March 31, 1959 J. F. SIEFEN 2,879,947

SPRAY GUN

Filed June 20, 1957 3 Sheets-Sheet 1

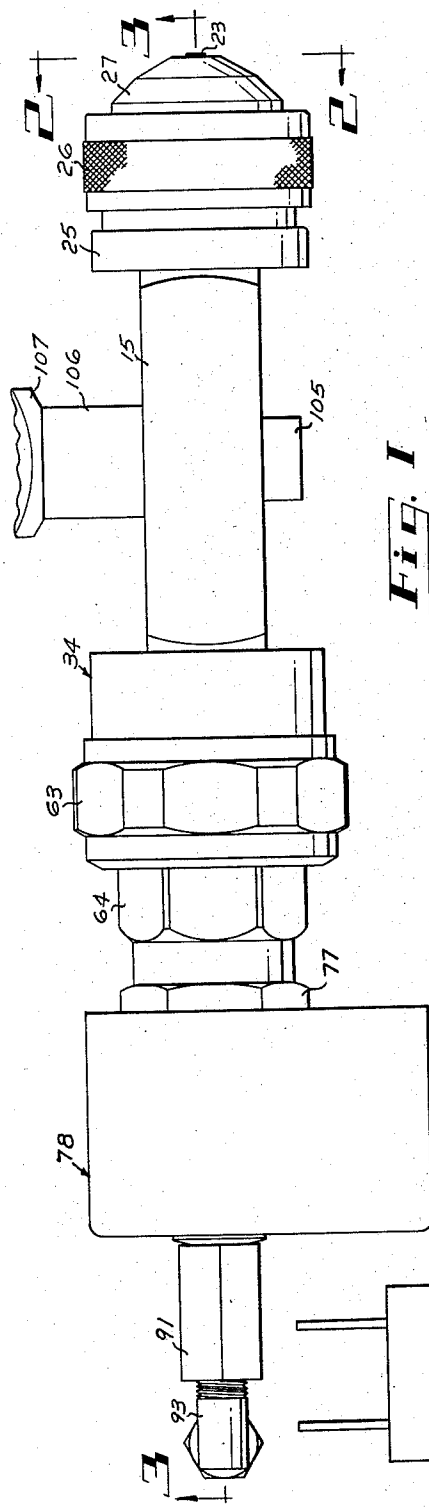


Fig. 1

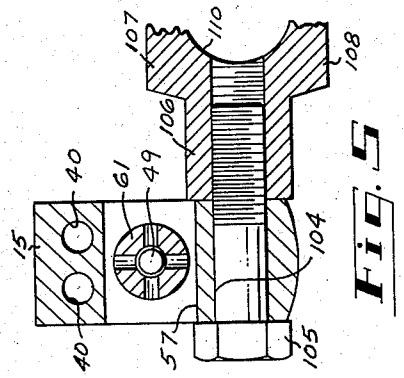


Fig. 5

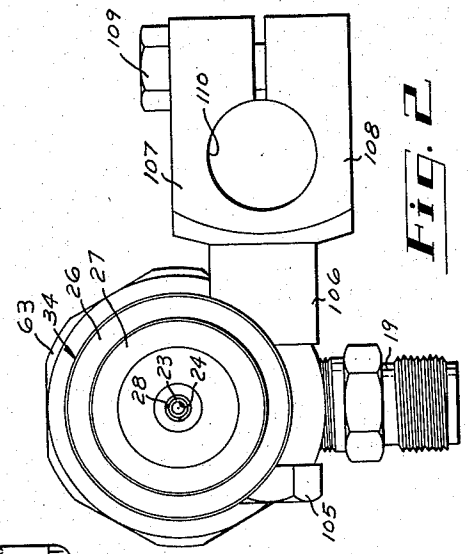
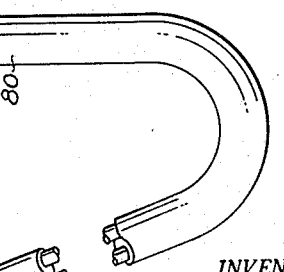


