Feb. 7, 1961 O. PRZYSTAWIK 2,970,771

NOZZLE ARRANGEMENT FOR FOUNTAIN DISPLAYS

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Fig. 1

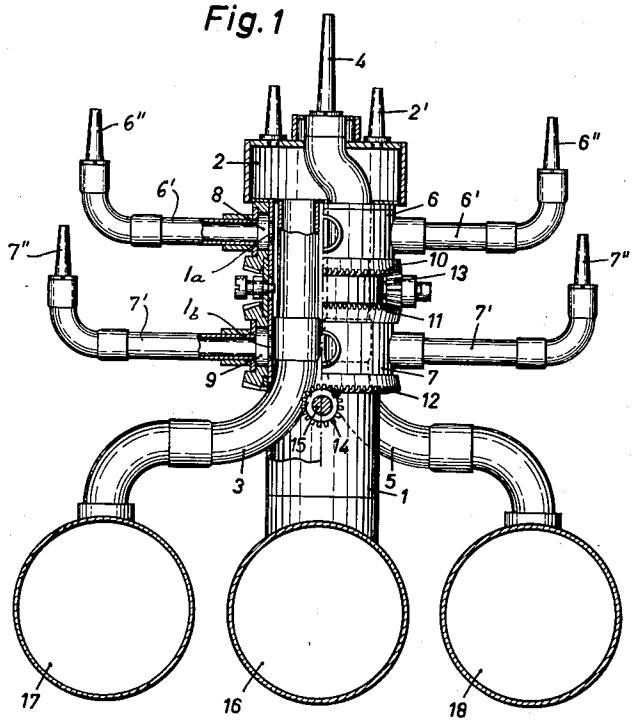
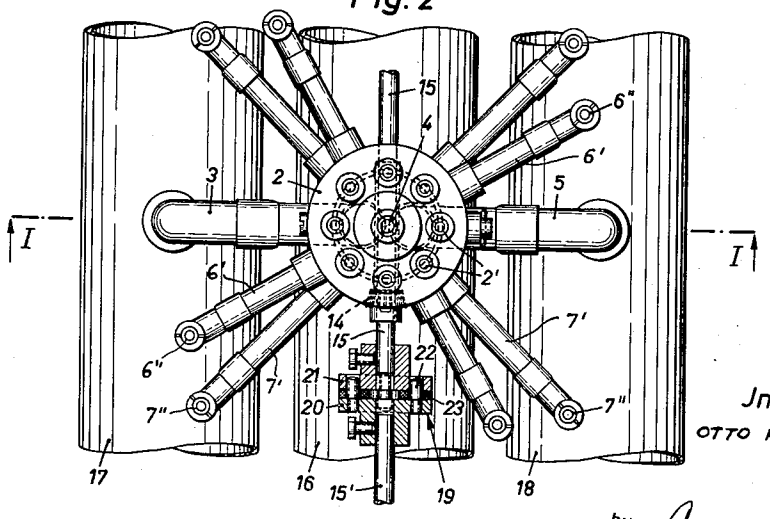


