April 18, 1950 A. H. DOWNS 2,504,116

MULTICOLOR SPRAY GUN

Filed Oct. 10, 1944 2 Sheets-Sheet 1

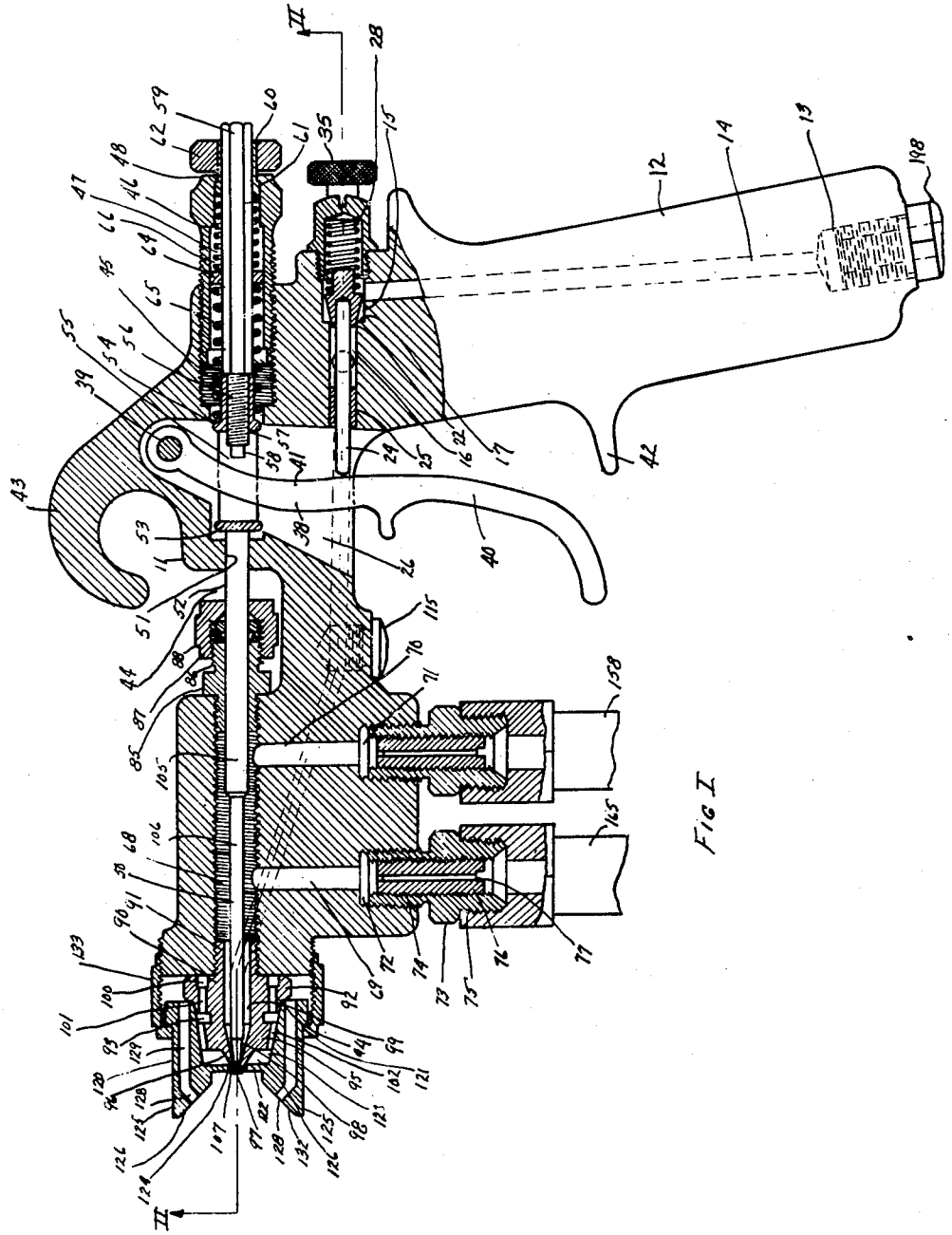


FIG I

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MULTICOLOR SPRAY GUN

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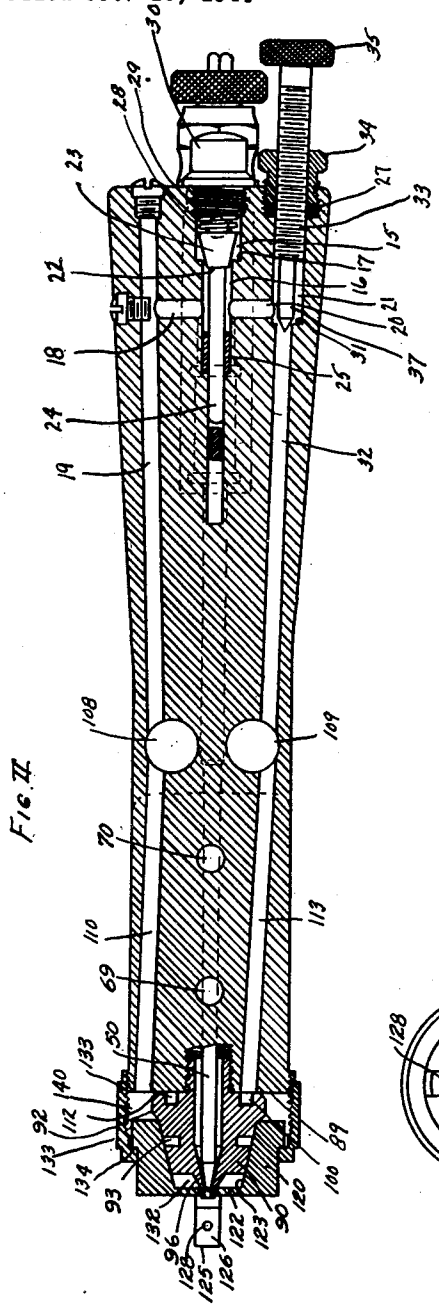


FIG. II

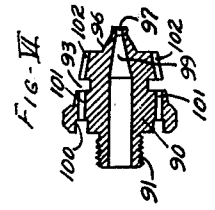


FIG. IV

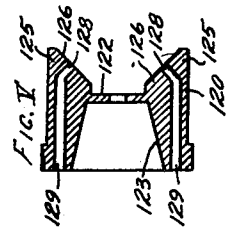


FIG. V

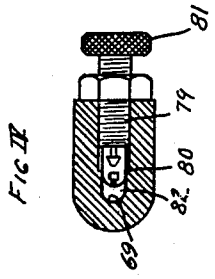


FIG. VI

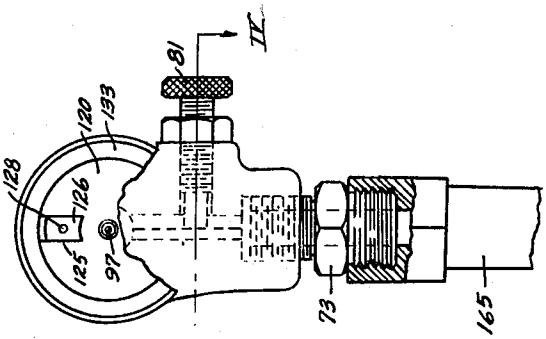


FIG. III

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UNITED STATES PATENT OFFICE

2,504,116

MULTICOLOR SPRAY GUN

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Application October 10, 1944, Serial No. 557,955

4 Claims. (Cl. 299—140)

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This invention relates to novel spray devices for spraying materials, such as paints and the like. More particularly the invention is directed to novel spray guns for simultaneously spraying different colored surfacing or coating media such as paints and the like onto a surface.

