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[54] **NOZZLE**

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Related U.S. Application Data

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[52] **U.S. Cl.** ..... **29/157 C,** 29/434, 239/590, 285/355

[51] **Int. Cl.** **B21d 53/00**

[58] **Field of Search** .. 239/590, 493; 29/157 C, 434; 285/355

[56] **References Cited**

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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.

3 Claims, 3 Drawing Figures

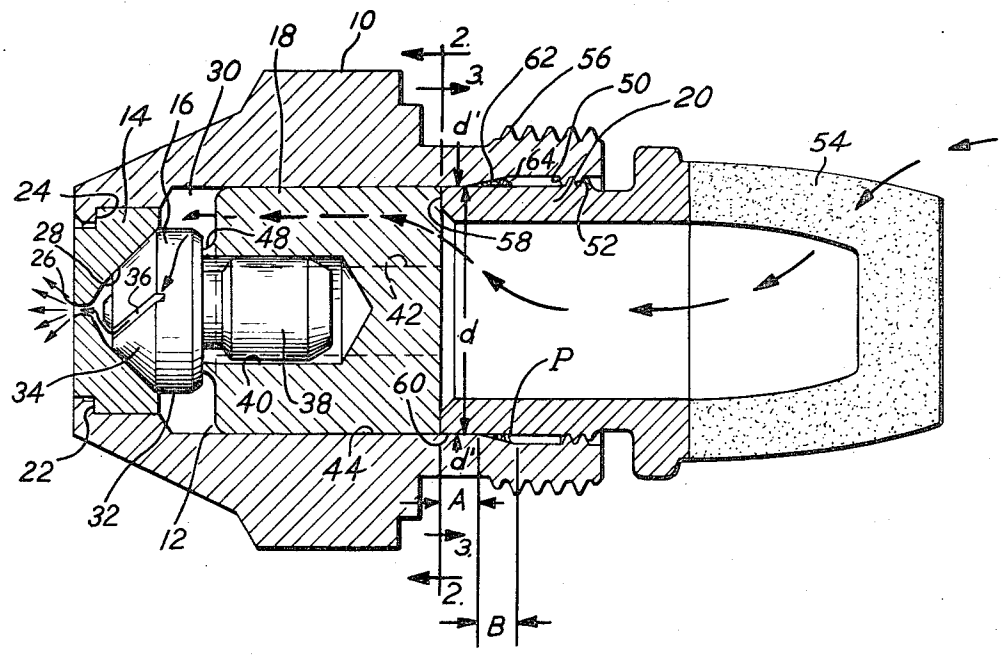


Fig. 1

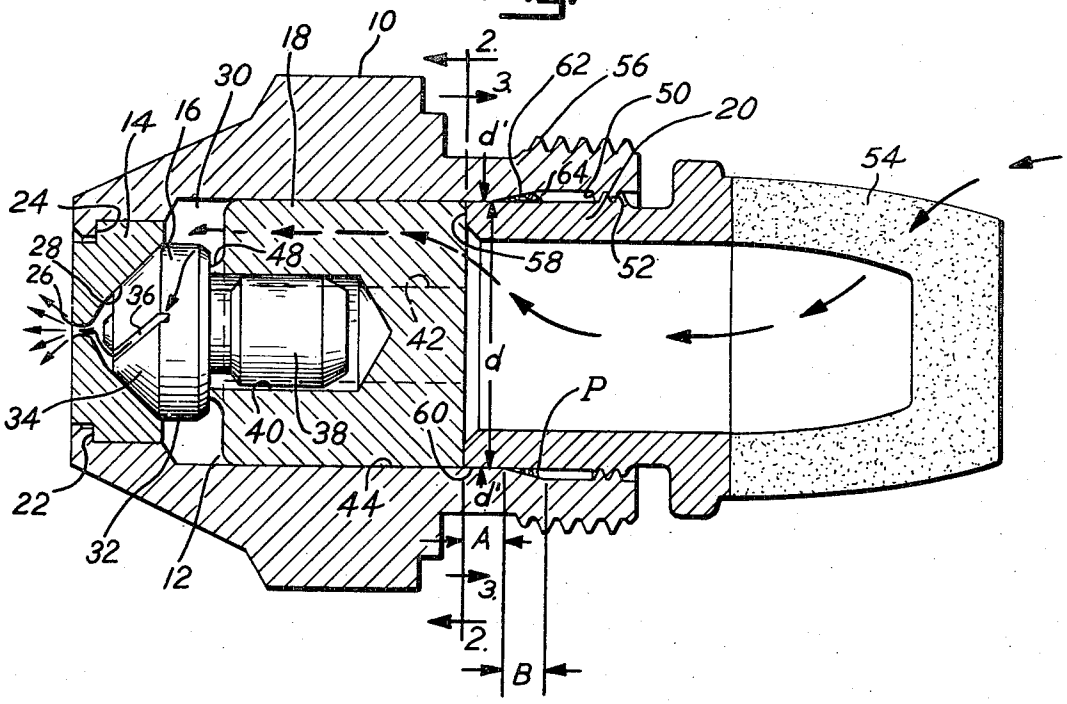


Fig. 2

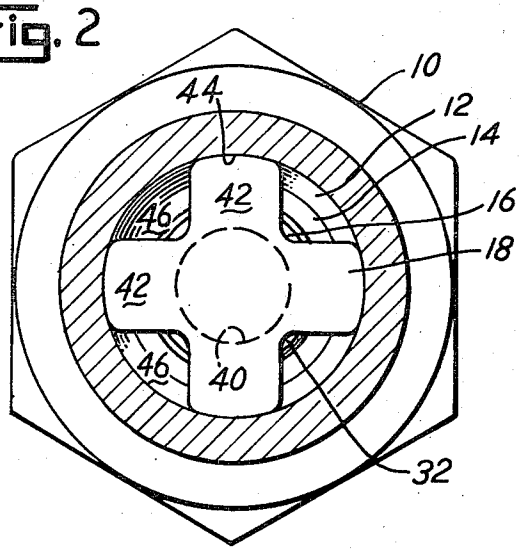
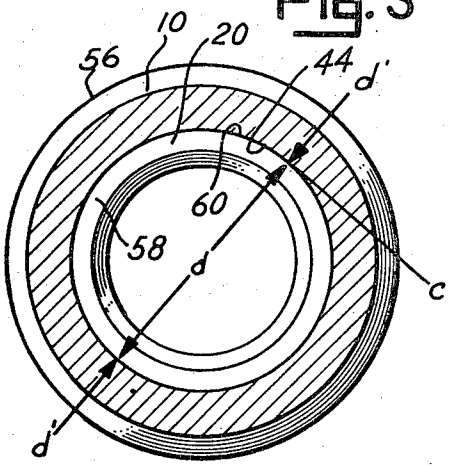


Fig. 3



NOZZLE

This is a division of application Ser. No. 65,545, filed Aug. 20, 1970, now U.S. Pat. No. 3,612,578.

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 distributor 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 assembing 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 a 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** is 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,** at 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 passage **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 blockage 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 interal 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 liklihood 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. A method of assembling a fluid nozzle which prevents the clogging of the minute fluid spray passages in the nozzle body by particulate contaminants present on threads in the nozzle body, comprising:

internally threading a threaded member into a passage in the body,

moving a surface of the threaded member into a zone where the surface is positioned relative to the internal surface of said body passage such that the clearance between said surfaces is smaller than the minimum cross sectional dimension of said minute fluid passages, said surface being moved into said zone before or substantially simultaneously with the commencement of threading said threaded member into said passage, said zone being located between the threads and said minute fluid passages, and

continuing to thread the threaded member into the body until the threaded member is fully positioned in the body while maintaining said clearance between said surfaces, whereby movement toward said minute fluid passages of the particulate contaminants present on the threads is blocked by said clearance in said zone.

2. The method of claim **1** wherein the blocked particulate contaminants are trapped in a chamber between the threads and said zone.

3. The method of claim **1** wherein said minute fluid passages comprise the fluid distribution passages of distributor means and the orifice of a spray nozzle, and said threaded member comprises retaining means.

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