Fig. 2



Jnventor:
OTTO PRZYSTAWIK

by Amster & Levy
Attorneys

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Fig. 3

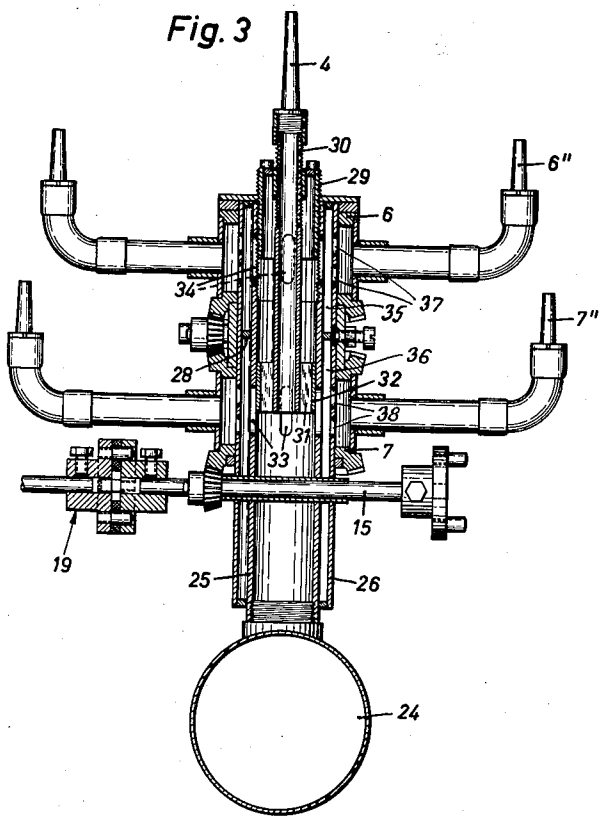
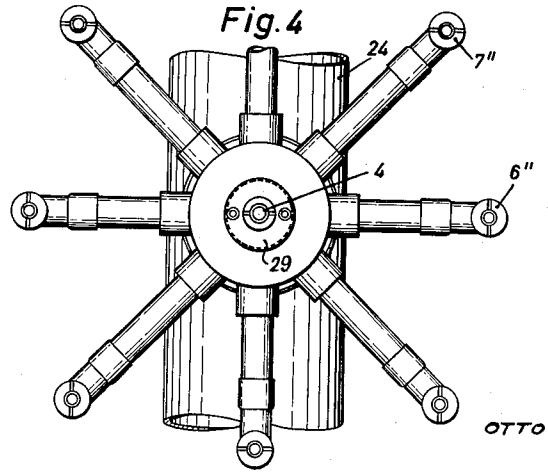


Fig. 4



Inventor:
OTTO PRZYSTAWIK

by Amster & Levy
Attorneys

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NOZZLE ARRANGEMENT FOR FOUNTAIN DISPLAYS

Otto Przystawik, Berlin-Lichterfelde-Ost, Germany, assignor to Dancing Waters, Inc., New York, N.Y., a corporation of New York

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16 Claims. (Cl. 239—17)

This invention relates to a novel and improved nozzle arrangement for water displays of the type in which fountain units are arranged in groups and are regulated rhythmically or selectively to produce visual effects. The nozzle assembly of this application is intended, for example, to be used as a part of the fountain installation shown and described in my co-pending United States patent application, Serial No. 377,596, now Patent No. 2,787,495, filed Aug. 31, 1953 and is shown therein as part of the complete fountain. This application is a continuation-in-part of the aforementioned patent application.

Water displays of the type mentioned above are referred to as "dancing fountains." The invention herein relates particularly to a plurality of nozzles for such fountains, which nozzles are arranged in groups and rotatably mounted about a substantially vertical axis.

It is customary in dancing fountains to vary the height of the water streams rhythmically where desired, as for example, in synchronization with music or musical effects. The object of the present invention is to provide a nozzle arrangement which will produce a spray arrangement forming an upstanding water figure, which figure may be readily and radically changed or varied in configuration as well as in height.

A novel characteristic of the invention is the selective adjustability of the water flow supplying the particular groups of nozzles. The water flow to one group of nozzles may be controlled or adjusted independently of that to the other groups of nozzles. In accordance with the invention, this control may be effected in two ways: First, several main pipe conduits are provided from which branch conduits lead to various groups of nozzles in one assembly, and each main pipe conduit may be independently controlled or adjusted. In the second way, the areas of the water inlet openings in the main pipe which lead to the nozzles are adjustable by means of sleeves which are axially movable in the main pipe. Additional objects and advantages of the invention will become apparent during the course of the following specification when taken in connection with the accompanying drawings in which:

Fig. 1 is a vertical section taken centrally through a nozzle assembly made in accordance with the invention, substantially along the lines 1—1 of Fig. 2;

Fig. 2 is a top plan view of the nozzle assembly shown in Fig. 1 with portions of the conduits or pipes broken away for convenience of illustration;

Fig. 3 is a central vertical section corresponding to Fig. 1 but through a modified type of nozzle arrangement also made in accordance with the invention; and

Fig. 4 is a plan view of the nozzle arrangement shown in Fig. 3.