Fig. 2



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SPRAY GUN

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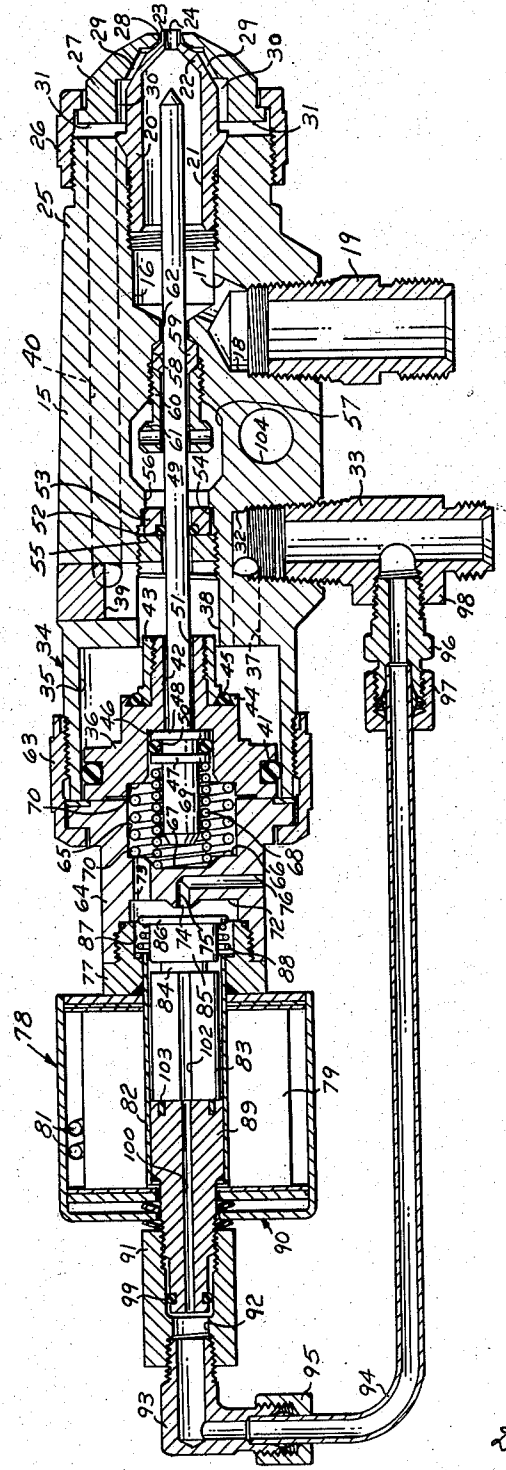

Fig. 3

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SPRAY GUN

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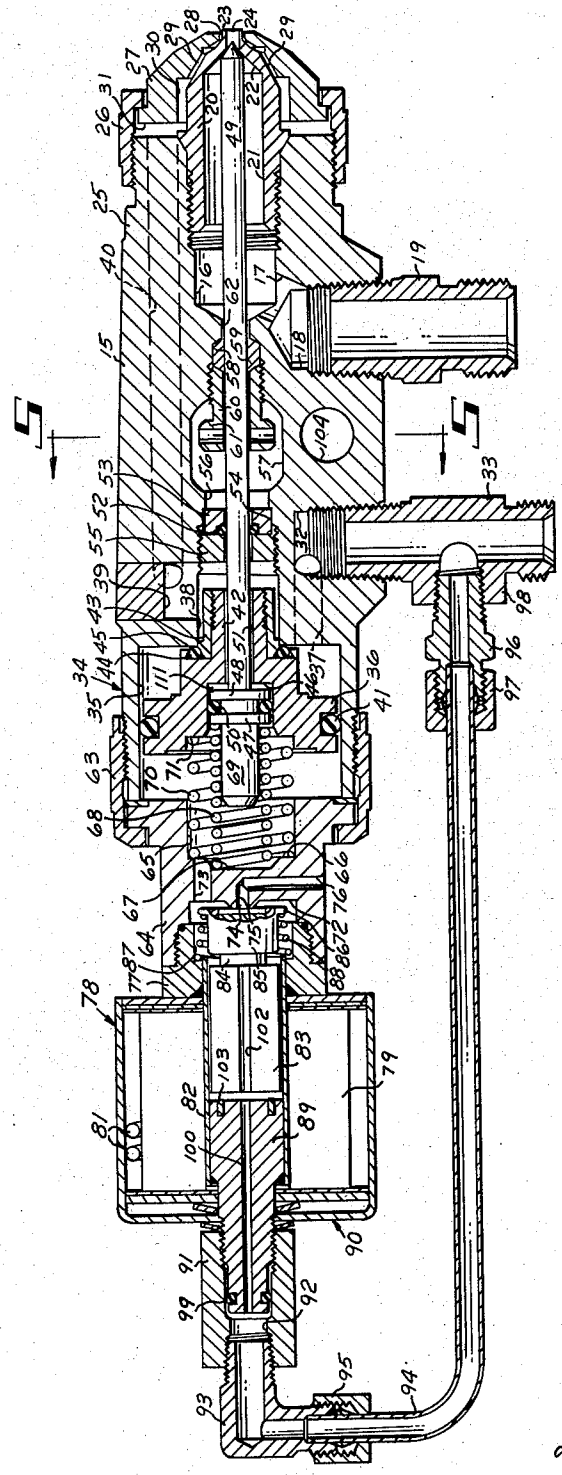

Fig. 4

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SPRAY GUN

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Application June 20, 1957, Serial No. 666,936

7 Claims. (Cl. 239—411)

My invention relates to a new and useful improvement in a spray gun for spraying buffing compounds, paints and/or like material in an atomized state.

