United States Patent

[11] 3,570,765

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[54] **FOUNTAIN**
4 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **239/21,** 46/41
[51] **Int. Cl.** **B05b 17/08**
[50] **Field of Search** 239/17, 21; 46/41

[56] **References Cited**

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Assistant Examiner—Michael Y. Mar
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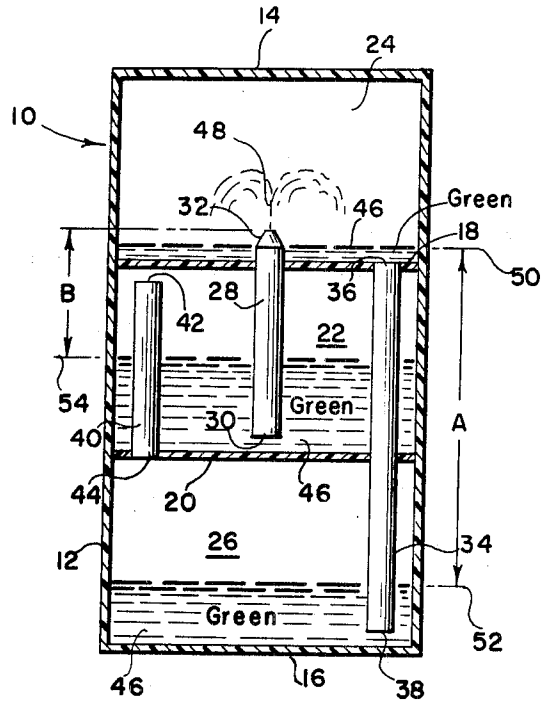
ABSTRACT: A fountain includes a closed fluid system having three superposed compartments. A first tube has an open end adjacent the bottom wall of the intermediate compartment and a nozzle end within the upper compartment. A second tube has an open end near the bottom of the upper compartment and extends downwardly into the bottom compartment. A third tube has an open end near the top wall of the bottom compartment and extends upwardly with an open end near the top wall of the intermediate compartment. A liquid is provided within the system of sufficient volume that, upon inversion of the device, it will fill the intermediate compartment and partially fill the normally upper compartment and, upon reinversion of the system to its upright position, will flow from the normally upper compartment through the second tube into the normally bottom compartment, displacing air from the bottom compartment into the intermediate compartment through the third tube, displacing liquid from the intermediate compartment through the first tube to cause a liquid jet into flow from the nozzle end into the upper compartment. Several embodiments of the fountain are disclosed. One embodiment includes an auxiliary compartment between the intermediate and bottom compartments to increase the pressure head causing the jet to flow. Another provides two closed fluid systems, one inverted with respect to the other, with compartments of the two systems interspersed in a vertical stack. An additional embodiment includes an upper compartment divided into two chambers with syphon means to transfer liquid received from the jet from the upper chamber to the lower chamber so that fluid may be transferred back through the second tube into the lower compartment. Toy and amusement devices of various types may be employed within the fountain for operation by or for use in conjunction with the jet.



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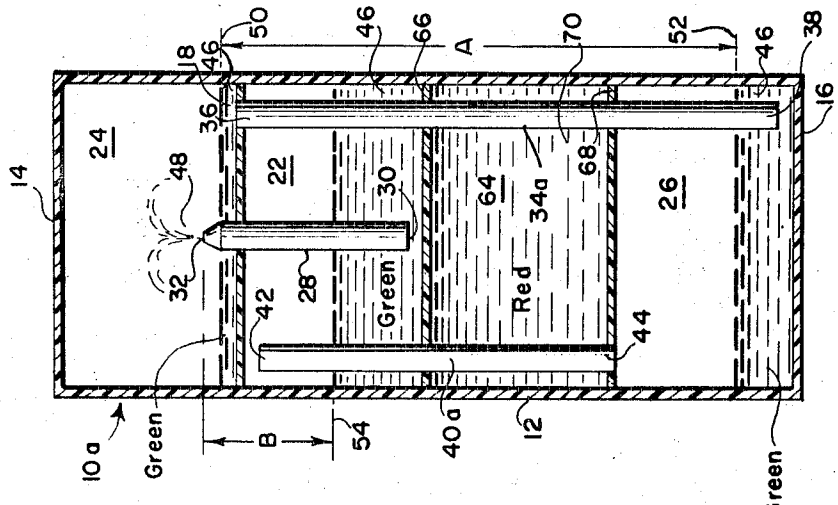

