March 26, 1929. A. H. DOWNS 1,706,875

DEVICE FOR SPRAYING PAINTS, LACQUERS, OR OTHER LIQUIDS

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Fig. 1.

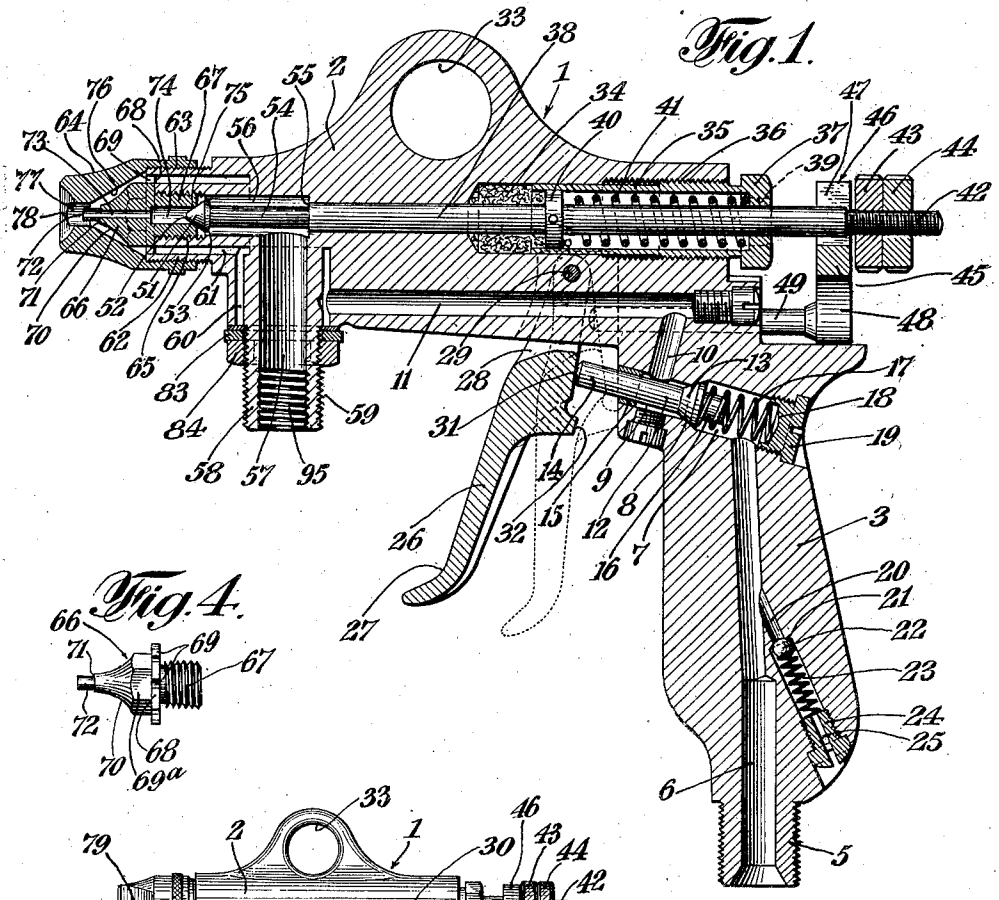


Fig. 4.

Fig. 2.

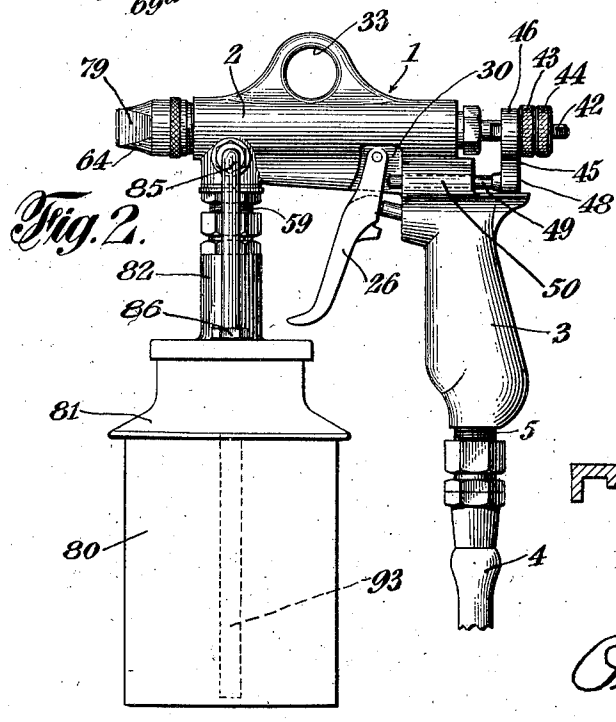
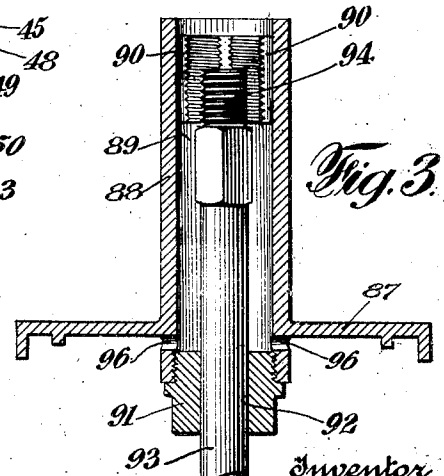


Fig. 3.



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Fig. 5.

