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R. W. TRACY

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SPRAY HEAD

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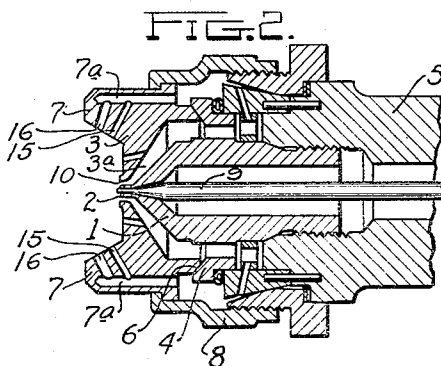
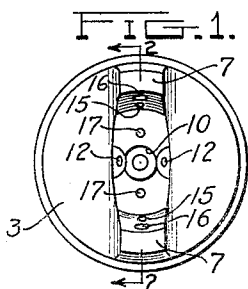


FIG. 3.

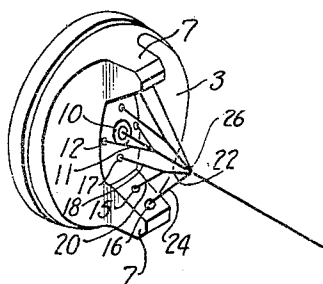


FIG. 4.

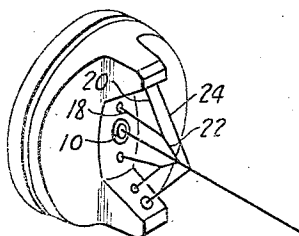


FIG. 5.

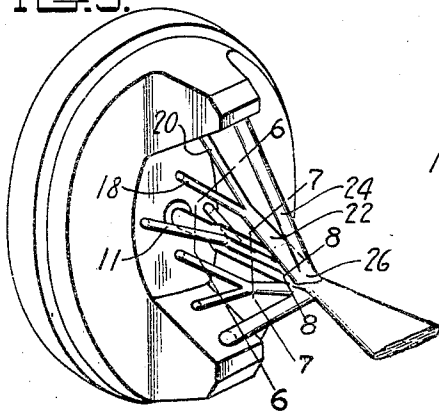


FIG. 6.

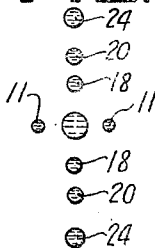


FIG. 7.

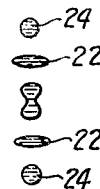


FIG. 8.



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2,070,696

SPRAY HEAD

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5 Claims. (Cl. 299—140.1)

This invention relates to spray coating equipment and is more particularly directed to the spray head portion of such apparatus.

It is recognized by those working in the art as desirable to shape the discharge from a spray gun to a configuration such that the cross-section of the spray, or the pattern applied to a surface, is elliptical with the major axis of the ellipse many times as long as the minor axis. The pattern must be well defined and free from over-spray caused by particles blown from the spray stream by the air jets which are used to form the stream to the desired shape. At the same time, the liquid particles making up the stream must be so finely divided that no spattering occurs when they strike the surface being coated. Further, the spray must be evenly discharged so that no portion of the pattern is so thin as to leave streaks of thinly coated surface, nor so heavy as to cause a rippled appearance of the finish. It is, therefore, imperative that the stream be a properly shaped, substantially homogeneous mass of finely divided particles.

To accomplish the desired dispersion and shaping of the spray stream, it has been proposed to atomize the particles with one or more pairs of atomizing jets piercing the stream at a high angle to break up the heavy central particles and to subsequently form the stream by flattening jets acting on the atomized stream. It has been found that flattening jets having sufficient force to collect and envelope the outer particles dispersed by the atomizing jets split the stream to such an extent as to cause a starved or sparsely distributed condition of the center of the resulting pattern. If the force is reduced to eliminate the piercing action of the jets, the spreading is insufficient and an oval pattern having a heavy center results.

It is the primary object of the present invention to provide streams of air uniting to form jets acting on the main fluid discharge from a spray gun with sufficient force to disperse and break up the heavy central particles of such discharge and at the same time to progressively flatten the discharge to produce the desired elliptical spray pattern.

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 front view of one form of spray head embodying the invention; Fig. 2 is a section on line 2—2 of Fig. 1; Fig. 3 is a diagrammatic representation of the fluid streams issuing from the cap; Fig. 4 is a similar representation in a

modified form of cap; Fig. 5 is an enlarged diagrammatic view of the cap showing the streams issuing therefrom; Fig. 6 is a diagrammatic cross-sectional view of the streams on line 6—6 of Fig. 5; Fig. 7 is a similar representation of the streams on the lines 7—7 of Fig. 5; and Fig. 8 is a cross-sectional representation of the streams on line 8—8 of Fig. 5.

Referring to the drawing and particularly to Figs. 1, 2 and 3, the invention is shown as applied to a spray head comprising an inner fluid nozzle 1 formed with a tip 2 through which the coating material is emitted, and an outer nozzle 3 which controls the air discharge. The rear end portion of the nozzle 1 is enlarged as shown at 4 and is connected in any suitable manner with the body of the spray gun 5. The enlarged portion 4 of the nozzle 1 is formed with a suitable seat 6 against which the air nozzle 3 may be held by a union nut 8 or other suitable means.

The fluid tip 2 is provided with a central orifice through which the emission of the spray material is controlled by a needle 9. The air nozzle 3 is in the form of a cap enclosing an air space 3^a surrounding the outer end portion of the inner nozzle 1 and has a central orifice 10 through which the air is discharged in enveloping relation to the material stream, as well understood in the art. The nozzle 3 is also provided with a pair of diametrically opposed forwardly projecting air horns 7 30 having the customary longitudinally disposed interior air supply passages 7^a. The chamber 3^a and passages 7^a are in communication with a source of air pressure supply.

