

[54] **MODULAR SPACE TOY**

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[51] Int. Cl. **A63h 29/10**

[58] Field of Search 46/43, 241; 272/8 R, 8 N; 35/46 R; 273/119 R

[56] **References Cited**

UNITED STATES PATENTS

2,949,682	8/1960	Humbert.....	35/46 R
3,101,946	8/1963	Ebert.....	46/43
3,208,185	9/1965	Silvera.....	46/241
1,961,147	6/1934	Harris.....	273/119 R
3,464,700	9/1969	Clatterbuck.....	273/119 R
2,890,537	6/1959	Benko.....	35/46 R
3,273,282	9/1966	Berry.....	46/241

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[57] **ABSTRACT**

A modular bowl-shaped toy, preferably having straight or convexly flared sidewalls, with a ball for rolling circularly around the inside of the bowl module to simulate an orbiting spacecraft. The bowl module has an upward and inwardly turned rim forming a circumferential channel and, preferably, a substantially tangential passageway leading therefrom so that at high circumferential velocities the ball can enter the channel and escape from orbit through the passageway. Additional bowl modules of similar design can be connected by conduits to simulate both orbital and interplanetary space travel. A spring-biased launching device in the bottom of the bowl module may be used to propel the ball into a circular path around the inside of the bowl, and a movable barrier selectively prevents the ball from entering the tangential passageway.

17 Claims, 8 Drawing Figures

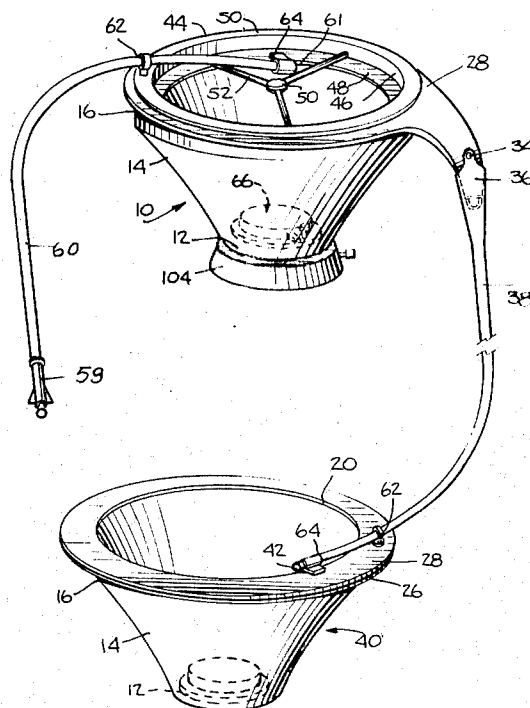


Fig. 1.