The nozzle assembly of the invention broadly comprises an arrangement of nozzles in which a plurality of vertically-disposed nozzles are arranged in a circle and are mounted to revolve about a vertical pipe, optionally in combination with fixed nozzles or groups of fixed nozzles.

Figs. 1 and 2 illustrate a nozzle unit, one or more of which may be incorporated into a fountain display. The

unit shown in Figs. 1 and 2 comprises four separate groups of nozzles, two of which are movable and two of which are fixed. The nozzles of each group are disposed on the circumference of a geometric pattern, the shapes of the different groups being similar and of different sizes. One of the nozzle groups consists of nozzles 2' which are upstanding from the top of a hollow housing 2, and are arranged in a circular row on said housing. While the number of such nozzles 2' is optional and may be selected to suit the particular display, eight of said nozzles 2' are shown in Fig. 2 in their circular arrangement. The hollow housing 2 is fixedly mounted at the top of a rigid support pipe 1 which is vertically or substantially vertically disposed, and acts as a cover to close off the top of said pipe 1. The housing 2 is fed with water under pressure by a conduit 3 which extends through the wall of pipe 1 and then extends upwardly through the interior of pipe 1 communicating with the bottom of the hollow housing 2 as shown in Fig. 1.

The second nozzle group consists of a single nozzle 4 which is mounted at the top of the housing 2 and is disposed vertically at the center of the circular row of nozzles 2'. The nozzle 4 is fed by a separate conduit 5 which also extends through the wall of pipe 1 and then extends vertically through said pipe 1 to said nozzle 4.

On the external circumference of pipe 1, a pair of vertically spaced rings 6 and 7 are rotatably mounted. Each ring 6 and 7 carries a plurality of radially-projecting pipes 6' and 7' at the ends of which respective vertically-extending nozzles 6'' and 7'' are mounted. In the preferred form of the invention shown in Fig. 2, the ring 6 is shown carrying four radial pipes 6' and the ring 7 is shown carrying four radial pipes 7', although the number of pipes and nozzles may be varied as required in the display. The nozzles 6'' comprise the third group of nozzles and the nozzles 7'' the fourth group.

Both rings 6 and 7 are hol'ow and have respective interior circular chambers 8 and 9 which communicate with the interior of pipe 1 by means of respective openings 1a and 1b in said pipe 1. The ring 6 has mounted on its lower end an annular bevel gear 10. The ring 7 has a pair of bevel gears 11 and 12 respectively mounted at its top and bottom ends. A bevel gear 13 is rotatably mounted on the pipe 1 for turning about a horizontal axis and is in mesh with the gears 10 and 11 in such a manner that the rings 6 and 7 will rotate about pipe 1 in opposite directions. The gear 12 is driven by the bevel gear 14 which is mounted on a horizontally disposed shaft 15 which extends entirely through pipe 1, as shown in Fig. 2. The shaft 15 is adapted to be driven by an external power source such as an electric motor, whereby the rings 6 and 7 with their respective nozzles 6'' and 7'' are whirled rapidly about the pipe 1 as an axis, in opposite directions.

The pipe 1 is connected to a main conduit 16 of the fountain display while conduit 3 is connected to a separate main conduit 17, and conduit 5 is connected to a main conduit 18. The main conduits or water lines 16, 17, and 18 of the fountain display are filled with water under pressure, which pressure may be independently adjusted in each water line or conduit, or may be shut off entirely. The conduits 16, 17 and 18 may also be connected to other nozzle arrangements of the fountain display.

In Fig. 2, a flexible, self-adjusting coupling 19 is shown, the coupling serving as a means of connection between the rigid shaft 15 and a shaft 15' which leads to a further arrangement of nozzles or nozzle units or electric motor or other power source. The self-adjusting coupling 19 comprises a pair of disks 20 and 21 which are mounted respectively on the ends of shafts 15' and 15. The disk 20 has a plurality of studs 22 projecting from

its face, which studs are off-set from the center of disk 20 and are preferably arranged circularly about said center. The studs 22 extend through respective openings in the disk 21, thereby providing a coupling between the two disks by means of which the disk 21 may be rotated by disk 20. A rubber ring 23 is disposed between the faces of disks 20 and 21, the ring 23 also having openings through which studs 22 extend. The coupling 19 allows for sufficient play during rotation of the shafts 15 and 15', so as to make exact axial alignment of shafts 15 and 15' unnecessary. This finds particular importance in connection with water displays which are of a temporary nature, and are intended to be set up and dismounted quickly and conveniently.

