

[54] **NOZZLE**

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[56] **References Cited**

UNITED STATES PATENTS

2,055,864	9/1936	Harsch.....	239/493 X
1,259,052	3/1918	Starr.....	239/493
2,044,695	6/1936	Huss.....	239/493
2,823,954	2/1958	Olson.....	239/493 X

3,053,462	9/1962	Schloz.....	239/493 X
3,204,876	9/1965	Elverston.....	239/493 X

FOREIGN PATENTS OR APPLICATIONS

980,303	1/1965	Great Britain.....	239/493
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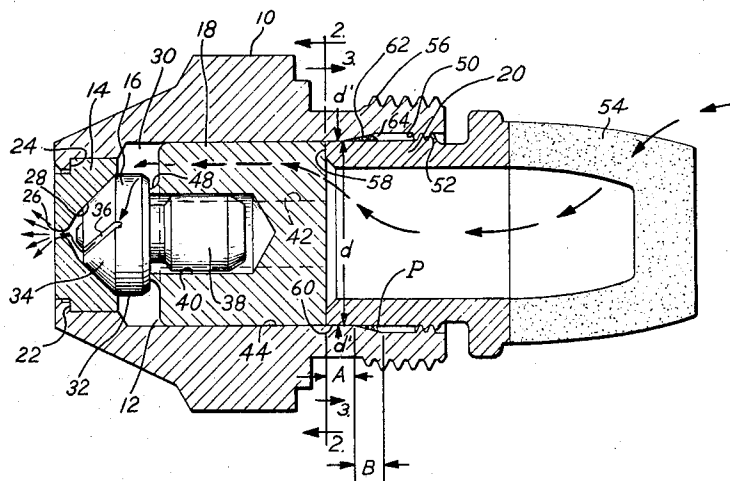
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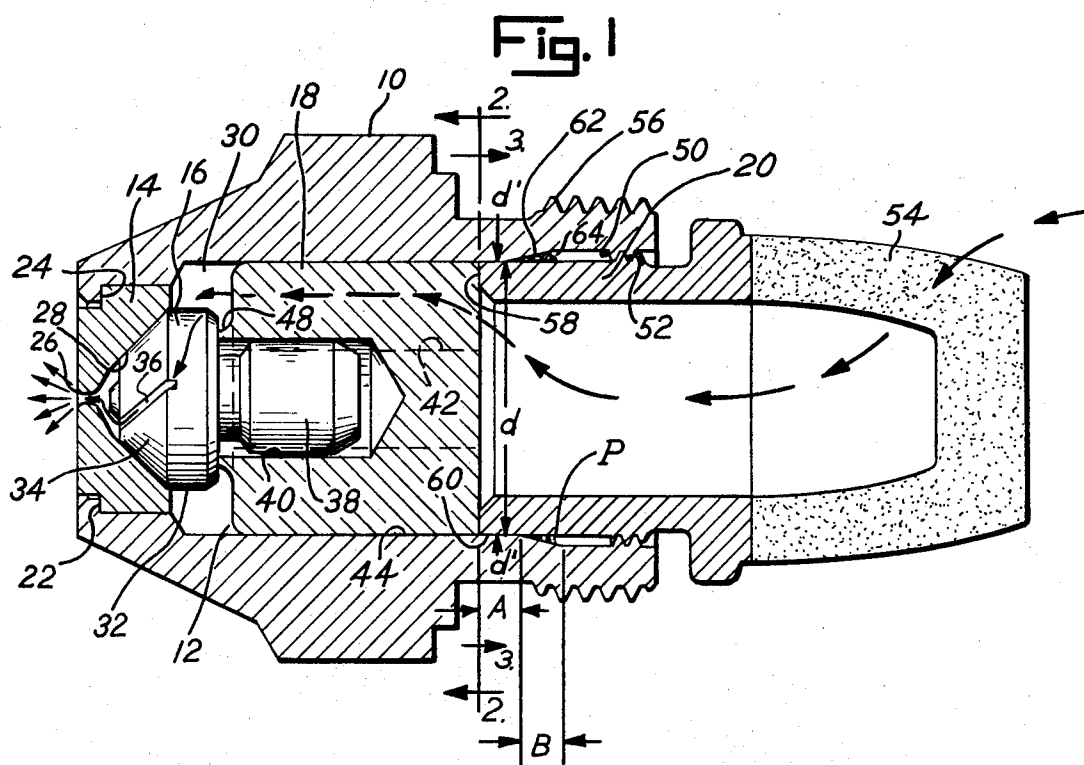
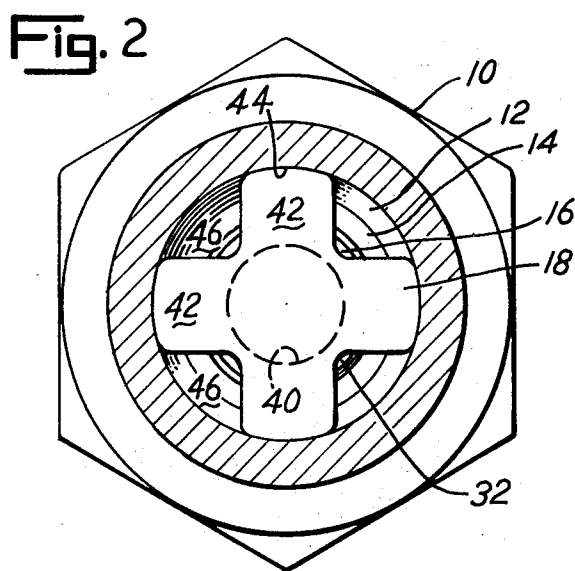
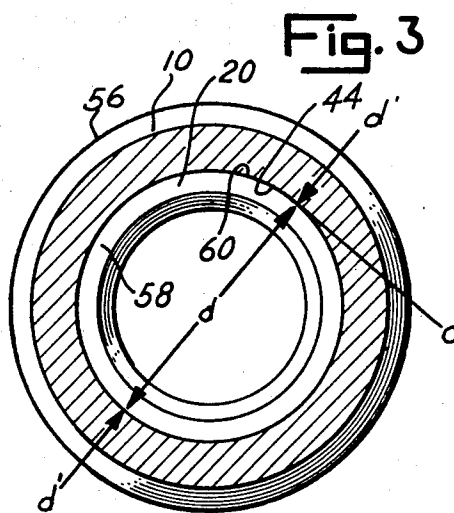
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[57] **ABSTRACT**

