Aug. 31, 1954 D. E. KEECH 2,687,915

COLORED FOUNTAIN

Filed Dec. 24, 1951 5 Sheets-Sheet 1

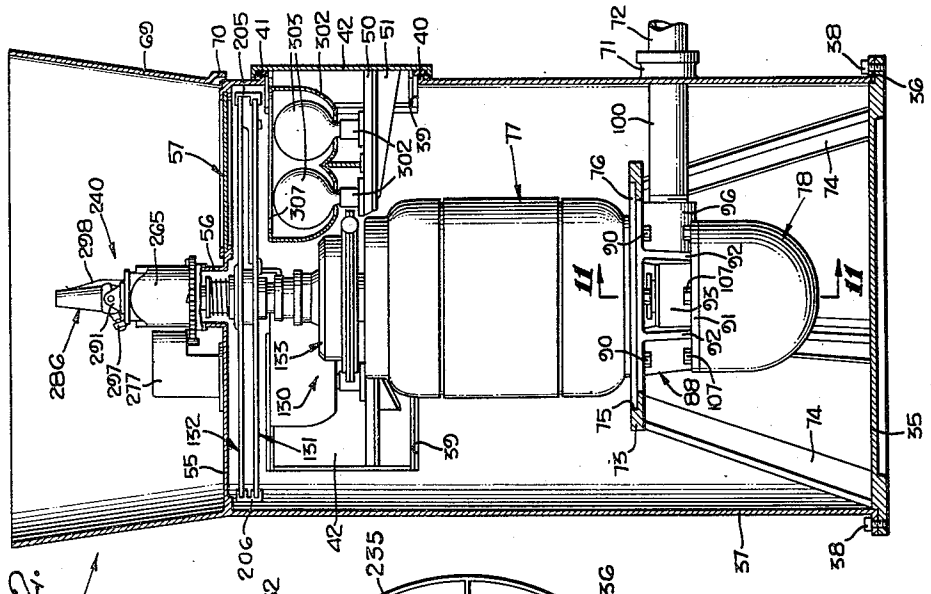


FIG. 2.

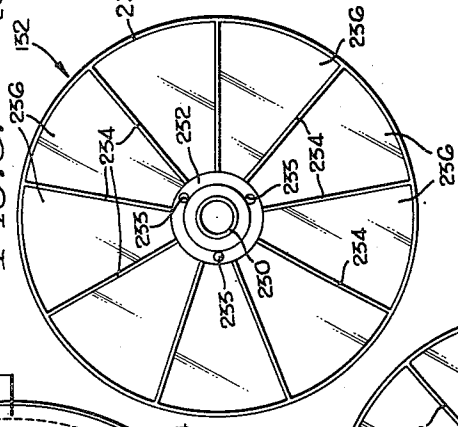


FIG. 3.

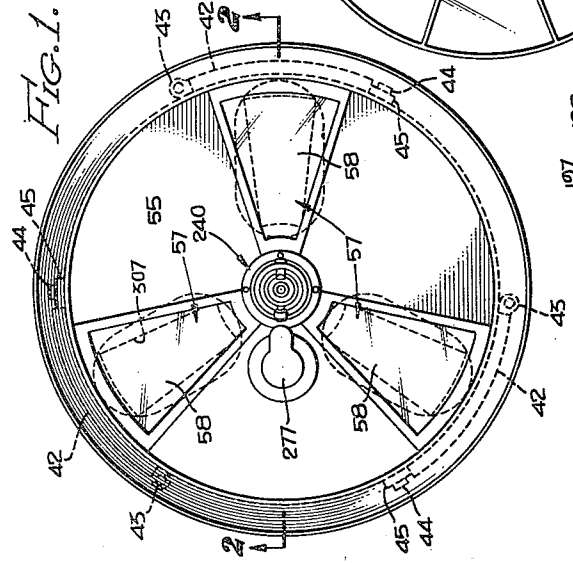


FIG. 1.

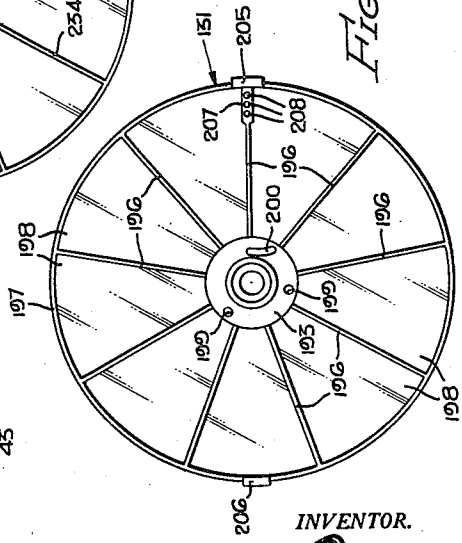


FIG. 4.

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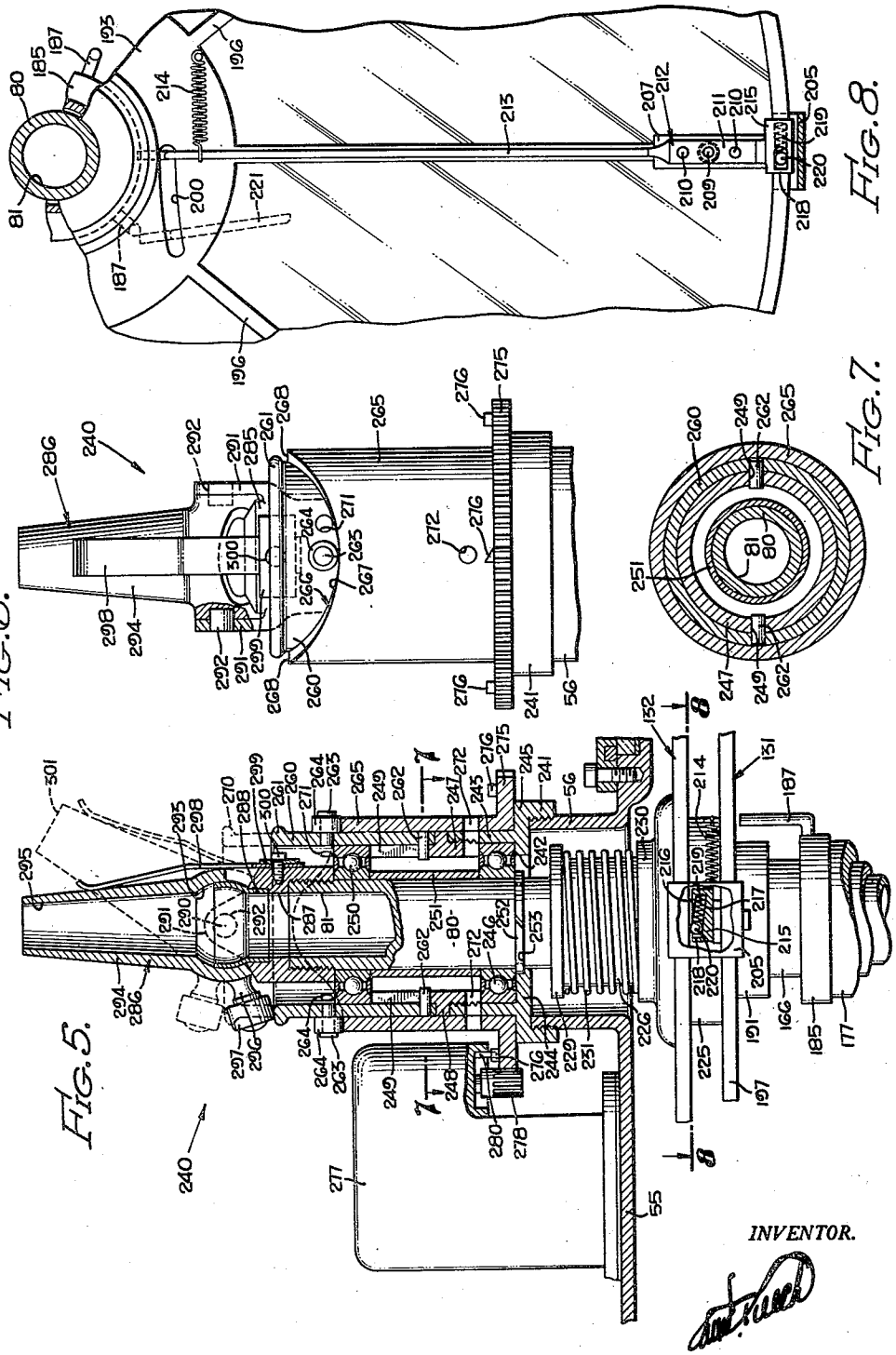


FIG. 8.

FIG. 6.

FIG. 7.

FIG. 5.

INVENTOR.

