

Feb. 12, 1963

H. HERZOG

3,077,306

FOUNTAIN WITH MOVABLE NOZZLES

Filed June 28, 1960

24 Sheets-Sheet 1

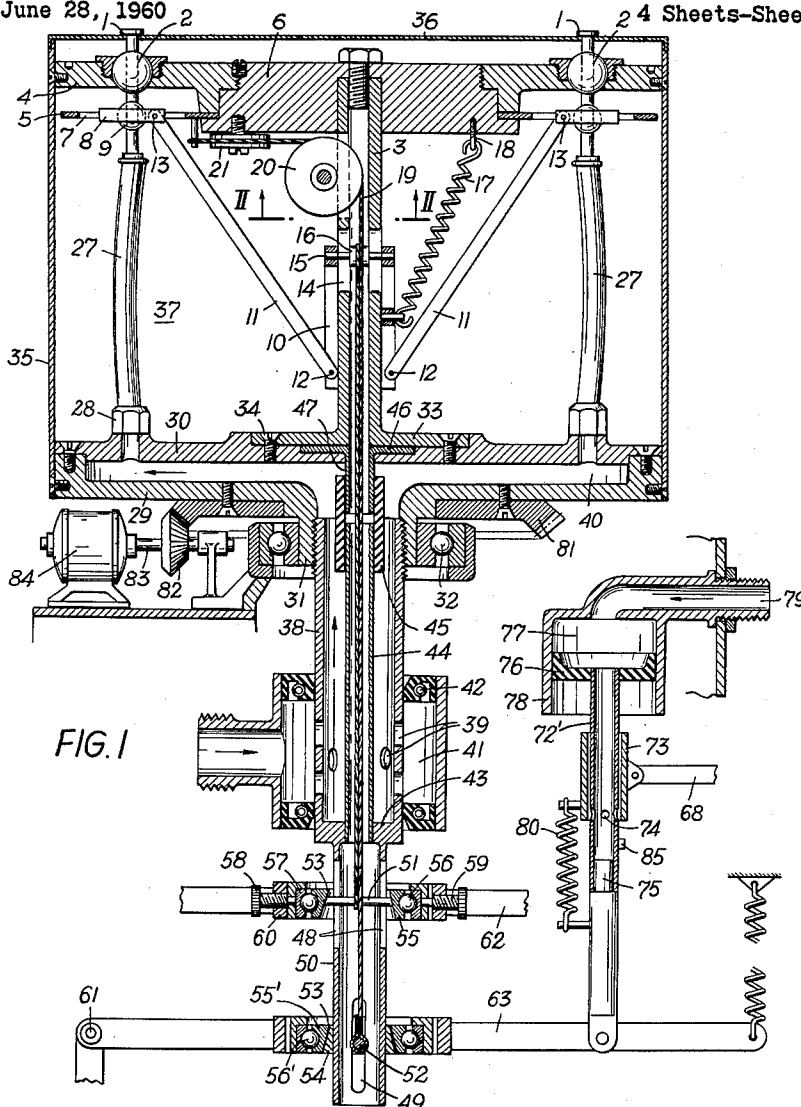


FIG. 1

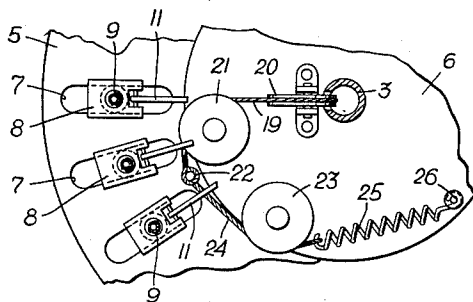


FIG. 2

HANS HERZOG
INVENTOR.

BY

Karl F. Ross
AGENT

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H. HERZOG

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FIG. 3

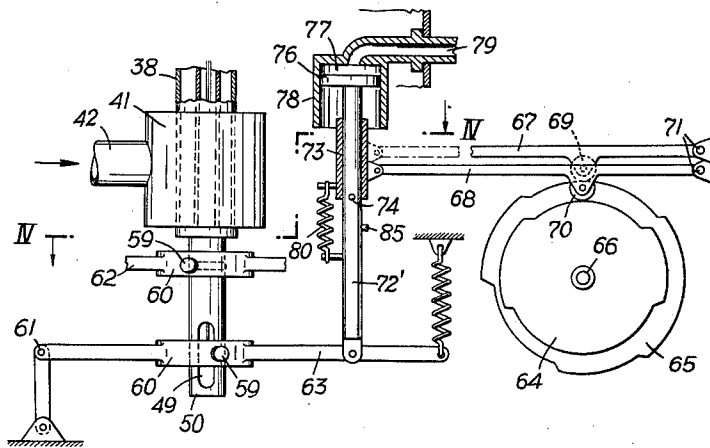
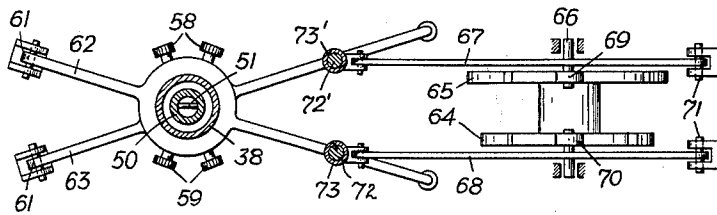


FIG. 4



HANS HERZOG
INVENTOR.

