

[54] **MULTI-JET SPRAY NOZZLE WITH A MOVABLE SHUTTER MEMBER**

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239/109, 239/452, 239/570

[51] **Int. Cl.**..... **B05b 1/08**

[58] **Field of Search** 239/101, 102, 569,
239/570, 452, 109; 128/40, 62 A, 66

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Primary Examiner—Richard A. Schacher
Attorney—Lane, Aitken, Dunner & Ziems

[57] **ABSTRACT**

A spray nozzle for expelling a jet of fluid, particularly suited for use in massaging the gums by the use of a liquid and for cleaning the teeth, comprises a nozzle body which defines an inner fluid cavity therein and an opening which is limited by a seating surface. A freely-movable shutter member is contained within the inner cavity in the spray nozzle and is arranged so that a bearing surface of the shutter member is pressed against the seating surface of the opening to cover the opening under the action of a fluid pressure. The seating surface of the opening and/or the bearing surface of the shutter member cooperate to define the nozzle aperture having at least one groove which permits passage of the fluid from the inner cavity of the spray nozzle to the exterior thereof. A number of possible configurations for the movable shutter member are disclosed. The grooves which define the nozzle apertures may be located either on the seating surface of the opening in the nozzle body or on the exterior surface of the movable shutter. Preferably, the nozzle is made from a plastic material, or from a plastic material with a metal insert.

44 Claims, 11 Drawing Figures

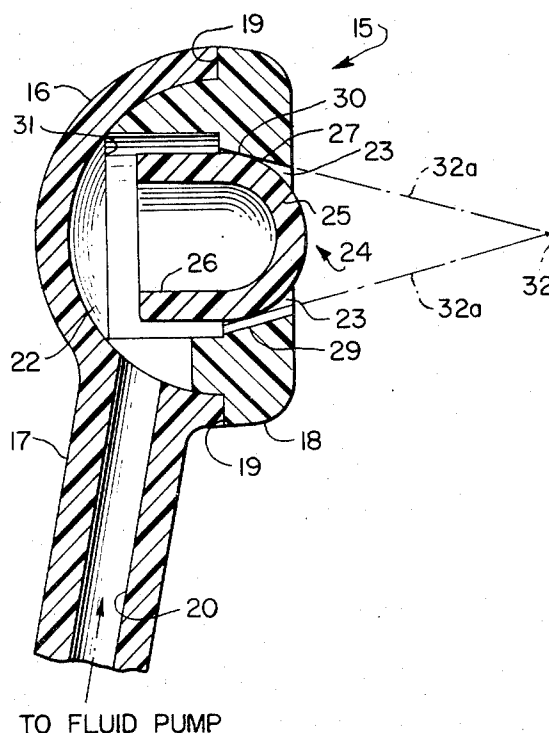


FIG. 1.

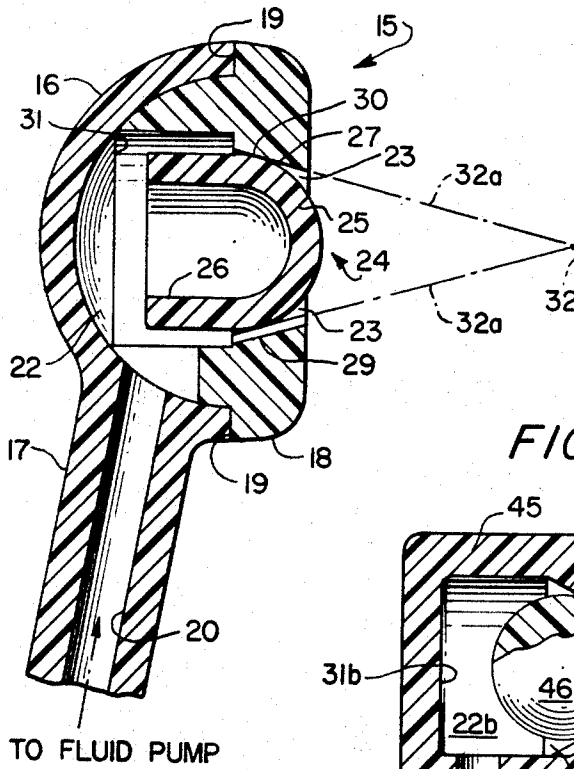


FIG. 2.

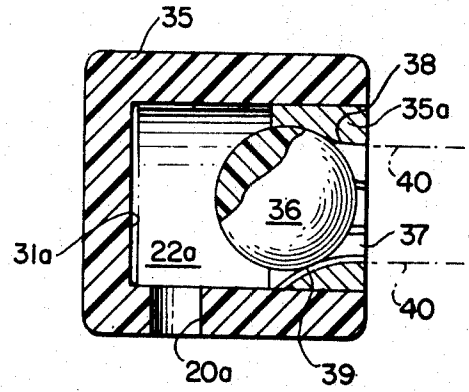


FIG. 3.

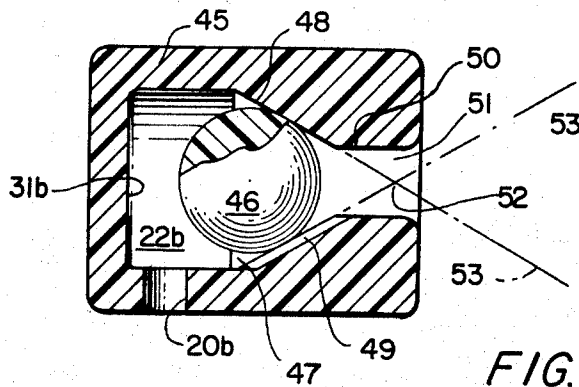


FIG. 4.

