# United States Patent [19]

**Aghnides**

[11] **3,829,026**

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[54] **SPRAY PRODUCING DEVICE**


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[21] Appl. No.: **344,654**

[52] **U.S. Cl.**..... **239/394,** 239/428.5, 239/443, 239/533.3

[51] **Int. Cl.**..... **B05b 1/16**

[58] **Field of Search** ..... 251/77; 239/428.5, 436, 239/443, 444, 446, 449, 553.5, 562, 394, 553.3



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 835,928 | 9/1906 | Allen | 239/562 |
| 1,454,280 | 5/1923 | Henrikson | 239/563 X |
| 2,968,443 | 1/1961 | Manning | 239/562 X |
| 3,633,824 | 1/1972 | Aghnides | 239/553.3 |



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*Assistant Examiner*—John J. Love
*Attorney, Agent, or Firm*—William D. Hall



[57] **ABSTRACT**

This disclosure relates to a spray producing device having an upstream disc for producing high velocity jets of liquid, and a downstream disc that includes mixing means in the form of screens, but also including certain open areas in place of some of the screens.

The downstream disc is rotatable to enable the user to select between one arrangement, wherein the jets are aerated, and another arrangement, wherein the jets are sharp, needle-like streamlets.

A lost-motion connection is arranged between said upstream and downstream discs so that when the downstream disc is rotated in one direction, the relation between the two discs is such as to result in said first arrangement, providing aeration of the jets, and when the downstream disc is rotated in the opposite direction, the relation of the discs is such as to result in said second arrangement, providing sharp, needle-like streamlets.


**19 Claims, 9 Drawing Figures**

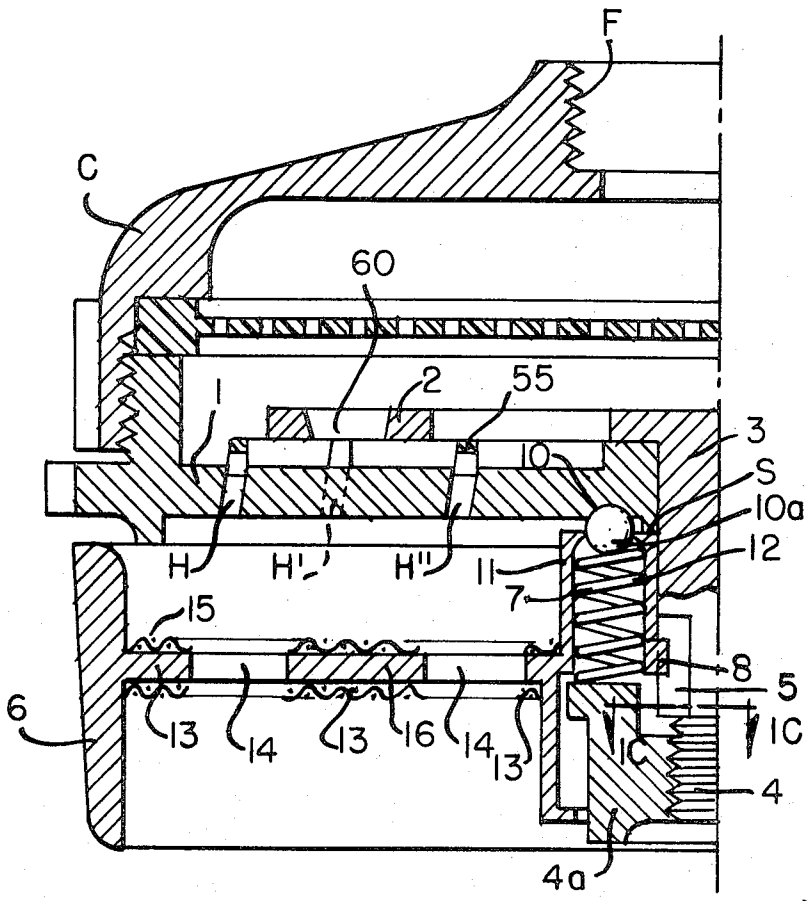


FIG. 1.

