United States Patent [19]

Hruby, Jr.

[11] **3,773,258**

[45] **Nov. 20, 1973**

[54] **CONTROLLABLE MULTITIER FOUNTAIN**

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[73] Assignee: **Rain Jet Corp.**, Burbank, Calif.

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[21] Appl. No.: **313,990**

[52] **U.S. Cl.** **239/17,** 239/406, 239/470

[51] **Int. Cl.** **B05b 17/08**

[58] **Field of Search** 239/17, 18, 22, 23, 239/406, 405, 470

[56] **References Cited**

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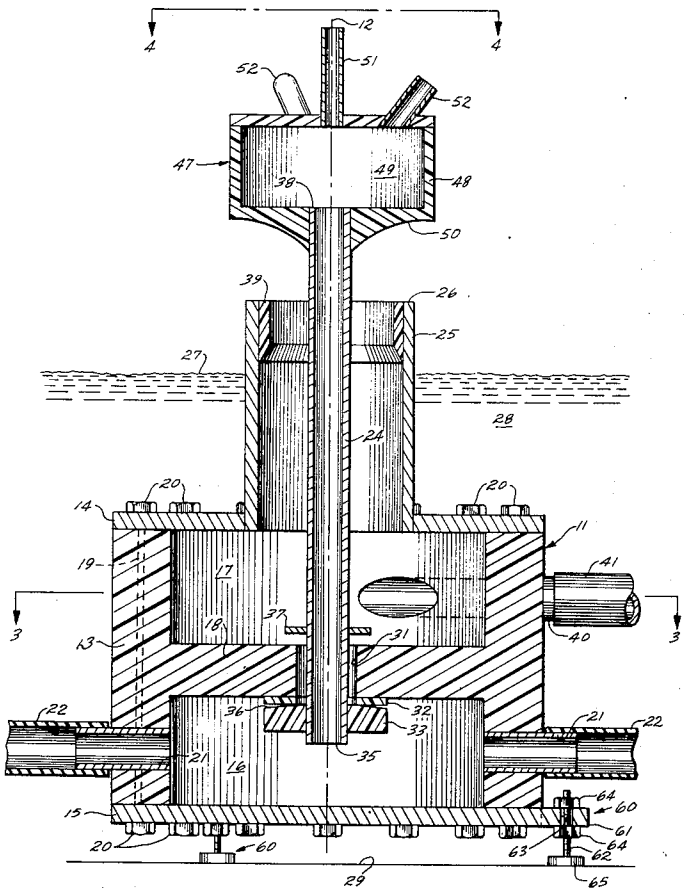
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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—John J. Love
Attorney—Robert L. Parker et al.

[57] **ABSTRACT**

An ornamental fountain comprises a housing which defines therein upper and lower chambers separated by a septum. A vertical duct member is connected to the housing to have its lower end in communication with the upper chamber. An open ended tube is disposed within the duct member and extends through the upper chamber and the septem to have its lower end communicating with the lower chamber. The upper end of the tube is disposed above the upper end of the duct member. Water inlet means are provided to the lower chamber. Also, water inlet means are provided to the upper chamber and are arranged with relation to the chamber to produce a spiral flow of water in the upper chamber and along the duct member around the tube to and through the upper end of the duct member.

