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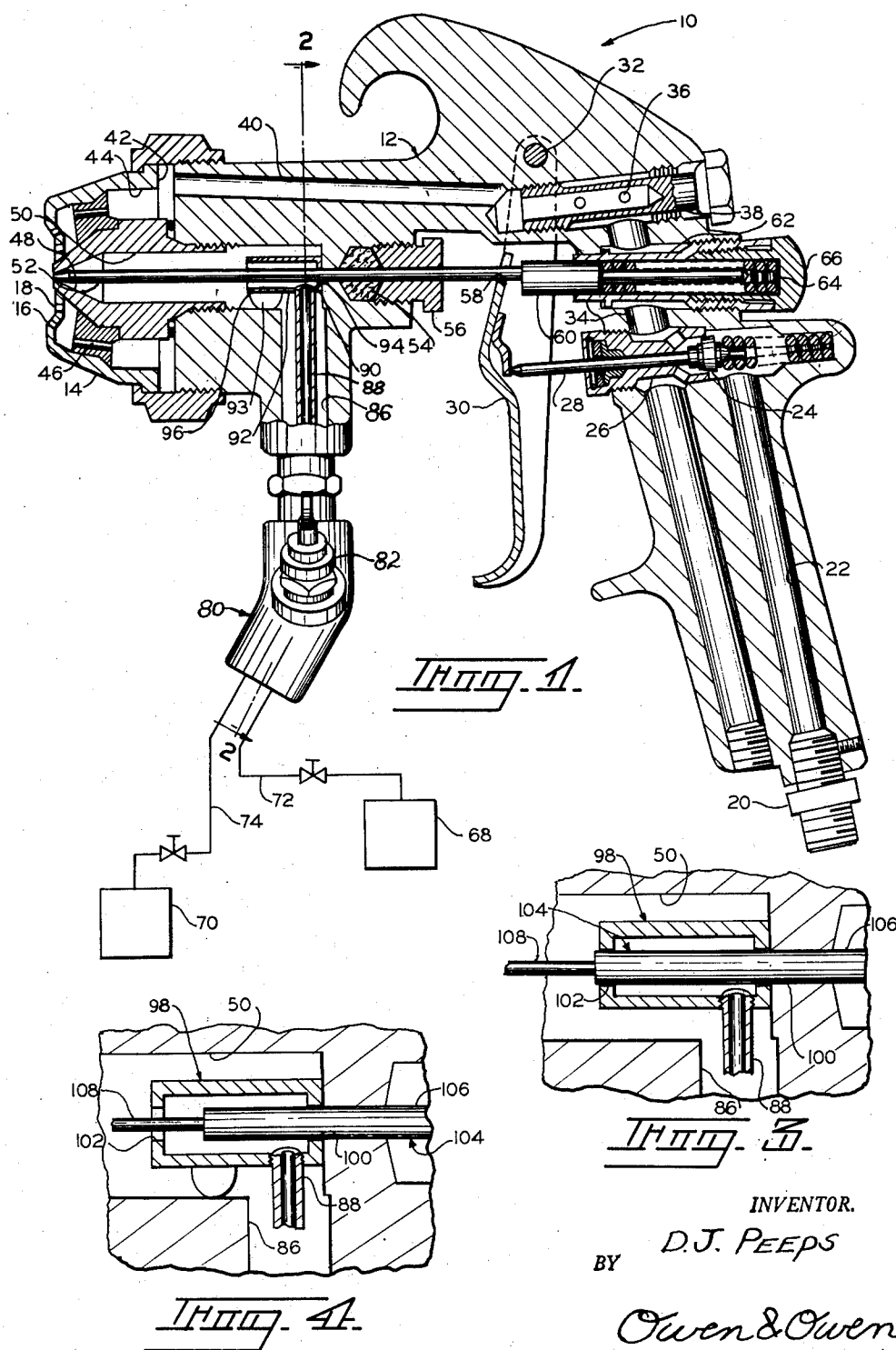
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MULTI-LIQUID SPRAY GUN

