

June 21, 1927.

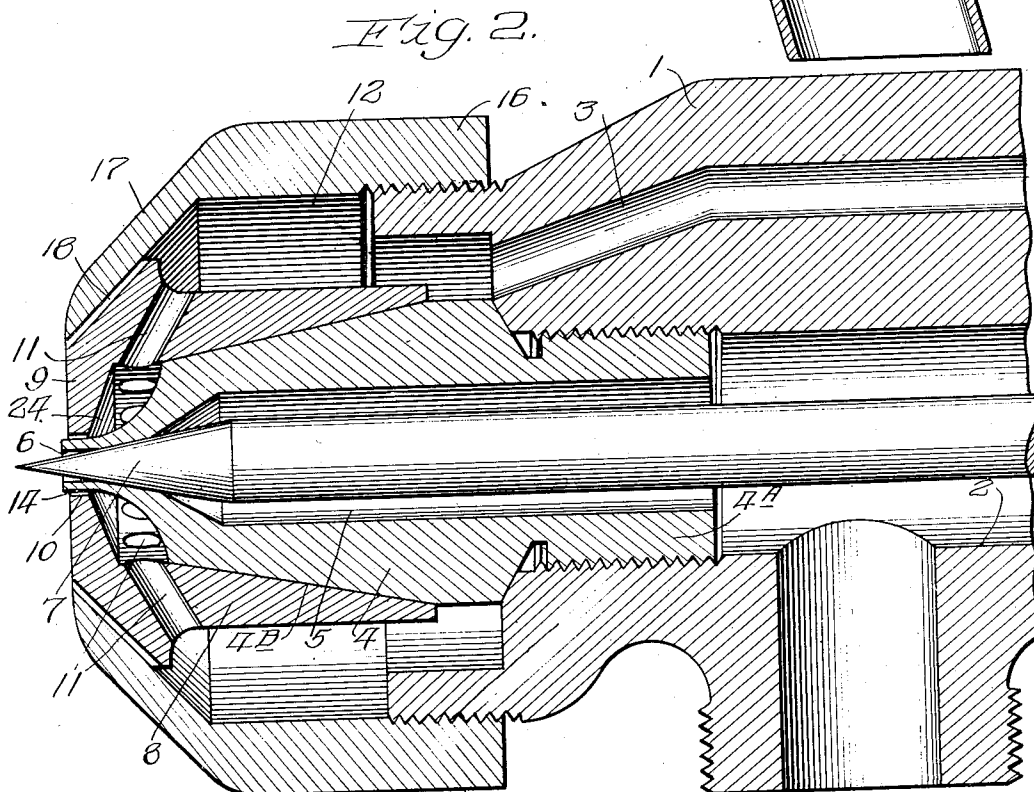
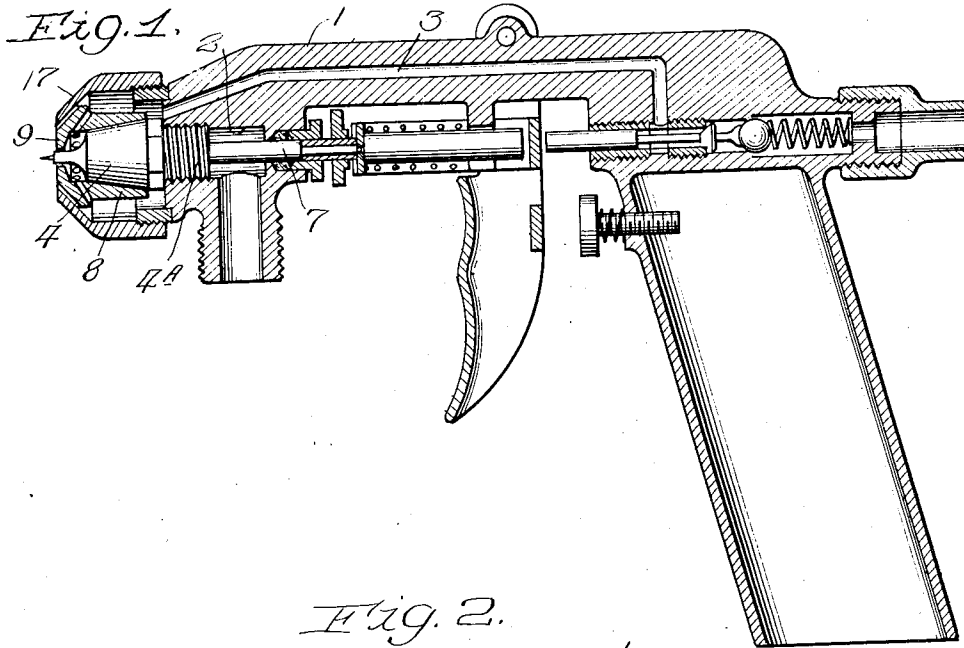
B. R. SAUSEN ET AL

