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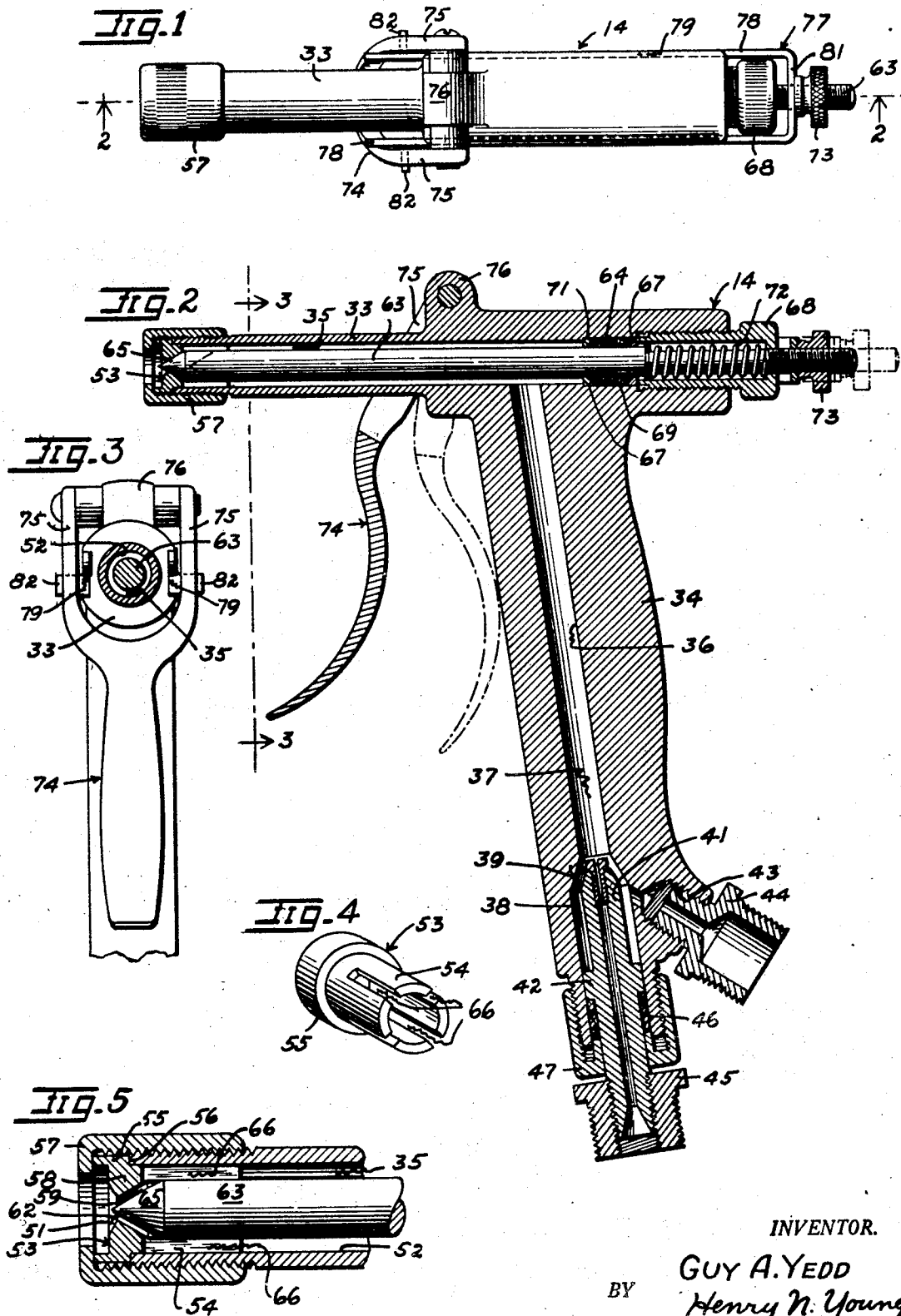
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PAINT SPRAYING APPARATUS

