MULTIPLE OUTLET WATER DISCHARGE HEAD WITH INTERNAL FLOW DISTRIBUTING BAFFLE
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John O. Hruby, Jr.
INVENTOR

BY
Beehler & Arant
Attorneys
This invention relates generally to improvements in ornamental fountain discharge heads of the kind which are characterized by a discharge member having a stem disposed longitudinally within a body and adapted for gyration about a vertical axis of the body with the axis of the stem inclined to the body axis. The invention has more particular reference to an improved multiple outlet discharge head of this kind which is equipped with a unique internal flow distributing baffle for effecting uniform flow of water to and eliminate pulsing of the water emerging through the several outlets of the head.

There is currently available on the market a water discharge head including a tubular body containing a discharge member having a tubular stem, the lower end of which extends through a cylindrical bearing in the lower end of the body. The internal diameter of this bearing is somewhat larger than the external diameter of the stem, such that the discharge member is adapted for gyration about the longitudinal axis of the body with the longitudinal axis of the stem inclined to the body axis, in such manner that the stem traces a geometric figure known as a hyperboloid of one sheet. The upper end of the stem projects externally of the body through an enlarged outlet in the upper end of the body. Mounted on the upper, external end of the stem is an enlarged manifold chamber having a number of spaced outlets with upwardly diverging axes.

In operation of the discharge head, the latter is mounted in an upright position in communication with a source of water under pressure. A portion of the water entering the head flows into the body, about the exterior of the stem, through a number of tangential openings in the wall of the body and then flows upwardly through the body to its upper outlet. The tangential attitude of the openings through which the water enters the body causes the water to swirl upwardly through the body, thereby imparting a gyraory motion to the discharge member. During this gyrotry motion, the discharge member rolls along an inner surface of the body and thereby acquires a simultaneous rotational motion about the axis of its stem. The remaining water entering the discharge head flows upwardly through the stem to the manifold chamber at the upper end of the stem and then out through the several outlets leading from the chamber. In order to facilitate the ensuing description of the invention, the water which flows upwardly through the body, about the outside of the stem, is hereinafter referred to as "stem driving water," or simply "driving water," and the water which flows upwardly through the stem is referred to as "stem water."

The water discharge head under discussion is used to create an ornamental water fountain display including a lower level fountain which is formed by the stem driving water emerging radially from around the exterior of the gyrating-rotating manifold chamber and an upper level fountain which is formed by stem water emerging upwardly from the several diverging outlets of the chamber. The combined gyratory and rotary motion of the discharge member is effective to break the emerging water into discrete droplets which follow upwardly arching, outwardly radiating paths from the discharge head. The gyratory motion of the manifold chamber causes the vertical angle of emergence of the stem driving water from the discharge head to cyclically increase and decrease progressively throughout a full 360° of the discharge head. The combined gyratory and rotary motion of the chamber causes a progressive, cyclic variation in the angle of emergence, relative to the vertical axis of the discharge head, of the streams of stem water from the several outlets in the chamber and a simultaneous epicyclic progression of the emerging water streams about said axis. These actions combine to produce a highly spirited, unusual, and aesthetically pleasing ornamental fountain display.

The existing ornamental fountain discharge head of the kind under discussion, however, is defective in one respect. This defect resides in the fact that there is a tendency for the stem water which enters the manifold chamber of the gyrating and rotating discharge member to flow in non-uniform and somewhat intermittent fashion to the several outlets from the chamber. This non-uniform and intermittent distribution of the water to the outlets, in turn, results in pulsing of the water emerging through the outlets which destroys the symmetry of the water display and produces other aesthetically unpleasing aberrations in the fountain.

It is a general object of this invention to provide an improved, ornamental fountain discharge head of the character described which is free of the defect discussed above.

A more specific object of the invention is to provide an improved ornamental fountain discharge head of the character described having an internal flow distributing baffle within the manifold chamber of the gyratory-rotary discharge member, which baffle is effective to cause uniform flow of water to the several outlets of the chamber and eliminate pulsing of the water emerging through the outlets.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the invention, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings wherein:

FIGURE 1 is a side elevation of an improved ornamental fountain discharge head according to the invention and showing the head installed on a riser for conveying water under pressure to the head;

FIGURE 2 is an enlarged section taken on line 2—2 in FIGURE 1;

FIGURE 3 is a bottom view of the flow distributing baffle and certain other parts of the discharge head shown in FIGURES 1 and 2; and

FIGURE 4 is a perspective view of the baffle per se.

The improved ornamental fountain discharge head of this invention, as it is represented in the drawings, is designated in its entirety by the reference numeral 10. The head comprises a tubular body 12 including an outer sleeve 14 and a coaxial inner sleeve 16 which extends through and beyond the normally lower end of the outer sleeve. The upper end of the inner sleeve 16 has an external, annular flange 18 which is rigidly secured to and peripherally sealed to the outer sleeve 14. The inner sleeve flange 18 is located intermediate the ends of the outer sleeve, thereby to define above the flange a well 20 which opens to the upper end of the outer sleeve 14. The outer sleeve is internally threaded at its lower end and is fitted with an inner sleeve flange 18. In the wall of the inner sleeve 16 are a number of slots 24 which open tangentially to the interior of the inner sleeve and define water inlets to the sleeve interior. The purpose of these inlets will be explained presently.

