July 3, 1951 W. P. DALRYMPLE 2,559,407

SPRAY GUN

Filed March 14, 1947 3 Sheets-Sheet 1

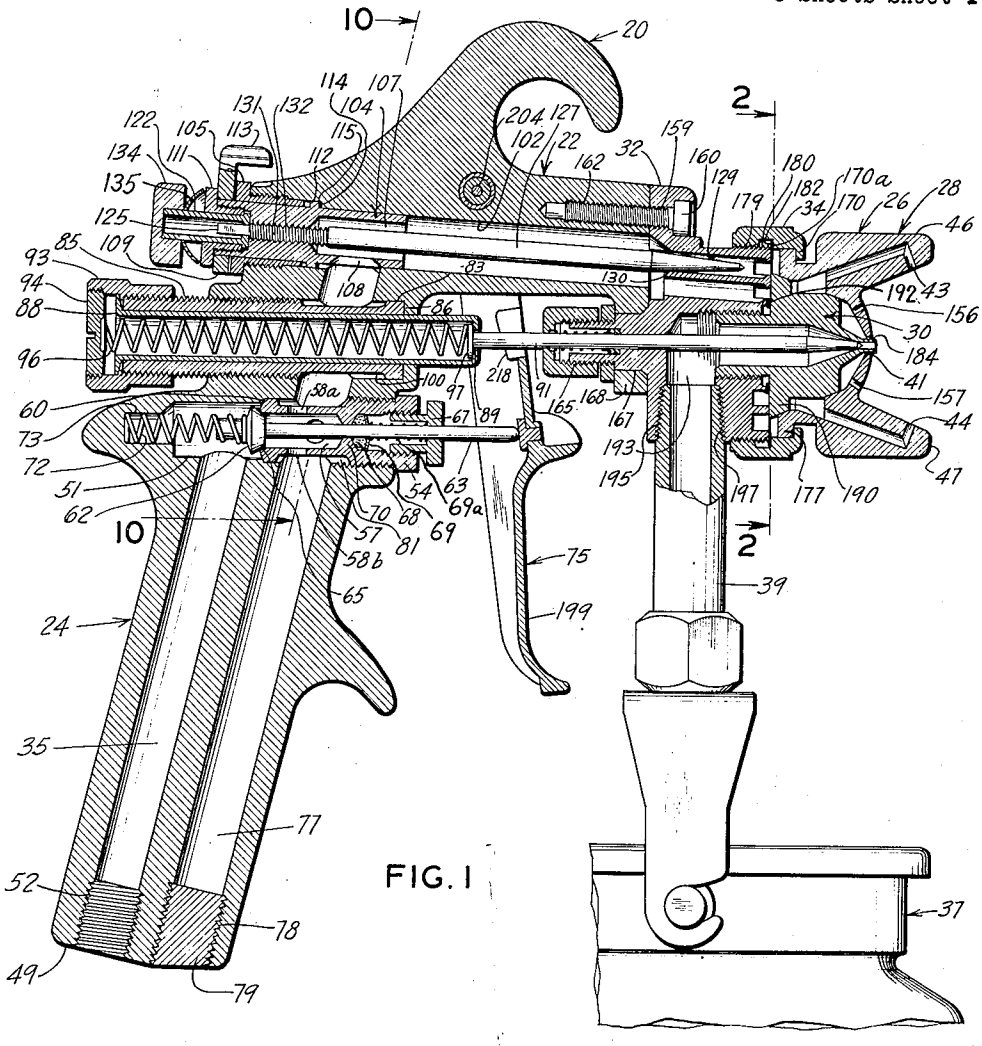
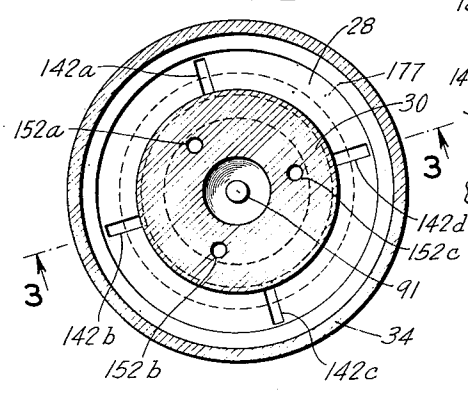


FIG. 1

FIG. 2



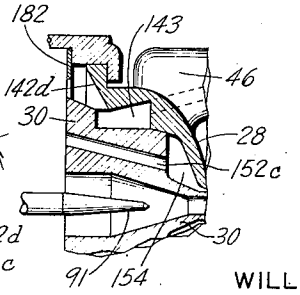


FIG. 3

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SPRAY GUN

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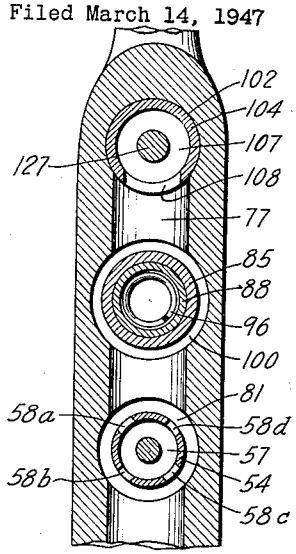


