United States Patent [19]

Parkison

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[54] **LAMINAR-FLOW SPOUT-END DEVICES**

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[73] Assignee: **American Standard Inc.,** New York, N.Y.

[22] Filed: **Sept. 20, 1971**

[21] Appl. No.: **182,121**

Related U.S. Application Data

[63] Continuation of Ser. No. 734,994, June 6, 1968, abandoned.

[52] **U.S. Cl.** **239/590.5**

[51] **Int. Cl.** **B05b 1/22**

[58] **Field of Search** 239/428.5, 548, 552, 239/590, 590.3, 590.5

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Primary Examiner—Allen N. Knowles
Assistant Examiner—Michael Mar
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[57] **ABSTRACT**

This invention comprises a fluid flow device for producing a coordinated stream of fluid from a spout. The exiting stream will be substantially free of splashes when the exiting stream is flowing at normal velocities. The fluid flow device includes a body having a plurality of independent nozzles, which may be seven in number, for example. In a preferred embodiment, one of the nozzle sections will be centrally disposed with its axis coinciding with the axis of the device, while the remaining nozzle sections will be spaced equally from the central nozzle section and peripherally arranged about the central section and pitched at substantially the same relative angle with respect to the central section. The diameters of all of the nozzle sections will be uniform and the lengths of all of the nozzle sections will be substantially the same.

10 Claims, 16 Drawing Figures

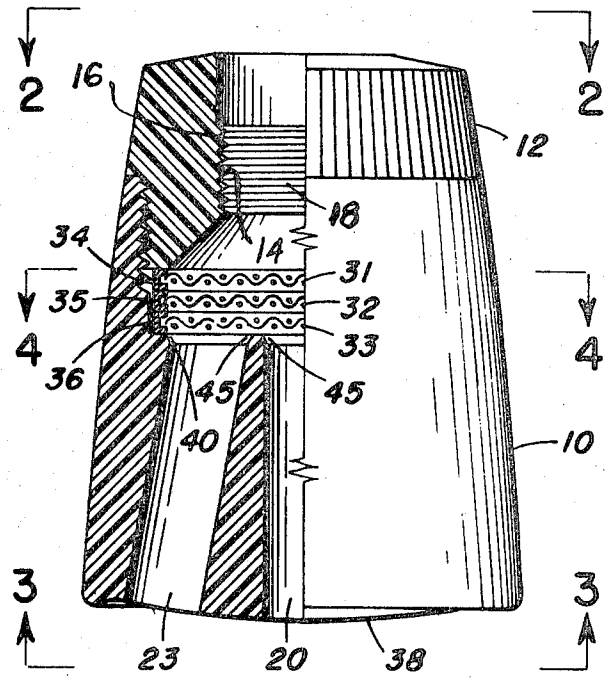


Fig. 2.

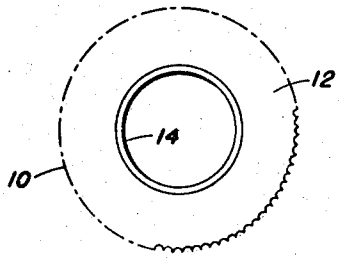


Fig. 1.

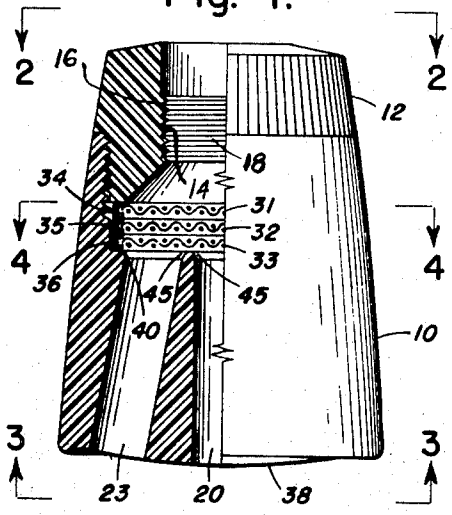


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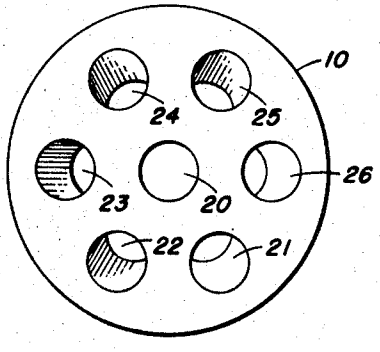