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COLORED FOUNTAIN

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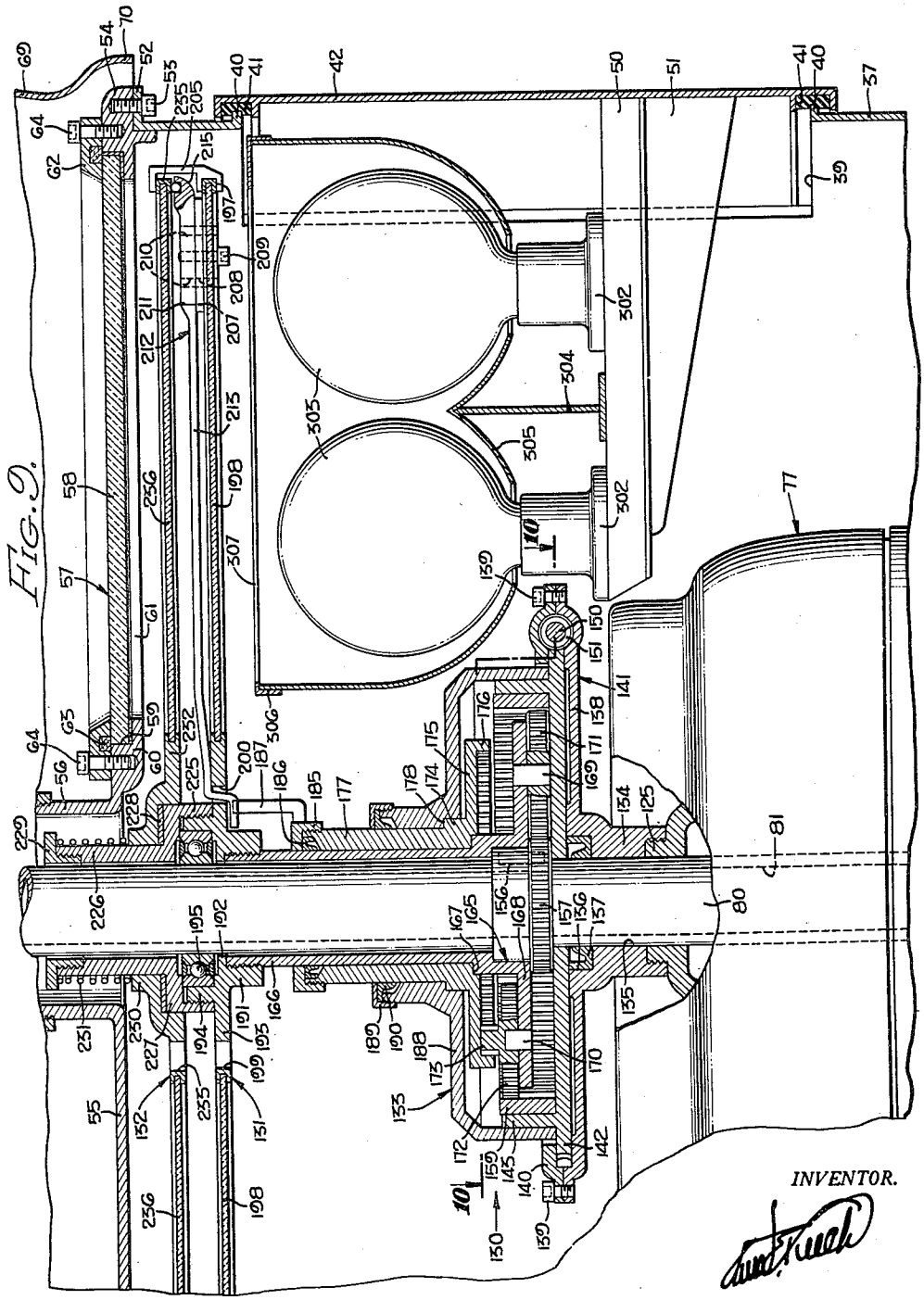


FIG. 9.

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COLORED FOUNTAIN

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FIG. 10.

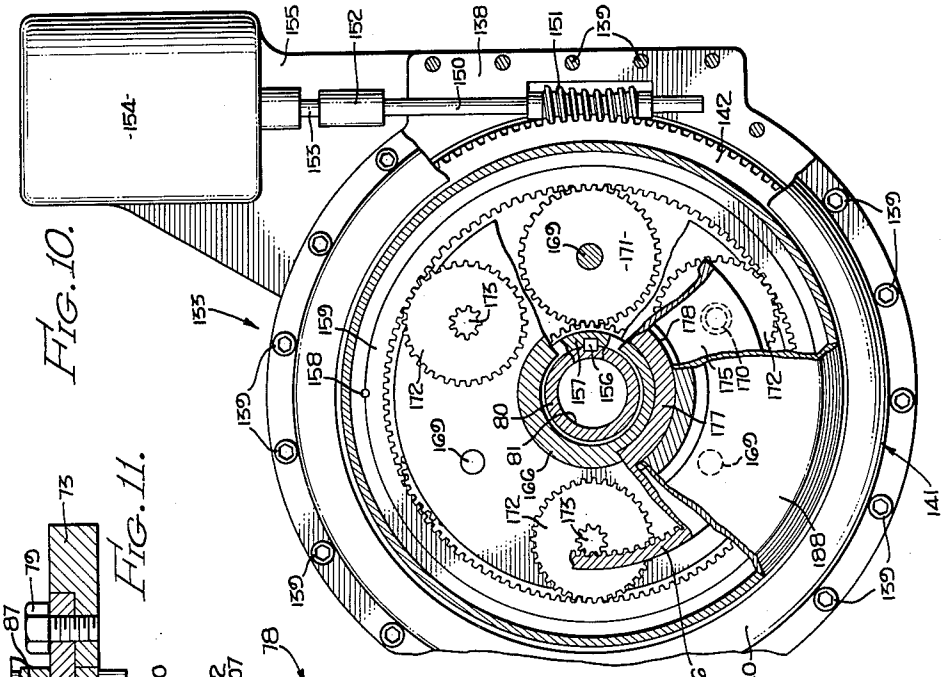
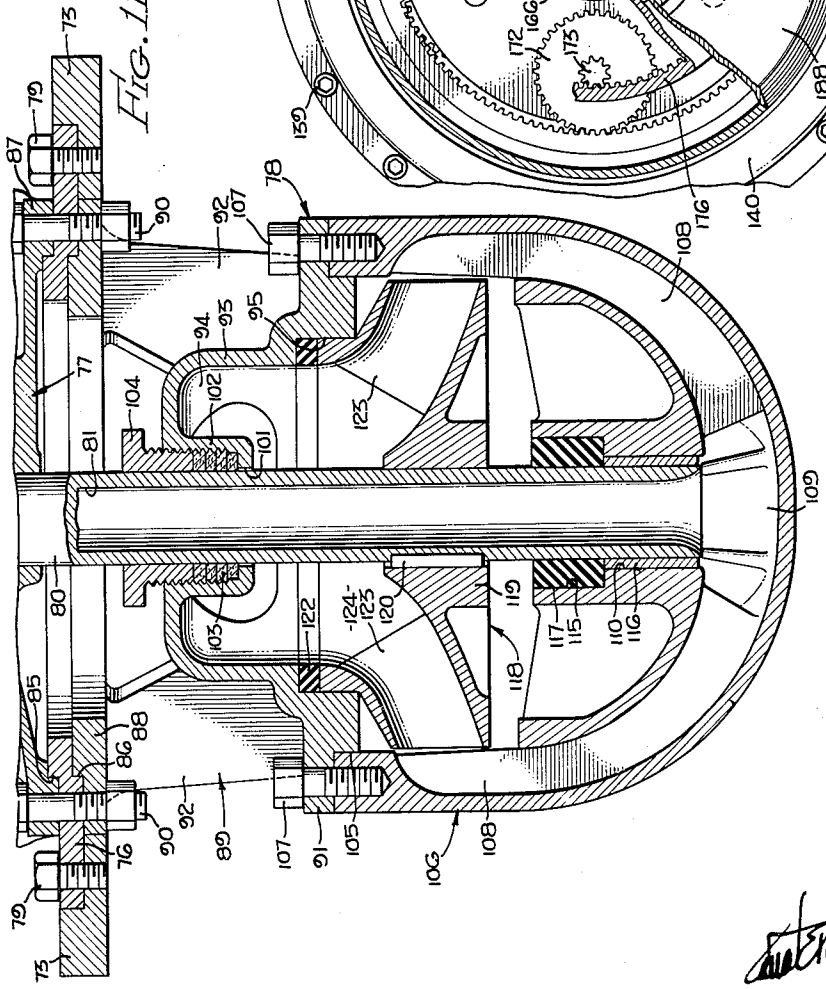


FIG. 11.