FIG. 10

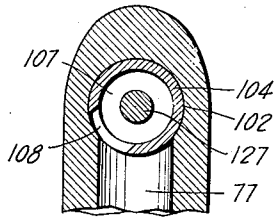


FIG. 11

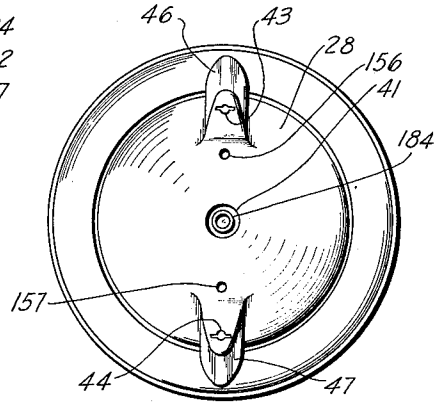


FIG. 12



FIG. 15

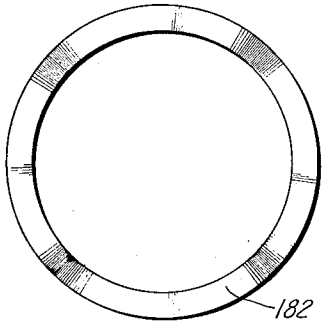


FIG. 14

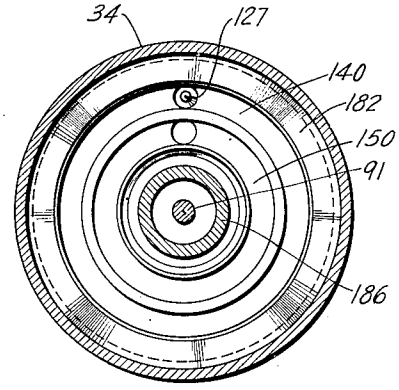


FIG. 13

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SPRAY GUN

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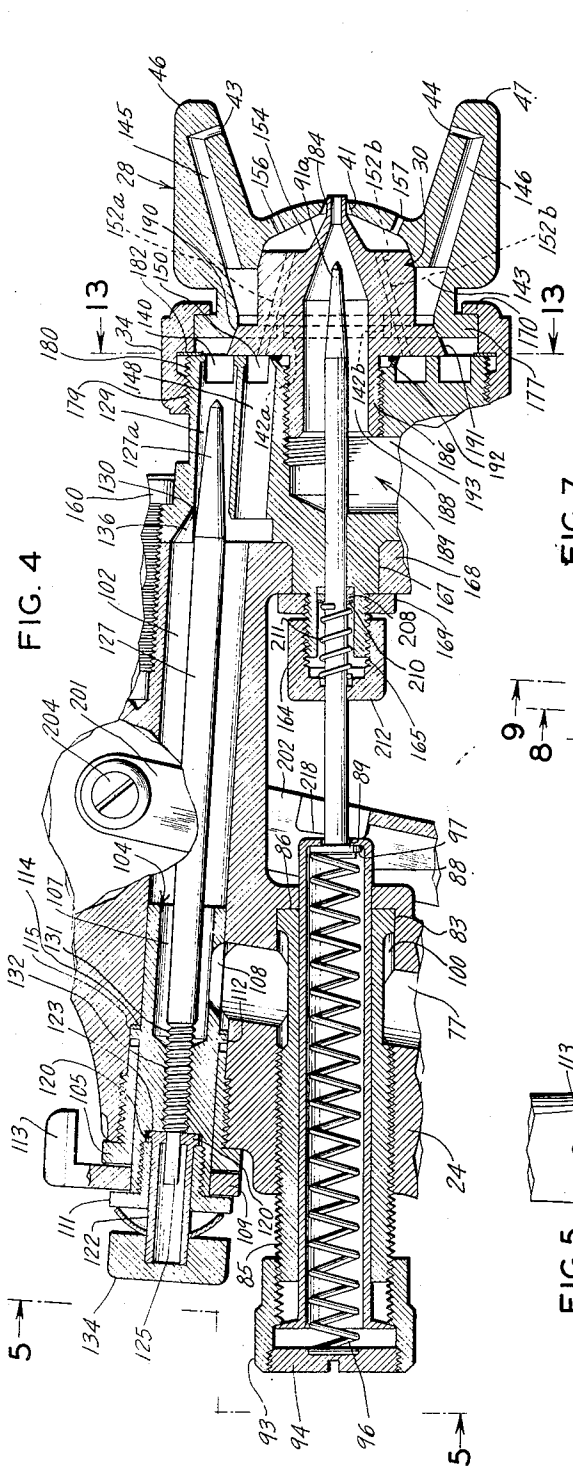