10 Claims, 9 Drawing Figures



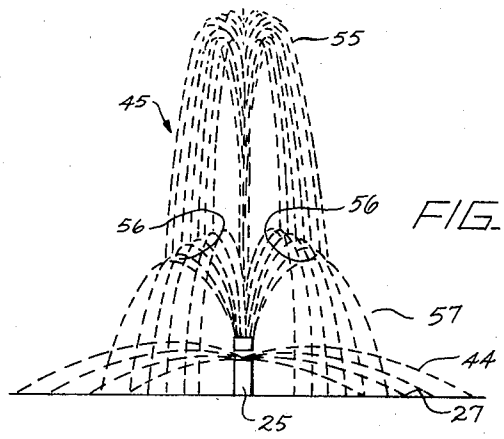


FIG_1

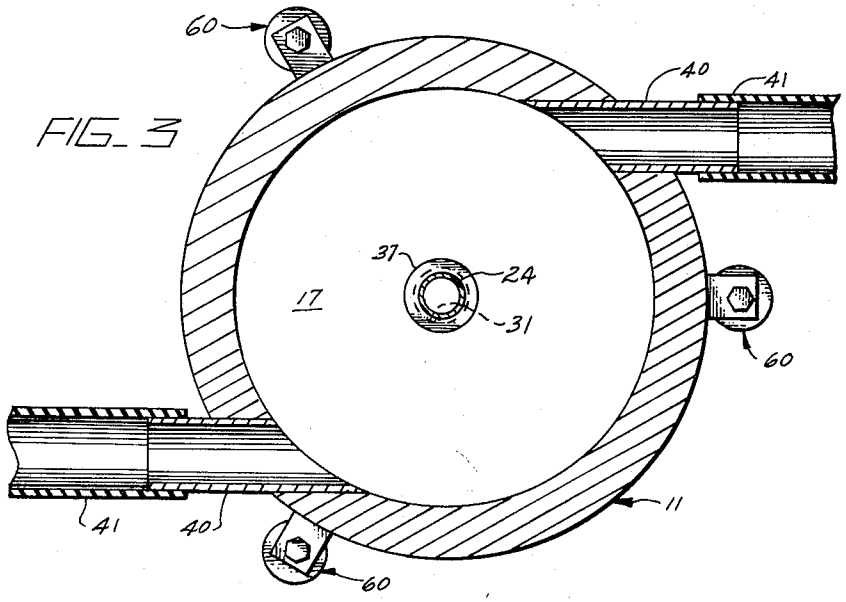


FIG_3

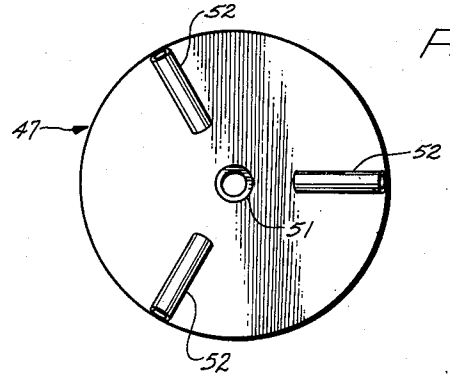


FIG_4

FIG. 2

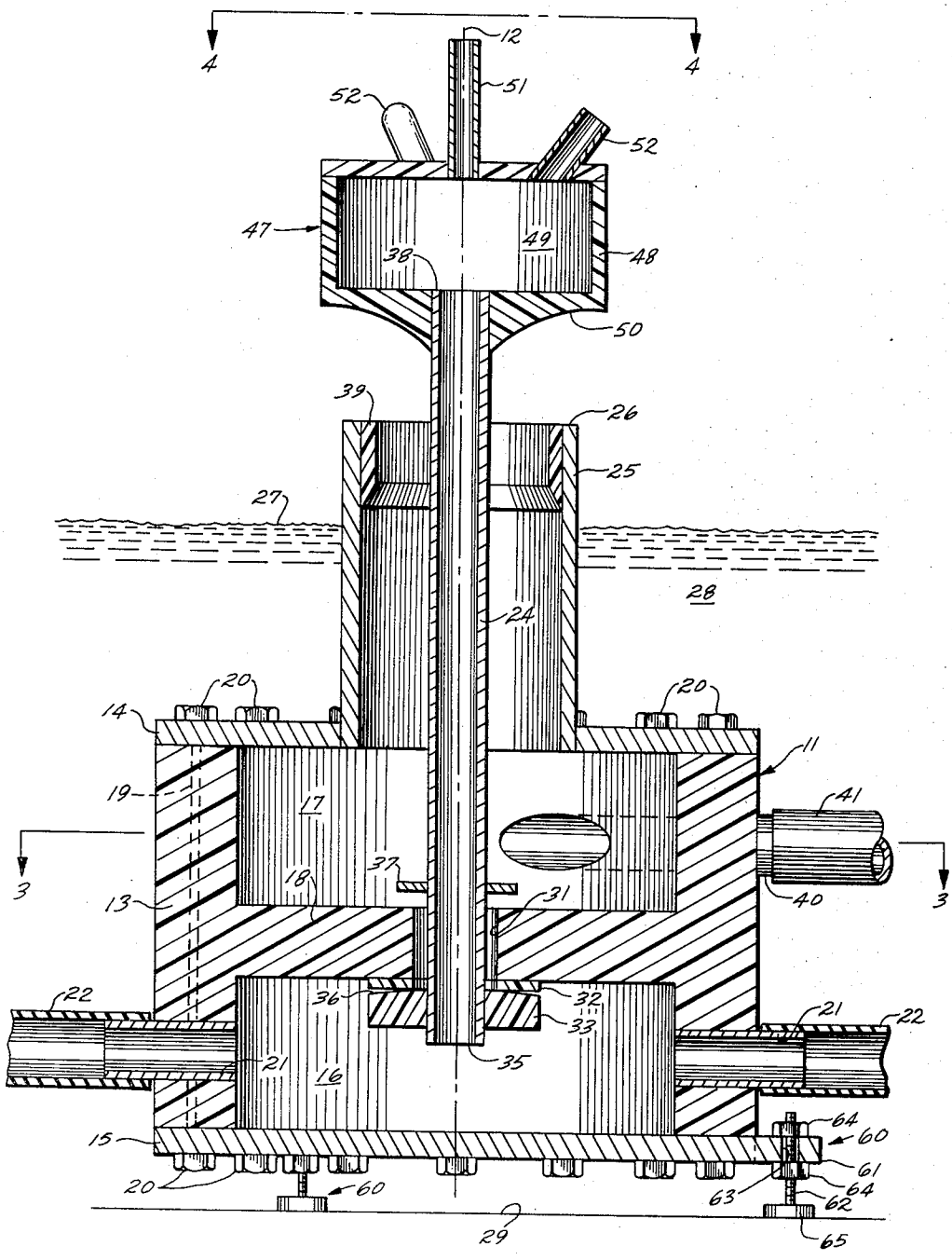

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FIG. 5

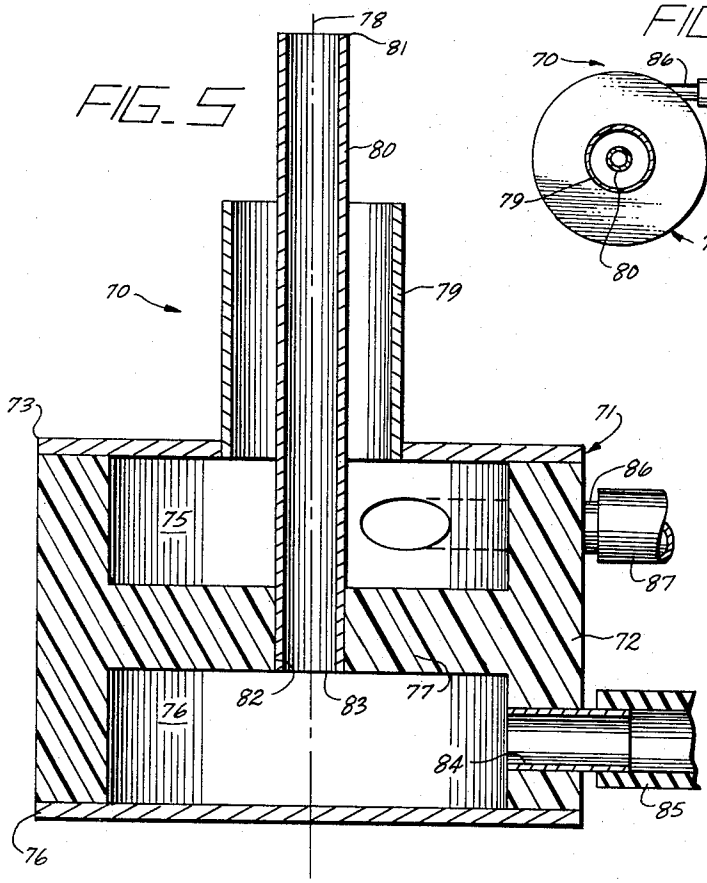


FIG. 6

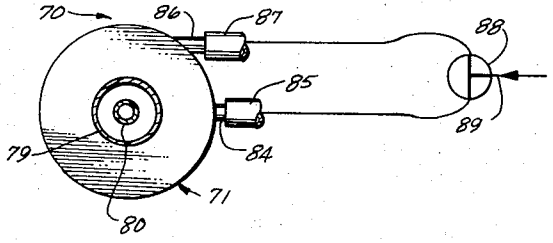


FIG. 8

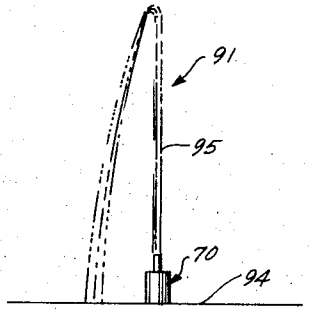


FIG. 9

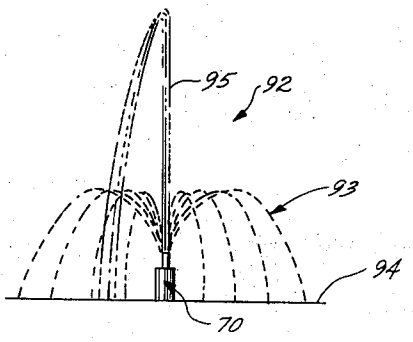
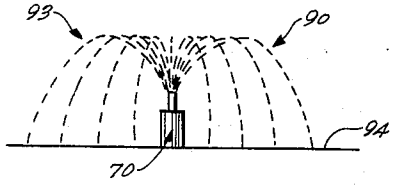


FIG. 7



CONTROLLABLE MULTITIER FOUNTAIN

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to liquid discharge devices, and more particularly, to multitier fountain assemblies.

2. Review of the Prior Art

The water discharge nozzles shown in my prior U.S. Pats. Nos. 2,589,942 and 2,639,191, for example, were originally designed as lawn sprinkler nozzles. These structures, however, have been adapted as shown in my prior U.S. Pats. Nos. 3,081,036 and 3,301,490, for example, to serve as nozzles in ornamental water fountains; as so modified, the nozzles are useful to produce the distinctive fountain patterns shown in my U.S. Design Pats. Nos. 208,754 and 208,755, for example. These fountain nozzles are characterized by a tubular body through which water flows to an open discharge end of the body. An elongated stem is disposed in the body and extends from the discharge end of the body. The stem is loosely journalled in the body so that it is freely pivotable about a fulcrum point lying within the length of the body. The stem is so mounted that it is secured from movement out of the open end of the body. At least one annular