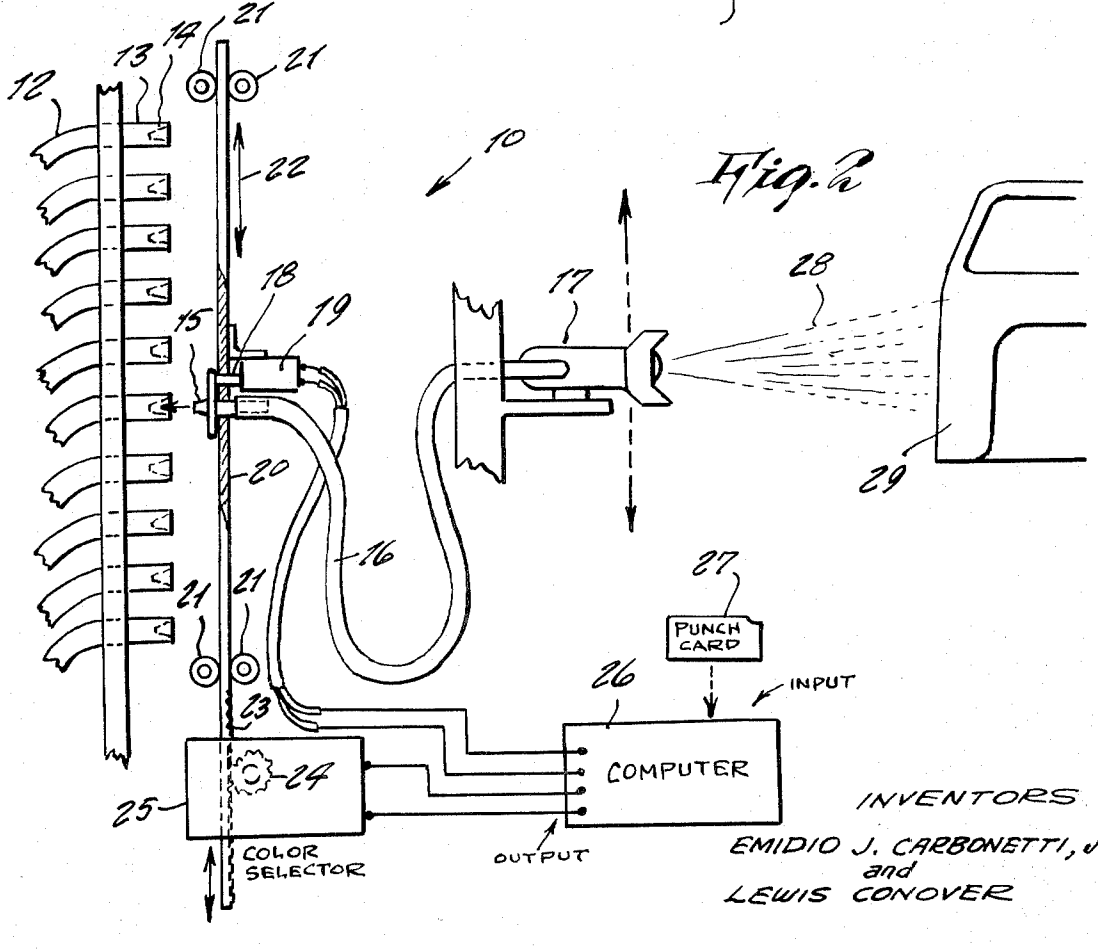


Fig. 2



INVENTORS
EMIDIO J. CARBONETTI, JR
and
LEWIS CONOVER

Fig. 3

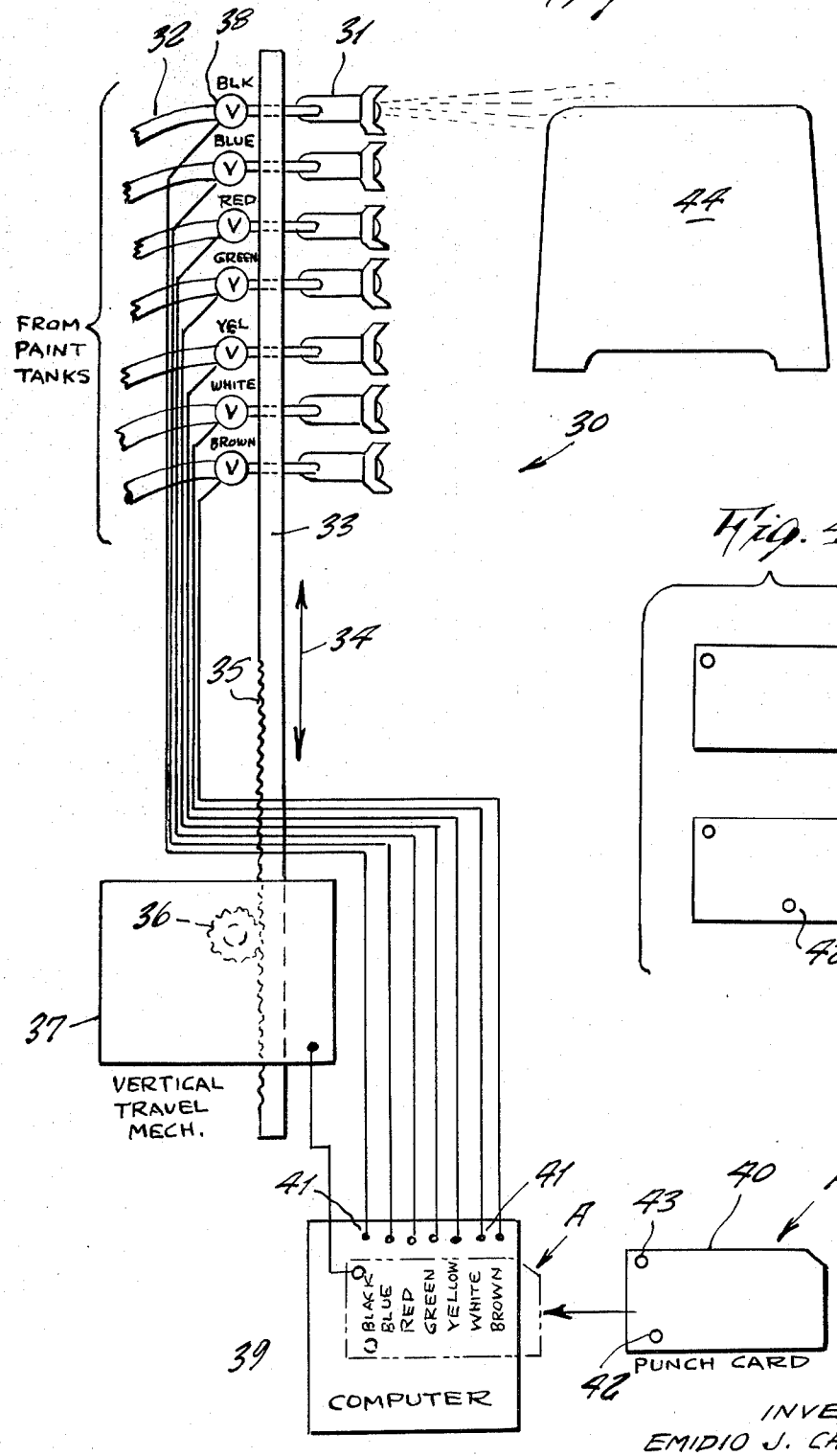
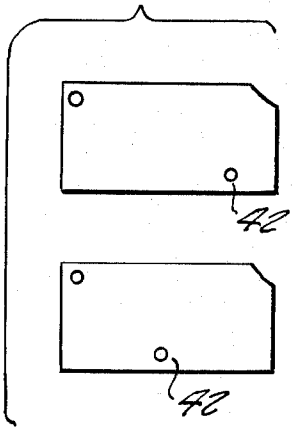


Fig. 4



INVENTORS
EMIDIO J. CARBONETTI, JR.
and
LEWIS CONOVER

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 will 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 on a production line tends 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 wi-l 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 valve **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 plunger **18** of a solenoid **19** which is fixed mounted upon 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 **10** 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 **10** 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 gear **36** driven by a vertical travel 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 electrically 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.

* * * * *