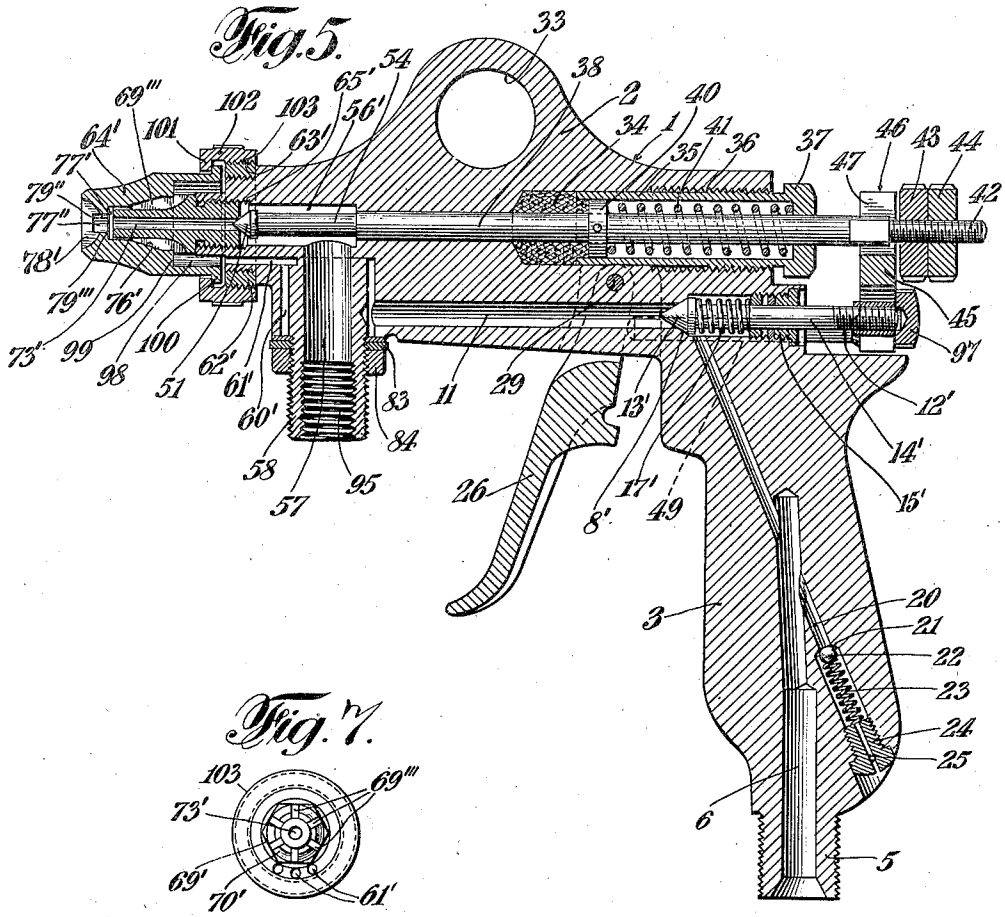
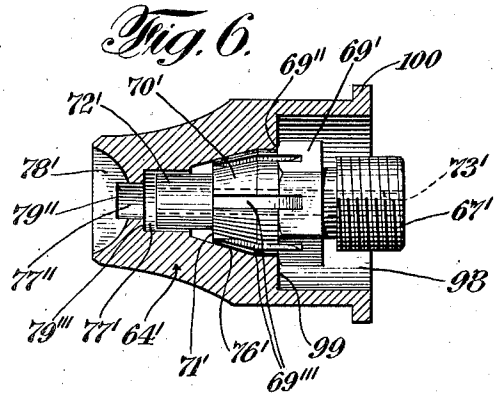


Fig. 7.

Fig. 6.



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DEVICE FOR SPRAYING PAINTS, LACQUERS, OR OTHER LIQUIDS

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Fig. 8.

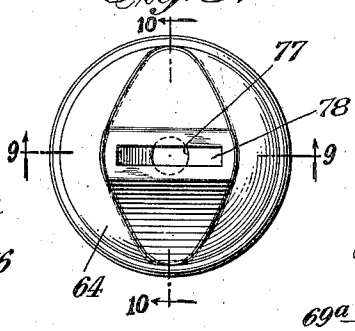


Fig. 9.

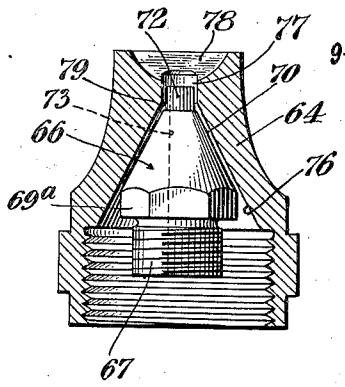


Fig. 10.

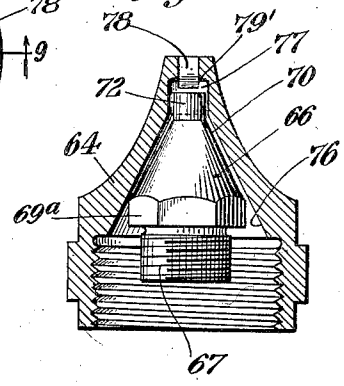


Fig. 11.

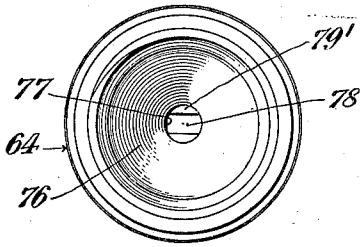


Fig. 12.