According to this invention, a plurality of different colored coating media, preferably in the liquid form, such as paints and the like, are fed into a common fluid receiving chamber terminating in a discharge orifice. Said liquids are fed into said chamber at different places and preferably along the length or longitudinal axis of said chamber, which is preferably elongated. These liquids are preferably fed into the space of said chamber as streams or free columns. The viscosity and color of the liquid of one of said streams or columns differs from the corresponding characteristics of the liquid of another of said columns. The inlet or places of entry of said columns are preferably spaced from each other; and said columns as they enter said chamber are disposed at an appreciable angle and preferably at approximately right angles to the longitudinal axis of the receiving chamber. The liquid of greater viscosity is fed to said chamber at a place closer to said orifice than the place of entry of said liquid of lower viscosity. The different colored, and preferably different viscosity liquids, are discharged from said orifice and as they leave this orifice in the course of their travel towards the surface to be coated a gaseous medium, such as air or the like atomizes said discharge and mixes said particles of discharge prior to their reaching the surfaces to be coated. The shape of the spray may be controlled by a pair of opposite streams of air projected towards each other and into the atomized discharge.

By employing my novel spray guns, I have obtained unusual and unique multicolored surface coatings by employing a single spraying operation. One of the outstanding characteristics of this invention is that by employing the invention multicolored coatings simulating hammered, pebbled, webbed, stipple or other type surfaces may be obtained by employing a single spraying operation.

Another object of this invention is to provide a novel spraying device.

Another object of this invention is to provide a novel spraying device for simultaneously spraying a mixture of different colored coating media onto the surface of an object to be coated.

These and other objects of this invention will be readily apparent from the following description and accompanying drawings, wherein:

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Figure I represents a vertical longitudinal cross sectional view of a spraying device embodying the invention.

Figure II is a horizontal longitudinal cross sectional view taken along line II—II of Figure I in the direction of the arrows.

Figure III is a view in front elevation of the liquid throttling means shown in Figures I and II but modified to show a modification of the liquid line throttling means shown in Figs. I and II.

Figure IV is a cross sectional view taken on line IV—IV of Figure III and in the direction of the arrows.

Figure V is a cross sectional view of the nozzle shown in Figures I and II.

Figure VI is a cross sectional view of the fluid tip shown in Figures I and II.

Referring to the drawings the numeral 10 designates the body of a paint spraying device illustrating an invention. The body 10 includes a barrel portion 11 and a handle portion 12. The handle portion 12 extends downwardly from the barrel portion 11 and is inclined slightly to the rear thereof so that the body 10 has somewhat the appearance of an automatic revolver.

The lower end of the handle portion 12 has an internally threaded opening 13 therein. The opening 13 communicates with a passage 14 which extends upwardly through the interior of the handle 12 to an air inlet valve chamber 15 in the rear part of the barrel portion of body 10. The chamber 15 communicates with an air distributing chamber 16 disposed forwardly thereof in barrel portion 11. The chamber 16 is of smaller diameter than the chamber 15 and the shoulder at the end of the chamber 15 as it meets chamber 16 acts as a valve seat 17. A passageway 18 communicates with and extends from chamber 16 directly to a passageway 19 extending along the barrel portion 11 from its rear towards the nozzle end of the device. Another passageway 20 communicates with and extends from chamber 16 directly to a valve chamber 21.

Mounted in the valve chamber 15 is a suitable valve member 22 having a valve proper 23 adapted to engage the valve seat 17 and having an operating rod or stem 24 integral therewith and extending forwardly therefrom. The valve stem 24 extends through a suitable bearing opening 25 in the barrel portion and into an open inverted approximately V-shaped slot 26 in said barrel portion. The rear end of the valve member 23 is provided with a stud or projection 27 receiving one end of a coiled compression spring 28. The other end of said spring 28 is positioned

in an exteriorly threaded socket 29 integral with and disposed at the forward end of a securing and tensioning adjusting nut 30 secured to the interiorly threaded rear end of the valve chamber 15. By this means the valve proper 23 is normally held in tight engagement with the valve seat 17 so that if air under pressure is admitted to the chamber 15 through the communicating passageways 13 and 14, no air under pressure is admitted through the passages 16, 18, 19, 20 and 21.

