Nov. 19, 1929. G. A. MUELLER 1,736,356

SPRAY HEAD

Filed Aug. 13, 1925

Fig 1

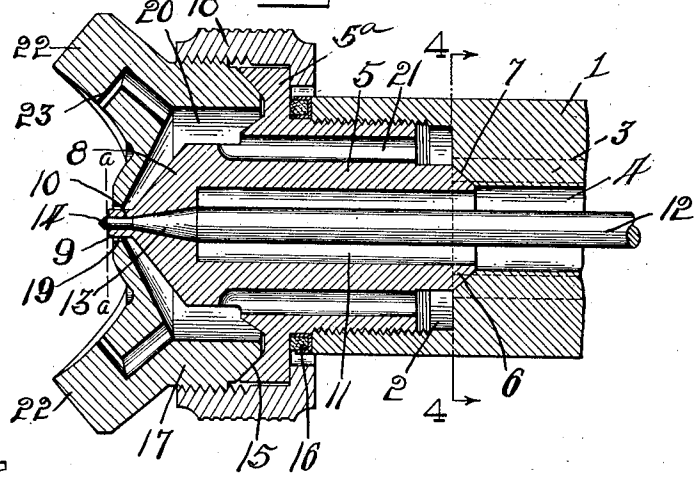


Fig 2

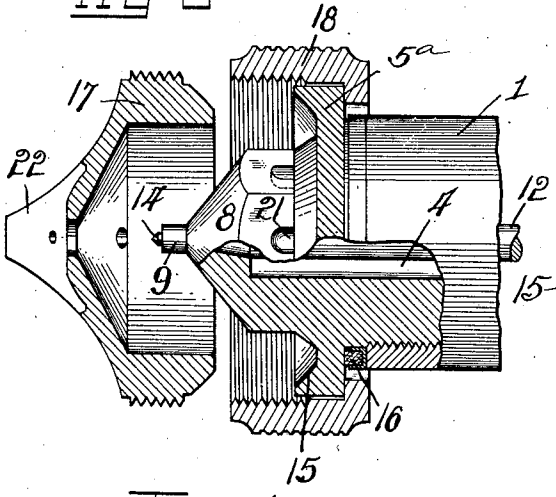


Fig 3

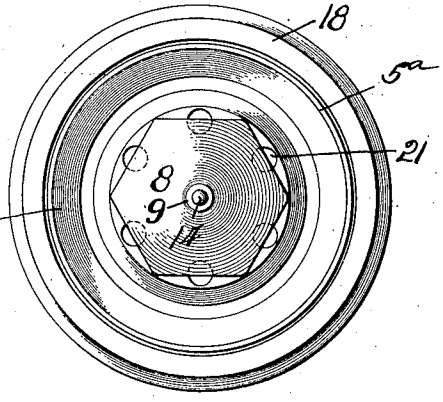
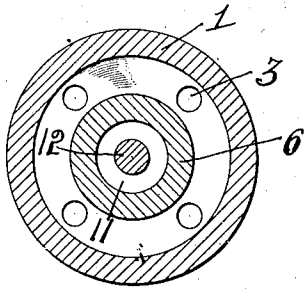


Fig 4



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UNITED STATES PATENT OFFICE

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SPRAY HEAD

Application filed August 13, 1925. Serial No. 49,947.

This invention relates to spraying apparatus of the character commonly used in the spraying of paints, varnishes, lacquers, and other surface coating materials, and relates particularly to the spray-head construction of such apparatus.

Apparatus of this character usually employ two separable concentric nozzle members, one for the material being sprayed and one for the atomizing fluid, and in securing these nozzles together in operative spraying relation it is extremely important that the discharge orifices thereof be and remain in true concentric relation, as otherwise an improper atomizing of the discharged material is obtained.

In the construction of spray-heads attempts have heretofore been made to obtain and retain this concentric relation between the nozzle members by conically seating one nozzle member on the other, as in Patent No. 1,613,588, dated January 4, 1927, and also providing a straight outer cylindrical surface on the inner nozzle fitting a bore in the outer nozzle, as in patent to Holten No. 1,474,324, dated Nov. 13, 1923.

These methods are theoretically correct and if the various parts are made with perfect accuracy the object sought is attained. However, in commercial manufacturing practice it is impossible to make the parts involved with sufficient accuracy and uniformity to obtain the concentricity desired and provide for complete interchangeabilty of parts for repair and replacement purposes.

In all methods heretofore employed in the attempt to obtain perfect concentric relation between the two nozzles, one nozzle is fitted to the other in such a manner that when the two nozzles are separately clamped, or otherwise attached to the body of the spray-head, the slightest error in machining the parts even within practical commercial tolerances will either disturb the concentricity of the nozzle orifices or result in leakage of the atomizing fluid around the threads of the clamping means or between the nozzle member and the clamping means, or between the nozzle member and the body of the spray-gun to which it is attached.