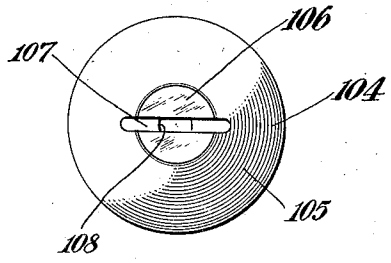
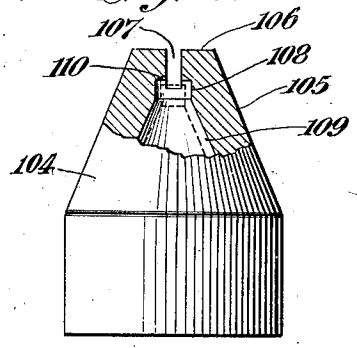


Fig. 13.



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UNITED STATES PATENT OFFICE.

AUSTIN H. DOWNS, OF NEWARK, NEW JERSEY.

DEVICE FOR SPRAYING PAINTS, LACQUERS, OR OTHER LIQUIDS.

Application filed August 2, 1926. Serial No. 126,507.

This invention relates to improvements in devices for spraying paints, lacquers or other liquids as well as heavy liquids, semi-pastes, etc. and the principal object is the provision of such a device which is highly efficient in operation, simple and readily controlled to use a minimum amount of material and a minimum amount of pressure to accomplish the best results.

Further objects include the provision of such a device in which the trigger control is very accurate and simple, which operates at low air pressures and volumes and with a low consumption of material, thereby reducing the amount of mists and fumes to a minimum and still affording perfect atomization of the material and application thereof to the surface being coated.

Another object of the invention is the provision of a new and improved form of nozzle construction whereby the liquid is completely atomized therein and delivered therefrom in the form of a fan-shaped sheet of finely divided spray of substantially uniform density throughout its entire extent. By "fan-shaped", I mean flaring or diverging in width, but preferably of the small depth or thickness.

Another object of this invention is the provision of such a device in which the entire body and handle are made of one piece preferably by die-casting or forging, whereby the manufacture of the same is simplified and cheapened and at the same time a more attractive appearing and substantial device is provided.

Further objects include improvements in details of construction and which are hereinafter set forth in full.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, this invention consists in the construction, combination and arrangement of parts hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof and which show, merely for the purpose of illustrative disclosure, a preferred embodiment of my invention, it being expressly understood, however, that various changes may be made in practice within the scope of the claims without digressing from my inventive idea.

In the drawings—

Figure 1 represents a vertical longitudinal cross section through a device constructed to embody my invention shown in inoperative or closed condition in full lines, the open position of the trigger being indicated in dotted lines.

Figure 2 is a side elevation of a device constructed to embody my invention shown with one form of connection to a pressure feed cup.

Figure 3 is a vertical cross section through another form of connection between the device itself and a pressure feed cup.

Figure 4 is a perspective view of the fluid tip.

Fig. 5 is a view similar to Fig. 1, showing a slightly modified construction, particularly with reference to the nozzle and fluid tip and also the air valve and its operating connections.

Fig. 6 is a longitudinal section on an enlarged scale of the nozzle and fluid tip construction shown in Fig. 5.

Fig. 7 is a front end elevation of the device shown in Fig. 5 with the nozzle removed.

Fig. 8 is a front view of the nozzle shown in Fig. 1.

Fig. 9 is a vertical cross section taken substantially on line 9—9 of Fig. 8, showing the fluid tip in elevation.

Fig. 10 is a vertical section taken at right angles to Fig. 9 on line 10—10 of Fig. 8.

Fig. 11 is a rear end elevation of the nozzle.

Fig. 12 is a front elevation of a modified form of nozzle.

Fig. 13 is a side elevation of the nozzle shown in Fig. 12, part being broken away and shown in section.

This application is filed as a continuation of my pending application Ser. No. 742,105 filed Oct. 7, 1924, in so far as the subject matter is common.

Referring now to the drawings, the numeral 1 designates the body of the device as a whole, this body including the barrel portion 2 and the handle portion 3, the handle portion extending downwardly from the barrel portion and inclined slightly to the

rear so that the device has somewhat the appearance of an automatic revolver.

Devices of this kind are employed to spray material principally for coating purposes, the material being atomized by air under pressure. The material is fed to the point of atomization by pressure and consequently this device has ports, passages and valves for controlling the admission and passage of the pressure fluid as well as the liquid material and the atomization of the same. A connection 4 to a suitable source of air or other fluid under pressure is made with the screw-threaded nipple 5 on the lower end of the handle portion 3. Usually this pressure is automatically maintained by suitable regulating means as is well understood. This nipple leads to the passage 6 which extends upwardly through the interior of the handle 3 to the air inlet valve chamber 7. This valve chamber is provided with a bevelled valve seat 8 leading to the passage 9 which communicates with an upwardly extending passage 10, which in turn communicates with the horizontally extending passage 11 located in the barrel 2. Mounted in the valve chamber 7 is a suitable valve member 12 having the valve proper 13 adapted to engage the seat 8 and having the operating stem 14 extending forwardly therefrom, and through a suitable bushing 15 to extend without the body, as shown, to bear against a trigger to be presently described. The rear end of the valve member 12 is provided with the stud or projection 16 to receive one end of the coil spring 17, the other end of which is positioned in a socket 18 in the securing and tension adjusting nut 19, which is screwed into the rear end of the valve chamber 7. By this means the valve 13 is normally held in tight engagement with its seat 8 so that no air pressure is admitted through the passages 6, 7, 9, 10 and 11 unless the valve is opened.

It is to be noted that in the passage 6 I provide a downwardly extending bypass or passage 20 which is provided with a valve seat 21 adapted to receive a valve 22, shown in the form of a ball, which valve is normally held in engagement with its seat by means of coil spring 23, which is held in position and under tension by means of a screw-threaded adjusting nut 24. This nut is provided with opening or aperture 25 therethrough, which has its outlet arranged in a downwardly extending position. The purpose of this last-described feature is to provide a signal for the operator so that if the fluid pressure becomes sufficiently great to overcome the regular tension of the coil springs 23, a jet of air will be emitted from the opening 25 and impinge against the hand or arm or the sleeve of the operator, giving him a signal, whereby he can adjust the pressure producing mechanism and take whatever precautions are necessary to prevent the dangerous increase in pressure which is likely to result in damage and injury to the mechanism, and also waste material as well as give unsatisfactory results. While this signal is in the form of one which affects the sense of touch or feeling, it is obvious that it can be made an audible signal in the form of a whistle.

The trigger above referred to is designated by the reference character 26 and has the downwardly extending portion 27 adapted to be engaged by certain fingers of the hand of the operator, the upper portion of the trigger being of yoke construction 28 and pivoted as at 29 on both sides of the barrel the latter being cut out as at 30 to receive the yoke portion 29 of the trigger (see Figure 2 particularly). The trigger is provided with a bearing face 31 on the rear side which engages the front end of the valve stem 14 and when the trigger is forced rearwardly the valve stem and its attached valve are forced rearwardly and the valve forced off its seat to permit the admission of air through passages previously mentioned. The rearward movement of the trigger is limited by means of the stop or abutment 32 coming into contact with a portion of the body. Spring 17 is of sufficient strength to normally hold the valve closed and the trigger in its extended open position shown in full lines in Figure 1 of the drawing, and to cause these parts to assume these positions when the pressure is released from the trigger and to cause these parts to move from these positions when the pressure on the trigger is reduced. Thereby 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 and without the necessity of long training and experience.

The barrel portion 2 extends in a horizontal direction forwardly from the handle portion 3 and is provided with the apertured lug or flange 33 to provide a convenient hanging means. The barrel is bored centrally to provide the packing gland and spring chamber 34 in its rear end portion. This chamber receives the packing gland which is in the form of an elongated sleeve 35 having an externally screw-threaded portion 36 to engage the internal threads formed in the rear part of the packing gland chamber. Sleeve 35 has the headed nut portion 37 whereby the packing gland may be screwed into the chamber 34 and its position therein adjusted. The valve rod 38 which controls the supply of liquid material, extends through and is movably mounted within the bore in the barrel and its rear portion passes through the packing gland chamber 34, the packing gland 35 and an opening 39 in the head 37 of the packing

gland. A washer 40 is secured to this valve rod 38 within the packing gland and a compression spring 41 is positioned around that portion of the rod within the packing gland 35 between the washer 40 and the head 37, this spring being placed under regulated tension by an adjustment of the packing gland 35. That part of the chamber 34 which is shown to the left of the packing gland 35 is filled with a suitable packing material so as to make the joint between the valve rod 38 and the body fluid tight.

This valve rod, as stated above, extends through the opening 39 in the head 37 of the packing gland and is provided at its end with the screw-threaded portion 42 to receive the adjusting nut 43 and locking nut 44. The valve rod 38 is moved by means of the yoke member 45 which has an engaging member 46 provided with a slot 47 to slidably receive the rear portion of the valve rod 38. This yoke member has each of its two arms 48 connected to a bearing rod 49 slidably mounted in a bearing passage 50 formed in one side of the body. The forward ends of these bearing rods 49 extend beyond the ends of the bearing passage 50 into the path of movement of the upper and yoke portion 28 of the trigger member 26, so that when the trigger member is moved a sufficient distance to the rear, the bearing rods 49 will be moved rearwardly and due to the engagement of the yoke member 45 with the nuts 43 and 44, the valve rod 38 will be moved rearwardly to open the valve to be presently described. It is to be expressly noted at this point that it is impossible to adjust these parts so that the valve rod 38 can be moved prior to the opening of the air valve 13. In other words, the initial movement of the trigger opens the air valve 13 and permits a supply of air under pressure to enter the device before the valve member 38 can be moved. It is also to be noted that in the position shown in full lines in Figure 1, the packing material in the packing gland is subject to the greatest pressure from the washer 40, that is when the valve rod 38 is in its closed position, and as the valve rod 38 is moved to open the same the pressure on the packing material lessens.

The forward end of the valve rod 38 is made in the form of a head 51 which has the blunt end 52 and the curved rear shoulder 53 leading to the reduced portion 54, which extends to the shoulder 55, which forms the reduced portion 54 from the valve rod as a whole. This part of the valve rod just described is mounted in the liquid material receiving chamber 56 which is formed in the front end of the barrel portion and communicates with the material supply passage 57 which extends vertically through the downward extension 58, this downward extension 58 having its lower portion screw-threaded as at 59 to afford a connection for a hose or pipe leading from a suitable liquid container or to the material cup to be presently described. Surrounding the upper portion of this extension 58 is the vertical annular air passage 60 which connects with horizontal passage 11 and also with a horizontal annular air passage 61 formed in a forward extension 62 of the barrel. This forward extension is screw-threaded on its outside as at 63 to receive the nozzle 64. This forward extension is also provided with the internal screw-thread 65 to receive the fluid tip 66.

This fluid tip is shown in detail in Figure 4 and is provided with the screw-threaded extension 67 whereby it is secured in position engaging the screw-threads 65 of the forward extension 62. It has the flange 68 which is provided with a plurality of slots or apertures 69, this flange tightly fitting within the end of the extension 62 and affording a closure for the horizontal annular air passage 61, it being noted that the end of the extension 62 is beyond the end of the inner wall and that the face of the disc 68 fits against the end of the inner wall. The outer face of the flange 68 is flush with the outer end of the forward extension 62, and the slots or openings 69, therefore, afford means of egress for the air from the horizontal annular air passage 61. This construction gives a very even distribution of air which is an important factor in the successful operation of this device. This fluid tip 66 is provided with the squared shoulder 69^a and then with the tapered portion 70, this taper being formed on a curve as shown and terminating in a shoulder 71 from which the tip portion 72 extends, this tip portion being of cylindrical or tubular shape. The fluid tip is bored entirely therethrough, the bore 73 through the forward portion being less in diameter than the bore 74 through the rear portion. The rear end of the fluid tip where the bore 74 opens forms a seat 75 for the valve 51 on the end of the valve rod 38. It is seen, therefore, that the fluid material passes up through passage 57 into the chamber 56, and when the valve 51 is moved off its seat the material will pass through bores 74 and 73 and emerge from the end of the fluid tip.

The nozzle 64 is shown in Figures 1 and 2 and in detail in Figures 8 to 11 of the drawing. This nozzle which I term a "fan slot" nozzle is of general cylindrical form, being substantially hollow for attachment to the external screw-threaded portion 63 of the barrel above referred to and has the conical shaped passage 76 extending therethrough and leading to a cylindrical passage 77. This cylindrical passage leads into a

flat fan shaped or arcuate slot 78. The cylindrical tip 72 of the fluid tip is positioned within the cylindrical passage 77 of the nozzle. The junction of the cylindrical passage with the conical passage 76 in the nozzle affords an annular shoulder or seat 79 with which the tapered portion 70 of the fluid tip may come into engagement when the nozzle is turned or screwed upon the barrel a sufficient extent. By this means the air may be shut off entirely or the flow adjusted so as to govern the atomization of the liquid. It is to be noted that the cylindrical passage 77 in the nozzle extends in the nozzle body beyond the innermost edge of the fan slot and as the slot is less in width than the diameter of passage 77, shoulders 79′ are formed and these shoulders assist in breaking up the liquid by diverting the direction of flow of the air and causing the air to undergo a sharp change of direction and pass into and across the stream of liquid from the fluid tip. This passage 77 is located centrally with respect to the slot. The abrupt changing of the direction of flow of the air across the stream of liquid as it emerges from the fluid tip, results in complete breaking up and atomization of the liquid, and its discharge in the form of a finely divided spray of uniform density. This action also retards the direct flow of liquid from the nozzle which would result in an uneven spray of non-uniform density. In other words, the liquid is forced through the fluid tip under pressure and would pass through the nozzle in the form of a thin narrow thick stream, but the air being directed by the shoulders 79′ across the stream of liquid retards the flow of the same through the nozzle, breaks it up into small particles and prevents its passage through the nozzle as a stream of liquid. This retarding action due to what might be termed eddy currents of air, is very important and gives the advantageous results hereinbefore referred to. It makes the use of a pressure feed cup possible in a device of this character and still gives efficient results in the application of these materials.

Referring now to Figure 2 the numeral 80 designates a cup or other receptacle which is adapted to receive a suitable supply of fluid material to be sprayed. This cup has a cap or top member 81 having the projection 82 adapted to be secured to the downward extension 58 of the gun. It is to be noted that the vertical annular air passage 60 of the gun is closed by means of suitable washers 83 and nuts 84 (Figure 1). In order to provide pressure in the cup for forcing the fluid material from the cup an air bypass 85 is connected to the side of the barrel and communicates with the vertical annular air passage 60, this bypass extending downwardly as shown in Figure 2, and communicating through the top or cap of the cup as at 86, so that when air pressure is in the vertical annular passage 60, part of the same may pass into the fluid cup or container whereby the material therein is under pressure and will be forced out through the connection 82 and the fluid passage 57 into the fluid chamber 56.

When the device is used on pressure tanks the bypass is closed and a connection is made from the extension 58 to the fluid container or tank which is subjected to air or other fluid pressure, as is well understood in the art.

In Figure 3 of the drawing I show a detail of a modified form of connection between the gun and the fluid cup. This includes the top or cap 87 adapted to be suitably secured to the cup by clamping or other means, having an extension in the form of tube 88 which is adapted to be secured to the downward extension 58 of the device by means of a screw threaded connection. This tube is formed of substantially thick material, having the bore or passage 89 formed therein and leading into this passage are a plurality of smaller passages 90 which are adapted to communicate with the vertical annular air passage 60 in the downward extension 58, it being understood that when this construction is attached, washers and nuts 83 and 84 are removed from extension 58. Nut member 91 having opening 92 is screwed into the cap 87 from its underside closing the passage or bore 89 and forming a bushing to receive and guide the liquid post or tube 93. This post or tube 93 has its upper end screw-threaded as at 94 for attachment to the screw thread 95 formed in the liquid passage in the extension 58, and extends downwardly to a point near the bottom of the cup or receptacle 80. The cap is bored from the inside, as at 96 to provide passages or ports leading from the bore or passage 89 to the inside of the cap and into the container whereby the liquid therein is subjected to air pressure from the air passages when the air valve 13 is open.