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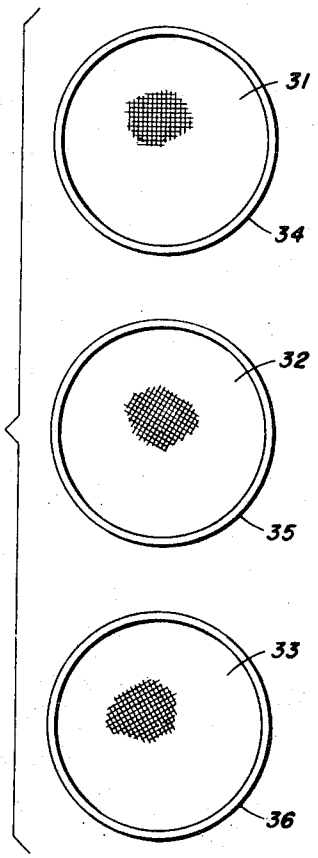


Fig. 9.

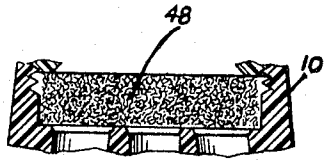


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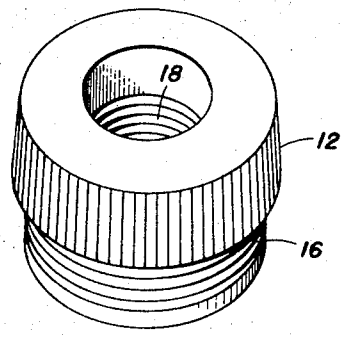


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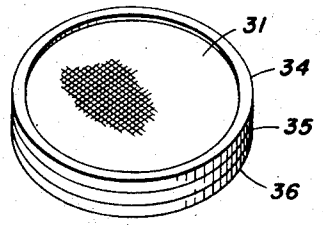
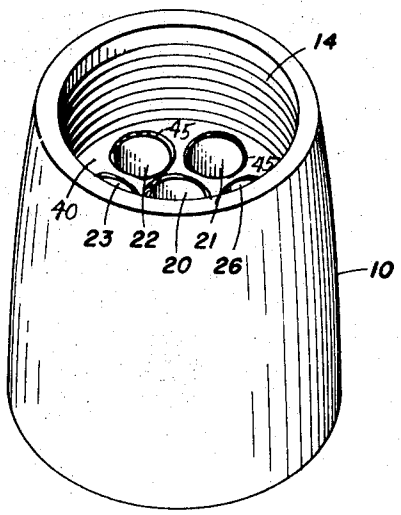


Fig. 7.



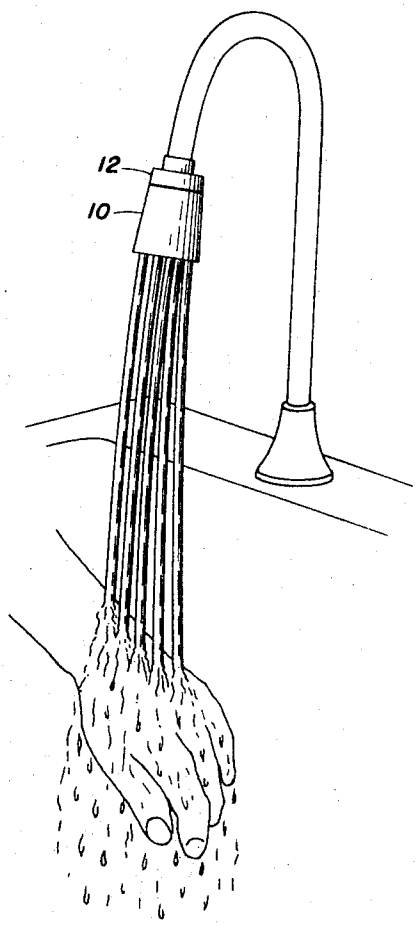


Fig. 8.