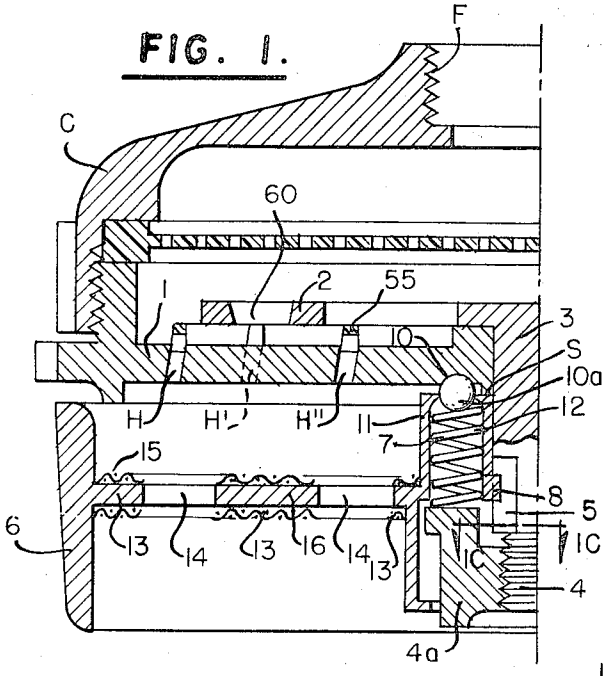



FIG. 2.

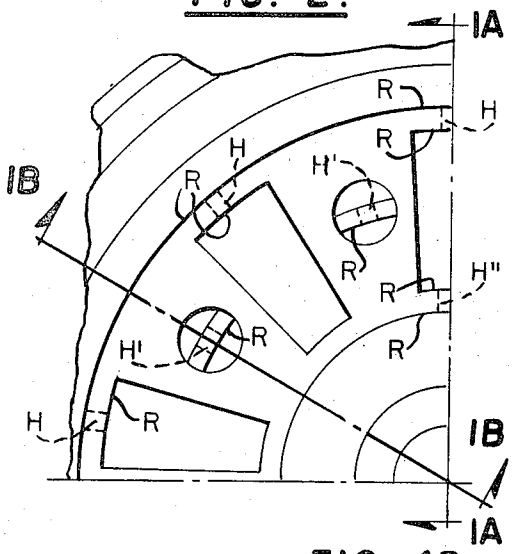



FIG. 3.

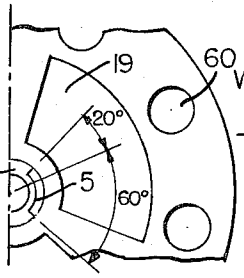



FIG. 4B.

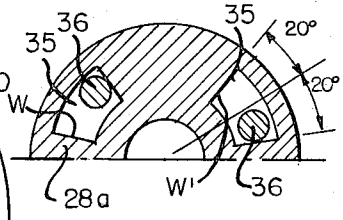



FIG. 4.

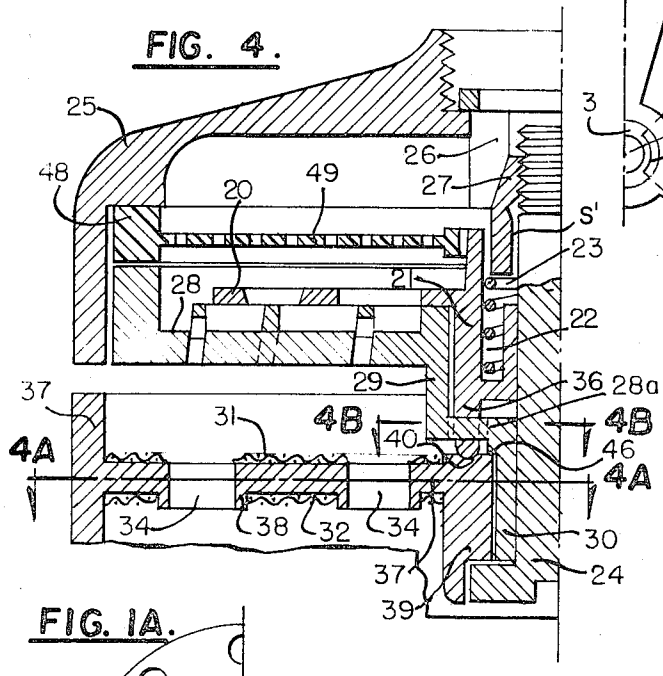



FIG. 4A.