BY

Karl F. Ross

AGENT

Feb. 12, 1963

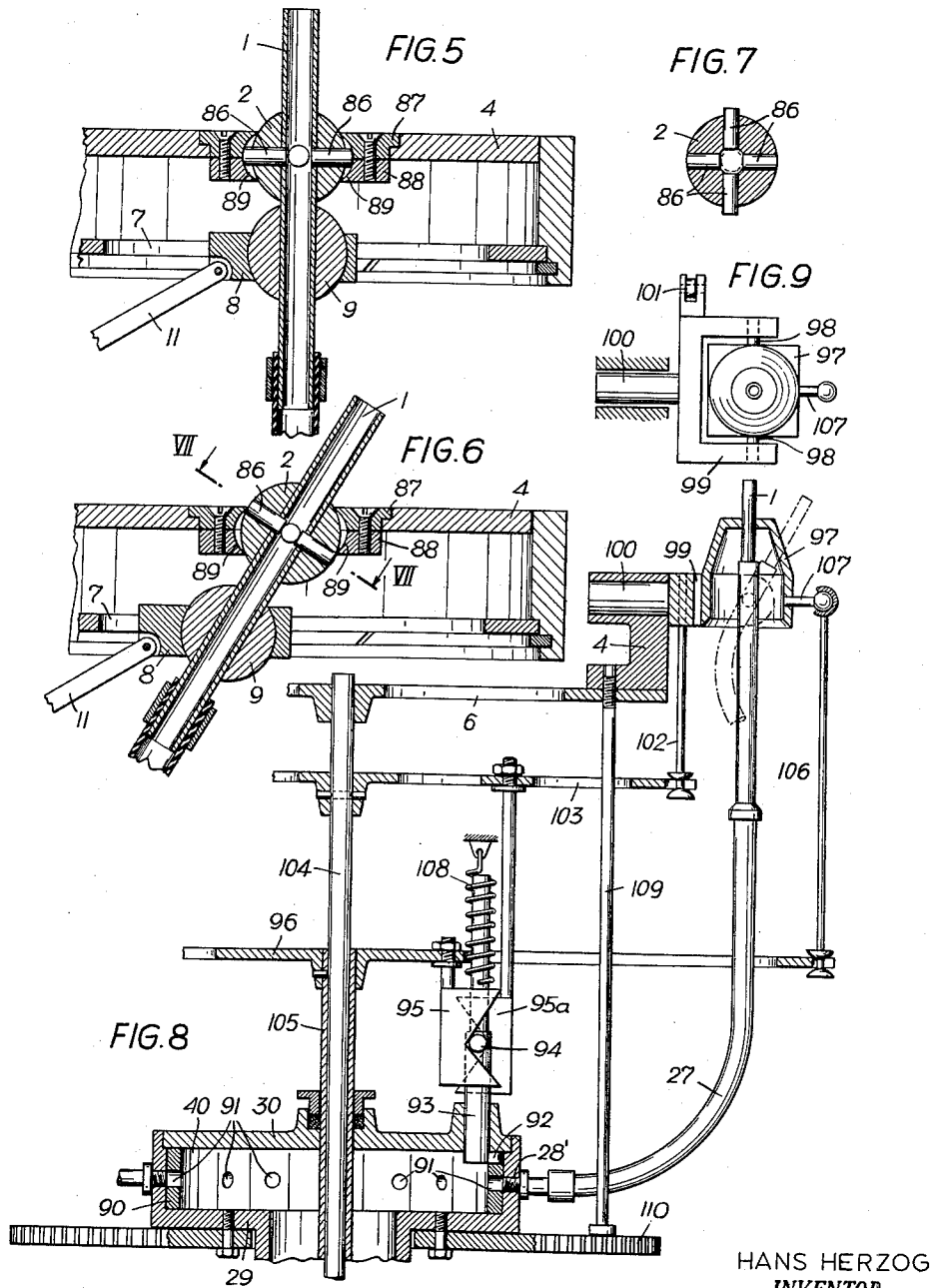
H. HERZOG

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HANS HERZOG
INVENTOR.

