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Scharfenberger

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[54] **IMPROVEMENTS IN AND RELATING TO THE COATING OF ARTICLES**

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Related U.S. Application Data

[63] Continuation of Ser. No. 879,440, Nov. 24, 1969, abandoned.

[52] **U.S. Cl.** **239/15**

[51] **Int. Cl.** **B05b 5/00,** F23d 11/28

[58] **Field of Search** 239/186, 15

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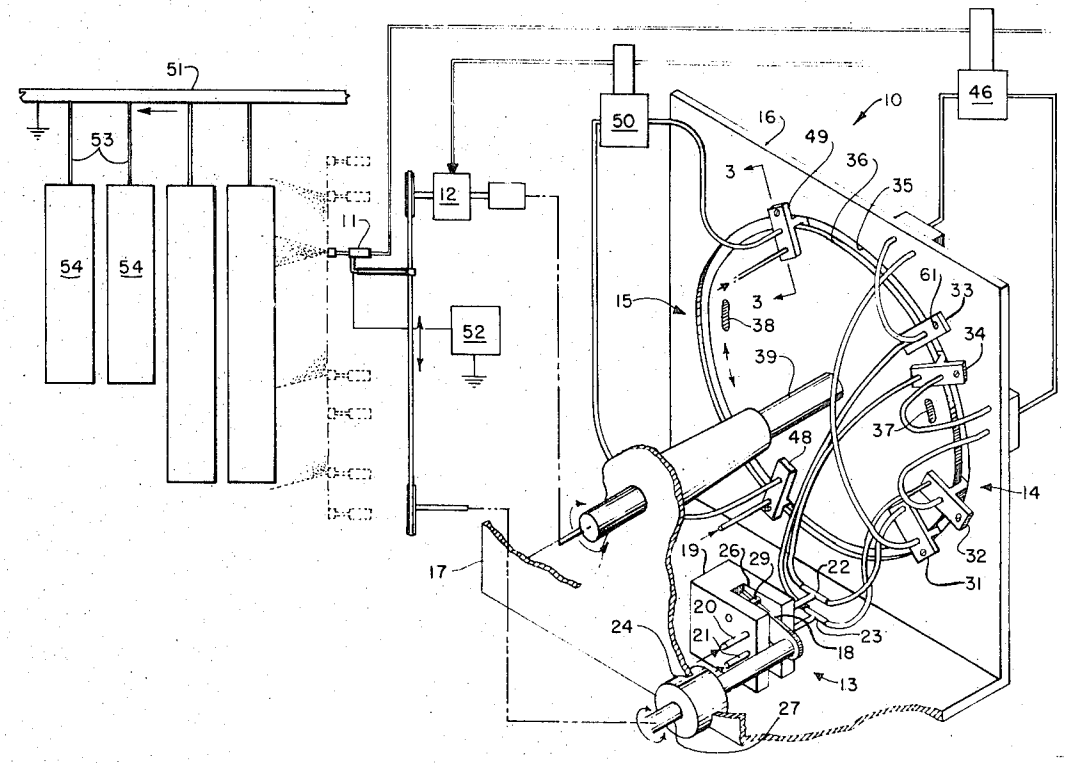
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[57] **ABSTRACT**

A fluidic apparatus for and a method of controlling the spray emission time and the direction of movement of a reciprocating spray emitting device of a spray coating system.