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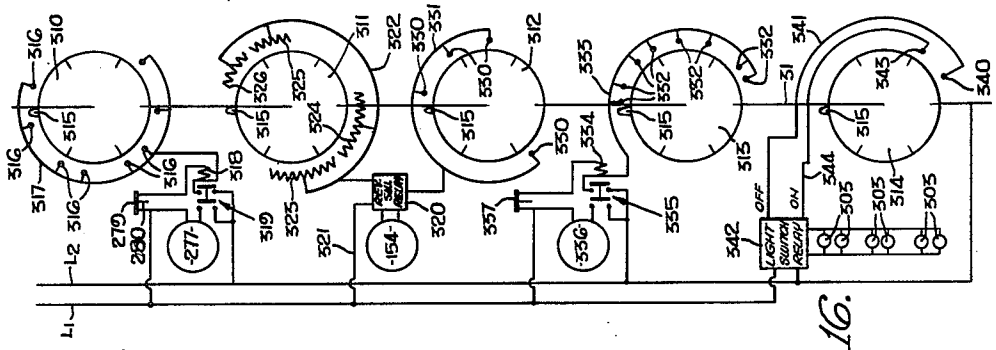


FIG. 16.

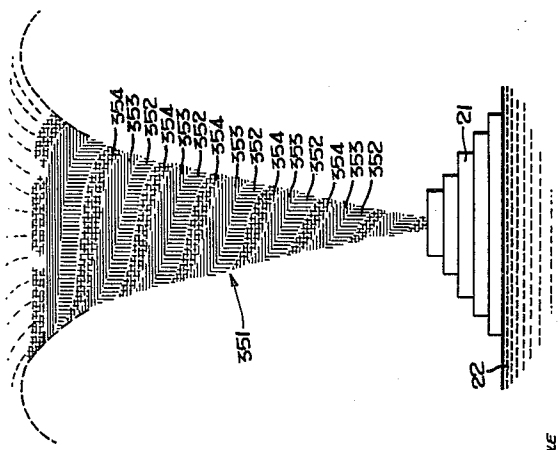


FIG. 14.

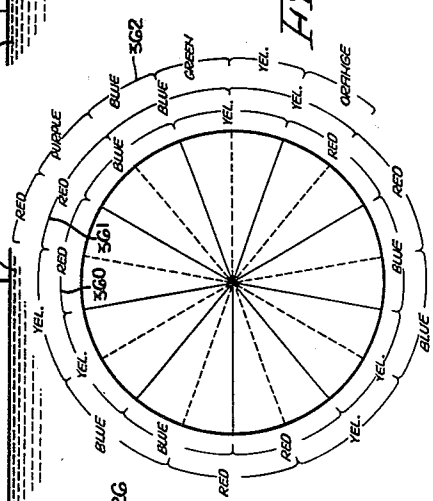


FIG. 15.

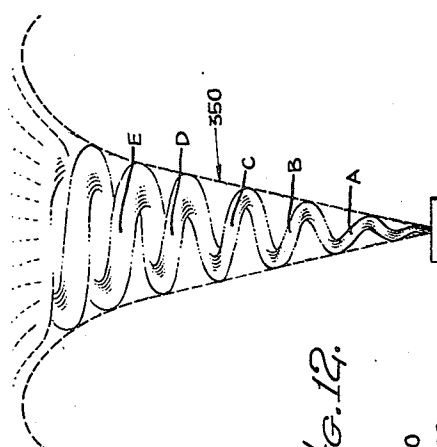


FIG. 13.

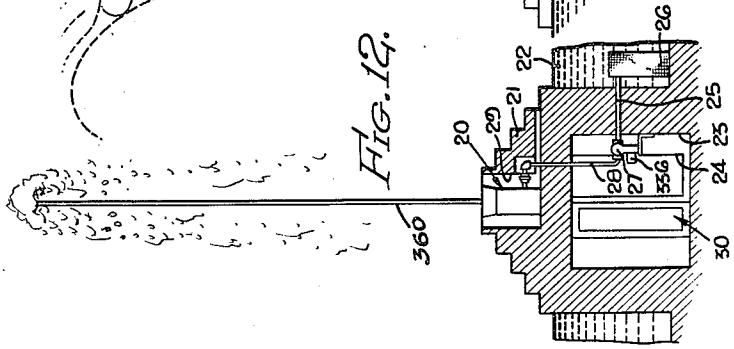


FIG. 12.

INVENTOR.

Patented Aug. 31, 1954 2,687,915

UNITED STATES PATENT OFFICE

2,687,915

COLORED FOUNTAIN

Dana E. Keech, Los Angeles, Calif.

Application December 24, 1951, Serial No. 263,047

7 Claims. (Cl. 299—4)

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This invention relates to ornamental colored fountains and is an improvement on a colored fountain and method of producing the same, invented by John E. Barber and which is the subject of co-pending application for U. S. Letters Patent Serial No. 252,379, filed October 20, 1951.

The preferred form of fountain disclosed in said Barber application includes nozzle means for discharging a stream of water upwardly in the form of a rapidly rising spiral of water droplets and with successive turns of said spiral stream spaced apart as they travel upwardly, and means for illuminating said rising spiral stream with a repeated pattern of successive rapid flashes of successively different colored lights in timed relation with the formation of said spiral stream so that each repetition of the illumination of said stream with a flash of each given color finds the turns of said stream disposed approximately in a corresponding series of spaced areas fixed in space, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals each corresponding in shape to the rapidly moving spiral stream of water actually discharged by said nozzle means. The effect of this is to produce a constantly beautifully multi-colored fountain of inverted conical shape.

It is an object of the present invention to provide a colored fountain advantageously utilizing the principle disclosed by Barber in a sustained pattern of variations of the same.

It is a further object of the invention to provide a colored fountain embodied in a simple unit which includes, in compact assembly, all the elements required for the performance of the fountain excepting electrical switches and controls therefor.

Yet another object of the invention is to provide a colored fountian unit capable of throwing a relatively high column of water and embodying means for concentrating a relatively large amount of light in the illumination of the fountain produced thereby.

One of the features previously used in many public fountains has been a tall, vertical column of water in the center of the fountain, and it is another object of the present invention to provide a colored fountain in which a vertical column is produced as one phase of the fountain pattern and having means for converting a vertical column at will to a spiral stream manifesting the brilliant coloring of the Barber fountain and then return the stream again to vertical

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form as a part of the fountain performance pattern.

A still further object of the invention is to provide a colored fountain having the nozzle mounted on the upper end of a vertical hollow shaft and in which the light filter through which light is shined for illuminating the fountain with successively different colors is disposed concentrically with the nozzle and provided with a plurality of like series of light filter panels to permit the simultaneous delivery of light upwardly through separate spaced areas circumferentially disposed about the axis of the nozzle thereby producing a simple mechanism by which multiple light sources may be constantly employed in the illumination of the fountain.

A yet further object of the invention is to provide a colorde fountain incorporating a plurality of super-imposed light filters mounted concentrically with the nozzle axis and having means for progressing one of said filters relative to the other at a uniform rate whereby the color scheme of said fountain goes through a timed series of changes making up a timed pattern which is uniformly repeated in the operation of said fountain.

A further object of the invention is to provide a colored fountain incorporating a motor having a hollow shaft, the lower end of which extends into and drives a pump and receives water therefrom which is forced upwardly through said shaft and from a nozzle mounted on the upper end of the latter, and in which the light filters are mounted on and driven by said shaft in timed relation with rotation of the latter.

A still further object of the invention is to provide a colored fountain as aforesaid which incorporates means for causing, as a regular part of a performance pattern, a rotation of the color scheme appearing in the fountain either in a clockwise direction or in an anti-clockwise direction.

The manner of accomplishing the foregoing objects as well as further objects and advantages will be made manifest in the following description taken in connection with the accompanying drawings in which

Fig. 1 is a plan view of a preferred embodiment of the invention.

Fig. 2 is a vertical, sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the upper filter disk of the invention.

Fig. 4 is a plan view of the lower filter disk of the invention.

Fig. 5 is an enlarged, vertical, sectional view of the nozzle of the invention and the control mechanism therefor taken on the line 2—2 of Fig. 1.

Fig. 6 is a side elevational view of Fig. 5.

Fig. 7 is a horizonal, sectional view taken on the line 7—7 of Fig. 5.

Fig. 8 is a horizontal, sectional view taken on the line 8—8 of Fig. 5 and illustrating the filter disk progressor mechanism.

Fig. 9 is an enlarged, vertical, sectional view of the filter disks and the drive mechanism therefor and is taken on the line 2—2 of Fig. 1.

Fig. 10 is a horizontal, sectional view taken on the line 10—10 of Fig. 9 and progressively broken away to illustrate the filter drive mechanism at various levels therein.

Fig. 11 is an enlarged, vertical, sectional view of the pump of the invention and is taken on the line 11—11 of Fig. 2.

Fig. 12 is a diagrammatic, vertical, sectional view of the colored fountain unit shown in Figs. 1 and 2 mounted in a masonry fountain base, and showing a vertical column of water approximately 40 ft. high being emitted from said unit.

Fig. 13 is a view similar to Fig. 12 and illustrating a rising spiral stream of water droplets into which said vertical stream has been converted by the operation of the invention.