Heretofore, spray guns have been developed which are commonly referred to as being automatically operated. These automatic spray guns are of two general classes, both of these classes of spray guns requiring either a mechanical or an electrical air control which is normally located at an external point, generally several feet from the spray gun. This is a disadvantage which results in poor economy of operation, since in the operation of these spray guns a certain length of time, from a fraction of a second to two seconds, is required for the air to travel from the external control to the outlet nozzle of the spray guns when the spraying operation is started, and, also, a certain length of time is required to exhaust the air to the shut-off point when the spraying operation is stopped.

One type of the aforementioned spray gun requires two air hoses to be led to the spray gun. One of these air hoses furnishes air at a normal high pressure to move a piston which opens an internal valve so as to permit air from a second air hose to be delivered through passages in the body to the air cap. The second air hose is used for delivering atomizing air to atomize or break into small particles the material being sprayed. The piston, after traveling a short distance opens a needle valve allowing the sprayed material to pass through the fluid tip.

A second broad classification of spray guns on the market today uses one air hose so that the supply of air, regulated at an external valve, moves a piston or diaphragm to open the needle valve. Through passages in the body of the spray gun this same supply of air is used to atomize the spray material. This type of gun generally has a spattering of the spray at the beginning and end of each operation which is especially noticeable at the end of the operation. This is due to the needle valve opening before normal atomizing air pressure has been built up at the air cap and, on closing, the atomization pressure at the cap drops before the needle closes.

The present invention has as its object the avoidance of these difficulties and the provision of a spray gun so arranged and constructed so that no external air valve to control the air flow is required, as the air control valve is made as a part of the gun itself.

Another object of the invention is the provision of a spray gun of this class having an air control valve adapted to provide substantially instantaneous opening and closing of the valve at the beginning and end of the operation.

Another object of the invention is the provision of a spray gun of this type wherein the air under proper pressure for atomization is always present in the gun, so that the disadvantages referred to as to the sprayed material are avoided.

Another object of the invention is the provision of a spray gun which will be simple in structure, economical

of manufacture, highly efficient in use and light and compact.

Other objects will appear hereinafter.

It is recognized that various modifications and changes may be made in the details of the structure illustrated without departing from the invention, and, it is intended that the present disclosure shall be considered to be but the preferred embodiment.

Forming a part of this application are drawings, in which:

Fig. 1 is a top plan view, partially broken away, of a spray gun embodying the principles of the invention;

Fig. 2 is a front end elevational view of the structure illustrated in Fig. 1, taken along the line 2—2 thereof;

Fig. 3 is a longitudinal elevational central sectional view of the structure illustrated in Fig. 1, taken along the line 3—3 thereof, and showing the control parts in the operative position;

Fig. 4 is a longitudinal elevational central sectional view similar to Fig. 3, showing the control parts in the operative position; and

Fig. 5 is a fragmentary elevational sectional view of the structure illustrated in Fig. 4, taken along the line 5—5 thereof.

In the drawings, I have indicated the spray gun as comprising an elongated body 15 having a longitudinally disposed chamber 16 in the forward end thereof which communicates through the passage 17 with the transversely disposed bore 18 in the side of the body. Threadably mounted in the bore 18 is the fitting or nipple 19 to which a suitable conduit may be attached for delivery of spray fluid from a suitable source into the chamber 16. As shown in Figs. 3 and 4, a nozzle 20 is threadably mounted in the outer end of the chamber 16, and this nozzle is hollow so as to provide a compartment 21 which communicates at the inner end thereof with the chamber 16 for reception of spray fluid. The front end of the nozzle 20 is enclosed by the conically shaped end wall 22 which terminates in the integral forwardly extended tip or outlet sleeve 23 through which is formed the fluid outlet opening 24.

The front end of the body 15 is provided with an integral enlarged annular portion or head 25 on which is threadably mounted the air cap ring or collar 26 which is adapted to releasably retain the air cap 27 in snug engagement with the front conical end 22 of the nozzle 20. The air cap 27 is provided with an annular air outlet passage 28 through which is extended the fluid outlet sleeve 23. The annular outlet passage 28 is connected by means of a plurality of passages 29 with the passages 30 which open into the annular chamber 31. The air under pressure in the gun discharges through the annular passage 28 to form and atomize the fluid which discharges from the fluid outlet opening 24.