Filed Aug. 30, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

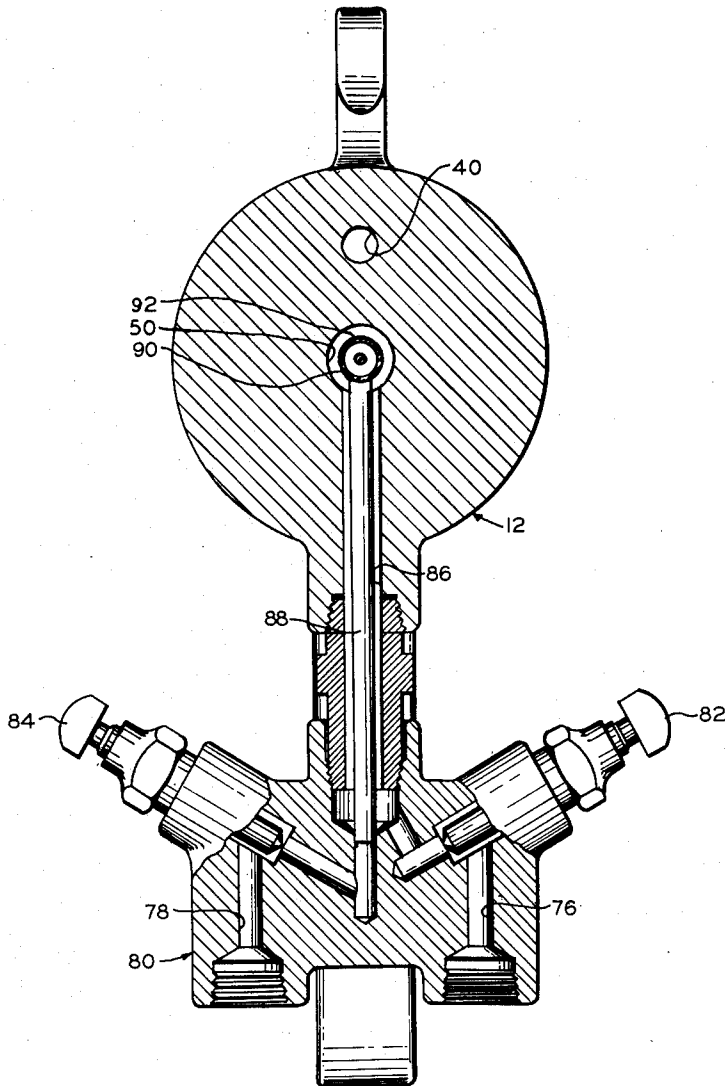


Fig. 2.

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MULTI-LIQUID SPRAY GUN

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This invention relates to improved spray apparatus capable of spraying at least two liquids simultaneously from a single orifice.

Spray guns of the general type referred to above are known in the art. These spray guns can be used with immiscible paints for producing spatter coatings, or can be used with compatible paints of different colors or shades to produce various effects in coatings having tremendous hiding powers. These guns are also useful for spraying the components of resin materials of the slowly reactive type which are admixed for the first time within the gun, during operation. Spray guns of this nature heretofore have included two concentric paint supply passages which open into a chamber through which extends a needle valve for controlling the flow of paints through an orifice located at one end of the chamber. Two different fluids, however, have a tendency to stratify when moving through the chamber and, therefore, produce erratic paint deposition or a non-uniform spray pattern. This condition occurs to a pronounced extent particularly when the spray gun is left dormant for awhile and the more dense of the two paints tends to settle in the chamber.

When paints or liquids having different viscosities are used in the two-liquid guns heretofore known, the one of lower viscosity tends to flow faster than the one of higher viscosity so that, although the ultimate flow of the respective liquids can be controlled by manually-operated supply valves, the thinner or less viscous material will initially tend to flow faster through the orifice from the chamber so that the initial spray has a different color than subsequent spray, even though the pattern is otherwise uniform.

The present invention relates to an improved construction and location of the liquid tubes supplying the liquids to the chamber, which overcome the above problems. With the liquids supplied through concentric tubes, the inner tube, in accordance with the invention, is provided with a central discharge housing located substantially concentrically and coaxially within the liquid chamber with a discharge opening directing the inner liquid through the center of the chamber toward the spray orifice. The outer liquid from the outer tube simultaneously flows between the chamber wall and the central housing. The two liquids thereby tend to flow in initially separated concentric paths toward the spray orifice and the tendency for stratification to occur is thus minimized. The discharge housing also maintains the liquids separately to a point closer to the discharge orifice so that there is less chance for one of the liquids to settle, even though the spray gun is at rest for awhile.

