March 25, 1969 I. S. DAGHISTANI 3,434,662

WATER FOUNTAINS FOR PLANE AND CONCAVE SHEETS

Filed May 20, 1966

Sheet 1 of 3

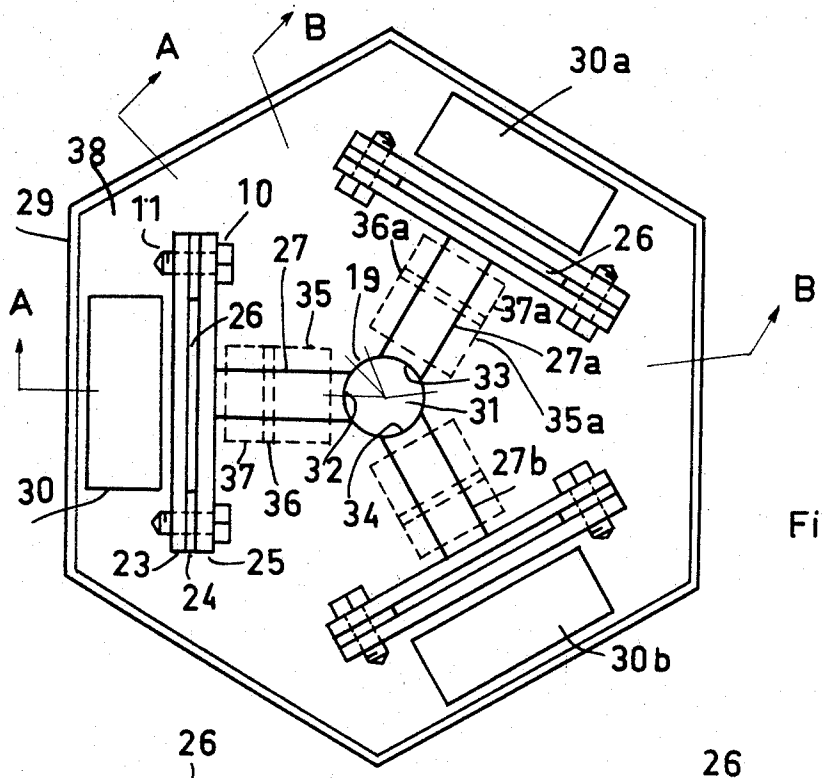

Fig.1.

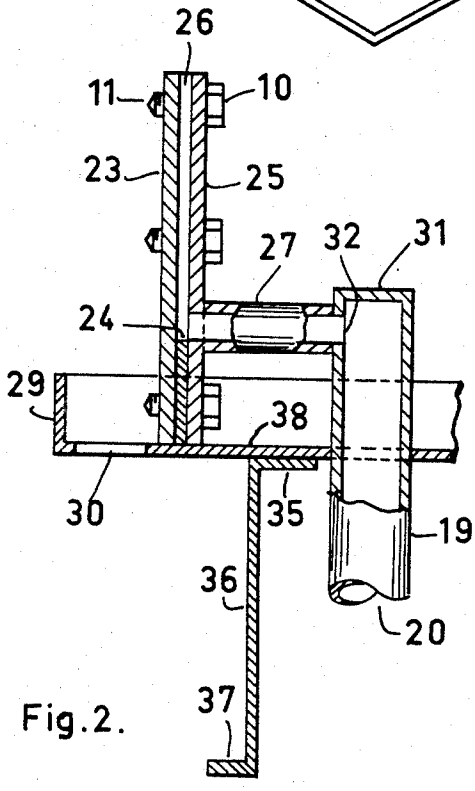

Fig.2.

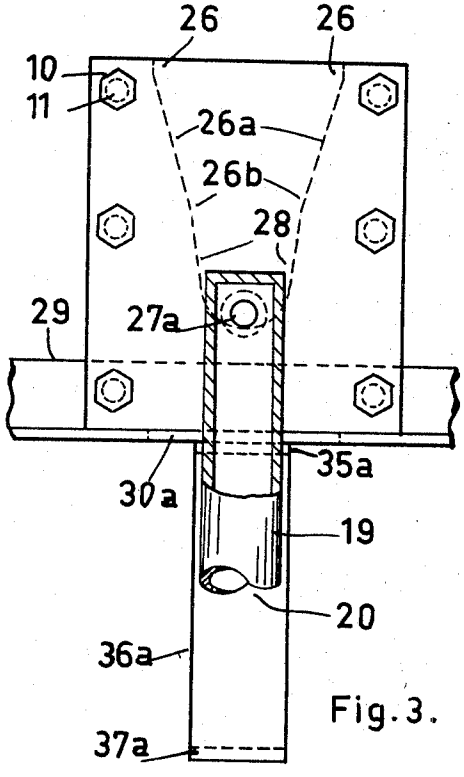

Fig.3.