BY

Karl F. Ross

AGENT

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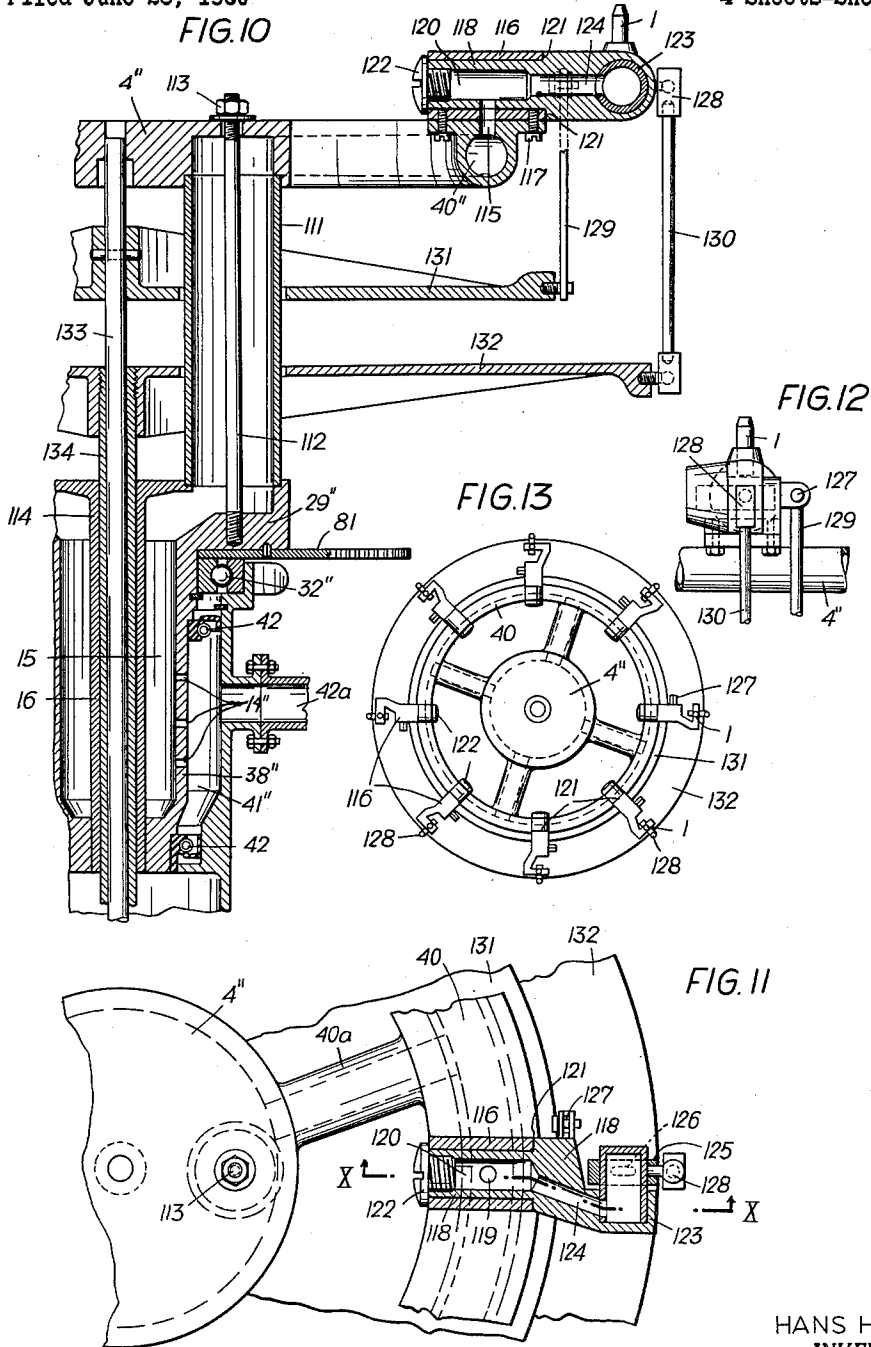
H. HERZOG

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HANS HERZOG
INVENTOR.

BY

Karl F. Ross

AGENT

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FOUNTAIN WITH MOVABLE NOZZLES

Hans Herzog, Hutteldorferstrasse 335/14,
Vienna XIV, Austria

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5 Claims. (Cl. 239—227)

This invention relates to a fountain which comprises a circular series of jet nozzles mounted in a carrying plate by means of articulated joints so as to be movable in all directions and connected by flexible hose connections to a distributor head having a like number of connecting nipples and having a limited freedom of movement, all jet nozzles having control elements connected thereto which are jointly operable to adjust the jet nozzles to different angular positions.

When the jet nozzles are pivotally moved in a radial direction toward and away from the center of the circular series of nozzles with the intensity of the jets of water remaining unchanged, the range which is sprayed is greatly enlarged so that only water basins having a very large diameter appear to be suitable for the erection of such fountains. In order to enable the incorporation of this fountain with an unchanged height of jet also in water basins which are firmly installed or provisionally erected in gardens, it is proposed according to the invention automatically to shorten the range of the water jets of the fountains when they are radially outwardly directed, e.g., from the center of the installation.

According to the invention this effect is achieved in that the path of water including the distributor chamber, the hose connections and the jet nozzles incorporates at one point a throttling device which reduces the range of the jets and has operating means positively connected to the mechanical, electrical or hydraulic control device for the jet nozzles so that during the pivotal movement of the jet nozzles from their vertical position the water paths are progressively constricted to reduce the range of the jets.

This basic solution of the idea of the invention may be embodied in various ways.

In one embodiment the throttling of the water jets is effected by a throttling device consisting of several flow retarding elements which are radially movable in the nozzle joint and, under the influence of control cams at the joint bearing and in dependence on the pivotal movement of the nozzles from their vertical position, automatically enter into the nozzle duct to restrict the free cross-section of flow of the nozzle and in the vertical position of the nozzle automatically return to their initial position under the liquid pressure of the water jet.

The invention may also be embodied in a structure in which the throttling device consists of an annular slide valve which is rotatably mounted in a distributor chamber on the inner surface of a restorated chamber wall communicating with the supply conduits for the water, this valve being indirectly connected to at least one element of the control means which rotate the nozzle joints and upon actuation of which said element restricts the cross-sections of flow of the connection openings in dependence on the magnitude of the angle of the pivotal movement of the nozzles.