bearing, through which the stem extends, is carried by the body at a location spaced from the fulcrum point and has an inner diameter greater than the diameter of the journal at the fulcrum point. When the device is operated by supplying water to it, the water is caused to flow spirally along and around the stem. This liquid flow pattern causes the stem to gyrate, or pivot and revolve, about the fulcrum point. The portion of the stem at the open end of the body thus rolls rapidly around the outlet opening to break into discrete drops the stream of water which passes between the stem and the body. The stem functions as a gyrating pendulum as these devices are operated.

Except where the teachings of my prior U.S. Pat. No. 3,369,758 are utilized, it has not heretofore been possible to provide these rotary pendulum fountain nozzles in large sizes, such as for use in fountains intended to be viewed from a distance.

SUMMARY OF THE INVENTION

This invention provides an improved ornamental fountain assembly which is useful to produce the types of discharge patterns such as are shown in the previously mentioned design patents, but in which the discharge pattern is substantially larger and more massive than has heretofore been realized. These benefits are provided in a structure which is simple, effective and reliable. Also, due to the structure of the present fountains, the relative proportions of various components of the discharge pattern may be adjusted or varied either as a part of a varying fountain program, or to produce the best effect for prevailing conditions at the time.

Generally speaking, a fountain assembly according to this invention includes a housing which defines therein upper and lower chambers. The chambers are separated by a septum. A vertical duct member is fixedly connected to the housing to have its lower end in communication with the upper chamber. An open-ended tube is disposed within the duct member and extends through the upper chamber and the septum to have its lower end in communication with the lower chamber. The upper end of the tube is disposed above the upper end of the duct member. Water inlet means are provided to the lower chamber. Also, water inlet means are provided to the upper chamber and are arranged with relation to the upper chamber to produce a spiral flow of water in the upper chamber, and then spirally therefrom along the duct member around the tube to and through the upper end of the duct member.

In one embodiment of the present fountain, the tube is rotatably journalled in the septum so that, during use of the fountain, the tube performs as the stem mentioned above with reference to U.S. Pats. Nos. 2,589,942 and 2,639,191, for example.

In another embodiment, the stem is fixed in the septum to be disposed coaxially of the duct member. In this case, the discharge pattern produced by operation of the fountain is similar to the discharge pattern produced by operation of the structure shown in my prior U.S. Pat. No. 3,645,449; in this discharge pattern a central plume of water rises above the upper extent of an inverted coaxial cone of water. In this second embodiment, the discharge pattern produced by the fountain can be comprised only of the plume, or only of the inverted cone, or both, in any desired proportion relative to each other.

DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features of this invention are more fully set forth in the following detailed description of presently preferred embodiments of the invention, which description is presented with reference to the accompanying drawings, wherein:

FIG. **1** is an elevation view of the fountain discharge pattern produced by operation of a first embodiment of the fountain;

FIG. **2** is a cross-section elevation view of the first embodiment of the fountain;

FIG. **3** is a view taken along lines **3—3** in FIG. **2**;

FIG. **4** is a view taken along line **4—4** in FIG. **2**;

FIG. **5** is a cross-section elevation view of a second embodiment of the present fountain;

FIG. **6** is a schematic representation of the water supply valving and ducting for the nozzle shown in FIG. **5**;

FIG. **7** is an elevation view of the discharge pattern produced by the fountain in FIG. **5** for one state of the valving;

FIG. **8** is an elevation view of another discharge pattern produced by the fountain shown in FIG. **5** for a second state of the valving; and

FIG. **9** is an elevation view of another discharge pattern produced by the fountain shown in FIG. **5** for a third state of the valving.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Referring initially to FIG. **2**, a multitier fountain **10** includes a right circularly cylindrical base housing **11** having an axis of symmetry **12**. The housing is composed of a body **13**, a top closure plate **14**, and a bottom closure plate **15**. A lower chamber **16** of right circularly cylindrical configuration is formed in the body concentric to axis **12** to open through the bottom surface of the body and to be closed by bottom closure plate **15**. An upper right circular cylindrical chamber **17** is formed in the upper extent of the body concentric to axis **12** and is closed by top closure plate **14**. The upper and lower chambers are separated by a horizontal partition or septum **18** defined by the body. The

housing body and closure plates are secured together by a plurality of through-bolts **19** and cooperating nuts **20,** as shown. Water is supplied to lower chamber **16** through inlet openings defined by a pair of coaxially aligned inlet nipples **21** which extend through the side walls of the chamber to receive suitable water supply conduits **22.** Nipples **21** open to lower chamber **16** at diametrically opposed locations of the chamber. The total water flow area of the two nipples is greater than the water flow area of an elongate hollow tube **24** which has its lower end disposed in communication with the lower chamber. A vertically disposed tubular duct member **25** is fixedly carried by housing upper closure plate **14** in coaxial alignment with chambers **16** and **17.** The duct member has an open lower end which communicates with upper chamber **17.** The upper end **26** of the duct member is also open and is disposed sufficiently far above top closure plate **14** that it lies above the surface **27** of a fountain pool **28** when fountain **10** is supported upon a floor surface **29** of the pool.

Tube **24** is disposed through an oversized hole **31** formed through septum **18** concentric to axis **12.** An annular bearing member **31** is secured to the top surface of lower chamber **16** concentric to hole **31** and cooperates with a bearing collar **33** carried by the tube adjacent its open lower end **35.** The upper surface **36** of the bearing collar is spherically curved and has a large radius of curvature for cooperation with the flat lower surface of bearing member **32.** A keeper collar **37** is secured to tube **34** above septum **18** and is of larger diameter than hole **31.** The spacing between collars **33** and **37** is sufficient that when bearing collar **33** is engaged with bearing member **32,** as shown in FIG. **2,** keeper collar **37** is disposed sufficiently above the upper end of hole **31** that it does not make contact with the bottom surface of upper chamber **17** during rotation and gyration of tube **24,** as described below. On the other hand, the spacing between collars **33** and **37** is sufficient that when fountain **10** is not in use, collar **37** cooperates with the floor of chamber **17** to prevent the lower end of tube **24** from moving into contact with the bottom of lower chamber **16.**

Tube **24** is sufficiently long that its upper end **38** is disposed above upper end **26** of duct member **25.**

The inner diameter of duct member **25** is substantially greater than the outer diameter of tube **24.** An annular bearing sleeve **39** is carried by the inner walls of duct member **25** at its upper end. The inner diameter of the bearing sleeve is greater than the diameter of hole **31.**

