

Fig. 1,

Fig. 2,

Fig. 3,

Fig. 4A,

Fig. 4,

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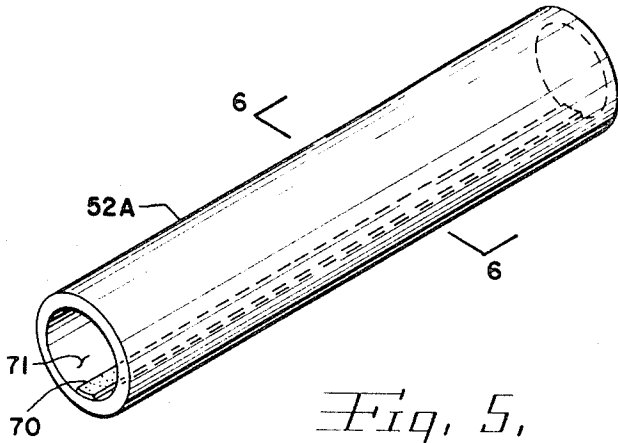


Fig. 5,

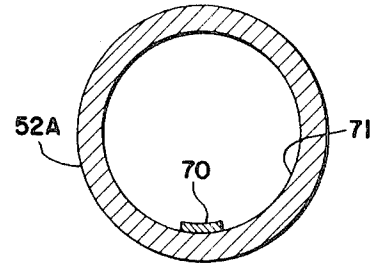


Fig. 6,

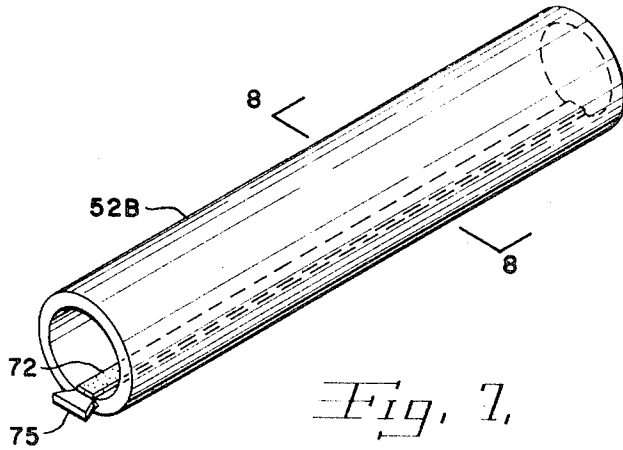


Fig. 7,

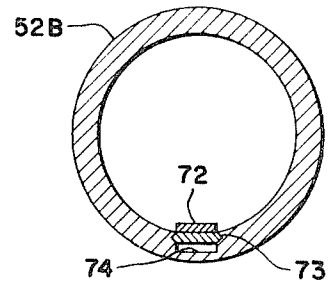


Fig. 8,

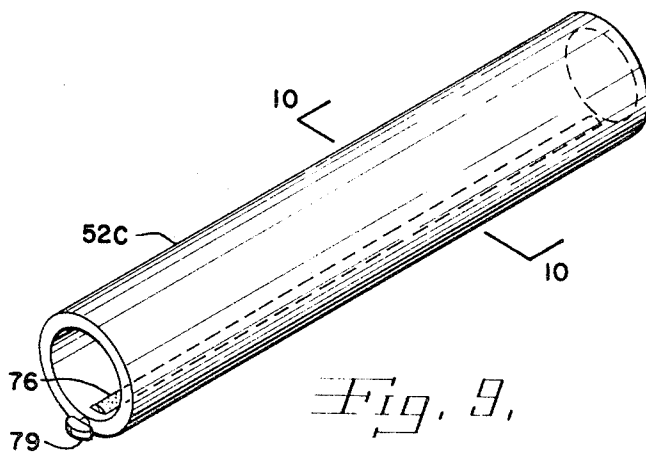


Fig. 9,

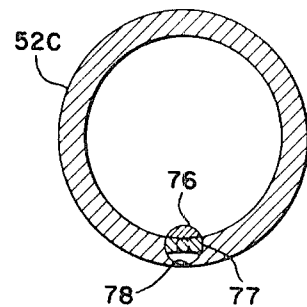


Fig. 10,

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AUTOMATIC BALL THROWER

BACKGROUND OF THE INVENTION

With the confinement and sophistication of modern life, children require toys of greater intellectual and physical play value. The toy of this invention provides amusement for children of both active and passive natures who may physically "play" with the ball-throwing device by catching balls or who may watch fascinated for hours as the device shoots balls with unerring accuracy at exactly timed intervals at a target or into a container.

