June 2, 1936. R. W. TRACY 2,042,746

SPRAY HEAD

Filed Jan. 18, 1934

Fig. 1

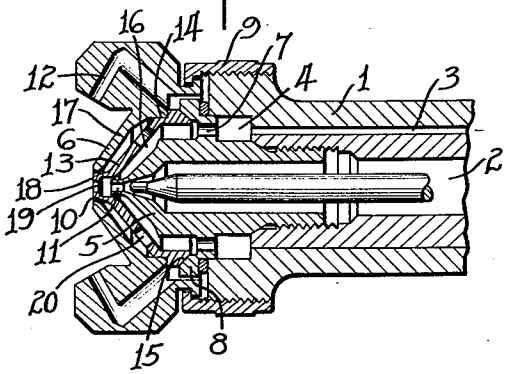


Fig. 2

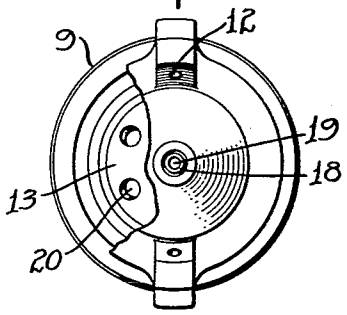


Fig. 3

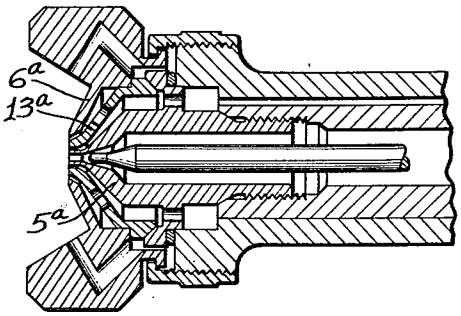


Fig. 4

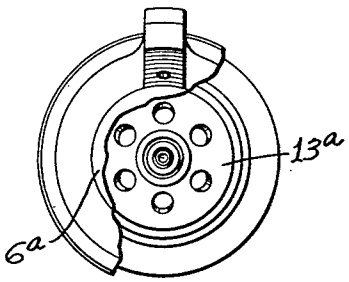


Fig. 5

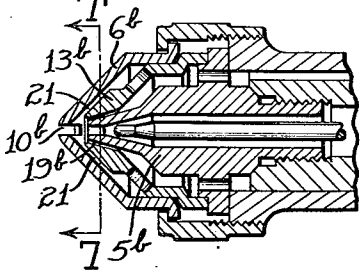


Fig. 6

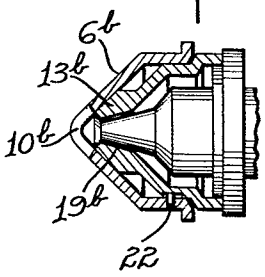
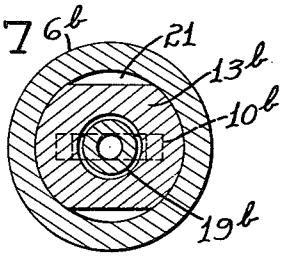


Fig. 7



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UNITED STATES PATENT OFFICE

2,042,746

SPRAY HEAD

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Application January 18, 1934, Serial No. 707,082

2 Claims. (Cl. 299—140.1)

This invention relates to spray-heads particularly for use on guns adapted for spraying surface coating materials in finely atomized fan shape form.

An object of the invention is the provision of certain improvements in spray-heads of this character, whereby a more efficient atomizing and application of the sprayed material to the work is possible than with the spraying heads now used.

A further object of the invention is the provision, intermediate the customary inner and outer material and air discharge nozzles of said spray-heads, of means for dividing the space between said nozzles into a plurality of passages or compartments for discharging atomizing air in efficient commingling relation to the discharging material.

A further more specific object of the invention is the provision, within the air nozzle and without the usual inner material discharge nozzle, of a supplemental nozzle member which cooperates with said nozzles to form a plurality of discharge passages for the atomizing air to facilitate breaking up of the discharged material and its application to the receiving surface, and which is also preferably easily removable from the spray-head for cleaning.

The invention is fully described in the following specification, and while in its broader aspect it is capable of embodiment in numerous forms three embodiments only of the invention are illustrated in the accompanying drawing, in which—

Figure 1 is a central longitudinal sectional view of a spray-head of the internal mix type equipped with my invention; Fig. 2 is a front view thereof with a portion broken away; Fig. 3 is a view similar to Fig. 1 of a spray-head of the external mix type equipped with the invention; Fig. 4 is a front elevation thereof with a part broken away; Fig. 5 is a view similar to Fig. 1 of a spray-head of the internal mix slotted discharge orifice type equipped with the invention, the section being taken crosswise of the discharge slot; Fig. 6 is a fragmentary section similar to Fig. 5 with the section taken lengthwise of the discharge slot, and Fig. 7 is an enlarged cross section on the line 7—7 in Fig. 5.