Filed May 8, 1931

2 Sheets-Sheet 1



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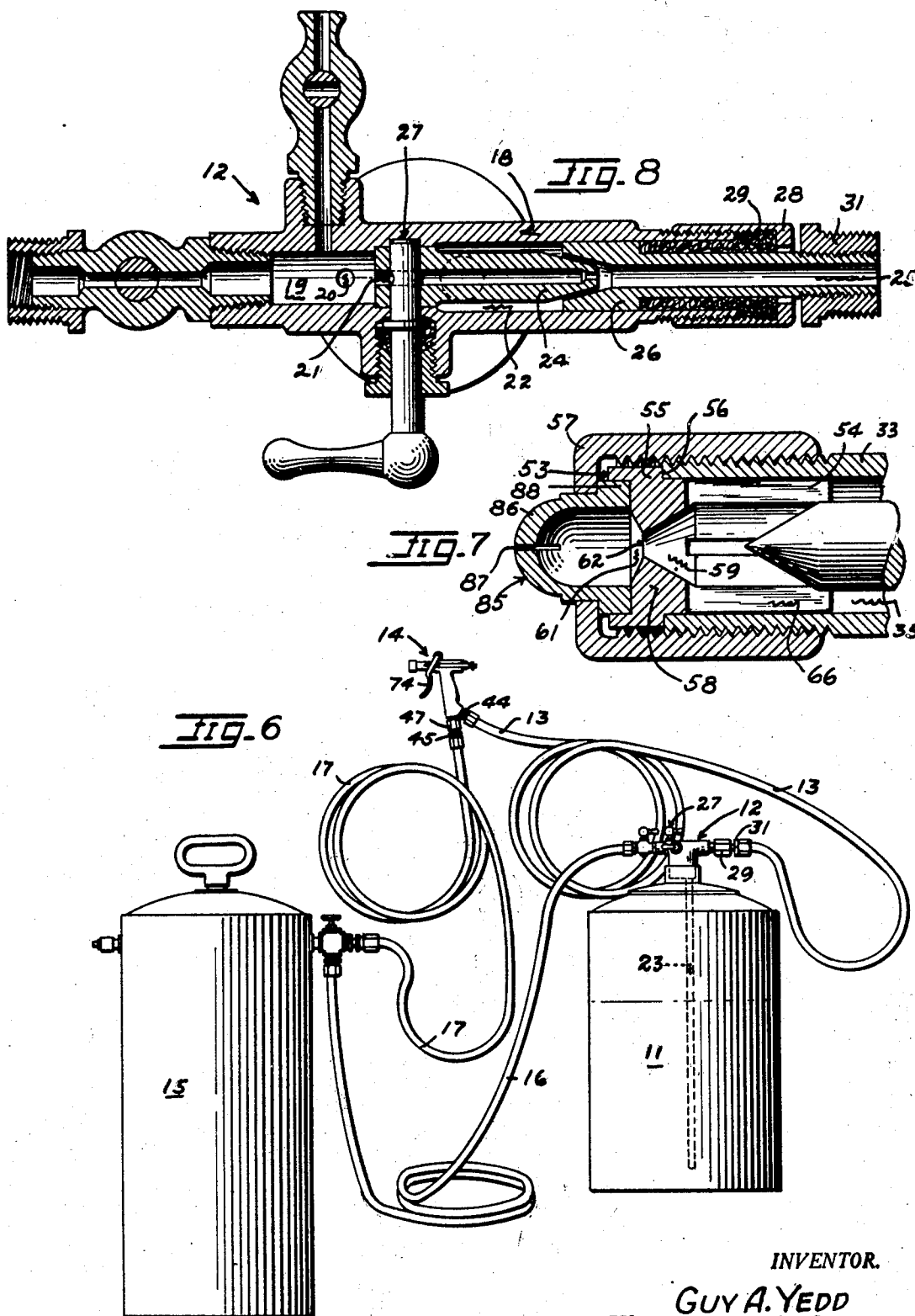
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PAINT SPRAYING APPARATUS

Guy A. Yedd, Oakland, Calif.

Application May 8, 1931, Serial No. 535,866

2 Claims. (Cl. 299-140)

The invention relates to an improved paint spraying apparatus.

An object of the invention is to provide a generally improved spraying apparatus of the type described for more or less universal use in handling both viscous and non-viscous liquids.

Another object of the invention is to provide for a multiple-stage atomization of the liquid during its passage from a supply reservoir thereof to its point of final disposition.

A further object of the invention is to provide for a diluting of the liquid with air to increase the fluidity thereof for its delivery to a discharge element disposed at a distance from the reservoir.