1,633,291

SPRAY GUN

Filed Sept. 7, 1926

2 Sheets-Sheet 1



Inventors:
Bert R. Sausen and Einar E. Olsen
by Albert Scheibel Attorney

June 21, 1927.

B. R. SAUSEN ET AL

1,633,291

SPRAY GUN

Filed Sept. 7, 1926

2 Sheets-Sheet 2

Fig. 3.

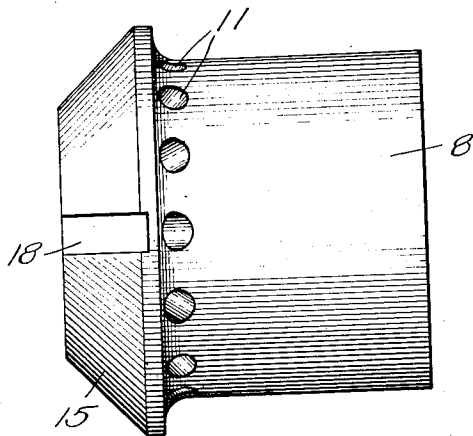


Fig. 4.

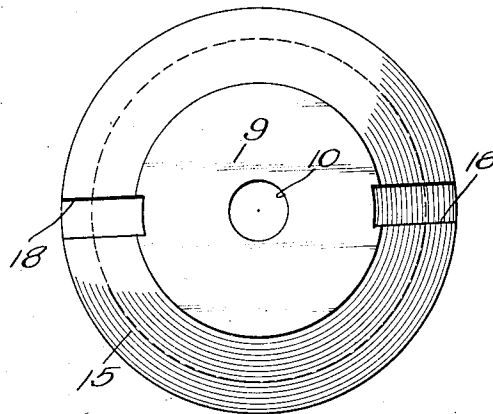


Fig. 5.

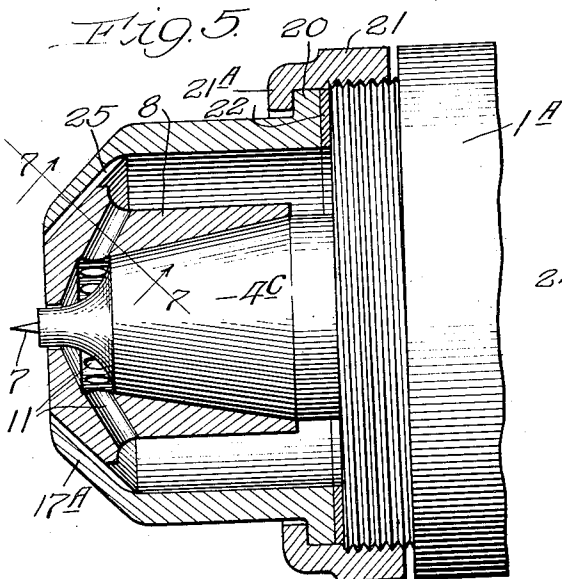


Fig. 6.