Referring to the drawing, and particularly to Figs. 1 and 2, 1 designates the body portion of a spray-gun to which the spray-head is attached and which is provided with the customary passages 2 and 3 for supplying material and air under pressure, respectively, to the spray-head, as well understood in the art. The air passage 3 customarily communicates with an annular air chamber 4.

The spray-head, in the present embodiment of the invention, comprises an inner material discharge nozzle 5, which projects from and is threaded in or otherwise secured at its rear end in the forward end portion of the material passage 2 and the outer air discharge nozzle 6, which is disposed without the nozzle 5 in spaced concentric relation to its outer end portion, as is customary with spray-heads of this type. The annular air chamber 4 surrounds the body portion of the nozzle 5 and has communication through one or more passages 7 with the air space between the nozzles. In the present instance, the passages 7 are through an annular radial flange 8 on the body portion of the inner nozzle 5, which flange serves to form the front wall of the chamber 4 and has a gasket seat against the forward end of the body 1. The outer nozzle 6 is held to the body 1 and in predetermined relation to the inner nozzle by a union nut 9.

The air-nozzle 6 has a discharge orifice 10, concentric to the discharge orifice 11 of the inner nozzle, and positioned a distance in advance of the inner nozzle to permit mixing of the atomizing air with the material discharging from the inner nozzle before the material passes without the air nozzle. A spray-head with this relative arrangement of nozzles is commonly referred to as the "internal mix" type. The nozzle 6 may also be provided with supplemental air discharge passages 12 at diametrically opposite sides of the central orifice 10 with their inner ends in communication with the air passage 3, and their outer ends disposed to direct opposed streams of air in converging relation against opposite sides of the material being discharged in spray-form from the nozzle, thus converting the stream into fan-form, as well understood in the art.

In equipping the spray-head thus described with my invention, the air discharge orifice 10 is made slightly larger than in the ordinary spray-head, and the width of the space between the two nozzles 5 and 6 may also be increased if found desirable. Into this space is disposed a cup member 13 having a cylindrical portion at its rear end for fitting into a complemental cylindrical portion 14 of the nozzle 6 and having the end of its cylindrical portion adapted to shoulder, in the present instance, in opposed relation against an inner end portion of the nozzle 6 and a conical surface 15 on the forward side of

the flange 8. A tightening of the nut 9 causes the cup 13 to be drawn into close seating relation to the flange 8. The cup 13, in advance of its cylindrical portion, is of substantially conical-form and projects down through the space between the inner and outer nozzles 5 and 6 in a manner to divide such space into two annular concentric air passages or compartments 16 and 17. The cup 13 terminates at its forward end in a restricted discharge nipple 18, which forms a central discharge orifice 19, which is in advance of and slightly larger than the material discharge orifice 11 in the nozzle 5 and in axial alignment therewith. The nipple 18 projects into the air discharge orifice 10 of the nozzle 6 in concentric spaced relation thereto to provide an annular air discharge orifice therebetween, and terminates substantially flush with the outer end of the nozzle 6. The annular orifice, which may be noted as 10, communicates with the passage 17 at the outer side of the cup 13, while the discharge orifice 19 communicates with the air passage 16 at the inner side of the cup. The interior of the nipple 18 is enlarged between the discharge orifice 19 and the discharge end of the nozzle 5 to provide a mixing chamber therebetween, so that the air and material will be commingled within the spray-head and before discharging from the orifice 19, as well understood in the art. Communication is provided between the chambers 16 and 17 through one or more perforations 20 in the cup 13.

It is apparent in the use of a spray-head equipped with my invention, that the air within the spray-head is divided into inner and outer streams, the inner one entering the nipple portion of the cup 13 where it communicates with the material discharging from the nozzle 5 and effects a discharge thereof in spray-form from the orifice 19 in the same manner as the customary internal-mix spray head. The outer stream has an annular discharge from the spray-head through the orifice 10 and around the nipple 18 in enveloping and converging relation to the spray stream emitting therefrom, so that it commingles with such stream slightly in advance of its discharge from the spray-head. The supplying of supplemental air to the spray stream in this manner produces a more finely atomized and efficient spray.

It is apparent that while the nozzle 6 is the customary outer nozzle of a spray-head, the orifice 10 thereof must be slightly enlarged from its ordinary form to adapt it to be used in connection with the supplemental cup feature. It is also apparent that the inner nozzle 5 and cup 13 cooperate to form a customary spray-head of the internal-mix type, and that the outer nozzle 6 cooperates with the cup 13 to form a supplemental air discharge in enveloping and commingling relation to the spray stream at substantially its point of discharge from the spray-head. This form of the invention combines the features of both an internal-mix type and an external-mix type of atomizer.