Axially positioned within the tubular body 12 is a rotary and oscillatory discharge member 26. This dis-
charge member comprises a lower tubular stem 28 which extends through and below the lower end of the inner sleeve 16 of the body 12. Fixed on the lower end of the stem 28, below the lower end of the inner sleeve 16, is a collar 30. Fixed to the upper end of the stem 28, within the well 20, is a cylindrical manifold chamber 32. The upper end of this chamber projects a distance above the inner edge of the outer body 14 and is radially enlarged above the sleeve to form a radial flange 34 on the chamber. The diameter of the manifold chamber 32, below the flange 34, is substantially smaller than the internal diameter of the body well 20. The diameter of the stem 28 is substantially smaller than the internal diameter of the inner sleeve 16 of the body 12.

Fixed in the lower end of the inner sleeve 16 is a bearing 36. The stem 28 extends through a coaxial bore 38 in this bearing. The diameter of the bearing bore 38 is slightly larger than the external diameter of the stem, whereby the latter has a loose fit in the bearing 36. The collar 30 fixed to the lower end of the stem 28 is engageable with the bushing 36 to limit upward movement of the discharge member 26 relative to the tubular body 12. The lower end of the stem 28 is open.

The upper end of the manifold chamber 32 is open and is cylindrically frustoconical, as shown at 40. Positioned in this open end of the chamber is a wall 42 which seats against the upwardly presented, annular shoulder 44 defined by the chamber rabbet 40. The wall 42 is retained in position in the chamber by a number of circumferentially spaced washers 46 which project radially in over the wall 42 and are secured to the manifold chamber 32 by screws 48. Preferably, the wall 42 has a tight, but removable fit in the open upper end of the manifold chamber to restrict or prevent water leakage between the wall and chamber.

Extending through the upper wall 42 of the manifold chamber 32 are a number of water outlets which, in the illustrated discharge head, are defined by a central tubular spout 50 and three tubular outer spouts 52. The central spout 50 extends centrally through the upper manifold chamber wall 42, along the common central axis of the chamber and the stem 28. The three outer spouts 52 are uniformly spaced about the central spout 50 and diverge radially away from the central spout, at an acute angle relative thereto, toward the upper ends of the spouts.

The ornamental fountain discharge head 10, as it is thus far described, is conventional. In use, the outlet sleeve 14 of the tubular body 12 of the head is threaded on the upper end of the stem 28. Referring to the illustrated discharge head, at least a portion of the water which enters the discharge head 10 from the riser flows through the tangential inlets 24 in the inner sleeve 16 of the body 12. This water, which is the stem driving water referred to earlier, swirls upwardly through the interior of the inner sleeve 16, then radially out between the upper surface of the inner sleeve flange 18 and the lower surface of the manifold chamber 32, then upwardly between the inner surface of the well 20 and the outer surface of the chamber, and is finally discharged upwardly and radially from the head through the space between the upper edge of the body outer sleeve 14 and the manifold chamber flange 34. The undersurface of the flange 34 is preferably formed with a number of circumferentially spaced notches 56 having upwardly sloping bottom walls. These notches are effective to direct the stem driving water emerging from the discharge head outwardly from the head along a number of upwardly arching, circumferentially spaced paths. The remainder of the water entering the discharge head 10 from the riser 54 flows upwardly through the stem 28 of the discharge member 26 into the manifold chamber 32 and is discharged from the head through the tubular spouts 50 and 52. The water which thus flows upwardly through the discharge member is the stem water referred to earlier. The stem water which enters the central spout 50 is discharged upwardly along the axis of the discharge member 26 to form a central spire of water. The stem water which enters the three outer spouts 52 is discharged therefrom along three upwardly arching, outwardly radiating paths.

It is apparent, of course, that the water which flows upwardly through the discharge head 10 up to its upper limiting position where-in the collar 30 on the lower end of the stem 28 engages the stem bearing 36. The stem driving water which enters the inner sleeve 16 of the tubular body 12, because of its swirling motion as it flows upwardly through the stem, urges the discharge member 26 laterally to a position in which the outer cylindrical surface of the manifold chamber 32 rests against the inner cylindrical surface of the well 20, whereby the axis of the discharge member is inclined at an acute angle to the axis of the tubular body 12, and imparts a gyrotary motion to the discharge member about the axis of the tubular body. This gyrotary motion of the discharge member is such that the central axis of the member traces a geometric figure known as a hyperboloid of one sheet having its construction point at the stem bearing 36. During this gyrotary motion of the discharge member, the cylindrical wall of the manifold chamber 32 rolls along the cylindrical surface of the well 20, thereby imparting a rotation to the discharge member about its central axis. Thus, the discharge member 26 undergoes both a gyrotary motion about the central axis of the tubular body 12 and a rotational motion about its own axis.