Yet another object is to provide a generally improved sprayer or spray gun for use in apparatus of the class described.

A still further object is to provide a spray gun having an improved nozzle for delivering streams of various characteristics without necessitating a change of nozzle members.

An added object is to provide in a high pressure apparatus of the class described means for increasing or boosting the discharge pressure of the spray gun element of the apparatus.

The invention possesses other objects and features of advantage some of which, with the foregoing, will be set forth or be apparent in the following description of a typical embodiment of the invention which is illustrated in the accompanying drawings, in which,

Figure 1 is a plan view of a spray gun of apparatus embodying the invention.

Figure 2 is a sectional elevation of the spray gun at the line 2-2 in Figure 1, a nozzle valve of the gun being closed.

Figure 3 is a sectional view taken at 3-3 in Figure 2.

Figure 4 is a perspective view of a nozzle element of the spray gun.

Figure 5 is an enlarged fragmentary view of the nozzle tip assembly shown in Figure 2, the valve thereof being shown as slightly opened.

Figure 6 is an elevation of a complete apparatus embodying the features of the present invention.

Figure 7 is an enlarged view of the nozzle portion shown in Figure 5, and discloses an accessory tip member mounted on said nozzle.

Figure 8 is a plan section through a tank head control valve of the apparatus.

The various structural and operative features of the present invention are generally disclosed in the showing of Figure 6 wherein apparatus is shown for delivering liquid from a tank or

reservoir 11 through a tank head control device 12 and a flexible hose 13 to a spray gun 14. The disclosed apparatus is designed for high pressure operation by means of compressed air received from a tank 15 or other suitable source. 60 In the present arrangement the tank 15 is shown as connected to the reservoir 11 and spray gun 14 by means of hoses 16 and 17 respectively. In the operation of the device the liquid from the tank 11 is arranged to be atomized and diluted 65 with air in its passage through the control device 12 and also in the spray gun 14. Furthermore, a third atomization of the liquid is arranged to be effected as the same is discharged from the spray gun. Besides the atomization produced in 70 the apparatus, certain other favorable results are accomplished through certain specific structural and operative features resident in the control device 12 and the spray gun 14.

Referring to the structure of the control device 75 12, the same being shown in section in Figure 8, it is noted that said device comprises a generally T-shaped body member 18 providing an air supply passage 19 which is branched to discharge air downwardly through a duct 20 into the top of 80 the tank and through a horizontal duct 21 into a passage 22 of the device. The passage 22, it is noted, is connected with a riser pipe 23 extending upwardly from within the liquid in the tank 11 whereby the pressure in the tank is 85 arranged to deliver liquid into the passage 22, and the air duct 21 terminates in the nozzle 24 disposed axially in said passage. It is noted that the various ducts and passages now described are all provided in relatively fixed parts of the 90 body element 18 of the control device.

The forward end of the nozzle 24 is conically tapered for seated engagement in the opposed end of the bore 25 of a tubular member 26, said member being adjustably and slidably engaged in 95 the passage 22 whereby the conical bore portion thereof may be variably disposed with respect to the tip of the nozzle 24; in this manner the nozzle 24 and member 26 are cooperative as a valve means to control the flow of liquid from 100 the passage 22 into the bore 26. When liquid flow is permitted from the control device, the discharge of air from the nozzle 24 into the bore 25 is arranged to effect an atomizing and aeration of the liquid in said bore. A valve 27 is operative 105 in the duct 21 whereby the flow of air and liquid into the bore 26 may be independently controlled, it being noted that either flow may be completely cut off.

The member 26, it is noted, slidably fits the 110

bore of the passage 22 at the inner end thereof and is reduced outwardly of its passage-engaging portion to provide a stuffing box between it and the bore of the passage 22. A gland cap 28 is
 5 threadedly mounted on the forward end of the bore 20 and is operative through the packing 29 in the stuffing box to determine the position of the member 26 with respect to the nozzle 24, it being noted that the pressure in the passage
 10 22 is arranged to urge said member to its outer position; in this manner the member 26 is sealed and adjustably engaged in the bore of the passage 22. The protruding end of the member 26 carries a coupling element 31 for use in at-
 15 taching the hose 13 thereto. The specific structure and use features of the control device 12 it is noted, are set forth in greater detail in my copending application, Ser. No. 535,867, filed May 8, 1931.

