This invention relates to spray guns for spraying paint and like surface coating materials, and particularly it relates to nozzle structures for producing an elongated spray pattern.

In spray guns for applying surface coating material such as paint, it is desirable that the spray nozzle form the discharged spray of paint into an elongated and generally rectangular form, and many different arrangements have been proposed for attaining this desirable spray pattern. Many of these prior spray nozzles have made use of what are termed wing jets that cause supplemental air to be impinged upon opposite sides of the originally conical spray so as to change the form thereof and cause the paint to be deposited in a rectangular or elongated pattern. Many problems have, of course, been encountered in such control of the paint spray pattern, and among these problems is the tendency of the spray pattern to divide about midway between the ends of the elongated spray pattern. In prior structures it has been somewhat difficult to control the action of the supplemental air issuing from the wing jets, and it is therefore an important object of the present invention to simplify the application of supplemental air from the wing jets of a paint spray nozzle, and a related object is to enable more accurate control of the pattern-forming action to be attained. Other objects related to the foregoing are to impart a new cross sectional characteristic to the supplemental air jets and to do this in such a way that the wing jets may be readily and easily manufactured.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments and the principles thereof and what I now consider to be the best mode in which I have contemplated applying those principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a vertical cross sectional view of a spray head embodying the features of the invention;

Fig. 2 is an enlarged portion of the structure shown in Fig. 1;

Fig. 3 is a front elevational view of the nozzle structure shown in Fig. 2;

Fig. 4 is a cross sectional view taken substantially along the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary view similar to Fig. 2 and illustrating an alternative construction;

Fig. 6 is a fragmentary front elevational view of the structure shown in Fig. 5;

Fig. 7 is a cross sectional view taken substantially along the line 7—7 of Fig. 5; and

Fig. 8 is a diagrammatic view illustrating the spray pattern and the relationship of the wing jets.

The nozzle or spray head structure of the present invention may be utilized with different forms or type of spray guns, but as herein shown, the invention is illustrated as embodied in a spray nozzle 10 that is mounted in association with the adapter fitting 11 which associates the spray nozzle with a spray gun body 12. The spray gun body 12 may constitute the body of a spray gun of the kind illustrated in my copending application, Serial No. 734,819, filed March 17, 1947, but it should again be observed that the spray nozzle 12 may be utilized in association with other types or kinds of spray guns. As shown in Fig. 1, the adapter fitting 11 has a paint supply pipe 14 extended downwardly therefrom so that paint or other surface coating material can be supplied to the nozzle as will hereinafter be described in detail. The adapter fitting 11 is secured on the forward end of the spray gun body 12 by means including a fastening bolt 15 and a connecting nipple 16, and when thus associated, a main air supply passage 18 of the spray gun body is associated with the various air passages of the adapter fitting 11. Thus the adapter fitting 11 has a main air passage 20 that connects directly with the passage 18, while a supplemental air passage 21 in the adapter fitting 11 connects to the passage 18 and is controlled by a needle valve 22 that forms a part of the spray gun.

The main air passage 20 of the adapter fitting 11 connects at its forward end with an annular distributing groove 24 formed in the forward face of the adapter fitting 11, while the supplemental air passage 21 discharges at its forward end into an annular distributing groove 25 formed in this same forward face of the adapter fitting, it being noted that groove 25 is of a larger diameter than groove 24. Centered with respect to the grooves 24 and 25, the adapter fitting 11 has an internally screw threaded axial opening 26 that opens through the forward face of the fitting 11 and is utilized in mounting a portion of the nozzle structure, as will hereinafter be described.

The screw threaded opening or pas-
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sage 26 opens at its rear end into a vertical passage 27 to which the paint supply pipe 14 is connected.

The nozzle 10 includes an inner nozzle member 30 and an outer nozzle member 31, and the inner nozzle member has a nipple at its rear end that is screw threaded into the passage 26. The inner nozzle member 30 has a flange 30P that covers the annular groove 24, and a central axial passage 30P in the inner nozzle member extends 10 through the nozzle member and terminates in an outer discharge tip 30T. A conventional needle valve 32, that forms part of the spray gun, extends through the passage 30P to control the discharge opening at the discharge tip 30T, and hence the flow of paint or other surface coating material through the passage 30P is controlled.

The outer nozzle member 31 has a forward wall 35 in which an opening 36 is provided centrally thereof, and the tip 30T of the nozzle member 30 extends through the opening 36 in a spaced relation so that the primary air may be discharged through the tip 30T for causing an aspirating and spray-forming action upon the paint. The forward wall 35 of the nozzle member 31 connects with a rearwardly extending tubular portion 31 that is concentric with the opening 36, and an attaching or retaining collar 33 is rotateably secured on the tubular portion 37. This attaching collar 38 is adapted to be threaded onto the threaded forward portion of the adapter fitting 11 to hold the outer nozzle member 31 in place as shown in Fig. 1. In this connection it should be observed that the outer edge of the flange 30P of the inner nozzle member 30 has a forwardly and inwardly tapered surface, and the cylindrical portion 37 of the outer member has a complemental tapered seat 39 formed therein so that the seat 39 acts on the tapered edge of the flange 30P to hold the two members 20 and 31 in a predetermined relationship to each other. Forwardly of the tapered seat 39, the outer nozzle member has another tapered seat 40 formed thereon, and this tapered seat is arranged to engage a complemental tapered seat 41 formed on a former portion of the inner nozzle member 30. Thus, the two tapered seat engagements afforded by the tapered seats 39 and 41 serve to afford a pair of annular distributing chambers. The first of these chambers is identified as 42 in Fig. 1 and is disposed about the tip 30T and rearward of the wall 35, and the primary air is supplied to this chamber 42 by a plurality of angular bores 43 formed through the inner nozzle 30 from the annular distributing passage 34 in the forward face of the nozzle member 30. The other of the two annular chambers is identified at 44 in Fig. 1, and this annular chamber has supplementary air supplied thereto by a plurality of grooves 45 formed in the outer tapered edge of the flange 36F. These grooves 45 afford air passages from the annular groove 26 past the tapered seat 39 and into the annular chamber 44.