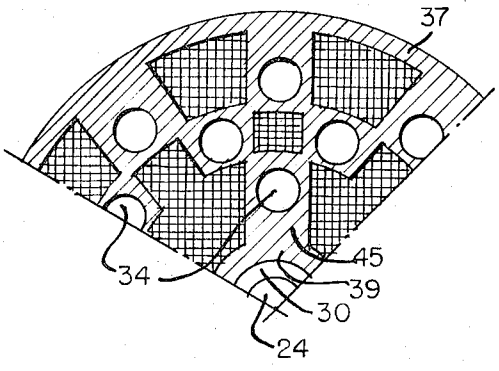



FIG. 1A.

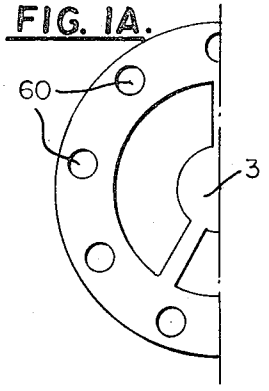



FIG. 1C.

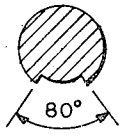
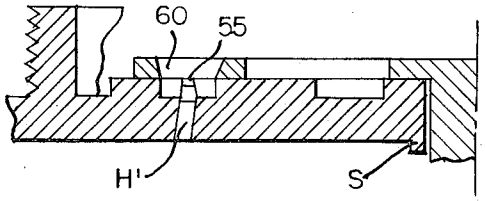



FIG. 1B.



# SPRAY PRODUCING DEVICE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to devices for selecting between two different forms of streams of water having different rates of flow.

2. Description of the Prior Art

In my prior U.S. Pat. No. 2,670,942, filed Nov. 10, 1952, entitled "Aerator," U.S. Pat. No. 2,797,906, filed Nov. 23, 1953, entitled "Convertible Aerators" and U.S. Pat. No. 2,811,340, filed Dec. 29, 1949, entitled "Fluid Mixing Device," I have shown means for selecting between a spray consisting of ordinary jets of water and a spray consisting of an aerated soft bubbly stream (or streams). In my prior copending application Ser. No. 266,039, filed June 26, 1972, entitled "Improvement In Spray Producing Device," I have shown a selecting mechanism for selecting between two different forms of streams, and have also shown means to decrease the rate of flow of the one or the other streams. The present application is an improvement of my application Ser. No. 266,039 in this respect.

## SUMMARY OF THE INVENTION

The invention relates to an apparatus for selecting between two different types of streams of liquid, for example, water. According to the invention in its broader aspects, the water passes through two devices in series, the relative positions of which determine the type of streams, and/or the number of jets, emerging from the second device. The devices are connected by a lost-motion connection so that when one of them is moved in a first direction, the relationship between them is such that one type of stream is emitted and when moved in a second direction, the relationship between them is such that another type of stream is emitted. The words "type of stream" may refer to any one or more aspects such as aerated stream, needle-like spray, number of jets,

In its narrower aspects, the invention comprises two spaced, superposed discs, the upstream one of which opens and closes holes in a partition. The jets produced by the water flowing through said holes are sharp and needle-like. The downstream disc has portions which constitute mixing means (for example screens) and other portions which are open and thus permit the jets to pass therethrough without change. There is a lost motion connection between the discs so that following movement of the downstream disc in one direction, predominantly sharp, needle-like jets are produced, and, following the movement of the downstream disc in the other direction, predominantly soft, bubbly jets are produced. Furthermore, by shifting the downstream disc within the range of "lost motion" of the lost-motion connection, the character of the stream may also be changed.

Instead of shifting between a stream in which most of the jets are aerated and one in which most of the jets are needle-like, the device may be arranged to shift between any two different types of streams, for example, one stream may include 12 jets and the other stream may include 21 jets.

An object of the invention is to produce a simple, low-cost device for switching between two types of streams.



Another object of the invention is to provide a device in which it is easier to select between two different types of streams than it has been heretofore.