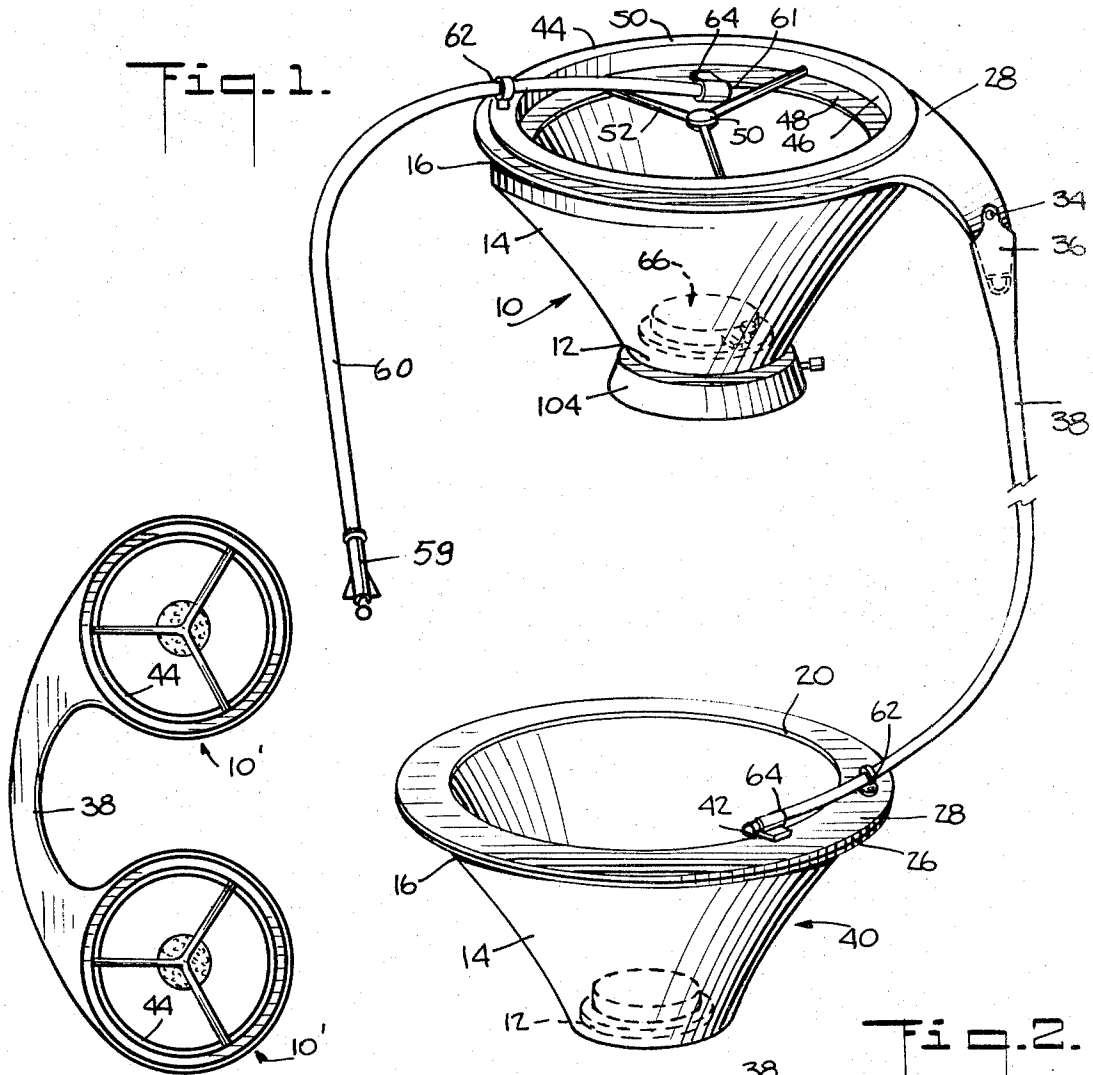


Fig. 3.

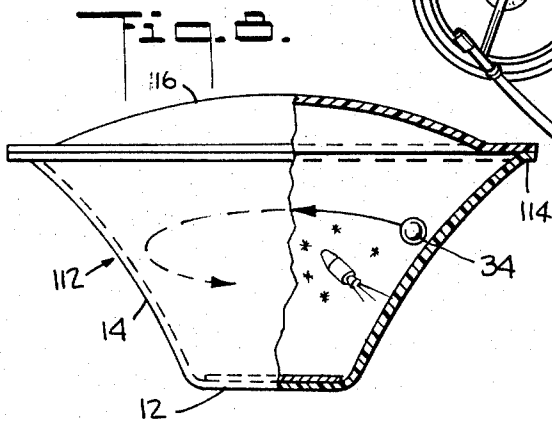


Fig. 4.