In Fig. 3, the arrangement and form of the parts is substantially the same as in Fig. 1, except that it is of the external-mix type, which necessitates the discharge end of the material of the inner or material nozzle, which is marked 5^a, being projected through the orifice of the cup member marked 13^a and terminating substantially flush with the discharge end of said member. In this form, the outer nozzle is marked 6^a.

In Fig. 5, the invention is modified to adapt it for use with a spray-head having a slot-form of discharge orifice for the outer nozzle. In this form, 5^b designates the inner or material discharge nozzle, 6^b the outer air nozzle, and 13^b the interposed cup member. The discharge orifice 10^b of the outer nozzle is in the form of a slot and the discharge end of the inner nozzle 5^b terminates short of the slot, or, in the present instance, within the inner wall of the outer nozzle 6^b, but in axial register with the slot. This permits the atomizing air to mix with the material stream before the latter is discharged from the slot.

The cup member 13^b in Fig. 5 is similar to that of the previous forms, except that its forward end cooperates with the wall of the nozzle 6^b to provide two diametrically opposed air discharge orifices 21, one being at each side of the slot, or in a plane which is normal to the discharge axis of the spray-head and is at right angles to the lengthwise plane of the slot. The discharge ends of the inner nozzle 5^b and cup 13^b cooperate to form an annular air discharge passage 19^b of conical form, with its small end forward, so that air is discharged against the material stream as it is emitted from the inner nozzle in entirely enveloping relation thereto, and before emerging from the slot 10^b. The supplemental air passages 21 discharge the air in converging relation against the mixture thus formed before such mixture is discharged from the slot 10^b, thus tending to flatten the mixture stream in the plane of the slot. The passages 21 are formed, in the present instance, by providing the cup member 13^b with a conical enlargement at its forward end which fits into the forward end portion of the cavity of the outer nozzle 6^b immediately at the rear of the slot 10^b, and has the sides thereof, which are disposed at opposite sides of the slot at right angles thereto, chamfered, as best shown in Fig. 7, to provide the passages 21. A pin and slot connection 22 between the nozzle 6^b and cup member 13^b facilitates assembly of the parts in proper relation.

It is apparent that with any of the forms of the invention illustrated, supplemental air is supplied to the mixed air and material stream to more effectually atomize the material and to facilitate the spraying action, the supplemental air streams in the form shown in Figs. 1 and 3 commingling with the main stream without the spray-head in completely enveloping relation to the stream, while in the form shown in Fig. 5, the supplemental air is divided into two streams which commingle with the main stream within the outer air nozzle and before the discharge of the stream therefrom.

It is further apparent that in the use of the spray-heads shown in Figs. 1 and 3, the material stream is first enveloped by an annular air stream, which combines therewith; that this combined stream is then enveloped by a second annular air stream, and that the combined material and multiple air stream thus formed is then acted on by the opposed supplemental air streams issuing from the jets 12 and flattened thereby into fan-form. It is found, in practice, that a fan shape spray formed in this manner has advantages over spray streams formed by the commingling of a single annular air stream with the material stream and the subsequent flattening of such stream by the opposed air jets.

I wish it understood that my invention is not

limited to any specific form or arrangement of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

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

1. In a spray head, an inner material discharge nozzle having a surrounding flange rearwardly of its discharge end forming a conical seat, an intermediate nozzle surrounding the discharge end of the inner nozzle and seating at its rear end against said seat, an outer air discharge nozzle enveloping the intermediate nozzle and mounted thereon, and means acting on the outer nozzle to retain it on the intermediate nozzle and to hold the intermediate nozzle to its seat, the discharge orifices of said nozzles being concentric and spaced from each other to provide annular discharge orifices between the inner and intermediate nozzle and the intermediate and outer nozzles.

2. In a spray head of the class described, a body member having material and air supply passages, a material discharge nozzle mounted in and projecting from the outer end of the material passage and having a restricted discharge tip and an annular flange rearwardly of its tip forming a discharge nozzle centering seat, an intermediate air nozzle surrounding the discharge end of the inner nozzle in spaced relation thereto and seating against said flange and forming a discharge orifice at its forward end, an outer air nozzle centered by and seating against a portion of said intermediate nozzle in opposition to the latter's seat against said flange, said outer nozzle forming an air space between it and the intermediate nozzle and having a discharge orifice in register with the discharge orifices of the inner and intermediate nozzles, the spaces between said nozzles being in communication with said air supply passage, and means connecting said body member and outer nozzle and serving to hold said outer and intermediate nozzles to their respective seats.

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