Further, in accordance with the principles of the invention, the discharge housing can have a control orifice at its end through which the body of the needle valve extends, the valve body or rod in this case having a diameter which closely approximates the diameter of the discharge opening or control orifice of the housing when the valve is in a closed position, thereby restricting flow of the inner liquid through the discharge opening of the housing. However, the valve rod is stepped so that a much thinner portion of it extends through the housing discharge opening when the needle valve is opened. In this latter position, the inner liquid can flow quite freely from the housing through the discharge opening. Thus,

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when the needle valve is closed and even when it is slightly open, the flow of the inner liquid supplied through the housing is severely restricted, thus substantially reducing its flow when the spray gun is initially operated. When the needle valve is opened to its fully opened position, the thinner portion of the valve does not seriously impede flow of the inner liquid so that once the valve is in its normal operating position, the two liquids will flow in the desired manner. However, until the fully opened position is reached, the flow of the inner liquid is restricted so that if the less viscous of the two liquids is supplied through the housing, the heavier or more viscous liquid will have a chance to flow initially more rapidly with respect to the thinner liquid than would otherwise be possible. Thus, a uniform spray is obtained even with the initial opening of the spray gun valve.

It is, therefore, a principal object of the invention to provide a multi-liquid spray gun capable of producing a more uniform spray.

Another object of the invention is to provide a multi-liquid spray gun in which the liquids tend to settle or stratify within the gun to a lesser extent.

Still another object of the invention is to provide a multi-liquid spray gun which will produce a more uniform flow of two liquids even when the gun is initially operated.

Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawing, in which:

FIG. 1 is a side view, with parts broken away and with parts in cross section, of a spray gun embodying the principles of the invention;

FIG. 2 is a view taken generally along the line 2-2 of FIG. 1, with parts broken away and with parts in cross section;

FIG. 3 is a detailed view in vertical cross section on an enlarged scale of a discharge housing embodying the principles of the invention and utilizing a stepped needle valve body shown in a closed position; and

FIG. 4 is a view in cross section similar to FIG. 3 but with the stepped needle valve body shown in a fully opened position.

Referring to the drawing, and more particularly to FIG. 1, a spray gun embodying the invention is indicated by the numeral 10. However, it is to be understood that the invention can be incorporated with many types of multi-liquid spray guns and is not limited to the particular one illustrated and described. The spray gun 10 includes a gun body 12 carrying a spray cap 14 which is provided with a plurality of atomizing air ports 16 and an annular air port 18. Air for these ports is supplied from a suitable source through a flexible hose to a fitting 20 and, hence, through an inlet passage 22 to a valve 24 which seats on an annular end of a valve seat member 26, the valve 24 being operated through a trigger rod 28 and a trigger 30 pivoted to the body 12 at 32. When the valve 24 is open, the air continues through a passage 34, through ports 36 in a cylindrical member 38, and through a longitudinal passage 40. From the passage 40, the air travels through an annular manifold 42, an annular space 44, and a plurality of small restricted passages 46 to the ports 16 and 18. Any suitable air control system may, of course, be substituted for the one described.

Coating liquid is discharged from the gun body 12 and the cap 14 through a central orifice 48 from a liquid chamber 50 therebehind and substantially concentric of the gun body. Flow of liquid through the orifice 48 from the chamber is controlled by an elongated needle valve 52 which extends through valve packing 54 held by a packing nut 56 at the rear of the chamber 50. The rod passes through a slot 58 in the trigger 30 to an enlarged, cylin-

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drical stop 60 against which the trigger 30 abuts when squeezed to pull the valve rod 52 rearwardly and open the orifice 48. The cylindrical stop 60 extends into a barrel 62 containing a spring 64 which contacts the stop 60 and urges the valve rod 52 into liquid-tight engagement with the orifice 48. A cap 66 is threaded into the end of the barrel 62 and can be screwed inwardly and outwardly to vary the amount of compression on the spring 64 and to limit the rearward movement of valve 52.