Yet another object of the invention follows the objectives set out in the two preceding objects and in addition provides variation in the number of output jets and/or the volume of flow.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross-section of one embodiment of the invention. FIG. **1A** is a partial top view of disc **2** of FIG. **1.**

FIG. **1B** is a cross-section taken along the line **1B—1B** of FIG. **2.**

FIG. **2** is a partial top view of the disc **1** of FIG. **1.**

FIG. **3** is a partial top view of the disc **2** of FIG. **1.**

FIG. **1C** is a cross-section along line **1C—1C** of FIG. **1.**

FIG. **4** is a cross-sectional view of another embodiment of the invention.

FIG. **4A** is a cross-sectional view along line **4A—4A** of FIG. **2.**

FIG. **4B** is a cross-sectional view along line **4B—4B** of FIG. **4.**

## DETAILED DESCRIPTION OF THE INVENTION

The device shown in the drawing may be built in the form of a shower head, in the form of a faucet attachment for kitchen sinks or the like, or in any other form.

The device includes a main coupling C having threads F for attachment to a source of liquid, for example, water, under pressure. Threaded to the casing C is a main disc or diaphragm **1** which has six indents **10,** located 60° apart, in circle whose center corresponds to the axis of the overall device. A steel ball **10***a*, pressed upwardly by a helical spring **12,** is adapted to move into said indents to hold the device in any one of six positions.

The device of this invention is very easy to operate. In order to select the desired type of stream, in the example given, all that is necessary is to rotate part **6** at least 60°, clockwise or counterclockwise as the case may be, stopping in one of said six positions.

The part **6** is integral with casing **7** that holds helical spring **12** and this casing has a short projection **8** that has an angular length (measured with respect to the axis of the overall device) of 20° and which moves back and forth in an indent **5** which has an angular length of 80°, whereby the projection **8** may move freely in indent **5** for an angular distance of 60°. The part **6** is attached to a spider **16** which is in turn attached to casing **7.** A top view of the spider **16** of FIG. **1** is similar to the spider **37** shown in FIG. **4A.** The spider is generally covered on both sides with screen wire **13** and **15,** except that there are holes **14** (**34** in FIG. **4A**) which are entirely open and therefore are not covered with screen wire. Threaded stop member **4a** engages thread **4** maintaining a constant predetermined space between the lower side of the disc **1** through step S at the inner end of the lower side of disc **1.** The screw jack force of the threads holds the sealing disc **2** flexibly against the upper side of disc **1,** inasmuch as the spring **12** is pressing on the upper end side of said stop member **4a.**

The disc **1** has three concentric rows of holes. The outer row H has nine holes equally spaced, as does the middle row H′. The inner row H″, however, has only

three holes spaced 120° apart. The holes H, H′ and H″ are spaced and disposed as shown in FIG. **2** and are of the type shown generally in my U.S. Pat. No. 2,998,929, granted Sept. 5, 1961, entitled "Water Aerators." These holes are therefore elongated and have a bridge such as **55** over them to give increased turbulance to the water in the elongated holes. The water enters holes H, H′ and H″ below said bridges on the inner and outer side walls of ribs R.

The sealing member **2** is a disc which is integral with shaft **3** and is rotated clockwise and counterclockwise, as the case may be, by the lost-motion connection. The sealing member **2** has a ring of nine equally spaced holes **60** which in one position will be centered over the nine holes H′ when the part **6** has been rotated until the ball **11** is retained in one of the six indents **10.** In this position, if part **6** has been rotated in a clockwise direction, water enters all twenty-one of the holes H, H′ and H″ to form twenty-one jets from H, H′ and H″ which strike screens **13** and **15** to form twenty-one bubbly streams as they pass the skeleton **16.**

If now part **6** is rotated an additional 60° in the same direction (clockwise) so that it stops in the next one of the six positions, the lost-motion connection rotates the sealing member **2** to a position where it covers the nine holes H′ and therefore the device emits only the twelve needle-like jets. Further rotation of part **6** in this same direction for another 60° will produce again 21 bubbly streams and at the following stop again 12 needle-like jets.

If the next rotation of part **6** is 60° in the opposite direction from said needle-like jets, stopping in one of said six positions, the sealing disc **2** continues to block holes H′ but the twelve output jets, instead of passing through holes **14,** pass through screens **13** and **15** and emerge as 12 soft bubbly streams; it is noted that neither sealing disc **2** nor partition **1** is rotated during this operation.