FIG. 4

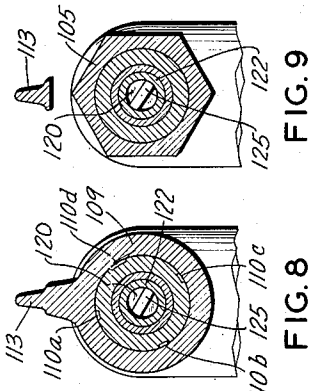


FIG. 9

FIG. 8

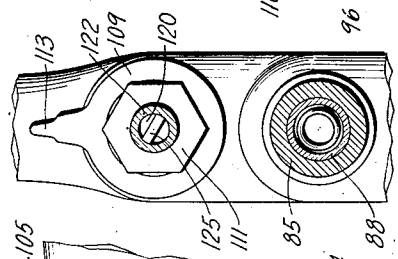


FIG. 7

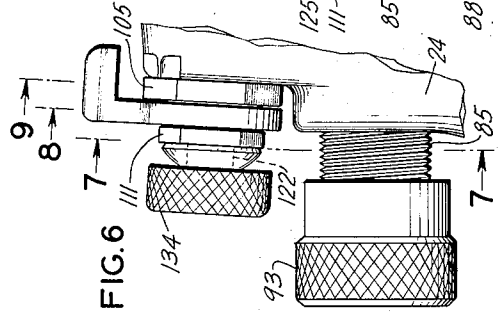


FIG. 6

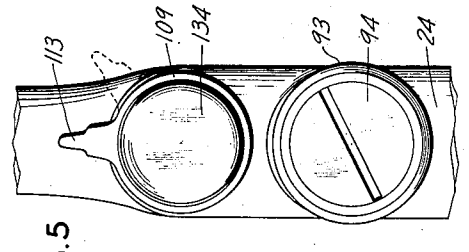


FIG. 5

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Patented July 3, 1951

2,559,407

UNITED STATES PATENT OFFICE

2,559,407

SPRAY GUN

William P. Dalrymple, Rochester, N. Y., assignor to American Brake Shoe Company, Wilmington, Del., a corporation of Delaware

Application March 14, 1947, Serial No. 734,819

3 Claims. (Cl. 299—140.1)

1

This invention relates to spraying devices and more particularly to spray guns of the type adapted to spray a coating material such as paint, or the like, in a finely divided and controlled spray.

It is the primary object of my invention to afford a novel spray gun which is relatively light in weight, can be easily handled and operated, and wherein the regulating and control valves, although being readily accessible to the operator, are in close fitting alignment with the gun so that they do not protrude therefrom in an objectionable manner and, therefore, are protected from being accidentally struck and thereby unintentionally dislodged from their desired settings during normal operation of the gun.

It is another object of my invention to afford a spray gun wherein the pattern of the spray discharged therefrom may be varied in a novel and expeditious manner by turning the nozzle of the gun to thereby shift the pattern, and an object ancillary to the foregoing is to afford a spray gun wherein the nozzle may be turned without varying the other settings of the gun.

A further object of my invention is to construct a spray gun wherein a master control valve is embodied in the body of the gun wherein a relatively large valve can be effectively used, and which valve is operable to efficiently regulate the pressure of the air flowing to the nozzle to values within the desired limits.

Another object of my invention is to construct a spray gun wherein the principal needle valve, controlling the flow of paint from the nozzle of the gun, is of a floating type which is relatively inexpensive to manufacture and which will adjust itself for minor misalignments in the gun.

An object ancillary to the foregoing is to associate the previously mentioned needle valve with a spray gun in such a manner that the needle valve may be readily removed and replaced when desired.

A further object of my invention is to construct a spray gun wherein the adjusting mechanism for setting the needle valve controlling the flow of air through the discharge nozzle is readily accessible to the operator during operation of the gun, and is positioned relatively close to the body of the gun and blends into the outlines thereof so as not to project an objectionable amount therefrom.

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An object ancillary to the foregoing is to construct a spray gun having needle valve adjusting mechanism of the aforementioned character which is in substantially the same proximity to the body of the gun in all positions of adjustment, and does not move in and out relative to the body of the gun during adjustment of the needle valve.

It is a further object of my invention to afford a spray gun wherein air may be blown along the face of the nozzle head, transversely to certain orifices from which air is discharged from the spray gun to thereby sweep the paint off from that portion of the face of the nozzle head adjacent to the orifices in a novel and expeditious manner, and prevent the paint from accumulating thereon.

A further object is to efficiently seal a spray gun from undesired air leakage.

Yet another object of my invention is to construct a spray gun which may easily be disassembled and assembled so that the gun may be quickly and readily cleaned both exteriorly and interiorly.

Yet a further object of my invention is to construct a spray gun which is simple and positive in operation and which can be economically manufactured commercially and will give long efficient service.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a sectional view showing a spray gun embodying the principles of my invention, certain parts thereof being shown in elevation;

Fig. 2 is a detail sectional view taken substantially along the line 2—2 in Fig. 1;

Fig. 3 is a detail sectional view taken substantially along the line 3—3 in Fig. 2;

Fig. 4 is an enlarged sectional view somewhat similar to Fig. 1;

Fig. 5 is a detail end elevational view looking in the direction of the arrows 5—5 shown in Fig. 4;

Fig. 6 is a detail side elevational view of the mechanism shown in Fig. 5;

Fig. 7 is a detail sectional view taken substantially along the lines 7—7 in Fig. 6;

Fig. 8 is a detail sectional view taken substantially along the line 8—8 in Fig. 6;

Fig. 9 is a detail sectional view taken substantially along the line 9—9 in Fig. 6;

Fig. 10 is a detail sectional view taken substantially along the line 10—10 in Fig. 1;

Fig. 11 is a detail sectional view similar to Fig. 10 but showing the master control valve in a different regulating position;

Fig. 12 is a front elevational view of the nozzle head used on my gun;

Fig. 13 is a detail sectional view taken substantially along the line 13—13 in Fig. 4;

Fig. 14 is a detail plan view of the spring washer used in the nozzle head of my gun; and

Fig. 15 is a side elevational view of the washer shown in Fig. 14.

General construction of the spray gun

The gun 20 shown in the accompanying drawings embodies a body 22 having a handle 24 projecting from one end portion thereof and a nozzle head 26 attached to the other end thereof. The nozzle head 26 comprises an air discharge nozzle 28 and a liquid discharge nozzle 30, nozzle 26 being attached to a coupling member 32 by a collar 34, the coupling member 32 being attached to the body 22 in a manner to be described hereinafter.