The net result of these several actions involved in the operation of the ornamental fountain discharge head 10 is to provide a fountain display including a lower level fountain formed by the stem driving water which emerges radially from between the upper edge of the body sleeve 14 and the manifold chamber flange 34 and an upper level formed by the stem water which emerges from the four tubular spouts 50, 52. The gyrotary and rotational motion of the discharge member 26 breaks up the water emerging from the discharge head into discrete droplets and, in addition, imparts various progressive and cyclic direction changes and rotational motions to the several streams of water, or more accurately, streams of water droplets, emerging from the discharge head. As a consequence of these several actions, there is produced a highly spirited water fountain of unusual and very esthetically pleasing appearance.

As noted earlier, the existing fountain discharge head of the character described above is defective for the reason that the former discharge head in the illustrated base is not the manifold chamber 32 flows non-uniformly and in somewhat intermittent fashion to the several water outlets or outlet spouts 50, 52 leading from the chamber. This non-uniform and intermittent distribution of water to the several outlets causes undesirable pulsing of the water emerging through the outlets.

According to the present invention, this defect of the existing fountain discharge head is cured by placing a flow equalizing or distributing baffle 58 in the manifold chamber 32. It has been determined by actual experiment that this baffle is effective to cause uniform distribution of water to all of the outlets from the manifold chamber and eliminate pulsing of water emerging through the outlets. The flow distributing baffle 58 shown comprises a sleeve 60 which is fixed on the lower end of the central spout 50, the latter projecting below the upper manifold chamber wall 42 for this purpose. On the lower end of the baffle sleeve 60 is an external annular flange 62 having a lower conically tapered surface 64. This surface presents itself toward the stem water entering the manifold chamber 32 from the stem 28. Fixed within the lower end of the central spout 50 is a flow restrictor 66 having a central water passage 68 of somewhat smaller diameter than the passage through the central spout.
In operation of the illustrated fountain discharge head 10, a portion of the stem water flowing upwardly through the stem 28 of the discharge member 26 flows directly into the center spout 50 through the flow restrictor 66 therein. The remainder of the stem water entering the manifold chamber 32 encounters the lower conically tapered surface 64 of the flow distributing baffle 58. This surface deflects the stem water radially out toward the outer spouts 52 in substantially uniform fashion throughout a fall 360° of the baffle in a way which has been found to be effective to smooth out the water flow and eliminate pulsing of the water emerging through the several spouts.

It is apparent, of course, that owing to the axial alignment of the lower end of the central spout 50 with the upper end of the stem 28, and the proximate location of the lower end of the spout to the upper end of the stem, the ram effect of the stem water entering the manifold chamber 32 from the stem 28 tends to cause a somewhat greater flow of water through the central spout than the three outer spouts. The reduced passage 68 in the flow restrictor 66 is proportioned to restrict the water flow through the central spout sufficiently to compensate for this ram effect.

While the invention has herein been shown and described in what is conceived to be its most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. An ornamental fountain discharge head comprising a manifold chamber having a water inlet in its lower end and having in its upper end a number of tubular water outlet passageways, one outlet passageway being located substantially in axial alignment with said inlet, others of said outlet passageways having entrance ends spaced radially outwardly from said one outlet passageway and extending angularly outwardly, said one outlet passageway having a portion including an entrance end extending into said chamber to a location spaced inwardly of the entrance ends of the others of said outlet passageways, said entrance end including a central opening aligned with said inlet and a flow distributing baffle comprising a frusto-conical tapered surface on said portion surrounding said opening and with the apex thereof facing toward said inlet.

2. An ornamental fountain according to claim 1 wherein there is a tubular body having an inner surface of a passageway therethrough surrounding and spaced from the exterior of said manifold chamber, and an annular outlet from said last passageway surrounding the exterior of said manifold chamber.

3. The subject matter of claim 1 wherein: at least said one outlet is defined by a tubular spout which projects into said chamber and towards said inlet, and said baffle being mounted on the inner end of said spout.

4. In an ornamental fountain discharge head comprising a tubular body, a tubular stem axially mounted in said body for gyration about the central axis of said body with the axis of the stem inclined to said body axis, the upper end of said stem extending to the exterior of said body through an enlarged outlet in the upper end of the body, means for effecting gyration of said stem by water flowing through said body, a manifold chamber on the upper end of said stem externally of said body, an inlet passage extending axially through said stem into said chamber, and a number of discharge spouts extending from the upper end of said chamber including one spout having its lower end located substantially directly opposite said stem passage, the improvements comprising: an annular baffle within said chamber mounted on the lower end of said one spout and having a conically tapered surface about said one spout and presented toward said stem passage for eliminating pulsing of the water emerging from said chamber through said spouts.

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EVERTT W. KIRBY, Primary Examiner.