The coating liquid is supplied to the liquid chamber 50 from separate pressure tanks 68 and 70, through flexible tubing 72 and 74 which are connected to passages 76 and 78 (FIG. 2) in a fitting 80. Flow through the passages 76 and 78 is controlled by manually operated valves 82 and 84. Liquid in the passage 76 flows through an outer passage 86 in the gun body 12 and, hence, into the rear portion of the chamber 50. Liquid in the passage 78 flows through an inner passage 88 located concentrically within the passage 86 and which is connected with an opening 90 in a liquid housing 92.

The liquid housing 92 in accordance with the invention is located and maintained concentrically and coaxially with the chamber 50 with the aid of laterally projecting fins or ribs 93. The housing has a rear opening 94 through which the needle valve body 52 extends in close proximity and a discharge opening 96 at the front portion of the housing 92 through which liquid supplied through the tubing 74 and the passages 78 and 88 is emitted toward the orifice 48. This inner liquid is thus separated from and flows substantially concentrically with the other liquid from the passage 86 toward the orifice 48 and reduces stratification to a minimum. Because of the length of the housing 92, the two liquids are also separated in the chamber 50 to a point closer to the liquid orifice 48 whereby the two liquids have a lesser chance to mix and settle when the gun is not in use. Even where settling does occur, a such smaller proportion settles than is true with conventional multi-liquid spray guns which supply both fluids at the rear of the chamber.

If the housing 92 is short enough, it can be inserted into the gun, with the tube forming the inner passage 88, through the outer passage 86. Otherwise, the housing 92 and the tube or passage member 88 are assembled after being positioned in the chamber 50, as, for example, by a threaded engagement.

Referring to FIGS. 3 and 4, a modified housing 98 embodying the principles of the invention is particularly adapted for spraying liquids of different viscosities, the liquid having the lower viscosity being supplied to the inner passage. The housing 98 is similar to the housing 92, including a rear or valve rod opening 100 and a discharge opening 102, which in this instance, are of the same diameter. The housing 98 communicates with the passage 90 which extends through the passage 88, as is also true in FIGS. 1 and 2. A modified valve rod 104, extending through the housing 98, has an enlarged portion 106 and a stepped down end portion 108. When the needle valve 104 is in its closed position, as shown in FIG. 3, the enlarged portion 106 extends through both of the openings 100 and 102, thereby substantially closing off the interior of the housing 98 from the liquid chamber 50. As the needle valve 104 is opened by being pulled rearwardly, the enlarged portion 106 retracts from the discharge opening 102 until it reaches its fully opened position (FIG. 4) with the trigger 30 fully retracted, leaving the discharge opening 102 relatively free for the passage of the inner liquid from the inner passage 88. As the stepped down end 108 of the valve 104 moves away from the liquid orifice 48, the discharge orifice 102 of the housing 98 remains substantially restricted until a more fully opened position of the valve 104 is reached. This enables the outer fluid, which may be the more viscous of the two, to flow initially while the inner, less viscous fluid is still restricted by the large portion 106 of the valve 104. If desired, the stepped

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down portion of the valve 104 may be somewhat tapered, rather than being sharply cut, as shown. The proper ratio of the diameters of the portions 106 and 108 will also depend on the relative viscosities of the liquids used.

Various modifications of the above described embodiments of the invention will be apparent to those skilled in the art and it is to be understood that such modifications can be made without departing from the scope of the invention, if within the spirit and tenor of the accompanying claims.

What I claim is:

1. In a spray gun body including an air passage, a liquid chamber, means forming two liquid passages for supplying coating liquid to said chamber, a liquid orifice communicating with said liquid chamber, an air nozzle spaced from said liquid orifice and communicating with said air passage, a needle valve having an end associated with said liquid orifice for opening and closing the same, said needle valve extending substantially concentrically through said liquid chamber and out of said gun body, means for opening and closing said needle valve, and means associated with said opening and closing means for controlling flow of air through said air passage, the improvement comprising a liquid housing located substantially concentrically in said liquid chamber and having a discharge opening directed toward said liquid orifice, a valve rod opening aligned with said discharge opening and spaced therefrom, and another opening communicating directly and solely with one of said passages and positioned between said valve rod opening and said discharge opening, said needle valve extending through said discharge opening and said valve rod opening, the portion of said needle valve extending through said discharge opening when said needle valve is opened being smaller than the diameter of said discharge opening.