As shown best in FIG. **3,** water is supplied to upper chamber **17** through a pair of inlet nipples **40** which extend through the chamber side walls to have their outer ends disposed outside base housing **11** for cooperation with the adjacent ends of a pair of suitable water supply conduits **41.** Nipples **40** open to upper chamber **17** at diametrically opposed locations of the chamber. Also, the nipples are aligned parallel to each other, but are not coaxially aligned. The nipples are disposed so that they open substantially tangentially to the circularly cylindrical configuration of upper chamber **17.** Accordingly, as water flows into upper chamber **17** through nipples **40,** the water flows spirally around the upper chamber, and then spirally upwardly around tube **24** to be discharged through bearing sleeve **39** and the open upper end of duct member **25.** The centrifugal forces associated with the spiral flow of the water emerging from the upper end of the duct member causes such water to be thrown upwardly and outwardly in all directions from the nozzle axis to define a relatively large diameter, shallow inverted cone lower tier **44** of the overall fountain discharge pattern **45,** as shown in FIG. **1.**

A nozzle assembly **47** is mounted to the upper end of tube **24** above the upper end of duct member **25.** The nozzle assembly includes a body **48** which defines therein a chamber **49** to which the interior of tube **24** communicates. The lower exterior surface **50** of the body is configured to serve as a deflector for water emerging from the upper end of duct member **25.** A central, relatively small diameter nozzle tube **51** is carried by the body of the nozzle assembly coaxially of tube **24.** Three additional nozzle tubes **52** are also carried by the upper portion of the nozzle assembly body to communicate with chamber **49.** Nozzle tubes **52** are all disposed at a common angle relative to the axis of tube **24,** and are inclined upwardly and outwardly relative to the axis of tube **24.** As shown best in FIG. **4,** nozzle tubes **52** are disposed at uniformly spaced locations about the circumference of central nozzle tube **51.**

During the operation of fountain **10,** water is supplied to lower chamber **16** through inlet nipples **21,** and through inlet nipples **40** to chamber **17.** As noted above, the flow of water in chamber **17** and through duct members **25** is spiral flow upwardly along and around the exterior of tube **24.** The spiral flow of water along and around tube **24** causes tube **24** to be gyrated about a fulcrum point associated with the lower end of the tube. Accordingly, tube **24** adjacent its upper end rolls around the inner diameter of bearing sleeve **39.** The cooperation between the exterior surfaces of tube **24** and the inner surfaces of bearing sleeve **39** produces rotation of tube **24** about its axis. Accordingly, tube **24** both rotates about its axis and gyrates relative to the axis of symmetry of the fountain. The rotary and gyratory motion of the tube is accommodated by the cooperation of bearing collar **33** with annular bearing member **32** in lower chamber **16.** The annular bearing collar is urged into contact with the annular bearing member during operation of the fountain by virtue of the pressure of water supplied to lower chamber **16.**

The water which enters lower chamber **16** through inlet nipples **21** is discharged from fountain **10** via nozzle tubes **51** and **52** of nozzle assembly **47.** The water which is discharged through nozzle tube **51,** because of the rotary and gyratory action of the supporting tube, is caused to break up into a plurality of discrete unaerated water droplets which form a central, inverted cone upper tier **55** in fountain pattern **45** symmetrically about fountain axis **12.** Also, the water which is discharged through nozzle tubes **52** is broken up into a plurality of discrete unaerated water droplets by virtue of the gryatory and rotary movement of tube **24.** The water discharged from each inclined nozzle tube **52** defines a corresponding one of three inclined inverted cones of water **56,** which cones collectively define the intermediate tier **57** of the three-tiered discharge pattern **45,** as shown in FIG. **1.** Fountain discharge pattern **45** is similar to the fountain pattern shown in my prior U.S. Design Pat. No. 208,754.

It is desired that the aggregate water flow area of nozzle tubes **51** and **52** not exceed the water flow area of tube **24.**

Workers skilled in the art to which this invention pertains will appreciate that nozzle assembly **47** may be

deleted from the structure of fountain **10**, if desired. In such a case, water emerging from the rotating and gyrating tube **24** defines a single inverted cone coaxially aligned with fountain axis **12**, and composed of discrete droplets of unaerated water. Alternatively, by substitution of an appropriately structured nozzle assembly for nozzle assembly **47**, a fountain pattern similar to that shown in my prior U.S. Design Pat. No. 208,755 may be produced.

Best aesthetic results are produced by fountain **10** when the fountain is disposed on pool floor surface **29** so that fountain axis **12** corresponds to a plumb line. Appropriate leveling of the fountain relative to the pool floor surface is facilitated by the inclusion in fountain **10** of three positioning assemblies **60**. As shown best in FIG. **3**, the positioning assemblies are disposed at uniformly spaced locations about the circumference of nozzle **11**. Each positioning assembly is comprised of a lug **61** which extends radially outwardly from bottom closure plate **15**. An externally threaded stud **62** is passed through an oversize hole **63** in the lug and is engaged adjacent the top and bottom surfaces of the lug in corresponding jam nuts **64**. A circular foot **65** is carried by the lower end of stud **62**.