The primary air supplied to the annular chamber 42 is discharged through an annular space afforded within the opening 35 and about the discharge tip 30T so as to aspirate the paint or other surface coating material that is in the same in a conical spray centered on the axis of the discharge tip 30T. This conical spray is modified as to form by supplementary air jets that are caused to impinge upon the opposite sides of the conical spray from wing jets 50 that are formed on the outer spray nozzle member 31. These wing jets 50 have angular supply pas-

sages 51 formed therein as bores extending from the chamber 44. The bores 51 terminate short of the ends of the wing jets 50, and discharge orifices are formed for the passages 51 so as to discharge the supplementary air in jets of such a form that they will act upon the conical paint spray to change the same from the circular cross sectional form indicated at 70 in Fig. 5 to the elongated and generally rectangular form indicated at 71 in Fig. 3. In accomplishing this action under the present invention, the discharge ends of the bores 51 are arranged so that the jets will be discharged in a triangular cross sectional form as identified at 72 in Fig. 5. In accomplishing such control of the cross sectional form of the jets of air discharged from the wing jets 50, the discharge ends are arranged so as to constitute passages that are of triangular cross sectional form, and this may be accomplished in different ways, as will hereinafter become apparent. Thus, as shown in Figs. 2, 3 and 4 of the drawings, angular bores 54 of circular form are made in wing jets 50 so as to intersect with the supply passages 51 near the ends of the wing jets, and these bores 54 are arranged so that the axes thereof will intersect on the axis of the passage 35 to a substantial distance from the discharge tip 30T. These bores 54 are utilized as a mounting for bushings 55 that are mounted thereon as by providing a drive fit. Each of the bushings 55 has a passage 56 formed therein and such passage 56 is in the form of a triangle. As herein shown the triangle is in a common plane that passes through the axis of the opening 35, while the opposite sides of these triangular openings 56 will in each instance be disposed perpendicular to such a plane. With the triangular passages 56 thus symmetrically related to the axis of the opening 35, the supplemental jets of air will be discharged therefrom in the relationship indicated at 72 in Fig. 5, and hence when the supplemental jets impinge on the opposite sides of the conical paint spray 70, the different parts of the jets of air will have a differential action that results in a more uniform modified conical spray pattern. Thus it has been found that with the triangular discharge openings 56, disposed in the relationship illustrated in Figs. 1 to 3, the paint spray pattern is modified and converted to an elongated form as shown in Fig. 5 of the drawings.

The discharge nozzles may, of course, be formed in different ways, and another way of accomplishing this is illustrated in Figs. 5 to 7 of the drawings. Thus in outer nozzle member 151, wing jets 150 are provided with supply passages 151 that have the same general description, and these supply passages 151 are each arranged to intersect with discharge passages 156 that are of triangular form and are disposed in the same way or relation as the passages 56. The passages 156, however, are afforded by forming a roll of and discharge them corresponding in general location to the bores 50. The shape of each of these bores is then modified by driving a suitable forming tool into such bore to change the shape thereof to the triangular form illustrated in the passages 156 of Figs. 6 and 7. The discharge passages 156 are effective in the same manner as the passages
56 to impart the desired elongated form to the spray pattern.

From the foregoing description it will be apparent that the present invention enables the spray pattern of a spray gun to be converted into an elongated form in a simple and effective manner, and it will also be clear that the employment of a triangular wing jet arrangement under the present invention assures gradual change of form of the paint spray so as to attain the desired elongated spray pattern without danger of splitting of the spray.

Thus, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that they are capable of variation and modification and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a spray head for paint spray guns and the like, means affording air and paint supply passages for forming a conical spray of paint discharged forwardly along a predetermined axis, and means affording supplemental air discharge passages terminating in discharge openings of triangular cross section and disposed on opposite sides of said axis disposed perpendicular to said axis so that such sides are parallel to each other and lie in a common plane, the corners of said triangles opposite said sides being disposed in a common plane passing through said axis.

2. In a spray head for paint spray guns and the like, means affording air and paint supply passages for forming a conical spray of paint discharged forwardly along a predetermined axis, and means affording supplemental air discharge passages terminating in discharge openings of triangular cross section and disposed on opposite sides of said axis disposed perpendicular to said axis so that such sides are parallel to each other and lie in a common plane, the corners of said triangles opposite said sides being disposed in a common plane passing through said axis.

3. In a spray head for paint spray guns and the like, means affording air and paint supply passages for forming a conical spray of paint discharged forwardly along a predetermined axis, and means affording supplemental air discharge passages terminating in discharge openings of triangular cross section and disposed on opposite sides of said axis disposed perpendicular to said axis so that such sides are parallel to each other and lie in a common plane, the corners of said triangles opposite said sides being disposed in a common plane passing through said axis.

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