In order to reduce, on the one hand, the length of the path of the water to the jet nozzles and to ensure, on the other hand, a sealing action which is as favorable as possible, the hose connections are eliminated according to the invention and each of the joints of the jet nozzles, consists of two cylinders which lie in a horizontal plane and are arranged at an angle, preferably a right angle, to each other and form a water-conducting unit. One of the cylinders of the joint having two degrees of freedom, which has a radial water passage provided with an an-

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nular slide valve which is rotatably mounted on said cylinder and carries the jet nozzle and connects it to the water passage of the cylinder and is adjustable by means of one of the links. The other cylinder, the axis of which is radially directed toward the center of the circular series of nozzles, is rotatably mounted in a stationary housing and is rotatable to move a radial bore relative to a water inlet provided in the housing to control the jet in an angular range of nozzle movement at right angles to the radius directed to the center of the nozzle joint, said other cylinder being operable by means of links which are independent of said first-mentioned links.

It is essential that the water jet be increasingly shortened as the jet nozzle is pivotally moved through increasing angles. In a development of the invention this is effected in such a manner that, on the one hand, the radial bore of one cylinder is adjustable relative to the water passage of the housing and the radial bore of the annular slide valve is adjustable relative to the radial water passage of the other cylinder to throttle the water pressure in the nozzles and to vary the range of the water jet.

A fountain having details embodying the invention is described hereinafter, reference being made to the accompanying drawing in which:

FIG. 1 is a diagrammatic vertical sectional view showing the fountain with all essential details;

FIG. 2 is a bottom view showing a portion of the carrying plate;

FIGS. 3 and 4 are an elevation and cross-sectional view along the line IV—IV of FIG. 3, respectively, showing the control mechanism;

FIGS. 5 and 6 are views similar to FIG. 1 showing two different positions of a jet nozzle with its control element for controlling the range of the jet;

FIG. 7 is a transverse sectional view showing the nozzle joint with reduced nozzle cross-section;

FIG. 8 is a vertical cross-sectional view of the distributing chamber of a second embodiment of the control device for controlling the range of the jet;

FIG. 9 is a top-plan view of the nozzle joint shown in FIG. 8;

FIG. 10 is a cross-sectional view taken along the line X—X of FIG. 11, showing the essential parts of a modified form of the fountain and showing one half of the fountain;

FIG. 11 is a top-plan view showing a portion of the carrying plate and of the distributor chamber and a horizontal sectional view of a universal joint;

FIG. 12 is an end view showing one of the joints of a jet nozzle; and

FIG. 13 is a top-plan view showing on a reduced scale the circular series of jet nozzles with the nozzle joints and the carrying plate.

The fountain comprises a circular series of jet nozzles 1 (best seen in FIGS. 5 and 6), each of which is firmly mounted in a ball 2. By means of these balls 2 these jet nozzles are movably mounted in angularly equipped positions in a disc-shaped support plate 4, which is rotatably mounted by means of its vertical shaft 3. Below this carrying plate 4 a control disc 5 is rotatably mounted on a hub 6 of the carrying plate 4 at a short axial distance therefrom and has a number of radial slots 7 which correspond in number to the nozzles and in which sliding members 8 are radially movable. Each of the latter is provided with a ball 9 having a bore through which a respective nozzle 1 extends and wherein the nozzle 1 is axially slidable. Thus, the two ball-and-socket joints 2, 9 associated with each nozzle enable the jet nozzles 1 to be jointly pivotally displaceable radially toward or away from the center of the support plate 4 and, by a relative rotation of the control disc 5 and the plate 4, to be adjusted in the direction of rotation to impart a twist to the

jet. The control means for the radial adjustment of the jet nozzles 1 consists of an adjusting slide 10, which is axially movable on the hollow shaft 3 and articulately connected by control rods 11 to the sliding members 8 of the control disc 5 to effect a radial movement of the members. These control rods 11 are connected by means of pivots 12, 13 to the adjusting slide 10 and the sliding members 8 and are disposed along generatrices of a frustum of a cone which is coaxial with the shaft 3. The adjusting slide 10 has a driver pin 15, which extends through two elongated slots 14 of the shaft 3 and to which one end of a pulling rope 16 is connected. The rope 16 extends in the tubular shaft 3 and maintains the adjusting slide 10 in its initial position against the action of a spring 17 tending to pull it back to its elevated extreme position (largest angle of inward deflection of the nozzles). The other end of the spring is connected to the carrying plate 4 at an eye 18.

For the rotation of the control disc 5 relative to the carrying plate 4 a pulling rope 19 is provided in the tubular shaft 3 and extends over two rollers 20, 21, mounted in stationary positions on the underside of the carrying plate, to a pin 22 on the control disc 5. This pin 22 has connected thereto a second rope 24 (FIG. 2), which extends in the opposite direction over a roller 23 and is subjected to the tension of a spring 25. The spring 25 is affixed to the carrying plate 4 by means of a bolt 26 so that the spring 25, having a predetermined initial stress, can maintain the control disc 5 in its initial position (shown in FIG. 6) to adjust the jet nozzles 1 to a position in which they extend at a maximum angle to the shaft 3 of the carrying plate 4.