If the part **6** is next moved in this same opposite (counterclockwise) direction by another 60°, the sealind disc **2** moves synchronously with part **6** and stops in a position leaving holes H′ open. In such event the 21 jets from holes H, H′ and H″ remain needle-like jets since they all pass through holes **14** rather than through screens. Further rotation of part **6** in this same direction another 60° will again produce 12 bubbly streams and at the following stop again 21 needle-like jets.

The construction of disc **1** is illustrated in FIGS. **1, 1B** and **2.** FIG. **2** shows a partial top view of disc **1** and its cross-sections **1A—1A,** shown in FIG. **1,** and **1B—1B,** shown in FIG. **1B,** show its upper configuration. Holes H′, like the other holes, are of square or arcuate cross-section and have, at their upstream ends, bridges **55** aligned with ribs R. While I have shown only single holes H, H′, H″, a pair of contiguous holes may be provided, as shown in my aforesaid pending application Ser. No. 266,039, if production of thicker, bubbly streams is desired.

In FIG. **4** the coupling **25** has threads for attachment to a faucet. There is an upstream perforated diaphragm terminating in an enlargement **48.** A disc **28** is of different shape from disc **1** of FIG. **1** but is the same in that it has the same three rows of holes H, H′ and H″. Further, there is a sealing member **20** that is shown in FIG. **1A** and cooperates with openings H, H′ and H″, the same as disc **2** of FIG. **1** cooperates with disc **1.**

The part **37** of FIG. **4** is shown in FIG. **4A** and is quite similar to part **6** of FIG. **1**; however, in FIG. **4** the part **37** has six indents (spaced 60° apart) into which pin **36,** which is pressed downwardly by spring **23,** extends. The pins **36** pass through holes **35** of the extension **28***a* of disc **28.**

In the position in which the sealing disc **20** closes the holes H, as shown in FIG. **4,** when the part **37** has been rotated counterclockwise and pin **36** is brought to rest on the opposite wall W after 20° rotation, holes H′ will be uncovered and after additional rotation of part **37** by 40° the first counterclockwise stop point will be reached, producing there and at successive counterclockwise 60° stops alternately twenty-one bubbly streams or twenty-one needle-like streams.

If now the part **37** is rotated clockwise by 20°, the pin **36** will engage the wall W′ of opening **35,** again closing holes H′, and producing alternately 12 bubbly streams or 12 needle-like jets, at successive clockwise 60° stops.

FIG. **4** has a sealing disc **20** which has a sleeve **21** providing an annular groove **22** containing a spring **23,** said sleeve being rotatably mounted around a screw **24.** The coupling **25** has webs **26** holding a tubular portion **27** which is threaded at its upstream portion, which threaded portion engages the threaded end of said screw **24.** Its inner tubular surface S′ helping maintain coupling **25** and screw **24** co-axial. The diaphragm **28** has a sleeve portion **29** around the sleeve portion **21** of the sealing disc and another sleeve portion **30** around the screw **24.** The sealing disc **20** of the diaphragm is like the one described in FIGS. **1, 1A** and **3.** The casing has screen **31** and **32** and holes **34.** The sleeves **29** and **30** of diaphragm **28** are connected by a horizontal link having three openings **35** which are traversed by the three legs **36** as shown in FIG. **4B.** In said figure, the spider **37,** like spider or skeleton **16,** has twenty-one holes **34,** as shown in FIG. **4A,** and is connected to casing **37** and, through the three legs **45,** to sleeve **39.**