11 Claims, 4 Drawing Figures



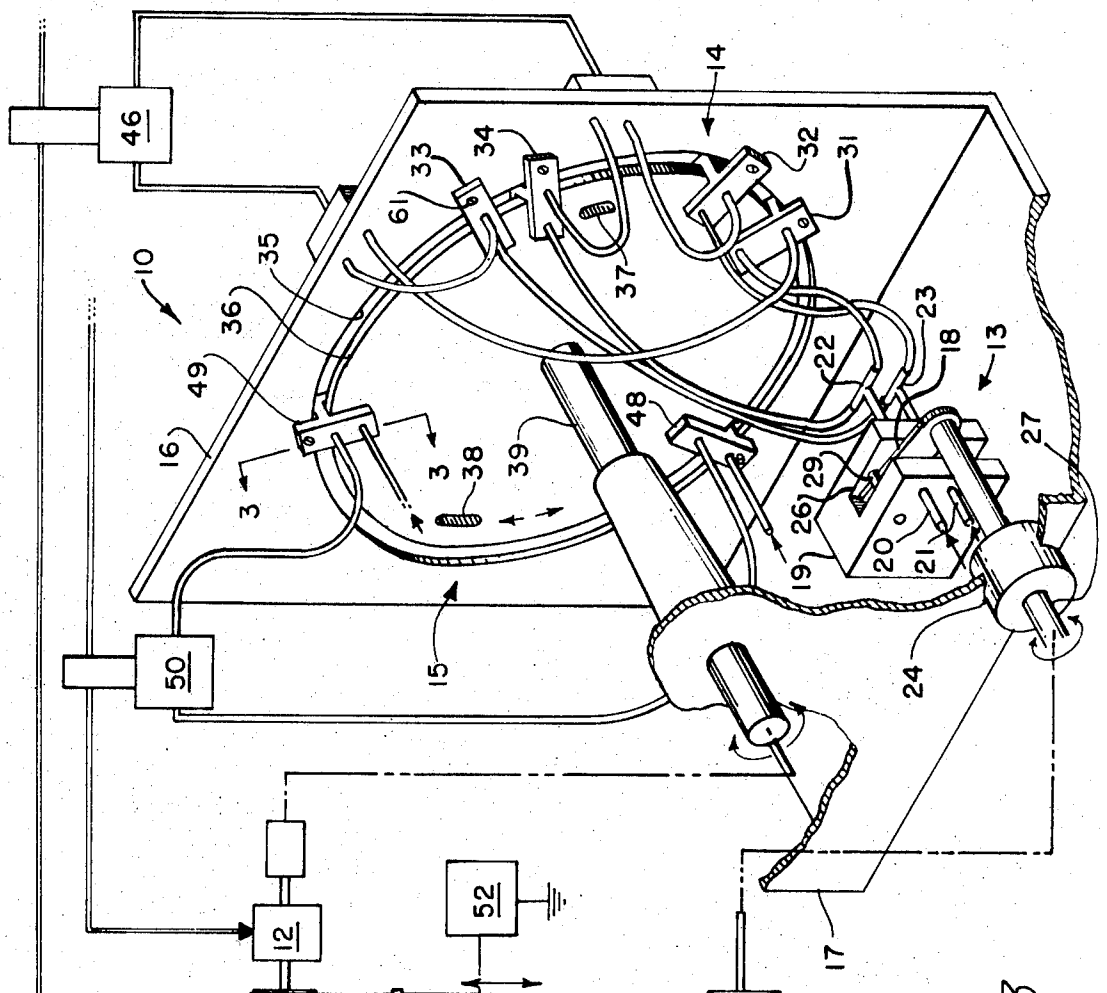


Fig. 1

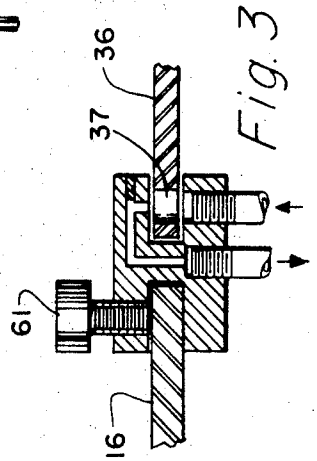


Fig. 3

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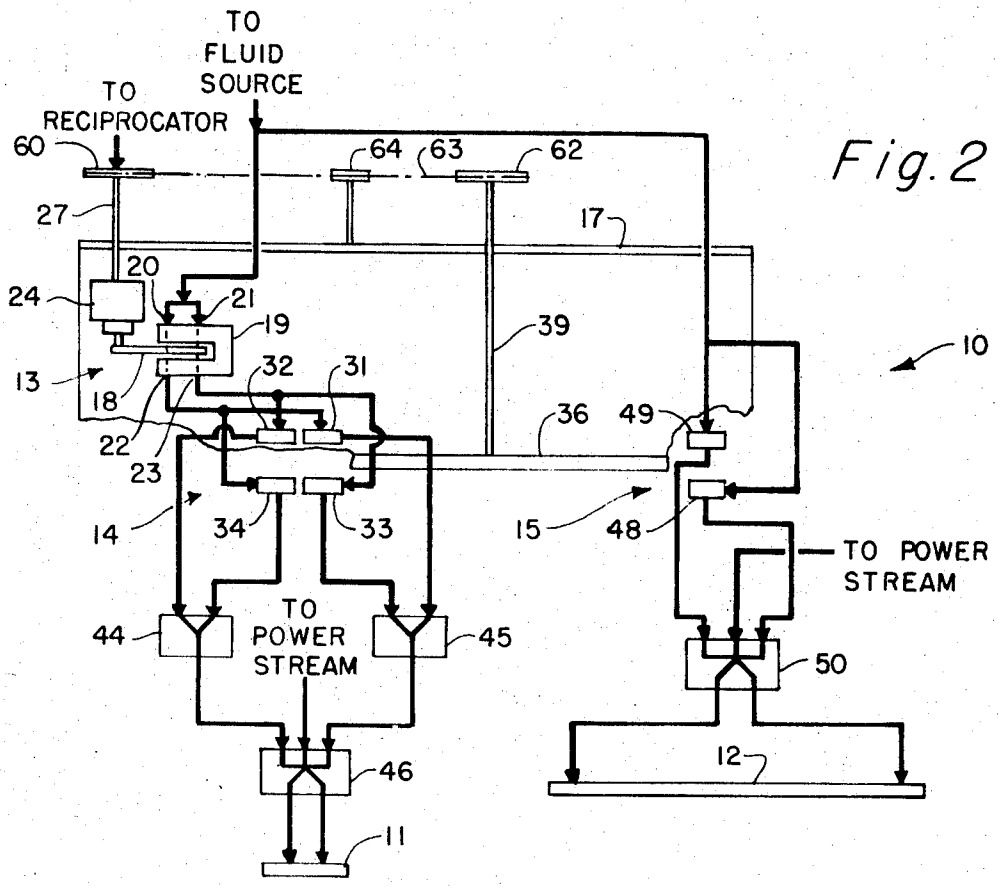