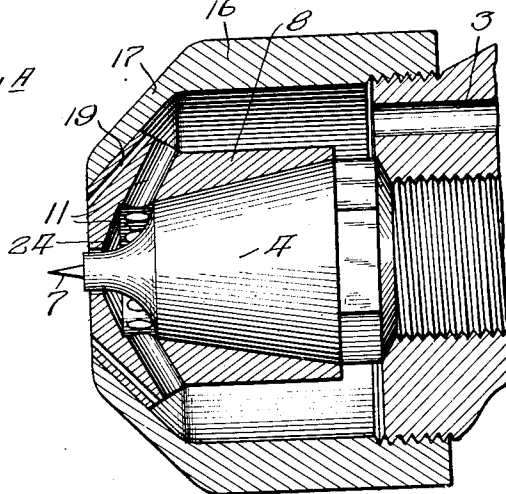
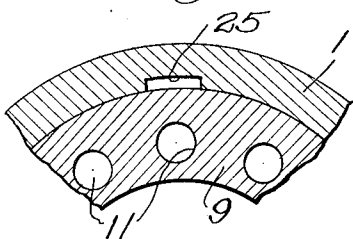


Fig. 7.



Inventors:
Bert R. Sausen
and Einar E. Olsen
by Albert Scheidt
Attorney

UNITED STATES PATENT OFFICE.

BERT R. SAUSEN AND EINAR E. OLSEN, OF CHICAGO, ILLINOIS, ASSIGNORS TO PEERLESS PNEUMATIC SYSTEMS INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SPRAY GUN.

Application filed September 7, 1926. Serial No. 134,114.

Our invention relates to the class of spraying appliances designed for projecting liquids in the form of a finely divided spray of predetermined form and density, such as the so-called "spray guns" employed for spraying paints, varnishes and the like.

Where such a coating material is to be applied in a uniformly dense distribution to surfaces of large area, it is customary to employ a spray gun in which the paint or other liquid is first projected in a cylindrical stream and is then flattened by jets of air directed against opposite sides of the projected stream. To keep the projected stream from enlarging in diameter before it is reached by the flattening jets of air, this stream is commonly housed by a tubular sheath of air which is projected through an annular space between the paint nozzle and the bore of an air nozzle. In practice, the paint nozzle and the air nozzle are usually supported independent of one another, and unless great accuracy is employed in the construction of the appliance, these two nozzles are not coaxial. That is to say, the two nozzles may have their axes parallel but relatively shifted, or these axes may be at an angle to each other. In every such instance the tubular air sheath is not uniform in thickness and hence will permit the stream of liquid within it to spread out of a true cylindrical section, so that the flattening air jets will not produce the desired uniformity in the resulting sheet or fan of spray.

Moreover, the air ports for the flattening air jets are usually formed in the same air nozzle which has its bore defining the initial contour of the tubular sheath of air, so that any relative shifting or tilting of the axis of the air nozzle with respect to the axis of the paint nozzle spoils the symmetry of the flattening air jets with respect to the stream of paint projected through the axial bore of the paint nozzle. This also alters the distribution of the spray in the resulting sheet or fan of spray.

Our present invention aims to overcome both of these difficulties by providing a spray-appliance head construction in which the air nozzle is accurately aligned and centered by the liquid nozzle, and aims to accomplish this in a construction which will

not require an unusual degree of accuracy in the manufacture or assembling of the constituent parts.

Furthermore, our invention aims to provide a spraying appliance of this class in which the air nozzle is clamped upon the liquid nozzle by an attaching collar and in which the ports for the flattening jets of air are formed by grooves cut either in the exterior of the liquid nozzle or in the bore of the attaching collar. In the constructions of that type, it is important that the joint between the attaching collar and the paint nozzle be tightly sealed except for the said grooves, and particularly adjacent to these grooves, as any air issuing forwardly at other points of the junctures between these two nozzles will project spray in undesired directions so as to produce "off spray" spottings which mar the uniformity of the resulting coating.