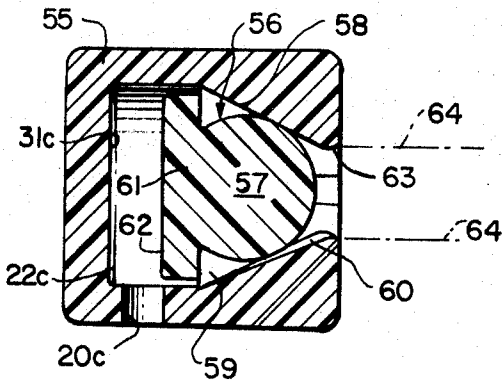


FIG. 5.

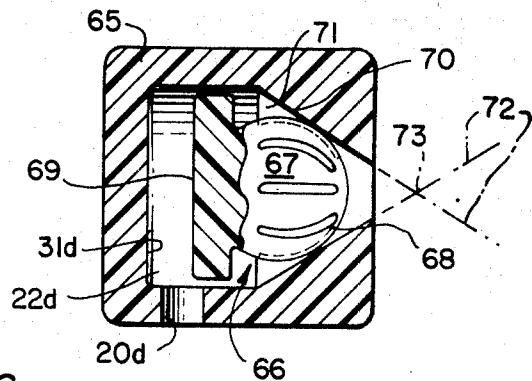
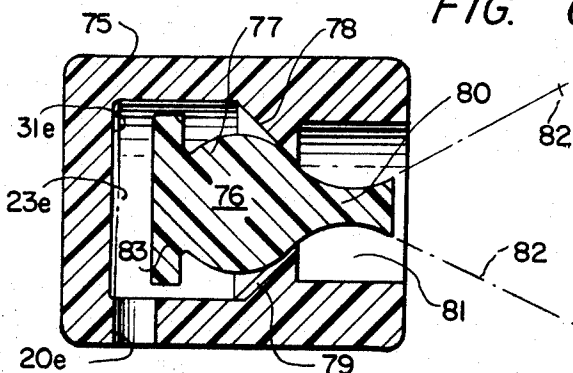


FIG. 6.



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FIG. 7.

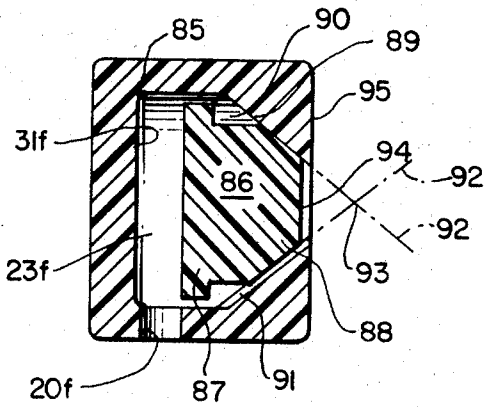


FIG. 8.

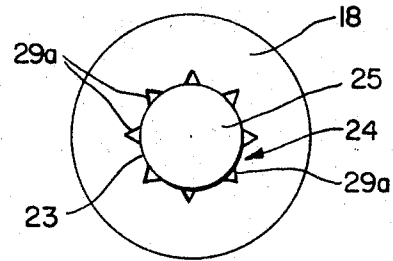


FIG. 9.

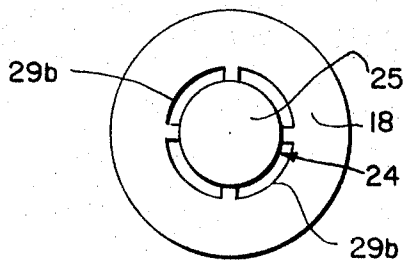


FIG. 10.

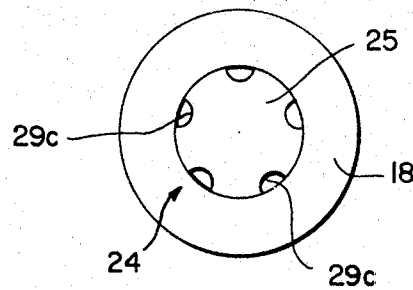
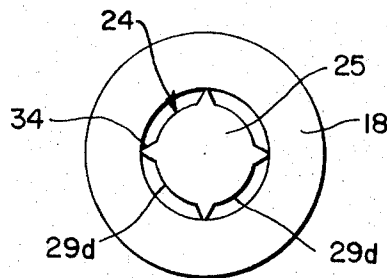


FIG. 11.



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MULTI-JET SPRAY NOZZLE WITH A MOVABLE SHUTTER MEMBER

BACKGROUND OF THE INVENTION

This invention relates to a spray nozzle for spraying a jet of fluid or liquid. More particularly, this invention relates to a spray nozzle for spraying a plurality of pulsed jets of liquid for massaging the gums and cleaning the teeth. Still more particularly, this invention relates to a spray nozzle having a movable shutter member which largely eliminates clogging of the fluid apertures in the nozzle body and which facilitates cleaning of the devices.