Fig. 2

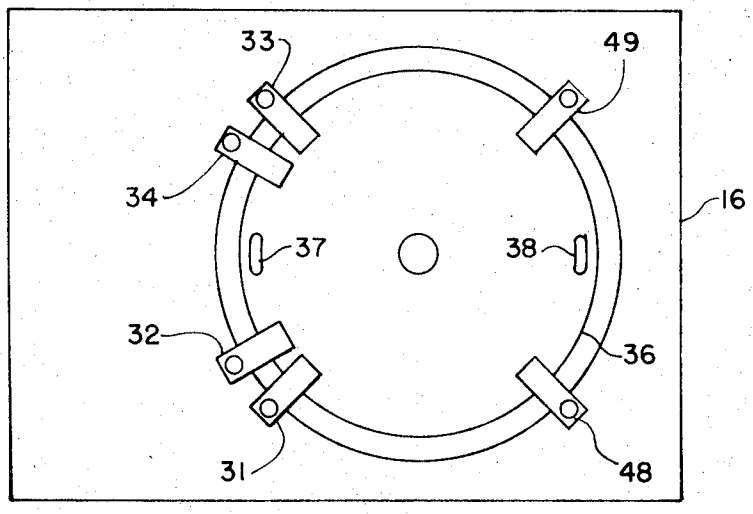


Fig. 4

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IMPROVEMENTS IN AND RELATING TO THE COATING OF ARTICLES

This is a continuation of application Ser. No. 879,440, filed Nov. 24, 1969, now abandoned.

The present invention relates to an apparatus for and a method of controlling the spray emission time and the direction of movement of a spray emitting device. More particularly, the invention relates to an electrostatic spray coating system including an apparatus for and a method of controlling the spray emission time and the direction of movement of the spray emitting device.

Electrostatic charging and deposition of coating materials has become an accepted method by which articles of manufacture are coated in several industries. Electrostatic spray coating of articles with a coating material lowers the cost of finishing the articles by, among other things, reducing the amount of overspray of the coating material. In addition, electrostatic spraying of an article with a coating material tends to result in a substantially uniform deposit of the coating material upon the surface or surfaces of the article thereby providing the article with an improved finish. Furthermore, the method of electrostatically charging and depositing of coating materials is particularly advantageous in coating articles having irregular contours since, generally, employment of extraordinary procedures are not necessary to ensure a deposit of the coating material in the area of the irregular contour.

A device for electrostatically charging and depositing liquid coating materials such as paint, non-liquid coating materials such as powder and the like upon an article generally includes a high voltage, low current DC (direct current) power supply and a means for dispensing and charging the coating material. The device may cause electrostatic atomization in the case of liquid coating materials, charging and depositing of liquid and non-liquid coating materials upon the article or the device may cause charging and depositing of the liquid and non-liquid particles of coating material upon the article. Where a liquid coating material is used to coat an article, it may be suitably atomized by electrical means, by mechanical means such as centrifugal force, hydraulic pressure, air pressure, combinations thereof and the like.

A suitable suspension means such as a hook-shaped member may be used to suspend the article from a conveyor. The conveyor is used to transport the article past the electrostatic spray device during application of the coating material thereto. The hook-shaped member is usually connected to ground through the conveyor.

The particles of coating material dispensed by the electrostatic spray device carry an electrical charge of such a character that particles of the coating material are drawn toward and deposited upon the article carried by the hook-shaped member. Generally, the article is maintained at a spray attracting potential, usually ground potential, by its connection to the hook-shaped member. Maintaining the article at about ground potential during deposition of the charged particles discharges substantially all of the charge carried by the deposited particles of coating material.

Where the article to be coated is of such configuration that the entire article cannot be properly coated by a stationary spray emitting device, the effective coverage area of the spray emitted by the electrostatic spray device may be increased by repetitive or reciprocatory movement of the spray device in a direction transverse to the path of movement of the article.