When the shaft 15 is driven, the groups of nozzles 6'' and 7'' are rotated rapidly in opposite directions to provide a novel fountain configuration. The water pressure in the main conduit 16 may be varied gradually to produce gradual or successive changes in this configuration. At the same time, the height of the water jets emerging from the nozzles 2' may be regulated by adjusting or rhythmically varying the pressure in the main conduit 17, and in a similar manner the height of the jet emitted from nozzle 4 may be similarly regulated by selective control of the water pressure in the main line or conduit 18.

The nozzle unit, as above described, is capable of producing extremely dramatic and lively water effects. In practice, a number of such units, for example six, are evenly spaced in a row extending the length of the fountain display, and are preferably operated independently of the other nozzles and nozzle arrangements in the display. That is to say, for best results, the remaining nozzles in the fountain display are turned off entirely while the nozzle units of the invention are operated. The ring of nozzles 2' produces a vertically-extending substantially cylindrical cascade of water, with a sing'e stream rising from its center, produced by the central nozzle 4. When the nozzles 6'' and 7'' are rotated and fed with water from the conduit 16, they produce jet swirls which cut through the central cascade, resulting in a rapidly-moving and form-changing swirling water effect. Visually, this effect gives the impression of leaping flames, and the dramatic effect may be heightened if coordinated with colored lighting of the water.

Figs. 3 and 4 show a modified construction in somewhat simpler form, which, in common with the embodiment of Figs. 1 and 2, has the central upstanding fixed main nozzle 4, upper rotatable nozzles 6'' mounted on ring 6, and lower rotatable nozzles 7'' mounted on ring 7. The circular row of nozzles 2' are omitted in this embodiment.

The rings 6 and 7 are driven by shaft 15 through the same type of bevel gear arrangement as was described in connection with the unit of Figs. 1 and 2.

The nozzle unit shown in Figs. 3 and 4 differs from that of Figs. 1 and 2 in that it is fed by a sing'e water main or conduit 24 instead of the three separate conduits of the previous embodiment. Since all of the nozzle groups are supplied with water from the same conduit 24, the regulation of the various water streams or jets is effected in a different manner.

The main conduit 24 is connected to an upstanding pipe 25 which has an outer jacket 26 spaced from the pipe 25 to provide a water chamber therebetween. The annular chamber formed between pipe 25 and jacket 26 is closed at its top and bottom ends and is divided into an upper chamber 35 and lower chamber 36 by a wall or partition 28 located between the two rings 6 and 7. The upper chamber 35 communicates with the interior of the hollow upper ring 6 through openings 37 in the wall of jacket 26. Similarly, the lower chamber 36 communicates with the lower ring 7 through jacket wall openings 38.

The pipe 25 has internal threading at its upper end into which a sleeve 29 is screwed. The nozzle 4 is mounted on an elongated pipe 30 which is externally threaded. The top wall of sleeve 29 has a central, internally-threaded opening in which the externally-threaded pipe 30 is mounted for vertically-adjusted movement.

The upstanding pipe 25 has a plurality of vertically-elongated slots or openings 33 which communicate with the lower chamber 36, so that water fed from main conduit 24 to pipe 25 will pass through said openings 33 into the lower chamber 26 and then flow through openings 38 to the lower nozzles 7''. The size of the slots 33 may be regulated by a short pipe 32 of large diameter which is mounted on radial vanes or ribs 31 fixed to the bottom end of pipes 30. When the pipe 30 is turned within the sleeve 39, the extension pipe 32 is raised or lowered relative to the slots 33 thereby increasing or decreasing the lengths of said slots and consequently varying the force of the stream or jet emitted by nozzles 7''.