A number of spray nozzles for controlling the passage of a fluid are known to the art. In particular, the art has produced a number of devices for cleaning the teeth and for massaging the gums which utilize spray nozzles of the general type described in this description. Thus, spray nozzles of this general type are known to the art which, when used, are connected to a liquid pump which projects a pulsed jet of liquid. An example of such an oral lavage device utilizing one type of spray nozzle is disclosed in the patent to Mattingly, U.S. Pat. No. 3,227,158, issued Jan. 4, 1966.

It is also known in the art to utilize such a spray nozzle as one of a number of interchangeable heads which may be alternatively mounted upon an implement for treatment of the human body. Such devices comprise a hydraulic motor for mechanically driving a tooth brush which can be fastened on the implement and other devices which can be mechanically driven. Examples of such devices are disclosed in the patents to Moret, U.S. Pat. No. 3,536,065, issued Oct. 27, 1970, and Swiss Pat. No. 471,460, as well as in the German published application No. 1,802,838. In those devices, a liquid pump to be connected to the implement either operates the hydraulic motor in the implement or, after shifting the position of a valve, provides a spray nozzle with a fluid through a secondary duct adapted to the implement.

While the art has provided a spray nozzle with one spray aperture for discharging a dense jet of liquid, it has been found advantageous to provide the spray nozzle with a number of distributed spray apertures, each having a relatively small outlet cross section. Such spray nozzles have been disclosed in applications assigned to the assignee of the instant invention as demonstrated in the Swiss patent specification No. 16231/69 and in United States patent applications Ser. Nos. 887,586 and 887,587, each filed on Dec. 23, 1969. With spray nozzles of these kinds in which the spray apertures preferably have very small diameters, for example in the ranges of 0.1 to 0.5 mm., a substantial difficulty is encountered in that these relatively small apertures may become rather promptly stopped by dirt, accumulations of dentifrice or other debris. Such accumulations in these apertures generally can be removed only with some difficulty, for example by passing air through the device under pressure to force the removal of the accumulation or by using a probe, such as a metallic needle, to remove the accumulation from the apertures. Both cleansing operations are time consuming and inconvenient to the user.

It is thus an aim of this invention to provide a spray nozzle of the type described which, while using apertures as small as desired, practically excludes the possibility of plugging such apertures with accumulations or

debris. Moreover, even if such an accumulation exists, it is also an aim of this invention to provide a spray nozzle in which the cleansing of the minute apertures is readily accomplished without dismantling the spray head.

It is an additional aim of this invention to obtain a plurality of jets of fluid having different converging or diverging shapes with different structures of the spray head since, in particular applications, diverse types of sprays are sometimes desirable. By way of a particular example, plural jets of fluid which converge at a predetermined distance may be desired in one application while jets in which the streamlines are essentially parallel, cylindric, or diverging may be desired for other applications. It is thus an aim to provide simple nozzle structures which can produce any of these jet shapes as desired.

It is also an object of this invention to provide a spray nozzle which can produce a converging liquid jet which can be focused at a predetermined distance from the spray nozzle, for example, at a distance of 8 to 12 mm. In this manner, the energy of the liquid concentrated at the focus can be employed by the user to remove the impurities adhering between the teeth. On the other hand, when the device is utilized for massaging purposes, and particularly for massaging the gums, the spray nozzle may be held at a distance correspondingly closer or further from the point to be treated so that the liquid impinges on the gums in the converging or diverging regions of the jet. Thus, the effect of the force applied to the gums may be somewhat controlled by the user.

These and other objects of this invention will become apparent from review of the accompanying written description of the invention taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

Directed to overcoming the difficulties in the prior art and achieving the aims and objects mentioned above, a spray nozzle according to the invention comprises a nozzle body which defines a cavity therein and an opening communicating between the exterior of the nozzle body and the cavity. A freely-movable shutter member is located in the cavity in such a manner that the shutter member may be pressed against the seating surface on the opening by the action of a fluid, such as a liquid under pressure, to substantially cover the opening. The seating surface of the opening or the bearing surface of the shutter member engaging the seating surface of the opening have at least one groove, which, when the shutter member is pressed against the seating surface, acts as a nozzle aperture for the passage of the fluid from the interior of the spray nozzle to its exterior.

In this manner, the shutter member, which is freely movable in the inner cavity of the nozzle body, covers the opening in the body only if there exists some fluid pressure acting against the shutter member. Under this condition, the fluid may escape through the aperture or apertures defined respectively by the groove or grooves on either of the seating surface of the opening or on the bearing surface of the shutter member. On the other hand, when there is no fluid pressure exerted against the shutter member, that is, by interruption of the fluid supply, the shutter member is free to retreat within the housing from the opening and thus uncover the opening. Therefore, no dirt, dentifrice or the like can rest or

accumulate in the aperture or apertures. Because of the mobility of the shutter member, particles remaining in the grooves are generally freely detached from the groove or grooves. In addition, a simple rinsing or brushing of the seating surface of the shutter head after each use will suffice to readily remove the dirt or accumulation from the exposed grooves. These features have substantial advantages over the types of spray nozzles which must be dismantled for cleaning or probed with a needle or the like to remove accumulations in the apertures.

It is further a characteristic of the invention that the shape of the grooves on the seating surface of the opening or on the bearing surface of the shutter member can be selected so that a desired pattern may be provided to the outgoing jet of liquid. By choosing particular groove shapes and characteristics, converging, parallel, cylindric, or diverging jets of liquid may be obtained in a relatively simple manner.