In a fluid nozzle the clearance between the nozzle body and an orifice retaining member is reduced in a zone between the spray orifice and passages in a fluid distributor and the threads by which the retaining means is threaded into the nozzle body such that the clearance is smaller than the minimum cross sectional dimension of either the spray orifice or the passages in the fluid distributor which distribute the fluid to be sprayed in the spray orifice to prevent clogging by particulate contaminants present on the threads.

8 Claims, 3 Drawing Figures





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NOZZLE

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to fluid nozzles and, more particularly, to improved fluid nozzles in which particulate contaminants on the internal threads of the nozzle body are prevented from blocking the nozzle.

Particulate contamination, such as metal chips and the like, is frequently formed upon the internal threads of nozzles, such as oil burner nozzles, in the course of manufacture of the nozzles. These particulate contaminants or chips frequently give rise to substantial clogging problems in such nozzles. Since the internal threading of the prior nozzles usually communicates in one way or another with the fluid which is being passed to the orifice of the nozzle, any particulate contaminants or chips which are left either on the internal threads of the nozzle body or on the components after assembly will be flushed from the threads and will enter the fluid stream when the nozzle is placed into use. When these contaminants reach the small fluid distribution passages in the fluid distributor of the nozzle which distribute the fluid to the orifices, or when they reach the orifice itself in the absence of such distributor, they tend to lodge in these openings, clogging the openings and causing the nozzle to malfunction. Needless to say, where the nozzle is for example an oil burner nozzle, such malfunction of the nozzles at a time when the outdoor temperature is extremely cold is unacceptable and could result in serious consequences.