Air enters the gun 20 through a passage 35 in the handle 24 and flows through the handle 24, the body 22, and out through the nozzle head 26.

When assembled in the manner shown in Fig. 1, wherein my novel gun 20 is connected to a paint container 37 which is not pressurized, the aspirating effect of the air being discharged from the nozzle head 26 is effective to cause coating materials, such as paint, to be drawn up from a container 37 through a pipe 39 into the nozzle head 26 and to be discharged from the nozzle head 26. However, it will be understood that this assembly is shown only for the purpose of illustration of my invention and not by way of limitation, and that my gun 20 may be equally as effectively connected to a paint supply wherefrom paint is fed to the gun under pressure. The paint so discharged from the nozzle head 26 intimately mixes with the stream of air being discharged therefrom and is thereby blown from the gun 20 in a controlled spray.

One portion of the air discharged from the nozzle head 26 is discharged from a central air orifice 41; another portion of the air is discharged through orifices 43 and 44 formed in wings 46 and 47, respectively, on the outer nozzle 28 and acts to modify the stream of air emitted from the central orifice 41; and yet another portion of the air discharged from the nozzle head 26 is directed against the outer face of the wings 46 and 47, transversely to the nozzle openings 43 and 44 therein, and acts to keep the wings free of paint which otherwise might accumulate thereon, as will be made more apparent hereinafter.

Specific construction of the spray gun

The air passage 35 extends from the free end 49 of the handle 24 substantially longitudinally into the handle 24 and terminates at its inner end portion in an air-inlet valve chamber 51. The outer end portion of the air passage 35 is tapped to provide threads 52 therein into which a suitable threaded coupling member may be screwed, to attach an air hose or the like to the gun 20.

A valve housing 54 having a longitudinally extending opening 57 and four transversely extending openings 58*a*, 58*b*, 58*c*, and 58*d*, Figs. 1 and 10, is screwed into the valve chamber 51 wherein it seats against a shoulder 60 formed therein. An air valve 62 having a spindle 63 attached thereto is mounted in the valve chamber 51 and is positioned to seat against a valve seat 65 formed on the inner end portion of the valve housing 54 adjacent to the inner mouth of the air passage 57. The spindle 63, attached to the air valve 62 extends through a gland plug 67 screwed into the outer end portion of the valve housing 54. Gland packing 68 is positioned between the gland plug 67 and an inwardly extending collar 70 in the valve housing 54 to form a seal around the spindle 63 against the leakage of air from the longitudinal passage 57 in the valve housing 54, and collar 69, mounted on the spindle 63, is urged against the packing 68 by a spring 69*a* mounted between the gland plug 67 and the collar 69, to thereby press the packing 68 against the collar 70. A compression spring 72 having one end portion engaged with the outer face of the air valve 62 and the other end portion thereof engaged with the inner surface of the handle 24 within a recess 73 formed therein, tends to normally maintain the valve 62 in engagement with the valve seat 65 on the valve housing 54 and thereby seal the connection between the air chamber 51 and the longitudinal passage 57 in the valve housing 54. As will be described in greater detail hereinafter the outer end portion of the spindle 63 engages a trigger 75 by which the spindle 63 and, therefore, the valve 62, may be moved inwardly to unseat the valve 62 from the valve seat 65 and thereby permit flow of air from the air chamber 51 into the air passage 57 in the valve housing 54.

A second passageway 77, substantially parallel to the air passage 35, is formed in the handle 24 and extends substantially through the entire length thereof. The outer end portion of the passageway 77 in the handle 24 is tapped to provide threads 78 into which a suitable plug 79 may be screwed to seal this outer end portion of the passageway 77 against the escape of air therefrom. At the point where the passageway 77 intersects the air chamber 51, the valve housing 54 is somewhat reduced in cross section so that a space 81 is provided between the valve housing 54 and the side walls of the air chamber 51 and the air passage 77, so that air flowing through the openings 58*a–d* may flow through the enlarged opening 81 around the valve housing 54 up into that portion of the air passage 77 thereabove.

From the valve housing 54 the air passage 77 extends on into the handle 24 and intersects with another bore 83 formed transversely through the handle 24. A threaded sleeve housing 85 is screwed into the bore 83 and seats against a

shoulder 86 formed therein. A smooth sleeve 88 is slidably mounted in the sleeve housing and has an opening 89 from which a needle valve 91 extends into the nozzle 30, the opening 89 being of substantially greater diameter than the needle valve 91. A collar 93 having a plug 94 screwed into the free end is screwed onto the sleeve housing 85 and a compression spring 96 is mounted between the plug 94 and the head 97 of the needle valve 91 and tends to press the needle valve 91 outwardly from the sleeve 88.

At the point where the passageway 77 intersects the bore 83 in the handle 24, the sleeve housing 85 is reduced in cross section so that a space 100 is formed between the sleeve housing 85 and the side walls of the bore 83 and the air passage 77, so that air may pass through the space 100 from that portion of the passageway 77 on one side of the sleeve housing 85 to that portion of the passageway 77 on the other side of the sleeve housing 85.

From the sleeve housing 85 the passageway 77 extends on through the handle 24 and intersects with an air passage 102 which extends substantially longitudinally through the body 22 of the gun 20.

A master control valve 104 is mounted in a bushing 105 screwed into one end portion of the air passage 102 and acts to control the flow of air from the passage 77 into the passage 102 as will be described in greater detail presently.