A converging jet of liquid focused at a predetermined distance from the spray nozzle, for example at a distance of 8 to 12 mm., is convenient in that the energy of the liquid concentrated at the focus can be employed by the user to remove particles of impurities adhering between the teeth. On the other hand, when the jet is used for massaging purposes, and particularly for the massaging of the gums, the spray nozzle need only be held at a distance correspondingly nearer or further from the point to be treated so that the liquid emerging from the spray nozzle may impinge upon the gums in the converging or diverging region of the jet.

Structurally, it is convenient for at least one of the surfaces of the shutter member or the opening to be tapered so that a portion of the shutter member may partially enter into the opening and be retained therein under pressure without being expelled from the nozzle body. The seating surface and the bearing surface advantageously can converge outwardly in such a manner that the bearing surface of the shutter member tapers more rapidly than the seating surface of the opening. In this latter case, the bearing surface of the shutter member abuts against the opening in essentially a line of contact so that the tolerance requirements assigned to the spray nozzle to achieve a satisfactory sealing of the opening are small. These tolerances, aside from the tolerances of the grooves, are factor which lead to a more economical manufacturing process for producing the spray nozzle.

Other convenient embodiments of the spray nozzle according to the invention will be better explained by consideration of the drawings which represent a number of embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 shows a cross sectional view of a spray nozzle with a movable shutter member according to the invention wherein the shutter member is defined by a body of revolution, the axial section of which is generally U-shaped, for producing converging jets of fluid;

FIG. 2 is a view of an embodiment of the spray nozzle according to the invention, partially in cross section, which utilizes a spherically-shaped shutter member cooperating with a curved seating surface on the opening for producing parallel or cylindric jets of fluid;

FIG. 3 is a view of an embodiment of the spray nozzle of the invention partially in cross section and similar to

the embodiment of FIG. 2, which utilizes a spherically-shaped shutter member cooperating with a conical seating surface on the opening for producing diverging jets of fluid from the nozzle body;

FIG. 4 is a cross sectional view of an embodiment of the spray nozzle of the invention wherein the shutter member comprises a generally spherically-shaped head portion and a rearwardly protruding projection for producing parallel or cylindric jets of fluid;

FIG. 5 is a view of an embodiment of a spray nozzle of the invention, partially in cross section, and similar to the embodiment of FIG. 4, wherein the grooves are located on the spherically-shaped head portion of the shutter member for producing converging-diverging jets of fluid;

FIG. 6 is a cross sectional view of an embodiment of the spray nozzle of the invention wherein the shutter member includes a shaped projection which protrudes outwardly through the opening in the spray nozzle to produce diverging jets of liquid;

FIG. 7 is a cross sectional view of an embodiment of the spray nozzle of the invention having a conical shutter head mating with a conical opening for producing converging-diverging jets of fluid; and

FIGS. 8-11 show a front view of the spray nozzle according to FIG. 1 illustrating different cross sectional shapes for the grooves wherein FIGS. 8 and 9 illustrate variously-shaped grooves on the seating surface of the opening and FIGS. 10 and 11 show the variously-shaped grooves arranged circumferentially on the shutter members.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, a spray nozzle according to the invention comprises a nozzle body, designated generally by the reference numeral 15, which includes a rear housing member 16 and a forward housing member 18. As shown, the rear housing member 16 is hemispherically-shaped and includes an inlet portion 17 connected to the housing 16. The inlet portion 17 is preferably integrally formed with the housing 16. The forward housing member 18 is connected to the rear housing member 16 such as by a threaded engagement (not shown) at the engaging surfaces 19 or by other suitable means for providing a fluid-tight connection.

The nozzle body 15 may assume a variety of shapes. For example, the rear housing may be generally cylindrical and closed on the rearward surface and arranged for receiving the forward housing member as an insert in the open forward end of the rear housing. This alternative is representatively shown in FIG. 2.

The inlet portion 17 of the spray nozzle 15 forms a handle for the convenience of the user. A fluid inlet conduit 20 is formed in the inlet portion 17 of the spray nozzle 15 to permit the passage of fluid, for example, through a flexible conduit (not shown) from a fluid pump (not shown) to the interior of the spray nozzle 15. In accordance with the teachings in the art, the fluid provided in the conduit 20 from the fluid pump may be a pulsated flow of liquid. On the other hand, the spray nozzle 15 together with an inlet portion 17 may be adapted for use on a known hand implement which is connected to a liquid pump.

The rear housing 16 and the front housing 18 together define a cavity 22 within the spray nozzle 15. The front housing 18 defines an opening 23 which com-

municates between the exterior of the spray nozzle and the cavity 22. Preferably, the cross sectional configuration of the opening 23 is circular. A freely-movable shutter member 24 is located in the cavity 22 of the spray nozzle 15. The shutter member 24 has the shape of a body of revolution comprising a generally hemispherical forward portion 25 and a generally cylindrical rearward portion 26. The shutter member of FIG. 1 is thus generally U-shaped when viewed along its axial section.

The outwardly tapering limiting wall of the opening 23 in the front housing 18 forms a seating surface 27 in the front housing 18. The seating surface 27 is adapted for receiving the semi-circularly shaped forward portion 25 of the shutter member 24. The seating surface 27 also defines a plurality of circumferentially spaced grooves 29 which, cooperation with the shutter member 24, define the apertures in the head of the spray nozzle when the shutter member is disposed in contact with the opening 23.