All the jet nozzles 1 pivotally mounted by means of balls 2 in the carrying plate 3 are flexibly connected by hoses 27 to hose nipples 28 of a disc-shaped distributor head 29, 30. This disc-shaped distributor head is hollow and its hub 31 is mounted in a stationary ball bearing 32 whereas its top 30, carrying the circular array of connection nipples 28, is rigidly connected at its center by several screws 34 to a flange 33 of the hollow shaft 3 of the carrying plate 4. The distributor head 29, 30 and the carrying plate 4 as well as its control disc 5 thus form a unit surrounded by a housing shell 35, which is liquid-tightly secured to the carrying plate 4 and the distributor head 29, 30 and extends somewhat beyond the carrying plate 4 and is covered by a top 36 consisting of yieldable plastic and permitting the displacement of the jet nozzles 1. In the space 37 surrounded by the housing shell 35, distributor head 29, 30 and the carrying plate 4, all control elements 10 to 26 are protected from the action of moisture and may be covered with lubricant.

The cavity 40 of the distributor head 29, 30 is supplied with water under pressure through a tube 38 directly connected to the hub 31 of the head 29, 30. This water enters through openings 39 of the tube wall from a head 41 of the supply conduit 42a, which head surrounds the tube 38 with a clearance. This head 41 is stationary and is watertightly closed at top and bottom by sealing rings 42 in sealing engagement with the rotating tube 38. The tube 38 itself has a bottom 43, through which a coaxial liner tube 44 passes. The small diameter tube 44 extends upwardly into the distributor head 29, 30, where its end is moisture-tightly, but rotatably connected by a hose coupling 45 to a connection tube 47 having the same inside diameter and watertightly fitted with a flange 46 in the top 30 of the distributor head. This narrow tube 44, 47 serves to guide the two pulling ropes 16, 19 required for controlling the jet nozzles 1. The lower ends of these ropes are connected each to one of two bolts 51, 52, which are relatively staggered in the axial direction and are offset by an angle of 90°, the bolts 51, 52 being axially guided in elongated slots 48, 49 of a tubular member 50 rigidly connected to the tube bottom 43. Each of the two bolts 51 and 52 is fitted in a cone 53, 54, which surrounds the tubular member 50 with a clearance and which

is firmly mounted in the inner race 55, 55' of a ball bearing 56, 56'. The outer race 57 of bearing 56 is held by the pins 58 and 59 of a fork 60 of a control lever 62 pivotally mounted on the pivot 61 and is movable in the axial direction of the tubular member 50 for shifting the ball bearing 56 and the pin 51 in the axial direction. FIG. 4 shows in a top view that the two control levers 62, 63 of the pins 51, 52 cross each other at an acute angle and indirectly cooperate with control arms 67 and 68, respectively, which will be described hereinafter.

In the embodiment shown, the operation of the control levers 62, 63 is effected partly by mechanical and partly by hydraulic means, which are motor-controlled. Two camwheels 64, 65 are secured to a common shaft 66, which can be driven by an electric motor or by a water turbine having a controllable speed. These camwheels make, say, one revolution per minute and alternately initiate the control action during one revolution and stop it during the next. Each of the two camwheels 64, 65 is replaceable and associated with a control arm 67 or 68, which carries a roller 69 or 70 engaging the periphery of its camwheel 64 or 65 and which is pivoted on a pin 71. Each of the two control arms 67, 68 guides a slide bush 73, 73' which slides on a tubular piston rod 72, 72' and in its normal position blocks a circular series of bores 74 of the piston rod 72, 72' (only the latter being seen in FIG. 3). The piston rod is closed below its bores 74 by a pin 75 and its lower end, consisting of a solid rod is articulately connected to the control lever 62, 63 (as shown for lever 63). The tubular piston rod 72' carries at its top end a piston 76, through which it extends so that the piston rod opens into the cylinder chamber 77 above the piston. In this chamber the piston 76 moves under the pressure of the water supplied to the cylinder 78 through the conduit 79. The slide bush 73 is also connected to the piston rod 72' by a spring 80 connected to the bush 73 and the piston rod 72' so that the piston rod 72' is always pushed into the slide bush 73 to such an extent that the radial bores 74 of the piston rod are within the slide bush. The distributor head 29, 30 has a gear rim 81 in mesh with a pinion 82 of a shaft 83 which is driven by an electric motor 84 or by a turbine.

The mode of operation of the fountain is as follows: It may be assumed that the distributor head 29, 30 together with the carrying plate 4 for the jet nozzles 1 rotates at 30 revolutions per minute and the camwheels 64, 65 are driven at a speed of one revolution per minute and during one revolution start the control means whereas they stop it during the next minute. The water pressure is suitably variable and may be adjusted to 4 kg./sq. cm. above atmospheric pressure so that the water jet may easily rise to a height of 6 metres.

When the jet nozzles 1 are in their position shown in FIG. 1, they extend almost vertically so that the water jets rise steeply and fall almost as steeply to form a rotating column, which extends uniformly upwardly or tapers upwardly or downwardly. If one of the camwheels 64, 65 is rotated to lower or raise one of the two control arms 67, 68, its slide bush 73 will also be displaced on the piston rod 72, 72' in the corresponding direction. When the slide bush 73 is lowered to a stop 85 of the piston rod 72', the radial bores 74 of the latter will be closed so that an outflow of pressure water from the cylinder 78 is prevented. The water pressure acts immediately on the piston 76 and urges it downwardly until the radial bores 74 emerge again from the lower rim of the slide bush 73 to permit a free outflow of the water from the piston rod 72'. This downward movement of the piston 76 has the result that the control lever 63 is swung downwardly and by means of the corresponding pulling rope 16, 19 moves either the adjusting slide 10 downwardly against the spring action or effects a movement of the control disc 5 relative to the carrying plate 4 against the action of the spring 25. Each of the described