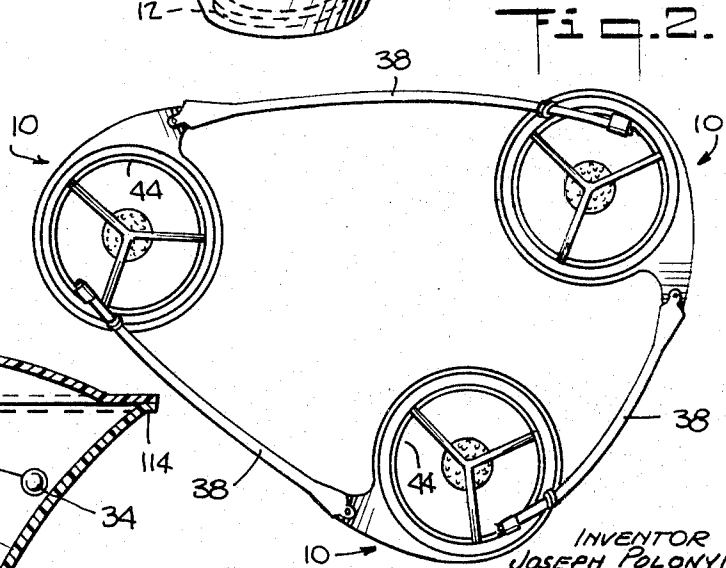


Fig. 2.

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FIG. 6.

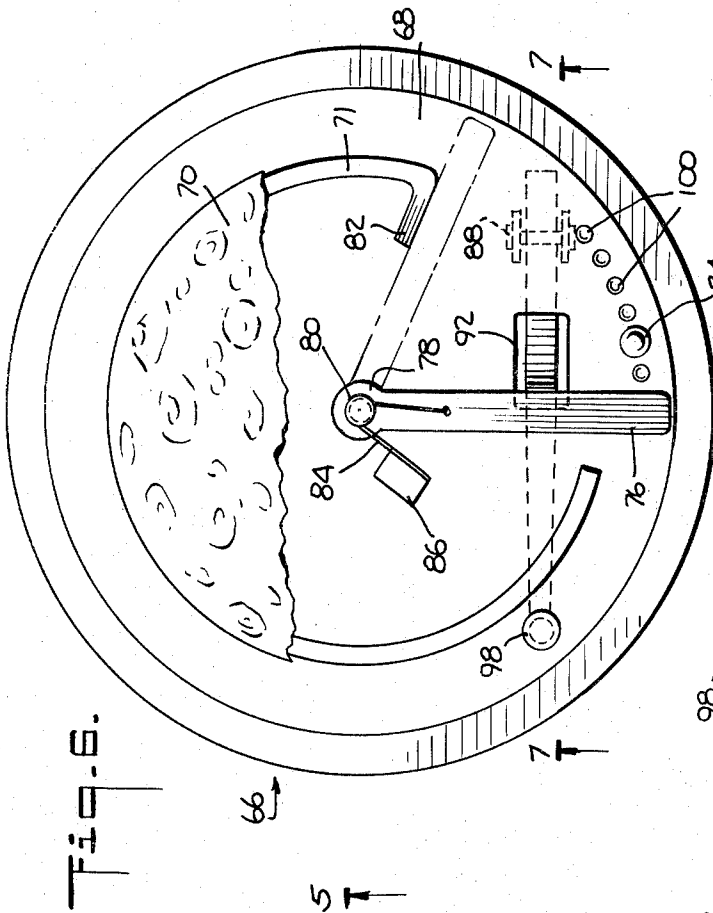


FIG. 4.

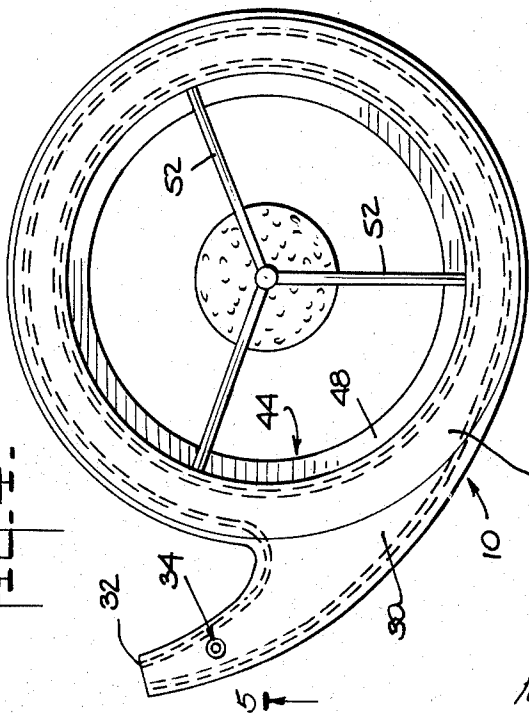


FIG. 5.