Fig. 14 is a view similar to Fig. 13 and illustrates the illusion created in the observer by the illumination of the spiral stream shown in Fig. 13 by light shined upwardly through said filter disks.

Fig. 15 is a diagram of the two filter disks of the invention super-imposed upon each other and shifted half the width of a single color panel from starting position and indicating the color of each panel on each of said disks and the colors produced by the overlapping of said panels.

Fig. 16 is a diagrammatic illustration of the control cam shaft of the invention and includes a wiring diagram of electrical controls manipulated by the cams on said shaft to put said colored fountain repeatedly through its performance of a varied pattern each performance of which lasts six minutes.

Referring specifically to the drawings, the preferred embodiment of the invention illustrated therein comprises a fountain unit 20 which is preferably mounted in a masonry fountain base 21 (Fig. 12) which is located in the center of a fountain pool 22 and which preferably has a control room 23 formed therein to which access is had by a suitable tunnel 24. The unit 20 is adapted to be supplied with water through a pipe 25, the outer end of which connects with the interior of a screen 26 submerged in the pool 22, the inner end of which pipe connects with a motor driven valve 27 which in turn connects to a supply pipe 28 which extends upwardly through the base 21 and into a recess 29 formed in the upper end of said base for receiving the unit 20. The room 23 also provides shelter for the master control mechanism 30 of the invention which has a master cam shaft 31 (Fig. 16).

The unit 20 includes a circular base 35 having a concentric external recess 36 into which the flanged lower end of a circular housing 37 is secured by capscrews 38. The housing 37 has three door openings 39 formed therein near its upper end, the metal of said housing being bent outwardly around each of said openings to form a sealing flange 40 against which a rubber gasket 41 provided around the outer edge of each of a

series of doors 42 is pressed when said doors are closed to seal said door openings from the outside atmosphere. Each of the doors 42 is mounted on hinges 43 (Fig. 2) and is held shut by capscrews 44 which extend through ears 45, provided on the opposite vertical edge of the door, and screwed into tapped holes provided therefor in the body of the housing 37.

Each of the doors 42 has a lamp mounting platform 50 secured on the inner face thereof, said platform being supported by a metal bracket 51 welded to the inner face of said door.

The housing 37 is provided at its upper edge with a flange 52 which is connected by capscrews 53 to the rim 54 of a housing top plate 55, the latter having a short neck 56 rising up axially therefrom, the upper end of said neck being externally threaded.

The doors 42 are equally spaced circumferentially about the axis of the unit 20 and the top plate 55 provides three windows 57 which are symmetrical with radial planes passing through the middle of said doors (Fig. 1). Each of the windows 57 comprises a heavy, clear plastic or glass pane 58 which fits into a recess 59 formed in a sash 60 provided by a downward thickening of the top plate 55 about a window opening 61. Each pane 58 is secured in place by a window rim 62 provided with packing material 63 and held down by screws 64.

Secured as by welding to the top rim 54 is an outwardly inclined light shield 69 which has one or more water drain spouts 70 (Figs. 2 and 9) for accomplishing the discharge of water falling within said shield.

Also provided in the housing 37 is a water pipe receiving neck 71 onto the threaded outer end of which a liquid seal 72 is adapted to screw, the purpose of this being made clear hereinafter.

Mounted within the housing 37 so as to be parallel with base 35 and concentric therewith, is a cradle ring 73, the latter being supported by five T-section legs 74 welded to said base and said ring. The ring 73 has a cradle recess 75 formed concentrically therein to receive a union ring 76 which serves to unite and support an electric motor 77 and a pump 78. The ring 76 is secured to the ring 73 by suitable bolts 79.

The motor 77 has a hollow shaft 80, and the hollow shaft motor made by U. S. Motors Co. and identified in their catalogue as 3 H. P., Type SCU, is suitable for this purpose. The shaft 80 is of special design and replaces the stock shaft supplied with this type of motor, the shaft 80 differing therefrom in being slightly larger at its lower end than the stock shaft and having upper and lower integral extensions which are 1½ in. O. D. The shaft 80 has an internal bore 81 which is preferably 1⅛ in. in diameter and extends from one end of the shaft to the other. The lower end of the bore 81 is flared (Fig. 11), for a reason to be made clear hereinafter, while the upper end of shaft 80 is externally threaded (Fig. 5).

The union ring 76 has concentric upper and lower annular recesses 85 and 86, the former snugly fitting a complementary ring 87 provided on the lower end of the motor 77, and the latter snugly fitting a complementary ring 88 provided on the upper end of a head casting 89 of the pump 78. The rings 76, 87 and 88 are united by bolts 90. The casting 89 includes a head plate 91 which is connected with the ring 88 by radial webs 92. The plate 91 has a dome 93 providing an intake chamber 94 which is concentric with

the shaft 80 and has a counter-bore 95 at its lower end, the purpose of which will be made clear hereinafter. Formed integrally with the dome 93 is an intake pipe socket 96 which is internally threaded and aligned with the neck 72 in the housing 37 so as to threadedly receive a two-inch intake pipe 100 extended inwardly through the neck 72 into said housing. The seal ring 73 is adapted to be tightened up on the neck 72 to form a water-tight seal about the pipe 100 where this enters the housing 37.

The dome 93 has a concentric hole 101 for receiving the shaft 80 and provides a stuffing box 102 in which packing 103 forms a seal about said shaft when compressed by a packing gland 104 threadedly received by said box.

The plate 91 has a concentric, annular recess 105 formed in the lower, outer portion thereof which is adapted to receive the upper end of a pump bowl 106, the plate 91 being secured to said bowl by capscrews 107.

Provided in the bowl 106 are water passages 108 which lead downwardly (Fig. 11) to the center of the bowl near the bottom thereof where these passages unite in a discharge vestibule 109. Provided in the central structure of the bowl 106 just above the vestibule 109 is a bore 110 having a counter-bore 115 and into which are pressed, respectively, a metal bearing sleeve 116 and a rubber bearing 117, said bearings rotatably centering the lower end of the shaft 80. Mounted on the shaft 80 within the upper portion of the bowl 106 is an impeller 118, a hub 119 of which is secured by a key 120 to the shaft 80. The impeller 118 has a neck 121 which fits rotatably into the counterbore 95 and the space between the upper end of said neck and the upper end of said counter-bore is occupied by a rubber seal ring 122.

The hub 119 and neck 121 of the impeller 118 are joined together by spirally disposed blades 123, the passages between which connect at their upper ends with an impeller throat 124 and at their lower, outer ends with the passages 108.

The normal direction of rotation of the shaft 80 is anti-clockwise and the blades 123 are pitched to be effective when the impeller 119 is so rotated with the shaft to suck water downwardly from chamber 94 and discharge this through the passages 108 and upwardly through the bore 81 of the shaft 80.

The shaft 80 extends upwardly from the motor 77 through an externally threaded neck 124 provided on the frame of the motor. The motor is provided, just above the bottom ring 87 and just below the neck 124, with heavy duty ball bearings (not shown) in which the shaft 80 journals. The portion of shaft 80 disposed between said bearings is shaped identically the same as the stock hollow shaft ordinarily used in this motor and which is replaced by shaft 80. The shaft 80 is thus shaped, between said bearings, to receive and have fixed thereon the armature of the motor, the anti-clockwise rotation of which is imparted to shaft 80.

Mounted on the neck 124, and on the shaft 80 where this extends upwardly therefrom, is a light filter device 130. This includes upper and lower filter disks 131 and 132 and a gear mechanism 133, the latter being rotatable relative to a base 134 which screws onto the threaded neck 124 of the motor 77 and has a bore 135 in which the shaft 80 rotates with a close fit. The upper end of bore 135 has a counter-bore 136 in which is mounted a Victor (Type W) grease seal 137 for preventing a downward flow of grease along shaft 80. Extending radially from the upper end of base 134 is a base plate 138 which is united at its peripherby by capscrews 139 with a ring 140 to form a housing 141 to enclose the peripheral portion of a flat-disk worm gear 142 which rotates freely on the shaft 80 and has an annular wall 143 extending upwardly therefrom (Figs. 9 and 10).

The housing 141 is shaped to form a bearing at the plane of meeting of the plate 138 and ring 140 for a worn shaft 150 and to accommodate a worm 151 fixed thereon which meshes with the worm gear 142. The shaft 150 is connected by a coupling 152 to the drive shaft 153 of a control motor 154 which is supported on a bracket 155 extending radially and downwardly from the base plate 138 (Fig. 10). The motor 154 is of the reversible, variable-speed type, the purpose of which characteristics will be made clear hereinafter.

Fixed on the shaft 80 by a key 156 is a drive pinion gear 157. Fitted within the annular wall 143 and secured thereto by a pin 158 (Fig. 10) is an internal ring gear 159, the pitch diameter of which is exactly three times the pitch diameter of the pinion gear 157.