FIG. 3

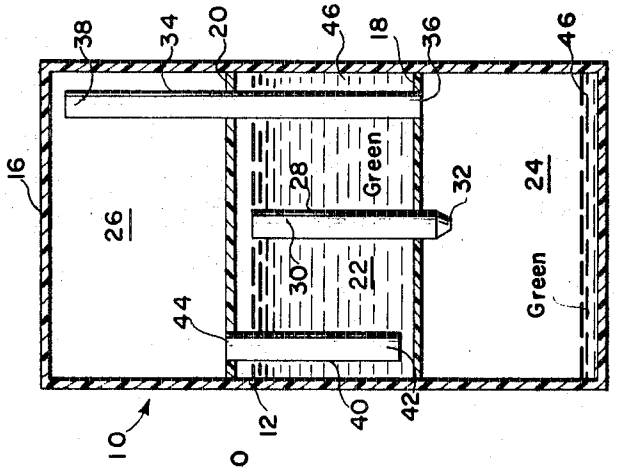

FIG. 2

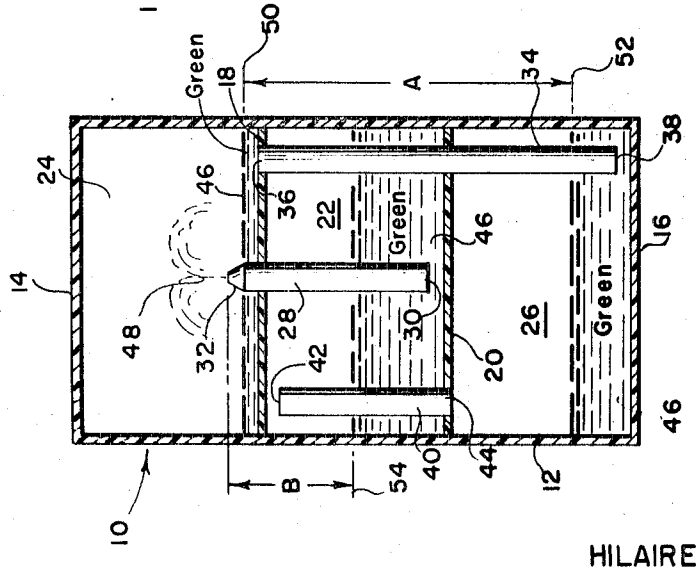

FIG. 1

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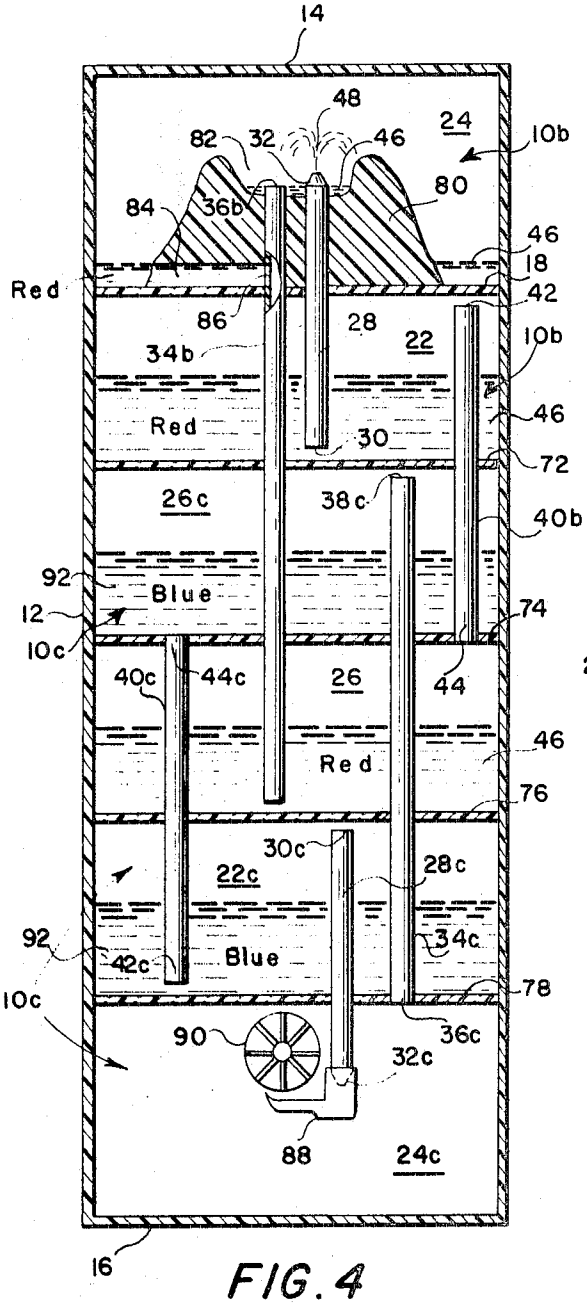