2. In a spray gun body including an air passage, a liquid chamber, means forming two concentric liquid passages for supplying coating liquid to said chamber, a liquid orifice communicating with said liquid chamber, an air nozzle spaced from said liquid orifice and communicating with said air passage, a needle valve having an end associated with said liquid orifice for opening and closing the same, said needle valve extending substantially concentrically through said liquid chamber and out of said gun body, means for opening and closing said needle valve, and means associated with said opening and closing means for controlling flow of air through said air passage, the improvement comprising a liquid housing located substantially concentrically in said liquid chamber and having a discharge opening directed toward said liquid orifice, a valve rod opening aligned with said discharge opening and spaced therefrom, and another opening communicating directly and solely with the inner one of said concentric passages and positioned between said valve rod opening and said discharge opening, said needle valve extending through said discharge opening and said valve rod opening, the portion of said needle valve extending through said discharge opening when said needle valve is opened being smaller than the diameter of said discharge opening.

3. In a spray gun body including an air passage, a liquid chamber, means forming two liquid passages for supplying coating liquid to said chamber, a centrally located liquid orifice communicating with said liquid chamber, an air nozzle spaced from said liquid orifice and communicating with said air passage, a needle valve having an end associated with said liquid orifice for opening and closing the same, said needle valve extending substantially concentrically through said liquid chamber and out of said gun body, means associated with said needle valve and located outside said gun body for opening and closing said needle valve, and means associated with said opening and closing means for controlling flow of air through said air passage, the improvement comprising

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said needle valve having a first portion closer to said liquid orifice of small diameter and a second portion away from said liquid orifice, but at least partly within said liquid chamber, of larger diameter, a liquid housing located substantially concentrically in said liquid chamber and having a discharge opening directed toward said liquid orifice, a valve rod opening spaced from said discharge opening, and another opening communicating directly and solely with one of said passages and positioned between said valve rod opening and said discharge opening, said discharge opening having a diameter slightly larger than the diameter of said second needle valve portion and said valve rod opening also having a diameter slightly larger than the diameter of said second needle valve portion, part of said second needle valve portion extending through said discharge opening when said needle valve is closed and part of said first needle valve portion extending through said discharge opening when said needle valve is fully opened.

4. In a spray gun body including an air passage, a liquid chamber, means forming two concentric liquid passages for supplying coating material to said chamber, a centrally located liquid orifice communicating with said liquid chamber, an air nozzle spaced from said liquid nozzle and communicating with said air passage, a needle valve having an end associated with said liquid orifice for opening and closing the same, said needle valve extending substantially concentrically through said liquid chamber and out of said gun body, means associated with said needle valve and located outside said gun body for opening and closing said needle valve, and means associated with said opening and closing means for controlling

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flow of air through said air passage, the improvement comprising said needle valve having a first portion closer to said liquid orifice of small diameter and a second portion away from said liquid orifice, but at least partly within said liquid chamber, of larger diameter, a housing located substantially concentrically in said liquid chamber and having a discharge opening directed toward said liquid orifice, a valve rod opening and spaced therefrom, and another opening communicating directly and solely with the inner one of said concentric passages and positioned between said valve rod opening and said discharge opening, said discharge opening having a diameter slightly larger than the diameter of said second portion and said valve rod opening also having a diameter slightly larger than the diameter of said second portion, part of the second portion extending through said discharge opening when said needle valve is closed and part of said first portion extending through said discharge opening when said needle valve is fully opened.

References Cited in the file of this patent

UNITED STATES PATENTS

1,470,111	Biersdorf	Oct. 9, 1923
2,265,209	Thompson	Dec. 9, 1941
2,511,626	Einbecker	June 13, 1950
2,513,081	Clark et al.	June 27, 1950
2,786,716	Peepe	Mar. 26, 1957

FOREIGN PATENTS

508,288	France	Jan. 10, 1920
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