The degree of force of the valve 22 in the direction of the valve seat 17 is controlled by the compression spring 28 which in turn is controlled by the nut 30.

The valve chamber 20 is provided with a valve seat 31 and communicates with and leads into a passageway 32 extending in the same direction as passageway 19 along the barrel interior and towards the nozzle end of the device. A needle valve 33 is mounted in the valve chamber 20 through an internally threaded portion of a mounting nut 34. The outer end of the valve 33 terminates in a knurled manipulating knob 35 by which the inner or valve end 37 may be adjusted relative to the valve seat 31 to regulate the flow of air into passage 32 as desired or to cut it off completely if required.

A trigger 38 has its upper end located at the apex of the slot 26 and is pivotally connected at its upper end to the barrel portion 11 by a pivot pin or bolt 39. The trigger 38 extends below the slot 26 and its downwardly extending lower portion 40 is curved to provide a hand saddle so it may be readily and positively engaged by certain fingers of the hand of an operator. The rear face of that portion of the trigger 38 in the slot 26 has a rear bearing face 41 engaging the free front end of the valve stem 24. When the trigger 38 is swung rearwardly about the pivot 39, the valve stem 24 and valve proper 23 are forced rearwardly against the action of the spring 28 whereupon the valve 23 is moved away from the valve seat 17 to permit the admission of air under pressure from the chamber 15 into passageways 16, 18, 19, 20 and 21 and if the needle valve 33 is in open position, into passage 32.

The rearward movement of the trigger 38 is limited by means of the abutment of the lower portion 40 thereof against the external face of the handle portion 12. Spring 28 is of sufficient strength normally to hold the valve 22 in closed position and the trigger in its fully extended open position shown in full lines in Figure I and to cause these parts to assume these positions when the external pressure on the trigger is sufficiently reduced. Thus a very simple and delicate control is provided for controlling the admission of air into the device and it is very easily regulated by an operator without the necessity of long training and experience. For additional ease of manipulation and to insure a firm grip, the handle portion 12 is provided with a finger lug or guard 42 projecting from said handle portion 12 directly below and adjacent the lower end of the trigger.

The barrel portion 11, when the gun is held in a normal position, extends in a horizontal direction forwardly from the handle portion 12 and is provided with a curved lug or hook 43 to provide a convenient hanging means for the device when not in use. On its upper part and in the vicinity of the midlength of the barrel portion, there is provided a cut out portion 44.

The barrel portion 11 is bored centrally at its rear to provide a valve operating chamber 45 interconnecting with the slot 26 in barrel 11. Chamber 45 is internally threaded and has threadedly coupled thereto a hollow elongated nut 46 screwed into the rear end thereof. The nut 46 has a spring chamber 47 and a central opening 48 at its rear end and axially aligned therewith.

A valve rod 50, for controlling the supply of liquid material, extends into the valve operating chamber 45 through its front end and is movably mounted within a forward bearing part 51 of the central barrel bore. Inside said chamber 45 said rod 50 is enlarged in diameter at 52 and is provided with two spaced shoulders 53 and 54. A vertical slot 55 is provided in the rod 50 between shoulders 53 and 54 and the upper portion of trigger 38 passes therethrough and is movable therein. The rear end of rod 50 is provided with an internally threaded bore 56 extending from said end through the rear end of slot 55. Threadedly engaged in said bore 56 is an operating rod 57 having a forward nose 58 projecting into said slot 55 and is adapted to be engaged by the trigger 38 when said trigger is moved rearwardly to operative position as hereinbefore described. Operating rod 57 may be of hexagonal or other polygon shape in section as at 59. A riveting collar 60 is slidably borne to the rear end of rod 50. This collar 60 has a flange 61 which engages the inner shoulder at the rear end of the nut 46. A rotatable knob 62 is fixedly mounted on collar 60 so that rotation of knob 62 will rotate collar 60 and in turn the rod 57.

