June 23, 1942. R. W. TRACY 2,287,458

SPRAYING APPARATUS

Filed March 8, 1937

FIG-1-

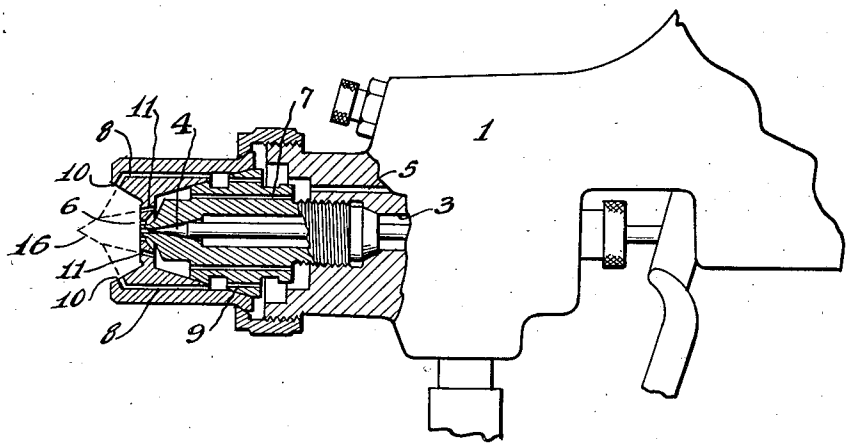


FIG-2-

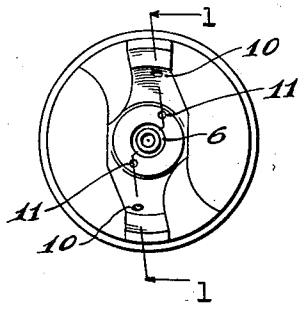
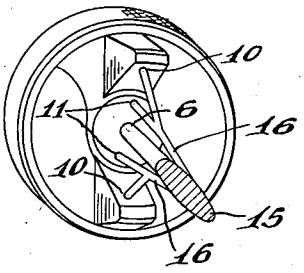


FIG-3-



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SPRAYING APPARATUS

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3 Claims. (Cl. 299—140.1)

This invention relates to liquid spraying equipment, and is more particularly directed to a cap for use with a spray gun which will form the spray stream into a transversely broadened and flattened mass of finely divided particles.

The conventional manner of forming a spray stream usually consists in striking the stream on each side with one or more pairs of oppositely disposed jets of air to atomize and distribute the stream particles into a symmetrical attenuated body. This conventional method is satisfactory where a continuous dense coating is desired, but does not spread the stream sufficiently for certain purposes where a less dense coating is used. In the conventional method, the jets oppose each other and, to a certain extent, each counteracts the effect of the other in forming the stream.

The principal object of the present invention is the provision of one or more forming-jets acting on each side of a stream of coating liquid issuing from a spray gun in such a manner that the jet or jets at one side do not directly oppose the jet or jets on the other side, but strike the stream tangentially so as to distribute the particles of liquid over a wide area in a highly efficient manner.

Other objects and advantages of the invention will become apparent as the description proceeds, reference being had to the accompanying drawing, in which—

Figure 1 is a fragmentary side elevation of a spray gun equipped with a cap embodying the invention, with the cap in partial section on the line 1—1 in Fig. 2; Fig. 2 is a front end view of said cap, and Fig. 3 is a perspective view of the cap with a diagrammatic sectional representation of the emitting spray stream and the forming jets acting thereon.

Referring to the drawing, the gun body is generally designated 1 and includes a central material passage 3 adapted to be closed by a trigger controlled needle valve 4 in the usual manner. The main air supply passage is designated 5 and supplies air to a central annular air orifice 6 in the cap through metering air passages 7, and to the air passages 8 of the cap horns through metering passages 9, as well understood in the art. In the present illustration, the annular air orifice 6 surrounds the material outlet of the gun and serves to atomize and form a discharging spray stream into circular cross-section.

Each horn of the cap is provided with a supplemental air discharge orifice 10 leading from the horn passage 8 and disposed to direct its air jet on an outward incline toward the adjacent side of the stream issuing from the orifice 6. These supplemental orifices are in a substantially diametrical line with the orifice 6. Provided in the face of the cap adjacent to each side of the main orifice 6, and between it and the respective supplemental orifice 10, is a supplemental air discharge orifice 11, in the present instance in communication at its inner end with the passage which supplies air to the orifice 6. The supplemental orifices 11 direct their jets outwardly at a slight incline toward the adjacent side of the main stream 15, and before striking such stream impinge against the jets discharging from the respective supplemental orifices 10, so as to cause the two jets from the adjacent supplemental orifices 10 and 11 to combine to form a flattened air jet 16 which impinges against the adjacent side of the stream 15 and cooperates with the opposing combined jet 16 to effect a transverse broadening of the stream.

The supplemental orifices 11, 11, are slightly offset in opposite directions from a diametrical line intersecting the discharge ends of the orifices 6 and 10, as best shown in Fig. 2, so that the axes of discharge of the supplemental orifices of each pair are disposed in crossing relation, with one positioned for the major portion of its jet to impinge against the other jet at one side of its axis to effect a broadening of the merged jet 16 in a plane lengthwise of the material stream 15 and abnormal to a plane common to the respective pair of supplemental orifices. This causes the major portion of each merged air jet 16 to impinge against the material stream forwardly of its orifice and at a side of its axis opposed to the side of impingement of the other jet 16 against the stream, thus causing a broadening and shaping of the material stream into a predetermined cross-sectional pattern, as illustrated in Fig. 3.