Air under pressure is supplied to the chamber 31 by means of the following described structure. The body 15 is provided with a transverse bore 32 in which is threadably mounted the inlet air fitting or nipple 33 to which a suitable conduit may be attached for delivery of air under pressure to the spray gun. The rear end of the body 15 is provided with an integral enlarged annular portion or head generally designated by the numeral 34. Extending inwardly from the rear end of the head 34 is the cylinder or annular chamber 35 in which is slidably mounted the piston 36. The cylinder 35 is connected with the transverse bore 32 by means of the passage 37. Extending forwardly from the front end of the annular chamber 35 and communicating therewith is a reduced centrally disposed annular chamber 38 which also communicates with the passage or chamber 39. The passage 39 communicates with the rear ends of a plurality of longitudinally extending

passages 40 which open at their front ends into the chamber 31. It will be seen, that when the piston 36 is in the "open" or operative position shown in Fig. 3, air under pressure will flow from the nipple 33, through the bore 32 and passage 37 into the cylinder 35, thence into the chamber 38 and the chamber 39, through the passages 40 into the chamber 31, and thence through the passages 30 and 29, and out to the atmosphere through the annular outlet passage 28.

The piston 36 is provided on its periphery with a suitable sealing ring 41, as for example, a sealing ring of the O type. The piston 36 is provided on its front end with an integral hub 42 on which is threadably mounted a retainer 43 which is adapted to function as a piston guide. The retainer 43 cooperates with the front end face of the piston 36 and the annular inwardly tapered lip 44 on the piston front end to retain the sealing ring 45 in place. The sealing ring 45 may be a conventional O type sealing ring and it is adapted to close communication between the cylinder 35 and the annular chamber 38 which surrounds the retainer 43 when the piston 36 is in the "closed" or "at rest" position as shown in Fig. 4.

Formed in the rear face of the piston 36 is a centrally disposed recess 46 in which is slidably mounted a pair of spaced apart integral annular flanges 47 and 48 which are carried by the stem of the needle valve 49. A sealing ring 50, preferably one of the O type, is positioned between said flanges 47 and 48 and operatively engages the sides of the recess 46. The stem of the needle valve 49 extends forwardly from the front flange 48 and passes through the bore 51 in the cylinder hub 42 and through the annular chamber 38 and thence through the sealing ring 52 which is preferably of the O ring type. The sealing ring 52 is seated around the stem of the needle valve 49 and is disposed in a recess in the rear face of the collar 53 which is mounted in the recess 54 in the body 15. The recess 54 is a reduced continuation of the annular chamber 38. The sealing ring 52 is operatively retained in place in the collar 53 by means of the retaining collar 55 which is threadably mounted in the forward end of the annular chamber 38. The sealing ring 52 functions as an air seal to prevent air leakage around the stem of the needle valve 49 from the chamber 38.

The stem of the needle valve 49 further extends forwardly in the body 15 through the annular passage 56 and through an enlarged chamber 57 which is open at its sides to the atmosphere and the reduced chamber 58 which communicates with the forward end of the open chamber 57. In the reduced chamber 58 there is disposed a suitable packing 59 which surrounds the valve stem and which is packed and held in place by means of the gland 60 which is provided with the head 61 for the reception of a suitable wrench. The packing 59 is accessible through the opening or chamber 57 and functions as a spray fluid seal to prevent leakage of the spray fluid rearwardly from the spray fluid chamber 16. After passing through the packing 59 the valve stem extends forwardly through the annular passage 62 and through the fluid chamber 16 and the nozzle 20 and into operative engagement with the forward conical end wall 22 of the nozzle 20 so as to function to open and close the fluid outlet passage 24.

Detachably secured on the rear end of the body 15 by means of the threadably mounted collar 63 is a supporting body or retainer 64 in the front end of which is formed an annular chamber or compartment 65 having the stepped inner shoulders 66 and 67. A first coil spring 68 is telescopically mounted around the head 69 of the needle valve 49. The front end of the spring 68 abuts the rear face of the valve flange 47 and the rear end of the spring 68 abuts the shoulder 67 of the chamber 65. A second coil spring 70 embraces or surrounds the first coil spring 68 and is disposed so that the front end thereof abuts the shoulder of the recess 71 formed in the rear face of the piston 36 and the rear end thereof abuts the shoulder 66 of the chamber 65.

Formed in the rear end of the retainer 64 is a stepped chamber 72 which is connected to the compartment 65 by means of the passage 73. A raised valve seat 74 is formed in the inner face of the chamber 72 and the chamber 72 communicates with the atmosphere through the passages 75 and 76.

Threadably mounted in the outer end of the chamber 72 is a fitting 77 which carries and is fixedly connected to a solenoid generally indicated by the numeral 78. The numeral 79 indicates the usual solenoid coil which is electrically connected to a suitable source of electrical energy by means of the cable 80 which carries the usual conductor wires 81.