20 Referring now to the structure of the spray gun 14, it is noted that the same is generally T-shaped to provide integrally associated barrel and grip portions 33 and 34 respectively, said portions being of appropriate shapes for their
 25 respective purposes. The grip portion 34 may if desired, slope rearwardly from its point of juncture with the barrel portion 33 whereby a desired pointing of the latter portion may be more naturally effected by a person holding the spray
 30 gun by means of the grip; this condition is shown in the present structure wherein the angle between the grip portion and the forward part of the barrel somewhat exceeds ninety degrees. Intersecting passages 35 and 36 are provided in the
 35 barrel and grip portions 33 and 34 respectively, whereby a continuous fluid passage is provided from the butt of the grip portion to a nozzle end of the barrel.

The grip passage 36, it is noted, provides a mixing chamber having portions 37 and 38 of different diameters and connected by a bevel 39, the chamber 38 being nearest the inlet end of said passage and being of greatest diameter. An injector nozzle 41 is mounted in the chamber 38 for longitudinal adjustment therein, said nozzle being conically tapered at its forward and discharge end for seating against the bevel 39. Intermedi-
 45 ately of the nozzle member, a portion of the same is radially expanded to provide a collar 42 for a close sliding fit in the chamber bore whereby the nozzle is held in axial alignment with the chamber 38 as it is moved to and from the bevel 39.

An inlet duct 43 of the gun grip portion is directed obliquely forwardly into the portion of the chamber 38 defined between the bevel 39 and the nozzle collar 42, and a connecting member 44 engages the outer end of said duct for use in
 60 attaching the hose 13 thereto. An axially perforated screw element 45 engages in the forward end of the nozzle bore, said element being operative to determine the maximum air flow from the nozzle and the head thereof being operative to restrict the passage for liquid provided along
 65 the bevel 39 in a manner to facilitate an atomizing of the liquid as it discharges into the chamber 37, it being noted that the nozzle tip is normally withdrawn from engagement with said bevel which constitutes a valve seat at which the
 70 liquid supply may be cut off. The outer nozzle end carries a coupling element 45 for connecting the air hose 17 thereto.

Means are preferably provided for sealing and securing the nozzle in adjusted position in the chamber 38. As shown, soft packing 46 is dis-

posed in the chamber space rearwardly of the nozzle collar 42, and a gland cap 47 is threadedly mounted on the grip extremity for engaging and compressing said packing in said space. By
 80 screwing up the said cap, the pressure exerted on the annulus of packing is operative against the nozzle collar 42 to move the nozzle inwardly toward the bevel 39 as desired, it being noted that the pressure of liquid in the chamber 38 is arranged to urge an outward movement of the nozzle. In this manner, the nozzle is sealed in the chamber bore which carries it, and at the same time is arranged for adjustment to vary the quantity of liquid supplied to the passage 36.

It is noted that the described injector device by which the liquid from the hose 13 is atomized and aerated within the spray gun independently of its treatment at the control device 12 also serves to create an increased and forwardly directed flow pressure in the gun, whereby an increase of the discharge pressure is effected and a somewhat lower pressure may be obtained in the hose 13 than is required or desired in the gun. This provision for boosting the operating pressure in the gun is understood to constitute an
 95 important operative feature of the present apparatus.

A discharge orifice 51 is provided at the forward end of the barrel portion 33 and through which the aerated liquid is arranged to be ejected in a stream of variable characteristics. The effective opening of said orifice is considerably less than a section of the adjacent portion of the barrel bore 52, the barrel bore being cylindric. Preferably and as shown, the orifice 51 is provided in a tip member 53 of special form, the structural details thereof, being brought out in
 105 Figures 4, 5 and 7. In its present embodiment, the tip member 53 is generally cup shaped and comprises a tubular portion 54 for fitted insertion within the outer end of the barrel bore 52 and an expanded forward portion 55 which provides a shoulder 56 for engagement against the barrel extremity. An axially perforated cap member 57 threadedly engages the forward barrel portion externally thereof for clamping the member 53 against the barrel end. As particularly shown, the outer and forward face of the member 53 is cylindrically countersunk whereby the annular cap head is arranged to engage the resulting annular flange of the member 53 when the same is in its mounted position on the barrel end.