SUMMARY OF THE INVENTION

A pneumatic ball-throwing device for use with a blower has a barrel connected to the blower through which balls are blown. An automatic air operated release mechanism holds each ball in the barrel for a desired time interval before releasing it. The release mechanism has a stop extending into the barrel and being fixed to a bellows. The bellows contains an adjustable air bleed valve and an air entrance flap valve so that force exerted by a ball on the stop causes air to escape from the bellows through the bleed valve to release a ball whereupon the stop reenters the barrel to check the next ball as air freely fills the bellows through the flap valve therein.

Balls from a tubular magazine are introduced into the barrel through a breech having a large ball-admitting flap valve associated with it. Suction developed in the breech on the launching of a ball draws another ball through the ball-admitting flap valve and the breech to be arrested by the stop in the barrel. Air pressure in the breech then closes the ball admitting flap valve to prevent air from blowing into the magazine. A friction strip may be placed in one side of the barrel to impart a spin to launched balls.

The toy of this invention can be used as an action toy to involve a child physically for hours catching thrown balls. In addition, it is fascinating to passively watch its automatic operation as it shoots balls at preset timed intervals. By placing a target or container a distance away, the toy can be used as a cannon to shoot balls at the target or into the container. If a friction strip is placed in one side of the barrel, a spin can be imparted to the balls so that they can be shot accurately around a corner to hit a target.

The device of this invention, despite its complex function, is relatively inexpensive to manufacture and is simple in its construction. It may be used with its own blower, or it may be used with the blower outlet of any vacuum cleaner.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal vertical section taken on line 1-1 of FIG. 2 through a fragment of the front of the magazine of the device of this invention and through a hopper attached thereto;

FIG. 2 is a perspective view of a complete pneumatic ball-throwing device according to my invention;

FIG. 3 is a vertical section taken on line 3-3 of FIG. 2;

FIG. 4 is a longitudinal section taken on line 4-4 of FIG. 2;

FIG. 4A is a vertical section taken on line 4A-4A of FIG. 4; FIGS. 5, 7 and 9 are perspective views of modified barrels used to impart a spin to launched balls; and

FIGS. 6, 8 and 10 are transverse sections taken, respectively, on lines 6-6, 8-8 and 10-10 of FIGS. 5, 7, and 9.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-4, the device of this invention has a base 20 with a rearwardly disposed retaining collar 21 and elevation stop ridges 22-28. The ball-throwing device, generally designated by the reference numeral 30, has an air inlet tube 31 with an end 32 adapted to be attached to a blower (not shown). The blower may be the pressure side of a vacuum cleaner or it may be a separate inexpensive electric motor-driven centrifugal blower. Collar 21 rotatably secures

tube 31 within it to mount device 30 on base 20. Limit stops 33 restrict the upward elevation of device 30 on base 20.

A 90° bend 34 in air inlet tube 31 conducts air into breech 35 which is shown to be rectangular but which may be modified in its shape. A ball magazine tube 36 leads through its offset portion 37 to one side of breech 35. A structural member 38 joins magazine 36 to the air delivery tube 31 to render device 30 rigid and aesthetically pleasing. A barrel support sleeve 39 extends forward from breech 35 and has the ball release mechanism 40 mounted thereon. A front brace 41 extends between magazine 36 and the enlarged forward portion 42 of barrel sleeve 39. A front support 44 is pivotally connected about brace 41 by a sleeve 45. The lower end of support 44 engages one of the elevation stop ridges 22-28 to hold device 30 at a desired elevation.

As may be seen in FIGS. 1 and 2, a conical hopper 47 is pivotally mounted on the front of magazine 36 by means of a lateral mounting 49 surrounded by a housing 50. Hopper 47 contains a spiral spring 54 which winds upward from lower opening 48 to support a stop 81 above lower opening 48 of the hopper 47. Housing 50 has a lower portion to which rod 51 is connected. The rear end of rod 51 is connected to support 44 so that, as the elevation of device 30 is changed, hopper 47 remains substantially level. A barrel 52 is inserted in front portion 42 of the barrel mounting sleeve 39.