An air passage 107 extends substantially longitudinally through the interior end portion of the master control valve 104, and another opening 108 extends transversely through, and is so positioned in the side wall of the master control valve 104 that when the control valve 104 is in operable position in the air passage 102, the transverse passage 108 may be aligned with the passage 77 thereby permitting air to flow from the passage 77 through the transverse passage 108 and the longitudinal passage 107, into the air passage 102.

A collar 109, having splines 110*a*, 110*b*, 110*c* and 110*d* engaged with corresponding slots formed in the outer end portion of the control valve 104, is non-rotatably mounted on the outer end portion of the control valve 104 and is held thereon by a hollow retaining screw 111. A thumb piece 113 projects transversely from the collar 109 and forms a convenient handle for rotating the control valve 104 in the bushing 105 to thereby move the transverse opening 108 in the control valve 104 into or out of alignment with the passageway 77. The master control valve 104 fits snugly into the passageway 102 and, therefore, it will be apparent that when the control valve 104 is turned into positions, such as those shown in Figs. 1, 4, 10 and 11, wherein the transverse opening 108 therein is in either direct alignment or partial alignment with the passageway 77, air may flow from the passageway 77 through the transverse opening 108 in the control valve 104 into the longitudinal opening 107 and on into the air passage 102. However, from the foregoing it will be apparent that when the valve 104 is rotated about its longitudinal axis to a position (not shown) 90° from the position shown in Figs. 1 and 10, the opening 108 therein is moved entirely out of alignment with the passage 77 so that the valve 104 effectively closes the connection between the passageway 77 and the passageway 102 and thereby prevents air from flowing therebetween. To effectively seal the control valve 104 against the leakage of air therearound, the control valve 104 not only seats tightly in the air passage 102 but also a suitable sealing member such as an O-ring 115 is mounted between a shoulder 112 formed on the control valve 104 and a shoulder 114 in the air passage 102.

The hollow retaining screw 111, screwed into the outer end portion of the master control valve 104, holds a collar 120, on the inner end portion of a hollow adjusting plug 122, in engagement with a shoulder 123 formed in the control member 104. As is best seen in Figs. 1, 4, 7 and 8, the collar 120 on the hollow adjusting plug 122 has a substantially oblong shaped opening extending therethrough, and which opening embraces a correspondingly oblong shaped end portion 125 of a needle valve 127. The needle valve 127 extends through the control valve 104 and the air passage 102 in the body 22, into an air passage 129 in the coupling member 32. The needle valve 127 has threads 131 formed on one end portion thereof which engage threads 132 formed in the control valve 104. The adjusting plug 122 has a knurled knob 134 thereon by which the adjusting plug 122 may be turned to thereby rotate the needle valve 127 and, through the engagement of the threads 131 on the needle valve 127 with the threads 132 in the master control valve 104, either advance or retract the needle valve 127 toward or away from the passage 129 in the coupling member 32, to thereby vary the effective size of the mouth 130 of the air passage 129 for purposes which will be discussed in greater detail hereinafter. A bowed washer 135 is mounted on the adjusting plug 122 and frictionally engages the knurled knob 134 and the hollow retaining screw 111 and thereby affords a frictional retaining member for holding the needle valve 127 in adjusted position.

The air which flows through the air passage 102 in the body 22 of the spray gun 20, when the control valve 104 is turned in such position that the transverse passage 108 therein is in alignment or partial alignment with the passageway 77, enters a passageway 136 in the coupling member 32, which passageway 136 is in alignment with the passageway 102. From the passageway 136 the air may flow through either one of two courses, or both. One of these courses is from the passageway 136 around the free end of the needle valve 127 into the passage 129, into a circular passage 140 in the coupling member 32, Figs. 4 and 13, and from there through any one of four slots 142*a*, 142*b*, 142*c* and 142*d*, Figs. 2 and 4, formed in the rear end portion of the air discharge nozzle 28, into an annular passage 143 formed between the liquid discharge nozzle 30 and the air discharge nozzle 28. From the annular passage 143 the air may flow through two passages 145 and 146 formed in the wings 46 and 47, respectively, in the air discharge nozzle 28, and outwardly from the passages 145 and 146 through the orifices 43 and 44, respectively.

The other course for the air to flow from the passageway 136 is into a passageway 148 extending through the coupling member 32 in substantially parallel alignment with the passageway 129, into a circular passageway 150 formed in the coupling member 32, Figs. 4 and 13, and from the passageway 150 through any one of three passageways 152*a*, 152*b*, and 152*c*, Figs. 2 and 4, in the liquid discharge nozzle 30 into an annular space 154 between the front end portion of the liquid discharge nozzle 30 and interior surface of the front end portion of the air discharge nozzle 28. From the annular space 154 the air may exit from the air discharge nozzle 28 through the cen-

tral orifice 41 and through auxiliary orifices 156 and 157 for purposes which will be described in greater detail hereinafter.

It will be noted that, as best seen in Fig. 1, the coupling member 32 of the nozzle head 26 has an opening 159 formed therein through which a screw 160 extends, the screw 160 being in threaded engagement with the body 22 of the spray gun 20 in a tapped opening 162 provided therein. A nipple 164, having threads 165 formed thereon, extends through an opening 167 formed in a flange 168 on the body 22 of the gun 20 and is held therein by a nut 169. Therefore, it will be seen that when the coupling member 32 is mounted on the body 22 of the spray gun 20 it is securely held in position by the screw 160 and the nut 169.