Fixedly mounted within the solenoid coil 79 is a sleeve member 82 which extends forwardly into the fitting 77 and is fixedly secured thereto. The solenoid core or armature 83 is slidably mounted in the forward end of the sleeve member 82 and is provided with an integral reduced neck portion 84 which in turn carries the bleeder valve 85. The valve 85 is provided with an enlarged head portion as 86 which is adapted to carry at its forward end a composition disc valve which engages the valve seat 74 and closes off communication of the chamber 72 with the passages 75 and 76. The valve 85 is disposed in the chamber 72 of the retainer 64 and in the communicating chamber 87 of the solenoid fitting 77. The valve 85 is normally held in engagement with the valve seat 74 by means of the coil spring 88, one end of which abuts the enlarged valve head 86 and the other end of which abuts the bottom shoulder in the chamber or recess 87 in the solenoid fitting 77.

Fixedly mounted within the rear end of the sleeve member 82 is a supporting shaft 89 which extends rearwardly through the rear wall 90 of the solenoid. A coupling 91 is threadably mounted on the outer end of the shaft 89 and secures the shaft in place in the solenoid. The coupling 91 is hollow and is adapted to have threadably mounted in the outer end thereof the tubing elbow fitting 93 which is connected to one end of the tubing 94 by means of the retainer nut 95. The other end of the tubing 94 is connected to the fitting 96 by means of the retainer nut 97. The fitting 96 is threadably mounted in the portion 98 of the air inlet fitting 33. The last described structure provides an external means for conducting air under pressure to the rear end of the spray gun for further passage through the gun to the rear side of the piston 36. The air will pass through the fitting 33, thence through the tubing 94 and fittings 92 and 93. The coupling 92 is provided with an air seal, as 99, which may be of the O ring type. The air under pressure passes from the coupling 92 through the centrally disposed longitudinal passage 100 in the shaft 89 and into the space marked 101 in Fig. 4, when the solenoid is inoperative and the spring 88 is normally holding the solenoid core 83 in the forward position shown in Fig. 4. Under these conditions, the air will pass from the space 101 through a pair of grooves or passages as 102 which are formed on the periphery of the solenoid core 83. The air then passes around the core neck 84, through the chambers 87 and 72, the passage 73, the chamber 65 and thence into the rear end of the cylinder 35 and into operative engagement with the rear face of the piston 36 for biasing the piston 36 forwardly to normally maintain the needle valve 49 in the closed position. When the solenoid is energized, the solenoid core 83 acts as a valve in that it will be moved into the position shown in Fig. 3, whereby the rear end face thereof will engage the annular sealing ring 103 in the front face of the shaft 89 and close off the flow of air under pressure through the grooves 102 in the periphery of the core 83.

As shown in Figs. 4 and 5, there is a horizontal transversely disposed hole 104 formed through the body 15 through which may be extended the stud or cap screw 105 which threads into a stem 106 of a yoke embodying

the separated arms 107 and 108, as shown in Fig. 2. The arms 107 and 108 may be drawn together by a suitable screw, as 109, so that these arms may clamp against a suitable support or rod which may be projected through the opening 110, thus affording a means for mounting the spray gun in a stationary position when desired.

In use, the inlet fitting 19 would be connected to a suitable source of spray fluid under pressure so that the nozzle chamber 21 would be loaded with spray fluid under pressure and be ready for emission through the outlet opening 24 upon opening of the needle valve 49. The air inlet fitting 33 would be connected to a suitable source of compressed air whereby air under pressure will flow into the front and rear ends of the cylinder 35. Due to the air being equalized on both sides of the piston, and the spring 70 urging the piston forwardly, the piston assumes the closed or "at rest" position as shown in Fig. 4, and the pressure of spring 68 will retain the needle valve 49 in the closed or "at rest" position as shown in Fig. 4.

A suitable switch would be interposed in the cable 80 and upon closing of this switch and the energizing of the solenoid 78, the solenoid core or armature 83 would move to the left, as shown in Fig. 3, so that the bleeder valve 86 would be moved into an open position relative to the chamber 72 and thus permit communication of the rear end of the cylinder 35 with the atmosphere, through the passage 73, chamber 72, and passages 75 and 76. Simultaneously, the solenoid core 83 functions as a gate valve when it is energized and moved to the left to close off the air passage 100. The left end of the core 83, as viewed in Fig. 3 engages the annular sealing ring 103 and the flow of air under pressure through passage 100 is stopped.