FIG. **4A** shows how the twenty-one holes of casing **37,** like those of casing **6,** are arranged, to let pass therethrough the twelve or twenty-one jets delivered by the discs **1** and **28.** The outer row of holes **34** comprises nine equally spaced holes, the middle row another nine equally spaced holes that are angularly positioned 20° from the angular position of the holes in the outer row. The inner row has three equally spaced holes in angular alignment with three of the holes of the outer row. In three of the six angular positions at which part **37** stops (due to the idents **40**) the 21 holes in disc **37** are directly below the 21 holes H, H′ and H″. The lower ends of holes **34** has tubular end portions **38** against which rest the live-edges of the cut-out portions of the screen **32.** The sleeve **39** has at its upstream end six depressions **40** in which rest the lower ends of legs **36.** The openings **35** shown in FIG. **4B** provide 40° of which 20° are assigned to each leg **36.** In other words, in the example described, the sealing disc **20** can rotate only 20° clockwise or counterclockwise, when the casing itself is rotating, in lost motion, clockwise or counterclockwise by 60° to go from one stop point to another. Rotation of sealing disc **20** by 20° in one direction will close the nine holes, in the middle row, and rotation of 20° in the other direction will uncover them. A step **46** is provided to transfer the pressure of the upwardly moving diaphragm during the assembling of the device against the washer **48** to insure proper sealing. The

washer **48** carries a perforate member **49.** After an aforesaid rotation of 20° clockwise, to produce one type of stream, further rotation by 60° will change to a different type of stream. Still a third stream can then be produced by a 20° counterclockwise rotation, while a fourth stream can be produced if there is an additional 60° counterclockwise rotation.

This arrangement of FIG. **4** has the advantage over that of FIG. **1** of doing away with the user's having to search for a desired spray, sharp or soft, large flow or limited flow of water, according to the available water pressure, by providing four positions, all obtainable by the mere rotation of the casing.

Devices built according to the following dimensions, under the present invention, gave very good results. The diaphragm **1** was three millimeters thick, above which the windows of the bridges were 1.0 mm high and 0.95 mm wide, whereas the holes below said windows had a 1.25 × 1.25 mm cross section and were inclined 6.5° in the outer row, 5.0° in the middle row and 3.5° in the inner row. Two screens were used, the upper screen **15** (and/or **31**) at 5.5 mm below said holes and having **40** wires per inch with 0.00875 inch wire diameter. The diameters of the three rows H″, H′ and H, were 33 mm, 50 mm, and 63 mm respectively. The screens had 80 mm diameters and were spaced 3 mm from each other. Where single holes were used, as shown, instead of pairs of holes, the windows of the bridges were 1.05 × 1.05 mm and the cross section of the square holes was 1.30 × **1.30** mm, whereas the pairs of holes had the dimensions given above, the thickness of the diaphragm being 3.00 mm in both cases.

While I have shown sealing discs located upstream of the diaphragm, it is understood that sealing may be effected by closing some of the outlet ends of holes and other means may be designed to limit the flow, when higher jet velocity is desirable.

I claim to have invented:

**1.** In a water discharge device, means for producing at least two types of streams comprising first and second members both of which are movable and which will determine the type of a stream of water depending on the relation of the members to each other, means for passing the water past said members in series to produce an output the type of which depends upon the relative position of said members, one of said members being movable with respect to the other to select the type of stream desired, and lost-motion connecting means between said members to give a relation between them to produce one type of stream when said one member is moved in one direction, and another type of stream when the said one member is moved in another direction.

**2.** In a water discharge device as defined in claim **1,** said lost-motion connecting means having substantial lost-motion so that said one member may be moved a substantial distance without moving the other member, said first and second members comprising means constructed and arranged so that the said one member may be moved within the limit of said lost-motion to a position that will change the type of the output stream.

**3.** In a water discharge device as defined in claim **1,** said lost motion connecting having substantial lost motion so that said one member may be moved a substantial distance without moving the other member, said first and second members comprising means constructed and arranged so that, when said one member is moved to a position within its lost-motion range, the device will produce a first output stream, and when moved farther in said direction will carry with it the other member to a position wherein a second type of stream is produced and may then be moved from that position in the opposite direction within the limit of the lost-motion to a position where it produces a third type of stream and may be further moved in said opposite direction so as to carry with it the second member to a position where a fourth type of stream is produced.

**4.** A device as defined in claim **1,** said second named means being a tubular casing, said first and second members being rotatable and connected by a shaft which shaft includes said lost-motion connecting means, said shaft being concentric with the casing, means in stationary relation with said casing and defining openings to produce many jets, said first member cooperating with the last-named means to close some of the holes in said last-named means in certain angular positions of its rotation, said second member comprising a disc having different portions that respectively change the jets from said last-named means into different types of output streams.