The automatic operation of the device 30, which launches balls at desired intervals, will now be described with reference to FIGS. 1-4. Balls 53 are loaded into hopper 47 which is best formed from transparent plastic so that the flow of balls 53 into magazine 36 may be observed. Spiral spring 54 and stop 81 have two functions. Hemisphere 55 causes balls introduced into hopper 47 to roll down the convolutions of decreasing diameter of spring 54. The cylindrical portion 56 of stop 81 urges downward rolling balls outward against the walls of hopper 47. The balls 53 are kept aligned in a single file by the cone 57 which tapers at the same angle as hopper 47. Thus, the balls 53 must enter one at a time without jamming into the lower opening 48. Stop 81 also may serve to stop a ball 53 blown from magazine 36 so that it will not fly clear of hopper 47.

As shown in FIG. 4, air from the blower rushes through air inlet tube 31 through a smaller diameter sleeve 63, through breech 35, and out barrel 52. Within breech 35 is a fixed baffle 58 which extends at an angle between offset portion 37 and the bend 34 to interrupt the flow of air through breech 35 into barrel 52. This baffle 58 causes a slight suction in magazine 36 to draw balls 53 towards and into breech 35. The first ball 53 starts to enter barrel support sleeve 39 and is stopped by release 40 as shown in FIG. 3.

The ball 53 arrested by stop 59 of release 40 in barrel support sleeve 39 prevents air from blowing through barrel 52 so that the air starts to blow into portion 37 of magazine 36. This air flow carries the ball 53 next to the arrested ball 53 back into portion 37 of magazine 36 and closes the flap valve 60 which is hinged within breech 35 to swing from behind fixed baffle 58 to cover the entrance of section 37 into breech 35. The smaller diameter sleeve 63 increases the vacuum in breech 35 when barrel 52 does not have a ball arrested in it. This increased vacuum more easily opens flap valve 60 and draws a ball 53 from magazine 36. Padding 69 cushions the opening of flap valve 60 and holds it away from baffle 58 so pressure in breech 35 may more easily close it. Flap valve 60 has a gasket 80 on its face to form a tight closure over the entrance to magazine 36. The closing of the ball entrance flap valve 60 prevents any further flow of air into a magazine 36.

As shown in FIGS. 4 and 4A, air blown into portion 37 of magazine 36 before the closing of flap valve 60 passes an open port 61 covered by a thin split ring 62. Ring 62 acts as a flap valve to relieve pressure blown into magazine 36. Ring 62 closes port 61 to allow suction to draw balls down magazine 36 at the start of each cycle.

Referring now to FIGS. 2 and 3, air pressure urges a ball 53 against a stop 59 of release 40. Stop 59 has a curved lower

portion extending into barrel support sleeve 39 so that pressure exerted by an arrested ball 53 tends to force stop 59 upward. Stop 59 has its upper end fixed to a bellows 64 disposed in a chamber 65. A flap valve 66 under a port closes chamber 65 and holds air in bellows 64. An air bleed valve 67 has a threaded shaft and a control knob 68 fixed thereto so that rotation of knob 68 may back out the threaded shaft to expose a larger tapered air bleed channel formed therein. Any other simple form of air bleed valve may be used.

The arrested ball 53 forces stop 59 upward as air escapes from bellows 64 through bleed valve 67. After a desired period of time adjusted according to the setting of air bleed valve 67, the arrested ball 53 passes stop 59 and is blown from barrel 52. Bellows 64, which is preferably of a resilient material, springs downward thrusting stop 59 rapidly into barrel support sleeve 39. Flap valve 66 freely admits air into bellows 64 but closes to prevent its escape. Air rushing from barrel 52 through breech 35 opens valve 60 to admit another ball 53 to pass through breech 35 and be arrested in barrel support sleeve 39 by stop 59. In this manner the ball launching cycle of the device 30 continues at times intervals.

It is to be noted that barrel sleeve 42 contains two openings 46 and 43 at its rearmost end. If barrel 52 is pulled forward, these openings 46 and 43 may be uncovered to a desired extent. The more these openings 46 and 43 are uncovered, the greater the amount of air which will escape through them to decrease the velocity of balls 53 launched through barrel 52.