The energization of the solenoid 78 thus communicates the rear end of the cylinder 35 to the atmosphere and also cuts off the flow of air under pressure to the rear end of the cylinder 35. This action unequalizes the air pressure on the opposite sides of the piston 36 so that the piston moves to the left as shown in Fig. 3, whereby, air under pressure is permitted to flow from the cylinder 35, and into the chambers 38 and 39, and through the passages 40 to the chamber 31. The air then flows from the chamber 31 through the passages 30 and 29 and out to the atmosphere through the annular outlet 28. After the piston 36 has moved to the left a short distance, it would pick up and move the needle valve 49 to the left. In this movement there would be a lag in said picking up effect, due to the fact that the needle valve flange 48 is spaced apart from the piston 36 when the gun is "at rest" as shown by the gap indicated by the numeral 111 in Fig. 4, so that the sealing ring 45 would be moved to an open position before the needle valve 49 is moved to an open position. This lag would be of very short duration, but, before the spray fluid would issue from the opening 24, atomizing air would be issuing through the outlet 28. Consequently, any fluid emitting through the outlet opening 24 will be immediately subjected to the air action.

In stopping the operation, the solenoid 78 is deenergized, which action causes the solenoid core 83 to be moved to the right in response to the pressure of spring 88 as shown in Fig. 4. The bleed valve 86 seats against the valve seat 74 and communication of the rear end of the cylinder 35 with the atmosphere is cut off. The air passage 100 in the member 89 is again opened by the movement to the right of the solenoid core 83 and the air pressures on the opposite sides of the piston 36 will then build up to equal pressures, and the spring 70 will force the piston 36 to the right, to the closed or "at rest" position as shown in Fig. 4. At the same time, spring 68 will force the needle valve 49 to the right, as viewed in Fig. 4. After piston 36 and needle valve 49 have moved to the right a distance equal to the travel distance between the open position of the needle valve 49 and the closed position of said needle valve, the delivery of spray fluid would cease. Piston 36 continues moving to the right, on account of gap 111, to its closing position, cutting off communication of cylinder 35 to chambers 38 and 39, by means of sealing ring 45 engaging the forward wall of the cylinder 35 around the chamber 38. It will be seen that sealing ring 45 functions as a valve means. Thus, atomizing air would cease to flow through passages 38, 39, 40, 31, 30, 29 and 28. This time lag which occurs on stopping the operation would assure that all spray fluid emitted from the gun would be atomized since the spray fluid will cease to be emitted before the atomizing air would cease to flow from the outlet 28. At the end of this action, the spray gun would be "at rest" or in the closed position.

In this manner, the various disadvantages and difficulties of the prior art guns would be overcome, and a substantially instantaneously controlled spray would be provided.

What I claim is:

1. A spray gun of the class described, comprising: a body; an outlet nozzle mounted on one end of said body and having an outlet opening for the emission of liquid therefrom; a cylinder on the opposite end of said body; a retainer mounted on said opposite end of said body and forming a closure for said cylinder and having passages for communicating with the atmosphere; a piston slidably mounted in said cylinder; a first spring normally urging said piston in one direction; a first air inlet port communicating with said cylinder at one side of said piston for conducting air under pressure thereinto, and moving said piston in the opposite direction against the compression of said first spring; an inlet port for conducting liquid under pressure into said body for emission through the outlet opening of said nozzle; a rod having a needle valve formed at one end for engaging said nozzle and closing said outlet opening, said rod at its opposite end extending through said piston; an enlargement on said rod engageable with said piston, upon movement of said piston against the compression of said first spring a slight distance for engaging said needle valve and moving said needle valve to open position; a valve for closing the passages in said retainer and closing communication of said cylinder with the atmosphere; a second spring extending into said cylinder and engaging at one end said retainer and at the opposite end said enlargement for normally urging said needle valve into closing position; a second air inlet port communicating with said cylinder at the other side of said piston for conducting air under pressure thereinto for effecting equalizing of air pressure on opposite sides of said piston; and, a solenoid for, upon being energized, opening said second last named valve and establishing communication of said cylinder at one side of said piston with the atmosphere.

2. A spray gun of the class described, comprising; a body; an outlet nozzle mounted on one end of said body and having an outlet opening for the emission of liquid therefrom; a cylinder on the opposite end of said body; a retainer mounted on said opposite end of said body and forming a closure for said cylinder and having passages for communicating with the atmosphere; a piston slidably mounted in said cylinder; a first spring normally urging said piston in one direction; a first air inlet port communicating with said cylinder at one side of said piston for conducting air under pressure thereinto, and moving said piston in the opposite direction against the compression of said first spring; an inlet port for conducting liquid under pressure into said body for emission through the outlet opening of said nozzle; a rod having a needle valve formed at one end for engaging said nozzle and closing said outlet opening, said rod at its opposite end extending through said piston; an enlargement on said rod engageable with said piston, upon movement of said piston against the compression of said first spring a

slight distance for engaging said needle valve and moving said needle valve to open position; a valve for closing the passages in said retainer and closing communication of said cylinder with the atmosphere; a second spring extending into said cylinder and engaging at one end said retainer and at the opposite end said enlargement for normally urging said needle valve into closing position; a second air inlet port communicating with said cylinder at the other side of said piston for conducting air under pressure thereinto for effecting equalizing of air pressure on opposite sides of said piston; a passage in said body for delivering air from said cylinder to and around said nozzle; and a valve on said piston for controlling communication of said last named passage with said cylinder and movable to open position upon movement of said piston against the compression of the first spring bearing against the same.