The possible free clearance for the shutter member 24 is limited by the inner portion 31 of the wall of the rear housing member 16 opposite to the opening 23, so that the shutter member 24 is not permitted to slide completely inwardly away from the opening 23. In this manner, the shutter member 24 is maintained in its required orientation to obtain the covering position relative to the opening 23 shown in FIG. 1, while the inner portion of the seating surface 27 of the opening 23 aids in guiding the shutter member 24 into the position shown in FIG. 1 when fluid pressure is applied to the nozzle body 15 through the conduit 20.

In the absence of a fluid pressure from the fluid pump to the interior of the spray nozzle 15, the shutter member 24 within the cavity 22 can move freely inwardly from the position shown in FIG. 1 to expose the seating surface 27 and the circumferentially spaced grooves 29 in the opening 23. Thus, when the shutter member 24 is in that position, the grooves 29 may be readily cleaned when desired by rinsing with water or by brushing. This feature is particularly advantageous when the fluid is a liquid antiseptic solution or a solution containing a dentifrice. In this manner, the grooves 29 in the opening 23 (as well as a portion of the interior of the nozzle 15) may be readily cleaned after each use.

When a fluid under pressure is applied to the interior of the spray nozzle 15, the shutter member 24, under the pressure of the fluid, is pressed from within the cavity 22 of the spray nozzle 15 against the seating surface 27 of the opening 23 so that the region of the bearing surface of the shutter member, indicated by the reference numeral 30, effectively seals the opening 23 except for the presence of apertures defined by the grooves 29. Thus, the fluid from the fluid pump can escape from the interior of the nozzle body 15 only through the apertures defined by the grooves 29.

Due to the outwardly converging conical shape of the seating surface 27, the spray nozzle 15 of FIG. 1 delivers a converging jet of fluid as shown by the streamlines designated by the reference numeral 32a. The converging streamlines 32a are focused on a focal point, designated generally by the reference numeral 32, which is conveniently located at a distance of about 8-12 mm., and preferably about 9-10 mm., from the front surface of the spray nozzle 15 so that the energy of the fluid concentrated at the focal point 32 may be used particularly for cleaning impurities which stick in

the spaces between the teeth. For rinsing, and for particularly massaging the gums, the user of the spray nozzle 15 can employ the converging region or the diverging region of the jet respectively nearer to or further from the nozzle body 15 relative to the focal point 32 by maintaining the nozzle head 15 at a lesser or greater distance from the point to be treated.

After interruption of the fluid supply to the nozzle body, the shutter member 24 again is freely movable to expose the seating surface 27 so that practically no particles or impurities can remain in the grooves 29, a difficulty which frequently occurred with spray nozzles having tiny apertures as has been previously described. A brief rinsing with water after each use of the spray nozzle 15 suffices generally to remove the remaining particles from the grooves 29. If stubborn particles remain, a light brushing will suffice to remove those particles from the grooves 29 as well.

The cross sectional configuration of the grooves 29 may be formed in a variety of shapes or configurations as desired as will be described in connection with the embodiments of FIGS. 2-7. Moreover, the grooves 29 may be located in either the seating surface 27 of the opening 23 as shown in FIG. 1, or in the bearing surface 30 of the shutter member 24, as will be described in connection with FIGS. 8-11.

FIGS. 8 and 9 are schematic frontal views of the spray nozzle 15 as disclosed in FIG. 1 showing two possible alternative cross sections for the grooves 29. In FIG. 8, the front housing 18 is shown defining the opening 23 with the forward portion 25 of the shutter member 24 located therein as would be the case of the shutter member 24 being influenced by fluid pressure. In this embodiment, the grooves are shown as generally triangular grooves 29a, while in FIG. 9 the grooves are shown as generally circular ring section grooves 29b. The grooves 29 may assume other shapes as well, for example the shapes shown in FIGS. 10 and 11.

Instead of providing the grooves in the seating surface 27 of the opening 23 as shown in FIGS. 1-4 and 6-9, the grooves 29 as shown in FIG. 1 can be placed in the region of the bearing surface 30 of the shutter member 24. As examples of this embodiment, FIGS. 10 and 11 show two different cross sections of the grooves located on the shutter member 24. FIG. 10 illustrates rounded or generally semi-circular grooves 29c, while FIG. 11 discloses circularly arcuated grooves 29d. In the latter case, these slitted grooves are formed by longitudinal ribs 34 on the peripheral wall of the shutter member 24.

The embodiments of FIGS. 2 through 7 disclose the manner by which the shape of the shutter members may be varied and the manner by which liquid jets of a predetermined pattern may be obtained by varying the particular shape of the seating surface and/or the bearing surface of the shutter member. For simplicity, the nozzle bodies in FIGS. 3 through 7, designated respectively by the reference numerals 45, 55, 65, 75 and 85 respectively, are illustrated as a one-piece construction, while the body of FIG. 2 is represented as a two-piece plastic-metal construction, designated by reference numerals 35 and 35a. However, in practice, these bodies generally consist of two or more pieces, such as the embodiments shown and described in connection with FIGS. 1 and 2. In addition, details of the inlet portion 17 and the inlet connection have been eliminated to simplify reproduction of these embodiments. In each

instance, the inlet conduit 20, the cavity 22, and the rear wall 31 have been designated by reference numerals corresponding to those utilized in connection with FIG. 1 followed by the letters a through f in the embodiments of FIGS. 2-7 respectively. In each instance, the operation of the nozzle member is like that described in connection with FIG. 1.