FIG. 4

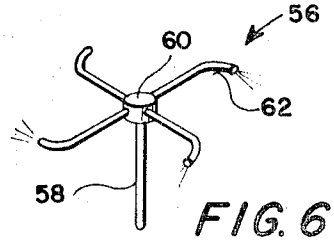

FIG. 6

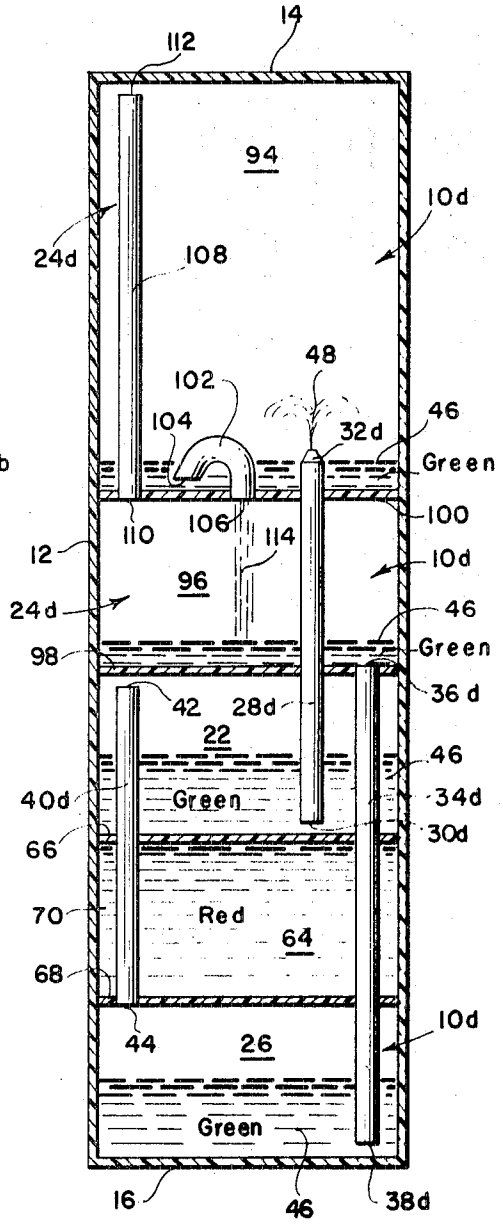

FIG. 5

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FOUNTAIN

BACKGROUND OF THE INVENTION

This invention relates to amusement devices and, more particularly, to a toy employing a fountain or the like.

Toy or amusement devices employing the principle of the fountain have been suggested in the prior art. In the toy fountain shown, for example, in U.S. Pat. No. 2,785,785, a hand-operated pump is employed for providing an upwardly projecting stream of liquid. It has also been suggested, in the toy shown in U.S. Reissue Pat. No. 23,612, that the flow of a liquid from an upper compartment into a lower compartment displaces air from the lower compartment through a vent pipe to operate a paddle wheel within the upper compartment. This device does not require a pump for its operation, being inverted to return the liquid to the upper compartment.