When using a reciprocating spray emitting device to increase the effective coverage area of the spray, it is desirable to be able to alter the length of the stroke of the reciprocator associated with the spray emitting device without having to terminate the coating operation to effect such an alteration. For example, it may be desirable to alter the length of stroke of the reciprocator from 6 feet to 4 feet and vice-versa in order to properly coat intermittent batches of 5 foot and 3 foot articles carried by the conveyor into coating relation with the spray emitting device without interrupting the coating operation or shutting down the conveyor line. A reciprocator having an adjustable stroke length reduces production time loss by eliminating the possiblity of having a reciprocating stroke length of 6 feet to coat a 3 foot article when a reciprocatory stroke length of about 4 feet will do nicely.

A problem generally associated with a reciprocating spray emitting device is that the reciprocator is unable to substantially immediately reverse its direction of movement during either its upstroke or its downstroke without experiencing a potentially harmful stress and strain of its components. In order to reduce the stress and strain experienced by the reciprocator to a tolerable degree during reversal of its direction of movement, the speed of the reciprocator is gradually slowed to a stop position, the direction of movement of the reciprocator is reversed and then the speed thereof is increased. The variable speed of the movement of the reciprocator at about its stroke limits at a substantially constant delivery rate of coating material to the spray emitting device affects the amount of coating material deposited on the article. If the periphery of the spray is caused to travel only to the top and bottom edge areas of the article, the coating material deposited upon the top and bottom edge areas tends to be excessive. The excessive coating material deposited at the top and bottom edges may run or sag thereby providing an undesirable finish. If the reciprocator is programmed in such a manner as to cause the spray emitting device to travel past the upper and lower edges of the article during slow down and reversal of the direction of movement of the reciprocator in an attempt to minimize excessively coating the edge areas of the article, some coating material is sprayed past the edges of the article, which results in overspray, and hence, may result in a waste of coating material.

Another aspect which should be considered when operating a paint spray emitting device is that most commercial paints include a volatile solvent which may ignite when sparking, a disruptive discharge and the like occurs in the vicinity of the solvent. For example, liquid coating material which includes an aliphatic petroleum naptha solvent such as hexane and which is about 1.25 volume percent hexane in air at about one atmosphere of pressure requires about 0.25 millijoules of energy to be ignited. It should be recognized that the amount of energy required to ignite solvents, particulate coating material and the like may vary with, among other things, the type of solvent, the type of coating

material and the like used during the application of the coating material to the article. Accordingly, it is a desideratum to provide a control system for the reciprocating spray emitting device which includes a minimum number of electrical components.

Therefore, it is an object of the present invention to provide an apparatus and a method for overcoming the abovementioned problems. The invention provides an apparatus and a method which controls the emission time and the direction of movement of a spray emitting means of an electrostatic spray coating system to minimize waste of the coating material and provide a quality finish. Also, the invention provides a remote spray control apparatus which is adapted to resolve intricate spray triggering logic functions utilizing components having relatively few moving parts, fast response time, low power consumption and the like. Adjustment of the spray emission time is accurately controlled since the apparatus receives signals from the reciprocator carrying the spray emitting means and, therefore, monitors the actual reversing points of the spray emitting means.

It is contemplated that the present invention may also be used to control the emission time and the direction of movement of a spray emitting means of a non-electrostatic spray coating system. Further, it is contemplated that the present invention may be used with both liquid and non-liquid coating systems.

With the aforementioned objects enumerated, other objects will be apparent from reading the following description and the appended claims.

In the drawing:

FIG. 1 is a view of an apparatus, with sections cutaway, which controls the emission time and the direction of movement of a spray emitting means or device;

FIG. 2 is a partial schematic view of the present invention;

FIG. 3 is a cross sectional view of an H-shaped block; and

FIG. 4 is a front view of the present invention.

Referring now to the several FIGURES of the drawing and in particular to FIG. 1, an apparatus for controlling the spray emission time and the direction of movement of a spray emitting means or spraying device is indictated by the reference numeral **10**. The spraying device is indicated by reference numeral **11** and the hydraulic reciprocator for the spraying device is indicated by reference numeral **12**. The apparatus **10** includes a switch **13**, a first fluidic trigger means **14** and a second fluidic trigger means **15** all carried by a suitable support means comprising spaced apart plates **16** and **17**. The switch **13** and the first fluidic trigger means **14** cooperate to control the length of time spray emission occurs from the spraying device **11**. The second fluidic trigger means **15** controls the direction of movement of the reciprocator **12**.

The switch **13** includes an arcuately displaceable vane **18** and a generally U-shaped block **19** having a plurality of input ducts **20** and **21** and output ducts **22** and **23** provided therein. The input duct **20** is aligned with output duct **22** so that a fluid flow from a suitable fluid source (not shown) may flow to output duct **22** through a suitable conduit (not shown) connected to the fluid source and the input duct **20**. The input duct **21** is similarly aligned with output duct **23**. The input duct **21** is connected to the fluid source (not shown) by a fluid conduit (not shown).