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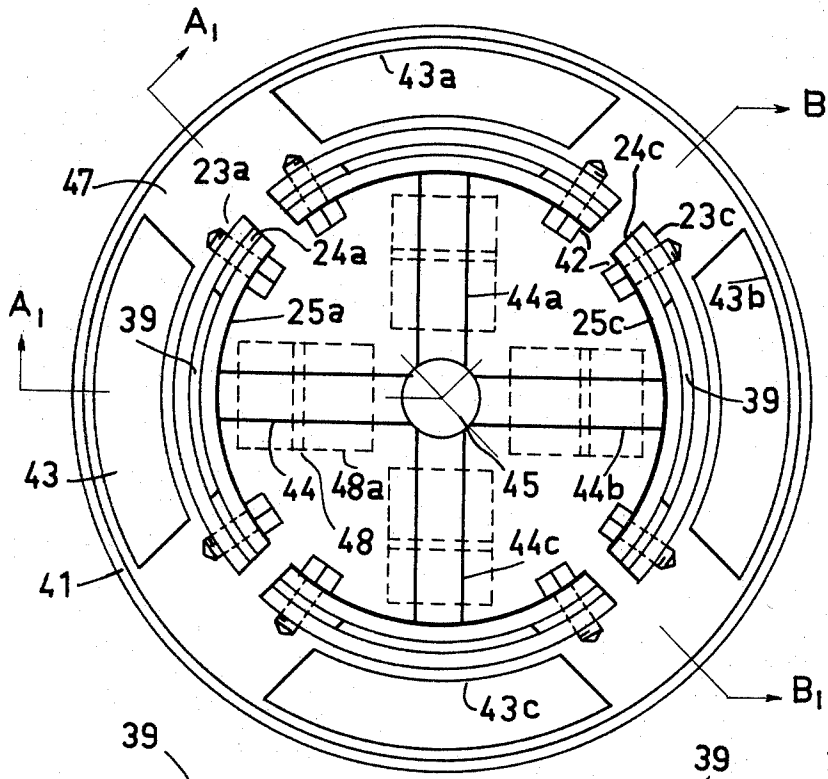

Fig.4.

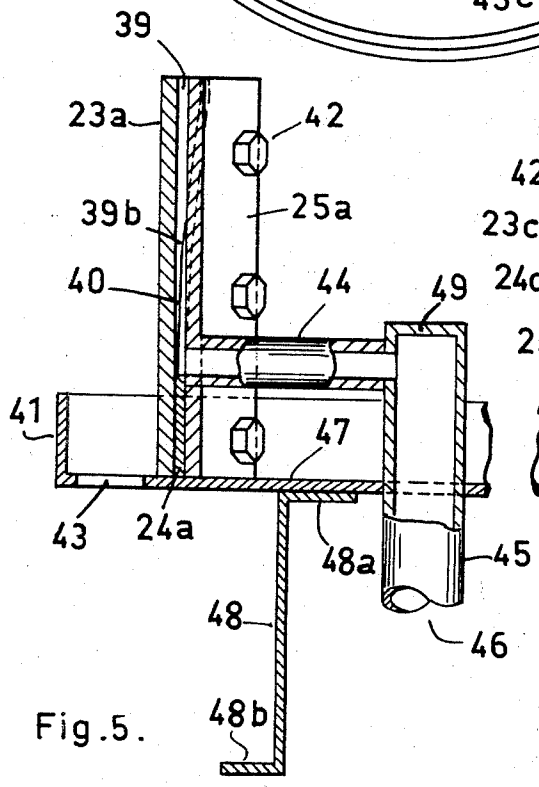

Fig.5.