SUMMARY OF THE INVENTION

It is a principal object of the invention to provide an improved fountain toy.

More specifically, it is an object of the invention to provide a fountain toy having a closed fluid system and providing an upwardly streaming liquid jet without employing external power means to operate a pump.

A related object is the provision of a fountain toy of this character which is reset by inverting the fluid system and which is caused to operate by reinverting the system.

A further object of the invention is he provision of a plurality of such fluid systems in a common fountain device.

Briefly, the invention contemplates the provision of a closed fluid system having a plurality of superposed compartments. A first tube extends upwardly from the intermediate compartment, having an open end near the bottom wall of the intermediate compartment and a nozzle end within the upper compartment. A second tube extends downwardly from the upper compartment to the lower compartment having an open end near the bottom of the lower compartment. A third tube has an open end near the top wall of the bottom compartment and an open end near the top wall of the intermediate compartment. The system is filled with a sufficient quantity of liquid so that when the system is inverted the intermediate compartment will be filled and the normally upper compartment will be partially filled. Upon reinversion of the system to its normally upright position, the liquid will flow from the normally upper compartment through the second tube into the lower compartment, displacing air from the lower compartment into the intermediate compartment through the third tube, and displacing liquid from the intermediate compartment through the first tube to cause a liquid jet to flow from the nozzle end into the upper compartment. Various toy devices may be provided within the system to cooperate with or be operated by the liquid jet.

An embodiment of the invention includes an auxiliary compartment sealed from the fluid system and positioned between the intermediate and lower compartments to increase the pressure head operating to provide the liquid jet. Another embodiment includes the concept of including two independent closed liquid systems with interspersed compartments, one system being inverted with respect to the other so that one system will operate while the other system is being reset due to the inversion thereof. Yet another embodiment includes the concept of dividing the upper compartment into two chambers with siphon means for transferring liquid received from the liquid jet in the upper chamber to the lower chamber from which it is transferred through the second tube to the lower compartment.

The foregoing and other objects, advantages, and features of the invention and the manner in which the same are accomplished will become more readily apparent upon consideration of the following detailed description of the invention when taken in conjunction with the accompanying drawings, which illustrate preferred and exemplary embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram showing a first embodiment of the invention;

FIG. 2 is a schematic diagram showing the device of FIG. 1 in its inverted position;

FIG. 3 is a schematic diagram showing a second embodiment of the invention;

FIG. 4 is a schematic diagram showing a third embodiment of the invention;

FIG. 5 is a schematic diagram showing a fourth embodiment of the invention; and

FIG. 6 is a perspective view of a toy device which may be employed with any of the embodiments of the invention.

DETAILED DESCRIPTION

Since the embodiment of FIG. 1 is the simplest version of the invention and most clearly illustrates the operating principles thereof, it will be described first. Referring to I FIG. 1, it will be seen that a fountain of the invention may comprise a closed fluid system **10** contained within a transparent plastic cylinder **12** having an upper end wall **14** and a lower end wall **16**. The fluid system is divided into three compartments by transverse walls **18** and **20** which may be made of the same transparent plastic material as cylinder **12** and end walls **14** and **16**. Dividing walls **18** and **20** are suitably sealed to the inner surface of cylinder **12** so that the only fluid flow between the three compartments will be through tube means which will be described presently. Walls **18** and **20** form a first or intermediate compartment **22**; walls **18** and **14** form a second or upper compartment **24**; and walls **16** and **20** form a third or lower compartment **26**.

A transparent glass or plastic tube **28** has an open end **30** positioned near the bottom wall **20** of compartment **22** and extends upwardly through compartment **22** and wall **18**, terminating a short distance above wall **18** in a nozzle end **32**. It has been found that tubing having an internal diameter of approximately three-sixteenths of an inch is satisfactory. The nozzle end **32** is pinched or otherwise partly closed to provide a somewhat smaller opening.