3. A spray gun of the class described, comprising: a body; an outlet nozzle mounted on one end of said body and having an outlet opening for the emission of liquid therefrom; a cylinder on the opposite end of said body; a retainer mounted on said opposite end of said body and forming a closure for said cylinder and having passages for communicating with the atmosphere; a piston slidably mounted in said cylinder; a first spring normally urging said piston in one direction; a first inlet port communicating with said cylinder at one side of said piston for conducting air under pressure thereinto, and moving said piston in the opposite direction against the compression of said first spring; an inlet port for conducting liquid under pressure into said body for emission through the outlet opening of said nozzle; a rod having a needle valve formed at one end for engaging said nozzle and closing said outlet opening, said rod at its opposite end extending through said piston; an enlargement on said rod engageable with said piston, upon movement of said piston against the compression of said first spring a slight distance for engaging said needle valve and moving said needle valve to open position; a valve for closing the passages in said retainer and closing communication of said cylinder with the atmosphere; a second spring extending into said cylinder and engaging at one end said retainer and at the opposite end said enlargement for normally urging said needle valve into closing position; a second air inlet port communicating with said cylinder at the other side of said piston for conducting air under pressure thereinto for effecting equalizing of air pressure on opposite sides of said piston; a passage in said body for delivering air from said cylinder to and around said nozzle; a valve on said piston for controlling communication of said last named passage with said cylinder and movable to open position upon movement of said piston against the compression of the first spring bearing against the same; and a portion of said piston engageable with said enlargement subsequent to the opening of communication of the cylinder at one side of said piston with the atmosphere for moving said needle valve to open position.

4. A spray gun of the class described, comprising; a body; an outlet nozzle mounted on one end of said body and having an outlet opening therethrough through which liquid may emit; means in said body for conducting liquid under pressure to said outlet opening; a rod comprising at one end a needle valve for closing said outlet opening; a cylinder on the opposite end of said body; a piston slidably mounted in said cylinder; a first spring normally urging said piston in one direction; a first air inlet means connected to said cylinder for delivering air under pressure into said cylinder at one side of said piston; a retainer mounted on said opposite end of said body; said retainer having passages formed therethrough for providing communication from said cylinder at the opposite side of said piston to the atmosphere; an enlargement on said rod; a second spring engaging at one end thereof with said enlargement and at the opposite end thereof with said retainer for normally moving said needle valve to closed position; a second air inlet means connected to said cylinder for delivering air under pressure into said cylinder at the other side of said piston; a solenoid; valve means operable, upon energizing of said solenoid, for opening communication of said other side of cylinder with the atmosphere through said passages and for closing said second air inlet means, and operable, in response to spring pressure, for closing said communication; an air cap mounted on said body and embracing the outlet end of said nozzle and having passages for delivering air under pressure outwardly around the outlet end of said nozzle; passages in said body for communicating the passages in said cap with said cylinder; and a valve for closing communication of said last named passages with said cylinder and operable for opening said communication upon movement of said piston in response to air pressure against the compression of the first spring bearing against the same; and means on said piston operable subsequent to the opening of said last named valve for moving said needle valve to open position.

5. A spray gun of the class described, comprising: a body; an outlet nozzle mounted on one end of said body, and having an outlet opening for the emission of liquid therefrom; an inlet port communicating through a passage in said body with a chamber formed in said body and into which said outlet nozzle is extended; a first air inlet port in said body for conducting air under pressure into said body, said air inlet port communicating through a passage with one side of a cylinder; a piston slidably mounted in said cylinder; a first spring engaging one side of said piston and normally urging the same in one direction; a rod comprising, at one end, a needle valve for engaging at said end with said nozzle and effecting a closing of the outlet opening therein, the opposite end of said rod projecting through said piston and movable relatively thereof; a second spring extending into said cylinder and engaging at one end a portion of said rod and normally urging said rod into closing position; a second air inlet means connected to said cylinder for delivering air under pressure into said cylinder at the other side of said piston; a retainer mounted at one end of said cylinder and serving as a closure therefor; said first spring engaging at one end with said piston and engaging at its opposite end with said retainer; said portion of said rod being spaced from said piston to provide a lag upon movement of said piston in response to air pressure prior to engagement of said piston with said enlargement on said rod for moving said needle valve to open position, there being a compartment in said retainer communicating with the interior of said cylinder; passages formed in said retainer for communicating the compartment of said retainer with the atmosphere; a valve for controlling said last named passages and said second air inlet means; a solenoid for controlling said last named valve, and, upon being energized, moving said last named valve to a position for closing said second air inlet means and for establishing communication of the compartment in said retainer through said last named passages with the atmosphere; a nozzle cap mounted on said body and embracing said nozzle and having air passages formed therein for discharging air outwardly around said nozzle in the path of flow of liquid passing through said nozzle; and, a valve carried by said piston for controlling communication of said last named air passages with said cylinder and movable to open position upon movement of said piston in response to air pressure.