Intermediate its ends rod 57 is provided with a slide ring 64. A coil spring 65 is mounted around the front part of rod 57, with one end of said spring abutting against shoulder 54 and its other end against one face of ring 64. A coiled spring 66 is mounted around the rear part of rod 59, with one end engaging the opposite face of the ring 64 and its other end abutting against the flange 61. These springs 65 and 66 normally urge the rod 57 and consequently valve rod 50 forwardly.

The adjustable positioning of the nose 58 through the knob 61 by the parts above described so that it is nearer to or further away from the trigger 38 permits a fine variation of the relative movement of the valve rod 50 when the trigger is actuated, as well as a fine control of the relative time of opening of the air valve 23 and the fluid outlet valve when the trigger is moved. The time may be thus controlled to effect simultaneous operation of the air and fluid outlet valves or later opening of the fluid outlet valve with respect to the air valve 23. In Figure I, the position of the nose 58 is such that the trigger 38 will first engage the stem 24 to first open valve 23 and then engages nose 58 to actuate valve rod 50.

The forward end of the barrel portion 11 is provided with an internally threaded longitudinal bore forming a liquid receiving chamber 68. The lower part of the barrel portion 11 is enlarged at its underside to provide an extension 69 having a plurality of, and as shown merely for the purposes of illustration two, supply passageways 69 and 70 communicating with the supply chamber 68. These passageways 69 and 70 may be of the same or of different lengths and diameters and as illustratively shown are of the same dimensions. Each of said passageways is preferably disposed roughly at right angles to the chamber 68 and depends therefrom. The passageways 69

and 70 are preferably one behind the other in single file relationship and are roughly parallel to each other and are located in about the same plane. The passageways 69 and 70 may be cylindrical and terminate at their lower ends in respectively enlarged internally threaded coupling bores 71 and 72 whose diameters are the same and materially greater than the diameter of passageways 69 and 70.

Demountably mounted in each coupling bore 71 and 72 is a double nipple 73 having each of its ends 74 and 75 threaded. The hollow nipple 73 is internally threaded and has demountably mounted therein, an exteriorly threaded cylinder 76 having a central cylindrical bore or passageway 77. The dimensions of the bore or passageway 77 are preferably such that the length thereof is many times the diameter. In one of the preferred embodiments of the invention the length of passageway 77 is at least 5 times the diameter thereof. The diameter of the passageway 77 is much less than the diameter of passageways 69 and 70 and the length and diameter of the passageways 69 and 70 and the passageway 77 are so chosen that the fluid under pressure discharges substantially as a column from the passageway 77 through passageway 69 or 70 and into chamber 68 without to any great extent striking the sides of the passageway 69 or 70. While the passageways 77 may be of the same diameter, I prefer to employ cylinders 76 having passageways 77 of different diameters. Instead of employing the cylinders 76 in the demountable nipples 73, a lateral threaded opening 78 communicating with the opening 69 or 70 may be provided in the barrel portion 11 and in each of said openings 78 there may be provided a valve 80. The valve 80 extends into the passageway 69 or 70 and may be actuated by knob 81 to vary the opening 82 between passage 69 or 70 and valve 80 to control the flow of material through the supply openings and into the chamber 68. These adjustable valves 80 may be associated with both of the openings 69 or 70 and are independently operable to vary the flow in either or both of said openings 69 or 70.