A second transparent tube **34** has an open end **36** communicating with compartment **24** at approximately the level of bottom wall **18** of compartment **24**. Tube **34** extends downwardly through compartment **22** and wall **20** to a point closely adjacent to the lower wall **16** of compartment **26**. The lower end **38** of tube **34** is also open.

There is, in addition, a third transparent tube **40** having an open end **42** within compartment **22** closely adjacent upper wall **18**. Tube **40** extends downwardly through compartment **22** and wall **20** and has a lower open end **44** at approximately the level of wall **20** communicating with compartment **26**. Tubes **34** and **40** preferably have the same internal diameter as tube **28**.

Closed fluid system **10** contains a liquid **46**, which may be tinted an intense attractive color. As an example, a green liquid is employed in FIG. **1**. The volume of liquid provided in closed fluid system **10** is sufficient to substantially fill compartment **22** when the fluid system is inverted, as shown in FIG. **2**, and partially fill compartment **24**. It is to be understood that compartment **22** becomes filled through tube **40** with liquid flowing from compartment **26** and, when compartment **22** is filled to the level of the upper end **30** of tube **28**, the overflow will spill through tube **28** into compartment **24**. After fluid system **10** is inverted, as shown in FIG. **2**, for a time sufficient for the filling of compartment **22** and partial filling of compartment **24**, it is then reinverted into the upright position shown in FIG. **1**. The liquid **46** within compartment **24** will then flow downwardly through opening **36** and tube **34** into compartment **26**, causing compartment **26** to begin to fill with fluid **46**. This will cause air within compartment **26** to be displaced upwardly through open end **44** of tube **40** and through tube **40** into compartment **22**. This, in turn, will cause the liquid **46** within compartment **22** to be displaced upwardly through open end **30** of tube **28** and through tube **28** and noz-

zle end 32 thereof. Due to the constricted opening 32 of tube 28 the liquid flowing through tube 28 will project from nozzle end 32 as a liquid jet 48. The liquid from liquid jet 48 will collect along the bottom wall of compartment 24 and flow through open end 36 of tube 34 and through tube 34 into lower compartment 26, further displacing air from this compartment to continue the operation until virtually all of the liquid in compartment 22 has been displaced. At this time, the jet 48 will cease to flow, and the fluid system will be ready to be reset by inverting it as shown in FIG. 2.

The force of jet 48 is a function of the hydraulic head H created within the system. This hydraulic head will be governed by the expression H = A–B, where A is the distance between the level 50 of the liquid 46 within compartment 24 and the level 52 of the liquid 46 within compartment 26 and B is the distance between the top of nozzle end 32 and the level 54 of the liquid 46 within compartment 22.

While the device may be used in the form shown in FIG. 1, it is to be understood that any number of toy devices may be incorporated therein to be operated by the jet 48 and/or by the fluid flow within compartment 26. Thus, for example, as illustrated in the embodiment of FIG. 4, a toy volcano might be positioned within compartment 24 so that the liquid jet 48 would appear as an eruption from the volcano. Alternatively, a waterwheel device could be incorporated within compartment 24 to be operated by the jet flowing from nozzle end 32. As shown in FIG. 6, the liquid jet could be employed for revolving a jet spinner 56. The jet spinner would include a tube 58 connected with tube 28 and communicating with a revolving hub member 60 and through hub 60 to a plurality of radiating jet pipes 62. As the fluid pressure operating in the system causes liquid to rise through tube 28 and tube 58, it is caused to flow rapidly through jet pipes 62 and appear as liquid jets extending from the open ends thereof. This will cause the hub to rotate with the result that a revolving jet spinner is provided. Other toys may be incorporated for operation by, or for use in conjunction with, the jet provided from tube 28. Examples include a toy decorative fountain, a geyser, a waterfall, an oil well, a grist mill, a paddle wheel boat, a spouting whale, a fireman and hose, a fire boat, a stream beneath a bridge, a spring or grotto, and a coffee percolator. Other devices could be incorporated within the system to be actuated by the airflow as the air is displaced from one compartment to another.