6. A spray gun of the class described, comprising: a body; an outlet nozzle mounted on the front end of said body and having an outlet opening for the emission of liquid therefrom; a liquid inlet fitting mounted on said body and communicating with said nozzle for delivery of liquid under pressure thereinto; a needle valve having an elongated stem and being slidably mounted in said

body and operable to open and close the nozzle outlet opening; a cylinder formed in the rear end of said body; a retainer mounted on the rear end of said body and enclosing said cylinder; a piston slidably mounted in said cylinder; an air inlet fitting mounted on said body and communicating with the front end of said cylinder so as to deliver air under pressure into the cylinder and into engagement with the front side of the piston; an air cap mounted on the front end of said body and embracing said nozzle and being provided with air passages through which air may be discharged around the liquid outlet opening in the nozzle; a first air passage in said body operable to connect the air passages in said air cap with the front end of said cylinder to permit air under pressure from the cylinder to flow therethrough; a valve means carried on the front side of said piston and operable to close said first air passage to cut off the flow of air to the atmosphere when the piston is moved forwardly to an inoperative position; the stem of said needle valve being slidably mounted through said piston; a first spring interposed between said retainer and said piston and adapted to normally bias said piston forwardly to the inoperative position; a flange on said needle valve stem disposed toward the rear side of the piston and being normally spaced a slight distance therefrom when the piston is in the inoperative position and the needle valve is in the closed position; a second spring interposed between said flange and said retainer to normally bias the needle valve forwardly into the closed position; a chamber formed in the rear end of the retainer; a second air passage connecting said chamber with the rear end of said cylinder; a third air passage in said retainer communicating said chamber with the atmosphere; a solenoid mounted on said retainer and enclosing said chamber; a fourth air passage through said solenoid and communicating with said chamber; an external air tube connecting said fourth air passage with said air inlet fitting in said body for passage of air under pressure therethrough and into said cylinder against the rear side of said piston to equalize the air pressure in said cylinder at opposite sides of the piston; a movable core valve means in said solenoid; and a third spring means in said solenoid engageable with said core valve means and operable to normally bias said core valve means forwardly to an inoperative position so as to close said third air passage for closing communication of said chamber with the atmosphere; and, said core valve means being operable to move rearwardly when said solenoid is energized to open said third air passage to communicate said chamber with the atmosphere, and, being operable upon said rearward movement to close said fourth air passage through the solenoid, whereby, the air in the cylinder engaging the front of the piston will be at a greater pressure than the air to the rear of the piston and the piston will be moved rearwardly to permit air under pressure to emerge through the air cap, and, continued rearward travel of the piston will cause the piston to engage said flange on the needle valve stem and the needle valve will be moved to the open position to permit liquid to emerge from the nozzle outlet opening.

7. A spray gun of the class described, comprising: a body; a fluid outlet nozzle mounted on said body; a chamber in said body operable to receive fluid under pressure from a source of delivery and conduct it to said nozzle; a needle valve movably mounted in said body and operable to open and close said outlet nozzle; an air cap on said body operable to discharge air under pressure around said outlet nozzle; a cylinder formed in said body; means in said body for conducting air under pressure from a source of delivery into the front end of said cylinder; means in said body for conducting air under pressure from said cylinder to said air cap; a piston movably mounted in said cylinder and operable to move said needle valve to an open position and simultaneously to permit the flow of air from said cylinder to said air cap; spring means engageable with said needle valve and operable to bias said needle valve to a closed position and said piston to a position to close the flow of air from said cylinder to said air cap; means on said body for conducting air under pressure from a source of delivery into the rear end of said cylinder to equalize the air pressure on both ends of the piston to hold the piston in the inoperative position; and, a solenoid operated valve connected to said body and operable to exhaust the air from the rear end of the cylinder to permit the air pressure on the front end of the piston to move the piston rearwardly and the needle valve to the open position.

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