Receiving chamber 68 is in axial alignment with valve operating chamber 45 and valve rod 50 projects into said chamber and is slidably movable toward and away from the front end of the chamber 68, is slidably borne and guided in a packing nut 85 screwed to the rear of said chamber 68. The rearwardly extending portion 86 of nut 85 is externally threaded and a hollow clamping nut 87 is screwed thereon and serves to force and clamp packing material 88 tightly about the valve rod 50 and seal the rear end of said receiving chamber 68 against leakage while permitting sliding movement of the said rod. The front end of chamber 68 is internally screw-threaded and terminates in the flat front face 89 of the barrel 11, and a fluid tip 90 is adapted to be received in said screw threaded chamber 68.

This fluid tip 90 is provided with a screw-threaded extension 91, whereby it is secured in position engaging the forward screw thread of the receiving chamber 68. It has a hexagonally or polygonally shaped flange 92 directly adjacent the extension 91 and a conical portion having a circular recess or slot 93 to provide a pair of frusto-conical portions 94 and 95, with the greatest diameter of portion 94 being equal to the perpendicular distance between the faces of flange 92. The forward end of tip 90 is a short conical section 96 terminating in a small diameter cylindrical nose. The forward end of conical opening 98 acts as a valve seat for the free forward end of valve rod 50. The nose has a small diameter opening 97 therein communicating with a conical opening 98 in cone 96 which in turn communicates with a cylindrical opening 99 whose diameter is equal to that of the base of cone opening 98.

The flange 92 has a shallow annular recess 100 therein at about the midthickness thereof. Equally spaced small cylindrical openings 101 parallel to the opening 99 extend through the portion 94 to provide communicating passageways between the recess 100 and annular recess 93. The portion 95 has a plurality of slots 102 throughout the entire length thereof. These slots 102 are of uniform depth and length. The lower ends of the slots 102 terminate near the ends of the openings 101.

The plunger or front portion of the valve rod 50 is in the form roughly of an elongated needle or rod having a rear portion 105 extending from the shoulder 53, through opening 51, packing nut 88 and bushing 85 and into chamber 68, and a front portion 106 of smaller diameter than rear portion 105 and terminating in a conical or valve tip 107. When the valve tip 107 seats in the conical opening 98 and is normally in this position when the trigger is not actuated by any outside force, the fluid receiving chamber is sealed to prevent the passage of fluid out of the orifice 97. When said valve 107 is opened by pressure on the trigger as before described, fluid passes from the chamber 68 and out through the forward end of the orifice 97 in the nose.

The air passages 19 and 32 extend horizontally along the barrel toward its forward end, to the respective chambers 108 and 109 (Fig. II) and converge slightly in their approach thereto. A passageway 110 extends upwardly and outwardly in the barrel 11 from the chamber 108 and terminates in the flat front face 112 of said barrel directly adjacent and outside of the flange 92.

A passageway 113 leads upwardly and outwardly in the barrel 11 from the chamber 109 and also terminates in the front flat face 112 of said barrel at a diametrically opposite point to terminus of said passageway 108. The passageway 113 communicates with the recess 100. The chambers 108 and 109 are provided to facilitate the boring of the respective passageways 110 and 13 and each is suitably sealed at its lower end by the respective sealing plugs 115 and 116. In this manner, two continuous air passages from the air distributing chamber 16 to the tip or forward end of the barrel are provided, one of which is independently valve controlled through the valve 33 whereby air through passageways 32, 109 and 113 may be adjustably restricted or cut off entirely as desired.

A nozzle 120 may be applied over the fluid tip 90 and is preferably of the external or outside mix type. The nozzle 120 is of generally cylindrical external contour and has a lower portion of enlarged diameter to provide a retaining shoulder 121. The nozzle 120 has a front closure 122 and is hollow to provide a generally conical internal face 123. The closure 122 has a central circular opening 124 therethrough and the diameter of this opening is somewhat larger than the external diameter of the nose of fluid tip 90. The nozzle 120 also includes a pair of air jet outlet members 125 integral with closure 123 and longitudinally extending therefrom. These members 125 are diametrically arranged at opposite sides of the opening 124.