The vane **18** is arcuately displaceable within recess **26** of the U-shaped block **19** so as to be in an interference path with the fluid flow from the fluid source to either output ducts **22** or **23**; that is, the vane substantially prevents fluid flow from the fluid source to either output duct **22** or duct **23**. However, the vane does not possess sufficient breadth to simultaneously prevent fluid flow to both output duct **22** and duct **23**.

A suitable low friction slip clutch **24** is carried by the rear plate **17** of the apparatus **10**. The friction clutch **24** is coupled to and driven by rotatable shaft **27**. Shaft **27** has one extremity thereof fixedly connected to a suitable driven means such as gear **60** as shown in FIG. 2. The opposite extremity of the shaft **27** is used to drive the slip clutch **24**. The output of the slip clutch **24** is suitably connected to vane **18** so as to arcuately displace the vane. Displacement of shaft **27** causes a displacement of vane **18** through clutch **24**. The slip clutch **24** is fabricated from materials having the proper characteristics for absorbing frictional energy during slippage and for dissipating heat developed during slippage.

The driven means, gear **60**, connected to shaft **27** is rotatably driven by reciprocator **12** which displaces the spray emitting device **11**. Rotational displacement of shaft **27** in the clockwise direction by suitable movement of the reciprocator **12** causes a clockwise arcuate displacement of vane **18**. Vane **18** is displaced in a clockwise direction by the reciprocator **12** acting through the driven means, shaft **27** and the slip clutch **24**. Upon engagement of the vane **18** with stop **29**, carried in recess **26** of the U-shaped block **19**, displacement of the vane in the clockwise direction ceases; however, shaft **27** continues to be displaced in the clockwise direction as long as its associated driven means is rotatably displaced in the clockwise direction by movement of the reciprocator **12**. The clutch slips, that is, shaft **27** continues to be displaced in the clockwise direction while vane **18** is retained in a stationary position due to its engagement with stop **29**. During engagement with stop **29**, vane **18** is in an interference path with the fluid flow from input duct **20** to its cooperatively associated output duct **22**, that is, a fluid flow is prevented between input duct **20** and output duct **22** from the fluid source. However, a fluid flow from the fluid source through the input duct **21** to the output duct **23** occurs since said flow is not impeded by the vane **18**.

Displacement of shaft **27** in the counterclockwise direction results when the reciprocator **12** reverses its direction of movement. Vane **18** is displaced in a counterclockwise direction by shaft **27** acting through the slip clutch **24**. Upon engagement of the vane **18** with a suitable stop (not shown) carried in recess **26** in substantially the same manner as is stop **29**, further displacement of the vane ceases. While vane **18** is restrained from further counterclockwise displacement, the clutch **24** slips as the shaft **27** continues to be displaced in the counterclockwise direction. The vane **18**, while engaged with stop (not shown) effectively prevents fluid flow from input duct **21** to its cooperatively associated output duct **23**. However, a fluid flow

from the input duct 20 to the output duct 22 flows since the vane 18 is no longer in a position to prevent such a fluid flow.

It is seen that the switch 13, which includes vane 18 and the U-shaped block 19 having its input and output ducts, is responsive to a change in direction of the reciprocator to thereby terminate a fluid flow from the fluid source (not shown) to one of but not both of the output ducts; that is, a fluid flow from the fluid source always appears at one or another of the output ducts.

The first triggering means 14 includes a plurality of substantially H-shaped fluid blocks 31, 32, 33 and 34 spaced about aperture 35 in front plate 16 and about disc 36. The H-shaped fluid blocks 31, 32, 33 and 34 each include input and output ducts which fall within the plane of aperture 37 upon alignment of the aperture with a pair of ducts. The fluid input duct to each of the fluid blocks 31 and 34 is connected to the output duct 22 of the U-shaped block 19 by a suitable fluid conduit. The input ducts of fluid blocks 32 and 33 are connected to the output duct 23 of U-shaped block 19 by any suitable fluid conduit. It is seen that any fluid flow from the fluid source present at the output duct 22 or 23 of the U-shaped block 19 is caused to flow to the input ducts of H-shaped fluid blocks 32 and 33 or 31 and 34 respectively..

Each of the H-shaped blocks 31, 32, 33 and 34 are attached to the front plate 16 of the support means by any suitable releasable fastening means such as a bolt 61, as shown in FIG. 3, which engages with the front plate 16. The fastening means may be released and the block adjustably displaced to any desired position about the periphery of aperture 35 formed in the front plate 16.