Rotatably mounted on the hub of the pinion gear 157 is a gear spider 165 from which a sleeve 166 extends upwardly the latter being externally threaded at its upper end and loosely surrounding the shaft 80. A shoulder 167 is provided at the juncture of the spider 165 and sleeve 166. The spider 165 includes a flat disk 168 into suitable vertical apertures in which are driven a set of three pivot pins 169 which are equally spaced circumferentially and extend downwardly therefrom and a series of three pivot pins 170 which extend upwardly from said plate and are interspersed between and circumferentially equi-distant from the pins 169. Freely rotatable on the pins 169 are three differential gears 171 which have the same pitch diameter as the drive pinion 157 and mesh both with this pinion and with the internal ring gear 159.

Pivotally mounted on the pins 170 are three differential gears 172 which mesh with ring gear 159 and have pinions 173 formed integrally therewith and extending coaxially upward therefrom.

Rotatable on the sleeve 166 and resting on the shoulder 167 is a gear mount 174 having a radial plate 175 on the perimeter of which is provided a downwardly extending internal ring gear 176 the teeth of which mesh with the pinions 173. The mount 174 has a sleeve 177 extending upwardly therefrom to provide a shoulder 178. The sleeve 177 rotatably fits the sleeve 166 and is externally threaded at its upper end to receive a cap 185 which encloses a resilient molded grease seal 186 for preventing the escape of lubricant upwardly from between the sleeves 166 and 177.

Resting on the shoulder 178 and extending downwardly in snug conformity with the wall 143 and into contact with the upper face of the gear 142 is a gear cover 188 an upper portion of the latter rotatably fitting the sleeve 177 and being provided with a cap 189 for enclosing a resilient molded grease seal 190 for preventing the escape of lubricant upwardly from between the sleeve 177 and gear cover 188.

Lower filter disk 131 includes an internally threaded hub 191 which is screwed onto the upper end of sleeve 166 (Fig. 9), the latter abutting against a shoulder 192 provided on said hub. The hub includes a circular flange 193 from which an

externally threaded annular wall 194 extends upwardly. Snugly received between this wall and the shaft 89 is a stainless steel double sealed ball bearing 195 which is preferably of the M–R–C "Synthe-Seal" type.

Extending radially from the hub flange 193 of filter disk 131 are a series of panel mounting spokes 196 having an I-beam-shaped cross section. Uniting outer ends of the spokes 196 is a filter disk rim 197 having an inwardly turned channel-shaped section. Mounted within the frames formed by the flange 193, spokes 196, and rim 197 are nine segmental color panels 198 which may be formed of a stiff plastic such as "Lucite" or of glass, these panels being arranged in three like series, each of which embraces a red panel, a blue panel and a yellow panel.

Hub flange 193 (Figs. 4 and 9) is provided with air holes 199 and a slot 200 the purpose of which will be made clear hereinafter.

Provided on the rim 197 at a point opposite the end of slot 200 which is located closest to the axis of the hub 191 is a guide 205 which extends outwardly, upwardly and inwardly over the periphery of the filter disk 132 (Fig. 9) so as to prevent the vertical separation of the two filter disks at this particular point more than the normal spacing of these. Provided on the rim 197 at a point diametrically opposite the guide 205 is a similar guide 206 which is adapted to span the rim of the upper filter disk 132 (Fig. 2) so as to prevent any change at this point in the vertical spacing between the two filter disks.

The slot 200 and guide 205 are preferably located at opposite ends of one of the spokes 196 (Fig. 4) which is enlarged near its outer end to form a progressor arm pivot base 207 having a plurality of vertical holes 208 disposed different distances from the rotative center of the filter disk. A screw 209 (Fig. 9) is adapted to be selectively extended upwardly through one of the holes 208 and screwed into the corresponding hole of a group of spaced threaded holes 210 formed in the body 211 of a filter progressor 212. Extending radially inwardly from the body 211 is a stiff wire arm 213, the inner end of which is bent to extend downwardly through the slot 200 and then inwardly underneath the flange 193 (Figs. 8 and 9). The inner end of arm 213 is thus disposed in the path of the actuating finger 187 provided on the cap 185. Fixed at one end to the flange 193 and at its other end to the arm 213 is a light coiled spring 214.

Formed on the outer end of the progressor body 211 is a pinch clutch 215 which lies within the guide 205 with its upper face 216 disposed very close to the lower face of the rim of the upper filter disk 132 where this passes through the guide 205. The pinch clutch 215 has a spring retaining hole 217 formed therein which inclines downwardly slightly from horizontal (Fig. 5) the left end of hole 217 terminating in a wall 218 and opening upwardly through face 216. A coiled spring 219 is pressed into the hole 217 and a pinch ball 220 is compressed between the outer end of spring 217 and wall 218. When inserting the pinch clutch 215 between the rims of filter disks 131 and 132 in assembling these, the spring 219 is further compressed by pressing the ball 220 downwardly along the hole 217 until the pinch clutch 215 is received between the two filter disks in the position in which this is shown in Figs. 5, 8, and 9. When so assembled with these disks, a rocking of the progressor 212 about the axis of the screw 209 by moving the arm 213 from its full line position shown in Fig. 8 to its dotted line position 221 shown therein, causes the pinch clutch 215 to grip the rim of the upper filter 132 and shift this circumferentially about three-eighths of an inch relative to the lower disk 131. This distance may be varied between one-quarter and three-quarters of an inch by shifting pivot screw 209 to another pair of the holes 208 and 210.

Screwed onto the externally threaded wall 194 of the filter disk hub 191 is a hub cap 225 which secures bearing 195 in place and has a sleeve 226 extending upwardly loosely around the shaft 89, a broad radial shoulder 227 being formed at the juncture between the cap 225 and the sleeve 226. Resting on the shoulder 227 is a friction ring 228. The upper end of sleeve 226 is counter-bored and threaded to receive a gland 229.

The filter disk 132 has a hub 230 which conforms to the sleeve 226, shoulder 227, and cap 225 so as to rotate on the concentric surfaces thereof, and the friction ring 228 is compressed between the hub 230 and the shoulder 227 by an expansion spring 231 which is coiled about the sleeve 226 between the gland 229 and the hub 230.

Extending outwardly from the hub 230 is a circular flange 232 of the same diameter as flange 193 and having vertical air holes 233 formed therein. Spokes 234 extend radially from the flange 232. These are joined together at their tips by a rim 235, said spokes, rim and flange of filter disk 132 being similarly shaped to corresponding elements of disk 131 so as to provide frames for and have differently colored light filter panels 236 which are identical in color and arrangement with the panels 198 of filter disk 131. That is, there are three like series of the panels 236 arranged circumferentially in order around the filter disk 132 each of these series having panels colored red, blue and yellow, respectively.

As shown in Figs. 5 and 9, the upper end of the light filtering device 130 extends upwardly into the neck 56 provided concentrically on the housing top plate 55.

Mounted on the upper end of the shaft 89 and on the neck 56 and plate 55 is a controllable nozzle mechanism 240. This mechanism includes an internally threaded cap 241 which screws onto the upper end of neck 56 (Fig. 5), this cap having a central opening 242 which very loosely receives the hollowed shaft 89, and an annular concentric wall 243 which is internally threaded near its upper end and divides the adjacent upper surface on the cap 241 into an annular internal shoulder 244 and an annular external shoulder 245. Snugly received within the wall 243 and resting against the shoulder 244 is a double-sealed stainless steel ball bearing 246 which is preferably of the same type as the ball bearing 195. Screwed into the upper end of the wall 243 is the externally threaded end portion of a sleeve 247 whereby an annular external shoulder 248 provided thereon is brought snugly against the upper end of the wall 243. Provided in the sleeve 247 is a pair of vertical slots 249.

Surrounding the shaft 89 and spacing the inner race of bearing 246 from the inner race of a similar bearing 250, the outer race of which rests on the upper end of sleeve 247, is a sleeve 251. The inner race of bearing 246 is supported by a split ring 252 which snaps in place into an annular groove 253 provided in the shaft 89. Surrounding the sleeve 247 so as to be vertically slid-

able thereon and normally resting downwardly on the shoulder 248 is a tubular track cam 260 having a roller track 261 formed on its upper edge. Pins 262 are driven into suitable holes provided therefor in the cam 260 so as to slidably extend into the vertical slots 249 in the sleeve 247 and thus guide the cam 260 in its vertical movement. Also driven into suitable diametral holes provided in the cam 260 are headed pins 263 on which rollers 264 are pivotally mounted.

Resting on the shoulder 245 of the cap 241 and rotatable about the wall 243 and cam 260 is a control cam 265. This cam has an upper cam face 266 which includes two diametrically opposed low sections 267 and two diametrically opposed high sections 268. The rollers 264 ride on the cam face 266 so that rotation of the control cam 265 raises the track cam 260 from the position in which it is shown in Figs. 5 and 6 to an elevated position in which it is shown in broken lines 270 in Fig. 5 when the rollers 264 ride on to the high cam face sections 268.