In order to prevent nozzle malfunction as a result of clogging by these particulate contaminants and chips which are flushed into the fluid stream, extensive and elaborate precautionary measures have been required in the past during the manufacture and/or assembly of the nozzles. These measures include extensive washing, air blasting, tumbling and/or brushing techniques, as well as electrolytic and chemical metal removal techniques, to insure that particulate contaminants and chips which might block these fluid passages in the nozzle have been removed from the internal threads prior to assembly. Even where these techniques are employed, the act of assembling the nozzle parts by screwing the parts together will frequently release additional chips which could not be removed by the above techniques and these chips will be pushed along at the leading end of the element which is being screw threaded into the nozzle body. After all the nozzle parts have been assembled, the chips which have been released by the threading process, as well as any of the chips which were not removed from the threads by blasting and the like, will be positioned on the leading end of the element which is located in a critical area of the nozzle in which they will be flushed into clogging relationship with the spray orifice or distributor passages when the nozzle is put into use. Even with near perfect thread dimensions and fine thread finishes, the act of tightening the threaded parts during assembly frequently results in unit forces which are exerted on the threads due to sliding metal contact and these forces will result in chip formation. For these reasons, in addition to the above mentioned elaborate and expensive chip removal techniques prior to assembly, nozzles for use in oil burner assemblies for example, must frequently be individually tested subsequent to assembly to insure that the spray orifices and/or distribution passages, which are frequently microscopic in size, are not clogged and that the nozzle will operate properly before it is put into use. Even where the above mentioned chip removal techniques have been employed, it is not unusual to find it necessary to disassemble, clean and retest from 20 to 25 percent of a production run due to clogging from these particulate contaminants and metal chips.

Where a nozzle is constructed in accordance with the principles of the present invention, the elaborate, time consuming and expensive removal techniques may be substantially simplified without an attendant increase in the incidence of clogging of the nozzle by particulate contaminants which are present on the threads in the nozzle body. In the nozzle constructed in accordance with the principles of the invention,

not only is the need for the elaborate chip removal steps reduced from that which was previously necessary to prevent contamination of the small distribution passages and/or spray orifice, but a substantial reduction in clogging of these small passages and orifices may actually be realized. Thus, when practicing the principles of the invention, both the time and expense in assembling the nozzles of the invention may be substantially reduced while a substantial increase in the reliability of such nozzles may be realized. Moreover, when practicing the principles of the invention the internal thread length in the nozzle body may be substantially reduced which not only reduces the expense of manufacture of the nozzles, but also reduces the number of chips which are likely to be present on these threads.

In a fluid nozzle constructed in accordance with the principles of the invention, the nozzle body is internally threaded and includes a spray orifice and a fluid inlet. Retaining means having external threads is threaded into the internally threaded body for positioning and maintaining the orifice in the body. Contaminant retaining means is defined by the nozzle body and the orifice retaining means in a zone between the orifice and the threads and prevents movement of particulate contaminants from the threads to the orifice.

In another aspect of the invention, the nozzle includes distribution means which is positioned in the nozzle body and the distribution means has at least one passage therein for distributing fluid to the spray orifice. The contaminant retaining means also prevents the movement of particulate contaminants from the threads to the passage.

In still another aspect of the invention, the clearance between the nozzle body and the orifice retaining means is smaller than the minimum cross sectional dimension of the passages in a fluid distribution means such that particulate contaminants larger than the passages are blocked from moving from the threads to the passages.

In still another aspect of the invention, a method of assembling a nozzle body is contemplated in which the clogging of the spray orifice and the distribution passages of distribution means by particulate contaminants present on the threads is prevented. In this nozzle assembling method, retaining means is threaded internally into a passage in the nozzle body and, while threading, a surface on the retaining means is moved into a zone between the threads and the distribution passages where the surface is positioned relative to the internal surface of body passage such that the clearance between these surfaces is smaller than the minimum cross sectional dimension of the distribution passages.

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 nozzle constructed in accordance with the principles of the invention;

FIG. 2 is a cross sectioned end elevation view of the nozzle taken substantially along line 2 — 2 of FIG. 1; and

FIG. 3 is a cross sectioned end elevation view of the nozzle taken substantially along line 3 — 3 of FIG. 1.