Illustrative of our invention, Fig. 1 is a central, vertical and longitudinal section through the forward portion of a spray gun designed for producing a flat spray and embodying our invention.

Fig. 2 is an enlargement of the forward portion of Fig. 1, with the liquid nozzle shown in section.

Fig. 3 is a side elevation of the air nozzle of this spray gun.

Fig. 4 is front elevation of this air nozzle member.

Fig. 5 is a section similar to the forward portion of Fig. 1, showing another embodiment of my invention, namely one in which an auxiliary sleeve secures the attaching collar to the body of the spray gun, and in which the grooves for the flattening air jets are cut in the bore of the attaching collar.

Fig. 6 is a similar section, showing an embodiment in which the ports for the flattening air jets are formed by bores extending through parts of the air nozzle.

Fig. 7 is a fragmentary section along the line of 5-5 of Fig. 5.

In the embodiment of Figs. 1 to 3 inclusive, the forward or head end of the spray gun body 1 has a longitudinal bore 2 through which the paint is supplied and a separate passage 3 for the compressed air. The forward end of the bore 2 is threaded to match

the male thread on the rear portion 4^A of a liquid nozzle 4 which has an axial bore 5, and the forward end of this paint nozzle is contracted in diameter to form a tubular liquid outlet 6. The forward portion of the bore 5 is correspondingly contracted and has a forwardly tapering bore portion affording a tight seat for the tapering forward end of the usual needle valve stem 7 which controls the discharge of the paint or other liquid.

The exterior of the liquid nozzle 4 has a forwardly tapering frustro-conical portion 4^B disposed between the threaded rear portion 4^A and the paint outlet 6. Sleeved upon this tapering portion 4^B is an air nozzle which is here shown in the form of a perforate cap comprising a tubular rear portion 8 bored to fit the taper of the said exterior nozzle surface 4^B, and a head 9 having a bore 10 somewhat larger in diameter than the exterior of the tubular liquid outlet 6. This liquid outlet extends into, and desirably entirely through the said bore 10 so as to leave an interposed annular port 14 through which the tubular air sheath is projected. To supply air for this sheath, we provide the tubular portion 8 of the nozzle member with perforations 11 leading to a space 12 back of radially outer part of the head 9 and in front of a portion of the air nozzle. These perforations 11 preferably have their axes in planes radial of the nozzle member and we desirably provide a large number of such perforations, all leading to an annular space 24 behind the head 9 and in front of a part of the air nozzle 4. By doing so, we can utilize this space 24 as an air supply chamber for projecting a tubular air sheath at high pressure through the annular air port 14, while making this port 14 so narrow (radially of the nozzle) as to require a comparatively small amount of air for the tubular air sheath projected through it.

To hold the air nozzle member socketed upon the tapering part of the liquid nozzle, we employ a retaining collar which snugly fits a part of the air nozzle so as to aline itself with the latter, and we secure this collar to the body member of the spray gun by attaching means which will permit the collar to adjust itself to this alining. With this in mind, Fig. 3 shows the air nozzle as having its forward peripheral surface portion 15 of a forwardly tapering frustro-conical shape, this surface being coaxial with the taper in the tubular part 8 and the bore 10. Fig. 1 also shows the attaching collar as comprising a tubular rear part 16 and a forwardly tapering contracted end 17 which is bored out to have its rear face match the taper of the portion 15 of the air nozzle member. The rear end of the main collar part 16 is threaded upon the forward end of the gun body 1, and this threaded

connection is sufficiently loose so that the collar can rock or shift slightly on the gun body.

In assembling the parts as thus described, the tapering fit of the air nozzle member on the liquid nozzle accurately alines these parts with each other, thereby disposing the bore 10 of the air nozzle member coaxial with the cylindrical exterior of the tubular liquid outlet 6. Hence the air forced through the annular port 14 issues in the form of an annular sheath of uniform thickness and accurately concentric with the liquid projected through the bore of the liquid outlet 6.