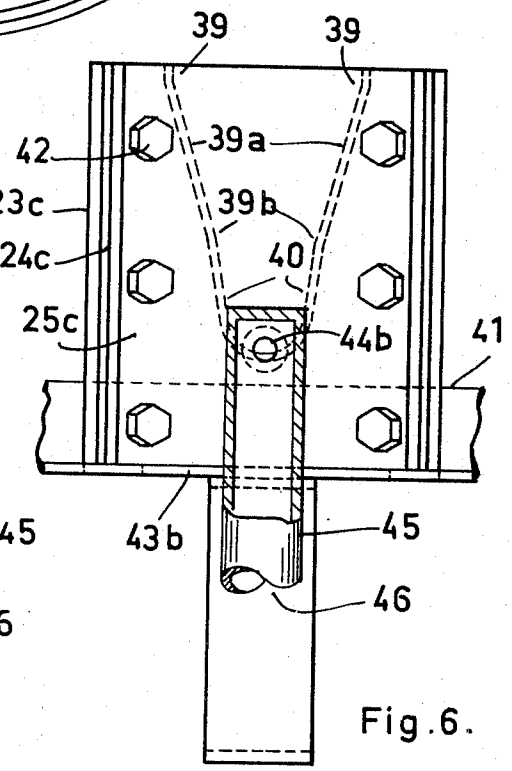

Fig.6.

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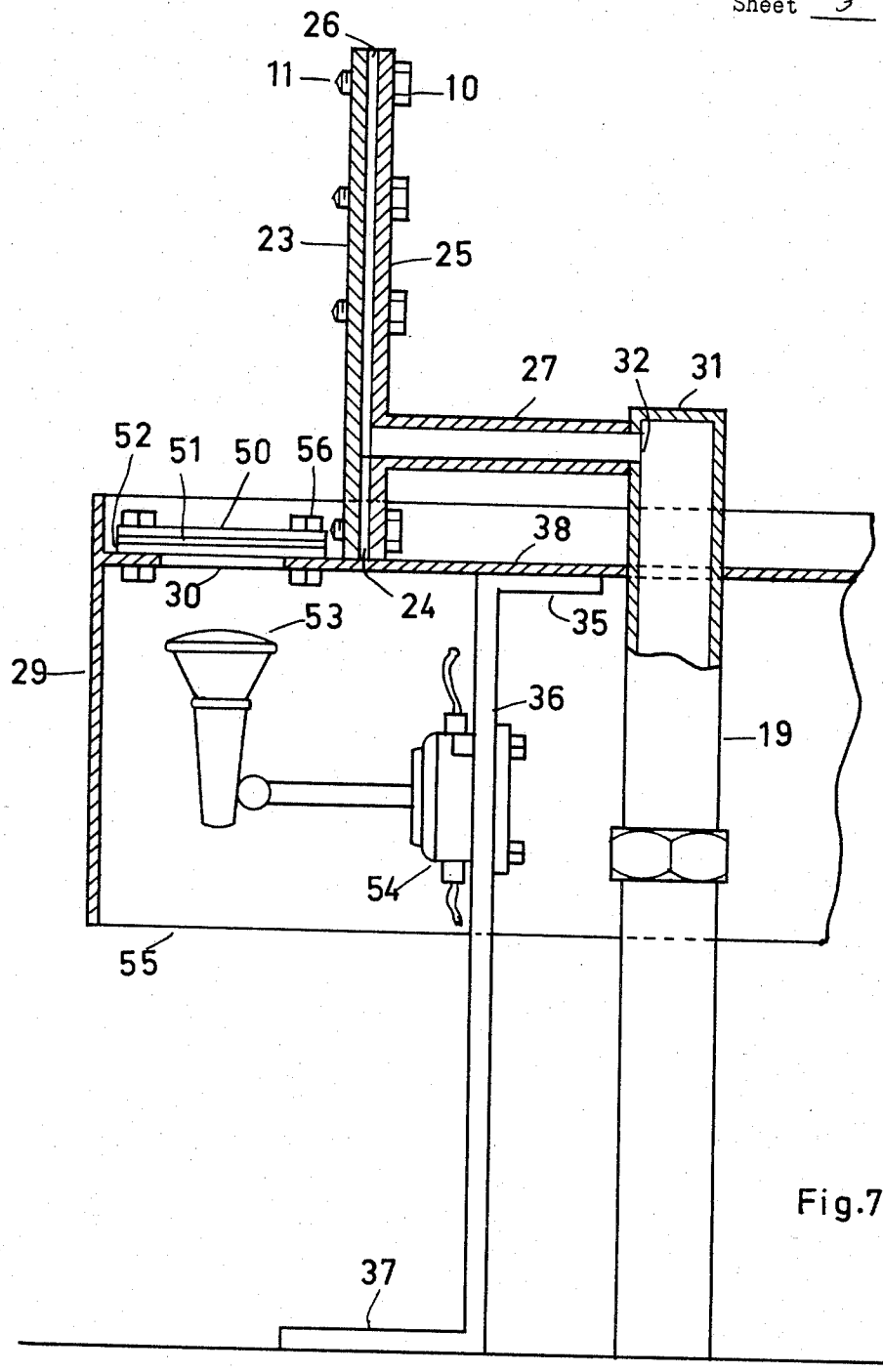