Pipe 25 also has a plurality of elongated slots 34 communicating with the upper chamber 35 to supply water to nozzles 6'' through openings 37 and ring 6. The size of these slots 34 may be adjusted by turning sleeve 29 in the threaded upper portion of pipe 25, whereby the water pressure in the nozzles 6'' may be adjusted.

By this construction, the size of the streams or jets emitted by the nozzles 6'' and 7'' may be adjusted independently of each other and of the central nozzle 4. Rhythmic variations in the height of the jets are produced by varying the pressure in the main conduit 24.

While preferred embodiments of this invention have been shown and described herein, it is obvious that numerous additions, changes and omissions may be made in these embodiments without departing from the spirit and scope of the invention.

I claim:

1. A nozzle assembly for a fountain display, said assembly comprising a plurality of separate groups of nozzles, the respective nozzles of each group being disposed on the circumference of a geometric pattern, the geometric patterns of the different groups being similar and of different sizes, means supporting all of said groups with the circumference of any given group, except the largest circumference, wholly located within the larger circumference of another group, the nozzles of each group being arranged to emit streams of water upwardly in a substantially vertical direction, means mounting at least one of said groups for rotation about a substantially vertical axis with respect to the remaining groups, remotely actuated drive means connected to said rotatably mounted group for rotating the same, conduit means terminating at said groups for feeding water under pressure to said groups, and valve means in said conduit means for individually controlling the flow of water to at least one of said groups whereby the sizes of streams emitted by the nozzles of said one group may be regulated.

2. A nozzle assembly as set forth in claim 1 wherein the one group regulatable by the valve means is the rotatably driven group.

3. A nozzle assembly as set forth in claim 1 wherein the conduit means includes a plurality of conduits, each communicating with a different one of the nozzle groups and thus feeding a different group and wherein there are valve means in at least two of the conduits for individually regulating at least two groups.

4. A nozzle assembly as set forth in claim 1 wherein plural valve means are provided in conduit means to different nozzle groups whereby the sizes of streams emitted by different groups may be individually regulated.

5. A nozzle assembly as set forth in claim 1 wherein the conduit means includes plural conduits for the different nozzle groups, wherein a supply pipe connects

each conduit to its respective group of nozzles and wherein one of the pipes is of substantially greater diameter than the other pipes and contains the other pipes.

6. A nozzle assembly as set forth in claim 1 wherein the conduit means includes a main water conduit, a supply pipe communicating with said main conduit and water outlet ports in the supply pipe communicating with the groups of nozzles, and wherein the valve means includes at least one sleeve movably mounted in said pipe, and means for moving said sleeve axially in said pipe to adjusted positions relative to the water outlet ports for adjustably varying the size of the latter.

7. A nozzle assembly as set forth in claim 1 wherein the conduit means includes a main water conduit, a supply pipe communicating with said main conduit, a first set of water outlet ports in the supply pipe communicating with one group of nozzles and a second set of water outlet ports in the supply pipe communicating with another group of nozzles, and wherein the valve means includes a pair of sleeves movably mounted in the pipe and respectively associated with the first and second set of ports, and means for independently adjusting the positions of said sleeves relative to their associated outlet ports, whereby the size of the sets of outlet ports may be individually varied.

8. A nozzle assembly as set forth in claim 1 wherein means is provided for mounting at least another of the groups for rotation about the same vertical axis as that about which the one group rotates, and wherein remotely actuated drive means further is provided and is connected to the said other rotatably mounted group for rotating the latter.

9. A nozzle assembly as set forth in claim 8 wherein the two rotatable groups are rotatably driven by the drive means in opposite directions.

10. A nozzle assembly as set forth in claim 9 wherein the same drive means is connected to both rotatably mounted groups of nozzles.

11. A nozzle assembly as set forth in claim 1 wherein the conduit means includes a substantially vertical upstanding water pipe and at least one hollow ring rotatably mounted on the exterior of said pipe and communicating with the interior thereof, the rotatable group of nozzles being mounted on and communicating with the interior of said ring, and wherein the drive means includes a drive member, a driven shaft, gear means coupling the shaft to said ring, and a self-aligning coupling connecting said shaft to said drive member.

