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PATENT SPECIFICATION

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(54) BALL PROJECTING AND CATCHING DEVICE

(71) We, DART INDUSTRIES INC, a Corporation organised and existing under the laws of the State of Delaware, United States of America, of 8480 Beverly Boulevard, Los Angeles, State of California, 90054 United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a toy construction and more particularly to a construction adapted for the projection and reception of spherical or similarly shaped projectiles.

Although various ball projecting devices have long been known there has been little or no emphasis placed on constructing an arrangement capable of accurately and forcefully ejecting a spherical projectile. Several of the prior art devices, for example, employ mechanical striking mechanisms to project a ball from a shell in which it is subsequently caught, retained and seated ready for projection again. This means of projection obviously gives little or no guidance to the ball as it is projected, and its pattern of flight and velocity will be erratic and unpredictable. Likewise, several early ball throwers employed fluid (air) propulsion means but these were also not constructed in a fashion enabling control of the flight of the projectile to be achieved along with maximum use of the fluid stream developed by the propulsion mechanism.

According to the present invention there is provided a toy construction adapted for the projection and reception of projectiles which comprises a collapsible pressure-producing propellent device having a restricted fluid outlet and a receptacle affixed to the outlet end of said propellent device, which receptacle includes means which is adapted to receive a projectile in close association therewith and is conical in shape, there being an outwardly-flaring extension emanating from the outlet of said means which terminates with an opening of a substantially larger cross-sectional area than the outlet of said means.

The present ball projecting and catching toy employs a collapsible propelling mechanism that is affixed to a receptacle and chamber combination wherein the ball or projectile is received and seated ready for projection therefrom. The chamber portion of this combination is shaped in the form of a doubly-divergent cone having a first tapered section that functions as a seat for the ball and effectively channels the propellant air against its underside and, integral with and above this first section, a second tapered section the cone angle of which is less than that of the first section. The reduced angle in the second section assures the maintenance of a close association between the ball and chamber thereby guiding the ball as it is impelled therefrom by expanding the air propellent.

It is an object of the invention to produce a ball receptor and projection device that, with a minimum of moving parts, is capable of accurately propelling a ball at relatively high velocities. Similarly, the construction of the device is intended to be of such a character as to enable the efficient production thereof and to enable the use, as the projectile, of any of the numerous makes of table tennis balls which are commercially available.

In one embodiment of the invention there is provided a toy construction adapted for the projection and reception of a spherical projectile which comprises means to propel the projectile therefrom, said means including a reservoir for containing a propelling medium, and a combined receptacle and chamber attached to said means in such manner that the propelling medium expelled from said means when the toy construction is in use is forced therethrough, which chamber includes first and second imperforate conical sections both of which sections taper outwardly toward the distal end thereof, the cone angle of the first section being greater than the cone angle of the second section.

The invention will now be further described and illustrated with reference to the accompanying drawings, in which:—

Figure 1 is an exploded perspective view of the ball projecting and catching device of this invention;

Figure 2 is a side elevational view, partly in section, of the assembled device; and

Figure 3 is an enlarged cross-sectional view of the combined receptacle and chamber of the toy taken along line 3—3 of Figure 2.

The toy construction shown in Figure 1 is generally indicated by the reference numeral *10* and includes a collapsible pressure-producing propellent device or element *12*, a combined receptacle and chamber *14*, and a spherical or similarly shaped projectile or ball *16*.

The propellent device or element *12*, as indicated, is a collapsible bellows type element which, in effect, is an integrally formed hollow enclosure including a pleated or corrugated outer wall *18*, a hemispherical bottom wall *20*, and a restricted fluid outlet *22*. As is evident, the pleated side or outer wall construction 18 enables such wall to collapse upon itself under the influence of pressure applied to the bottom of the toy as indicated by arrows (P) in Figure 2. The collapse of outer wall *18* generates a fluid (air) flow through the reduced or restricted exit end 22 which, of course, is intended to be and is directed against ball 16 in the combined receptacle and chamber 14.

Reduced outlet 22 also incorporates a threaded portion *24* which readily enables the interconnection between propellent device 12 and the combined receptacle and chamber 14. Note also from Figure 2 that the bottom wall 26 of the device is preferably hemispherically shaped. Such shaping ensures that applied pressures directed in other than an axial manner will be effectively transferred to the intended end, i.e. collapsing the bellows side wall. It should be appreciated nonetheless that other propulsive mechanisms, as well as those of different shapes, may be used in combination with the receptacle and chamber combination 14 which combination is more fully described hereinafter.

The volumetric capacity of device 12 may, of course, vary and its size will be determined by the pneumatic pressure that is required to propel projectile 16 at a preselected velocity. As will also be appreciated, device 12 is preferably blow-molded of polyethylene or some similar thermoplastic material so that the thickness of the corrugated wall 18 is less than that of the wall in other areas thereof. This produces greater flexibility so that the pleats or corrugation offer a minimum of resistance to collapse yet maintain sufficient resiliency to ensure their return to the normal extended position when pressure (P) is released.

The receptacle and chamber combination 14, as can be seen from Figure 2, is affixed to propellent device 12. To accommodate this, the proximal end *30* of chamber means *32* is threaded as at *34* (see Figure 3) to receive the threaded portion 24 of outlet 22.