The air discharge nozzle 28 is securely held on the outer end portion of the coupling member 32 by the collar 34 which has an inwardly extending flange 170 which engages an outwardly extending collar 177 formed on the inner end portion of the air discharge nozzle 28, and which also has threads 179 which are operably engaged with corresponding threads 180 on the outer end portion of the coupling member 32 to thereby hold another flange 170*a* on the collar 34 tightly against a spring washer 182, Figs. 2, 14 and 15, positioned between the outer end of the coupling member 32 and the flange 170*a*. The pressure exerted by the spring washer 182 tends to frictionally hold the collar 34 in adjusted position on the coupling member 32.

The liquid discharge nozzle 30 has a liquid jet nozzle 184 formed in the central portion thereof, and this liquid nozzle 30 is positioned between the air discharge nozzle 28 and the coupling member 32 with the liquid jet 184 projecting outwardly through the central orifice 41 formed in the air discharge nozzle 28. The liquid discharge nozzle 30 has a threaded nipple 186 which is screwed into threads formed in one leg 188 of an L-shaped passage 189 in the coupling member 32. When the liquid discharge nozzle 30 is screwed into position in the leg 188 of the passage 189, a collar 190 on the nozzle 30 is in engagement with the front end of the coupling member 32, and a suitable sealing member, such as an O-ring 192, may be positioned therebetween; and the peripheral edge 191 of the collar 190 is in engagement with a complementary surface on the inner edge portion of the air discharge nozzle 28. The other leg 193 of the L-shaped passage 189 has threads 195 tapped in the outer end portion thereof which, as is best shown in Fig. 1, are engageable with complementary threads 197 formed on the free end portion of the coupling pipe 39 so that, as will be discussed in greater detail hereinafter, paint may flow from the container 37 through the pipe 39 into the leg 193 of the L-shaped passage 189 and out through the other leg 188 and the jet 184.

The trigger 75 comprises a bifurcated lever having a finger grip 199, Fig. 1, and bifurcations 201 and 202, Fig. 4. The bifurcations 201 and 202 extend up past opposite sides of the body 22 of the gun 20 and are pivotally attached thereto by any suitable means such as a bolt 204, the finger grip 199 of the trigger 75 extending downwardly therefrom and lying in front of the spindle 63 on the valve 62.

The needle valve 91 extends forwardly from the sleeve 88 through the space between the bifurcations 201 and 202, forwardly through the nipple 164 on the coupling member 32 into the leg 188 of the elbow-shaped passage 189, the tapered end portion 91*a* of the needle valve 91 cooperating with the forward end portion of the liquid discharge nozzle 30, adjacent to the jet 184, to control the flow of coating material through the jet 184 in a manner which will be discussed in greater detail hereinafter. The space between the nipple 164 and the needle valve 91 is sealed by gland packing 208 positioned within the nipple 164. A collar 210 is slidably mounted on the needle valve 91 within the nipple 164 and is urged against the packing 208 by one end of a spring 211, the other end of which presses against a gland nut 212 screwed onto the threads 165 of the nipple 164, and which is operable to be advanced onto the nipple 164 to push the spring 211 inwardly to thereby increase the pressure on the collar 210 and, therefore, the gland packing 208, whenever necessary.

During a typical operation of my novel spray gun, the spray gun 20 is attached to an air hose or the like by a suitable coupling member screwed into the threads 52 in the passage 35, and compressed air is fed to the gun from the air hose attached to the passageway 35 in the handle 24. When it is desired to operate the gun, the trigger 75 is manually pulled or squeezed toward the handle 24, to the left as viewed in Fig. 1, to thereby unseat the air valve 62 from the valve seat 65 and permit air to flow through the longitudinal opening 57 and the transverse openings 58*a–d* in the valve housing 54, into the air passage 77, through the space 100 and, the master control valve 104 being turned into position where the transverse opening 108 therein is in at least partial alignment with the air passage 77, the air flows from the space 100 on through the passage 77, through the transverse opening 108, into the longitudinal opening 107 in the control valve 104, and from there out through the passage 102 in the body 22 into the passage 136 in the coupling member 32. As previously described, part of the air then flows from the passage 136 through the passage 150 through the passages 152*a–c* into the annular space 154 between the liquid nozzle 30 and the air nozzle 28 from whence it flows outwardly from the nozzle head 26 through the orifices 41, 156 and 157. Although my novel gun may be used in a system where paint, or other coating material, is fed to the gun under pressure, it is so constructed that it may also be used in systems where the paint is not fed under positive pressure, and for this purpose the construction of the gun 20 is such that the aspirating effect produced by the outward flow of the air through the central orifice 41 is sufficient to cause paint to be drawn up from the container 37 through the pipe 39 and the passage 189, and to be discharged from the jet 184 into the stream of air flowing from the central orifice 41, where it is intimately mixed with the air in a fine spray and blown from the gun 20. It will be understood by those skilled in the art that the atomizing effect of the stream of air flowing from the central orifice 41 on the coating material flowing from the jet 184 will be realized in my novel gun, whether the coating material is fed under pressure or by aspiration, and that in both cases the air and coating material will be intimately mixed together in a fine spray.

Part of the air which enters the passage 136 flows between the tapered end portion 127*a* of the needle valve 127 and the mouth 130 of the passageway 129 into the passageway 129. From

the passageway 129 air flows into the circular passageway 140, and from there through the slots 142*a–d* into the annular passageway 143 between the air discharge nozzle 28 and the liquid discharge nozzle 30. From the annular passageway 143, the air flows through the passageways 145 and 146, in the wings 46 and 47, respectively, and is discharged therefrom through the orifices 43 and 44, respectively, at the proper angle to properly modify the paint spray flowing from the jet 184. The detailed construction and operation of a nozzle to effect proper modification of the paint spray flowing from the jet 184 mixed with the air flowing from the central orifice 41 is fully discussed in the co-pending application of Burr W. Mantle, Serial Number 672,077, filed May 24, 1946, now Patent No. 2,511,-356 issued on June 13, 1950.