In FIG. 2, the spray nozzle includes a generally spherically-shaped shutter member 36 disposed in the cavity 22a. The body 35a of the spray nozzle defines an opening 37 having a curved seating surface 38. A plurality of spaced grooves 39 are located on the seating surface 38 and generally follow the contour of the curved seating surface 38. Thus, essentially cylindrical jets of liquid as indicated by the streamlines 40 are obtained since the grooves 39 at the outlet portion of the opening 37 are substantially parallel.

In FIG. 3, the spray nozzle includes a generally spherical member 46 similar to the spherical member 36 in FIG. 2 which cooperates with a conical seating surface 48 on the opening 47. The conical seating surface 48 defines a plurality of grooves 49. The opening 47 is further extended within the nozzle body which defines a generally tubular wall portion 50 defining an opening 51 which communicates with the opening 47. The axial length of the opening 51 defined by the wall portion 50 is greater than the distance of the focus 52 of the jets of fluid. Thus, the user can only utilize the diverging portion of the jets of liquid, the streamlines of which are designated generally by the reference numerals 53. Such an embodiment is convenient when the user must exclude the possibility of unintentionally causing the focused, concentrated fluid to flow directly onto the gums, for example, where concentrated energy could cause irritation. In such an embodiment, the force exerted by the diverging fluid is less than the force which would be exerted by the fluid at the focal point 52.

In FIG. 4, the spray nozzle includes a shutter member designated generally by the reference numeral 56 within the body 55 of the nozzle. The shutter member 56 includes a spherical head portion 57 which cooperates with the seating surface 58 on the wall defining the opening 59. The grooves 60 located on the seating surface 58 in the opening 59 have a cross section which becomes wider outwardly in a conical form. Thus, the width of the grooves 60 at the outlet of the opening is greater than at any inner portion of the grooves. The shutter member 56 also includes a rearwardly extending protrusion 61 which presents a relatively flat surface 62 to the fluid (in a manner similar to a piston face) which extends substantially over the largest portion of the cross section of the internal cavity 22c of the nozzle body 55 and simultaneously limits the inwardly extending clearance of the shutter member.

The shape of the grooves 60 and the forward slightly curved region 63 of the limiting wall of the opening 59 generates liquid jets with an essentially parallel or cylindrical pattern as shown by the streamlines 64 of the emerging jets of fluid.

The spray nozzle of FIG. 5 has a shutter member 66 which includes a spherically-shaped head portion 67 having grooves 68 disposed therein and a rearwardly directed protrusion 69. Structurally, the shutter member 66 in FIG. 5 is similar to the structure of the shutter member 56 in FIG. 4 but wherein the grooves 68 are located on the shutter member rather than on the seating surface. The shutter member 66 cooperates with

the ungrooved conical seating surface 70 defining the opening 71 in order to generate converging jets as designated by the streamlines 72 having a focus at a point designated by the numeral 73. In the embodiment of FIG. 5, the rearward protrusion 69 on the shutter member 66 and the rearwardly extending region of the cavity 22d defined by the nozzle body 65 are adapted to insure that the shutter member 66 maintains the orientation needed for achieving the covering position and that, when in this position, the grooves 68 are essentially parallel with the central axis of the opening 71.

In FIG. 6, the spray nozzle includes a shutter member 76, the central portion 77 of which is spherically curved and which cooperates with the conical seating surface 78 having grooves 79 therein. The shutter member 76 further includes a forwardly extending protrusion 80 which projects outwardly into an opening 81 beyond the region of the seating surface 78. The last-named protrusion generates diverging jets of fluid, shown by the streamlines 82, because of its outwardly diverging shape. The forward protrusion 80 may also be shortened or merged into a cylindrical projection in such a way that a cylindrical jet of liquid is obtained, in a manner similar to the streamlines of FIGS. 2 and 4. The shutter member 76 further includes a rearwardly extending protrusion 83 which cooperates with the body 75 and the cavity 23e therein in a manner similar to that described in connection with FIGS. 4 and 5.

In FIG. 7, the spray nozzle includes a shutter member 86 which includes a rearwardly extending protrusions 87 and a conical forward portion 88 which cooperates with the conical seating surface 89 defining the opening 90. The conical seating surface 89 defines a plurality of grooves 91 therein. The extent of the forward surface 94 of the forward portion 88 of the shutter member 86 when positioned in the opening 90 is slightly rearward of the forward surface 95 of the body 85. In this manner, converging jets of fluid shown by the streamlines 92 will be obtained having a focus indicated by the reference numeral 93.

When the clearance available for the shutter member in any of the embodiments described in FIGS. 4-7 is a result of its rearward shape relative to the shape of the rearwardly extending portion of the inner cavity in the nozzle body and results in limiting the rearward protrusion so that the shutter when in a position covering the opening in the front portion of the nozzle body always takes the same orientation, the grooves which form the nozzle apertures may also or in the alternative be placed on the periphery of the shutter head. In addition, when the shutter member is a symmetrical body of revolution, as in the examples of FIGS. 1 and 4-7, the grooves, instead of being provided on the seating surface of the opening may be provided on the periphery of the shutter member since the shutter member can essentially only rotate about its axis of symmetry. When the seating surface along with the region of the bearing surface of the shutter member which cooperates with the seating surface converges outwardly to a different degree as in the embodiments of FIGS. 1 to 6, there will be essentially a line of contact between the shutter member and the seating surface in the covering position so that the manufacture of the nozzle body and of the shutter members is not subject to substantial tolerance requirements for the primary reason that the shutter adjusts itself into the covering position.