Provided just above the bearing 250 in the cam 260 are drain holes 271. Similar holes 272 are provided in the members 243, 247 and 265 just above bearing 246 (Fig. 5).

The lower end of the cam 265 is provided with a master gear 275 having four switch kick-out cams 276 mounted on the upper face thereof, each of which is in vertical alignment with a midpoint of one of the cam face sections 267 and 268. Mounted on the plate 55 so that a portion thereof overlies the gear 275 is a control motor 277 having a gear driven pinion 278 which extends downwardly from said motor into meshing relation with the gear 275. A relay brake switch 279 (Fig. 16) is provided within the housing of the motor 277 this having an arm 280 (Fig. 5) which extends downwardly from said housing into the path of the cams 276 so that said switch is actuated by each of these cams as they travel into contact with said arm in the operation of the controllable nozzle mechanism 240, as will be made clear hereinafter.

Screwed downwardly onto the threaded upper end of the shaft 80 is the body 285 of a nozzle 286, said base having a bore 287 which is thus made to connect directly with the upper end of the bore 81 of the shaft 80. The bore 287 is counter-bored at its upper end to receive with a driven fit a thin sleeve 288 an upper portion 289 of which extends upwardly out of the body 285, said portion being expanded into semi-spherical form about a central point on a transverse axis 290. The body 285 has arms 291 which extend upwardly from opposite sides thereof, these arms being apertured on the axis 290 to receive short trunnion pins 292 pressed therein. Snugly fitting between arms 291 and internally shaped to provide a semi-spherical chamber 293, which slidably fits the upper semi-spherical portion 289 of the sleeve 288, when rotated about axis 290, in a rockable nozzle member 294, the latter having a tapered discharge orifice 295 which communicates with the chamber 293 and extends therefrom to the upper end of said nozzle member.

Extending outwardly and downwardly from the nozzle member 294 is an arm 296 having a stainless steel double-sealed ball bearing cam follower roller 297 mounted on its outer end.

Fixed to the nozzle base 285 on the opposite side thereof from the roller 297 is a leaf spring 298, this being secured at its lower end to said base by a plate 299 and screw 300. The upper end of spring 298 is bent inwardly so as to pressurably contact an upper portion of the nozzle member 294 to rock this about the axis 290 and thus maintain the roller 297 always in contact with the cam track 261.

The nozzle member 294 is in vertical alignment with the axis of the shaft 80 when the cam 260 is in its downwardmost position, as shown in full lines in Fig. 5. When the cam 265 is rotated by the motor 277 to bring the high sections 268 centered beneath the rollers 264, the cam track 261 is lifted to its broken line position 270 shown in Fig. 5 which lifts the roller 297 and rocks the nozzle member 294 about the axis 290 with a change in inclination of this member represented by the broken lines 301 in this view.

Mounted on each of the platforms 50, in the medial radial plane of the window 57 immediately thereabove, is a pair of lamp receptacles 302 in which are mounted a pair of lamps 303 which are preferably GE Mazda 400 watt floodlights which have an operating life of 800 hours. Each table 50 also carries a bracket 304 on which is mounted a spun metal reflector 305 which substantially encloses the lamps 303 and has a cover 306 from which an opening 307 is cut (Figs. 1 and 9) which limits the light projected upwardly from the lamps 303 to that which falls within the pattern of opening 307 which approximately conforms to the segmental shape of the window 57 disposed thereabove.

The master cam shaft 31 of the control mechanism 30 (Fig. 16) carries cams 310, 311, 312, 313 and 314 which are fixed on said shaft so that fingers 315, one of which is provided on each of said cams, is electrically connected with shaft 31 which in turn is electrically connected to lead L2 of a pair of leads L1 and L2 through which electricity is supplied for controlling the fountain unit 20. Suitable power means (not shown) are provided for continuously rotating shaft 31 at a uniform rate amounting to once for each performance period, which, in the routine to be described, lasts six minutes.

All the cams on shaft 31 rotate therewith and the fingers 315 always have corresponding angular positions about said shaft so that it can readily be determined, by an examination of the diagram of Fig. 16, as to just how the various mechanical elements of the unit 20 are caused to coact to produce a particular performance pattern.

Referring now to Fig. 16, it will be seen that a series of contacts 316 are disposed circumferentially about the cam 310 to be contacted by the finger 315 thereof at various angular positions of said finger about the shaft 31. Contacts 316 are connected by a conductor 317 which connects to one end of a coil 318 of a 4-pole magnetic switch 319 which connects the motor 277 with leads L1 and L2 when it is actuated. As will be readily apparent, when said switch is actuated, it maintains itself closed, as long as holding switch 279 is closed. When the motor 277 is energized, it rotates the cam 265 a quarter of a revolution until one of the cams 276 engages the finger 280 so as to open the switch 279 thereby breaking the holding circuit of the coil 318 and causing the switch 319 to open, thereby de-energizing the motor 277 and leaving the nozzle 286 in its new position caused by the quarter revolution imparted to control cam 265. Thus if the nozzle at the beginning of said quarter revolution was in straight up position, as shown in full lines in Fig. 5, it would, at the conclusion of said quarter revolution be inclined from vertical as indicated

by broken lines 301 in this view. If on the other hand, the nozzle was inclined from vertical at the beginning of said quarter revolution, the latter would terminate with the nozzle pointed straight upwardly as shown in full lines in Fig. 5. Because of the automatic opening of the switch 279 at the conclusion of each quarter revolution of the cam 265 by the motor 277, this motor remains de-energized until another one of the contacts 316 is engaged by the finger 315 of the cam 310 whereupon another quarter revolution will be imparted to the cam 265 and the nozzle 286 will be swung from the position it has at that time to the other of its two extreme positions.

The period of time consumed in effecting such a nozzle shift may be varied by using different motor speeds and gear ratios, this period, in the six minute performance pattern to be described hereinafter, being ten seconds.

The cams 311 and 312 control the operation of the motor 154 in its rotating the gear mechanism 133 so as to cause a rotation about the vertical axis of the fountain of the spiral illumination pattern appearing in the fountain. This rotation is accomplished at varying speeds and either in a clockwise or anti-clockwise direction by the operation of cams 311 and 312. The energizing of the motor 154 is accomplished through a reversing switch relay 320 which is connected by a conductor 321 to lead L1 and through a conductor 322 to the center points in each of a series of variable resistance, elements 323, 324, 325 and 326, and which receive current from lead L2 through the finger 315 of cam 311 as this finger is rotated into successive contact with the turns of said variable resistance elements. When cam 311 rotates so that its finger 315 first engages the variable resistance element 323, the motor 154 is energized by a relatively low voltage causing it to rotate slowly and thus impart a fairly slow rotation to the gear mechanism 133 which causes a rotation of the color pattern in the fountain as will be made clear hereinafter.

As said finger 315 comes closer to the midpoint in its engagement with the resistance element 323, the amount of voltage transmitted to the motor 154 increases thereby increasing its speed and correspondingly increasing the speed of rotation of the color pattern in the fountain. As said finger 315 moves away from the center of resistance element 323 while still contacting the same, the voltage delivered to motor 154 becomes gradually less with a resulting deceleration in the speed of rotation of the color pattern in the fountain.

The cam 312 is surrounded by a series of contacts 330 which are connected by a conductor 331 which connects with the relay 320 so that when the finger 315 of cam 312 engages any of contacts 330, it causes the relay 320 to be energized to reverse the direction of rotation of the motor 154, thereby reversing the direction that the color pattern in the fountain will be caused to rotate about the axis of the latter by the motor 154.

Cam 313 is surrounded by a series of contacts 332 connected by a conductor 333 which leads to one side of a magnetic switch coil 334 which actuates a 4-pole switch 335 controlling the energizing of motor 336 which is located in the control room 23 and is connected to the valve 27 to move the latter between open and closed positions with successive five second periods of rotation of said motor in the same direction. A holding switch 337 is provided to be actuated by the motor 336, as t completes each valve opening or valve closing cycle, so as to open the circuit of the coil 334 and de-energize the motor 336 and thus leave the valve 27 in the position to which it has been moved by the motor 336 in said cycle. The valve 27 is closed or opened gradually by the motor 336, either operation consuming approximately five seconds.

Cam 314 has a contact 350 which is connected by a conductor 341 with a light switch relay 342 so that when contact 340 is engaged by finger 315 on cam 314, relay 342 turns off the lamps 353 of the unit 20. Cam 314 also has a contact 343 connected by a conductor 344 to the relay 342, and contact with which, by the finger 315 of the cam 314, causes the relay 342 to turn on said lamps.

Operation

By virtue of the fact that lower and upper filter disks 131 and 132 are alike insofar as their color panels 198 and 236 are concerned, these disks may be super-imposed so that each panel 198 of disk 131 has a panel 236 disposed directly thereabove which is of the same color as said panel 198. When the disks 131 and 132 are so related and the motor 77 is started so as to rotate the shaft 80 approximately 1200 R. P. M. in a counter-clockwise direction, the gear mechanism 133 functions to rotate the filter disks 131 and 132 400 R. P. M. and in the same direction. At the same time, the gear mechanism 133 rotates the sleeve 177 approximately 300 R. P. M. and in the same direction. This causes the inner end of the arm 213 to overtake the finger 187 provided on the sleeve 177 about 100 times each minute so that finger 187 swings the arm 213 each time it is so overtaken between the full line position of arm 213 and its dotted line position 221 shown in Fig. 8, after each of which actuations, the arm 213 is returned to its full line position by the spring 214. The pinch clutch 215 is thus caused to circumferentially shift the periphery of the disk 132 during each minute of operation a distance equal to 100 times the distance which it is so shifted by a single actuation of said pinch clutch.

As the disks 131 and 132 are preferably 28 inches in diameter, the peripheral length of each of the three like series of color panels of each disk is 29.4 inches. To extend a complete color cycle of the unit 20 to last one minute, the pinch clutch 215 is set to cause a progression of the upper disk relative to the lower disk of .3 inch for each acuation of the clutch. If it is desired for the color pattern to be completed in 30 seconds, the pinch clutch is adjusted so as to cause a progression of .6 inch per actuation. For the purpose of illustration, it will be assumed that the latter adjustment is in effect so that the performance of a complete color cycle in the unit 20 is completed each 30 seconds.

Assuming for the moment that this color cycle starts with the nozzle member 294 in its tilted broken line position 301 as shown in Fig. 5 and that the valve 27 is in open position, water is thereby sucked upwardly from the fountain pool 22, through pipes 22, 23 and 100 by the pump 76 and delivered upwardly from this pump through the hollow shaft 80 so as to be discharged from the nozzle 286 at an angle relative to the vertical axis of said nozzle, to produce a rapidly upward moving spiral stream of water 350 (Fig. 13).

Because of the continuous generation of stream 350 and the rapidity of its upward movement, the human eye is incapable of identifying the form

of this stream as it is shown in Fig. 13. This, however, is how this stream would appear in a very rapid photographic exposure of the same. It is also to be noted that the stream 350 is shown in Fig. 13 as it appears with the nozzle 286 located at a precise point in the rotation thereof and that each time said nozzle returns in its rotation to said precise point, the spiral stream 350 will again appear exactly the same as it appears in Fig. 13. Each time the nozzle returns to the precise point in its rotation above mentioned and at which instant the spiral stream 350 appears as it is shown in Fig. 13, and assuming that panels of like colors in the disks 131 and 132 are exactly super-imposed as in the start of a color cycle, the three sets of lamps 303 disposed beneath the windows 57 will be projecting their light upwardly through three sets of super-imposed panels of the same color.

Assuming that these panels are colored red, it will be apparent that all portions of the spiral stream 350 will be brilliantly illuminated with the color red at the precise instant in which it is illustrated in Fig. 13. As with each rotation of the nozzle 286, the filter disks 131 and 132 make exactly ⅓ of a revolution, and as there are three like series of color panels provided on each of said two disks, the spiral stream 350 will be illuminated with the color red each time it is regenerated to appear as shown in Fig. 13.

By virtue of the fact that there are successive adjacent half turns A, B, C, D and E, for instance, of the spiral stream 350 in the same respective positions shown for these in Fig. 13 during each of the successive illuminations of the spiral stream with the color red, the observer will experience the illusion in viewing the fountain 351 (Fig. 14) that the series of areas 352, fixed in space, which are repeatedly occupied by these successively generated half turns, are constantly illuminated with the color red.

The same phenomenon is repeated by the illumination of the stream 350 by the color blue at the moment when the nozzle has turned ⅓ of a revolution from the precise position it was in at the instant illustrated in Fig. 13. Here, each of the turns A, B, C, D and E will have moved upwardly ⅓ of the distance intervening between that particular turn and the turn shown in Fig. 13 as next thereabove. Turns A, B, C, D and E, therefore, as regenerated by repeated rotations of nozzle 286, will be located successively and repeatedly in areas 353 as shown in Fig. 14 at the moments during which the spiral stream 350 is illuminated by the color blue, which areas will thus present to the observer the appearance of being constantly illuminated with a brilliant blue color.

In a similar manner, when the nozzle 286 has rotated ⅔ of a revolution from the position corresponding to the appearance of the spiral stream 350 shown in Fig. 13, each of the half turns, A, B, C, D and E will have advanced upwardly ⅔ of the distance between that turn and the turn immediately thereabove and at that instant the spiral stream 350 will be illuminated yellow by the yellow panels of both filter disks being superimposed in the areas of the windows 57 so that the repeated illumination of the spiral stream 350 with the color yellow, with said half turns positioned uniformly in areas 354 of the fountain 351, will produce the illusion of areas 354 of the fountain being stationary and constantly illuminated yellow.

The coloration of the fountain 351 just described and illustrated in Fig. 14 lasts for approximately five seconds of a 30 second color cycle. Fig. 15 shows the filter disks in the relative positions they have at the end of said 5 seconds, in which the upper filter disk has been advanced ½ the angle of a single panel so that each panel of the upper disk equally overlaps a correspondingly colored panel of the lower disk and the differently colored panel immediately in advance thereof. Thus each of the red panels 236 shown in Fig. 15 overlaps half of the red panel 198 therebeneath and half of the yellow panel therebeneath and just in advance of said red panel 198.

In Fig. 15 the legends in the circle 360 indicate the colors of panels 236 and the legends in circle 361 represent the colors in panels 198. The legends in arc 362 indicate the colors produced by overlapping portions of panels 198 and 236 with the filter disks 131 and 132 positioned as shown in this view which, as above mentioned, occurs approximately 5 seconds after the start of a 30 second color cycle. As will be noted in Fig. 15, the overlapping of color panels of different colors thus produced, practically has the effect of cutting the size of the color panels in half and multiplying the number of colors projected on the spiral stream 350 by two and also cutting the time period of illumination by each color in half. The result of this is to modify the color scheme shown in Fig. 14 by producing twice as many spiral colored bands in the fountain and some tendency of the colors to meld toward the upper end of the fountain by virtue of the fact that the vertical width of the turns of the spiral stream in the upper portion of the fountain are substantially wider and closer together than the turns in the lower portion thereof, thereby rendering the pattern somewhat less distinct in the upper portion of the fountain than it is in the lower portion thereof.

The pattern produced in the fountain with the filter disks positioned as shown in Fig. 15 is thus seen to include the colors red, purple, blue, green, yellow and orange in the order named and reading upwardly with respect to the axis of the fountain.

At the end of the first 10 seconds of a 30 second color cycle the blue filter panels 236 completely overlie the red filter panels 198; the yellow filter panels 236 completely overlie the blue filter panels 198; and the red filter panels 236 completely overlie the yellow filter panels 198. It will thus be seen that the filter disks 131 and 132 combine when so related as to present three like series of three color panels each, the colors displayed in each of said series being purple, green and orange. While the disks are so disposed the areas 352 of the fountain (Fig. 14) will be colored purple the areas 353 will be colored green and the areas 354 will be colored orange.

At the end of 15 seconds of a 30 second color cycle the red panels 236 will be equally overlapping the yellow and blue panels 198 with corresponding overlapping by the other panels 236 of the other panels 198 with a result that a 6 color pattern will be projected on the fountain 351, reading from the bottom upwardly: purple, orange, green, purple, orange, green. At the end of 20 seconds of a 30 second color cycle the yellow panels 236 will entirely overlie the red panels 198 with the other panels 236 correspondingly overlying the other panels 198 to produce a three color pattern reading from the bottom upwardly: orange, purple, and green.

At the end of 25 seconds of a 30 second color

cycle, the yellow panels 236 will equally overlap the dividing lines between the red and yellow panels 198 with corresponding overlapping of the border lines between the other panels 198 by the other panels 236 so as to produce a color pattern with colors reading upwardly on the fountain 351 as follows: orange, red, purple, blue, green and yellow.

As the 30 second color cycle closes, the panels 236 return to positions overlying like-colored panels 198 so as to give a color pattern, reading upwardly, red, blue and yellow.