FIGS. 5-10 show three modified barrels 52A, 52B, and 52C. Barrel 52A has a strip 70 of resilient, high friction material fixed along its bore 71. This strip 70 holds one side of a ball 53 being blown down barrel 52A to impart a spin to the ball. If ping-pong balls 53 are used, rotation of barrel 52A in barrel support sleeve 39 will cause thrown balls 53 to curve in any desired direction. The use of ping-pong balls 53 of different weights will cause them to curve to different degrees so that a mixture of balls of different weights will keep a ball catcher jumping.

Barrel 52B has a strip 72 glued on a slide 73 disposed in a longitudinal groove 74. Slide 73 has a handle 75. Slide 73 may be removed from groove 74 and reinserted in an inverted position to inactivate strip 72. Barrel 52C has a strip 76 glued on a longitudinal rotor 77 disposed in a circular channel 78. Rotor 77 may be rotated by handle 79 to inactivate strip 76. Strips 70, 72 and 76 may be of sponge rubber.

Adjustment of knob 68 enables release 40 to be set so that balls 53 may be thrown at any desired interval. Rotation of the barrels 52A, 52B, or 52C in the barrel support sleeve 39 enables device 30 to launch balls 53 to curve in any direction. Thus it may be seen that this invention may be used for a wide variety of games which involve shooting a series of balls at a desired destination or catching or batting balls launched at a player.

While this invention has been shown and described in the best form known, it will nevertheless be understood that this is purely exemplary and that modifications may be made in the construction, combination, and arrangement of parts without departing from the spirit and scope of the invention except as it may be more limited in the appended claims wherein I claim:

1. A pneumatic ball-throwing device for use with a blower or like source of air pressure, said ball-throwing device comprising, in combination, a blower, a magazine containing balls to be thrown, a barrel connected to said blower, means in-

roducing balls from said magazine into said barrel to be blown therefrom, a release having a stop extending into said barrel arresting each ball for a time interval, said stop of said release being urged outward from said barrel by each arrested ball, said release having a bellows and an air bleed valve communicating with said bellows, said stop being connected to said bellows, air escaping from said bellows through said air bleed valve allowing each arrested ball to move said stop outward in said barrel until each arrested ball is released to be blown from said barrel.

2. The combination according to claim 1 wherein said release has an air inlet flap valve in said bellows to rapidly admit air into said bellows after release of each arrested ball.

3. The combination according to claim 2 wherein said means introducing balls from said magazine into said barrel comprises a breech through which air blows from said blower to said barrel, said magazine communicating with said breech so that air blowing through said breech into said barrel draws balls from said magazine through said breech into said barrel, and with the addition of means preventing air blowing from said breech into said magazine.

4. The combination according to claim 3 wherein said breech contains a baffle entering at an angle the flow of air through said breech from said blower to said barrel, said magazine entering said breech behind said baffle.

5. The combination according to claim 4 wherein said magazine is tubular and wherein said means preventing air blowing from said breech into said magazine is a ball entrance flap valve within said breech hinged to close over said magazine and open behind said baffle.

6. The combination according to claim 5 wherein said magazine contains a port adjacent to said breech and with the addition of valve means associated with said port allowing air to escape from said port and preventing air from entering said port.

7. The combination according to claim 5 with the addition of a conical ball hopper attached to the end of said magazine, said hopper having a lower opening communicating with said magazine, a spiral spring winding upward in spirals of increasing radius from said lower opening, and a stop disposed over said lower opening, said stop being suspended from an inward extending upper coil of said spiral spring.

8. The combination according to claim 7 wherein said magazine and said barrel are parallel and side-by-side, and with the addition of a base, a collar disposed at the rear of said base, an air inlet tube pivotally passing through said collar, a 90° bend connecting said air inlet tube to said breech and thereby to said barrel and said magazine, and means securing said ball throwing device at a desired elevation on said base.

9. The combination according to claim 8 with the addition of a front brace extending horizontally between said barrel and said magazine and with the addition of transverse stop ridges on said base, said means securing said device at a desired elevation comprising a front support pivotally connected to said front brace to be selectively lodged against one of said stop ridges.

10. The combination according to claim 9 wherein said hopper is pivotally attached to said magazine and has a lower extension, and with the addition of a link extending from said lower extension of said hopper to said front support maintaining said hopper in a horizontal position as elevation of said ball throwing device is changed.