The section of the grooves may be of any shape and particularly they may correspond to the shape shown in FIGS. 8 to 11. In addition, the grooves may also diverge in the longitudinal direction.

The nozzle body and the shutter of the shutter member of the spray nozzle according to the invention are preferably made from plastic material, although a plastic nozzle body having a metallic insert corresponding to the forward housing 35a can also be used in practicing the invention.

The invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the claims rather than by the foregoing description, and all changes which come within the meaning and range of the equivalents of the claims are therefore intended to be embraced therein.

What is claimed is:

1. A spray nozzle for expelling a fluid therefrom comprising:

a nozzle body which defines a cavity therein and includes a surface which defines an opening communicating with the cavity and the exterior of the nozzle body, at least a portion of said surface being characterized as a seating surface, said nozzle body including fluid receiving means for receiving a fluid under pressure, and

a freely-movable shutter member disposed in said cavity, said shutter member being free from permanent structural connection to said nozzle body and capable of being located at least in a first position in said cavity substantially free from structural contact with said seating surface on said opening, said shutter member including a bearing surface characterized as being capable of securely cooperating in a second position with said seating surface on said opening when said shutter member is subjected to a fluid pressure to cover substantially said opening to define in said second position at least a nozzle aperture for directing the passage of said fluid from said cavity to the exterior of said nozzle body and for directly discharging a jet of said fluid from said nozzle body, said nozzle aperture being readily accessible from the exterior of the nozzle body when said shutter member is in said first position in the absence of fluid pressure for cleaning said aperture and said nozzle body, said freely-movable shutter member being further characterized as being freely-movable from said first position to said second position under fluid pressure and capable of retreating from said bearing surface to said cavity in the absence of said fluid pressure to substantially uncover said opening.

2. The spray nozzle as set forth in claim 1 wherein either one of said seating surface or said bearing surface includes at least a groove thereon, said groove defining said nozzle aperture when the bearing surface of said shutter member cooperates in said second position with said seating surface when said nozzle member is subjected to said fluid pressure.

3. The spray nozzle as set forth in claim 2 wherein at least one of said seating surface and said bearing surface taper outwardly so that at least a portion of said shutter member can be engaged with said opening without expelling said shutter member from said nozzle

body when said shutter member is subjected to a fluid pressure.

4. The spray nozzle as set forth in claim 3 wherein said seating surface tapers more rapidly than said bearing surface.

5. The spray nozzle as set forth in claim 4 wherein either of said seating surface and said bearing surface is conical and the other is curved in the direction of the escape of said fluid from said nozzle body.

6. The spray nozzle as set forth in claim 4 wherein both of said seating surface and said bearing surface are curved in the direction of the escape of said fluid from said nozzle body.

7. The spray nozzle as set forth in claim 3 wherein both of said seating surface and said bearing surface are conical.

8. The spray nozzle as set forth in claim 3 wherein said shutter member is defined by a symmetrical body of revolution and said nozzle body structurally cooperates with said shutter member to maintain said shutter member in a predetermined orientation relative to said opening.

9. The spray nozzle as set forth in claim 8 wherein said predetermined orientation is maintained by the clearance between said nozzle body and said shutter member.

10. The spray nozzle as set forth in claim 8 wherein said shutter member comprises a generally spherical forward portion and a generally cylindrical rearward portion, said shutter member further being characterized as having a generally U-shaped axial cross section, said forward portion extending into said opening when said shutter member is subjected to fluid pressure, and wherein stop means are provided in said nozzle body for impeding the complete inward sliding of said shutter member from said opening.

11. The spray nozzle as set forth in claim 10 wherein said stop means comprise the inner wall of said nozzle body opposite said opening.

12. The spray nozzle as set forth in claim 3 wherein said shutter member is spherically-shaped.

13. The spray nozzle as set forth in claim 2 wherein said shutter member includes a rearwardly extending protrusion which cooperates with said nozzle body to maintain said shutter member in a predetermined orientation relative to said opening.

14. The spray nozzle as set forth in claim 13 wherein said protrusion is generally piston-shaped and occupies the largest portion of the cavity in said nozzle body.

15. The spray nozzle as set forth in claim 13 wherein the portion of the cavity of said nozzle body which cooperates with said protrusion is shaped like said protrusion.

16. The spray nozzle as set forth in claim 1 wherein either one of said seating surface or said bearing surface includes a plurality of grooves thereon, said grooves defining a plurality of nozzle apertures in said nozzle body for the passage of a plurality of jets of fluid from said cavity to the exterior of said nozzle body when said shutter member cooperates in said second position with said opening when subjected to a fluid pressure, and wherein at least one of said seating surface and said bearing surface tapers outwardly so that at least a portion of said shutter member can be engaged with said opening without expelling said shutter member from said nozzle body when said shutter member is subjected to a fluid pressure.

17. The spray nozzle as set forth in claim 16 wherein said shutter member is defined by a symmetrical body of revolution and said nozzle body structurally cooperates with said shutter member to maintain said shutter member in a predetermined orientation relative to said opening.