The resulting spray stream formation is diagrammatically represented in cross-section in Fig. 3 and is elongated on a diagonal plane across the face of the cap, or in a plane which intersects at an oblique angle the diametrical line of the orifices 6 and 11. It will be seen that the air jets do not oppose each other, but are free to carry the stream of coating liquid past the center of the cap and thus give a very wide distribution to the spray particles. It has been found that a spray width of approximately thirty inches at a distance of twelve inches from the nozzle is obtainable with this distribution of the forming air, and that the spray stream is regular in its conformation and the distribution of the spray

particles even throughout the width of the spray.

The cross-sectional pattern of the material stream may be changed to suit the work to be performed by a change in the relationship of the direction of discharge of the air jet orifices 10 and 11 with relation to each other, and/or with relation to the axis of discharge of the main stream. In the present instance, the orifices 10 and 11 of each set are disposed in different radii of the main stream axis of discharge with one radii in close relation to the other so there is a sharp angle therebetween, and the axes of these jet orifices are disposed to cross each other in a manner so that the major portion of the air of one jet strikes the other jet at one side of its axis so as to transversely broaden the merged air stream in a plane which is lengthwise of the material stream and abnormal to the planes of both radii. Such disposition and manner of merging the air jets also causes the major portion of the merged jets to impinge the material stream at one side of its axis so that the opposing material air streams cooperate to broaden the material stream in a plane lengthwise of the material stream and abnormal to both said radii, or to a plane lengthwise of the material stream which would substantially extend through both air discharge orifices.

It is apparent from the foregoing that the spraying apparatus embodying the invention includes means having a main orifice for discharging a stream of air supported surface coating material and also includes means having a pair of supplemental orifices 10 and 11 at each side of said main orifice, with each of said pairs acting to discharge air jets into merging relation to each other to form the air stream 16 and to direct such merged air stream into merging impingement with the respective sides of the material stream. In such arrangement, the orifice 11 of each pair is between the main orifice, and the outer orifice 10 of the pair, and the axes of discharge of the supplemental orifices of each pair are disposed in crossing relation, with one positioned for the major portion of its jet to impinge against the other jet at one side of its axis to effect a broadening of the merged air jet stream 16 to a plane lengthwise to the material stream and abnormal to a plane common to the supplemental orifices. Thus, it will be seen that the major portion of each merged air stream 16 impinges the material stream 15 forwardly of its orifice and at a side of its longitudinal axis opposed to the side of impingement against the stream of the merged air stream 16 at the other side of the main stream to cause broadening and shaping of the material stream into a predetermined cross-sectional pattern.

While the invention has been described in connection with jets having a particular relationship and disposition, it should be expressly understood that this relationship may be varied and the disposition changed without departing from the invention as defined in the appended claims.

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

1. A spraying apparatus of the class described including means to discharge an air supported stream of coating material and means to discharge a plurality of air jets to change the cross-sectional contour of the stream to a broadened form of substantially predetermined pattern, said last means including, on each of two opposite sides of the stream, means to forwardly discharge two air jets with one jet between the stream and other jet, the two jets being directed to converge and merge to form a single broadened jet directed towards said stream, the axes of discharge of the two jets being disposed out of direct intersecting relation to cause the plane of broadening of the merged jets to be abnormal to a plane lengthwise of the stream and common to both said axes and to cause the major portion of the merged jets to impinge the stream at one side of its axis of discharge and in opposition to the merged jets at the other side of the stream to effect a transverse broadening of the stream in a plane abnormal to a plane substantially common to the axes of discharge of the merging jets and lengthwise of the material stream.

2. A spraying apparatus of the class described including means having a main orifice for discharging a stream of air supported surface coating material and also including means having a pair of supplemental orifices at each side of said main orifice, each of said pairs acting to discharge air jets into merging relation to each other and to direct the merged air stream into merging impingement with the material stream, one orifice of each pair being between said main orifice and the other orifice of the pair, the axes of discharge of said supplemental orifices being disposed in crossing relation with one disposed for the major portion of its jet to impinge the other jet at one side of its axis to effect a broadening of the air stream of the merged jets in a plane lengthwise to the material stream and abnormal to a plane common to such supplemental orifices so that the major portion of the merged air stream impinges the material stream forwardly of its orifice and at a side of its axis opposed to the side of impingement of the stream by the merged jets discharging from the other pair of supplemental orifices to cause broadening and shaping of the material stream into a predetermined cross-sectional pattern.

3. A spraying apparatus of the class described including means having a main orifice for forwardly discharging a stream of air supported surface coating material and also including means having a pair of orifices at each side of said main orifice for forwardly discharging air jets into merging relation to each other and to direct the merged air stream into shape changing impingement with the material stream, the orifices of each pair being differently spaced from the main orifice and disposed in different radii of the main orifice axis with their axes of discharge in crossing relation and with the axis of the outermost orifice, at least, directed toward the material stream at one side of its axis and at the side of the axis of the companion jet orifice most remote from the material stream axis to cause the air jets to merge in a stream which is broadened in a plane lengthwise of the material stream and abnormal to both said radii and to cause the major portion of the merged air stream to impinge the material stream at one side of its axis to cooperate with the merged air stream at the opposite side of the material stream to impart a predetermined cross-sectional shape to the latter.

ROBERT W. TRACY.