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movements results thus in an adjustment of the jet nozzles 1 about their ball-and-socket joints 2 either in a radial or peripheral direction or in both directions at the same time so that the water jets can be continuously displaced to form jet patterns of all kinds. If the control arm 67 is lifted by the camwheel 64 its slide bush 73 will also be moved upwardly. This causes an increase in the stress of the respective spring 80 pulling the piston rod 72 with the piston 76 so that this displaces additional pressure water in the cylinder 73 until the radial bores 74 of the piston rod 72 enter the slide bush 73 to reduce the cross-section of flow for the pressure water to such an extent that the upward movement of the piston 76 is interrupted. This upward movement of the piston 76 enables the stressed spring of the control lever 62 to swing the lever 62 upwardly so that the spring 17 of the adjusting slide 10 or the spring 25 of the control disc 5 is released for action and causes a movement of the sliding members 8 in the direction opposite to that which has been described hereinbefore. Thus, a lifting of the associated slide bush 73 will effect an outward radial movement of the sliding members 8 and an inward radial pivotal movement of the jet nozzles 1 and a lowering of the associated slide bush 73 will effect an inward radial movement of the sliding members 8 towards the shaft 3 and an outward radial pivotal movement of the jet nozzles 1. The pivotal movement of the jet nozzles 1 in one or the other direction of rotation of the control disc 5 may be effected independently of the carrying plate 4 rotating continuously in one direction by means of the camwheel 65, the control arm 68, a slide bush 73 and the control lever 63.

All these control movements are effected by means of the two camwheels 64 and 65, which can be driven by a drive motor of any desired type having a low speed (1 revolution per minute).

Instead of the camwheels, a perforated tape or a magnetic tape may be used as controlling means and may have electrical or electromagnetic control members associated with it which are connected to the pulling ropes 16, 19 to change the position of the jet nozzles.

In order to ensure that during a radial pivotal movement of the nozzle 1 from the periphery to the center of the circular series of nozzles or outwardly from the periphery of the circular series of nozzles the water jets will not splash beyond the predetermined circular range, a throttling device is incorporated in the water path leading to the nozzles 1. According to the embodiment shown in FIGS. 5 and 6 of the drawing the throttling-valve means consists of several valve members 86, which are radially slidably mounted in the ball-and-socket joint 2 and consist of small pins or the like, which are smaller in diameter than the bore of the nozzle 1 and are fitted in radial bores of the ball 2 and of the nozzle tube 1. The bearing body of the joint ball 2 consists of two annular bearing members 87, 88 and has a hollow-spherical seating face 89, which forms a cam face for the pins 86. The radius of curvature of this seat face in longitudinal section is much smaller than its diameter adjacent to the apex of the curvature. As a result, the joint ball 2 of the nozzle 1 engages only the top and bottom rim portions of the hollow-spherical seat face 89 of the joint bearing 87, 88 and a crescent-shaped annular space is left free in the bearing between the peripheral surface of the joint ball 2 and the hollow-spherical seat face 89. The pin-shaped valve members 86 are always urged back into the radial bores of the joint ball 2 and held with their blunt end faces against the camming surface 89 under pressure of the water flowing in the nozzle tube. FIG. 5 shows the displacing bodies 86 in the normal unthrottled condition of the jet nozzle 1, the cross-section of flow of the nozzle being undiminished. If the jet nozzle 1 is pivotally moved in any direction from its vertical position, at least two of the displacing bodies 86 will be automatically cammed inwardly by the face 89 into the position apparent from FIG. 6, whereby

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the cross-section of the jet nozzle is reduced and the water jet is throttled. FIG. 6 shows the jet nozzle in one extreme position, in which the valve bodies 86 restrict the nozzle cross-section to reduce the intensity of the water jet so that the range of the water jet is reduced to that extent which is predetermined by the periphery of the basin or the like.

The second mode of throttling the water jet is apparent from FIG. 8 and has the great advantage that all elements can lie in the water of the fountain basin. An annular slide valve 90 is rotatably mounted in the distributor chamber 40', which has passages 91 arranged in a circle and alignable with the openings 28' of the connecting lines 27' of the chamber wall. If the rotary slide valve 90 is rotated by a part of the diameter of a passage 91, the openings 28' of all connecting conduits 27' will be reduced in size so that the water pressure in the jet nozzles 1 is correspondingly reduced and the length of the water jets is diminished. To enable a rotation of the annular slide valve 90, the same has a recess in the form of a gap, which is engaged by a cog 92 of a vertical shaft 93, rotatably mounted in the top 30' of the distributor chamber 40'. That portion of this cog shaft 93 which extends out of the chamber top 30' has a pin 94 extending in opposite radial directions from the shaft. Under the pressure of a spring 108 connected to the cog shaft 93 each of these pins engages a wedge-shaped control member 95 or 95a. One of these control members 95 is rigidly connected to the control plate 96 and the other control member 95a is rigidly connected to the control plate 103. The control plates 96 and 103 are mutually independently movable up and down parallel to themselves and serve to move the jet nozzles 1 radially inwardly and outwardly and also at right angles to the radial displacement. The jet nozzles 1 are mounted in a joint head 97 constructed like a Cardan or universal joint and consisting of a head holding the nozzle tube 1 and having two aligned cross pins 98 and a joint fork 99, in the two prongs of which the two cross pins 98 are rotatably mounted to enable a radial pivotal movement of the head 97 toward the center of the circular array of nozzles. The joint fork 99 is mounted for rotation about its longitudinal axis on the pivot pin 100 in the stationary carrying plate 4 so that the jet nozzle 1 and its head are free to oscillate about a substantially horizontal axis which extends radially. In order to enable the rotation of the joint fork 99 about its pivot pin 100, the fork is provided with an eye 101, protruding laterally from one prong of the fork which has a connecting rod 102 connected thereto. The latter is operable by a control plate 103 common to the connecting rods of all joint forks. This control plate 103 is firmly mounted on a control rod 104, concentrically mounted in the carrying plate 4, 6 and axially slidable to rotate the joint forks 99. A tube 105, loosely mounted on this control rod 104, is rigidly connected at its upper end to the second control plate 96, which is articulatedly connected by a link 106 to a lever arm 107 radially protruding from the associated joint head 97. When one of the control plates 96, 103 is lifted and lowered either the joint forks 99 or the joint heads 97 of all jet nozzles 1 will be jointly pivotally moved from the vertical position in the desired direction to vary the pattern formed by the water jets. The movement of the two control plates 96, 103 is effected, e.g., by means of the two camwheels 64 and 65 and by the control levers 67 and 68.