**5.** A device as defined in claim **4,** in which some of said portions of said disc comprise screens to convert the jets from said last-named means into soft bubbly streams and other portions of said disc define openings through which jets from said last-named means may pass without interruption.

**6.** A device as defined in claim **4,** in which said first member and said disc are so constructed that when said one member is rotated clockwise well beyond its limit of lost-motion, a different number of the openings in said last-named means will be open for flow of water therethrough than when said one member is rotated counterclockwise well beyond the limit of lost-motion.

**7.** A device as defined in claim **5,** in which said one member is the disc, said portions of the disc being arranged so that when the disc is rotated within the limit of lost-motion some of the jets from said last-named means will encounter different portions of the disc to thus produce different types of streams.

**8.** A device as defined in claim **5,** in which said one member is a disc, said portions of the disc being arranged so that when the disc is rotated in one direction from one limit of lost-motion to the other, some of the jets from said last-named means will encounter different portions of the disc to thus produce a different type of stream and when further rotated in said direction the first member will change its position respecting said last-named means to thus change the number of openings therethrough through which water flows and thus change the type of output stream.

**9.** A device as defined in claim **8,** in which said last-named means, the first member and the disc are so arranged with respect to each other that rotation in the direction opposite to said one direction within the limit of lost-motion will change the portions of the disc that are in the path of at least some of the jets and that further rotation in said opposite direction will also cause the first member to change the number of openings in said last-named means through which water may flow to thus change the number of output jets.

**10.** A shower head comprising a partition through which is discharged a spray formed by spaced jets, a ro-

tatable member located in the path of at least some of said jets, screen means held by said rotatable member which is at least partly movable away from the path of at least some of said jets, a sealing member which is located adjacent to and cooperates with said partition, to alternately decrease and maintain the number of said jets, means connecting the sealing member and said rotatable member so that the rotation of said rotatable member alternately decreases and maintains the number of said jets as well as alternately produces a conventional spray and a spray comprising a number of bubbly streams.

**11.** The device of claim **10** in which said sealing member is located upstream of said partition.

**12.** The device of claim **10** in which the screen means is held by said rotatable member in coaxial, spaced relationship with the downstream side of said partition.

**13.** The device of claim **12** in which the rotation of said rotatable member results in the rotation of said connecting means which in turn rotates said sealing member to change the number of jets.

**14.** The device of claim **13** in which rotation of said rotatable member in one direction results in the rotation of said connecting means which in turn rotates said sealing member to provide one or more types of streams and rotation of said rotatable member in the opposite direction similarly provides one or more different types of streams.

**15.** The device of claim **14** in which the rotatable member has different portions so that at least one of the types of streams is characterized by a plurality of soft, bubbly streams and at least one of the types of streams is characterized by sharp, needle-like jets.

**16.** A water discharge device comprising a casing adapted for connection to a source of water under pressure, jet producing means in the path of the water in casing for converting the water entering the casing into a plurality of high velocity jets, and disc shaped rotatable means downstream said jet producing means rotatable to a position in which it converts at least one of the jets from said jet producing means into a different type of stream, said rotatable means comprising an element having an axial opening and extending outward therefrom, and a central connecting element passing through said axial opening in said element and connected to said casing, said jet producing means comprising a disc-shaped perforated diaphragm having a central sleeve extending downstreamwardly around said central connecting element and being supported thereby.

**17.** A device as defined in claim **16** in which said central connecting element is a screw having threads at its upstream end connecting the element to said casing and also having a head at its downstream end, said sleeve of said disc-shaped perforated diaphragm and said disc-shaped rotatable means resting upon and being carried by the upstream side of the head of said screw.

**18.** A water discharge device as defined in claim **17** in which said casing has a water inlet and webs between which the water entering said inlet may flow to said jet forming means, said web joining together to form a common element which element defines a threaded hole for receiving the upstream threaded end of said screw.

**19.** A water discharge device as defined in claim **16** in which said casing has a water inlet and webs between which the water entering said inlet may flow to said jet forming means, said webs joining together to form a common element which element is attached to the upstream end of said central supporting element in order to carry it and thus in turn carry the jet forming means and the disc-shaped rotatable means.

* * * * *