Fig.7

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WATER FOUNTAINS FOR PLANE AND CONCAVE SHEETS

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Int. Cl. B05b 17/08, 1/04
U.S. Cl. 239—17 5 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to new types of water fountains. Water herein is shaped into plane and concave sheets having homogeneous, transparent and even surfaces with straight and vertical edges. By the use of underwater illumination, or by the transmission of coloured lighting through special arrangements within the fountain's structure, more impressive aesthetic effects than known before are produced on these sheets of water.

The invention introduces not only thoroughly new geometrical combinations, but it also offers to the eye a variety of shapes, depending on the angle from which the fountain is viewed.

This invention works with the aid of a centrifugal pump containing a filter and a regulating valve, to supply water inside a centrally installed main tube, which communicates at its closed upper part with a plurality of branch pipes disposed horizontally, and at equal angles from each other. The further ends of the said branch pipes are welded on either rectangular-shaped plane or concave metallic plates which are rust-proof and have smooth, even and polished surfaces. The welding is done, after having made holes at the axis of the said metallic plates, which communicate with those of the branch pipes, at a distance of 5.6 inches between the top of the said plates and the lower tangent of each branch pipe.

Another metallic plate of similar dimension, and of a thickness ranging between 0.08–0.12 inch which has to be cut in the form, hereinafter described, is placed behind each of the welded plates. A third plate with identical dimension is placed behind the second and is fixed tightly with screws at equal intervals to the two above mentioned plates. Thus, the intermediate metallic plate leaves a free homogeneous chamber through which water moves under conditions, which hereinafter, will be described, to eject from the slots formed between the upper edge of the welded and the third metallic plates, in the form of plane or concave sheets of water.

The invention is illustrated in the accompanying drawings as follows:

FIG. 1. A top plan view of one embodiment of the invention in which three plane sheets of water are to be formed.

FIG. 2. A view in vertical section taken on line A—A of FIG. 1.

FIG. 3. A section in vertical frontal elevation on line B—B of FIG. 1.

FIG. 4. A top plan view of a second embodiment of the invention in which four concave sheets of water are to be formed in the shape of a cylinder.

FIG. 5. A vertical section taken on line A1—A1 of FIG. 4.

FIG. 6. Section view in vertical frontal elevation on line B1—B1 of FIG. 4.

FIG. 7. Details of FIG. 2.

According to FIGURE 1, the apparatus comprises the central main tube **19**, the lower end of which **20** is to be connected with a hose or a pipe system, which leads to a centrifugal pump and a filter located in an underground

chamber near a concrete basin. The main tube is disposed vertically and with a size large enough to permit three branch pipes **27**, **27***a*, **27***b*, having an inner diameter of 0.4 inch to engage with its closed head horizontally. The branch pipes deflect at an angle of 120°. Thus the lower edge of the closed head **31** of member **19** has to be as near as possible from the bottom of the upper edges of the branch pipes which communicate with the main tube **19** through the circular open holes **32**, **33** and **34**.

The further ends of the branch pipes are welded vertically and centrally onto three plain rust-proof metallic plates **25** at a distance of 5.6 inches between the top of the said plates and the inner lower tangent of the holes made in them, directly in front of the inner holes of the welded branch pipes. Thus, the water with the regulated pressure coming through the tube **19** flows into three equal streams through the branch pipes **27**, **27***a*, **27***b* and communicates thereof through the three metallic plates **25**. A second metallic plate **24** of equal dimension to that of **25** and having a thickness of 0.02 inch is disposed behind it after being cut centrally, at a distance of 5.6 inches from the top, in the following manner: the lower end of the cutting has the shape of a semicircle with a radius of 1 inch; the two walls **28**, adjacent to the semicircle deflect at an angle of 5° from the vertical tangent of each side of the said semicircle. The height of the upper end **26***b* of wall **28** to the lower tangent of the semicircle is 2.4 inches. The other two walls **26***a* stretch from the top **26***b* of the lower wall **28** to the limit defined by the lower ends of the vertical walls **26** which should not exceed 0.12 inch, and which give plate **24** a slot with 4 inches length, when it is fixed between the welded plate **25** and the third plate **23**.