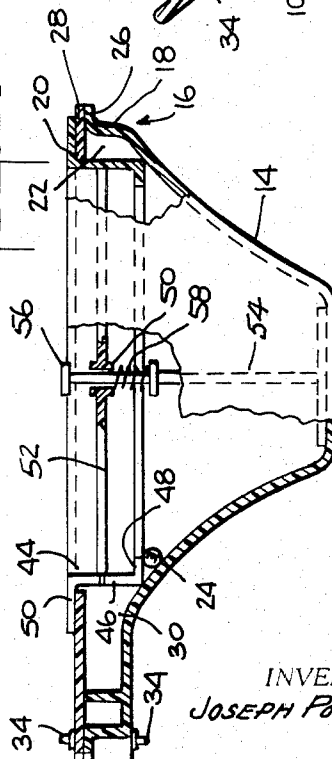
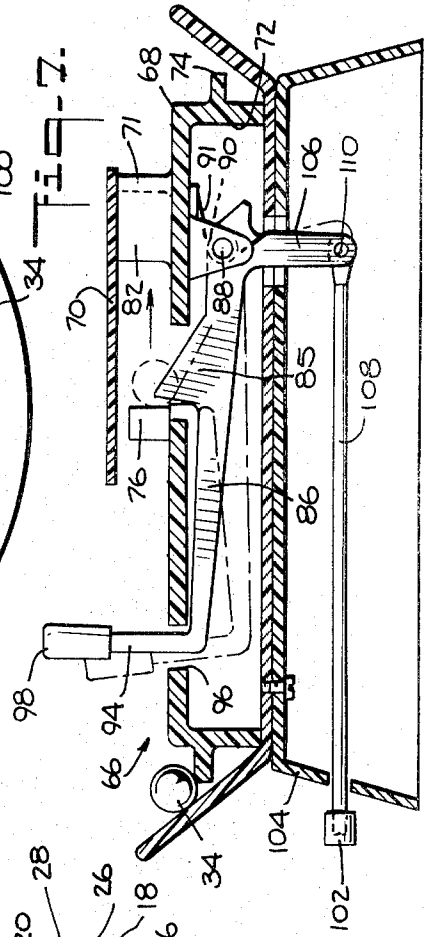


FIG. 7.



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MODULAR SPACE TOY

BACKGROUND OF THE INVENTION

The present invention is an improved educational toy of the type in which a ball is rolled around the inside of a bowl to simulate an orbiting spacecraft.

The basic form of such toys is simply a concave bowl, usually with a circular or hemispherical region at the center to simulate the earth, and a ball which can be placed in a rolling path around the inside of the bowl by giving the bowl a circular motion.

The prior art also includes various mechanical means for placing or propelling the ball into a rolling path around the inside of the bowl. Simplest of these is a ball projecting device, such as a "pop gun," which is merely aimed inside the bowl in a generally tangential direction. Alternatively, U.S. Pat. No. 2,949,682 to R. J. Humbert discloses a magnet slidably attached to a radial arm positioned adjacent the outer surface of a shallow, non-magnetic bowl. The radial arm is pivotally connected for rotation about the central axis of the bowl to sweep the magnet around the outside of the bowl. A magnetic ball placed inside the bowl opposite the magnet will then follow, by magnetic attraction, the circular path swept by the magnet. The radius of this path is, of course, determined by the radial location of the magnet on the radial arm.

As an alternate launching means, U.S. Pat. No. 3,208,185 to R. E. Silvera discloses a circular magnet mounted in the center of a shallow nonmagnetic bowl for rotation about the central axis of the bowl. If a steel ball is placed in the bowl against the magnet and the magnet rotated, as by a variable speed electric motor, the magnet will impart a spinning and rolling motion to the ball until it attains sufficient velocity to disengage from the magnet and shoot out into the bowl.

The above and other prior art devices use conventionally shaped concave bowls, that is, bowls in which the slope of the sidewall increases with distance from the center. This creates an incorrect simulation of orbital spaceflight because the circumferential velocity necessary to maintain an equilibrium path increases with the distance of the ball from the center. On the other hand, equilibrium velocity of an orbiting spacecraft decreases with increasing orbital radius.