The first triggering means 14 also includes a displaceable or movable apertured member 36. The apertured member 36 may be an apertured disc generally positioned within the aperture 35 formed in the front plate 16. The member 36 includes a plurality of apertures 37 and 38 formed therein. Member 36 is supported by rotatable shaft 39 suitably journaled in rear plate 17. A suitable drive means such as a gear 62, as shown in FIG. 2, is fixedly connected to an extremity of the shaft 39 opposite to the extremity to which member 36 is attached. Member 36 is driven by the gear 62 through shaft 39. The gear 62, connected to shaft 39, is driven by gear 60, connected to shaft 27, through any suitable coupling or linking means such as chain 63. It is seen that if the gear 60 carried by shaft 27 is driven in the clockwise direction by the reciprocator, the gear 62 carried by shaft 39 is also driven in the clockwise direction and vice-versa. The shaft 39 and hence the member 36 are also driven in the clockwise direction and vice-versa. Thus, it is seen that an arcuate displacement of gear carried by shaft 39 by the gear carried by shaft 27 through the chain causes an arcuate displacement of member 36.

An idler sprocket 64, rotatably journaled in rear plate 17, may be used to provide the chain 63 with the proper tension. Generally, gear 60 would be smaller in diameter than gear 62. Such a relationship provides a suitable gear reduction so that member 36 is in concert with the movement of spray emitting device 11. The gear reduction is selected based on, for example, the desired maximum reciprocator stroke length.

Upon suitable displacement of member 36, aperture 37 is aligned with one of the ducts in H-shaped blocks 31, 32, 33 or 34 thereby allowing fluid flow from the fluid source (not shown) to flow from the input duct of that H-shaped block to the output duct of that H-shaped block. The aperture 37 of the member 36 is of such length that it can be aligned with the input and output ducts of only one of the H-shaped blocks. The member 36, therefore, prevents any fluid flow to the remaining H-shaped blades from the fluid source from flowing to the output duct of those H-shaped blocks.

The position of the H-shaped blocks 31, 32, 33 and 34 along the periphery of the member 36 corresponds to the point during reciprocation of the spray device 11 at which it is desired to cause the device to receive a fluidic signal which causes the device to either emit or terminate emission of coating material as the case may be. For example, a fluid flow at the output duct of either H-shaped block 31 or 33 transmitted to the device 11 would cause the device to emit coating material. A fluid flow at the output duct of either H-shaped block 32 or 34 transmitted to the device 11 would cause the device to terminate emission of a coating material.

It is seen that in order for a fluid to flow from the fluid source to the spray device 11, two conditions must be satisfied. One condition which must be satisfied is that vane 18 should be in such a position as to allow a fluid flow from the input duct to the output duct of the U-shaped block 19. Another condition which must be satisfied is that aperture 37 must be aligned with the input duct and the output duct of the appropriate H-shaped block 31, 32, 33 or 34 before the fluid from the fluid source can flow to the spray device 11. If neither one of the conditions is satisfied, a fluid pulse from the fluid source is not transmitted to the spray device 11.

Fluidic OR gate 44 is connected to the output ducts of the H-shaped blocks 32 and 34 through a suitable conduit. The output ducts of the H-shaped blocks 31 and 33 are connected to fluidic OR gate 45 through a suitable conduit. The fluid OR gates 44 and 45 function to provide an output signal as long as a fluid signal appears at the input thereto.

Fluidic flip-flop 46 is any suitable "lock-on" or memory type fluidic device. The flip-flop 46 has one input duct connected to the output duct of fluidic OR gate 44 and the other input duct connected to the output duct of fluidic OR gate 45 through suitable fluid conduits.

The operation of fluidic flip-flop 46 is similar to that well known in the fluidic art; therefore, the operation of a fluidic fip-flop will not be discussed here since the invention is not thought to reside in the flip-flop, per se.

By the introduction of control pulses emitted by either of the OR gates 44 or 45 to the flip-flop 46, the power stream (not shown) fed to the flip-flop can be switched to the desired output duct of the flip-flop and thereby used to appropriately signal the spray device 11 suitably connected to the output duct of flip-flop 46. The power stream provided to the flip-flop 46 remains "locked-on" the desired output until an opposite control pulse is introduced thereto of sufficient magnitude to cause the power stream to switch to the remaining output duct thereby appropriately signaling the spray device 11. The flip-flop 46 is, therefore, a memory device.

If desired, the output of the flip-flop **46** may be amplified by any suitable fluidic amplifier (not shown) and transmitted to spray device **11**.

Generally, an output flowing from one output duct of the flip-flop **46** is used to cause the spray device **11** to be actuated whereas an output flowing from the other output duct is used to cause the spray device to be deactuated. For example, a fluid flow present at the output ducts of H-shaped blocks **31** or **33** could cause the flip-flop **46** to assume such a state that the spray emission device **11** is signaled to initiate spraying whereas a fluid flow at the output ducts of H-shaped blocks **32** or **34** could cause flip-flop **46** to assume such a state that the spray emission device is signaled to terminate spraying.

The H-shaped blocks are so spaced about the periphery of the member **36** as to correspond to the points at which the spray emission device is to initiate or terminate spraying as the case may be. It should be noted that the H-shaped blocks **31**, **32**, **33** and **34** may be moved about the periphery of member **36** so as to correspond to the points during reciprocation when spraying is to be initiated or terminated.

