

[54] SEMI-AUTOMATIC COLOR CHANGE
SYSTEM FOR PAINT SPRAY
INSTALLATION

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Related U.S. Application Data

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1967, Pat. No. 3,572,366, which is a
continuation-in-part of Ser. No. 440,736, March 18,
1965, Pat. No. 3,348,774.

[52] U.S. Cl. 239/70, 239/112, 239/120

[51] Int. Cl. B05b 15/02

[58] Field of Search 239/70, 61, 62, 104, 106,
239/112, 113, 120, 124; 222/144.5; 137/240

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[57] ABSTRACT

A semi-automatic color change system for a paint spray installation is disclosed herein. The system includes selectively actuatable valving and controls uniquely arranged therefor in a manner to provide for the delivery of paint to a spray gun nozzle under comparatively low pressure during painting stages and to provide for the delivery of solvent to the same nozzle under comparatively high pressure during solvent flush or purge stages. Additionally, provision is made to discharge automatically or to dump paint in the spray nozzle and the paint supply lines into a reclaim receptacle prior to a solvent purge and preparatory to a "color-change" stage. The "dumping" is effected at high pressures. The selected employment of high pressures enables the purging and the recharging of the system with a new color paint to take place with great rapidity.

5 Claims, 7 Drawing Figures

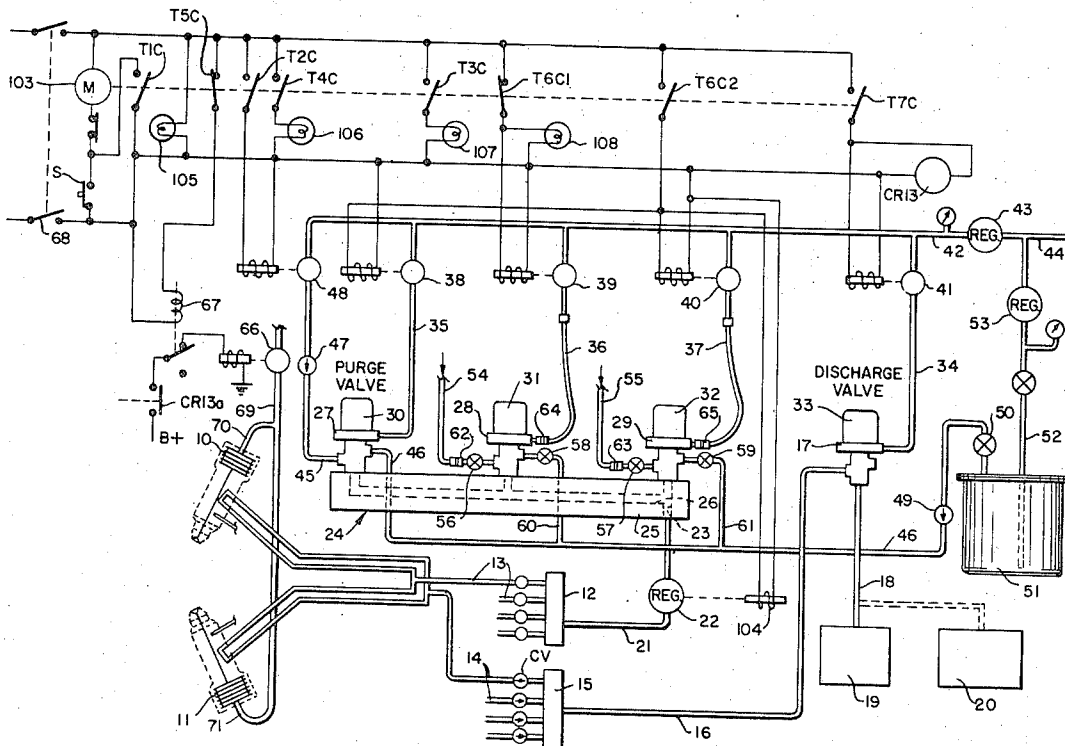
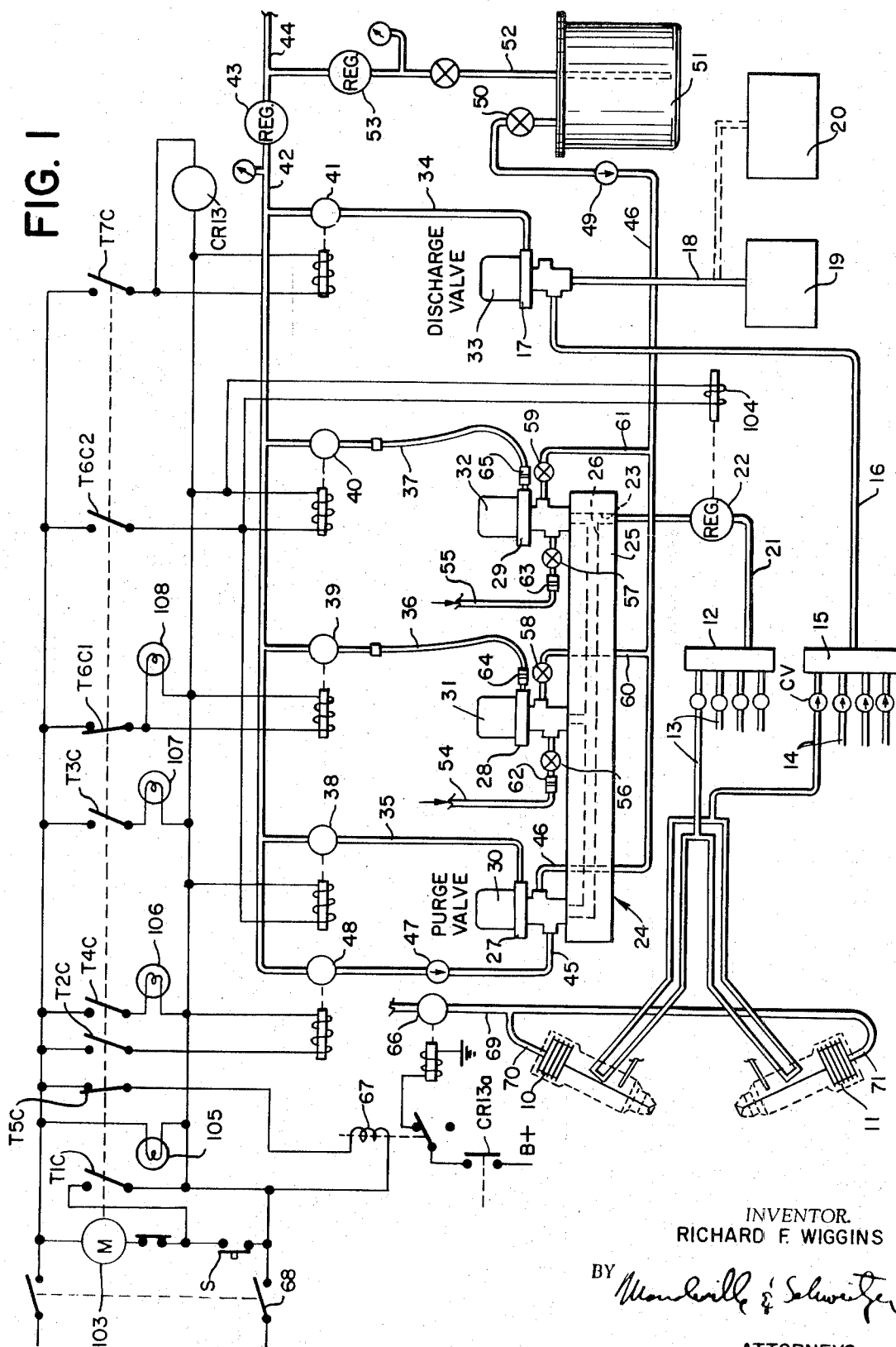