Moreover, the devices of the prior art are limited to simulating satellite ascent, descent, and orbital flight in a single bowl and have no way of providing the additional play and educational value of simulated interplanetary flight. For this same reason they have limited play or game potential for more than one person.

SUMMARY OF THE INVENTION

The improved space toy of the present invention includes a bowl module having a circular, preferably flat, central region and sidewalls that extend outward and upward, preferably straight or convexly, to a rim that forms a circumferential ball-retaining channel. In a preferred embodiment, a tangential passageway opens into the circumferential channel so that a ball rolling circularly around the inside of the bowl with sufficient speed may spiral up into the channel and thence escape out the passageway. A similar bowl module may be coupled to the passageway by a conduit so that the ball will then enter the second bowl module to describe an orbital path to simulate interplanetary space travel. In

the same manner additional bowl modules may be coupled into the system to provide entertainment and instruction for any number of persons.

The invention also includes a unique spring-biased launching mechanism for selectively propelling a ball at various velocities from the center of a bowl module into an orbital or escape path. For added flexibility and control, movable barrier means can be selectively positioned to deflect the ball, if desired, from entering the circumferential channel at the bowl rim and thence escaping through the tangential passageway.

Accordingly, it is one object of the invention to provide an improved modular space toy for simulating both orbital and interplanetary space flight.

Another object of the invention is to provide a space toy that closely simulates the effects of gravitational forces on a spacecraft.

Another object of the invention is to provide a modular space toy that can be easily expanded with additional modules for increased variety of play and to accommodate a greater number of players.

Another object of the invention is to provide a simple and inexpensive launching device for a space toy of the type described.

Another object of the invention is to provide an inexpensive souvenir-type space toy that is safe for small children yet has high educational value for both children and adults.

Other objects and advantages of this invention will appear from the following description of the preferred embodiments and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the invention.

FIG. 2 is a plan view of an alternate arrangement of the bowl modules shown in FIG. 1.

FIG. 3 is a plan view of an alternate preferred embodiment of the invention.

FIG. 4 is a plan view of one of the bowl modules of FIG. 1.

FIG. 5 is a side view in partial section of the module of FIG. 4.

FIG. 6 is a plan view of a preferred embodiment of the launching device of the invention.

FIG. 7 is a side view of the launching device of FIG. 6 taken along the section line 7-7.

FIG. 8 is a side view in partial section of an alternate embodiment of the bowl module of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, 4 and 5, a bowl 10, designated an orbit support transfer module, has a circular region 12 at the center and sidewalls 14 extending outward and upward from region 12 to a rim 16. The bowl is made preferably of a transparent thermoplastic material such as polystyrene, but any other suitable material, including metal, can be used. Rim 16 preferably includes a short upward extending portion 18 and an inward lip 20 to form a circumferential channel 22 for receiving a rolling ball 24 to prevent the ball from flying out of the bowl at high velocities.

In the embodiment shown, rim 16 is manufactured in two pieces for ease of molding, with the upward ex-

tending portion 18 terminating in an outward extending flange 26 and a flat ring 28 of the same outer diameter as flange 26 secured thereto by any suitable means such as cement or screws. The inner diameter of ring 28 then forms the inward extending lip 20.

An important feature of the orbit support transfer module, bowl 10, is the substantially tangential passageway 30 opening into circumferential channel 22. In the version illustrated by FIGS. 1, 2, 4 and 5, passageway 30 is molded as an integral part of bowl 10, but it could be made separately and attached to bowl 10 by any suitable means, if desired.

Passageway 30 terminates at its outer end in opening 32. Pins 34 protruding from the top and bottom surfaces of passageway 30 adjacent opening 32 serve to couple one end 36 of flexible transfer conduit 38 to passageway 30. The other end 42 of transfer conduit 36 is led to the interior of a second bowl 40, designated an orbit support terminal module. The terminal module, bowl 40, is identical to the transfer module, bowl 10, except for the elimination of tangential passageway 30. Thus, once ball 34 has entered bowl 40, it is constrained to follow an orbital path around the inside of the bowl until frictional losses cause it to come to rest at the bottom of the bowl.