The object of the invention is the provision in a spray-head of the class described of means for effecting a positive and automatic centering of the discharge orifices of the two members when they are clamped or drawn together in assembled relation, in such a way as to make it easily possible in ordinary commercial machine practice to produce the parts within practical tolerances, and at the same time eliminate the possibility of slight errors in machining disturbing the concentricity of the two nozzle members and absolutely preventing leakage of the atomizing fluid from the joints between the various parts of the spray-head.

The invention is fully described in the following specification, and one embodiment thereof illustrated in the accompanying drawings, in which:—

Figure 1 is a central longitudinal section of the spray-head portion of a spray gun embodying the invention; Fig. 2 is a similar view thereof with the inner and outer nozzle members separated and with parts in full; Fig. 3 is an outer end view of the spray-head with the outer nozzle member removed, and Fig. 4 is a section on the line 4—4 in Fig. 1.

Referring to the drawings, 1 designates the barrel or spray-head carrying portion of a spray gun, which is provided at its outer end with a large bore 2 in communication at its inner end, in the present instance, through a series of small passages 3 with a source of air pressure supply. A bore 4, which is smaller than the bore 2, leads centrally from the bottom of the bore 2 and has communication with a source of supply of paint or other material to be sprayed, as well understood in the art.

A plug 5 is threaded into the bore 2 of the barrel 1 and is provided at its inner end with a reduced extension 6, which has a close conical seat 7 at its outer end in the outer marginal end wall of the barrel bore 4. The outer end portion of the plug 5 is reduced to form the inner nozzle 8 of the spray-head, such nozzle having its outer end, in the present instance, of conical form and terminating at its apex in a tip 9 concentric with the plug axis. The nozzle 8 and its tip 9 has a dis-

charge orifice 10 provided axially therethrough such orifice conically enlarging a distance inwardly from its discharge end and opening into an enlarged bore or axial passageway 11 in the plug, which opens at its rear end into the bore 4. 12 designates a valve stem which projects axially through and is smaller in diameter than the bores 4 and 11 and has its forward end forming a conical valve 13, which seats in the conical portion of the orifice 10 and terminates at its forward end in a tip 14 that is adapted to project into and through the reduced discharge end of said orifice when the valve is seated. The tip 14 serves as a cleaning member for the discharge orifice.

The plug 5 at the rear of the nozzle 8 is provided with an annular flange 5^a having a straight face at its rear side and being annularly undercut at its forward side to form an annular tapering or conical seat 15, which tapers inwardly and rearwardly from adjacent to the outer edge of the flange. The flange 5^a extends radially beyond the peripheral portion of the barrel 1 and is adapted to seat against the end of the barrel through an interposed gasket 16. The outer nozzle 17 of the spray-head is substantially cup-shape in form and is adapted to fit over and around the inner nozzle 8 in spaced relation thereto and to seat at its rear edge against the conical surface 15 of the flange 5^a. The nozzle 17 is held closely to its seat against the flange 5^a by a union nut 18, which threads onto the cylindrical portion of the outer nozzle and has an internal flange at its inner end which engages the rear side of the flange 5^a so that a tightening of the nut will draw the nozzle 17 closely to the seat against said flange.

The discharge orifice 19 of the outer nozzle 17 has its axis coincident with the axis of such nozzle and is of a size, in the present instance, to permit the projection of the inner nozzle tip 9 therethrough and to provide an annular air discharge space therearound from the air chamber 20 provided between the inner and outer nozzles. This air chamber has communication with the inner end portion of the bore 2 through a plurality of passages 21 provided lengthwise through the large portion of the plug 5. The projections 22 on the face of the outer nozzle 17 are provided with angled air discharge passages 23 in communication at their inner ends with the air chamber 20 and having their outer ends arranged to direct the streams of air against the stream of combined air and material being discharged from the orifices 10 and 19 of the spray-head nozzles to effect a flattening of such stream, as well understood in the art. This feature has nothing to do with the present invention and may be used or not as desired.