Fig. 12.

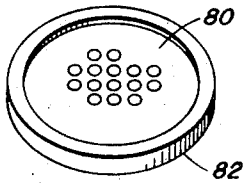


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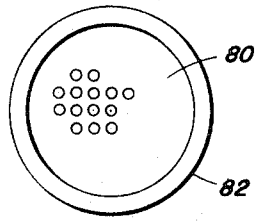


Fig. 11.

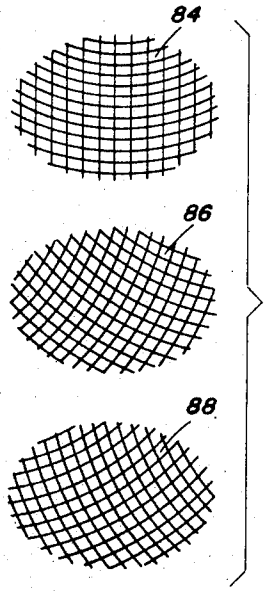


Fig. 14.

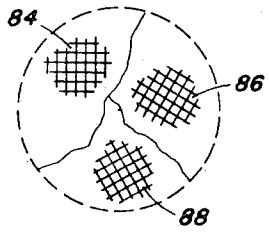


Fig. 10.

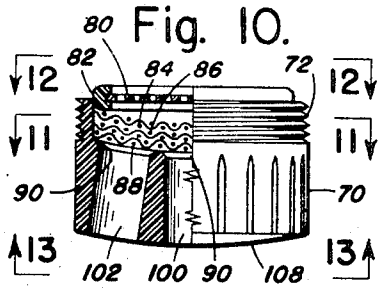


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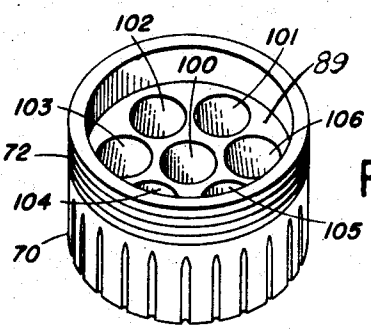
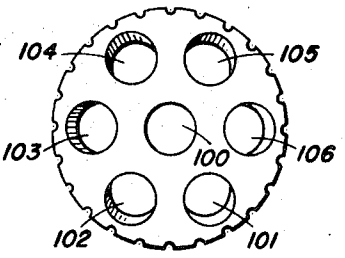


Fig. 16.



LAMINAR-FLOW SPOUT-END DEVICES

This application is a continuation of application Ser. No. 734,994, filed June 6, 1968, bearing the same title but now abandoned.

This invention relates, in general, to fluid flow devices, such as spout-ends, for use in or with spouts and, more particularly, to fluid flow devices employing a plurality of nozzles which are coordinated and interrelated with each other so as to constitute a single or composite discharge device for emitting a substantially continuous and coordinated stream of fluid, such as water, which will be substantially free of splashes when striking objects being rinsed under the stream.

In connection with sinks and lavatories, it is frequently desirable, for various reasons, to employ a spout or spout-end for producing a stream of fluid which will be substantially free of splashes. Such splash-less sinks or lavatories are especially desirable in laboratories and hospitals and more especially for surgeons' scrub-up sinks. Any fluid flow device for use in a scrub-up sink may have, in or adjacent to the receptacle of the sink or lavatory, harmful and contaminating organisms which, if scattered by a stream of water, will quite often spread the organisms throughout the receptacle and, as may also happen, drive them out of the sink or lavatory and into the surrounding or adjacent room or rooms. Public health authorities and services have been especially critical of sinks or lavatories having spout devices emitting splash-producing fluid jets which inherently have the deficiencies above-noted. It is, therefore, desirable to avoid any such dissemination of harmful chemicals or organisms for the protection of the public health and for other purposes which would be apparent to those familiar with the problems arising from such matters.