I have found that during the operation of a spray gun there is a tendency for a certain portion of the paint which passes outwardly from the jet 184 to swirl away from the air stream passing from the central orifice 41 and be thrown onto the adjacent front surface of the nozzle head. In spray guns of the character with which my invention is primarily concerned, wherein orifices in the nozzle head, such as the orifices 43 and 44, are utilized to modify the paint spray issuing from the gun, the depositing of paint on adjacent front surfaces of the nozzle head is detrimental to the proper operation of the gun because it tends to accumulate and cake thereon and eventually to alter the effective size and characteristics of the orifices through which the modifying air flows. To prevent this, I have provided the orifices 156 and 157 which are positioned in the front face of the air discharge nozzle 28 in such a manner that the air which flows therefrom is directed against the front face of the wings 46 and 47 just inside the orifices 43 and 44 so that the air stream issuing from the orifices 156 and 157 tends to sweep off any paint which might be deposited on the wings 46 and 47 and which, if not removed, would alter the effective size and the discharge characteristics of the orifices 43 and 44. Thus it will be seen that in my novel gun 20, the orifices 156, 157 provide an effective way of keeping the orifices 43 and 44 free of accumulated paint and thereby assist in preventing undesirable alteration of the operating characteristics of the gun by the accumulation of paint on the wings 46 and 47 during the operation thereof.

Control of the paint flow through the jet 184 is effected in part through control of the velocity of the air issuing from the orifice 41, and in part through operation of the needle valve 91 by the trigger 75. For this latter control, shoulders, such as the shoulders 218, Figs. 1 and 4, are formed on the bifurcations 201 and 202 of the trigger 75 and are engageable with the free end portion of the sleeve 88. Thus it will be seen that, the trigger 75 being at all times in engagement with the spindle 63 on the air valve 62, upon depression of the trigger 75 toward the handle 24, the air valve 62 is first opened so that air is permitted to flow from the passage 35 through the gun 20 and out through the central orifice 41 in the air nozzle 28, as previously described, and that upon further depression of the trigger 75 the shoulder 218 thereon engages the free end portion of the sleeve 88 and pushes the sleeve 88 outwardly, or to the left as viewed in Fig. 1. Outward movement of the sleeve 88 causes the free end portion of the sleeve 88 to press against

the head 97 of the needle valve 91 and thereby withdraw the needle valve 91 from the jet 184. It will be apparent that one of the controlling factors in determining the amount of paint which will flow through the jet 184 is the size of the opening through this jet, and that the position of the needle valve 91 with respect thereto is a controlling factor in determining this. Therefore, from the foregoing it will be apparent that, as the trigger 75 is depressed toward the handle 24, the needle valve 91 is withdrawn from the opening in the jet 184 so that the effective opening of the jet 184 is enlarged to permit a larger quantity of paint to flow therethrough, and, conversely, as the trigger 75 is released by the operator, the spring 96 is effective to move the needle valve 91 back toward the jet 184 to thereby restrict the effective opening of the jet 184 and thereby retard the flow of paint therethrough. This, it will be seen, gives the operator of my spray gun 20 a quick and easily operated control of the flow of paint from the gun.

The master control valve 104, as will be apparent to those skilled in the art, may be readily adjusted by turning the thumb piece 113 to any position between the position in which the passageway 108 is completely out of alignment with the passageway 77 and, therefore, no air is permitted to flow from the passageway 77 through the control valve 104, and the position, shown in Figs. 1 and 10, wherein the transverse passage 108 is in complete alignment with the passageway 77 and the control valve 104 is completely open to permit a maximum air flow therethrough into the passageway 102. Thus it will be seen that the master control valve 104 may be adjusted to permit any desired amount of air to flow therethrough, and thereby provides an effective means for regulating the pressure of the compressed air reaching the needle valve 127. Also, it will be seen that the lever 113 by which the master control valve 104 is adjusted, is in a readily accessible position so that the control valve 104 may be easily adjusted by the operator without interrupting operation of the spray gun 20, but does not project an undesirable amount from the body 22 of the spray gun and blends in to the outlines of the body 22 so as to be thereby protected from being knocked out of adjusted position.

While the master control valve 104 provides mechanism for adjusting the flow of air to the nozzle head 26, the needle valve 127 provides additional valve mechanism for this purpose whereby the fine adjustment of the air flow through the nozzle head 26 may be accomplished. Thus it will be apparent to those skilled in the art that by rotating the knurled knob 134 in the proper direction, the needle valve 127 may be screwed into or out of the master control valve 104 to thereby adjust the position of the needle valve 127 relative to the mouth 130 of the passage 129 in the coupling member 32 and thereby regulate the modifying air stream which flows outwardly from the wings 46 and 47 of the air discharge nozzle 28 through the orifices 43 and 44. It will be noted that while the knurled knob 134 on the adjusting plug 122 is in a readily accessible position and may be readily turned by the operator during operation of my gun 20 to change the setting of the needle valve 127, it does not project an undesirable amount, and, like the lever 113, blends in well with the outlines of the body 22 so as to be protected from being accidentally knocked out of position during operation of the

gun 20. Moreover, it will be noted that in adjusting the needle valve 127, the knurled knob 134 and the adjusting plug 122 are merely rotated on their longitudinal axis and do not move longitudinally of the body 22 of the gun 20, so that this same desirable position of the knurled knob 134 longitudinally of the barrel 22 is maintained for all positions of adjustment of the needle valve 127. This represents a substantial improvement over the spray guns heretofore known to the prior art.