12. A nozzle assembly for a fountain display, said assembly comprising a plurality of separate groups of nozzles, the nozzles of each group being arranged to emit streams of water upwardly in a substantially vertical direction, an upstanding water pipe, said nozzle groups including a first group of nozzles and a second group of nozzles, means for mounting said first and said second groups of nozzles on said water pipe for rotation about a common substantially vertical axis, the respective nozzles of said first and said second groups being disposed on the circumferences of different geometric patterns, said patterns being similar and of different sizes, said mounting means supporting said groups with the smaller circumference within the larger circumference, said mounting means including first and second hollow rings rotatably mounted about said pipe and vertically spaced from each other, a plurality of pipes extending radially from said first ring and communicating with the interior of said first ring, each of said pipes carrying one of said first group of nozzles, a second plurality of pipes extending radially from said second ring and communicating with the interior of said second ring, each of said second pipes carrying one of said second group of nozzles, each of said rings communicating with the interior of said upstanding water pipe, said water pipe having an inlet opening adapted to be connected to water under pressure, and remotely actuated drive means operatively connected to said rings for rotating the rings in opposite directions about the upstanding water pipe.

13. A nozzle assembly according to claim 12 in which said drive means includes a first bevel gear on the lower side of the upper ring, second and third bevel gears respectively on the upper and lower sides of the lower ring, a drive shaft, a fourth bevel gear connected to and driven by said drive shaft, said fourth bevel gear meshing with said third bevel gear to rotate said lower ring upon rotation of the drive shaft, and a fifth bevel gear between and meshing with the upper and second gears whereby to rotate the first ring in the opposite direction.

14. A nozzle assembly for fountain displays comprising a water pipe, a first and second spray pipe unit mounted on said water pipe in spaced relationship for rotation about the axis of said water pipe, each of said spray pipe units comprising a plurality of spray pipes extending radially from said water pipe, each spray pipe communicating with the interior of said water pipe and each having a nozzle directed upwardly substantially parallel to the axis of said water pipe, said water pipe including an inlet adapted to receive water under pressure for transmission through said water pipe to said spray pipes and then to said nozzles, drive means operatively connected to said first pipe unit for rotating the first spray pipe unit about said upstanding water pipe, and coupling means connecting said spray pipe units for rotation of the second pipe unit in response to rotation of the first pipe unit.

15. A nozzle assembly for fountain displays comprising an upstanding water pipe, a first and second spray pipe unit mounted in vertically spaced relationship on said upstanding water pipe for rotation about the axis of said water pipe with the first spray pipe unit located above the second spray pipe unit, each of said spray pipe units comprising a plurality of spray pipes extending radially from said water pipe, each spray pipe communicating with the interior of said water pipe and each having at least one upwardly-directed nozzle, said water pipe including an inlet adapted to receive water under pressure for transmission through said water pipe to said spray pipes and then to said nozzles, drive means operatively engaging the first spray pipe unit for rotating said unit about said upstanding water pipe and coupling means connecting said spray pipe units for rotation of the second pipe unit in response to rotation of the first pipe unit, the nozzle of the first spray pipe unit being located radially outwardly of the nozzle of the second spray pipe unit.

16. A nozzle assembly for fountain displays comprising an upstanding water pipe, a first and second spray pipe unit mounted in vertically spaced relationship on said upstanding water pipe for rotation about the axis of said water pipe, each of said spray pipe units comprising a plurality of spray pipes extending radially from said water pipe, each spray pipe communicating with the interior of said water pipe and each having an upwardly-directed nozzle, said water pipe including an inlet adapted to receive water under pressure for transmission through said water pipe to said spray pipes and then to said nozzles, drive means operatively connected to the first pipe unit for rotating the first spray pipe unit about said upstanding water pipe in one direction, and coupling means connecting said spray pipe units for rotation of the second pipe unit in the opposite direction in response to rotation of the first pipe unit.

References Cited in the file of this patent

UNITED STATES PATENTS

130,798	Finley	Aug. 27, 1872
165,668	Galvin	July 20, 1875
1,096,638	Miller	May 12, 1914
1,255,711	Crane	Feb. 5, 1918
1,710,953	Sullivan	Apr. 30, 1929