SPRAY NOZZLE

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ABSTRACT

In a fluid spray nozzle having a spray orifice, a fluid distributor and a distributor retainer member, each of which is firmly positioned in an elongate passage in the nozzle body by way of a threaded nipple which is threaded into the passage and bears against the distributor retainer member, and in which the axial forces which are exerted by the nipple are limited by cantilevered arms on the distributor retainer member which flex into a radially extending groove in the member to prevent damage to the spray nozzle components, yet firmly position the components in the nozzle body.

7 Claims, 3 Drawing Figures
This invention relates to fluid spray nozzles and, more particularly, to improved fluid spray nozzles in which the components are protected from damage and/or deformation from forces exerted on the components during assembly.

Fluid spray nozzles frequently incur damage during assembly as a result of the overthreading or forcing of the component of the nozzle which positions and holds the various other components of the nozzle in assembled order. For example, nozzle assemblies employing a fluid distributor device which has fine grooves cut in a tapered surface of the distributor to distribute fluid to the spray orifice are frequently damaged during assembly. These tapered surfaces and their grooves usually are machined to critical tolerances and cooperate with a tapered surface in the spray orifice plate to form minute passages. If the fluid distributor is forced against the spray orifice plate by excessive forces during assembly, distortion or other deformation of the grooves frequently results and the spray nozzle becomes defective. In addition, various components of the spray nozzle are usually machined or otherwise formed of various soft metals, such as brass, and if these components are subjected to undue forces during assembly, they also will tend to deform and expand in the nozzle body and effectively become press fitted therein. Thus, disassembly, either for inspection or servicing of the spray nozzle, is rendered difficult, if not impossible.

The present invention substantially reduces the possibility of distortion or other deformation of the various nozzle components during the assembling operation. Not only is the tendency of precision surfaces to become marred or defaced so as to degrade the accuracy and precision of the fluid flow substantially reduced when practicing the invention, but also the ability to quickly and easily disassemble the spray nozzle of the invention is preserved and insured. In the present invention, deformable cantilevered means in at least one of the components of the nozzle will limit a substantial portion of any undue unit compressive forces which may be exerted on the components during assembly.

In a principal aspect of the invention, the nozzle body of a fluid nozzle includes spray orifice means and retaining means for firmly positioning and retaining the spray orifice means in the body, the retaining means being threadedly received on the body and positioned in an elongate passage in the body. The retaining means includes deformable cantilevered means which bend to limit the compressive forces which would otherwise be exerted by the retaining means when the retaining means is received into the body.

In another principal aspect, the retaining means includes a distributor retainer member which is grooveed adjacent one end thereof and nipple means for firmly positioning the member in the nozzle body. The groove defines cantilevered means adjacent the nipple means end of the member and the cantilevered means is deformable into the groove to limit the compressive forces which are exerted on the distributor member during assembly.

These and other objects, features and advantages of the present invention will be more clearly understood through a consideration of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWING

In the course of this description, reference will frequently be made to the attached drawing in which:

FIG. 1 is a cross-sectioned side elevation view through a preferred embodiment of fluid spray nozzle constructed in accordance with the principles of the invention;

FIG. 2 is a cross-sectioned side elevation view of the distributor retainer member shown in FIG. 1 and showing the distributor retainer in the process of absorbing compressive forces which are exerted during assembly;

and

FIG. 3 is an end elevation view of the distributor retainer member viewed substantially along line 3-3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of nozzle which is constructed in accordance with the principles of the invention is shown in the drawings. The nozzle is of the type which generally includes a nozzle body having an elongate passage therein which is open at both ends for receiving an orifice disc, a fluid distributor, a distributor retainer member, and a nipple member which is threaded into the end of the passage for maintaining the various components firmly positioned in place in the nozzle body.

The orifice disc is preferably stepped at to cooperate with a corresponding annular shoulder which is formed at one end of the nozzle body to maintain the disc firmly positioned at that end of the nozzle body in the body passage. A conventional spray orifice is formed in the disc and communicates between the external face of the orifice disc and a tapered surface in the orifice disc in the opposite face of the disc adjacent the end of the passage.

The fluid distributor is preferably provided with an enlarged head at one end which is tapered to complement and closely fit against the tapered surface in the disc. A plurality of extremely small grooves, which are frequently microscopic in size in the instance of, for example, an oil burner nozzle, are cut or formed in any other suitable manner in the tapered end portion of the head. These grooves, together with the tapered surface of the orifice disc, form elongate passages which communicate between the end of passage upstream of the disc and the orifice to distribute fluid to the orifice.

The other end of the fluid distributor is preferably provided with a smaller head which is received in an axially extending recess in the distributor retainer member, as shown in FIG. 1. The retainer member is preferably cruciform in cross-section having webs and extending axially of the passage and which diometrically span the distance between the internal surface of the passage, but allow the passage of the fluid which is to be sprayed along the retainer through longitudinal channels to the grooved passages in the enlarged head of the
distributor as shown by the arrows in FIG. 1. An annular lip 48 is preferably formed on the end of the distributor retainer 18 adjacent head 32 and butts against the enlarged head as shown in FIG. 1 to firmly retain the distributor in place against the disc 14.