It is very important in securing the nozzle members 8 and 17 together in assembled relation that the discharge orifices of the two shall accurately align or be truly concentric, as hereinafter more particularly described, as otherwise more air will be permitted to discharge from one side of the orifice 19 of the outer nozzle than from the other side thereof and prevent a proper atomization of the material being sprayed and a properly balanced spray. In the use of most spray guns, especially those equipped with the fan spray feature, it is necessary to frequently loosen the outer nozzle with respect to the inner nozzle, so that a rotary adjustment of one relative to the other may be obtained, and then to again clamp or secure the two nozzle members in rigid relation. In doing this, considerable difficulty is experienced in causing an accurate registering of the discharge orifices of the two nozzles when clamping the same together, and the primary purpose of the present invention is to provide simple means for automatically accomplishing such accurate aligning of the orifices of the two nozzle members when clamping the same together, regardless of ordinary machining errors found in manufacturing practice and of commercial tolerances in the dimensions of the various parts of the spray-head. This is accomplished by curving the annular end surface of the nozzle 17 which coacts with the tapered seat 15 to form a portion of the surface of a sphere, the center of which falls at a point in the axis of the inner nozzle 8 which is approximately intersected by a line *a—a* drawn across the face portion of the nozzle 17 which is marginal to its orifice 19.

This permits the outer nozzle 17, by reason of its ball or spherical seating surface, to automatically adjust itself to a line seat on the tapered surface 15 of the inner nozzle 8 when the two nozzles are drawn together by the union clamping nut 18; so that the nut 18 will always bear uniformly all around against the flange 5^a regardless of small errors of misalignment of the various parts. It is obvious also that such small errors or tolerances in machining the parts will not disturb the practically perfect concentricity of the nozzle orifices at 19, as any movement of the rear end portion of the nozzle 17 sidewise on the seat 15 will simply cause such rear end portion to revolve in the arc of a circle around the center located at the intersection of the inner nozzle axis and the line *a—a*. It is also obvious that such movement of the nozzle 17 on the seat 15 of flange 5^a incident to obtaining a perfect seating between the two parts will not cause a leakage between them, as the contact between the two parts will always within limits be a line contact in circular form.

It is evident that I have provided a simple and efficient form of spray-head having inner and outer nozzles which form between

them, when clamped together in operative relation, an orifice for the atomizing fluid always concentric with the material orifice of the inner nozzle regardless of small machining errors and tolerances of these parts or other related parts of the spray-head.

I wish it understood that my invention is not limited to any specific construction, arrangement or form 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 Letters Patent, is:

1. In a spray-head, the combination of two nozzles having respectively an inner discharge orifice and an outer discharge orifice surrounding said inner orifice, a seat fixed with respect to one nozzle and against which the other nozzle seats, and means for clamping the two nozzles, the co-engaging portions of said seat and the coacting nozzle being formed one with a conical surface and the other with a spherical surface having its center coincident with the center of the outer end of its orifice, whereby said orifices will automatically assume a concentric relation, when the two nozzles are clamped together, regardless of any minor divergence between the axes of the two nozzles.

2. In a spray-head, the combination of two nozzles having respectively an inner discharge orifice and an outer discharge orifice surrounding said inner orifice, a seat fixed with respect to one nozzle and against which the other nozzle seats, and means for clamping the two nozzles together, the co-engaging portions of said seat and the coacting nozzle being formed with surfaces forming a substantially universal joint, whereby said orifices will automatically assume a concentric relation, when the two nozzles are clamped together, regardless of any minor divergence between the axes of the two nozzles.

3. In a spray-head, a nozzle having a discharge orifice, a shoulder fixed with respect to said nozzle and extending outwardly therefrom, a substantially conical seat formed in said shoulder, a second nozzle having a discharge orifice surrounding the orifice in the first named nozzle and having a part formed to engage the conical seat of the first named nozzle, and means extending beneath the shoulder and engaging the second nozzle for clamping the nozzles together, said engaging portions of the nozzles forming a substantially universal joint, whereby said orifice will automatically assume a concentric relation when the two nozzles are secured together regardless of any minor divergence between the axes of the two nozzles.

4. In a spray-head, a nozzle having a discharge orifice, a substantially conical seat formed in said nozzle, a second nozzle having a discharge orifice surrounding the orifice in the first named nozzle and having a part formed to engage the seat in the first named nozzle, and means for clamping the two nozzles together, said engaging portions of the nozzles forming a substantially universal joint, whereby said orifices will automatically assume a concentric relation when the nozzles are secured together regardless of any minor divergence between the axes of the nozzles.

5. In a spray-head, the combination of two nozzles having respectively an inner discharge orifice and an outer discharge orifice surrounding said inner orifice, a seat fixed with respect to one nozzle and against which the other nozzle seats, and means for clamping the two nozzles together, the co-engaging portions of said seat and the co-acting nozzle being formed one with a conical surface and the other with a surface of arcuate form the arc being struck from a point adjacent to the discharge ends of the nozzles whereby to form a substantially universal joint so that the orifices automatically assume a concentric relation when the nozzles are clamped together, regardless of any minor divergence between the axes of the two nozzles.

In testimony whereof, I have hereunto signed my name to this specification.

GODFREY A. MUELLER.