Provision is made for threaded holes at equal intervals of the metallic plates **23**, **24**, **25**, corresponding to the threaded part **11** of the set screws **10**, so that the said plates are fixed together without the help of auxiliary parts. The main tube **19**, the branch pipes **27**, **27***a*, **27***b* and the adjoining members **23**, **24**, **25** which are fixed to each of them, form a unit which engages by means of member **19** inside the centre of a hexagonal casing **29**. As a result, the bottom of members **23**, **24** and **25** lay on an even and horizontal platform **38** of the hexagonal casing. Near three edges of platform **38**, and facing each of the three member units **23**, **24** and **25**, three rectangular openings **30**, **30***a*, **30***b* are arranged to permit underwater illumination or other sources of light to illuminate the three plane sheets of water, ejecting from the straight slots **26**.

The construction rests on three legs which have their upper edge **35** welded to the lower part of platform **38**; the leg **36** extends vertically down the upper edge and is bent at its lower end **37** horizontally in order to be fixed on a cement surfaced basin. Internal light system is mounted to leg **36**.

According to FIGURE 4, the apparatus comprises the main tube **45**, the lower end of which, **46**, is to be connected with a hose or a pipe system leading to a centrifugal pump. The tube **45** is of enough size to permit four branch pipes **44**, **44***a*, **44***b* and **44***c* to communicate with its upper end at a deflection of 90° from each other. Symmetric precision forms part of the conditions for securing an equal distribution of water pressure through each of the branch pipes. Another condition is that the said branch pipes have to communicate through the tube **45** as near as possible from its upper closed end **49**.

I have found by experiment that when the main tube **45** extends for a longer distance over the upper edge **44**, water coming through the head **49** and then down to the communicating opening of branch pipe **44**, tends to form a vacuum which in its turn interrupts the homogeneous flow of water and consequently disturbs the homogeneity

of the sheet ejecting through the slot **39** or **26** of the preceding apparatus.

Each of the welded concave metallic plates **25***a* should be of the same size. The intermediate plate **24***a* and the other three similar ones are cut through the axis at a distance of 5.6 inches from the top, in the same manner described earlier in FIG. 1. The three concave plates **23***a*, **24***a* and **25***a* are fixed tightly by a plurality of screws **42**, located at equal intervals in such a way as to prevent water supplying the four chambers and limited by the walls **39**, **39***a*, **39***b*, and **40**, from escaping in between the plates.

The main tube **45**, the four branch pipes **44**, **44***a*, **44***b* and **44***c*, together with the group of concave plates **23***a*, **24***a*, and **25***a*, form a unit which engages with the centre of cylinder **41** through a hole made in its basement and which permits the passage of member **45**. The circular plate **47** of the cylinder **41** serves as a platform for the bottom of the group of concave plates **23***a*, **24***a* and **25***a*, thus giving the apparatus a stable position.

Near the periphery of platform **47** and across the horizonal and vertical diameters, four openings **43**, **43***a*, **43***b* and **43***c* are arranged and are large enough to permit the underwater illumination or other source of light, to illuminate the whole surface of the concave sheets of water ejecting through the four curved slots **39**. Four legs **48** with the upper edge **48***a* welded to the lower part of platform **47**, and the lower edge **48***b* to be fixed to the ground of a basin, form a pedestal upon which the construction rests.

FIGURE 7 is a detailed drawing of the component parts as in FIG. 2. The casing **29** surrounding the hexagonal platform **38** extends above and below its six edges. The upper edge of the casing **29** extends to a level slightly higher than that of member **50**. Thus, the falling sheets of water fill the upper basin of the casing before water spills outside. The lower edge of the casing **29** below the platform **38** extends beneath the level of the light sources **53** and **54** in order to protect them from the falling sheets of water. Moreover, the lower edges of the hexagonal casing indicated at the level **55**, has to be slightly over the level of water in the cement surfaced basin, so that the warm air within finds an outlet.