Furthermore, spout devices for lavatories and sinks have oftimes employed aerators, that is, spout devices or spout-ends having air inlet ports. However, such devices are also deficient because their inlet ports are not cleaned and flushed with the running water. A sponge, for example, used to clean the aerator will generally spread the contaminating organisms. It is, therefore, desirable to employ a fluid control device which is free of aerators or other air inlet or like devices. Another type of device which has been used recently for producing a more or less continuous laminar flow in spout structures for kitchens and lavatories employed a so-called "rosette" or fluid straightener. One such structure is shown and described in connection with FIG. 2 of U.S. Pat. No. 3,321,140, issued May 23, 1967, entitled "Fluid Flow Device Including a Parallel Passageway Flow Straightener," which is assigned to the same assignee as the present application.

Neither the aerator spout device nor the fluid straightener embodying a "rosette" produced a substantially splash-less stream for washing the hands or other objects under the stream of fluid.

And it is especially desirable, in accordance with this invention, to employ a fluid flow device which is or would be constantly self-cleaning throughout its normal use and operation. That is, every use and operation of the fluid flow device during which water or other fluid is transmitted therethrough will serve not only to produce the fluid stream of the desired characteristics but also to simultaneously and continuously cleanse the device of any internal contamination.

It is accordingly one of the main objects of this invention to devise a fluid flow device, such as a spout or spout-end, so organized and channeled that it will virtually eliminate splashing when the device emits its stream of fluid for washing the hands, or rinsing the hands, or when washing or rinsing any irregularly shaped object against which the stream is directed.

It is another of the objects of this invention to produce a fluid flow device which will generate a continuous stream of fluid which will be substantially a splash-less flow during its operation at normal flow rates.

It is still another of the objects of this invention to devise a multiple nozzle structure which is arranged so that the several ports will emit corresponding streams which will be coordinated and interrelated as they are emitted from the various component nozzles to thereby produce a substantially continuous and even pattern of flow.

Still another of the objects of the present invention is to provide a device for producing a coordinated laminar stream of fluid from a faucet and especially a splash-less stream. It is important to devise such a device which would be relatively inexpensive, and, moreover easy to manufacture.

This invention will be better understood from the more detailed description hereinafter following when read in connection with the accompanying drawing in which

FIG. 1 illustrates a lateral plan view, partly in section, of a form of multiple nozzle spout device of this invention;

FIG. 2 shows a top plan view of the spout device of FIG. 1, when observed along the lines 2—2 of FIG. 1;

FIG. 3 designates a bottom plan view of the spout device of FIG. 1, when viewed along the line 3—3 of FIG. 1;

FIG. 4 shows the screens of the device of FIG. 1 and the relative angles of their cross-meshes when viewed from position 4—4 of FIg. 1;

FIGS. 5, 6 and 7 respectively illustrate perspectives of the cap, the screens and the body of the spout device of FIG. 1;

FIG. 8 shows the spout mechanism of FIG. 1 when employed for a scrub-sink and the nature of the generated fluid flow pattern;

FIG. 9 shows a foam material as a replacement for the screens;

FIG. 10 represents a lateral plan view, partly in section, of still another form of multiple spout device according to this invention;

FIG. 11 shows a schematic and composite view of the screens of the device of FIG. 10 when viewed along the line 11—11 of FIG. 10;

FIG. 12 shows a plan view of the strainer of FIG. 10 which may be observed from line 12—12 of FIG. 10;

FIG. 13 illustrates a bottom plan view of the spout device of FIG. 10 as would be seen from line 13—13 of FIG. 10;

FIG. 14 shows schematically the screens employed in the FIG. 10 device; FIG. 15 shows a perspective of the strainer of the device of FIG. 10; and

FIG. 16 illustrates a perspective of the base of the FIG. 10 structure.

Similar reference characters will be employed in the drawing to designate the same or similar parts.

The housing of the multiple nozzles spout-end of this invention includes a body **10** and an externally serrated cap **12**, the body **10** having an internally threaded section **14** which joins the externally threaded section **16** of the cap **12**. The cap **12** also includes an internally threaded section **18** which may join the usual threaded portion of the spout through which fluid such as water may normally flow.