Another important feature of the invention is movable barrier 44 for selectively preventing rolling ball 34 from entering circumferential channel 22 and thence escaping through passageway 30. Barrier 44 is a ring like member having a Z-shaped cross section including an upstanding cylindrical portion 46, an annular lip 48 extending inward from the lower edge of portion 46, and an annular lip 50 extending outward from the upper edge of portion 46. Portion 46 fits loosely inside lip 20 of rim 16 and when in place is supported thereupon by annular lip 50. The lower edge of portion 46 then contacts sidewall 14 of bowl 10, with lip 48 forming an inward extending shelf to prevent ball 34 from entering channel 22 (as shown in FIG. 5) when barrier 44 is in place.

To facilitate removing and replacing barrier 44, it is equipped with a spider having a central hub 50 and spokes 52. Barrier 44 can be merely set in place and lifted out, or it can be permanently mounted in bowl 10 (FIG. 5), for example, by slidably mounting hub 50 on an upstanding shaft 54 fixed at its lower end to the bottom of the bowl. Stop 56 at the upper end of shaft 54 serves to retain barrier 44 to prevent its loss. If desired, the barrier can be biased against the stop 56, as by a spring 58 so that it normally does not impede passageway 30 unless forced down into the position shown by pressure on hub 50.

In operation, ball 34 is projected into an orbital path around the inside of bowl 10, either by holding the bowl and moving it in a circular motion or by throwing or injecting it into the bowl as with a conventional spring-loaded plunger 59 inserted in one end of a flexible inject hose 60 (FIG. 1). The other end 61 of inject hose 60 is led through support ring 62 to clamp 64, which is fixed to lip 48 of barrier 44 so as to position end 61 for injecting ball 34 into an orbital path below lip 48. A similar support ring 62 and clamp 64 support the end 42 of transfer conduit 38 in proper position for injecting ball 34 in the orbit support terminal module, bowl 40, as described above.

It will be appreciated that the orbit modules of the invention lend themselves easily to configurations other than that shown in FIG. 1. In FIG. 2, for example, three orbit support transfer modules are coupled together to form a closed loop interplanetary travel system. Such a system could alternatively contain two, four or even more transfer modules, depending on the number of persons playing. The arrangement of FIG. 2 is well suited to three players, each player controlling, by circular motion, the velocity of ball 34 in his bowl 10 and selectively positioning barrier 44 either to retain ball 34 in orbit or to permit it to escape into an interplanetary path through transfer conduit 38.

Still another possible arrangement is illustrated by FIG. 3, where two orbit support transfer modules, bowls 10', are molded from a single sheet of plastic with an integral transfer conduit 38' joining them. Since the two modules of this embodiment are molded as a rigid unit, they can be easily manipulated by one person to place a ball in a high speed orbiting path in one bowl, then to lift the barrier 44 and allow the ball to transfer through conduit 38' to the other bowl.

A preferred means for propelling ball 34 into an orbital path is launching device 66, as shown in the bottom of bowl 10 in FIG. 1 but suitable also for use in the arrangements of FIGS. 2 and 3.

Device 66 (shown in detail in FIGS. 6 and 7) comprises a flat circular platform 68 with a cover 70 mounted on cylindrical support 71 in spaced relation to platform 68. The cover may have a picture painted or pasted on it to simulate the earth, moon, or other planet for added realism. Platform 68 is supported above the bottom of bowl 10 by a short cylindrical section 72, preferably having a flange 74 extending outwardly therefrom to provide a shelf for ball 34 when it comes to rest.

The operating mechanism of launcher 66 includes a launching arm 76 pivotally mounted at one end 78 for rotation about a pin 80 located at the center of platform 68. Cylindrical support 71 is cut out for a portion of its circumference to provide a slot for rotation of launching arm 76. At one end of this slot a radial stop 82 is integrally attached to the wall of support 71 to absorb the impact of launching arm 76. A biasing means such as coil spring 84 also mounted on pin 80 with one end fixed to launching arm 76 and the other end braced against block 86 normally urges launching arm 76 against stop 82.