The orifice 51 is provided axially in the transverse wall 58 of the member 53 and comprises conical bore portions 59 and 61 intersecting in a line intermediately of the orifice ends, the effective orifice being least at said line. Preferably, and as shown, the conical angle of the inner bore portion 59 is of the order of sixty degrees, while that of the bore portion 61 is of the order of one hundred and twenty degrees; in this manner, the angle of the distinct and sharp edge 62 defined at the line of intersection of the bore portions is of the order of ninety degrees.

A cylindric valve stem 63 of somewhat less diameter than the barrel bore 52 is mounted in the barrel in coaxial relation therewith. The forward end of said valve stem is arranged to slidably fit in the bore of the tubular portion 54 of the tip member 53. Rearwardly of the juncture
 145 of the grip passage 36 with the barrel passage 35, the valve stem 63 extends through a stuffing box 64 and to a point beyond the rearward end of the barrel; in this manner the valve stem is held for axial reciprocation in the barrel. A conical 150

valve 65 is provided at the forward end of the valve stem 63 for movement to and from the conical bore portion 59 of the member 53, said valve being complementary to said bore portion where-
 5 by the bore portion is thus arranged to serve as a seat for the valve. A means for controlling the operative disposition of the valve 65 is hereinafter described.

Longitudinal kerfs 66 are provided in the tubular portion 54 of the member 53 and extend from the inner end of the member 53 to a greater or less degree into the seat provided by the conical bore portion 59; in this manner, when the valve 65 is unseated, the liquid in the barrel passage 35 is arranged to be delivered along the stem and forwardly of the valve in a plurality of laterally separated streams which are directed radially inwardly between the valve and seat and unite for projection from the discharge orifice 53. In the present instance, four kerfs 66 are provided and their inner ends are substantially perpendicular to the barrel axis.

It will now be particularly noted that the discharge valve provided by the described structure, besides accomplishing a final atomization of the liquid, is arranged to produce discharge streams of varied characteristics, and that the degree of variation is the extreme range required in spray guns; with spray guns of usual structure, however, said extreme range may usually be accomplished only by an interchangeable use of a plurality of different tip members. In the present structure, the spread of a discharged stream will generally decrease as the valve 65 is unseated. By appropriately varying the settings of the control head valves and the valves of the spray gun, discharge streams may be provided having distinct outside boundaries and without producing side mists, such mists representing a waste of material and preventing a completely controlled depositing of the painting liquid. The present device is arranged to produce a solid and homogeneous jet which is so sharply defined that writing may be executed therewith on a receiving surface with a relatively non-flaring jet. It is noted that the conical angularity of the outer portion 61 of the discharge orifice is such that none of the discharging liquid contacts the surface of the same.

In effecting the double aeration and triple atomization of a painting liquid by the described apparatus, an operative condition of importance is the fact that the spray gun discharge pressure is arranged to be very much higher than is usual for spray guns for the same purpose. The present spray gun is arranged to operate under pressures varying from ninety pounds per square inch to six hundred fifty pounds per square inch, with one hundred fifty pounds per square inch the usual operating pressure. Under the foregoing high-pressure operating conditions of the spray gun, the discharged jet of painting material is accurately projected for a considerable distance without losing its clearness of definition, whereby a minimum waste of the painting material results.

In view of the high pressures which are arranged to obtain within the barrel passage 35 of the spray gun, the valve stem packing and control means are of special design. As particularly shown in Figure 2, the stuffing box 64 is defined between gland rings 67 slidable on the stem 63 and between an enlarged bore portion of the passage 35 and the stem, a forward movement of the forward packing ring 67 being limited by its engagement with the step or shoulder

provided at the forward end of the enlarged passage portion at the stuffing box. A cup-shaped gland member 68 threadedly engages in the bore of the passage 35 rearwardly of the stuffing box portion thereof and with its forward end engaging the rearward ring 67 for compressing suitable soft packing 69 within the stuffing box space between the rings and to a required degree. It is noted that the freedom of the forward packing ring 67 permits its displacement to further compress the packing in the stuffing box by reason of the pressure in the passage 35 whereby the arrangement is adapted for automatically maintaining a seal for the valve stem.