The upper parts of the facing sides 126 of members 125 slant upwardly outwardly away from each other. Each of said members is provided with a passage outlet 128 disposed at about right angles to the face 126 and communicating with an opening 129 which extends from opening 128 and extends through the lower or inner face of the nozzle 120. The nozzle 120 is mounted on the fluid tip 90 as shown in Figures I and II, with the inner edge of the lower part of nozzle 120 abutting against the inner edge of flange 92. The lower face of nozzle 120 extends outwardly beyond flange 92 leaving exposed the lower end of passageways 129. The entire outermost conical faces of portions 94 and 95 of fluid tip 9 snugly abut against the lower internal conical face 123. The nose of the fluid tip 90 extends through the opening 124 and its outer extremity is located beyond the front face of closure 122. Between the inner face of closure 122 and the upper end of the conical portion 95 is an air chamber 132. A threaded collar or clamping nut 133 is threadedly connected to the front end of barrel 11 and has a flange 134 abutting against shoulder 121 to demountably lock the fluid tip 90 in position. The desired angular position of the members 125 may be varied by merely loosening the nut 133 and rotating the nozzle the proper amount.

Air under pressure passes out of passageway 113, into annular recess 100 and then through the equally spaced openings 101. From the openings 101, the air travels through into annular recess 93, through the slots 102, into the chamber 132, through the portion of the passage 124 around the circumference of the projecting nose of fluid tip 90.

The air as it passes beyond the front face of the closure 122 sets up an eddy current effect at the discharge terminus of said nose of tip 90. These eddy current effects serve to atomize and mix the fluid as it passes out of said nose and towards the surface to be coated.

Air under pressure from the passageway 110 enters the chamber 140, whose one side is formed by the lock nut 133, then passes through the passageways 129, then through 128 and project towards each other to further mix and control the shape and dimensions of the spray as it leaves the nozzle 120.

The novel spray gun may be coupled with different sources of coating materials through flexible hose lines 158 and 165 connected to the nipples 73 for delivering the coating materials under pressure to the chamber 68. The spray gun may be coupled with a flexible hose 198 carrying air under pressure and connected thereto at the lower end of the handle 12 to supply air under pressure to the passageway 14.

In operation, after the pressure of the sources of coating material supply has been properly adjusted and pressure in the air supply line to the spraying device has been properly adjusted, and the spraying device has been connected to said air supply line and to the fluid supply lines from said sources of coating material supply, the operator is ready to spray coat. In the practice of this invention, it is preferable to employ paints of different viscosities in the lines 158 and 165 and I prefer that the higher viscosity paint be in line 165 connected to the passageway 69 and both paints be at the same pressure. Paint is conveyed under pressure through hose 165, front passageway 71 from which it discharges as a free column through the passageway 69 and into the chamber 68. Paint is conveyed under pressure

through hose 158, rear passageway 71 from which it discharges as a free column through passageway 70 and into chamber 68. The air under pressure is conveyed through hose 198 to the passageway 13 into chamber 15. With the valve 33 set in the open position shown in Figure II, the spraying device is ready for operation. It is to be understood that if desired the valve 80 may be completely eliminated and is employed only if adjustable means for regulating the flow of fluids in passageways 69 and 70 are desired. The chamber as shown has an internal diameter of about .375" and the diameters of the openings 71 may vary preferably between about .025" and .10" and are at least .5" long.

The operator forces the trigger 38 towards the handle 13. The trigger 38 first strikes the rod 24 to unseat valve 23 whereupon the air passes into chamber 16, through passages 18, 19, 108, 110 into chamber 140 and through passages 129 and 128; and also from chamber 16 through passages 20, chamber 33, passages 32, 109, 113, slot 100, openings 101, slots 93, 102, chamber 132 and then between the outside of the nose of fluid tip 90 and the orifice 124.