It is seen that the first trigger means **14** includes a plurality of fluid output ducts and input ducts which are connected to the output ducts of switch **13**. The switch **13** and the first trigger means **14** are used to control the length of time spray emission occurs from the spraying device **11**.

Second trigger means **15** includes a plurality of substantially H-shaped fluid blocks **48** and **49** spaced about the periphery of member **36**. The H-shaped fluid blocks **48** and **49** each include input and output ducts which fall within the plane of aperture **38** when aperture **38** is aligned therewith. The fluid input to the blocks **48** and **49** is supplied by a suitable fluid source (not shown) through any suitable conduit (not shown). It is seen that a fluid flow is present at the input orifices of H-shaped blocks **48** and **49** under all operating conditions of the apparatus **10**.

The H-shaped blocks **48** and **49** are releasably attached to the front plate **16** by any suitable fastening means such as a bolt **61** which engages with the front plate **16**. The fastening means may be released and the block displaced to any desired position about the periphery of aperture **35** formed in front plate **16**. The H-shaped blocks **48** and **49** are spaced from each other in such a manner as to correspond to the maximum desired limits of the upstroke and downstroke of the reciprocator **12**. The arcuate distance separating the blocks **48** and **49** corresponds to a desired stroke distance of the reciprocator **12**. The arcuate distance represents a reciprocator distance reduced by a factor determined by the relationship between the circumferences of the gears used to drive shaft.

The second trigger means **15** also includes the displaceable or movable apertured member **36**. Aperture **38**, formed in the member **36**, is shown as being displaced about 180° from aperture **37**. Alignment of aperture **38** of member **36** with the input and output ducts of either blocks **48** and **49** permits fluid to flow from the fluid source through the input duct to the output duct of that block, when the aperture **38** is aligned with the input and output ducts of that block. Assuming that the position of block **48** corresponds to the maximum desired upstroke distance which the reciprocator **12** travels, the alignment of the aperture **38** with the input duct and the output duct of block **48** causes a fluid flow to be transmitted to memory or "lock-on" flip-flop **50**.

Flip-flop **50** is similar in construction and function to flip-flop **46**. The output of the flip-flop **50** may be amplified by any suitable fluidic amplifier (not shown) and transmitted to the reciprocator **12** through a suitable conduit. The signal emitted by the flip-flop **50** initiated by receipt of a signal from block **48** causes the reciprocator **12** to commence its downstroke.

The H-shaped block **49** carried by the front plate **16** is used to apply an appropriate signal to the reciprocator **12** through the flip-flop **50** to cause the reciprocator to terminate its downstroke and commence its upstroke. It should be appreciated that the physical position of blocks **48** and **49** are of inverted polarity to each of their respective functions in order to provide appropriate polarization of the functions of blocks **31**, **32**, **33** and **34**. It is seen that the length of the reciprocator stroke may be altered by displacing the H-shaped blocks **48** and **49** about the arcuate line of travel of aperture **38** without having to terminate the coating operation to effect such an alteration.

The H-shaped blocks **31**, **32**, **33** and **34** are appropriately placed about the periphery of aperture **35** so as to signal the spray device **11** to either emit or terminate emission of coating material depending on the position of the spray device with respect to the article thereby accurately controlling the amount of coating material deposited on the top and bottom edges of article **54**.

Using the apparatus **10** in the manner described permits excellent control of lead and lag of the fluidic signals provided to the spray device **11**. The use of the low friction clutch provides the apparatus with long mechanical life. The vane **18**, the U-shaped block **19**, and the H-shaped blocks **31**, **32**, **33** and **34** cooperate with the apertured member **36** to provide an efficient means of maintaining control of a reciprocating spray device and of spray triggering. The apparatus **10** is fabricated from lightweight materials and has few moving parts. The apparatus **10** requires low mechanical forces for operation therefore, the apparatus has extended the life and reduced mechanical failure.

The movement of the vane **18** is controlled by the reciprocator **12** thereby permitting rapid inversion or arming of the spray device **11**. Therefore, less time is spent in recycling the spray device **11** as the reciprocator reaches its upstroke and downstroke limits. The time wasted overstroking the article is minimized and precise control of paint lead — lag time is accomplished resulting in a coating material savings and increased production.

The spraying device **11** may be any suitable spraying device such as an electrostatic spraying device. A suitable electrostatic spraying device is shown in U.S. Pat. No. 3,169,882. A suitable high voltage direct current supply **52** is connected to the electrostatic spraying device. The direct current power supply **52** is capable of supplying up to about 90,000 volts direct current to the spraying device **11**.

The spraying device **11** may be mounted for vertical reciprocation by hydraulic reciprocator **12** along the dotted line path shown in FIG. **1**.