The various contacts and variable resistance units associated with the cams on shaft 31 (Fig. 16) are adjustably disposed circumferentially relative to said shaft so these can be located to be contacted by the fingers 315 at any desired point in a given performance cycle. As shown in Fig. 16, these elements have been adjusted circumferentially with reference to shaft 31 so as to cause the fountain unit 20 to accomplish a 6 minute performance cycle during each revolution of the shaft 31. This performance cycle may be described as follows:

Elapsed Time	Six Minute Routine
0:00	Jet starts rising in column form (water turned on).
0:05	Reaches full height (remains in column form 15 sec.).
0:20	Starts to fan out.
0:30	Reaches fanned out extreme (stays full color cycle).
1:00	Starts to return to column form.
1:10	Reaches column form.
1:20	Starts to fan out, spirals rotating clockwise.
1:30	Reaches fanned out extreme (stays one color cycle).
2:00	Starts to return to column form.
2:10	Reaches column form.
2:20	Starts to fan out (spirals rotate anti-clockwise).
2:30	Reaches fanned out extreme (stays one color cycle).
3:00	Starts to return to column form.
3:10	Reaches column form.
3:20	Starts to recede gradually (water turned off).
3:25	Disappears (lights turned off).
3:30	Jet starts rising in column form (dark).
3:35	Reaches full height (dark).
3:40	Starts fanning out (dark).
3:50	Reaches fanned out form (turn lights on).
4:20	Jet starts to recede (water turned off).
4:25	Jet disappears.
4:35	Jet starts to rise in fanned form (spiral clockwise).
5:00	Jet starts to recede in fanned form.
5:05	Jet disappears.
5:10	Jet starts to rise in fanned form (spiral anti-clockwise).
5:15	Reaches full height.
5:45	Starts to recede in fanned form.
5:50	Disappears.
6:00	Jet starts to rise in column form.

It is, of course, clear that the above routine is suggested merely by way of example and that the electrical control mechanism 30 is subject to adjustment to produce a wide variety of routines in the performance of the fountain unit 20.

The six minute routine above outlined begins with the shaft 31 (Fig. 16) of the master control mechanism 30 (Fig. 12) and the cam fingers 315, carried thereon, positioned as shown in Fig. 16. Shaft 31 is rotating in a counter-clockwise direction at the rate of one revolution in six minutes.

The nozzle 286 is at this moment pointed straight up as shown in Fig. 5. The motor 77 is rotating shaft 80 in a counter-clockwise direction at approximately 1200 R. P. M. causing the nozzle 286 and the pump impeller 118 fixed thereon to rotate therewith. This results in the pump 78 sucking water upwardly from the fountain pool 22 through the screen 26, pipe 25, motor controlled valve 27 (just turned on) and pipe 28, and discharging this water upward through the shaft 80 and out of the nozzle 286 to form a pencil-like column 360 varying from twenty-five to forty feet in height and from three-quarters of an inch to one inch in diameter.

This column reaches its full height in five seconds and remains in column form for fifteen seconds, at the end of which, finger 315 of cam 310 engages the first of contacts 316 thereby energizing motor 277 which slowly rotates cam 265 a quarter turn. This causes column 360 to be gradually fanned out by inclination of the nozzle 286 to form a spiral stream whereby the spiral stream 350 is produced when, at the end of ten seconds, the nozzle 286 reaches its maximum inclination.

The lamps 303 are energized when the cycle starts and the colored light filter discs 131 and 132 are constantly rotated counter-clockwise throughout the cycle at 400 R. P. M. with disc 152 being constantly advanced by the pinch clutch 215 to cause the fountain 351 to go through a complete color cycle pattern each thirty seconds.

Thus the fountain is colored while the vertical column 360 is fanning out as well as when the fountain is later returning to column form.

The clockwise rotation of the colored spirals 352, 353 and 354 starts at 1:20 when the column 360 begins to fan out the second time and is caused by the finger 315 of cam 311 contacting variable resistance element 323. This energizes motor 154 to rotate worm gear 142 first very slowly and then at an increasing rate in a clockwise direction as the contact with the resistance element 323 approaches its midpoint where this element connects with conductor 322. From this point on to where contact with this element is broken off, the rotation of gear 142 gradually decreases in speed causing a corresponding decrease in the speed of rotation of the spiral color bands 352, 353 and 354 about the vertical axis of the fountain 351.

The manner in which subsequent pattern changes included in the above outlined six minute routine are accomplished by the master control mechanism 30, will be made readily manifest by reference to the detailed description of said mechanism and to Fig. 16 illustrating the same.

What is claimed is:

1. In a colored fountain, the combination of: a hollow shaft; means for mounting said shaft for rotation about a vertical axis; a nozzle mounted on the upper end of said shaft, said nozzle being shaped to discharge a substantial stream of water upwardly therefrom at an angle relative to said axis; a light filter disk mounted beneath said nozzle for rotation about the axis of said shaft; a light source disposed beneath said disk and positioned to direct light upwardly through said disk, said filter disk including a series of segmental panels of distinctive colors; means for delivering water under pressure to said shaft and through said shaft to said nozzle; means for very rapidly rotating said shaft to cause water discharged from said nozzle to form a spiral stream rising upwardly from said nozzle and embodying a vertically spaced series of distinct successive turns; and means operable by said power means for rotating said filter disk in timed relation with the rotation of said shaft to present said segmental colored panels of said disk to said light source to illuminate said spiral stream during each of the successive revolutions of said nozzle with a given uniform sequence of rapid flashes of differently colored light, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals, each corresponding approximately in shape to the rapidly moving spiral stream of water actually discharged by said nozzle.

2. In a colored fountain, the combination of: a nozzle rotatable about a vertical axis and adapted to discharge a stream of water upwardly at an angle relative to said axis; a light filter disk mounted for rotation coaxially with said nozzle, said filter disk including a series of segmental panels of different colors; a light source disposed beneath said disk and shining upwardly successively through said panels as said disk is rotated; and means to rotate said nozzle and said disk in timed relation, the rotation of said nozzle producing an upwardly travelling spiral stream, including an endlessly generated series of complete superimposed successive turns, the light passing upwardly through said disk and illuminating said rising spiral stream with a repeated pattern of successive rapid flashes of successively different colored lights in timed relation with the generation of said stream so that each repetition of the illumination of said stream with a flash of each given color finds the turns of said stream disposed approximately in a corresponding series of spaced areas fixed in superimposed relation in space, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals, each corresponding approximately in shape to the rapidly moving spiral stream of water actually discharged by said nozzle means.

3. In a colored fountain the combination of: a nozzle mounted for rotation on a vertical axis for discharging water delivered thereto in a rising spiral stream; means for illuminating said stream substantially uniformly during each rotation of said nozzle with a repeated pattern of successive rapid flashes of successively different colored lights, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals each corresponding in shape to the rapidly moving spiral stream of water discharged by said nozzle; and means operable while said nozzle is rotating to vary the angle relative to said axis at which water is discharged from said nozzle thereby varying the width of said spiral stream and correspondingly varying the illusion aforesaid.

4. In a colored fountain, the combination of: a nozzle mounted for rotation about a vertical axis, said nozzle delivering a unitary stream of water upwardly, and being shiftable between a position in which said stream travels straight upwardly along said axis and a position in which said stream travels outwardly and upwardly at an angle relative to said axis; means for rotating said nozzle with the latter positioned to discharge said stream of water straight up along said axis; means for illuminating said rising stream of water substantially uniformly during each rotation of said nozzle with a repeated pattern of successive rapid flashes of successively different colored lights; and means operable while said nozzle is rotating to change the position of said nozzle with reference to said axis whereby the stream of water discharged from said nozzle is discharged at an angle relative to said axis thereby producing an upwardly rising spiral stream of water successive turns of which rise in timed relation with said repeated pattern of rapid flashes of successively different colored lights so that each repetition of the illumination of said stream with a flash of each given color finds the turns of said stream disposed approximately in a corresponding series of spaced areas fixed in space, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals, each corresponding approximately in shape to the rapidly moving spiral stream of water actually discharged by said nozzle means.

5. A combination as in claim 4 in which said means for shifting the position of said nozzle relative to said axis to cause the stream of water discharged thereby to first extend along said axis and subsequently take the form of a rising spiral stream, is operative, while said nozzle is still rotating, to reverse the change in the position of said nozzle so as to return the latter to a position in which water is discharged straight upwardly therefrom along said axis.

6. A combination of: an electric motor mounted on a vertical axis; a hollow shaft extending axially through said motor and rotated thereby; a pump provided on the lower end of said hollow shaft where it extends downwardly from said motor said pump including an impeller mounted on said shaft and driven thereby, said pump enclosing the lower end of said shaft to form a discharge basin into which water passing through said pump is discharged and from which said water flows upwardly through said shaft; a nozzle mounted on the upper end of said shaft to discharge said water at an angle relative to said axis to produce a rising spiral stream; and means driven by said shaft for illuminating said rising spiral stream substantially uniformly during each rotation of said nozzle with a repeated pattern of successive rapid flashes of successively different colored lights, thereby creating in the observer the illusion of viewing simultaneously a series of approximately stationary intertwined differently colored spirals each corresponding in shape to the rapidly moving spiral stream of water actually discharged by said nozzle means.

7. A combination as in claim 2 in which means is provided for modifying the timed relation with which said nozzle and said disk are rotated, said means being operative during said rotation to render the rotation of said nozzle and said disk slightly out of phase, thereby creating in the observer the illusion of a palpable rotation of said differently colored spirals about the axis of rotation of said nozzle.

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