The body **10** of the housing of the spout end includes seven nozzle sections for illustrative purposes, these including a central nozzle section **20** and six adjacent nozzle sections **21**, **22**, **23**, **24**, **25** and **26**. The central nozzle section **20** has its axis co-linear with the axes of the body **10** and the cap **12**. The remaining six nozzle sections are arranged to be spaced peripherally as shown, so that their axes are uniformly spaced from the axis of the nozzle section **20**, but they are pitched or inclined at a predetermined angle of, for example, 9° with respect to the axis of the central nozzle section **20**, so that the streams emitted therefrom will be diverted from each other by a small predetermined angle. If desired the central nozzle section may be omitted in which case the peripheral nozzle sections may be more closely spaced from each other.

The arrangement embodies three screens **31**, **32** and **33** each held within its own retainer such as **34**, **35** and **36**, respectively. These are preferably screens made of cross-meshed wires having the same diameter and the same mesh, for example, No. 40 mesh, and they are mounted or stacked on each other as shown in FIG. **1**, for example. The group of three screens are seated on a step or ridge **40** of the body **10**. Each nozzle section has its individual chamfer **45** and the angle between the chamfers of each such nozzle may be, for example, 60° as indicated in FIG. **1**.

The lowermost portion **38** of the body portion **10** is preferably spherical in shape and hence the several nozzle sections are of equal lengths. It is important to employ nozzle sections of substantially equal lengths so that they may transmit the fluid through equal distances before they are caused to emerge from the several nozzle sections. Substantial equality in the lengths of the several nozzle sections can be achieved even with the lowermost portion **38** being substantially flat or uncurved.

In the arrangement shown in FIG. **9**, the three screens **31**, **32** and **33** are replaced by an open-cell foam material **48** which embodies an infinite number of interstices through which the fluid may readily flow before traversing the several nozzle sections.

Where screens such as **31**, **32** and **33** are employed, or where a pore foam material such as **48** is employed, foreign material will normally be caught or retained on the screens or on the pore material, whichever is used. This enables the fluid flow device to filter out and prevent such foreign materials from being transported through the several nozzle sections and into the basin of the sink or lavatory. The screens or the pore foam material may be removed whenever desired, cleaned without much difficulty and then returned to their respective positions.

The fluid flow device above-described embodies a plurality of nozzle sections, i.e., more than one nozzle, for transmitting the fluid into a sink or lavatory as already explained. In a preferred arrangement such as that shown which embodies seven discrete nozzle sections, each nozzle section will carry approximately one-seventh of the total fluid. The liquid stream is therefore broken up into a corresponding and predetermined number of segments. Any number of nozzle sections, different from seven, as, for example, five, nine, etc., may be employed, of course, in accordance with this invention, but an arrangement embodying seven nozzle sections or channels as shown will present substantially the maximum opening space relative to the diameter of the spout-end. If the central section is omitted, the several nozzle sections may be arranged in one or more concentric circular patterns.

The lengths of the nozzle sections, which are seven in number in FIG. **1**, should be greater than one-eighth of an inch in length and their common lengths may be varied as desired, within limitations, but always retaining substantial equality of the lengths of the several sections. In one embodiment, the nozzle sections had a length of about 1.2 inches and each nozzle section had a diameter of about 0.312 inches. If the exit orifices are too close together or if the divergent angle of the axis of adjacent orifices is not great enough, the streams will adhere to each other upon exiting and result in an undesirable, distorted stream. It is especially important to maintain the integrity of each of the several streams and this is accomplished with a substantially long diverging channel as above noted especially in the FIG. **1** arrangement. An appropriate length for the several channels will cause the various streams to coordinate into a common pattern.

All of the parts shown and described may be made of metallic or plastic materials as may be desired. Plastic materials are preferred because they are easier to manufacture and to maintain and their cost is substantially lower.

In accordance with this invention, the several channels or nozzle sections have sharply defined corners, especially at the exit line **38** at the bottom. However, a rounded exiting edge having a radius of about 0.015 inches will be satisfactory. Any irregularity at the exit line **38** would necessarily disturb the smooth flow of the individual streams and might cause the streams to adhere to each other causing a distorted exiting stream.