The spray stream issues from the cap in a 35 circular form, and in the form of the invention shown in Figs. 1, 2 and 3, is first acted upon by atomizing jets 11 issuing from orifices 12 in the face of the cap. For convenience, reference numerals are applied only on one side of the cap, and it will be appreciated that the orifices and streams are duplicated on each side of the center. The atomizing jets 11 converge towards the stream at a high angle and, being relatively close thereto, pierce substantially to the center of the stream at diametrically opposite points and break up the heavy particles of material. Such action is well known in the art. The stream thus acted on has a cross-section analogous to an hour glass and consists essentially of two contiguous streams 45 of partially atomized particles.

The present invention is particularly directed to the means to complete the atomization and shape the spray stream to its final form. The air horns 7 are each provided with two spaced 55

air orifices 15 and 16 each communicating with the respective interior air passage 7^a. The orifices 15 and 16 are in a common plane diametrical to the axis of the spray stream. The purpose of this arrangement will presently become apparent.

In the face of the cap and in the same plane as the outer orifices 15 and 16 are inner air orifices 17, disposed one on each side of the center in equidistantly spaced relation thereto and between the air horns and the liquid discharge orifice. As diagrammatically shown in Figs. 3 and 5, air streams 18 issuing from the orifices 17 in the cap are directed toward the spray streams at corresponding angles, but before striking it are flattened by air streams 20 issuing from the orifices 15 in the air horns. These two bodies of air unite to form a single stream 22 which is elliptical in cross-section, as shown in Fig. 7, the major axis of the elliptical stream section being in a plane which is at right angles to the diametrical plane of the horn orifices 15 and 16. Just before the streams 22 impinge the spray stream, each is supplemented by a third air stream 24 issuing from the adjacent horn orifice 16. The resulting jet 26 which acts upon the spray stream in direct opposition to its companion jet 26, is somewhat triangular in cross-section as diametrically shown in Fig. 8. It will be seen that the jet 26 is composed of the broad elliptical stream 22 on which is superposed the round stream 24, the latter being added at the forward edge of the elliptical stream. Thus the spray stream is impinged first by the broad base of the jets 26 and immediately thereafter by a constantly narrowing air body as the apex of the triangular jet reaches the spray stream.

As above noted, the spray stream issues from the cap in a circular form which is changed by the air jets 11 to the hour glass form in which the stream really comprises two contiguous streams of partially atomized fluid droplets. By the progressive action of the flattening jets 26, these two adjacent parts of the main stream are brought together forcibly. The abrupt change of position of the particles in these two stream parts causes a smashing and tearing of any remaining liquid particles so as to complete the atomization of the stream.

The progressive flattening action obtained by the merging of the three air streams 18, 20 and 24 produces a more effectual and even spread than has heretofore been obtainable, since the flattening force is not suddenly applied to the stream with the attendant danger of splitting the stream to produce a thinly coated central area in the spray pattern.

In some instances it is desirable to separate partially the elliptical jets 22 from the round jets 24 so that the two jets impinge the stream in succession. This may readily be done by changing the angle of discharge of the several air streams as diagrammatically indicated in Fig. 4.

Obviously, various modifications and changes will suggest themselves to those skilled in the art, and it should be expressly understood that such changes may be made without departing from the invention as defined in the appended claims.

What I claim is:

1. The method of forming an air supported stream of coating material discharging from a spray head, which consists in striking the stream of material, on opposite sides, first with a broad enveloping jet of air and immediately after the initial striking of said first jet with a narrower air body acting only on the central part of the stream.

2. The method of mixing and finely breaking up the constituents of an air supported stream of coating material discharging from a spray head, which consists in first directing opposing air jets against the stream of material to divide it into two adjacent parts and then in striking the stream first with broad enveloping jets directed against opposite sides of the two parts of the stream and subsequently with narrower air bodies acting only on the central part of the stream previously formed by said broad jets.

3. The method of mixing and finely breaking up the constituents of an air supported stream of coating material discharging from a spray head, which consists in forming and discharging opposed air jets of substantially triangular form against opposite sides of the stream in the general direction of discharge of the stream with a side of the triangle crosswise of the stream and facing its source, whereby the jets have opposed progressive impingement on the stream in diminishing volume outwardly from its source.

4. The method of mixing and finely breaking up the constituents of an air supported stream of coating material discharging from a spray head, which consists in first directing opposing air jets against the stream to divide it into two adjacent parts and then in discharging opposing air jets of substantially triangular form in cross-section against opposite sides of the two parts of the stream in a plane substantially normal to the plane of the first air jets and in the general direction of discharge of the stream with a side of the triangle crosswise of the stream and facing its source, whereby the jets have opposed, progressive, impingement on the stream in diminishing volume outwardly from its source and effecting a re-combination of the two parts of the stream.

5. In a spray head of the class described, the combination with means for discharging an air supported stream of coating material, of means for discharging air jets in predetermined relation to such stream, and including a set of orifices at each of opposite sides of said stream disposed in a plane diametrical to the stream axis, at least two of the orifices of each set being relatively inclined to each other and the outer one at least being relatively inclined to the material stream so that their jets merge and continue toward and against the material stream at an incline thereto and in opposition to the merged jets of the corresponding opposite set, and another orifice of each of said sets for directing a jet of air against the material stream at a point on its axis slightly beyond the point at which the merged jet of the same set initially strikes the material stream.

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