FIG. 1



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FIG. 2

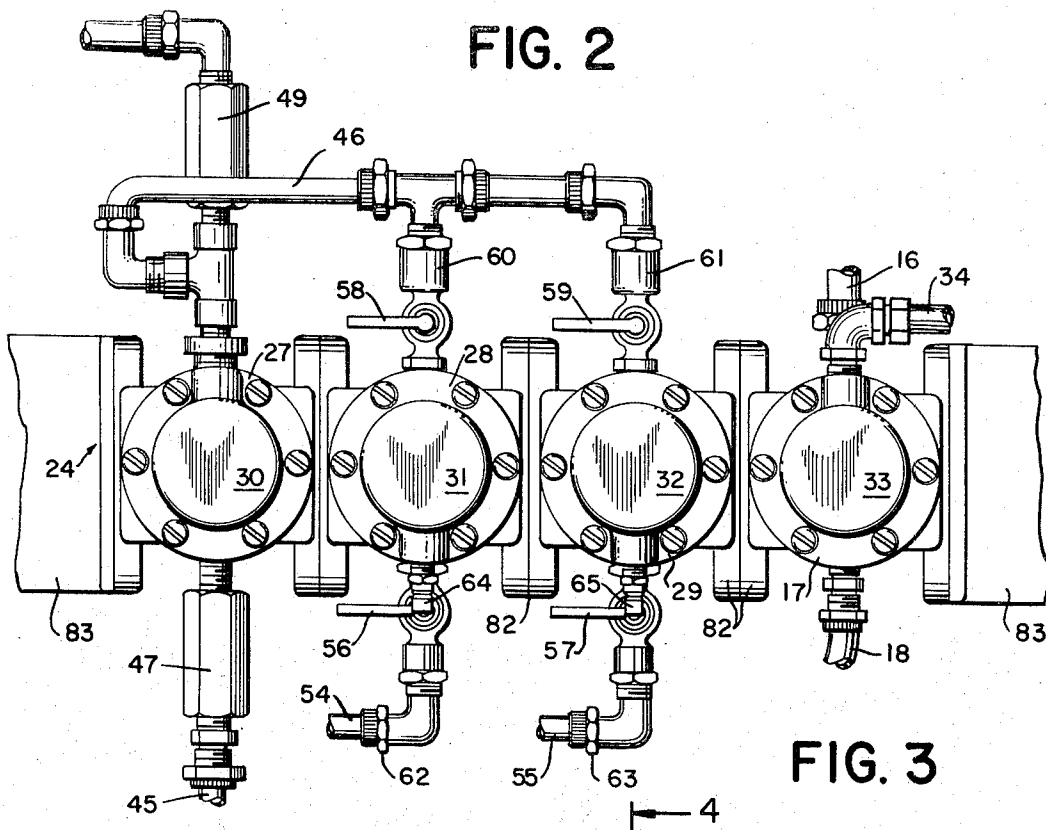
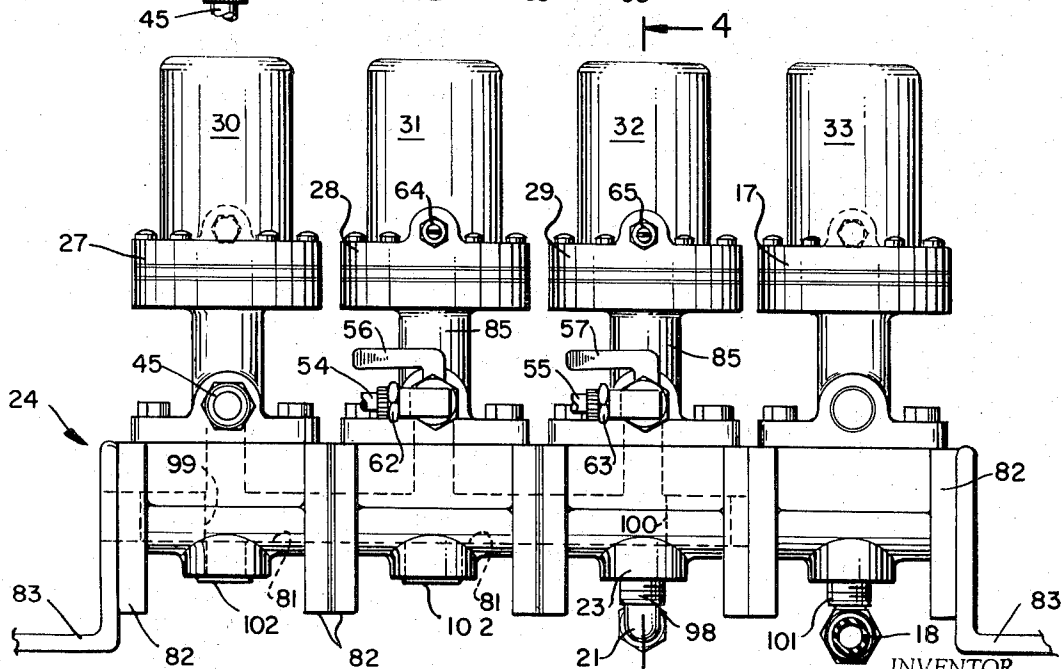


FIG. 3



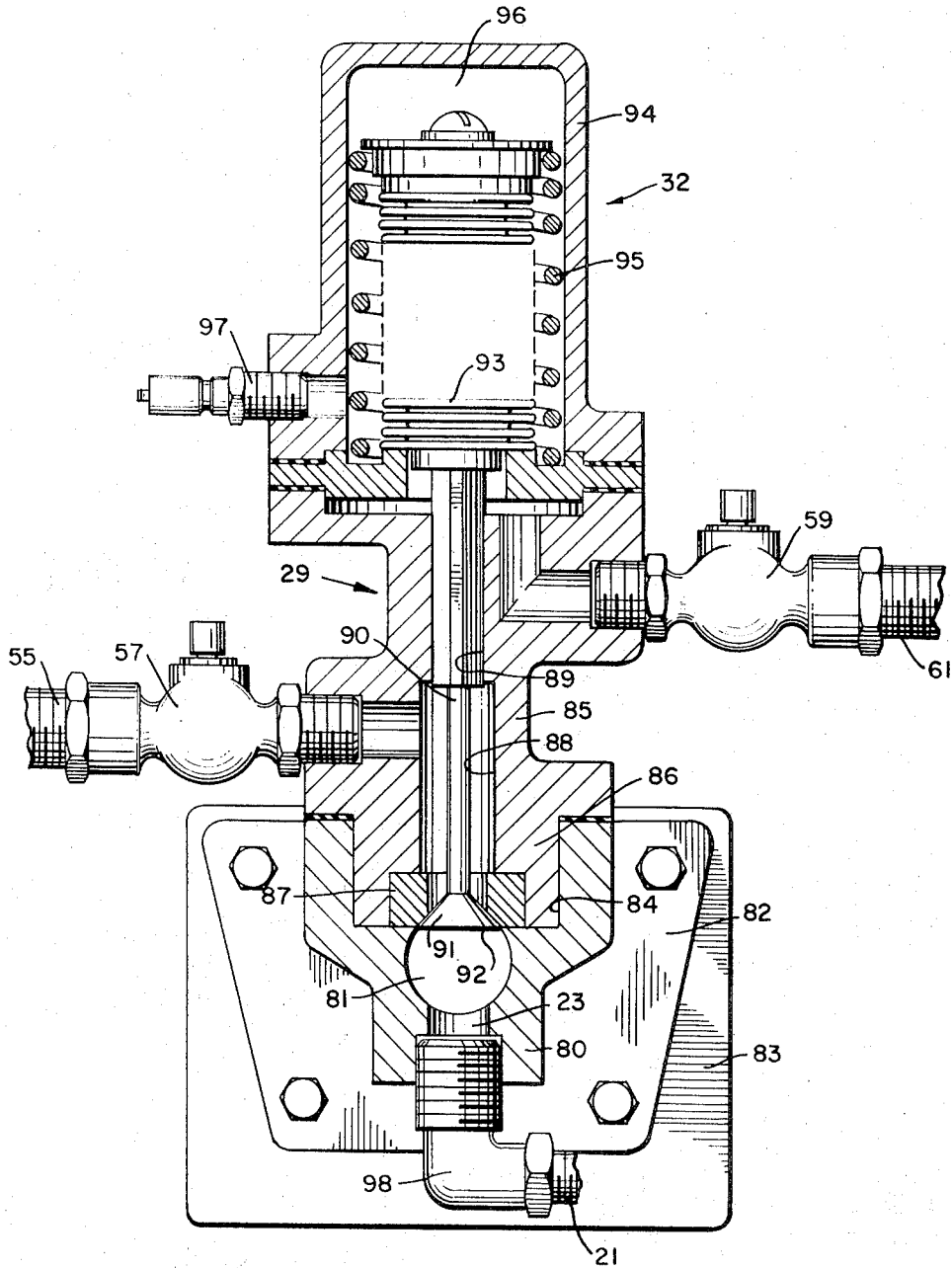
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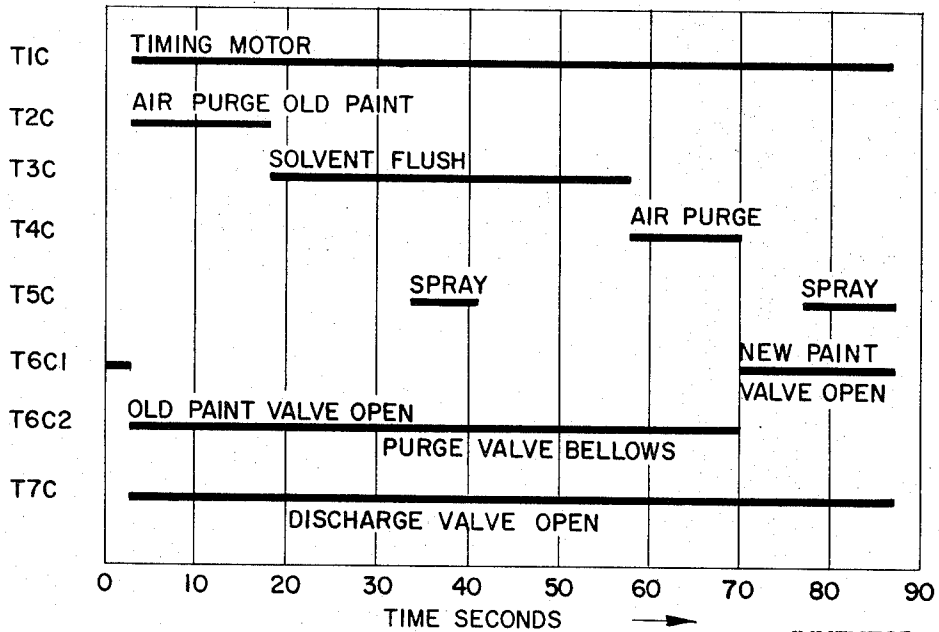
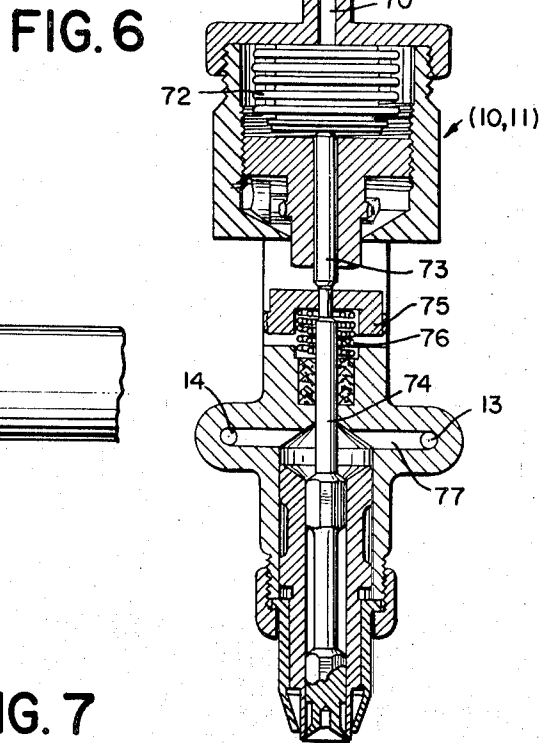
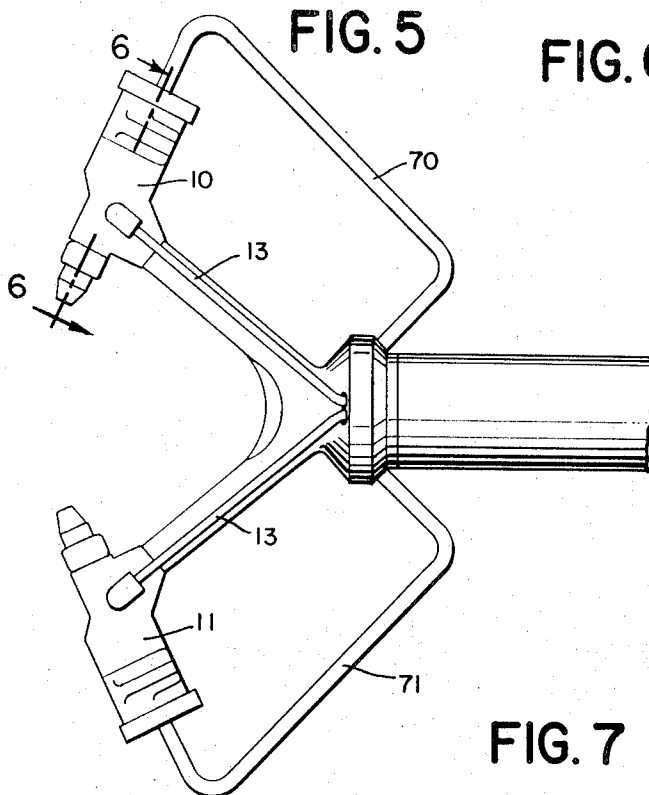
FIG. 4



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SEMI-AUTOMATIC COLOR CHANGE SYSTEM FOR PAINT SPRAY INSTALLATION

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of copending application Ser. No. 676,824, filed Oct. 20, 1967, now U.S. Pat. No. 3,572,366, which is a continuation-in-part of original application Ser. No. 440,736, filed Mar. 18, 1965, now U.S. Pat. No. 3,348,774, for "Semi-Automatic Color Change System For Paint Spray Installation".

The present invention relates to industrial paint spray installations, and is directed more particularly to novel and improved semi-automatic arrangements for facilitating the changing from one paint color to another with a minimum expenditure of time, paint loss, and area or spray booth contamination.

Industrial paint spray lines commonly are called upon to supply paint in a variety of colors in regular, day-to-day production. Theoretically, it would be possible to provide a completely separate paint spray system for each color used in regular production, but this would be impractical in most instances, because of the high cost of the initial installation and the undue complication of the controls and other facilities. Accordingly, it is customary to provide arrangements for purging and flushing out the paint spray system to remove all residue of a first-used paint color, after which the system is filled with paint of a second color and readied for further production. Particularly where the paint spraying procedure is carried out on a production line basis, with extensive conveyors and related facilities, it is important to effect the change-over from one paint color to another very quickly on a controlled and predictable basis so that there is a minimum of lost production. At the same time, it is desirable from an economy standpoint to eliminate or minimize wastage of residual paints purged from the system during change-over, as well as of the purge fluids themselves. The present invention is directed to an improved and simplified apparatus which enables the foregoing objectives to be met in an automatic and efficient manner avoiding spray booth contamination with an installation of control facilities of essentially simplified nature.

In accordance with one aspect of the invention, an otherwise relatively conventional paint spray installation is provided with a fluid supply system including a plurality of paint valves and a purge fluid valve, all connected in series, with the purge valve being upstream of the paint valves. The paint spray nozzle or nozzles, supplied from the paint valves, are, in addition, provided with discharge lines leading to a controllable discharge valve. In conjunction with the beforementioned control valves, there are provided pressurized supplies of paints, purging solvent and purging air, and a novel, simplified sequencing control system for effecting timed actuation of the various control valves and other control elements of the system on an automatic basis, whereby purging and recharging of the system is carried out quickly and with utmost efficiency.

In addition to providing a novel and simplified overall system, the invention is directed in part to the provision of control valves which are novel and improved in themselves and which are utilized to particular advantage in the overall system. According to the invention, control valves used for purge fluids, paints of various

colors, and for discharge may all be of substantially identical construction, arranged to be secured in side-by-side relation. Each of the valves, except the discharge or dump valve, has a flow housing portion provided with a through-flow passage, such that, when the individual flow housings are secured together, a continuous common flow passage of smooth and relatively uniform cross-section on the discharge side of the valves is provided. Where necessary or desirable to isolate one flow housing from another, as in the case of isolating the discharge valve from the other valves of the present system, a plug may be inserted at the end of a flow housing.

In accordance with the invention, an assemblage of individual control valves as described above presents a series flow passage of smooth and substantially uniform cross-section into which the individual control valves discharge. With respect to the downstream valves, at least, each is provided with a controllable valve element which, when closed, forms part of the smooth and substantially uniform flow passage. In the assemblage, the valve positioned farthest upstream controls purge fluids, and these fluids travel downstream past the individual color paint valves, efficiently cleansing the system of unwanted paint of the previously used color.

In accordance with one specific aspect of the invention, an assemblage of valves of the type mentioned above may include a separate, individual control valve for each of a substantial plurality of paint colors regularly utilized in production. As a simplified alternative for smaller installations, the system may be arranged for the utilization of only two paint control valves, with a valve for a previously used paint color being completely purged and cleaned during change-over to a new color. During the next subsequent color change, the previously purged valve is connected to accept any desired new color of paint. An ideal system according to the invention may advantageously comprise a given number of separate paint control valves which are connected at all times to respective regularly used paint supplies, in conjunction with a pair of alternately usable control valves arranged for selective connection to any of a large variety of less frequently used paint colors.

For a better understanding of the invention, reference should be made to the following detailed description and to the accompanying drawing, in which:

FIG. 1 is a simplified, schematic representation of an industrial paint spray installation incorporating the color change system of the invention;

FIG. 2 is a top plan view of a control valve assemblage incorporating features of the invention and suitable particularly for utilization in the system of FIG. 1;

FIG. 3 is a front elevational view of the assemblage of FIG. 2;

FIG. 4 is an enlarged cross-sectional view taken generally on line 4—4 of FIG. 3;

FIG. 5 is a fragmentary plan view showing details of a paint spray head adapted for utilization in the system of FIG. 1;

FIG. 6 is an enlarged, fragmentary, cross-sectional view taken generally on line 6—6 of FIG. 5; and

FIG. 7 is a time-function chart reflecting the sequence of events which occurs in a color change cycle.

Referring now to the drawing, and initially to FIG. 1, the reference numerals 10, 11 designate paint spray nozzles of a typical industrial paint spray installation.

Advantageously, the paint spray head of which the nozzles 10, 11 form a part, are Gyromat ULPE electrostatic heads, made available by The Gyromat Corporation, Stratford, Conn., although the invention is not limited to paint spray heads of this specific design.

In a typical installation, there may be a number of spray heads simultaneously spraying the same paint color, and these would be fed with paint from a manifold 12 supplying individual paint supply lines 13. In the system of the invention, each of the spray guns 10, 11 also has a discharge, leading to a discharge line 14 and, where there are a number of guns, into a discharge manifold 15. The discharge manifold leads through a discharge line 16 through a normally closed, controllable discharge valve 17 to a discharge outlet 18. As will appear, the discharge outlet may be associated with a reclaim receptacle 19 or a disposal receptacle 20, as may be expedient.

The supply header 12 is connected through a supply line 21 and a pressure regulating valve 22 to the outlet port 23 of a control valve assemblage generally designated by the numeral 24, to be described in greater detail herein. In general, the control valve assemblage includes a housing assembly 25, providing an internal flow passage 26 of smooth and substantially uniform cross-section. The flow passage 26 communicates at its upstream end with the outlet of a purge fluid control valve 27 and at selected downstream points with individual paint control valves 28, 29. For the purpose of the present illustration and description, only two individual paint control valves are illustrated, as all of the relevant principles of the invention may be incorporated in a two-color system. However, it will be understood that more extensive, high production systems may be assembled utilizing a greater number of individual paint control valves where desired. Each of the paint control valves has its valve outlet communicating with the main flow passage 26 of the housing assembly 25 for controllably directing paint of a selected color into the system.

Where more than one spray gun is served by the same delivery system, as in the illustration of FIG. 1, it is customary to provide each gun with a separate regulator R, which may be independently adjusted. In such cases, all of the discharge lines 14 include individual check valves CV, so that all lower pressure lines will be isolated from higher pressure lines when the discharge valve 17 is closed.

Each of the principal control valves 17 and 27-29 of the illustrated system is pneumatically or electrically actuated and, for this purpose, includes an actuating bellows 30-33 connected by means of control lines 34-37 and individual solenoid operated actuating valves 38-41 to an air supply line 42. The supply line 42 is, in turn, connected through a pressure regulator 43 to the main source 44 of compressed air. By controlled, timed actuation of the actuating valves 38-41 control is established over the opening and closing of the control valves 17, 27-29, as will be understood.

Advantageously, and as will be described in more detail, each of the primary control valves has two inlets controlled by the valve elements and arranged to discharge fluid into the main flow passage 26 when the associated primary control valve is open. Thus, the purge valve 27 has its inlets connected to a purging air supply line 45 and a purging solvent supply line 46. The air supply line 45 is connected through a check valve 47

and a solenoid operated control valve 48 to the air supply line 42. The arrangement is such that, when the control valve 48 is open, air under pressure is supplied to the purge valve 27, for discharge into the system upon opening of the purge valve. The solvent supply line 46 is connected through a check valve 49 and shut-off valve 50 to a solvent supply container 51. The solvent supply is maintained under pressure by an air supply line 52 leading through a shut-off valve and a pressure regulator 53 back to the main air supply source 44. For reasons which will become apparent, the output side of the pressure regulator 53 is significantly lower than the output side of the regulator 43, such that, in a typical installation, the air supply line 42 is under about 60 pounds pressure (psi), while the solvent system is maintained under about 40 pounds pressure.

The paint control valves 28, 29 have their inlets connected to individual paint supply lines 54, 55 through shut-off cocks 56, 57. Second inlets of the paint control valves are connected through shut-off cocks 58, 59 with solvent supply lines 60, 61. In the illustrated system, in which the paint supply valves 28, 29 are intended to accommodate a larger number of paint colors, the paint supply lines 54, 55 are provided with quick disconnect couplings 62, 63, by means of which the valves may be quickly connected with additional paint supply lines (not shown). In accordance with one aspect of the invention, the control lines 36, 37, which may be referred to for convenience as paint control and purge control lines, respectively, are connected to selected paint control valves by means of quick disconnect couplings 64, 65. In this respect, it is contemplated that, regardless of the number of paint control valves utilized in the system, all would be serviced by a single paint control line 36 and a single purge control line 37.

Control over the opening and closing of the spray heads 10, 11 is effected by means of a master solenoid valve 66 which is energized from an independent, separately controlled source indicated by the B+ and "ground" designations at the left in FIG. 1. Assuming that the B+ supply has not been switched out by the other control facilities (not shown), it can energize the solenoid of the master valve 66 through normally open contacts CR13a of a control relay CR13 and normally closed contacts of an energized control relay 67. The relay 67 is kept energized through a normally closed switch T5C when the system power is on through switches 68 and the equipment has not been energized to carry out a color change cycle. When the master control valve 66 is in its de-energized condition, air under pressure is supplied through lines 69 to individual control conduits 70, 71 (see FIGS. 5 and 6) leading to the respective spray heads 10, 11.

As shown particularly in FIG. 6, each of the spray heads has an actuating bellows 72 which, when acted upon by the control air, advances a plunger rod 73 to project a valve stem 74 through a predetermined valve opening stroke determined by the setting of an adjusting nut 78. A return spring 76 acts upon a nut 75 to reclose the valve when control air pressure is removed.

While specific details of the spray heads do not form a part of the present invention, the spray heads, for the purpose of incorporation into the overall system of the invention, include paint supply chambers 77 communicating with the paint supply lines 13 and discharge lines 14. Additionally, the spray heads are supplied with at-

omizing air facilities (not shown) in accordance with known practices.

With reference now to FIGS. 2-4, there is shown a control valve assemblage according to the invention, which is particularly suited for incorporation in the system of FIG. 1. The illustrated assemblage includes four control valves of substantially identical construction, the individual features of which are illustrated in FIG. 4. Thus, each valve includes a flow housing 80 provided with a longitudinal flow passage 81 extending from one end to the other. At its end extremities, the flow housing is provided with outwardly extending flanges 82 adapted to be bolted or otherwise secured to the similar flanges of adjacent valves or to mounting brackets 83.

In the upper portion of each of the flow housings 80, there is a machined recess 84 which extends downward and into open communication with the longitudinal flow passage 81, which is horizontally oriented in the illustrated arrangements. A valve housing 85 having a downwardly projecting machined boss 86 is secured in fluid-tight relation to the flow housing 80, with the boss 86 being received in and maintained in sealed relation with the recess 84. The valve housing 85 is provided at its lower end with a hardened and ground valve seat 87 of annular form, the opening of which communicates with a lower, primary valve passage 88 and an upper, secondary valve passage 89.

An elongated hardened and ground valve stem 90 extends through the valve passages 88, 89, being slidably guided in the secondary valve passage 89. At its lower end, the valve stem has a conical valve head 91 which closes against the annular valve seat 87 in the manner shown, such that the lower surface 92 of the valve head forms part of the wall of the flow passage 81. The arrangement is such that the flow passage 81, from one end to the other of the flow housing 80, is smooth and relatively uniform in cross-section, affording a relatively minimum opportunity to form eddies and collection pockets which would reduce the efficiency of clean-out.

At its upper end, the valve stem 90 connects with a bellows element 93 which is located within a bellows housing 94 and forms a seal between the housing and the valve passage 89. The bellows is normally urged upward by a spring 95, but is actuated in a downward direction by introduction of pressure fluid (air) into the bellows chamber 96 through a quick disconnect control air fitting 97.

The specific valve illustrated in FIG. 4, which is the downstream paint valve 29, has its flow passage plugged on the downstream side and is provided with a fitting 98 in its bottom outlet port 23, which causes the fluid flow to be discharged into the supply line 21. The valve is also connected to the solvent line 61, through stop cock 59 and to the paint supply line 55 (downstream of the quick disconnect fitting 63) through the stop cock 57. The paint supply discharges into the primary valve passage 88, while the solvent supply discharges into the secondary valve passage 89, upstream of the paint supply.

In accordance with the invention, a complete installation advantageously incorporates a unitized bank of primary control valves, including the discharge valve 17 and purge valve 27, as well as paint valves 28, 29. Actually, the discharge valve 17 may be located elsewhere in the installation, without inconvenience, but it is particularly advantageous for the purge valve and

paint control valves to be arranged in a unitized bank, as shown in FIGS. 2 and 3. Thus, a series of primary control valves including the purge valve and as many paint control valves as may be desired to be used in the system are assembled in end-to-end relation, with their respective flanges 82 in abutting relation and secured together in a fluid-tight manner by bolts or other suitable means (not shown). The arrangement is such that the flow passages 81 of the respective flow housings are aligned and in communication to form an elongated, relatively smooth passage of relatively uniform cross-section from one end to the other.

In a complete assembly of valves, a suitable plug 99 is inserted in the upstream end of the flow passage of the purge control valve 27, while a similar plug 100 is inserted in the downstream end of the flow housing of the downstream paint valve 29. Other suitable plugs close off two of the three openings of the flow housing for the discharge valve 17, while the remaining opening, advantageously at the bottom, is connected with the discharge line 18 through a fitting 101. The discharge valve is thus isolated from the other valves of the installation.

As shown in FIG. 3, suitable plugs 102 close off the bottom outlets of the upstream control valves, while the discharge outlet 23 in the bottom of the downstream control valve 29 is connected with the supply line 21 through the fitting 98.

The entire bank of control valves, as shown in FIGS. 2 and 3, forms a convenient unitary assembly, which is secured at each end to suitable mounting brackets 83.

OPERATION OF EQUIPMENT

The operation of the system is best described with reference to a description of the sequencing timer arrangement illustrated in FIG. 1 and to the time-function chart illustrated in FIG. 7. Advantageously, the sequence timer is a conventional, electromechanical timer including a timing motor 103 arranged to operate through a timing cycle and actuate a plurality of timer switch contacts T1C-T7C by means of a plurality of preset cams (not shown) which may be individually adjusted with respect to the several switch contacts to achieve a desired timing sequence, in accordance with conventional techniques.

When the system is operating and in readiness for color change, the timing power supply switch 68 will be closed and typically, although not necessarily, the spray heads 10, 11 will be in operation. Under assumed initial conditions, the actuating valve 39 is open and the paint control valve 28 previously has been actuated to an open condition supplying a paint to the system. The paint stop cock 56 is open and the solvent cock 58 is closed so that a first color paint is being supplied through the line 54 and valve 28 and into the main flow passage 26 of the valve assemblage. The actuating valve 40 and therefore its associated paint control valve 29 is de-energized and closed, as are the actuating and control valves 38, 27 for controlling purge fluids. The stop cocks 57, 59 associated with the paint control valve 29 are closed. The air control valve 48 is de-energized and open, so that air under pressure is supplied to the closed purge valve 27, as is solvent under pressure through the unvalved line 46. The actuating valve 41 is de-energized and closed, as is its associated discharge valve 17.

To commence a color change cycle, a start button S is depressed momentarily to energize the timing motor 103. The start button is held closed until the motor advances slightly, enough to close holding contacts T1C which are connected in parallel with the start switch. In a typical 90 second color change cycle, it is contemplated that the holding contacts T1C will close in about 3 seconds. They will thereafter remain closed until reopened by the cam to stop the motor and terminate the timing cycle.

Simultaneously with the closing of the holding contacts T1C, timer contacts T2C, T6C2 and T7C are closed and contacts T6C1 are opened.

The closing of timer contacts T7C causes the energization of the control relay CR13 which closes contacts CR13a in the B+ energizing circuit of the master solenoid valve 66, such that the valve is energized and closed to shut off the spray heads. The closed contacts T7C also energize the actuating valve 41, admitting pressure fluid to the line 34 to the bellows of the discharge valve 17, so that the discharge lines 14-16 are placed in communication with the reclaim or disposal containers 19, 20, as the case may be. Typically, in order to conserve paint for reuse, the discharge lines are connected to the reclaim container 19, at least during the initial stages of the color change cycle, when reusable paint is being purged from the system.

Opening of the timer contact T6C1 effects de-energization of the actuator valve 39, closing off the air supply to the thenactive paint control valve 28 to close this valve and block off any further flow of paint to the system. The companion timer contact T6C2, when closed at the start of the cycle, simultaneously energizes actuating valves 38, 40 to admit pressure fluid through the lines 35 and 37 to open the purge fluid valve 27 and the inactive paint valve 29. When the stop cocks 57 and 59 closed, however, opening of the inactive paint valve is without consequence. Closure of contacts T6C2 also brings about the energization of a solenoid control 104 of the pressure regulator 22, which has the effect of decreasing the pressure drop across the regulator, enabling the purging and recharging of the system to take place with greater rapidity. Typically, the outlet side of the regulator 22 will have an operating pressure of about 5 psi, and this will be increased to about 20 psi when the solenoid 104 is energized but returns to its original setting at the end of the color change cycle.

Along with the closure of timer contacts T6C2 and T7C, contacts T2C are closed to actuate the air control valve 48 to an open condition. This immediately admits purging air into the now-open purge control valve 27, and this air, at a typical pressure of about 60 psi, advances through the flow passage of the valve assembly, through the supply lines 21, 13, and out through the discharge lines 14-16, through the discharge valve and discharge line 18, forcing the main body of paint through the system ahead of it and expelling it into the reclaim container 19. This initial air purge advantageously continues for a period of about 15 seconds.

During the air purge interval, the operator of the system carries out a sequence of manual operations comprising closure of the paint stop cock 56, switching the controlled pressure fluid lines 36, 37, so that the active control line 37 is connected to the just-used paint valve 28, while the inactive control line 36 is connected to the paint valve 29. Thereafter, the stop cocks 57 and

58 are opened to admit a second color paint up to the closed valve 29 and to admit solvent and purge air to the just-used paint valve 28, which is now open by admission of pressure fluid through the line 37. This sequence of manual operations may be carried out quickly and conveniently by reason of the quick disconnect couplings 64, 65 and the convenient grouping of the various stop cocks, so that the operations are completed well within the 15 second period during which air purging of the system is being carried out.

It will be understood that, during the initial air purge interval, an open solvent line is connected to the purge valve 27 and, after opening of the stop cock 58, also to the just-used paint valve 28. Nevertheless, solvent does not at this time enter the system because the purging air is at a substantially higher pressure than the purging solvent in the line 46, causing the solvent to be held back by the air. Solvent is not backed up in the line 46 by the higher air pressure, however, because of the interposition of the check valve 49 in the solvent supply line.

At the end of the air purging interval, the timer contact T2C is reopened, de-energizing and closing the purging air control valve 48. The purge control valve 27 remains open, however, and the solvent, with the restraining back pressure removed, advances through the purge valve and also through the just-used paint valve 28. The solvent travels through the paint supply lines and the discharge lines in the same manner as just described with respect to the purging air, cleansing residual paint from the system. Advantageously, the discharge line 18 is redirected at this time into the disposal container 20, or perhaps into a second reclaim container, so as not to contaminate the paint previously discharged into the reclaim container 19.

Advantageously, the solvent purge interval continues for about 40 seconds and, at some time during this interval, the timer contact T5C opens for a brief period, say 10 seconds, to de-energize the control relay 67 and momentarily de-energize and open the master control valve 66. This opens the spray heads 10, 11 for a brief interval, causing solvent to be discharged therefrom to cleanse the nozzle areas of residual paint which cannot be removed during the normal flow of solvent and air through the supply and discharge lines 13, 14. If desired, during this interval, the paint supply line 54 for the just-used color may be disconnected at the fitting 62, and a new supply line carrying a third color may be substituted therefor to supply new color paint up to the closed stop cock 56.

After a predetermined solvent flush period, timer contacts T4C are closed, and this re-energizes the purging air control valve 48, such that the flow of purging air is reestablished, and further solvent flow is stopped by reason of the higher back pressure of the purging air. The second air purge interval is continued for a period of about 15 seconds, during which the solvent, with which the system is at that time charged, is purged forward out of the system and discharged into the disposal container 20. During this interval, the operator may close the solvent cock 58 associated with the just-cleansed paint valve 28.

At the end of the second air purge interval, timer contacts T6C are reactivated so that contacts T6C1 are reclosed and contacts T6C2 are reopened. Actuating valve 39 is thereupon energized and opened, actuating the paint valve 29 to an open condition and causing

paint of a second color to be discharged into the system. The activating valve 40 is at the same time deenergized and closed, to deactivate and close the previously used paint valve 28. Simultaneously, the regulator solenoid 104 is de-energized so that the output of the regulator is re-established at the normal, low pressure desired.

In order to fully charge the system with paint of the new color, an interval is provided during which the new color paint valve 29 is open and discharging paint into the system and the discharge valve 17 is open and discharging air.

The nozzle regions of the spray heads 10, 11 are, at this stage, filled with solvent, and it is desirable to reopen the spray head valves momentarily during the charging of the system with new paint, so that the residual solvent is discharged and the nozzles are "primed" with the new paint. This is brought about by reclosure of the timer contacts T5C during the paint charging interval.

After a paint charging interval of about 18 seconds, the timer contact T1C is opened, along with timer contact T7C. This de-energizes the motor 103 to end the color change cycle and simultaneously de-energizes the actuating valve 41 to close the discharge valve 17 and energizes the control relay CR13 to reactivate the spray heads 10, 11.

Advantageously, a series of indicator lights 105-108 is provided in connection with the sequence timer, to keep the operator apprized of the progress of the color change cycle. Thus, the indicator light 105 is arranged to be energized upon closure of the main switch 68, to indicate a "ready" condition. The indicator light 106 is energized by closure of either contacts T2C or T4C and indicates the carrying out of the air purge intervals, before and after the intervening solvent cleansing interval. As indicator light 107 is energized by timer contacts T3C, arranged to be closed simultaneously with the opening of the contacts T2C and to be opened simultaneously with the closure of contacts T4C. Thus, energization of the signal light 107 reflects the carrying out of the solvent cleansing interval. The signal lamp 108 is energized by closure of timer contacts T6C1 and reflects the actuated condition of whichever one of the paint control valves 28 or 29 is connected to the pressure fluid line 36 on the outlet side of the actuating valve 39.

In the just-described color change cycle, it has been assumed that the two paint control valves 28, 29 were being utilized to service a system supplying paint of a larger number of colors. In such cases, it is appropriate to supply solvent to the paint control valves, upstream of the paint inlets to the valves, in addition to supplying solvent to the purge valve 27, in order to cleanse the valves themselves of previously used paint. However, in installations where a separate paint control valve is provided for each color, internal solvent cleansing of a just-used paint valve would not be required, and it would not be necessary to provide the actuating valve 40 and its associated control line 37. In a combined system, there may be a plurality of paint control valves continuously serving an equal number of regularly used paint colors, advantageously combined with a pair of control valves arranged in the manner of the valves 28, 29 of FIG. 1, to handle a larger variety of relatively less frequently used colors. Where a control valve is assigned premanently to a given paint color, the valve it-

self need not, of course, be purged out during color change. Accordingly, the valve port which otherwise would serve as a purging solvent inlet can be utilized as a paint outlet and connected to the main paint supply for the assigned color. This enables the paint to be kept in continuous circulation, even when not in use.

The system of the present invention represents an advantageous combination of manual and automatic control facilities to provide an effective and relatively sophisticated color change cycle, which is economical of time and supplies and yet which can be installed without undue cost and complication.

It should be understood that the specific system and components herein illustrated and described are intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claims in determining the full scope of the invention.

I claim:

1. A semi-automatic color change system for a paint spray installation having predetermined color change cycles having multiple stages including at least one solvent flush stage, said system comprising
 - a. plural fluid delivery lines including at least two paint lines and one solvent line;
 - b. a valve controlled paint spray nozzle;
 - c. a fluid supply line communicating between said plural fluid delivery lines and said spray nozzle;
 - d. a fluid pressure regulator interposed in said fluid supply line and being selectively controllable between first and second conditions in which fluid leaves said regulator at comparatively high pressures and comparatively low pressures, respectively;
 - e. fluid pressure control means for said fluid pressure regulator to select the first or second of said conditions of operation in accordance with predetermined stages of said cycles; and
 - f. selective fluid delivery control means permitting the communication with said supply line of only one of said fluid delivery lines at a time.
2. The color change system of claim 1, in which
 - a. said selective fluid delivery control means includes remotely controlled fluid valves interposed in each of said fluid delivery lines;
 - b. all of said valves communicating directly with a manifold interposed between said valves and said fluid pressure regulator.
3. The color change system of claim 2, in which
 - a. said valves are pneumatically or electrically actuated.
4. The color change system of claim 2, in which
 - a. said fluid pressure regulator is electrically controlled between said first and second conditions.
5. The color change system of claim 1, which further includes
 - a. a reclaim tank;
 - a fluid discharge line communicating between said spray nozzle and said reclaim tank;
 - c. a selectively actuatable dump valve interposed in said fluid discharge line;
 - d. dump control means opening said dump valve for predetermined limited durations when said fluid pressure regulator is in a first condition and when one of said valves is arranged to admit air under high pressure into said fluid delivery lines;
 - e. whereby paint is reclaimed from said nozzle under comparatively high pressure.

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