When the collar has its rear end screwed under the gun body, the tapering rear face of its contracted forward end 17 seats upon the tapering surface portion 16 of the air nozzle and automatically alines this collar with both the air nozzle and the liquid outlet, while also insuring a tight seal between the collar and the air nozzle. The tightness of this sealing also permits us to form the ports for the flattening air jets by grooves extending along the juncture of the interfitting tapered surfaces of the portions 15 and 17 in planes radial of the air nozzle member.

This we preferably accomplish by milling a pair of grooves 18 in the tapering portion 15 of the air nozzle, with the axes of the grooves in a common plane radial of this nozzle member and with the grooves diametrically opposite each other. By using a milling tool for cutting these grooves, we can readily secure groove edges free from burrs and running snugly up to the inner face of the collar, thereby avoiding the issuing of any stray air such as would produce an "off spray". So also, by merely providing a slight looseness of the threaded connection between the collar and the gun body, we readily permit the needed accurate alining of the heretofore described tapering portions without requiring the threading to be so loose as to permit air to issue at this connection, although any such leaking air would issue rearwardly and hence could not affect the spray.

By initially constructing the paint nozzle separate from the gun body, we facilitate the accurate machining of this part. However, we do not wish to be limited to this or other heretofore described details of construction and arrangement, since many changes might obviously be made without departing either from the spirit of our invention or from the appended claims.

For example, the liquid nozzle 4^C might be made integral with the gun body, as shown in Fig. 5, and the ports for the flattening air jets might be formed by grooves milled in the tapering rear face of the forward collar portion 17^A such as the grooves

25 of Fig. 5. Or, these ports might be drilled through the air nozzle, as shown by the bores 19 of Fig. 5.

Likewise, the slight relative adjusting movement which may be required between the collar and the gun body need not be provided by a loose threading. Instead, we may provide the collar at its rear end with an outwardly directed annular flange 20, as shown in Fig. 5, and may secure the collar to the gun body by an auxiliary collar 21 which is threaded at its rear end upon the gun body 1^A and which has a contracted forward end 21^A engaging the front of the flange 20, this flange having a bore larger than the adjacent main portion 16 of the collar. In this case, we can readily interpose a packing ring 22 between the rear end of the collar and the forward end of the gun body 1^A, as also shown in Fig. 5, so as to obtain a tight seal between these parts.

With each of the illustrated embodiments, the width of each port for the flattening air (namely, the width of each groove 18 or 18^A, or the diameter of the bores 19) is preferably a little narrower than the bore of the paint outlet. By using this proportion, we avoid disrupting the liquid stream unduly through a glancing action of the lateral edge portions of the flattening air jets, while also avoiding a splitting of the stream such as would occur if the flattening jets of air were considerably narrower than the diameter of this stream. However, both the dimensions of the grooves (or diameters of the ports if bored) and the radial width of the annular air port 10 may be varied according to the viscosity of the paint or other material which is to be sprayed. By using relatively long grooves with sides parallel to, but at opposite sides from, a plane radial of the projected stream of liquid, we can accurately predetermine the widths of the flattening jets of air, which we have not found feasible with bored air ports owing to the fact that even a minute enlargement of such a bore at its outlet has a material effect on the cross-section of the issuing jet of air.

Furthermore, by forming two grooves of uniform depth in the same tapering surface, we can easily produce air ports having their axes directed to exactly the same point on the axis of the air nozzle. This is not so feasible with drilled air ports, as each port has to be drilled separately and even a slight wearing of the jig for guiding the drill will permit variations which show a considerable effect on the uniformity of the spray. By combining this accurate dimensioning and directing of the flattening air jets with a uniform thickness of the tubular air sheath, we are able to secure the long desired uniformity of distribution of finely divided paint in a flat (or substantially flat) spray. Hence we eliminate the manual "touching up" of

surfaces upon which a coating has been sprayed and likewise avoid the spotty effects heretofore encountered on account of the so-called "off spray". Moreover, we accomplish these results by employing a spray gun head construction comprising quite few parts and having each of these parts so designed that any reasonably skilled machinist can readily manufacture them with a sufficient degree of accuracy.