By appropriate valving of the water flow paths provided to chambers **16** and **17** through conduits **22** and **41**, respectively, the water flow rates to these chambers may be regulated as desired. In this manner, the rate of rotation and gyration of the tube **24** may be adjusted for best aesthetic effects under particular conditions. Also, the size of lower tier **44** relative to the other tiers of the fountain pattern may be adjusted by regulating the relative volumes of water supplied to chambers **17** and **16**, respectively. For example, on a windy day it may be desirable to reduce the volume of water supplied to chamber **16** and to increase the volume of water supplied to chamber **16** and to increase the volume of water supplied to chamber **17**, as compared to the volume of water supplied to these chambers during use of fountain **10** on calm days.

In a second embodiment of the invention, a fountain **70** (see FIG. **5**) includes a base housing **71** which is similar to base housing **11** of fountain **10**. Accordingly, housing **71** is comprised of a body **72** and top and bottom closure plate **73** and **74** which cooperate with the body to close upper and lower chambers **75** and **76** defined on opposite sides of a septum portion **77** of the body. The closure plates are secured to the body by through-bolts and nuts (not shown) similar to those described with reference to FIG. **2**. Housing **71** and the chambers defined therein are symmetrical about an axis of symmetry **78** for the fountain.

An enlarged diameter duct member **79** is fixedly connected at its open lower end to top closure plate **73** to be in water flow communication with upper chamber **75**; and the duct member is concentric to axis **78**. An elongate, hollow, open-ended tube **80** is disposed coaxially of the fountain and has its upper end **81** disposed above the upper end of duct member **79**. The lower terminal portion of tube **80** is intimately received in a bore **82** formed through septum portion **77** so that the lower end **83** of the tube is in water flow communication with lower chamber **76**. The cooperation of the lower terminal portion of the tube within bore **82** is sufficiently snug that no water flow path exists through bore **82** or around the exterior of the tube, and that the tube is held fixed relative to body **72**.

An inlet connection nipple **84** is disposed through the side walls of lower chamber **76** and has its outer end disposed exteriorly of the housing for cooperation with a suitable water flow conduit **85**. Preferably the elongate extent of connection nipple **84** is aligned radially of axis **78**. Water is supplied to upper chamber **75** via a connection nipple **86** to the outer end of which is connected a suitable water supply conduit **87**. Connection nipple **86** is disposed through the side walls of upper chamber **75** so that it communicates substantially tangentially with the circular configuration of the upper chamber. Accordingly, water introduced into the upper chamber through connection nipple **86** from conduit **87** flows spirally within chamber **75** and spirally upwardly along and around tube **80** through duct member **79**.

The structure of fountain **70** illustrates a feature which may be provided, if desired, in the structure of fountain **10**, namely, that only one of water inlet opening may be provided to each of the two chambers in a fountain according to this invention. Whether or not one or two water inlet openings are provided to either or both chambers is dependent, in part, upon the volume of water to be discharged by the fountain during use.

Preferably fountain **10** is connected to a source of pressurized water via a three-way valve **88** interposed between a source water conduit **89** and conduits **85** and **87** for the lower and upper chambers of the fountain, respectively. Valve **88** may be operated to provide communication from source conduit **89** only to conduit **85**, or only to conduit **87**, or to both conduits **85** and **87**. Accordingly, fountain **70** may be operated to produce any one of the three fountain patterns **90**, **91** and **92** illustrated in FIGS. **7**, **8** and **9**, respectively.

Fountain pattern **90** is composed of a single inverted cone **93** of water which rises to moderate height above the top of duct member **79** to fall back to the surface **94** of a fountain pool in which fountain **70** is installed. The inverted water cone **93** is produced as a result of the centrifugal energy present in water discharged through the upper end of duct member **79** in response to the supply of water to upper chamber **75** through conduit **87**. During those periods when fountain **70** is operated to produce discharge pattern **90**, no water is supplied to lower chamber **76** through conduit **85**.