In FIG. **10** of the drawing, there is shown a modified form of flow control device for kitchen sinks and for lavatories. This embodiment is a smaller and compromised version of the FIG. **1** device and is in accordance with this invention. The device embodies a unitary body structure **70** which is externally serrated as shown. The upper portion of body **10** which is designated **72**, is threaded externally so as to be received by the internal threads at the mouth of a kitchen or lavatory spout. A flat strainer preferably made of brass or plastic material and designated **80**, is held by a retainer **82**. Immediately below the retainer **82**, there are three separate and parallel screens **84**, **86** and **88** which are, prior to their assembly in the structure of FIG. **10**, for example, substantially flat. The diameters of each of the three screens **84**, **86** and **88** are somewhat larger than the opening at the upper end of the body or housing **70** into which they are pressed so that the three screens, after they are pressed into the body **70**, assume a concave shape when viewed from a point upstream as shown in FIG. **10**. The three screens

84, 86 and 88 are seated on a spherical surface 89 which forms, in effect, a seat for retaining the three screens 84, 86 and 88 in their concave positions as shown in FIG. 10 and holding them against any movement even under the influence of the pressure of a high velocity flow of water through the housing 70.

As in the form of fluid device shown in FIG. 1, the body 70 of FIG. 10 includes seven nozzle sections for illustrative purposes. These include the central nozzle section 100 and six peripheral nozzle sections 101, 102, 103, 104, 105 and 106 uniformly spaced from the central section 100 as shown. The several peripheral sections form a common angle with respect to the central section 100. As in FIG. 1, the lower most portion 108 of the body 70 is preferably spherical in shape so that the lengths of all seven nozzle sections are substantially identical. This enables the fluid portion emitted through the several sections to assume a common phase upon exit.

The strainer 80 is preferably made of copper or brass but may, of course, be made of any other material whether or not metallic. The three screens 84, 86 and 88, although described as pressed into a concave shape, may be and probably are substantially spherical in shape having a substantially common center along the line of the axis of the body of housing 70. The three screens are preferably made of bronze or Monel or other metal but may also be made of any other material as may be desired. These screens preferably have about 24 meshes per inch.

The strainer 80 serves principally to segregate from the fluid any foreign material that may be present therein. Such foreign material would be filtered out and retained by the strainer 80 and, whenever desired, the device 70 may be removed from the end of the spout and the strainer 80 cleaned so as to be free-flowing at all times.

The three screens 84, 86 and 88 may have any desired mesh alignment with respect to each other, such as that shown in FIG. 14, so as to influence the path of the fluid, such as water, that may be transmitted through the housing 70. The angular projection of chamfer 90 at each nozzle section, such as 100 or 102, will tend to move the stream of fluid toward the center of the respective nozzle section. This angular projection serves also to absorb irregularities that may be at the periphery of the stream at exit. The angular projection of the chamfer 90 points each stream toward a common and general transmission path. The emitted stream will form a substantially parallel path, i.e., a cylindrical and continuous path, which will extend for a considerable distance beyond the mouth of the housing 70.

The three screens 84, 86 and 88 provide a rather definite concavity or sphericity to the structure and may be likened to a concave or spherical light transmitting lens. The perforations of the three screens are as small as possible but not so small as to unduly restrain the flow or to cause clogging. While three screens are shown and described for illustration, of course any other number of screens may be employed, two or four screens, for example, being suitable for many installations.

The strainer 80 may be omitted in certain installations; strainer 80 is not indispensable in the practice of this invention. If employed, however, it serves not only for filtration, but also to distribute the flow evenly over an entire area of the opening 70. Although a predetermined angle has been suggested as desirable between the central nozzle section and the pheripheral nozzle sections of the housings of FIGS. 1 and 10, any other angular formations may also be employed. It has been found that, in general, the smaller the angle, the more uniform the flow pattern will be; if the angle is too small or is zero, however, its effectiveness will be greatly reduced or eliminated.

The illustrated fluid flow device of this invention includes a plurality of nozzle sections, one centrally disposed and the others peripherally disposed at a common angle to the central section, all nozzle sections having substantially the same length, and combined therewith are a plurality of screens oriented so as to join with the nozzle sections to improve the pattern of fluid flow. Chamfering is added to the structure to point the flow through the nozzle sections. The fluid flow device generates a laminar and substantially splash-less coordinated flow at normally used flow rates that provide, for example, an adequate quantity of fluid for generous rinsing. The device is self-cleaning. The avoidance of splashing renders the device highly suitable for sanitary applications in hospitals, laboratories and restaurants and like establishments, as well as in homes.