Rearwardly of the stuffing box 64, the valve stem 63 is reduced to provide a shoulder 71, and a helical compression spring 72 is operative within the member 68 between said shoulder and the head of the member to urge a maintenance of the valve 65 in seated relation to the seat 59 of the nozzle tip member 53. The rearward end portion of the valve stem extends through and from an axial perforation of the member 68, and its protruding portion is threaded to receive a knurled nut 73.

It will now be noted that a valve-opening displacement of the stem 63 is arranged to be effected by and upon an appropriate rocking of a trigger member 74 pivoted to the barrel portion of the spray gun, said trigger arranged to be operatively rocked against the resistance of the spring 72 for opening said valve. As shown, the trigger member 74 is forked or bifurcated to span the barrel 33, and the fork portions 75 of the member 74 are pivoted at their extremities to a laterally projecting ear 76 of the barrel, said ear lying at the opposite side of the barrel from the gun grip portion 34 for swinging theretoward by use of the fingers of a hand grasping the grip, the grip serving as a stop to limit the degree of rocking of the trigger member, as is indicated in dotted lines in Figure 2.

A strut means is operative between the trigger member and the protruding valve stem portion whereby a rocking of the trigger toward the grip is arranged to unseat the valve 65 to a maximum degree determined by the permitted operative movement of the trigger. As particularly shown, said strut means comprises a U-shaped member 77 having its side portions 78 mutually parallel and engaged in slideways 79 provided in opposite sides of the barrel 33 and its cross portion, or head, 81 perforated to receive the valve stem 63 therethrough with said head disposed forwardly of the nut 73. Ears or trunnions 83 extend outwardly from the forward ends of the strut portions 78 and into the paths of movement of the trigger portions 75 for engagement thereby as the trigger is rocked toward the grip. In this manner, the strut member is directly operative between the trigger and the valve stem nut 73, and adjustment of said nut on the valve stem is understood to control the permitted operative movement of the trigger from its normal forward position to a contact with the spray gun grip portion. It is noted that the present arrangement cannot at any time prevent a return of the valve to its seated position in the nozzle outlet when the trigger is released, and an operator may at the same time be assured of a constant and adjusted degree of opening of the valve by holding the trigger back against the gun grip portion.

If a flat-spreading, or fan-tail, jet is to be produced with the present spray gun, it is merely

necessary to mount a suitable auxiliary tip on the barrel forwardly of the tip member 53. As particularly shown in Figure 7, a tip member 85 is provided, said tip member of general cup shape and having a dome-shaped forward end portion 86 provided with a radial kerf 87 of desired angular length. A flange 88 extends radially from the base of the member 85, said base and flange being arranged for a centered seating in the forward depression of the member 53, and the cap 57 being utilized to engage the flange 88 to secure the member 85 in its place. The described nozzle valve assembly is understood to discharge the fluid to the cavity of the member 85 in a regulated manner to insure the desired fan-tail discharge of fluid from the spray gun.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made, when desired, as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States the following:

1. In a spray gun of the type described, a body providing a tubular discharge barrel, a valve stem disposed axially in said barrel and of less size than the body bore whereby to define a fluid passage therealong, a conical valve carried at the

forward end of said stem, and a member fixed at the forward end of said barrel and comprising a sleeve portion fittedly engaged in the barrel bore and slidably receiving the stem and a transverse outer end portion providing a discharge port axially therethrough and for control by said valve, said first portion of said member having longitudinal slots to provide laterally spaced fluid passages along the valve stem portion, said slots terminating at the inlet mouth of said discharge port whereby fluid discharged therefrom is directed radially inwardly against said valve.

2. In a spray gun of the type described, a body providing a tubular discharge barrel, a cylindric valve stem disposed axially in said barrel and of less size than the body bore whereby to define a fluid passage therealong, a conically tapered valve carried at the forward end of said stem, and a member fixed at the forward end of said barrel and having a sleeve portion thereof fittedly engaged in the barrel bore and slidably receiving said stem and a transverse outer end portion providing a discharge port axially therethrough and for control by said valve, said first portion of said member being longitudinally kerfed to provide laterally spaced fluid passages along the valve stem portion thereat and for discharge forwardly of said valve when the same is unseated, and the bore of said port having an inner conical portion providing a seat for said valve and an outer conical portion intersecting the inner bore portion at an angle of the order of ninety degrees in an edge defining the port point of greatest restriction.

GUY A. YEDD. 110

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