Launching arm 76 is cocked by rotating it against the force of spring 84 past a latching means such as stop 85 extending laterally from a releasing means such as lever 86. Lever 86 is pivotally mounted on pin 88 between lugs 90 extending downward from the under surface of platform 68 and is urged by spring 91 toward a position adjacent the bottom of platform 68 so that stop 85 extends through slot 92 in platform 68 in the way of the plane of rotation of launching arm 76.

One end 94 of lever 86 is turned up to extend through hole 96 in platform 68 and is capped with a knob 98. Finger pressure on knob 98 tends to pivot lever 76 against the force of spring 90 into the position shown by the dashed lines (FIG. 7), thereby withdrawing stop 85 into slot 92 and releasing launching arm 76 to swing around to stop 82. If a ball 34 has been placed in one of the series of depressions 100 positioned along

the path of rotation of launching arm 76 in the upper surface of platform 68, the launching arm will strike the ball and propel it into an orbital path around the inside of bowl 10. The series of depressions 100 comprises a means for varying the initial velocity of ball 34; the closer to the cocked position of launching arm 76 that ball 34 is initially placed, the higher will be its launch velocity when lever 86 is released.

In the preferred embodiment of FIGS. 1 and 7, lever 76 can be alternately released by finger pressure on a second knob 102 extending laterally from a module-supporting base 104. Knob 102 is connected to a downward extension 106 of lever 76 by a pushrod 108 pivotally attached to the lower end of extension 106 by pin 110; so that inward pressure on knob 102 tends to rotate lever 76 into its released position.

As mentioned above, an object of the present invention is to demonstrate the relation of gravitational force to distance from a planet by appropriately shaping the sidewalls of the bowl module. Referring to FIG. 8, a simple device for demonstrating this feature is provided in a small souvenir-type toy which is also suitable for very young children. This embodiment comprises a small transparent plastic bowl 112 having a flat circular region 12 in the center to simulate a planet and sidewalls 14 extending outward and convexly upward to a rim 114, where the term, convexly upward, defines sidewalls whose slope decreases with increasing distance from the center. A ball 34 is placed inside the bowl, and then a domed transparent plastic cover 116 is permanently cemented on the top of the bowl so that the ball cannot get lost or swallowed by small children.

The toy of FIG. 8 is operated by giving the bowl a circular motion to get the ball rolling in a circular orbit around the center region. To heighten realism, a flat circular disk painted or covered with a decal to resemble the earth or some other planet can be cemented to the bottom of the bowl, and decals of space ships, satellites and asteroids can be pasted to the outside of the bowl.

As explained above, the sidewalls of the bowl modules of the invention are preferably flared convexly outward to simulate the variation of the gravitational field with distance. Since the field within a few hundred miles of a planet is substantially constant, the sidewalls could be straight (i.e. conical) if it is desired to merely simulate the region of space immediately adjacent the planet. Or the walls can be a combination of conical and convex sections.

The ball 34 may be made of metal, glass, plastic, or any other suitable material. If made of clear plastic, the ball may have a model spacecraft imbedded inside for added realism and play value.

From the above description it is apparent that the orbit support transfer modules of the present invention provide a toy of great flexibility with both instructional and play value. Possible combinations of modules and games that can be played are limited only by the imagination of the players. More than one ball can be used, for example, for space races, or balls of different sizes can be used to simulate spacecraft of various sizes. Accordingly, the invention is not limited to the foregoing description of the preferred embodiments but is defined by the following claims.

I claim:

1. In a toy of the type including a bowl having a planet-simulating region at its center and a ball for rolling circularly around the inside of the bowl to simulate a spacecraft orbiting the planet, the improvement wherein:

the bowl comprises a circular base defining the central planet-simulating region and sidewalls extending outward and convexly upward from the base, whereby the centripetal reaction force exerted by the sidewalls upon the circularly rolling ball diminishes with increasing radius of the circular path to simulate the relation between gravitational force and orbital radius of an actual spacecraft.

