May 24, 1955 D. J. PEEPS 2,708,898

SPRAY GUN CONTROL

Filed April 17, 1952

FIG-1-

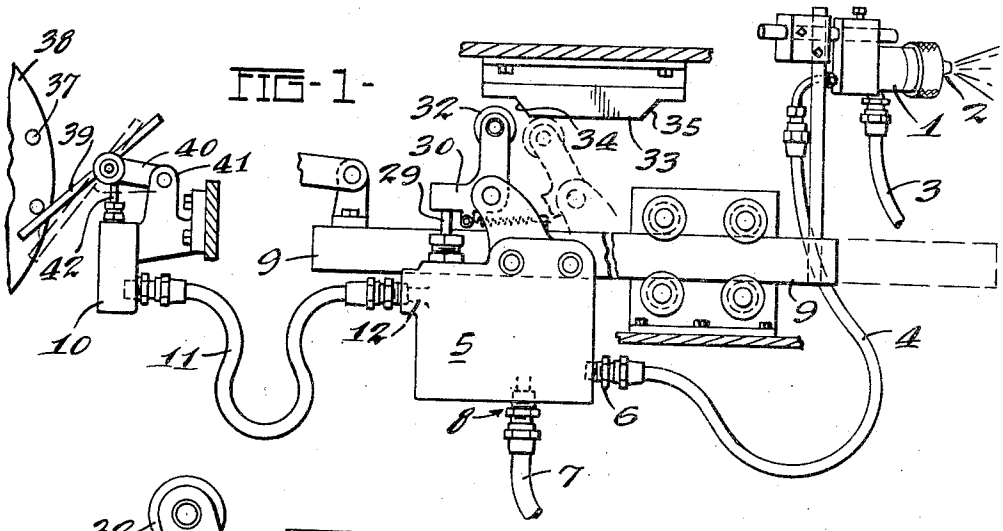
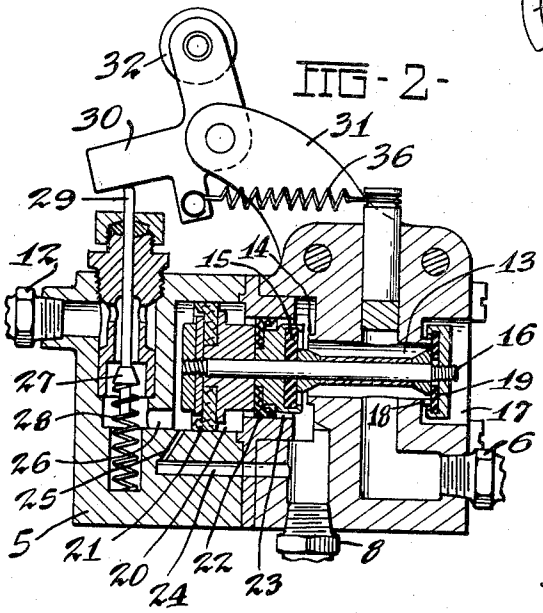


FIG-2-



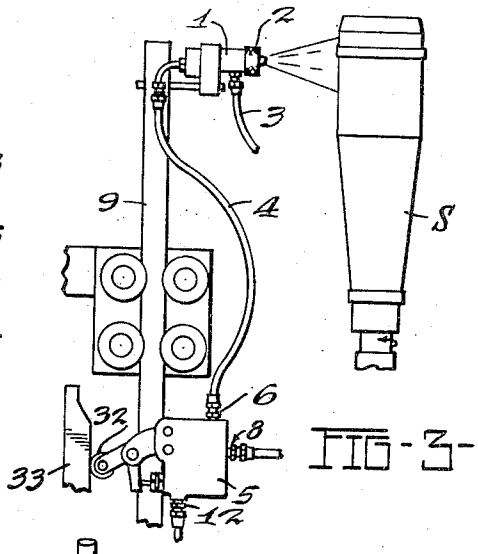


FIG-3-

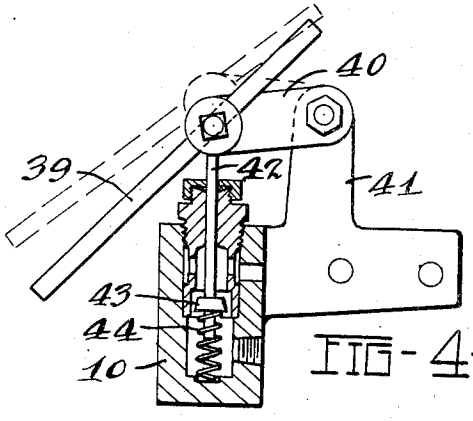


FIG-4-

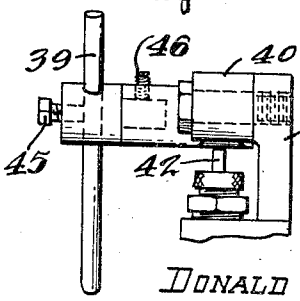


FIG-5-

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SPRAY GUN CONTROL

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6 Claims. (Cl. 118—8)

This invention relates to an air valve control arrangement for air actuated spray guns and particularly to such a control in which a combination of factors determine the functioning of the control.

In automatic spray coating apparatus spray guns are frequently mounted for movement in order to apply material over more of the full surface of the article being coated. Usually the spray gun discharges the coating material only during a certain portion of the spray gun movement. This is to avoid excessive deposit as well as to reduce the amount of overspray by passing the object.

The articles being coated are positioned at fixed intervals on supports on a conveyor which travels through the spray station where the spray guns are located. Due to various causes the supports on the conveyor are not always carrying articles. For instance the operator responsible for loading may be interrupted by supplemental duties. An inspector may find a defective article on the conveyor and remove it for corrective work or scrapping. Also the supply of articles received by the loading operator may be insufficient to maintain his stock.

When an article support without an article thereon reaches the spray station, waste of the coating material and troublesome dirtying of the support results unless the spray gun is kept from functioning.

This invention provides means for actuating the spray gun during only a predetermined part of its movement and only when there is an article on the support passing through the spray station.

This object is accomplished by having a single valve in the air line supplying actuating air to the spray gun and two separate elements which must both be actuated for opening the single valve. Through such means the invention provides a simple, effective arrangement for the purpose outlined.

Other advantages and objects will become apparent upon reading the following description with reference to the accompanying drawings, in which:

Figure 1 is a somewhat diagrammatic elevation of an embodiment of my invention including a reciprocably mounted spray gun, an air line for delivering actuating air to the spray gun, a valve assembly incorporating a single valve in the air line and a main vent valve, a supplemental vent valve, and separate means for opening the vent valves.

Figure 2 is a vertical section of the valve assembly of Figure 1;

Figure 3 is a fragmentary elevation of a spray gun and a munition shell being coated, similar to the showing of Figure 1 but with the gun mounted for vertical movement instead of horizontal.

Figure 4 is an enlarged elevation partly in section of the supplemental vent valve embodied in Figure 1; and

Figure 5 is a fragmentary side elevation of the supplemental vent valve.

In the embodiment of the invention selected for illustration the spray gun **1** has a discharge nozzle **2**. Coating material reaches the spray gun through hose **3** while

atomizing and actuating air is delivered to the spray gun through supply hose **4**.

In accord with long practice in the art the spray gun has an air piston therein connected to a needle valve controlling the discharge from the nozzle of the coating material. A gun of this type is shown in U. S. Patent #2,052,953, issued to R. W. Tracy on September 1, 1936. On delivery of air to the spray gun the piston is motivated thereby to pull the needle valve to open position. When the supply of air is discontinued and the air pressure released from the piston the piston through the effect of a spring returns the needle valve to closed position and thereby terminates the spray action.

The hose **4** is connected to the valve assembly **5** at the outlet connection **6**. Air from a supply source reaches the valve assembly through hose **7** connected to the air inlet **8**. The valve assembly **5** and the spray gun are mounted for joint reciprocating movement on a movable carriage **9**. The latter is driven by a crank, chain, or other suitable means.

The carriage is motivated by such mechanism when an article support on the conveyor reaches the range of the spray gun; the spray gun is thus moved relative to the article to bring successive surfaces of the article in line with the spray gun discharge.

The supplemental vent valve **10** is stationarily mounted. It is connected by a flexible hose **11** to the air exhaust outlet **12** of the valve assembly **5**. Hose **11** is of sufficient length not to hinder the movement of the valve assembly on the carriage.

Within the valve assembly **5** in a passage **13** joining the air inlet with the air outlet is the annular valve seat **14**. A valve **15** is reciprocably mounted in the passage **13** for closing the passage by sealing contact with seat **14**. This valve is assembled with other elements upon the elongated rod **16**. The assembly of parts on rod **16** is referred to hereafter as member A. An atmospheric vent opening **17** at one end of the passage **13** is encircled by an annular valve seat **18**. A valve **19** positioned on the end of rod **16** faces inwardly to meet seat **18**. Valves **15** and **19** are so spaced on the rod **16** that when one valve is in sealing contact with its seat, the other is in open position.

The other end of member A extends from the passage **13** into the cylindrical chamber **20**. A cup leather **21** integral with the member has a sliding fit in the chamber. Between the large cup leather **21** and valve **15** is a smaller cup leather **22** fixed to the member A. This has sliding fit within cylindrical bore **23** of reduced diameter in respect to that of enlarged cylindrical chamber **20**. The outer or right hand face of the smaller cup lever **22** is subject to the pressure of the air from an inlet **8**. The inner or left hand face of the large cup leather **21** is also subject to the pressure of such air reaching chamber **20** through bore **24** and metering passage **25**. Because of the greater area of cup leather **21** compared to that of the smaller cup leather **22**, the air pressure against the former moves the member A to the right as viewed in Figure 2.

This seats valve **15** and thereby shuts off the flow of air to the spray gun and opens valve **19** thereby venting the air from air supply hose **3** and the spray gun. The spray gun thus becomes inoperative.

Communicating with the inner end of the chamber **20** is exhaust opening **26**. The flow of air therethrough is primarily controlled by the main vent valve **27** and secondarily controlled by the supplemental vent valve **10**. When these valves are both open air pressure within chamber **20** is immediately released as the metering passage **25** is too restricted in size to pass enough air to maintain the pressure.

Consequently member A is promptly moved to the left

to the position shown in Figure 2 by the pressure of the air upon the cup leather 22, opening valve 15 and closing valve 19. Compressed air is thus again delivered to the spray gun for actuation thereof. The spray gun discharge action continues until either or both the main and supplemental vent valves are closed permitting pressure against cup leather 21 to be reestablished. This pressure build-up occurs almost instantaneously due to the small capacity of the chamber 20 and the passages communicating with the vent valves.

The main vent valve 27 is yieldably held to its seat by spring 28. The exteriorly extending valve stem 29 has engaging contact with a leg of the rocker 30. The rocker is pivotally supported between the arms of yoke bracket 31. On the end of the other leg of the rocker is a roller 32. Adjacent the path of the joint reciprocating movement of the valve assembly 5 and the spray gun 1 is a stationary track 33 of predetermined length and position. At the ends of the track are inclined surfaces 34 and 35.

In moving to the right with the carriage, as viewed in Figure 1, the rocker is moved counterclockwise as the roller 32 is thrust to the left and downwardly by the inclined surface 34 and is thus held for the length of the track. It is released at the other end thereof. The main vent valve 27 is accordingly held in open position while the rocker is downwardly thrust during this movement of the valve assembly.

With the return movement of the valve assembly 5 the inclined surface 35 at the right end of the track 33 turns the rocker 30 clockwise and the rocker is thus held out of contact with the valve stem 29 during the return trip. At the termination of the return movement the rocker assumes the position shown in Figure 1 through the action of spring 36 which is under tension only when the rocker is turned clockwise from the position illustrated.

The supplemental vent valve 10 is mounted adjacent what is termed a "skip-spray" mechanism of which a portion only is diagrammatically shown. A detailed description of a "skip-spray" device may be found in U. S. Patent #2,376,980, issued May 29, 1945, to J. S. Petersen et al. on a Spray Coating Machine. A similar device is illustrated in Figures 15 through 18 of U. S. Patent No. 2,547,884, issued April 3, 1951, to J. A. Paasche. Such mechanism ordinarily includes a light weight detecting rod inclined to swing horizontally above the article supports on the conveyor. When an article is on the support the rod is held back from its swing across the support. When its swinging movement is not thus interrupted an element attached to the rod depresses one of a series of pins which are normally aligned to move against the actuating arm of a spray gun control valve. When so depressed the pin does not strike the valve arm and the valve is thus not actuated.

The spacing and movement of the pins are synchronized with the conveyor movement and the article supports thereon whereby each pin acts in respect to a particular article support reaching the spray gun station.

When the detector rod is prevented from swinging over a support by the presence of an article thereon the actuating pin associated with that particular support remains in its raised position ready to motivate the valve when the article on the support reaches the spray station.

Such pins 37 are figuratively shown in Figure 1 mounted upon a rotating table 38. When raised from the face of the table they are in line to meet the arm 39. This arm is adjustably secured to the valve actuator 40 pivotally mounted on a post 41. When the arm 39 is moved through the action of a contacting pin 37 the actuator 40 is swung downwardly against the exterior end of valve stem 42 and therethrough opens the valve 43 against the spring 44.

The length and radial positioning of the arm 39, alterable by loosening set screws 45 and 46 shown in Figure 5, are so selected that the pin contact therewith is of a duration that holds the valve 43 open for a period beginning before and extending later than the opening of the primary vent valve 27 by the coaction of the rocker 30 and track 33. Through this arrangement the duration of the spray discharge is determined by the length of the track.

In Figure 3 the spray gun carriage 9 reciprocates vertically with the spray gun mounted for lateral discharge. As shown therein the spray gun is close to the end of its upward stroke during which it has been discharging a coating upon the surface of the shell S. The rocker arm 30 is pivoted to a valve-opening position by the track 33 and is approaching the end of the track where it is released from its pivoted position. In order to have the coating applied to the full periphery of the shell the latter may be rotated on a vertical axis during the coating operation.

It may be seen from the description of the operation that when no article is on the conveyor support reaching the spray station that the corresponding pin 37 is depressed and does not contact arm 39. Consequently supplemental vent valve 10 is not opened and air is locked in hose 11. This prevents the exhaust of air from chamber 20 when the main vent valve 27 is opened with the spray gun movement.

When an article is on a conveyor support reaching the spray station the corresponding pin 37 is in raised position and accordingly opens supplemental vent valve 10. This exhausts air from hose 11 whereby when main vent valve 27 is opened with the spray gun movement air from chamber 20 is free to escape and permits member A to move to the left effecting the spray discharge from the moving gun for the interval valve 27 remains open.

The track 33 is built to have a length substantially equal to the dimension of the article being spray coated during the gun movement. For instance the track 33 would have a length between the inclined ends 34 and 35 approximately equal to the heighth of the shell S.

With the apparatus provided by this invention the spray gun operation is subject to the two factors of the presence of an article in position to be coated and a predetermined portion of the movement of the spray gun. Waste of spray material is thereby avoided and the application of the material is restricted to the exact surface to be coated.

Various modifications may be made in the invention without departing from the spirit and scope thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and are set forth in the appended claims.

What is claimed is:

1. A control system for an automatic spray apparatus in which articles are brought by a conveyor on spaced supports to a spray station at which a spray gun is mounted on a carriage which moves during the coating operation and there is a mechanism detecting and recording the presence or absence of an article on each support, said control system comprising a spray gun, a movable carriage for the spray gun, an air line delivering actuating air to the spray gun, a main valve with closed and open positions controlling the flow of air through the air line, means under air pressure normally holding the main valve in closed position, an air pressure releasing passage communicating with said means, two separate vent valves in series controlling the flow of air through said passage, engaging means opening one of said vent valves when an article is in a position to be spray coated, motivating means actuated by the movement of the gun carriage opening the second of said vent valves, and means opening the main valve when the air pressure is released by the opening of both vent valves from the means holding the main valve closed.

2. A control system as set forth in claim 1 in which one of the vent valves is mounted on the gun carriage, a cam track of predetermined length is positioned along the path of the carriage, and a rocker arm pivotably mounted on the valve and actuatingly associated therewith is engaged and pivoted by the track to open the valve during movement of the carriage in one direction.

3. A control system as set forth in claim 1 in which the vent valve opened by engaging means is opened before the other vent valve is opened and remains open after the other vent valve is closed.

4. A control system as set forth in claim 1 in which there are adjustable means for varying the opening and closing time of the vent valve opened by engaging means.

5. A control system for an automatic spray apparatus in which articles are brought by a conveyor on spaced supports to a spray station at which a spray gun is mounted on a carriage which moves during the coating operation and there is a mechanism detecting and recording the presence or absence of an article on each support, said control system including a spray gun, a movable carriage for the spray gun, an air line through which the flow of air actuates the spray gun, two independent valves in series arrangement controlling the flow of air through said hose, engaging means opening one of said valves when an article to be coated is in coating range of the spray gun, and motivating means, associated and moving with the spray gun carriage, opening the other of said valves during a certain, predetermined portion of the movement of said spray gun carriage, the opening period of the first one of said valves beginning before and extending after the opening period of the other or latter of said valves, whereby the opening period of the latter of said valves determines the timing and duration of the spray gun actuation.

6. A control system as set forth in claim 5 in which the spray gun movement is reciprocatory and the spray gun is actuated during such movement in only one direction.

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