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 generally includes a nozzle body 10 having an elongated passage 12 therein which is open at both ends for receiving an orifice disc 14, a fluid distributor 16, a distributor retainer 18, and an orifice or distributor retaining member 20 which is threaded into the end of the passage 12 for maintaining the various components positioned in place in the nozzle body.

The orifice disc 14 is preferably stepped at 22 to cooperate with a corresponding annular shoulder 24 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 26 if formed in the disc and communicates between the external face of the orifice disc and a tapered passage 28 in the orifice disc in the opposite face of the disc adjacent the end 30 of the passage 12.

The fluid distributor 16 is preferably provided with an enlarged head 32 at one end which is tapered at 34 to complement and closely fit against the walls of the tapered passage 28 in the disc. A plurality of extremely small grooves 36, 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 32. These grooves, together with the tapered walls 28 of the orifice disc 14, form elongate passages which communicate between the end 30 of passage 12 upstream of the disc and the orifice 26 to distribute fluid to the orifice.

The other end of the fluid distributor 16 is preferably provided with a smaller head 38 which is received in an axially extending recess 40 in the distributor retainer 18, as shown in FIG. 1. The retainer 18 is preferably cruciform in cross section having arms 42 which extend axially of the passage 12 and diametrically span the distance between the internal surface 44 of passage 12, but allow the passage of the fluid which is to be sprayed along the retainer through channels 46 to the grooved passages 36 in the enlarged head 32 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 which butts against the enlarged head as shown in FIG. 1 to firmly retain the distributor in place against the disc 14.

Finally, in order to secure the disc 14, distributor 16 and distributor retainer 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 retaining member 20, which is externally threaded over at least a portion of its length 52 is threaded into the end of the passage 12 until it butts against the end of the distributor retainer 18. As shown in FIG. 1, the distributor retainer 20 may take the form of a filter nipple upon which a suitable filter or strainer 54 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 56 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 which has been described is substantially conventional in design. In such prior conventional nozzles, the internal threads 50 frequently extend well into the passage 12 to a point which is frequently near the left end 30 of the passage as shown in FIG. 1 and the distributor retainer 18 is also threaded into the passage. Even where the distributor retainer is only slip fitted into the passage as shown in FIG. 1, the threads 52 will extend over the entire length of the nipple retainer 20 to the end 58 of the nipple. In either of these prior nozzle assemblies, metal chips and other particulate contaminants which are present either on the internal threads 50 or on the external threads 52 and which have been formed either during the cutting of the threads themselves or as a result of threading the parts together during assembly, will be carried by the leading edge 58 of the retainer 20 during assembly of the nozzle and will be left on the edge 58 in the finally completed assembly. Since this leading edge 58 is positioned directly in the fluid stream, as soon as fluid is introduced to the nozzle body these particulate contaminants will be flushed into the fluid stream and, more likely than not, will clog either the grooved passages 36 in the distributor 16 or the spray orifice 26. It is a principal purpose of the present invention to prevent this clogging particulate contamination from reaching the passages 36 and spray orifice 26, or least to

prevent particulate contaminants from the threads which are large enough to clog the passages and orifice from reaching same.

In the present invention clogging and malfunction of the nozzle is prevented by blocking the movement of particulate contaminants which may be present upon the threads and which are large enough to clog the passages 36 from communicating with the fluid stream and the passages. Referring to FIGS. 1 and 3, the cross sectional dimension, generally d , of the retaining member or nipple 20 adjacent its leading edge 58 is substantially the same as the internal dimension, generally d' , of the passage 12. Thereby, the clearance c between the external surface 60 of the retainer member 20 and the internal surface 44 of the passage 12 over the axial length defined by zone A as shown in FIG. 1 is such that the clearance in zone A is smaller than the minimum cross sectional dimension of grooved passage 36. By such dimensioning of the clearance c , a blockade is effectively established between the threads 50 and 52 and the passage 36 and spray orifice 26 which will prevent the passage to edge 58 during assembly of any particulate contaminants which may be present upon the threads and which are of a dimension larger than the passage. Any contaminants P larger than the clearance c will be retained in an annular chamber 62 which is defined between the external surface 60 of the retainer member 20 and a slightly larger diameter portion 64 of the passage 12 in an axially extending zone B between the threads 50, 52 and zone A. The maximum diameter in zone B is preferably substantially the same as the root diameter of the internal threads 50 in passage 12.