18. The spray nozzle as set forth in claim 17 wherein said predetermined orientation is maintained by the clearance between said nozzle body and said shutter member.

19. The spray nozzle as set forth in claim 16 wherein said shutter member comprises a generally spherical forward portion and a generally cylindrical rearward position, said shutter member further being characterized as having a generally U-shaped axial cross section, said forward portion extending into said opening when said shutter member is subjected to fluid pressure, and wherein stop means are provided in said nozzle body for impeding the complete inward sliding of said shutter member from said opening.

20. The spray nozzle as set forth in claim 19 wherein said stop means comprise the inner wall of said nozzle body opposite said opening.

21. The spray nozzle as set forth in claim 16 wherein said shutter member is spherically-shaped and said grooves are provided in said seating surface.

22. The spray nozzle as set forth in claim 16 wherein said shutter member is spherically-shaped and said grooves are provided on said shutter member.

23. The spray nozzle as set forth in claim 16 wherein said shutter member includes a rearwardly extending protrusion which cooperates with said nozzle body to maintain said shutter member in a predetermined orientation relative to said opening.

24. The spray nozzle as set forth in claim 23 wherein said protrusion is generally piston-shaped and occupies the largest portion of the cavity in said nozzle body.

25. The spray nozzle as set forth in claim 23 wherein the portion of the cavity of said nozzle body which cooperates with said protrusion is shaped like said protrusion.

26. The spray nozzle as set forth in claim 16 wherein said seating surface and said bearing surface cooperate to produce a plurality of jets of fluid which converge.

27. The spray nozzle as set forth in claim 26 wherein the focal point for the converging plurality of jets is located at a distance of about 8 to 12 mm. from said nozzle.

28. The spray nozzle as set forth in claim 16 wherein said seating surface and said bearing surface cooperate to produce a plurality of jets of liquid which are substantially parallel.

29. The spray nozzle as set forth in claim 16 wherein said seating surface and said bearing surface cooperate to produce a plurality of jets of liquid which form a generally cylindrical streamline.

30. The spray nozzle as set forth in claim 16 wherein said seating surface and said bearing surface cooperate to produce a plurality of jets of liquid which diverge.

31. The spray nozzle as set forth in claim 16 wherein said seating surface and said bearing surface cooperate to produce a plurality of jets of fluid which converge, and wherein said nozzle body defines a generally tubular opening which communicates with said opening defined by said surface, the axial length of said opening being greater than the distance of the focal point of the converging jets from the apertures of said nozzle body.

32. The spray nozzle as set forth in claim 16 wherein said shutter member includes an outwardly-extending protrusion which projects outwardly of said opening when said shutter member is subjected to fluid pressure.

33. The spray nozzle as set forth in claim 32 wherein said outwardly-extending protrusion cooperates with said opening to produce a plurality of jets of fluid which diverge.

34. The spray nozzle as set forth in claim 16 wherein the cross-sectional configuration of said grooves is any one of the following: round triangular, rectangular, or circularly arcuate.

35. The spray nozzle as set forth in claim 16 wherein the cross-section of said grooves diverges in the longitudinal direction of said seating surface of said opening.

36. The spray nozzle as set forth in claim 16 wherein said nozzle body and said shutter member are made from plastic material.

37. The spray nozzle as set forth in claim 16 wherein said nozzle body is defined by a first member made from plastic and a second member made from metal and said second member defines said opening.

38. The spray nozzle as defined in claim 1 wherein said spray nozzle is particularly adapted for cleaning the teeth and massaging the gums by the use of said fluid.

39. The spray nozzle as defined in claim 16 wherein said spray nozzle is particularly adapted for cleaning the teeth and massaging the gums by the use of said fluid.

40. The spray nozzle as set forth in claim 1 in combination with:

a source of fluid, and

means for providing said fluid under pressure from said source to said nozzle body.

41. A method for expelling a fluid from a nozzle body comprising the steps of:

providing a source of fluid to a nozzle body which defines a cavity therein and includes a surface which defines an opening communicating with the cavity and the exterior of the nozzle body, at least a portion of said surface being characterized as a seating surface, said nozzle body including fluid receiving means for receiving said fluid under pressure, a freely-movable shutter member disposed in said cavity, said shutter member being free from permanent structural connection to said nozzle body and capable of being located at least in a first position in said cavity substantially free from structural contact with said seating surface on said opening, said shutter member including a bearing surface characterized as being capable of securely cooperating in a second position with said seating surface on said opening when said shutter member is subjected to a fluid pressure to cover substantially said opening in said second position to define at least a nozzle aperture for directing the passage of said fluid from said cavity to the exterior of said nozzle body, and for directly discharging a jet of said fluid from said nozzle body, said nozzle aperture being readily accessible from the exterior of the nozzle body when said shutter member is in said first position in the absence of fluid pressure for cleaning said aperture and said nozzle body, said freely-movable shutter member being further characterized as being freely-movable from said first position

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to said second position under fluid pressure and capable of retreating from said bearing surface to said cavity in the absence of said fluid pressure to substantially uncover said opening; and causing said fluid to pass under pressure from said source of fluid through said nozzle aperture to produce said jet.

42. The method as set forth in claim 41 further in-

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cluding the step of utilizing said jet for body care.

43. The method as set forth in claim 42 wherein the step of utilizing includes the step of cleaning the teeth.

44. The method as set forth in claim 42 wherein the step of utilizing includes the step of massaging the gums.

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