This movement of the control plate 96 is followed by the wedge-shaped control member 95, which is moved upwardly or downwardly in its longitudinal direction. The pin 94 of the cog shaft 93 slides under the action of the spring 108 along the wedge-shaped control edge of the control member 95 to cause a rotation of the cog 92 and consequently of the annular slide valve 90 to an extent which corresponds to the pivotal movement of the jet nozzles 1. Thus the cross-sections of flow of the openings 28 of the connecting conduits 27 are reduced

by the annular slide valve 90 and the water pressure correspondingly reduced to such an extent that the range of the water jets is progressively decreased as the nozzles are pivotally moved through an increasing angle. The same effect of throttling the water jet will be achieved if the control plate 103 is axially moved to swing the jet nozzles 1 in a tangential direction with respect to the pitch circle of the circular series of nozzles. The control plate 103 with its wedge-shaped control member 95a moves the pin 94 for rotating the cog shaft 93 and the annular slide valve 90 so that the cross-sections of flow of the openings 28 of all connecting conduits 27' of the jet nozzles 1 is achieved. Since each of the two wedge-shaped control members 95, 95a is connected to one of the two pins 94 which project radially from opposite sides of the cog shaft 93, neither of the two control members 95, 95a will interfere with the function of the other. The hub 6 of the carrying plate 4 or the carrying plate itself is firmly connected by several struts 109 to the gear, in this case a spur gear 110, which is secured to the distributor chamber 29', 30', as has already been described. As a result, the gear 110, the distributor chamber 29', 30', the connecting conduits 27' and the carrying plate 4 constitute a rigid unit. The provision of nozzle joints consisting of universal joints affords the great advantage that the entire control means can be immersed directly in the water of the fountain basin so that the housing filled with lubricating oil is eliminated.

The fountain has a carrying plate 4 of FIG. 10, which forms an annular distributor chamber 40" dividing the water to be delivered to the several jet nozzles 1. This carrying plate 4" rests on a plurality of columns 111, e.g., on three columns spaced 120° apart, each of which consists of a water-conducting tube. These three columns 111 bear on a rotary head 29", which is rotatably mounted on a stationary ball bearing 32" and can be rotated by means of a gear ring 81 about its imaginary vertical axis. Each of the columns 111 has a tightening screw 112 extending longitudinally therethrough and having a screw thread which is threaded into the rotary head 29" and carries at its top end a nut 113, by which the carrying plate 4" can be fixed to the rotary head 29". The housing in which the ball bearing 32" is mounted surrounds the hub 38" of the rotary head 29 with a certain clearance, which provides an annular space 41" between the housing and the rotary head hub 38". This annular space is sealed in both axial directions by seal rings (Simmer rings) 42. The housing has a connecting flange 42a for the admission of pressure water and the rotary hub 38" has radial bores 14" through which the pressure water enters the cavity of the rotary head. A centrally disposed sleeve 114 extends through this cavity. The cavities of the columns 111 communicate with the cavity of the rotary head 29" and, via radial ducts 40a (FIG. 11), with the annular distributor chamber 40. The housing is provided with a base, not shown, which can be anchored on a support, e.g., the bottom of the fountain basin.

Through bores 115 in the carrying plate 4" the distributor chamber 40" has connected thereto a plurality of rotary slide-valve housings 116, which are detachably, but firmly and water-tightly affixed to the carrying plate 4" by means of screws 117. These housings 116 are substantially cylindrical tubes and the cylinder axes extend radially with respect to the axis of rotation of the carrying plate 4". Each housing 116 contains a hollow cylinder 118 with a radial bore 119, which connects the cylindrical cavity 120 through the bore 115 with the distributor chamber 40". The hollow cylinder 118 is freely rotatable about its longitudinal axis but secured against axial displacement by a shoulder 121 and by a cover 122 which can be screwed into the housing 116. This hollow cylinder 118 is connected to a second hollow cylinder 123, which extends at an angle, preferably a