In assembling the preferred embodiment of nozzle of the invention, the orifice disc 14, the fluid distributor 16, and the distributor retainer 18 are first slipped through the open end of passage 12 until they are positioned as shown in FIG. 1. The retainer member or nipple 20 to which the filter 54 is attached is then screwed into the open end of the passage 12. Edge 58 will first pass the internal threads 50 and then enter zone B, but will not carry any chips or other particulate contaminants which may be present in the thread grooves, since surface 60 adjacent this end of the nipple does not threadedly engage the internal threads 50 in the passage 12. By the time threaded engagement does commence between threads 50 and 52, end 58 of the nipple will enter zone A. Continued threading of the nipple 20 into the passage 12 will sweep chips and other particulate contaminants from the thread grooves. However, movement of any of these chips which are larger than the dimension of clearance c to a location on end 58 of the nipple will be prevented by this small clearance. Instead, these chips will deposit in the chamber 62 in zone B where they cannot be flushed by the fluid stream when the nozzle is placed into use.

It will be understood when considering the above description of the invention that, in addition to the blockage of movement of particulate contaminants which may be present upon the threads of the nozzle body in zone A, the overall length of the internal thread 50 as well as external thread 52 may be and is preferably substantially reduced over that of the prior nozzles. Since the internal threads 50 no longer need extend to the end 30 of the passage, and since threads 50 and 52 actually should be shortened to the extent that they do not extend into zone A, a saving in manufacturing expense may be realized and the likelihood of the presence of chips is actually reduced.

It will also 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 having an internally threaded nozzle body for the receipt of a threaded member therein, fluid inlet means and spray orifice means in said nozzle body, and a threaded member having external threads for the threading of said member into the internally threaded body, wherein the improvement comprises in combination therewith:

contaminant retaining means defined by said nozzle body and said threaded member in a zone between said spray orifice and said threads, said contaminant retaining means preventing the movement of particulate contaminants from said threads to said spray orifice both during and after the threading together of said nozzle body and said threaded member.

2. In the nozzle of claim 1 wherein said contaminant retaining means comprise a zone adjacent said threads in which the clearance between said nozzle body and said threaded member is smaller than the minimum cross sectional dimension of said spray orifice, whereby particulate contaminants larger than said spray orifice are blocked from moving to said orifice.

3. In the nozzle of claim 1 including fluid distribution means positioned in said body by said threaded member between said threads and said spray orifice, said distribution means having at least one passage therein for distributing fluid to said spray orifice, and wherein said contaminant retaining means are positioned in a zone between said passage and said threads and prevent the movement of particulate contaminants from said threads to said passage.

4. In the nozzle of claim 3 wherein said contaminant retaining means comprise a zone adjacent said threads in which the clearance between said nozzle body and said threaded member is smaller than the minimum cross sectional dimension

of said passage, whereby particulate contaminants larger than said passage are blocked from moving to said passage.

5. In the nozzle of claim 4 including a plurality of said passages in said fluid distributor means each having a minimum cross sectional dimension smaller than the minimum cross sectional dimension of said spray orifice.

6. In the nozzle of claim 1 wherein said contaminant retaining means comprise first and second zones adjacent said threads and spaced axially from each other and from said threads, the clearance in said first zone between said nozzle body and said threaded member being smaller than the minimum cross sectional dimension of said spray orifice, said nozzle body and said threaded member being spaced from each other in said second zone to define an annular chamber therebetween and between said threads and said first zone, whereby particulate contaminants larger than said spray orifice are retained in said chamber.

7. In the nozzle of claim 6 including fluid distribution means positioned between said first zone and said spray orifice and having at least one passage therein for distributing fluid to said spray orifice, the clearance in said first zone also being smaller than the minimum cross sectional dimension of said passage.

8. In the nozzle of claim 1 wherein said threaded member comprises retaining means for positioning and retaining said orifice in said body.

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