Discharge pattern **91** consists of a vertical plume of water **95** which rises to substantial height above fountain **70** before the water falls back to pool surface **94**. Plume **95** is formed by the discharge of water through tube **80**, and therefore is essentially coaxial with fountain **70**. During those periods when the fountain is operated to produce discharge pattern **91**, no water is introduced into upper chamber **75** through conduit **87**.

Discharge pattern **92** is composed of the combination of discharge patterns **90** and **91**, i.e., the combination of inverted water cone **93** and coaxial higher plume **95**, as shown best in FIG. **9**. To produce fountain pattern **92**, valve **88** is operated to provide water flow communication from source conduit **89** to both of conduits **85** and **87**.

It should be appreciated that separate flow control valves (not shown) may be disposed in each of conduits **85** and **87** in addition to or in place of flow control valve **88**, and may be operated to produce fountain patterns **90**, **91** and **92**. Where each of conduits **85** and **87** includes a flow control valve in combination with

three-way control valve **88,** the relative proportions of cone **93** and plume **95** may be adjusted for best aesthetic effects relative to each other, or individually, in the context of the particular environment of a given fountain at a given time.

It should be understood that, if desired, one or more of water inlet openings may be provided to lower chamber **76,** either at regularly spaced locations around the circumference of the chamber or through the bottom plate of the chamber at locations symmetrically disposed about axis **78.** Also, it is within the scope of this invention that two or more tangential water inlet openings may be provided to upper chamber **75.**

Workers skilled in the art to which this invention pertains will readily understand that modifications and alterations may be made in the structures of the two embodiments of this invention which are described above while still using the teachings provided by this invention. Such workers will also understand that it is not essential to the practice of this invention that a nozzle assembly similar to nozzle assembly **47** be mounted to the upper end of rotating and gyrating tube **24,** and that if a nozzle assembly is used, it can be a nozzle assembly of the type shown in any of the previously issued patents pertaining to a rotary pendulum fountains and owned by the assignee of this invention. In this respect, many of the teachings of the previously issued, commonly owned patents pertaining to rotary pendulum lawn sprinklers and the like may be used to advantage in the embodiment shown in FIG. **2.** It will also be understood that, if desired, artificial illumination assemblies may be mounted to the base housings of the fountains of this invention. Accordingly, in view of the foregoing considerations, it will be apparent that the present invention is not limited specifically to the structural arrangements described above, and that the foregoing description is not be regarded as limiting the scope of this invention.

What is claimed is:

1. An ornamental fountain comprising a housing defining therein upper and lower chambers having a septum therebetween, a vertical duct member connected to the housing with its lower end communicating with the upper chamber, an open ended tube disposed within the duct member and extending through the upper chamber and the septum to have its lower end communicating with the lower chamber, the upper end of the tube being disposed above the upper end of the duct member, water inlet means to the lower chamber, and water inlet means to the upper chamber arranged in relation to the chamber to produce a spiral flow of water in the upper chamber and along the duct member around the tube to and through the upper end of the duct member.

2. A fountain according to claim **1** wherein the chambers and the duct member are coaxially aligned along a vertical axis of the fountain.

3. A fountain according to claim **2** wherein the outer diameter of the tube is substantially less than the inner diameter of the duct member.

4. A fountain according to claim **3** wherein the septum defines a hole therethrough concentric to the axis which is greater in diameter than the tube and through which the tube passes to communication with the lower chamber, and bearing means cooperating between the housing and a lower portion of the tube for accomodating rotation of the tube about its own axis and gyration of the tube relative to the fountain axis.

5. A fountain according to claim **4** wherein the bearing means comprises a bearing member carried by the tube in the lower chamber.

6. A fountain according to claim **4** including annular bearing means carried by the duct member adjacent its upper end for cooperation with the tube, the annular bearing means having an inner diameter greater than the hole in the septum.

7. A fountain according to claim **4** including a nozzle assembly carried by the upper end of the tube for receiving water from the tube and for discharging received water from the fountain.

8. A fountain according to claim **3** wherein the tube is fixedly supported in the septum to be coaxially aligned with the fountain axis.

9. A fountain according to claim **1** including separate water supply conduit means connected from the inlet means for the upper and lower chambers, and valve means coupled to the conduit means for controlling the rate of water flow through the upper chamber inlet means relative to the rate of water flow through the lower chamber inlet means.

10. A fountain according to claim **9** wherein the valve means is operable to supply water either only to the upper chamber, or only to the lower chamber, or to both the upper and lower chambers.

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