A suitable conveyor 51 is provided with movable conductive hook means 53 for carrying and transporting a plurality of articles 54 to be coated. The conveyor 51 and the hook means 53 are electrically grounded. It is seen that the articles 54 are grounded by virtue of being connected to ground through hook means 53 and conveyor 51.

The present invention is not intended to be limited by the disclosure herein, changes and modifications may be made by those skilled in the art without departing from the spirit and scope of the present invention. Such modifications are considered to be within the purview and scope of the present invention and appended claims.

I claim:

1. An apparatus for controlling the spray emission time of a spray device and the direction of movement of a reciprocator moving the spray device, the apparatus comprising means for controlling the spray emission time of the spray device including a fluidic switch adapted to be actuated by a change in the direction of movement of the reciprocator and a first fluidic trigger means having an input coupled to the switch and an output coupled to the spray device, the first trigger means providing a fluidic output signal to the spray device in response to actuation of the switch which triggers the spray device to an actuated or de-actuated state thereby controlling the length of time spray emission occurs from the spray device; and means for controlling the direction of movement of the reciprocator including a second fluidic trigger means responsive to and controlling the distance traveled by the reciprocator, the second trigger means providing a fluidic output signal to the reciprocator upon the reciprocator traveling a determined distance, the output signal of the second trigger means transmitted to the reciprocator causing the reciprocator to reverse its direction of movement.

2. The apparatus as claimed in claim 1, wherein the switch includes at least two fluid input ducts and at least two fluid output ducts and a vane interposed between the input ducts and the output ducts, the vane adapted to be responsive to a change in direction of movement of the reciprocator thereby terminating fluid flow to one of the fluid output ducts and causing fluid flow to appear at the other output duct.

3. The apparatus as claimed in claim 2 further including a clutch connected to the vane, the clutch displacing the vane in response to a change in the direction of movement of the reciprocator.

4. An apparatus for controlling the emission time of a coating device and the direction of movement of a reciprocator moving the coating device, the apparatus comprising means for controlling the emission time of the coating device including a fluidic switch adapted to be actuated by a change in the direction of movement of the reciprocator and a first fluidic trigger means having an input coupled to the switch and an output coupled to the coating device, the first trigger means providing a fluidic output signal to the coating device in response to actuation of the switch which triggers the coating device to an actuated or de-actuated state thereby controlling the length of time emission occurs from the coating device; and means for controlling the direction of movement of the reciprocator including a second fluidic trigger means responsive to and controlling the distance traveled by the reciprocator, the second trigger means providing a fluidic output signal to the reciprocator upon the reciprocator traveling a determined distance, the output signal of the second trigger means transmitted to the reciprocator causing the reciprocator to reverse its direction of movement.

5. The apparatus as claimed in claim 4, wherein the first fluidic trigger means includes a displaceable member and fluid input and output ducts, the input ducts connected to the fluidic switch, the displaceable member interrupting the fluid flow from at least one of the input ducts to at least one of the output ducts in response to the position of the reciprocator, the fluid flow at the output duct controlling the length of time emission occurs from the coating means.

6. The apparatus as claimed in claim 5, wherein the fluid input and output ducts are adjustable with respect to the displaceable member.

7. The apparatus as claimed in claim 6, wherein the first fluidic trigger means includes a fluidic flip-flop connected between the output of at least one of the adjustable ducts and the reciprocator.

8. The apparatus as claimed in claim 5, wherein the second fluidic trigger means includes a displaceable member and fluid input and output ducts, the displaceable member interrupting the fluid flow from the input duct to the output duct in response to the position of the reciprocator, fluid flow at the output duct causing the reciprocator to reverse its direction of movement.

9. The apparatus as claimed in claim 8, wherein the fluid input and output ducts are adjustable with respect to the displaceable member.

10. The apparatus as claimed in claim 9, wherein the second fluidic trigger means includes a fluidic flip-flop connected between the output of at least one of the adjustable ducts and the reciprocator.

11. An apparatus for controlling the emission time of a coating device and the direction of movement of means for moving the coating device, the apparatus comprising means for controlling the emission time of the coating device including fluidic switch means adapted to be actuated by a change in the direction of movement of the means for moving the coating device and a first fluidic trigger means having an input coupled to the switch means and an output coupled to the coating device, the first trigger means providing a fluidic output signal to the coating device in response to actuation of the switch means for triggering the coating device to an actuated or de-actuated state to control the length of time emission occurs from the coating device; and means for controlling the direction of movement of the means for moving the coating device including a second fluidic trigger means responsive to and controlling the distance traveled by the means for moving the coating device, the second trigger means providing a fluidic output signal to the means for moving the coating device upon the means for moving the coating device traveling a determined distance, the output signal of the second trigger means transmitted to the means for moving the coating device causing the means for moving the coating device to reverse its direction of movement.

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