Chamber 32 is conically shaped in a doubly-divergent outward fashion and is composed of a first conical section *36* and a second conical section *38*. These sections, 36 and 38, receive the projectile or ball 16 and are particularly constructed to ensure that the projectile 16 remains in close association therewith even as it is propelled therethrough by a fluid (air) stream. Thus, first section 36 is designed to act as a seating member for the projectile 16 and to effectively direct the propellent air against the underside thereof. To this end it is important that the length (L_1) of the first section and its distal diameter (D) approximate to the diameter of spherical projectile 16. Similarly, it is desirable to incorporate therein an outwardly directed cone angle (A) of between 5.0 and 10.0 degrees, preferably between 7 and 9 degrees, extending from the proximal end 30 to the distal end *40*.

The second conical section 38 is an extension of the first section and its proximal end coincides with first section distal end 30. It should also be noted that the cone angle (B) of this second section is substantially less than that of the first section. A preferred angle is between 1.0 and 3.0 degrees but this may be as much as 4.0 degrees under certain circumstances. Furthermore, in order to control and accurately eject the projectile, it is necessary to have a second section chamber length (L_2) of from 1.25 to 3.25 times the projectile diameter, preferably from 1.75 to 2.25 times that diameter.

The above referred to chamber dimensions result in the fluid stream generated by propellent device 12 being directed against the ball 16 and in the maintenance of the effective force of the fluid stream so that maximum velocity and accuracy of projection is obtained.

Integral with the chamber 32 is an outwardly flaring perforate basket-like extension 42. Extension 42 emanates from the distal end *44* of the second section 38 of chamber 32 and is preferably composed of a plurality of ribs *46* that are spaced at their widest point of separation so as to retain the projectile 16 in the basket-like interior formed thereby. As shown in the drawings,

these ribs 46 flare outwardly to generate an opening *48* of substantially larger cross-sectional area than the maximum cross-sectional area of the chamber 32. This facilitates the catching or receiving of a projectile 16 either as it is thrown to or projected by another player, or as it may return to a sole player either by ricochet or as a result of gravity.

It is also preferred that the outer rib extremities be supported by a peripherally extending rim *50* which may form an integral part thereof. These various parts of the combined receptacle and chamber 14 are preferably integrally molded from polyethylene or a similar material but may also, of course, be made separately and assembled in the final form described. Likewise, it is anticipated that the basket-like extension 42 may take various shapes and forms without affecting the satisfactory utilization of the toy construction of this invention.

WHAT WE CLAIM IS:—

1. A toy construction adapted for the projection and reception of projectiles which comprises a collapsible pressure-producing propellent device having a restricted fluid outlet and a receptacle affixed to the outlet end of said propellent device, which receptacle includes means which is adapted to receive a projectile in close association therewith and is conical in shape, there being an outwardly-flaring extension emanating from the outlet of said means which terminates with an opening of a substantially larger cross-sectional area than the outlet of said means.

2. A toy construction as claimed in claim 1, wherein the outwardly-flaring extension is perforate and basket-like.

3. A toy construction as claimed in claim 1 or claim 2, wherein the receptacle is removably affixed to the propellent device and the extension includes a plurality or ribs supported at their outer extremities by an integral peripheral rim.

4. A toy construction as claimed in any one of claims 1 to 3, wherein the propellent device is a hollow enclosure having a pleated outer wall that is adapted to collapse upon itself under the influence of pressure applied to the bottom of the device so as to displace fluid therefrom through the outlet and into said means.

5. A toy construction as claimed in any one of the preceding claims, wherein said means includes a first open-ended frusto-conical section having a length and a distal end diameter approximately equal to the diameter of a spherical projectile intended for projection therefrom when the toy construction is in use and a second open-ended frusto-conical section integral with the first section and extending therefrom for a distance of from 1.25 to 3.25 times the diameter of the projectile.

6. A toy construction as claimed in claim 5, wherein the second section uniformly tapers outwardly from its proximal to its distal end at an angle of between 1.0 and 4.0 degrees.

7. A toy construction as claimed in claim 5 or claim 6, wherein the first section uniformly tapers outwardly from its proximal to its distal end at an angle of between 5.0 and 10 degrees.

8. A toy construction adapted for the projection and reception of a spherical projectile which comprises means to propel the projectile therefrom, said means including a reservoir for containing a propelling medium, and a combined receptacle and chamber attached to said means in such manner that the propelling medium expelled from said means when the toy construction is in use is forced therethrough, which chamber includes first and second imperforate conical sections both of which sections taper outwardly toward the distal end thereof, the cone angle of the first section being greater than the cone angle of the second section.

9. A toy construction as claimed in claim 8, wherein the cone angle of the first section is between 5.0 and 10.0 degrees and the cone angle of the second section is between 1.0 and 4.0 degrees.

10. A toy construction substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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4. A toy construction as claimed in any one of claims 1 to 3, wherein the propellent device is a hollow enclosure having a pleated outer wall that is adapted to collapse upon itself under the influence of pressure applied to the bottom of the device so as to displace fluid therefrom through the outlet and into said means.

5. A toy construction as claimed in any one of the preceding claims, wherein said means includes a first open-ended frusto-conical section having a length and a distal end diameter approximately equal to the diameter of a spherical projectile intended for projection therefrom when the toy construction is in use and a second open-ended frusto-conical section integral with the first section and extending therefrom for a distance of from 1.25 to 3.25 times the diameter of the projectile.

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