In order to secure the disc 14, distributor 16 and distributor retainer member 18 in place in passage 12, the internal surface 44 of the passage is internally threaded at 50 over some portion of its length and the nipple 20, which is externally threaded over at least a portion of its length 52, is threaded into the end of the passage 12 until its leading end 54 butts against the end 56 of the distributor retainer member 18. As shown in FIG. 1, the nipple 20 may take the form of a filter nipple upon which a suitable filter or strainer 58 is mounted on the external end thereof for filtering the fluid prior to its entry into the nozzle body. Nozzle body 10 may also be threaded externally at 60 for the coupling of a suitable fluid conduit (not shown). Although a filter of the ceramic or sintered type is shown in FIG. 1, it will be understood that other suitable forms of straining components may be employed in place of that type of filter, as desired.

Thus far the nozzle assembly which has been described is substantially conventional in design. In such prior conventional nozzles, it is not uncommon that the nipple 20 will be overthreaded into the nozzle body during assembly. When such overthreading occurs, the leading end 54 of the nipple 20 will exert a substantial compressive unit force upon the end 56 of the retainer member 18. This force obviously will be transmitted through the retainer member 18 to the enlarged head 32 of the fluid distributor and frequently forces the tapered surface 34 of the distributor against the tapered surface 28 in orifice disc 14, such that this precision surface is marred and defaced and the microscopic grooves 36 may also be deformed to the extent that accuracy and precision of fluid flow are substantially degraded. Moreover, the distributor retainer member 18 is frequently formed of a soft material, such as brass or the like, and if the compressive forces exerted upon the retainer member during assembly are great, the distributor retainer member has a tendency to deform and expand such that its webs 42, 42', 42'' and 42''' will tightly fit against the internal surface 44 of the passage. Now if it is desired to disassemble the spray nozzle for inspection or servicing, removal of the distributor retainer member 18 will be difficult, if not impossible.

The tendency to overtighten the nipple 20 such that undue compressive forces are generated is accentuated by the fact that frequently an annular space 62 will exist between the end 64 of the nozzle body 10 and the tool receiving surface 66 of the nipple 20 once the nipple has been properly threaded into the passage by the correct amount. This space 62 will tend to mislead the serviceman or other individual who is assembling the nozzle to believe that further tightening is necessary and the result will be overthreading.

The present invention substantially reduces the likelihood of marring or other damage to the tapered surfaces 28 and 34 and grooves 36 and also prevents deformation of the distributor retainer member 18 which might otherwise prevent or impair disassembly of the nozzle body.

In the present invention, a radially extending annular groove 68 is cut into the end of the distributor retainer member 18 adjacent end 56. It will now be seen that this groove establishes a plurality of cantilevered arms 70, 70', 70'' and 70''' in webs 42, 42', 42'' and 42'''.

These arms extend radially outward from the axis of the distributor retainer member 18 adjacent end 56 and are positioned such that they will be contacted by the leading end 54 of the nipple 20 during assembly.

Referring to FIGS. 1 and 2, when the nipple 20 is now threaded into the elongate passage 12, its leading end 54 will come to bear against the several cantilevered arms 70, 70', 70'' and 70''' so as to maintain the various components firmly positioned in the elongate passage 44. If the nipple is now further threaded into the passage 12, any excessive compressive forces which might otherwise have been generated will now be limited by the bending of the cantilevered arms to the dotted position as shown in FIG. 2. The bent cantilevered arms 70, 70', 70'' and 70''' not only will thus limit compressive forces which might otherwise damage the fluid distributor head 32 or deform the distributor retainer member 18, but will also provide a spring action which will insure that the various components will not vibrate loose during use.

It will be understood that the embodiment of the present invention which has been described is merely illustrative of an application of the principles of the invention. Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention.

What is claimed is:

1. In a fluid nozzle including a nozzle body having a spray orifice means therein and retaining means at least a portion of which is threadedly received on said body and positioned in an elongate passage in said body for firmly positioning and retaining said spray orifice means in said body, wherein the improvement comprises in combination therewith for preventing damage to components of said fluid nozzle:

   - deformable cantilevered means on said retaining means, said cantilevered means bending to limit compressive forces which would otherwise be exerted by said retaining means when said retaining means is received into said body.

2. In the nozzle of claim 1 wherein said deformable cantilevered means includes a radially extending annular groove in said retaining means.

3. In the spray nozzle of claim 1 wherein said spray orifice means comprises a spray orifice and fluid distributor means in contact with said spray orifice, said retaining means comprises distributor retainer means in said elongate passage in contact with said fluid distributor means and nipple means which is threadedly positioned on said body and is received in said passage so as to bear against an end of said distributor retainer means opposite said fluid distributor means to firmly position the spray orifice, fluid distributor means and distributor retainer means in said body, and wherein said deformable cantilevered means is positioned on said distributor retainer means adjacent an end thereof.

4. In the spray nozzle of claim 3, wherein said deformable cantilevered means comprises a radially extending annular groove in said distributor retainer means spaced axially from said cantilevered means and
thereof whereby the portion of said distributor retainer means between said groove and said cantilevered means end is deformable toward said groove when said nipple means is received in said passage to preferentially limit the force exerted by the nipple means.

5. In the spray nozzle of claim 4 wherein said groove is on the end of said distributor retainer means adjacent said nipple means.

6. In the spray nozzle of claim 3 wherein said distributor retainer means comprises a member which is substantially cruciform in cross-section and said cantilevered means comprises a radially extending annular groove in said member spaced axially from one end thereof to define a plurality of radially extending arms on the member between said groove and the end of said member which is grooved and which are deformable toward said groove when said nipple means is received in said passage to preferentially limit the force exerted by the nipple means.

7. In the spray nozzle of claim 6 wherein said arms are contacted by said nipple means when said nipple means is received in said passage.

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