It will be apparent that the central nozzle section may be omitted if desired, but the peripheral nozzle sections should be sufficiently close to each other to achieve the desired overall stream pattern.

While this invention has been shown and described in particular arrangements merely for illustration and explanation, it will be understood that the general principles and features of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A non-aerated fluid flow device for a water spout for a plumbing fixture and capable of producing and continuously emitting a substantially splashless coordinated stream of water free of air or other gas, said device including a plurality of elongated nozzle sections which are all substantially cylindrical in shape and of the same diameter and splashlessly discharging all of the water received by the device without air or other gas, all of said nozzle sections being positioned peripherally about the axis of the device and all pitched at a common predetermined angle with respect to said axis, and a plurality of screens seated and stacked on a chamfered ridge of the device immediately upstream of the plurality of nozzle sections and positioned substantially symmetrically across all of the openings of all of the nozzle sections, so that solid foreign material will be filtered out and prevented from passing through the nozzle sections.

2. A fluid flow device according to claim 1 in which the bottom of the device is substantially spherical in shape so that all of the nozzle sections will have substantially the same length, notwithstanding their pitched orientations.

3. A fluid flow device according to claim 2 in which each of said plurality of screens is held within a retain-

ing ring so that said screens are cross-meshed and held together while remaining equally spaced from each other and so that they may be seated above the chamfers of the nozzle sections.

4. A fluid flow device according to claim 2, in which said plurality of screens are larger than the chamfered ridge and become seated on the chamfered ridge by being pushed into place, the screens thereby having a spherical formation all pointed in the downstream direction.

5. A fluid flow device according to claim 4 including, in addition, a strainer which is held within a retainer positioned on and above the screens.

6. A fluid flow device according to claim 2 in which each of the screens has the same cross-mesh but the cross-meshes are oriented at different angles with respect to each other and are held oriented at said different angles.

7. A fluid flow device according to claim 6 in which the exterior of the device is longitudinally serrated so that the device may be rotated for engaging with or disengaging from a spout.

8. A non-aerated fluid flow device for continuously producing a substantially splash-less stream of water at normal velocities of water flow therethrough without the addition of air or other gas, comprising a body which may be connected to a spout, said body having a plurality of elongated longitudinal nozzle sections one of which is coaxial with the body and all of the others of which are pitched at substantially the same angle with respect to the central nozzle section, the lengths of the sections being substantially equal, and means immediately up-stream of the nozzle sections for filtering the water to prevent solid foreign material from traversing the nozzle sections of the device, said filtering means comprising a pore foam filter positioned laterally of the device across all of said nozzle sections, whereby all of the water entering the device will be discharged splashlessly through the nozzle sections without air or other gas.

9. A fluid flow device according to claim 8 in which each of the nozzle sections is chamfered at its upper end so as to centralize the transmission of water through the respective nozzle sections, the filtering means being seated above all of the chamfers of said nozzle sections.

10. A non-aerated spout for a plumbing fixture having an upstream inlet for continuously receiving incoming water free of air or other gas for transmission, comprising a plurality of substantially identical elongated cylindrical nozzle sections the upstream ends of which are chamfered and receive the incoming water, one of the nozzle sections being positioned axially of said spout, the other of said nozzle sections being positioned peripherally of said axial nozzle section, but their axes being pitched at a common predetermined angle with respect to the axis of said spout so that the angle of each peripheral spout section will diverge and have its apex at a common point along a line which extends upstream of the axis of said spout, so that the spout will continuously emit a coordinated group of divergent water streams free of air or other gas through the downstream ends of the nozzle sections, and a plurality of screens each formed of wires which are perpendicular to each other, the wires of each screen being oriented at a different angle from the angles of the other screens, the screens being seated adjacent to each other immediately up-stream of said nozzle sections on chamfers at the upstream ends of said nozzle sections.

* * * * *