The members **50** and **52** are rectangular sheets of unbreakable plexiglass with a thickness of 0.2 inch and of high tolerance to heat. The intermediate sheet **51** is of thin colored plastic, either in green, blue, red or a mixture of colored plastic sheets, cut and shaped as desired, so that rays of light penetrating through them are projected upon sheets of water ejecting through slots **26** in varying colored images. The three members **50**, **51** and **52** are fixed to the rectangular openings **30**, **30***a*, **30***b* by a plurality of screws **56**.

It is clear that a large variety of fountains can be formed without departing from the spirit of the invention. The number of sheets of water can be increased, their position can likewise be varied as desired, their breadth can be enlarged or made smaller, and can be disposed either vertically or at any suitable angle, within the wide range of manipulations which this invention facilitates.

I have chosen here two examples for the formation of plane and concave sheets of water, arranged in various ways. I have described in detail, by giving requisite dimensions which are the result of a series of experiments on the study of the formation of plane sheet of water. After having studied the reaction of water through a variety of constructions carried out first in plastic, of slots formed according to principles described, it was found necessary to have the water pressure distributed homogeneously so that water ejects through the slots with a continuous and even pressure.

One of the obstacles met was that water has a tendency to split into fine particles and to spread out in the shape of a mist or a fog, if the pressure of water is too high or if the opening of the slot has been of a dimension irrelevant to the size of the branch pipe. This could partly be rectified by having the area of the slot adjusted, i.e., having its slot as near as possible in area to the circular opening of the branch pipe. Moreover, I have observed that to get a plane sheet of water into air, water has to travel a certain specified distance within the chamber of the slot.

It has been found that even if the area of the slot and the hole in the tube supplying water were similar, an excess of surface tension is apt to occur if the distance separating the slot from the said tube was longer than 5.6 inches. The rotation of water and its agitation under such circumstances tends to disturb the homogeneity of water pressure and that of the sheet.

If the distance covered by water, inside the slot chamber, is less than 5.6 inches, no sheet can be forced. Water ejects consequently in a fan-like way, even if vertical walls have been secured near the outlet of the slot.

Another problem faced is that water has a tendency to draw inwards and to form a rope-like flow if the vertical walls **26** adjacent to the slot have been higher than 0.12 inch as specified. In addition to that, I have found that that if the slot has been too long in comparison to the diameter of the branch pipe, water flows near the walls of the intermediate plate and ejects into the two rope-like streams thereof, while the lower part of the chamber formed in between the other two plates is covered with water. With any increase of water pressure, the two streams eject higher while water in the said lower chamber hardly reaches the opening of the slot.

In the light of these experiments, the accompanying drawings reflect the practical results obtained after solving the two mentioned problems. Due to the fact that water passing through a tube, and communicating between two smooth and even metallic plates, moves at a centrifugal force, provision has to be made for this kind of movement. In the present example, the intermediate plate **24** is cut from the axis and at a distance of 5.6 inch from the top, in the shape of a semicircle and in a ratio of 1:5 pertaining to the radius of the branch pipe supplying water; the radius of the branch pipe opening being 0.2, the radius of the semicircle is 1 inch.

The free movement of water inside the mentioned chamber has been devised with a view to counteracting two opposite actions occurring at the same time in the said chamber. The first action takes place at the upper periphery of the branch pipe through the comparatively large space in which the centrifugal force facing the periphery of the said pipe is allowed to move. As a result, it tends to draw water towards the two walls **28** of the lower part of the chamber.

The other action takes place in the lower section of the periphery of the branch pipe, which after covering the distance separating the centre of the branch pipe to the periphery of the semicircle, tends to draw water inwards towards the centre of the said lower chamber.

Due to the fact that pressure of water coming through branch pipes into free spaces of the above mentioned lower chambers, issues in centrifugal force, and that the area covered by the water of the upper section of the branch pipe, and represented by a triangle extending from the centre of the opening of said branch pipe to a horizontal line stretching from the two pointed edges **26***b*, is approximately equal to the area covered by the rest of the section in the said branch pipe opening, the two actions of water drawn ouwardly and inwardly take place simultaneously and at equal intensity with a view to counteracting each other, and thus allowing water to flow in to the upper chamber homogeneously and to continue thereof the uniform centrifugal force of the branch pipe.