As was previously mentioned, the opening 89 in the sleeve 88 through which the needle valve 91 extends is preferably of relatively considerably greater diameter than the diameter of the needle valve 91. This being true it will be apparent that the needle valve 91 may be swiveled in any direction, and to any extent, within the confines of the walls of the opening 89.

Heretofore in the art, coring and machining of openings such as the openings 83 and 167 has presented a serious problem because, although these openings were in two separated members they had to be relatively accurately aligned so that the needle valves heretofore known could be properly inserted therein. However, in my spray gun 20, because of the novel manner in which I mount my needle valve 91, the needle valve may be swiveled sufficiently that the openings 83 and 167 need be aligned only within relatively broad limits, which are readily obtained in production, in order to properly position the needle valve 91 therein and need not be aligned within the relatively narrow limits which were heretofore necessary and difficult to obtain.

Relatively fine adjustment of the position of the needle valve 91 relative to the jet 184 may be effected by screwing the collar 93 onto and off from the sleeve housing 85 to thereby vary the compression of the spring 96. It will be apparent that this adjustment is also effective to control the extent to which the needle valve 91 can be withdrawn from the jet 184 by operation of the trigger 75, the movement of the collar 93 onto or off from the housing 85 correspondingly moving the plug 94 to thereby vary the position at which the plug 94 will strike the outer end of the sleeve 88.

From the foregoing it will be apparent to those skilled in the art that the opening 89 in the sleeve 88 may be considerably larger than the diameter of the needle valve 91 and the needle valve 91 can "float" therein, so as to automatically adjust itself for misalignment which may occur in the body of the needle valve 91. Also it will be apparent that to change the needle valve 91, all that is necessary is to unscrew the collar 93 from the sleeve housing 85 and pull out the sleeve 88 together with the needle valve 91, the plug 94 then being removed from the collar 93, the compression spring 96 then being removed from the sleeve 88 and the sleeve 88 inverted, and the needle valve 91 permitted to drop therefrom. A new needle valve 91 may then be inserted into position in the sleeve 88 and the needle valve 91 and the sleeve 88 pushed into position in the sleeve housing 85, the compression spring 96 reinserted into the sleeve 88, the plug 94 screwed back into the collar 93, and the collar 93 screwed back onto the sleeve housing 85. Thus it will be seen that removal and replacement of the needle valve 91 is a relatively simple operation in my novel spray gun 20.

From the foregoing description of the construction and operation of my novel spray gun, it will be apparent to those skilled in the art that I have provided a lightweight, practical spray gun which is both positive and efficient in operation and which can be economically manufactured commercially, all of the internal openings therein being formed by the simplest types of coring and drilling operations or the like.

Furthermore, it will be noted that my spray gun is efficiently sealed against undesirable air leaks and that the various valves thereof are held positioned so as to be readily accessible to the operator but also so as to be protected from being accidentally knocked out of adjustment.

Furthermore, it will be noted that the nozzle head of my spray gun is so associated with the body of the gun that it may be readily adjusted by the operator during operation of the gun to vary the position of the spray issuing from the gun so as to render it unnecessary to twist and turn the gun to accomplish this.

Thus while I have illustrated and described preferred embodiments of my invention, it is to be understood that these are capable of variation and modification and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a spray gun, a nozzle head adapted to pass coating material therethrough, means for feeding coating material to said nozzle, a sleeve, a needle valve for controlling the flow of coating material through said nozzle head, resilient means within said sleeve for swivelly mounting said needle valve in said sleeve and in position to urge said sleeve toward said nozzle head, and means for reciprocating said sleeve to thereby move said needle valve relative to said nozzle head.

2. In a spray gun, means including a nozzle head for feeding coating material therethrough, a handle connected to said nozzle head, an elongated sleeve slidably mounted in said handle for reciprocation therein in a longitudinal direction toward and away from said nozzle head, a spring mounted in said sleeve and yieldingly urging said sleeve toward said nozzle head, an elongated needle valve mounted in said nozzle head for controlling the feeding of coating material therethrough, said needle valve being operatively connected to said sleeve and transversely swivelable relative thereto, and means including said spring for reciprocating said sleeve in said handle and thereby reciprocating said needle valve relative to said nozzle head.

3. In a spray gun, means including a nozzle head for feeding coating material therethrough, a handle connected to said nozzle head, an elongated sleeve slidably mounted in said handle for reciprocation therein in a longitudinal direction toward and away from said nozzle head, an elongated needle valve for controlling the feeding of coating material through said nozzle head, said needle valve having one end portion reciprocably mounted in said nozzle head and the other end portion thereof operatively connected to, and swivelly mounted in, one end portion of said sleeve for swivelling movement in all directions relative to said sleeve, said sleeve being operable upon reciprocatory movement away from said nozzle head to pull said needle valve in a direction away from said nozzle head, a spring mounted in said sleeve and engaged with said needle valve and yieldingly urging said sleeve

and needle valve toward said nozzle head, and means engageable with said sleeve for moving said sleeve away from said nozzle head to thereby move said needle valve in a direction away from said nozzle head.

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