The force of the jet may be increased by increasing the hydraulic head. This may be accomplished, as illustrated in the embodiment of FIG. 3, by incorporating an additional compartment between two of the compartments of the fluid system 10*a*. As shown in FIG. 3, an auxiliary compartment 64 is positioned between compartments 22 and 26, being separated from compartment 22 by a transverse transparent plastic wall 66 and from compartment 26 by a transverse transparent plastic wall 68. Compartment 64 is preferably completely sealed from compartments 22 and 26 and may be filled with a second liquid 70 which is preferably of a contrasting color to liquid 46. For example, as shown in FIG. 3, liquid 70 is red, while liquid 46 is green.

While tube 28 will remain the same length as in the embodiment of FIG. 1, the tube extending from compartment 24 to compartment 26 must be considerably longer. Thus, tube 34*a* extends from open end 36 in communication with compartment 24 through compartment 22, wall 66, compartment 64 and wall 68 to open end 38 adjacent to lower wall 16 within compartment 26. In like manner, a tube 40*a* has an open end 42 adjacent top wall 18 of compartment 22 and extends down through wall 66, sealed compartment 64, and wall 68 to communicate through open end 44 with compartment 26 adjacent wall 68. By virtue of this arrangement the distance A is considerably larger than the distance A in the embodiment of FIG. 1. Since the hydraulic head H = A–B, is thus considerably larger in the embodiment of FIG. 3, greater pressure will be available within compartment 22 to provide a fluid jet 48 of considerably greater force. Various toy devices, as previously described, may be incorporated within the embodiment of FIG. 3.

It is also possible within the purview of the invention, to incorporate two or more closed fluid systems within a single device. In the embodiment shown in FIG. 4, for example, two fluid systems 10*b* and 10*c* are combined within a single unitary device, one system being inverted with respect to the other. As before, a transparent plastic cylinder 12 encloses the device and has an end wall 14 at one end and an end wall 16 at the other end. A first closed fluid system 10*b* includes three compartments 22, 24, and 26, corresponding to similarly numbered compartments shown in previously described embodiments. A transverse wall 18 separates compartments 22 and 24. However, compartments 22 and 26 are separated by one compartment 26 26*c* of three compartments forming closed fluid system 10*c*. System 10*c* also includes compartments 22*c* and 24*c*. A transverse transparent plastic wall 72 separates compartments 22 and 26*c*; a transverse wall 74 is positioned between compartments 26*c* and 26; a transverse wall 76 separates compartments 26 and 22*c*; and a transverse wall 78 is positioned between compartments 22*c* and 24*c*.

Closed fluid system 10*b* resembles the closed fluid systems previously described. The first tube 28 extends from just above wall 72 of compartment 22 upwardly through wall 18 and terminates at a constricted nozzle end 32 at a point within compartment 24. A second tube 34*b* has an upper open end 36*b* positioned within compartment 24 at a point below the level of nozzle end 32 of tube 28. It will be observed that, in this embodiment, which incorporates a toy volcano, the tubes 28 and 34*b* extend upwardly through a volcano structure 80, both being positioned within a crater portion 82 thereof. When jet 48 projects from tube 28, it is received with in crater 82 and the fluid passes downwardly through tube 34*b*. In the event that some of the fluid projects or splashes over the edge of crater 82 and is received in the bottom of compartment 24, a passageway 84 is provided through the bottom of volcano 80 and communicates through an opening 86 to tube 34*b*. Thus, any excess fluid collecting at the bottom of compartment 24 is also received in tube 34*b* and passed downwardly therethrough.

Closed fluid system 10*b* also includes a third tube 40*b*, which has an open end 42 closely adjacent wall 18 within the upper portion of compartment 22, and which extends downwardly through compartment 22, through wall 72, through compartment 26*c*, and through wall 74, having an open end 44 communicating with compartment 26. Fluid system 10*b* is provided with a colored liquid 46 of one color (red liquid is employed as an example) of sufficient volume to fill compartment 22 and partially fill compartment 24 when the fluid system 10*b* is in its inverted position (as shown in FIG. 4, this fluid system is shown in its upright position).

Fluid system 10*c* is essentially the same as fluid 10*b*, being, however, in inverted position with respect thereto. Thus, as shown in FIG. 4, fluid system 10*c* is in its inverted position. A tube 28*c* has an open end 30*c* closely adjacent to wall 76 within compartment 22*c* and extends through compartment 22*c* and wall 78 to terminate with a nozzle end 32*c* within compartment 34*c*. It will be observed that, in the embodiment as shown in FIG. 4, nozzle end 32*c* is incorporated within a toy waterwheel device. Thus, nozzle opening 32*c* communicates with a water channel member 88 which will channel water received from nozzle 32*c* to a position where it will splash down (when fluid system 10*c* is in its upright position) upon a waterwheel 90. While not shown in this figure, the waterwheel could be incorporated within a more elaborate toy representing, for example, a grist mill, or the like.

Fluid system 10*c* also includes a tube 34*c* having an open end 36*c* communicating with compartment 24*c* adjacent to wall 78. Tube 34*c* extends through compartment 22*c*, through wall 76, through compartment 26, and through wall 74, terminating in an open end 38*c* closely adjacent wall 72 within compartment 26*c*. Fluid system 10*c* also includes a third tube 40*c* having an open end 44*c* communicating at wall 74 with

compartment 26c. Tube 40c extends through compartment 26, wall 76, and terminates in an open end 42c adjacent wall 78 within compartment 22c.

A quantity of liquid 92 is provided within fluid system 10c of sufficient volume to substantially fill compartment 22c and partially fill compartment 24c when inverted as shown in FIG. 4. Compartment 22c is filled from compartment 26c through tube 40c; an intermediate point in the filling cycle is shown in FIG. 4. Liquid 92 may be of a different color than liquid 42, blue liquid being employed as an example.

In operation of the embodiments of FIG. 4, when fluid system 10b is in its upright position a fluid jet 48 will be caused to be projected through nozzle 32. At the same time, fluid system 10c will be reset, being it its inverted position, with the fluid 92 filling compartment 22c and partially filling compartment 24c. Thus, when fluid system 10b has completed its operation and the device is inverted, fluid system 10c will then operate to project a fluid jet through nozzle 32c to operate waterwheel 90. At that time, fluid system 10b will be in its inverted position and will be reset as previously described.

It is also possible to incorporate more than two closed fluid systems within a single device. This may be accomplished by providing concentric fluid systems in addition to the interleaved and inverted systems as shown in FIG. 4. Thus, any number of fluid systems in either the inverted or upright orientations may be provided in a single device to provide a highly stimulating and amusing apparatus.

A further variation is shown in the embodiment of FIG. 5. Here, again, the device is enclosed within a transparent plastic cylinder 12. A closed fluid system 10d includes a compartment 22 and a compartment 26 corresponding to similarly numbered compartments in previously described embodiments. In addition, an upper compartment 24d is divided into two chambers 94 and 96. An auxiliary compartment 64, corresponding to compartment 64 in the embodiment of FIG. 3, is also provided between compartments 22 and 26. As previously described, compartment 64 is sealed from the compartments of the closed fluid system 10d and contains a liquid 70 having a contrasting color (red in this example) to the liquid 46 (colored green) within closed fluid system 10d.

Fluid system 10d includes a tube 28d having an open lower end 30d within chamber 22 adjacent to wall 66 separating chamber 22 from chamber 64. Tube 28d extends upwardly through a wall 98 separating compartment 22 from compartment 24d, through chamber 96 and through wall 100 separating chamber 96 from chamber 94. Within chamber 94 tube 28d has a nozzle end 32d at a position somewhat above wall 100. A curved siphon tube 102 has an open end 104 closely adjacent to wall 100 within chamber 94 and extends through wall 100 having an open end 106 thereat. In addition, a tube 108 has an open end 110 within chamber 96 closely adjacent to wall 100 and extends upwardly through wall 100 and chamber 94 to a point closely adjacent to wall 14, having an open end 112 at this position.

Fluid system 10d also includes a tube 34d having an open end 36d communicating through wall 98 with chamber 96 and extending downwardly through compartment 22, compartment 64, and compartment 26 and terminating with an open end 38 near wall 16 within compartment 26. The system further includes a tube 40d having an open end 42 within compartment 22 closely adjacent to wall 98 and an open end 44 at wall 68, separating compartments 26 and 64, communicating with compartment 26.

The operation of the embodiment of FIG. 5 is similar to the operation of the embodiment of FIG. 3. However, the upper compartment has been divided into two subchambers 94 and 96. After the fluid system 10d has been inverted long enough to permit fluid 46 to fill compartment 22 and partially fill chamber 94, the system is reinverted. At this time, fluid 46 will communicate with open end 104 of siphon tube 102. The siphon tube will then serve to siphon the fluid through open end 106 into chamber 96 and from chamber 96 through opening 36d and tube 34d into compartment 26. This will cause air within compartment 26 to be displaced through tube 40d into compartment 22. The air pressure building up within compartment 22 will force fluid from compartment 22 upwardly through tube 28d and through nozzle end 32d thereof within chamber 94. This will cause a fluid jet 48 to be created as previously described. As the fluid from fluid jet 48 is received within chamber 94, it will be siphoned by siphon tube 102 to chamber 96 where, as previously described, it will be communicated to lower compartment 26 through tube 34d. It should be noted that tube 108 serves to maintain air pressure within chamber 94 for facilitating the operation of the siphon tube 102. A stream of liquid 114 is shown flowing from siphon tube 102 into chamber 96.

Any number of amusing devices may be created within the purview of the present invention. As already mentioned, various types of water toys may be incorporated to operate in conjunction with the fluid jets provided within devices of the invention and various other devices may be strategically located to be operated by the flow of liquid or air within the system. Highly artistic devices may be created by combining several systems of the invention and may, in certain cases, be useful for the creation of artistic water sculptures and the like.

While the various embodiments of the invention have been described as being made entirely of transparent thermoplastic material, it is to be understood that other transparent materials may be employed, such as glass or the like. It is also not necessary that the walls of the device be made of entirely transparent materials. In some cases, some of the materials or portions thereof may be opaque or translucent to add to the mystery and appeal of the device.

While preferred embodiments of the invention have been shown and described, it will be apparent to those skilled in the art that changes can be made without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims. Accordingly, the foregoing embodiments are to be considered illustrative rather than restrictive of the invention, and those modifications which come within the meaning and range of equivalency of the claims are to be included therein.

I claim:

1. A fountain device comprising a closed fluid system including: a first compartment, a second compartment normally positioned above said first compartment, and a third compartment normally positioned below said first compartment; a first tube having an open end adjacent a lower wall of said first compartment, extending upwardly into said second compartment, and having an upper nozzle end within said second compartment; a second tube having an open end communicating with the second compartment at a level below the level of said nozzle end, extending downwardly into said third compartment, and having an open end adjacent to the bottom wall of said third compartment; a third tube having an open end in said first compartment adjacent the upper wall of said first compartment, and an open end in said third compartment adjacent an upper wall thereof; and a liquid within said system of sufficient volume that it will, upon inversion of the device, fill said first compartment and partially fill said second compartment and, upon reinversion of said device to its normally upright position, will flow from said second compartment through said second tube into said third compartment, displacing air from said third compartment into said first compartment through said third tube, displacing liquid from said first compartment through said first tube to cause a liquid jet to flow from said nozzle end into said second compartment, said second compartment being divided by a common wall into an upper chamber and a lower chamber, said first tube extending through said lower chamber into said upper chamber, a siphon tube positioned with an open end adjacent said common wall in said upper chamber and extending through said common wall, said open end of said second tube within said second compartment being adjacent the lower wall of said lower chamber, and a fourth tube having a lower open end within said lower chamber near said common wall and an

upper open end within said upper chamber near the upper end thereof.

2. A fountain device as recited in claim 1, wherein at least one compartment of one of said fluid systems is positioned between a pair of compartments of the other of said systems.

3. A fountain device as recited in claim 2, wherein said third compartment of one of said systems is positioned between the first and third compartments of the other of said systems.

4. A fountain device as recited in claim 1 wherein said systems contain fluids of contrasting colors.