However, we do not wish to be limited to the embodying of the various features of our invention in a hand appliance of the so-called spray gun type, nor to the use of our invention for spraying paints or varnishes.

We claim as our invention:

1. In a liquid spraying appliance, a body member having a forwardly tapering portion and a liquid passage extending through and coaxial with the said tapering portion, a cap-like air nozzle having a forwardly tapering bore extending into it from its rear end and tapered to fit the tapering portion of the body member, the air nozzle having an outlet bore coaxial with and leading forwardly from its tapering bore and freely housing the forward end of the tapering portion of the body member, the air nozzle having a forwardly tapering frustro-conical outer wall coaxial with its tapering bore and having passages leading to its bore from the peripheral portion of the air nozzle behind its said frustro-conical wall; and a retaining collar secured to the body member and having a part thereof spaced from the air nozzle to provide an air space therebetween, the body member having an air passage leading to the said space, the collar having a contracted front end tapered on its rear face to fit upon the frustro-conical wall of the air nozzle; the securing of the collar to the body member being such as to permit relative movement thereof to allow a firm seating of the interfitting tapering parts of the body member, the air nozzle and the collar.

2. A liquid spraying appliance as per claim 1, in which the air nozzle is provided on its frustro-conical wall with a pair of diametrically opposite longitudinal grooves.

3. A liquid spraying appliance as per claim 1, in which the air nozzle is provided on its frustro-conical wall with a pair of diametrically opposite longitudinal grooves extending for the entire length of the said wall, the lateral walls of each groove being both parallel to a plane diametric of the air nozzle and medial of the groove.

4. A liquid spraying appliance constructed as per claim 1 and having a pair of diametrically opposite air ports extending through the air nozzle from the said air space and directed toward a common point forwardly of the air nozzle and on the axis of the nozzle.

5. A liquid spraying appliance including

a liquid nozzle, an air nozzle fitted upon the liquid nozzle, the interfitted parts of the two nozzles comprising forwardly tapering frustro-conical seats coaxial with the nozzles; an air confining collar having a portion thereof fitted upon the air nozzle, the said collar portion and the part of the air nozzle fitted upon it comprising forwardly tapering frustro-conical seats coaxial with the air nozzle and collar; and securing means rigidly connecting the collar to the liquid nozzle, the said means being arranged to permit relative movement of the collar and liquid so as to permit an accurate aligning and tight seating of the said interfitted parts during the fastening of the securing means.

6. A spray gun comprising a body member, a liquid nozzle projecting forwardly from the body member and smaller in diameter than the adjacent part of the body member, the liquid nozzle having a forwardly tapering frustro-conical portion and a cylindrical outlet part extending forwardly from the said portion and having a bore coaxial with the said portion and part; an air nozzle having a forwardly tapering bore tapered to fit upon the frustro-conical portion of the liquid nozzle and having coaxial therewith an outlet bore larger in diameter

than the outlet part of the liquid nozzle and housing the said part, the air nozzle also having coaxial with its outlet bore a peripheral and forwardly tapering frustro-conical wall; a retaining collar having a contracted forward end tapered on its rear face to fit the said wall and having another portion freely housing the air nozzle to provide an air space therebetween, the body member having an air supply passage leading to the said space, the air nozzle having ports connecting the said space with its outlet bore and also having a pair of diametrically opposite passages extending to the front of that nozzle from the said space and directed toward a common point disposed on the axis of the air nozzle forwardly of that nozzle; and securing means operatively interposed between the collar and the body member, the said means being arranged to permit a relative rocking and shifting of the collar and body member so as to allow a tight interfitting of the tapering air nozzle portions with the tapering portions of the liquid nozzle and collar.

Signed at Chicago, Illinois, September 2nd, 1926.

BERT R. SAUSEN.
EINAR E. OLSEN.