2. The toy of claim 1 comprising a transparent cover permanently attached to the bowl for preventing loss of the ball.

3. In a toy of the type including a bowl having a planet-simulating region at its center and a ball for rolling circularly around the inside of the bowl to simulate a spacecraft orbiting the planet, the improvement wherein:

the bowl has a rim comprising an upward and inward extending circumferential channel formed with a substantially tangential passageway leading therefrom for preventing escape of the ball when rolling at high circumferential velocities except through said passageway.

4. The toy of claim 3 comprising a movable barrier for selectively preventing the rolling ball from entering the tangential passageway.

5. The toy of claim 4 wherein the bowl comprises: a circular base defining the central planet-simulating region and sidewalls extending conically outward and upward from the base to the rim.

6. The toy of claim 4 wherein the bowl comprises: a circular base defining the central planet-simulating region and sidewalls extending outward and convexly upward from the base.

7. The toy of claim 4 wherein the movable barrier comprises:

an upstanding cylindrical portion adapted for slidably fitting within the opening of the inward extending portion of the rim whereby the rolling ball is prevented from entering the circumferential channel and thence escaping through the tangential passageway when the cylindrical portion of the barrier is positioned within the opening of the rim.

8. The toy of claim 7 wherein the movable barrier comprises:

a spider having a central hub and radial members extending therefrom to connect the hub to the cylindrical portion of the barrier, whereby the barrier can be selectively positioned in the way of or clear of the circumferential channel by respectively lowering or raising the hub.

9. The toy of claim 4 comprising a launching device for propelling the ball into an orbital path around the inside of the bowl.

10. The toy of claim 9 wherein the launching device comprises:

a launching arm pivotally mounted for rotation about one end, the axis of rotation coinciding with the central axis of the bowl;

biasing means for urging the launching arm in one rotational direction;

latching means for releasably holding the launching arm from rotation by the biasing means; and

finger-operated means for releasing the latching means after the ball has been placed in the path of rotation of the launching arm at the bottom of the bowl, whereby the released launching arm will rotate under the influence of the biasing means and strike the ball to propel it into an orbital path around the inside of the bowl.

11. The toy of claim 10 wherein: the finger-operated releasing means comprises a pivotally mounted lever spring biased toward a position adjacent the plane of rotation of the arm, and

the latching means comprises a stop extending laterally from the lever in the way of the launching arm when the lever is in said position.

12. The toy of claim 11 wherein the launching device comprises: means for selectively varying the launch velocity imparted to the ball by the launching arm.

13. The toy of claim 12 wherein the launch velocity varying means comprises: a series of depressions in the bottom of the launching device positioning the ball along the path of rotation of the launching arm.

14. The toy of claim 4 comprising means for injecting the ball into an orbital path around the inside of the bowl, said inject means including:

a tube having an inside diameter larger than the diameter of the ball, one end of said tube being clamped to said barrier in position for injecting the ball into an orbital path inside the bowl, and

a releasable spring-loaded plunger inserted in the other end of the tube for impelling the ball through the tube for injection into said orbital path.

15. The toy of claim 7 wherein the movable barrier further comprises an annular lip extending inward from the lower edge of the cylindrical portion.

16. A toy for simulating orbital and interplanetary space flight comprising:

first and second bowls, each bowl including a circular planet-simulating base region, upward and outward extending sidewalls, a rim with an inward extending lip to form a circumferential channel around the top of the bowl, and a passageway opening into the circumferential channel and extending substantially tangentially therefrom;

a transfer conduit joining the tangential passageways of the first and second bowls; and

a ball for selectively rolling either circularly around the inside of one of the bowls to simulate orbital space flight or into the circumferential channel and thence escaping through the tangential passageway and transfer conduit to the other bowl to simulate interplanetary space flight.

17. The toy of claim 16 comprising a movable barrier in the one bowl for selectively preventing the rolling ball from entering the tangential passageway.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,686,789 Dated August 29, 1972

Inventor(s) Joseph Polonyi

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract, line 4, change "bowel" to -- bowl --
Col. 7, line 27, after "device" insert -- for -- .

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents