

June 18, 1940.

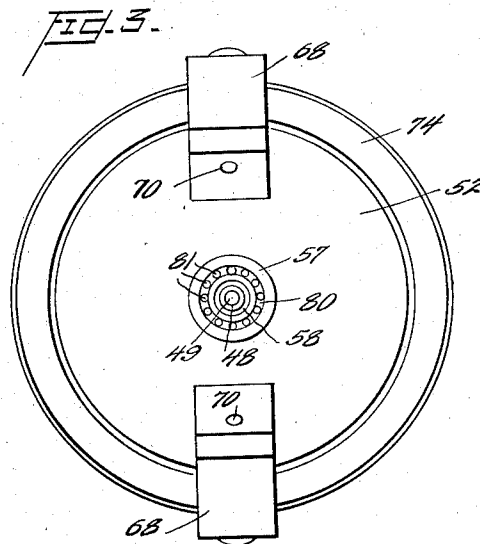
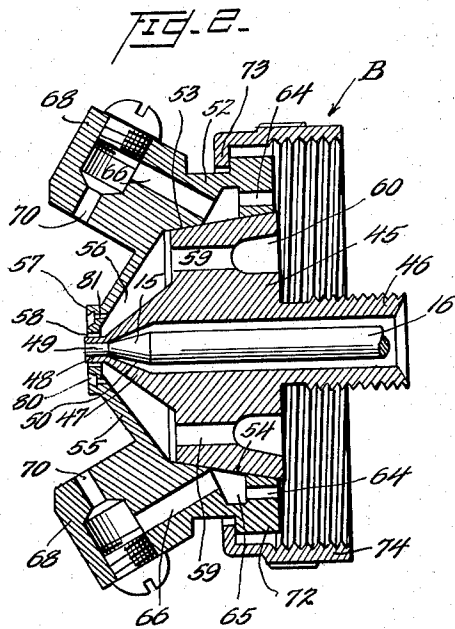
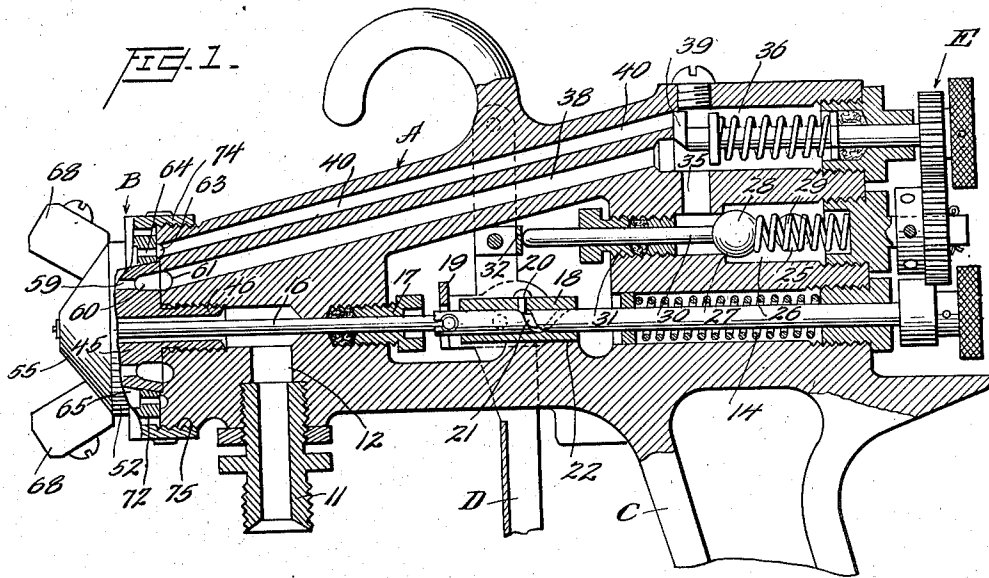
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2,204,599

SPRAY GUN

Filed Jan. 9, 1936

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG-4-

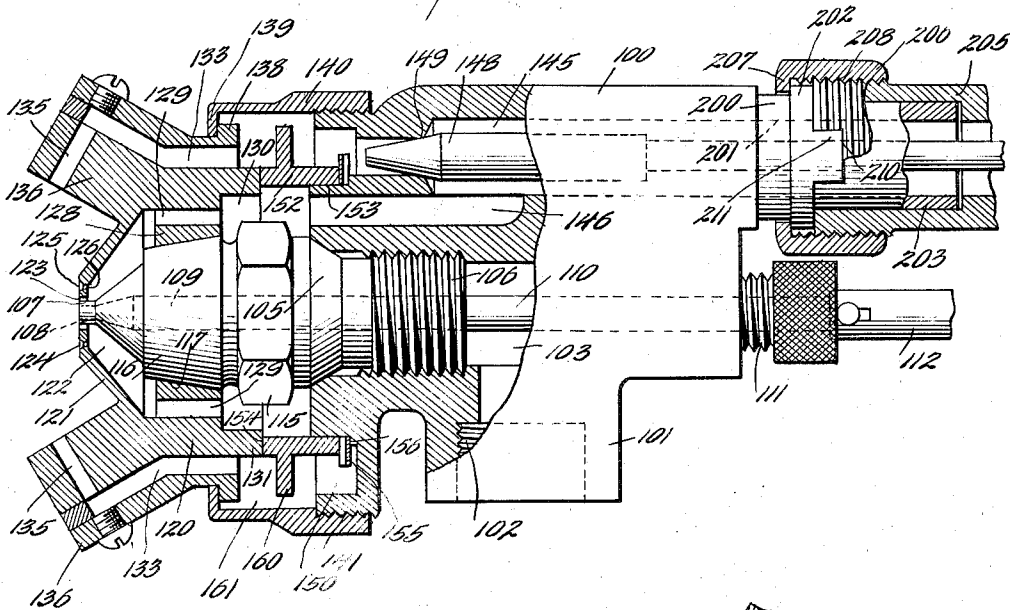


FIG-5-

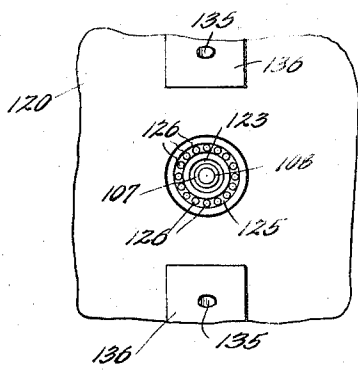
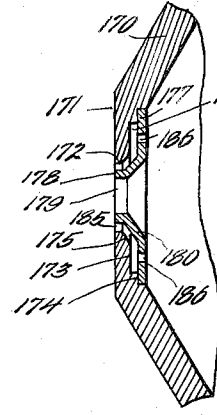


FIG-6-



UNITED STATES PATENT OFFICE

2,204,599

SPRAY GUN

Alexander Frederick Jenkins, Baltimore, Md.

Application January 9, 1936, Serial No. 58,399

5 Claims. (Cl. 299—140.1)

This invention relates to spray guns for coating material or the like, and has to do more particularly with the nozzles of such guns.

The present application is a continuation in part of my copending application Serial No. 714,766, filed March 9, 1934.

The general object of the invention is to provide a novel and improved nozzle construction for devices of the class described, which exhibits certain advantages in efficient operation and ease of manipulation which will be readily apparent as the detailed description proceeds.

In the utilization of the ordinary spray gun for applying coating materials, especially when such materials are of a viscous nature, there occurs an accumulation of the liquid material on the face of the nozzle around the spraying orifices. Considerable inconvenience has been experienced with the dripping of the liquid from the nozzle of the gun and also the building up of deposits of hardened coating material about the nozzle orifice deleteriously affects the spraying operation.

Another object of the invention, therefore, is the provision of a self-cleaning and non-dripping nozzle, which embodies means for preventing the building up of an accumulation of paint, enamel, or other coating material on the face of the nozzle adjacent the spray orifices. The means which I have provided for this purpose preserve the sharp clean edges of these orifices and improve the accuracy of the spray as well as attaining the objects already described.

Another object of the invention is to provide in connection with a nozzle of this type, novel air baffling means for reducing the velocity of the air supplied to certain of the nozzle jets and for obtaining better distribution and equalization of flow between certain of the spaced orifices of the nozzle.

A further object of the invention is the provision of an improved connection between the nozzle end of the spray gun and the main body portion thereof which carries the controlling and actuating mechanisms.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which certain embodiments of my invention are illustrated by way of example.

In the drawings:

Figure 1 is a view in side elevation of a paint spray gun embodying the principles of my invention, the greater portion of the gun being broken away and shown in vertical longitudinal section;

the example shown being of the same type as that illustrated and described in detail in my copending application to which reference has been made;

Figure 2 is an enlarged longitudinal sectional view through the nozzle of the gun shown in Figure 1;

Figure 3 is a view in front elevation of the nozzle illustrated in Figures 1 and 2;

Figure 4 is a view partly in side elevation and partly in vertical longitudinal section illustrating a modified form of nozzle and nozzle attaching structure;

Figure 5 is a fragmentary view in front elevation of the central portion of the nozzle shown in Figure 4;

Figure 6 is a fragmentary view in vertical longitudinal section of a front modification in my improved nozzle; and

Figure 7 is a fragmentary front elevational view of the same nozzle.

In the illustrative example of my invention in Figure 1 the spray gun to which the nozzle is applied is the same as that illustrated in my copending application referred to above and only as much of the actuating and controlling mechanism as is necessary to an understanding of the features constituting the present invention will be described in detail herein.

The gun comprises essentially the body portion indicated generally by the reference character A, the detachable nozzle B, the handle or grip C, the trigger D and the air and liquid flow regulating devices denoted generally by the reference letter E.

In the forward portion of the gun there is inserted the nipple 11 through which communication may be had from a suitable supply of coating material or the like. The coating material enters the passageways 12 and from thence passes into the central jet portion thereof where the emission of the liquid material is controlled by a needle valve 15 having a stem 16 passing longitudinally of the gun through the stuffing box 17 and urged forwardly to valve closing position by means of the spring 14. The stem 15 carries upon its intermediate portion the longitudinally movable abutment member 18 which by rotation of the stem 16 may be positioned at selected points along the stem in order to control the point of engagement thereof by the yoke 19 carried by the trigger D. This positioning is attained by means of the cooperation of the pin 20 carried by the member 18 with the spiral slot 21 formed in the valve stem 16. The member 18

is prevented from rotating during adjustment by contact with the flat surface 22 formed on the body portion of the gun.

The spray gun is placed in communication with a suitable source of compressed air through the opening 25 which leads into the actuating valve chamber 26. This chamber is provided with a valve seat 27 upon which the ball valve 28 is normally pressed by means of the coil spring 29. The valve 28 is provided by a stem 30 which passes through the stuffing box 31 and is disposed adjacent the trigger D for contact with the element 32 carried by the trigger. When permitted to flow through the valve chamber 26 the air passes through the passageway 35 into the regulating valve chamber 36 at which point the air stream is divided, a portion of the air passing through the passage 38 leading to the propelling jet portions of the nozzle, and the other portion of the compressed air supply, as controlled by the regulating valve 39, passing into the passageway 40 leading to the spray modifying or flattening jet portions of the nozzle B.

From this disclosure, and the more detailed description in my copending application, it will be readily seen that by manipulation of the trigger D the yoke 19 will engage the abutment 18 and retract the needle valve 15 and the element 32 on the trigger will, through the stem 30, force the air valve 28 off its seat and permit the compressed air to flow to the nozzle. It has previously been found expedient to so adjust the abutment member 18 along the liquid valve stem 16 that the yoke member 19 will not contact it for actuating the liquid valve until after the air valve 28 has been unseated and a flow of aspirating air projected through the nozzle jet. Similarly, upon releasing the trigger D, the liquid valve is permitted to close first and the aspirating air allowed to continue momentarily after the liquid flow has ceased. This diminishes to some degree the dripping of the paint from the nozzle and has some tendency to prevent the accumulation forming around the jets. However, this measure has been found insufficient to entirely prevent the accumulation and dripping of the liquid material, especially when this material is of a viscous nature such as in the case of enamels, and my improved device for eliminating this difficulty will now be described in connection with the detailed description of the nozzle structure.

The nozzle which is shown in connection with the spray gun illustrated in Figure 1 is illustrated to the best advantage in the enlarged views comprising Figures 2 and 3 of the drawings. The inner central liquid material enclosing member 45 is provided with the threaded nipple 46 which is inserted in the forward end of the liquid passageway 12, the rear surface of the body portion of this member 45 abutting the front surface of the body portion of the gun. The forward end 47 of the member 45 is tapered and is provided with the central liquid orifice 48 which is adapted to be closed by the forward attenuated end 49 of the needle valve 15, the tapered portion 50 of which in cooperation with the conical inner end of the nozzle portion 47 serving to graduate the flow of liquid material through the orifice 48.

An outer enclosing nozzle portion 52 is provided which has an interior frusto conical surface 53 which fits snugly against the similar conical surface 54 formed on the inner member 45. The forward tapered wall 55 of the outer member 52 encloses the propelling or aspirating

air chamber 56 and the flat front face 57 of the outer nozzle member is provided with a central orifice 58 which surrounds the tip of the inner member 45 with sufficient clearance to provide an annular aspirating air jet which accomplishes the main spraying function of the gun. The air for this purpose passes into the chamber 56 through the annular series of passageways 59 formed in the body portion of the inner nozzle member 45 and communicating with the annular groove 60. The groove 60 registers with a corresponding groove 61 formed in the face of the body portion of the gun and communicating with the air passageway 38. Another annular groove 63 is formed in the front face of the body portion of the gun exteriorly of the groove 61 and is in communication with the air passageway 40. An annular series of passageways 64 is provided in the outer member 52 of the nozzle and these passageways lead into the annular chamber 55 from whence the two diametrically oppositely disposed passageways 66 pass through the horns or projections 68 so that a portion of the air may be projected through the inwardly directed orifice 70 and impinge upon the main circular spray so as to modify its shape and flatten it to the desired degree in a well-known and conventional manner. The outer nozzle member 52 is formed with the flange 72 having a forward shoulder around which is spun the flange 73 of the retaining ring 74 threaded for application to the body portion of the gun as at 75.

In order to more effectively prevent dripping of the liquid material from the nozzle and to prevent the building up of an accumulation of material around the nozzle orifices, there is provided by the present invention an annular groove 60 formed in the front face of the flattened central portion 57 of the nozzle and surrounding the main liquid and air openings 48 and 58. Communication is provided between this groove 60 and the compressed air chamber 56 by means of the annular series of short passageways 61. In the embodiment shown in Figures 1, 2 and 3 this groove is given a conical or convergent form so as to cause the air supplied through the passageways 61 to be directed slightly inwardly toward the main supply jet. The provision of this annular "wall" of air not only effectively prevents the accumulation of coating material upon the face of the nozzle but has some beneficial influence upon the main spray itself, aiding in preserving the well defined outlines of the spray and preventing spattering. The anti-dripping device thus described is disclosed as receiving its supply of air from the same passageways as the main aspirating air jet, but it is to be understood that it may receive air in any other convenient manner.

In Figures 4 and 5 of the drawings, there is shown a modified form of nozzle which embodies additional improvements all directed toward the provision of a more efficient spraying operation. In Figure 4 the nozzle attaching portion of the gun is designated by the reference numeral 100. A boss 101 upon the lower portion of this member is provided with the threaded opening 102 for the reception of the liquid component of the spray which from this point passes through the passageways 103 into the interior of the central nozzle member 105 threaded as at 106 into the forward end of the member 100. The inner nozzle member 105 is provided interiorly with a liquid passageway similar to the embodiment described in the earlier figures of drawings and is

provided with the tip 107 which contains the liquid orifice 108 controlled by the needle valve 109 carried by the stem 110 which passes through the stuffing box 111 and is extended rearwardly as at 112 to be controlled in any suitable manner.

The inner nozzle member 105 is provided with the polygonal portion 115 to which a suitable tool may be applied in assembling and dismantling the nozzle. The element 105 is also provided with the frusto conical surface 116 which provides a seat for the correspondingly tapered surface 117 of the outer nozzle member 120. This outer member is provided with the forward wall portion 121 which encloses the air chamber 122 supplying the annular aspirating air jet 123 and the "clean-up" jet 124 which comprises the annular groove 125 and the annular series of small passageways 126.

The inner flange 128 of the member 120 is provided with the annular series of passageways 129 leading to the annular chamber 130 formed between the rearwardly directed flange 131 of the member 120 and the inner nozzle member 105. Exteriously of the flange 131 the outer member 120 is provided with passageways 133 leading to the supplemental flattening jets 135 carried by the horns 136 disposed in the usual diametrically opposed positions. A radially outwardly directed flange 138 is formed on the outer member 120 and cooperates with the spun-over flange 139 on the retaining ring member 140 which is threaded to the forward gun portion 100 as at 141.

A compressed air passageway 145 is provided in the gun member 100 for supplying the air to both the aspirating and modifying jets. A branch passageway 146 leads from the passageway 145 to the intermediate portion of the nozzle and communicates with the chamber 130 from which the aspirating air passes to the central portion of the face of the nozzle. A needle valve 148 cooperates with the seat 149 in the passageway 145 to control the air supplied to the modified or flattened jets. Beyond this valve arrangement, the air flows into the annular groove 150 formed in the face of the member 100 and from there it passes around a baffling device and thence to the passageways 133 leading to the horns of the nozzle.

This baffling member, which may be considered an element of the member 100, comprises a sleeve 152 which is disposed within the annular groove 150 in the member 100 and fits snugly around the inner wall of this groove as at 153. The outer end of the sleeve 152 abuts an inwardly directed flange 131 of the outer nozzle member, when assembled, as at 154. A crimped spring washer 155 is disposed between the inner end of the sleeve 152 and the shoulder 156 formed on the wall of the annular groove 150. This insures the effective sealing off of the inner aspirating air passageways and the outer modifying air passageways.

A radially directed annular flange 160 is formed on the sleeve member 152 so as to project into the modifying air chamber 161 enclosed by the retaining ring member 140. Since the modifying or flattening air is supplied through the valve control passageway 145 at only one point on the periphery of the nozzle, this baffling flange 160 is provided in order to retard the flow of this air somewhat and to insure that it is substantially equally distributed between the two passageways 133 leading to the supplemental jets 135 at the upper and lower portions of the nozzle. It will be noted that the baffling and partitioning sleeve

152 is applied to the body portion of the gun and is not carried by the nozzle elements. This is an important feature making for convenience and ease in assembling the device.

In Figures 6 and 7 an important modification of my improved nozzle is shown. In this embodiment a portion of the outer nozzle member 170 is shown having the usual flat forward face 171, of relatively limited extent as compared with the whole front of the nozzle. The nozzle is drilled centrally as at 172 to provide a circular opening and upon the inner side of the face 171 the surface is cut away or countersunk in two stages, one lever providing the surface 173 and the other the shouldered outer recess 174. The corner between the surface 173 and the margin of the opening 172 is preferably bevelled such as at 175. Into the larger recess 174 there is forced an annular insert 177 which is provided with the forwardly projecting annular flange 178 formed centrally with the opening 179 and connected with the main disc-like portion of the insert by the frusto conical web 180. Between this disc-like insert and the wall of the nozzle portion 170 the space 181 is provided which is directed forwardly to form the annular jet 185. An annular series of openings 186 is formed in the flat rearward portion of the inserted disc 177 which supplies the air to the space 181. It will be understood that an inner nozzle member such as disclosed for example in Figures 2 and 4 of the drawings is adapted to project through the opening 179 in this construction to form the concentric liquid and aspirating air jets. The supplemental clean-up air jet is projected through the annular orifice 185 in the present construction. In this embodiment the air passing through the small openings 186 impinges upon the front wall of the space 181 and is effectively baffled so as to retard the flow somewhat. The wall or tubular ring of air provided by this supplemental jet is more completely annular in form at the face of the nozzle than if the series of passageways 186 were provided adjacent the orifice. Furthermore, this construction enables the making of the proper thickness of the wall after inserting the disc 177.

In Figure 4 of the drawings there is also shown a novel attaching means for securing the nozzle supporting member 100 of the gun to the main rearwardly disposed body portion which carries the controls. A tubular rearwardly projecting member 200 is provided on the rear portion of the member 100, the bore 201 of which communicates with the air passageway 145. This member is provided with the flange 202 and the narrowed rearward cylindrical portion 203 which is adapted to be received within the interior of the forwardly projecting end 205 of the main body portion of the gun. A clamping ring 206 is provided forwardly with an inwardly spun flange 207 surrounding the shoulder of the flange 202 of the member 200. The clamping ring is threaded as at 208 upon the body portion 205. In order to prevent rotation of the forward nozzle supporting member 100 with relation to the body portion, the member 205 is notched as at 210 to receive the correspondingly shaped projection 211 formed on the member 200 and merging with the flange 202. The two members are thus effectively locked together in the proper alignment and they may be readily disconnected for cleaning or other purposes.

Various changes and modifications may be made in the device as disclosed herein without

departing from the scope of the invention as defined in the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a nozzle for spray guns or the like, in combination, an outer forward wall enclosing a compressed air chamber and provided with concentric centrally disposed spray liquid and air orifices, an annular groove formed in the outer forward face of said wall surrounding and closely adjacent to said orifice and connected to said air chamber by an annular series of small closely spaced perforations passing through the wall and opening into the bottom of said groove.

2. In a nozzle for spray guns or the like, in combination, an outer nozzle member having a forward wall enclosing a compressed air chamber and provided with a centrally disposed opening, a circular depression formed in the inner wall of said member and a ledge formed around the periphery of said depression, a disc-like insert disposed upon said ledge and spaced from the bottom of said depression, said insert having an annular nipple centrally thereof and projecting through said central opening in said outer nozzle member and spaced from the margin thereof, and openings in the disc member communicating with the space between said disc and the bottom of said depression.

3. In a nozzle for spray guns or the like, in combination, an outer nozzle member having a forward wall enclosing a compressed air chamber and provided with a centrally disposed opening, a circular depression formed in the inner wall of said member and a ledge formed around the periphery of said depression, a disc-like insert disposed upon said ledge and spaced from the bottom of said depression, said insert having an annular nipple centrally thereof and projecting through said central opening in said outer nozzle member and spaced from the margin thereof, an annular series of openings in the disc

member communicating with the space between said disc and the bottom of said depression, the diameter of said series of openings being greater than the diameter of said central opening in said outer member, whereby an indirect or somewhat tortuous passageway is provided for baffling the air supplied to the supplemental orifice.

4. In a spray gun for coating materials or the like, in combination, a nozzle provided with a centrally disposed valve controlled liquid orifice, an annular orifice closely surrounding and concentric with said centrally disposed orifice for the projection of a jet of air for aspirating said liquid during the spraying operation, an annular series of fine orifices concentric with and disposed exteriorly of said annular orifice, means for placing said last named orifices in communication with a source of compressed air, and a pair of diametrically oppositely disposed orifices for projecting converging spray flattening jets of air upon the main central spray jet as modified by the jets from said annular series of orifices.

5. A spray gun nozzle of the class described, comprising in combination, an inner liquid nozzle member having a valve controlled liquid orifice in the tip thereof, an outer air cap member provided axially with an opening surrounding the tip of said liquid nozzle portion with sufficient clearance to provide an annular orifice for the projection of a jet of aspirating and atomizing air, an annular series of fine passageways passing through said air cap adjacent said central orifice and concentric therewith and communicating with a source of compressed air, diametrically oppositely disposed converging passageways provided in said air cap for projecting spray modifying jets of air against the main central spray jet formed by the liquid passing through said liquid orifice and the enveloping bodies of air passing through said first named air orifices.

ALEXANDER FREDERICK JENKINS.