In operation, it being understood that the fluid cup is connected to extension 58 and that a source of air pressure is connected to extension 5, the operator presses the trigger 26 which immediately opens air valve 13 whereby a supply of air under pressure is admitted through passages 10 and 11, the vertical passage 60, bypass 85, or in the form shown in Figure 4, passages 90, 89 and 96 into the cup 80. This air under pressure also passes through the horizontal annular passage 61 into the nozzle, in the space between the nozzle and the fluid tip and passes from the nozzle through the fan slot. Due to the fact that the valve rod 38 has not as yet been moved, there is no passage of paint or other liquid and this does not occur until

air under pressure is flowing through the nozzle. Further movement of the trigger results in a movement of the valve rod 38, which moves the valve 51 from its seat in the rear end of the fluid tip and permits the liquid which, due to the air pressure thereon in the cup, has been forced up through passage 57 into the chamber 56, to pass through the bores 74 and 73 in the fluid tip into the cylindrical bore 77 in the nozzle. There the fluid meets the outrushing current of air under pressure and is completely broken up and atomized and forced out of the fan-slot passage opening in the form of a sheet of misty fluid material in proper shape to coat the surface. When the pressure is relieved from the trigger the fluid valve 51 first seats, closing the fluid passages and preventing the material dripping or otherwise discharging from the nozzle. After this valve has seated the air valve seats, disconnecting the parts of the apparatus from the source of air pressure. Then the air pressure on the cup or container exhausts into the atmosphere through the bypass, vertical annular passage 60, horizontal annular passage 61 and the nozzle, so that the fluid cup is relieved of pressure and the parts assume a normal condition. This action of exhausting the air from the fluid cup and the passage of air through the device after the fluid valve is seated, results in a thorough cleaning of the valve parts, preventing waste of material and the very objectionable dripping feature, and also relieves the container from all pressure when the device and apparatus are not in use.

The construction shown in Fig. 5 of the drawing operates in the same manner as the construction previously described. In that view however, the air valve member 12′ is mounted to move horizontally in the barrel portion 2 of the device and has the valve proper 13′ formed at its end to rest against the seat 8′ formed in the longitudinal air passage 11 in the barrel. The stem or plunger 14′ of this valve extends through the bushing construction 15′ beyond the rear end of the barrel and has a nut connection 97 with part of the yoke 45, whereby when the yoke is moved the stem 15′ and valve 13′ are moved. Spring 17′ is positioned about the stem between the valve proper 13′ and the bushing construction and normally tends to force and hold the valve in closed position. By this construction the movement of the air valve, as well as the liquid valve, is in a straight horizontal direction, which is an advantage in operation. The nut 97 constitutes an abutment with which the yoke 45 engages and these parts are so arranged that in the initial part of the movement of the trigger the air valve only will be opened and it is not until after this air valve is opened that the yoke 45 engages the abutment 43 to open the liquid valve. This relation of the parts is the same as in Fig. 1.

Referring now to the nozzle or discharge end of the device shown in Fig. 5 and also to detail views Figs. 6 and 7 the new form of nozzle construction will now be described. It includes the nozzle 64′ having a tapered passage 76′ leading to and communicating with a cylindrical passage 77′ which in turn leads to and communicates with another cylindrical passage 77″ which is of lesser diameter than the first mentioned cylindrical passage 77′. This last mentioned cylindrical passage 77″ communicates with the flat fan shaped slot 78′ formed in the end of the nozzle, this slot being less in width than the diameter of the cylindrical passage 77″, whereby shoulders 79″ are provided. These shoulders are preferably straight, but may be slightly inclined as shown and are for the purpose of abruptly changing the direction of the current of air across the stream of liquid emerging from the fluid tip just as in the previous construction. The tapered passage 76′ in the nozzle leads from an air receiving compartment 98 formed in the nozzle, as shown at the right in Figs. 5 and 6. This chamber provides an abrupt and substantial shoulder 99. The inner surface of this chamber and nozzle is not screw threaded. The nozzle is provided with the end securing annular flange 100, which is engaged by an inwardly extending flange 101 on the locking ring 102, which is interiorly screw threaded as at 103 to engage the threads 63′ formed on the outside of the forward extension 62′ of the barrel.

The fluid tip itself includes the threaded extension 67′ whereby it may be screwed into engagement with the internal screw thread 65′ of the forward extension, the flat face or shoulder seats air-tight against the end of the forward extension. The fluid tip is provided with the squared flat faced shoulder portion 69′ with the tapered portion 70′ extending forwardly therefrom to the cylindrical tip or projection 72′, the tapered portion 70′ terminating in the abrupt shoulder 71′. The squared or flat faced portion 69′ is provided with front shoulders 69″. Both the tapered portion 70′ and the squared or flat shaped portion 69′ are provided with a plurality of longitudinal extending slots or passages 69‴, these passages opening into the squared or flat faced portion 69′ and opening into the end of the tapered passage 76′ in the nozzle. The fluid tip is bored as at 73′.

The fluid tip is mounted in position in the end of the liquid receiving chamber or compartment 56′ the inner end of the bore 73′ serving as a valve seat for the liquid valve. The nozzle 64′ is positioned over the fluid tip and the shoulder 99 of the nozzle engages the shoulder 69″ of the fluid tip, whereby

the nozzle and the fluid tip are positioned relatively to each other. The nozzle is secured in position by means of a locking ring 102 previously described. This construction provides for a fixed adjustment and an adjustment which may always be obtained regardless of the number of times the nozzle and fluid tip are taken from the device or substitutions of these parts made. The liquid of course, passes through the liquid passages and through the bore of the fluid tip when the liquid valve is open. The air under pressure passes through the air passages and through the plurality of small air ports or passages 61′ which are formed in the end of the forward projection of the barrel and communicate with the vertical air passage 60′ therein. This air under pressure is admitted into the chamber 98 formed in the rear or inner end of the nozzle, and enters the ends of slots 69‴ passing through the tapered passage 76′ and into the cylindrical passages 77′ and 77″ and in its passage therethrough is subjected to abrupt changes of direction, due to the shoulders 79″ and 79‴. The position of the fluid tip with reference to these cylindrical passages and the shoulders and the fan slot is of utmost importance in securing perfect atomization and operation of this device. The arrangement of the slots 69‴ gives an even distribution of air throughout the confines of the nozzle.

It is to be noted that the nut 97 affords means for adjusting the position of the air valve 13′ whereby the amount of air may be readily controlled. The fixed adjustment of the nozzle 64′ is of material importance in making the device fool proof and in saving workman's time in attempting to secure proper adjustment. The action of the shoulders in the two forms of nozzle in abruptly changing the direction of flow of the current of air causes eddy currents which gives a swirling action within the nozzle which results not only in complete atomization, but also in keeping the inside of the nozzle clean and free and prevents the same from clogging and improperly operating on that account, even with relatively thick materials.

This nozzle construction as stated before, is readily adaptable to the pressure cup devices shown in Figs. 2 and 3 of the drawings and enables the use of this form of device, even with very heavy and thick materials. The inside mixed type of nozzle and the specific construction thereof permits the satisfactory use of the pressure cup.

In Figs. 12 and 13 a somewhat different form of fan slot nozzle is illustrated. It includes the nozzle member 104 having a frusto conical outer shape as at 105 terminating in the flat round face 106 which is provided with the flat slot 107 extending a substantial distance down into the body of the nozzle whereby the slot is of substantial width and with the result that a wide spray will be emitted from the nozzle. This nozzle has the cylindrical passage 108 and tapered passage 109 communicating therewith and the shoulders 110 form at the junction between the cylindrical passage 108 and the slot 107 due to the fact that the slot is less in width than the diameter of the cylindrical passage.

While I have illustrated and described only one form of nozzle, being what is termed a "fan slot nozzle" and also an "inside mix nozzle," it is to be understood that various other forms of nozzles, such as conical nozzles and outside mix nozzles, may be used in connection with this construction.

This device results in a number of advantages, a few of which are as follows: a saving of a substantial percentage of the amount of material used, operation at greater speed, and operation on considerably less power. In addition, the device is composed of few wearing parts, being made strong and substantial and capable of maximum severe service. Mists, fumes and the chilling of the liquid material is minimized and a smooth, even flowing coat free from all blemishes is assured. The flow of liquid material is under perfect trigger control and the device is balanced, light in weight, convenient and easy to operate and unusually easy to clean.

I claim:

1. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot and means to discharge a stream of material rearwardly of and spaced from said shoulders whereby to cause the air to intercept and flow across the stream of material at points within the nozzle member.

2. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot, said shoulders being parallel with the long dimension of the slot and means to discharge a stream of material rearwardly of and spaced from said shoulders whereby to cause the air to

intercept and flow across the stream of material at points within the nozzle member.

3. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot and a fluid tip member bored to permit the passage of liquid therethrough and having its outlet end positioned in said nozzle member adjacent to but spaced rearwardly from said shoulders whereby to cause the air to intercept and flow across the liquid at points within the nozzle member.

4. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot, and a fluid tip member bored to permit the passage of liquid therethrough and having its outlet end cylindrical in shape and less in diameter than said bore and positioned in said nozzle member adjacent to but spaced rearwardly from said shoulders whereby to cause the air to intercept and flow across the liquid at points within the nozzle member.

5. A paint spraying device including a nozzle member having an air passage and having a fan shaped slot relatively narrow in width communicating with said air passage, means interposed between said air passage and slot to abruptly change the direction of flow of the air before it enters the slot and means to discharge a stream of material rearwardly of and spaced from said air-flow direction changing means whereby to cause the air to intercept and flow across the liquid at points within the nozzle member.

6. A paint spraying device including a nozzle member having an air passage and a fan shaped slot with which said air passage communicates, a fluid tip member having a material passage mounted within the nozzle with its end spaced from said slot, and means in the nozzle arranged in advance of and spaced from said end of the fluid tip member for abruptly changing the direction of air passing therethrough to cause the same to flow across the material egressing from the outlet of the fluid tip before the material reaches the slot.

7. A paint spraying device including a nozzle member having an air passage and a fan shaped slot with which said air passage communicates, a fluid tip member having a material passage mounted within the nozzle with its end spaced from said slot, and means in the nozzle arranged in advance of and spaced from said end of the fluid tip member for abruptly changing the direction of air passing therethrough to cause the same to flow across the material egressing from the outlet of the fluid tip before the material reaches the slot, said means being provided by a cylindrical passage between said air passage and the slot, the slot being less in width than the diameter of the cylindrical passage forming abrupt shoulders.

8. A paint spraying device including a nozzle member having an air passage and a fan shaped slot with which said air passage communicates, a fluid tip member having a material passage mounted within the nozzle with its end spaced from said slot and means in the nozzle arranged in advance of and spaced from said end of the fluid tip member for abruptly changing the direction of air passing therethrough to cause the same to flow across the material egressing from the outlet of the fluid tip before the material reaches the slot, said means being provided by a cylindrical passage between said air passage and the slot, the slot being less in width than the diameter of the cylindrical passage forming abrupt shoulders, said fluid tip having a cylindrical end, less in diameter than said cylindrical passage.

9. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot, a fluid tip member bored to permit the passage of liquid therethrough and having its outlet end positioned in said nozzle member adjacent to but spaced rearwardly from said shoulders, and means permanently fixing the position of the outlet end of the fluid tip relative to said shoulders.

10. A paint spraying device including a nozzle member having an air passage and a cylindrical bore communicating with said air passage, said nozzle member having a slot in its tip or outlet portion communicating with said cylindrical bore, said slot being less in width than the diameter of said bore whereby shoulders are provided at the junction of the bore and slot to form means for abruptly changing the direction of the air before it enters the slot, a fluid tip mem-

ber bored to permit the passage of liquid therethrough and having its outlet end positioned in said nozzle member adjacent to but spaced rearwardly from said shoulders and means permanently fixing the position of the outlet end of the fluid tip relative to said shoulders said means including engaging shoulders on said fluid tip and in said nozzle.

11. A paint spraying device including a nozzle member having an air chamber, an air passage communicating therewith, a plurality of communicating cylindrical passages of varying diameters, an arcuate slot in the end of said nozzle member communicating with the last cylindrical passage, a fluid tip member within said nozzle member spaced rearwardly of said slot and having a bore for the passage of material therethrough and further having a cylindrical end portion fitting within one of said cylindrical passages.

12. A paint spraying device including a nozzle member having an air chamber, an air passage communicating therewith, a plurality of communicating cylindrical passages of varying diameters, an arcuate slot in the end of said nozzle member communicating with the last cylindrical passage, a fluid tip member within said nozzle member spaced rearwardly of said slot and having a bore for the passage of material therethrough and further having a cylindrical end portion fitting within one of said cylindrical passages, said fluid tip having a plurality of spaced passages therealong to afford an even distribution of air from the air chamber to the cylindrical passages.

13. A paint spraying device including a nozzle member having an air chamber, an air passage communicating therewith, a plurality of communicating cylindrical passages of varying diameters, an arcuate slot in the end of said nozzle member communicating with the last cylindrical passage; a fluid tip member within said nozzle member spaced rearwardly of said slot and having a bore for the passage of material therethrough and further having a cylindrical end portion fitting within one of said cylindrical passages, said fluid tip having shoulders adapted to engage said nozzle member to fix the adjustment of the cylindrical end of the fluid tip.

14. A paint spraying device including a nozzle member having an air chamber, an air passage communicating therewith, a plurality of communicating cylindrical passages of varying diameters, an arcuate slot in the end of said nozzle member communicating with the last cylindrical passage, a fluid tip member within said nozzle member having a bore for the passage of material therethrough and having a cylindrical end portion fitting within one of said cylindrical passages, said fluid tip having shoulders adapted to engage said nozzle member to fix the adjustment of the cylindrical end of the fluid tip, said fluid tip also having a tapered portion disposed axially within said air passage of the nozzle member and having a discharge spaced rearwardly from said slot.

15. A paint spraying device including a nozzle member and a fluid tip member positioned within said nozzle member, said fluid tip member having a bore for the passage of material therethrough, said nozzle member having an air chamber of the same general shape as but larger than said fluid tip, a substantially cylindrical air passage communicating with said air chamber, and a slot communicating with said air passage, and means for connecting said nozzle member to the paint-spraying device in a fixed position relative to said fluid tip so as to permit the passage of air around the outside of said fluid tip and so as to position the end of the fluid tip within said cylindrical air passage but spaced rearwardly from said slot so that the air engages the material discharged from said fluid tip before it is discharged through said slot.

16. A paint spraying device including a nozzle member and a fluid tip member positioned within said nozzle member, said fluid tip member having a bore for the passage of material therethrough and being of general conical shape, said nozzle member having an air chamber of the same shape as and of somewhat greater dimension than said fluid tip, said nozzle member also having a substantially cylindrical air passage communicating with said air chamber at the front end thereof and a discharge slot communicating with said cylindrical air passage, and means adapted to hold said nozzle member on said paint spraying device in a fixed adjustment so as to permit the passage of air about the outside of said conical fluid tip to said cylindrical air passage and so as to position the end of said fluid tip short of and rearwardly of said slot so that the air strikes the material discharged from said fluid tip before it passes into said slot.

17. A paint spraying device including a fluid tip member adapted to be secured to the paint spraying device and having a bore to permit the passage of material therethrough and having a reduced cylindrical end, a nozzle member adapted to be positioned on the end of said paint spraying device and to have communication with air passages therein, said nozzle member having an air chamber of the same general shape as that of the fluid tip but of somewhat larger dimension so as to provide a space therebetween for the passage of air when assembled, a restricted cylindrical air passage in its forward portion and a slot communicating with said cylindrical air pas-

sage, said cylindrical air passage being of greater diameter than the reduced cylindrical end of said fluid tip, and means for assembling and holding said nozzle member on the paint spraying device so that the reduced cylindrical end of the fluid tip is positioned within said cylindrical air passage and spaced rearwardly from the entrance of said slot so that the air passing around said fluid tip and into the cylindrical passage engages the material discharged from the fluid tip before it enters said slot.

In testimony that I claim the foregoing, I have hereunto set my hand this 30th day of July, 1926.

AUSTIN H. DOWNS.