The deflection of the two walls **26***a*, Ref. FIG. 3, and the two vertical walls **26**, in the upper part of the chamber, are done to secure the assemblage of the particles of water, after having overcome the two opposing factors of inward and outward drawing of water, into a homogeneous ejection in sheet forms under the given maximum pressure of 100 liter per minute, for which this con-

structure has been adjusted in order to fulfill the object of this invention.

While making this invention, it was noticed that plane sheets of water resulted in a homogeneous and continuous flow and reached a height of 1.6 yards. It is only when the sheets attained that height, they fall back into fine globules.

What I claim is:

1. A water fountain comprising three straight slots, arranged according to the construction in which a main central tube communicates from its upper closed head with three branch pipes, which, in turn, and through their further ends are connected vertically to a unit comprising three plane and rectangular metallic plates of equal size, the intermediate one of said plates leaves a room between the other two for the passage of water of said branch pipes; the said rooms being formed by a cut made at a defined distance from the central top of the said intermediate plates and limited from the lower part by the peripheric wall of a semicircle with a defined radius and extending thereof into two oblique walls with defined deflection, adjacent to the side edges of the said semicircle and continuing from the top of the said two walls into other two oblique walls to the limit defined by the lower edges of two vertical walls of a slot with defined length which secures the formation of homogeneous and continuous plane sheet of water in each of the three member units connected accordingly to each of the said branch pipes.

2. A water fountain according to claim 1, in which the main central tube, the three branch pipes communicating horizontally and at equal angles with the upper closed head of the said main tube, and the said three member units of metallic plates connected vertically and centrally to each of the three branch pipes, form a unit engaging in the center of a hexagonal platform, the said platform being provided with three rectangular openings for the transmission of light to the three sheets ejecting through the three slots of the said three metallic units; a casing being provided on the six edges of the said hexagonal platform while a combination of three legs with an upper edge fixed to the underside of the said platform and a lower edge fixed to the ground of a cement surfaced basin keep the construction in stability.

3. A water fountain includes four curved slots, disposed in accordance with the construction in which the main central tube, communicates from its upper closed head with four branch pipes of equal lengths, which, in turn, are connected centrally and vertically with a unit composed of three concave metallic plates, the intermediate one of which leaves a room between the other two for the passage of water of the said branch pipes; the said room being shaped by a cut made through the central top of the said intermediate metallic plate and limited from the lower part by the peripheric wall of a semicircle

with a defined radius, and extending thereof into two oblique walls with defined deflection, adjacent to the side edges of the said semicircle, the said two walls continue into other two oblique walls to the limit defined by the lower edges of two vertical walls which give the water of the said rooms curved slots through which the water ejects in the shape of concave, homogeneous and transparent sheets.

4. A water fountain according to claim 3, includes a central main tube, four branch pipes communicating horizontally and at right angles with the head of the said main tube, a component of said three metallic plates connected centrally and vertically to each of the said branch pipes; the whole forming a unit which inserts, by means of the main tube, in a central hole made in the platform of a cylindrical casing, the said platform being provided on its vertical and horizontal peripheric edges, with four large openings for the transmission of underwater illumination to the sheets of water, and having welded on its underside four legs with upper and lower edges which give the construction stability.

5. A water fountain according to claim 2, includes a hexagonal casing extending over and beneath a hexagonal platform, said platform being provided with three rectangular openings upon which a unit of three plexiglass sheets are tightly held, the intermediate sheets being of varying colors, thus permitting the light rays, whose source is attached to the legs on the lower part of the platform, to illuminate the three sheets of water in a variety of colors.

References Cited

UNITED STATES PATENTS

763,614	6/1904	Keith	239—17
1,228,186	5/1917	Darlington	239—20
1,335,267	3/1920	Ambrose et al.	239—568 X
1,532,056	3/1925	Keske	239—18
1,549,204	8/1925	Merigold	239—20
1,718,556	6/1929	Harrison	239—597 X
2,045,898	6/1936	Cullison	239—23 X
2,888,205	5/1959	Trucco	239—20
3,292,861	12/1966	Kawamura et al.	239—17

FOREIGN PATENTS

1,007,304	10/1965	Great Britain.

OTHER REFERENCES

German printed application No. 1,184,287, Schalk et al. Published Dec. 23, 1964.

EVERETT W. KIRBY, *Primary Examiner.*

U.S. Cl. X.R.

239—549, 565, 597, 600, 601