While the air continues following the aforementioned path, the trigger strikes the nose 58 and retracts the valve rod 50 to open the fluid or paint discharge orifice 97 at the end of the common paint receiving chamber formed by the aligned chamber 68, and the chamber in said fluid tip 90. The different colored paints discharge out of said orifice 97 and are atomized and mixed by the eddy currents created by the discharge of air through orifice 124 and as the atomized paint mixture in its course of travel towards the surface to be painted passes between the air jets from openings 128, it is further mixed and the configuration of the spray is modified. When the trigger 38 is released, the orifice 97 is first closed by the valve rod 50 and then the valve 15 assumes its closed position.

The foregoing system and spray device may be employed by even an unskilled workman and may be employed to carry out my novel methods for obtaining unique spray coatings of different colors. Although the invention has been described in detail, it is not to be limited thereby because many changes and modifications may be made without departing therefrom.

What is claimed:

1. A paint or the like spraying device, capable of producing spatter finish coatings in a single spraying operation, comprising a body, an elongated fluid receiving chamber having a restricted discharge orifice at one end thereof, a plurality of separate fluid supply inlets communicating with said chamber, each of said inlets being completely unsurrounded by the other throughout the entire length thereof, the central longitudinal axis of each of said inlets being at an angle to the central longitudinal axis of said chamber, the distance between said orifice and the point at which said axis of one of said inlets enters said chamber being greater than the distance between said orifice and the point at which said axis of another of said inlets enters said chamber, said body having a passageway for transmitting air under pressure close to and externally of said orifice to convert into a spray the fluid discharge therefrom.

2. A paint or the like spraying device, capable of producing spatter finish coatings in a single spraying operation, comprising a body, an elongated fluid receiving chamber in said body, a dis-

charge tip having a discharge orifice at one end thereof and communicating with said chamber, a plurality of separate fluid supply inlets communicating with said chamber, the central longitudinal axis of each of said inlets being at an angle to the central longitudinal axis of said chamber, the distance between said orifice and the point at which said axis of one of said inlets enters said chamber being greater than the distance between said orifice and the point at which said axis of another of said inlets enters said chamber, each of said inlets being completely unsurrounded by the other throughout the entire length thereof, a housing surrounding said tip and connected to said body, said housing having a small opening in the front end thereof, the orifice end of said tip extending through said opening, said body having a passageway for transmitting air under pressure and communicating with said opening for the passage of air under pressure out of said opening and close to and externally of said orifice to convert fluid discharge therefrom into a spray.

3. A paint or the like spraying device, capable of producing spatter finish coatings in a single spraying operation, comprising a body, an elongated fluid receiving chamber in said body, a discharge tip having a discharge orifice at one end thereof and communicating with said chamber, a plurality of separate fluid supply inlets communicating with said chamber, extending downwardly therefrom and spaced from each other along the length of said chamber, each of said inlets being completely unsurrounded by the other throughout the entire length thereof, a housing surrounding said tip and connected to said body, said housing having a small opening in the front end thereof, the orifice end of said tip extending through said opening, said body having a passageway for transmitting air under pressure and communicating with said opening for the passage of air under pressure out of said opening and close to said orifice to convert fluid discharge therefrom into a spray.

4. A paint or the like spraying device, capable of producing spatter finish coatings in a single spraying operation, comprising a body, an elongated fluid receiving chamber in said body, a discharge tip having a discharge orifice at one end thereof and communicating with said chamber, a plurality of separate fluid supply inlets communicating with said chamber, extending downwardly therefrom and disposed one completely behind the other along the length of said chamber, a housing surrounding said tip and connected to said body, said housing having a small opening in the front end thereof, the orifice end of said tip extending through said opening, said body having a passageway for transmitting air under pressure, and communicating with said opening for the passage of air under pressure out of said opening and close to said orifice to convert fluid discharge therefrom into a spray, said housing having air passageways for directing air jets towards each other to modify the shape of said spray.

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