right angle, to the longitudinal axis of the cylinder 118 and which communicates by a connecting duct 124 with the cavity 120 of the rotary slide valve. Both hollow cylinders 118 and 123 lie in a plane and form a unit. An annular slide valve 125 is freely rotatably mounted on the hollow cylinder 123, which is closed at both ends. This annular slide valve 125 carries a jet nozzle 1, which, with its end fitted in the annular slide valve 125 registers with a radial water passage 126 formed in the cylinder 123 in a radial longitudinal center plane of the hollow cylinder 118. The cylinder 118 has a radially projecting eye 127 and the annular slide valve 125 has a radially projecting ball pivot 128 so that each of the two elements 118 and 125 can be rotated through a controllable angle about its longitudinal axis, thereby permitting displacement of the jet nozzle 1 in two planes extending at right angles to each other. Each eye 127 and each ball pivot 128 has a respective link 129, 130 connected thereto, which controllably connects the cylinder 118 to a star-shaped control member 131 and the annular slide valve 125 to a star-shaped control member 132. Each of the two star-shaped control members 131 and 132 is axially movable independently of the other. The star-shaped control member 131 is movable up and down by means of an adjusting rod 133, which is centrally mounted in the carrying plate 4" and extends with a clearance through the rotary head 29". The star-shaped control member 132 is firmly mounted on a sleeve 134 surrounding the adjusting rod with a clearance and is movable up-and-down by means of this sleeve. By an up-and-down movement of the two star-shaped control members 131, 132, all jet nozzles 1 can thus be controlled in any desired manner and in all components of the two directions of movement, so that all pattern combinations of the water jets from the circular array of nozzles can be obtained.

In a development of the invention the water passages 115 of the housing 116 and of the cylinder 123 are designed so that the cross-section of flow decreases as the nozzle is increasingly moved from its vertical position so that the range of the water jets is automatically reduced.

The movement of the two star-shaped control members 131 and 132 can be performed with the aid of mechanical, hydraulic or electric means, by hand or automatically to obtain a predetermined sequence of patterns. The motor 84 driving the gear 81 may also be used for driving the control device 62—79.

I claim:

1. In a fountain, in combination, a support rotatable about a generally upright axis, a circular array of angularly spaced nozzles mounted in respective ball joints on said support with at least limited freedom of angular movement about a substantially vertical axis and a substantially horizontal axis, inlet means for supplying said nozzles with a liquid under pressure, drive means for rotating said support, respective control means for angularly displacing each of said nozzles about its vertical and horizontal axes in accordance with a predetermined program of operation, and respective valve means assigned to each of said nozzles for throttling the flow of said liquid therethrough upon angular displacement of the nozzle about its said horizontal axis, said valve means including at least one valve member within each of said nozzles displaceable into the path of the liquid flowing therethrough and a respective surface provided in each of said ball joints for cammingly displacing a respective valve member upon said displacement of its nozzle about the horizontal axis thereof.

2. In a fountain, in combination, a support rotatable about a generally upright axis, a circular array of angularly spaced nozzles mounted on said support with at least limited freedom of angular movement about a substantially vertical axis and a substantially horizontal axis, inlet means for supplying said nozzles with a liquid under pressure, drive means for rotating said support, respec-

tive control means for angularly displacing each of said nozzles about its vertical and horizontal axes in accordance with a predetermined program of operation, said inlet means including a source of said liquid under pressure and a distributing chamber coupled with said source and common to all of said nozzles for distributing said liquid thereto, and valve means in said distributing chamber coupled with said control means for selectively throttling the flow of said liquid through said nozzles upon angular displacement thereof about their respective horizontal axes.

3. The combination according to claim 2 wherein a wall of said distributing chamber is provided with respective bores communicating with each of said nozzles, said valve means including an angularly displaceable valve member disposed between said wall and said source and slidably engaging said wall, said valve member being provided with passages alignable with said bores, further comprising valve-operating means connecting said valve member with said control means, said valve-operating means including a shaft projecting into said chamber and provided with a radial lug engaging said valve member, mechanical link means connected to said control means for rotating said shaft, thereby shifting said valve member relatively to said wall, and restoring means bearing on said valve member against the force of said link means.

4. In a fountain, in combination, a support, a circular array of angularly spaced nozzles mounted in respective ball joints on said support with at least limited freedom of angular movement about a substantially vertical axis and a substantially horizontal axis, inlet means for supplying said nozzles with a liquid under pressure, respective control means for angularly displacing each of said nozzles about its vertical and horizontal axes in accordance with a predetermined program of operation, and respective valve means assigned to each of said nozzles for

throttling the flow of said liquid therethrough upon angular displacement of the nozzle about its said horizontal axis, said valve means including at least one valve member within each of said nozzles displaceable into the path of the liquid flowing therethrough and a respective surface provided in each of said ball joints for cammingly displacing a respective valve member upon said displacement of its nozzle about the horizontal axis thereof.

5. In a fountain, in combination, a support, a circular array of angularly spaced nozzles mounted on said support with at least limited freedom of angular movement about a substantially vertical axis and a substantially horizontal axis, inlet means for supplying said nozzles with a liquid under pressure, respective control means for angularly displacing each of said nozzles about its vertical and horizontal axes in accordance with a predetermined program of operation, said inlet means including a source of said liquid under pressure and a distributing chamber coupled with said source and common to all of said nozzles for distributing said liquid thereto, and valve means in said distributing chamber coupled with said control means for selectively throttling the flow of said liquid through said nozzles upon angular displacement thereof about their respective horizontal axes.

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