June 2, 1970 A. R. BAGINSKI ET AL 3,515,112

PROJECTILE FIRING GUN TOY

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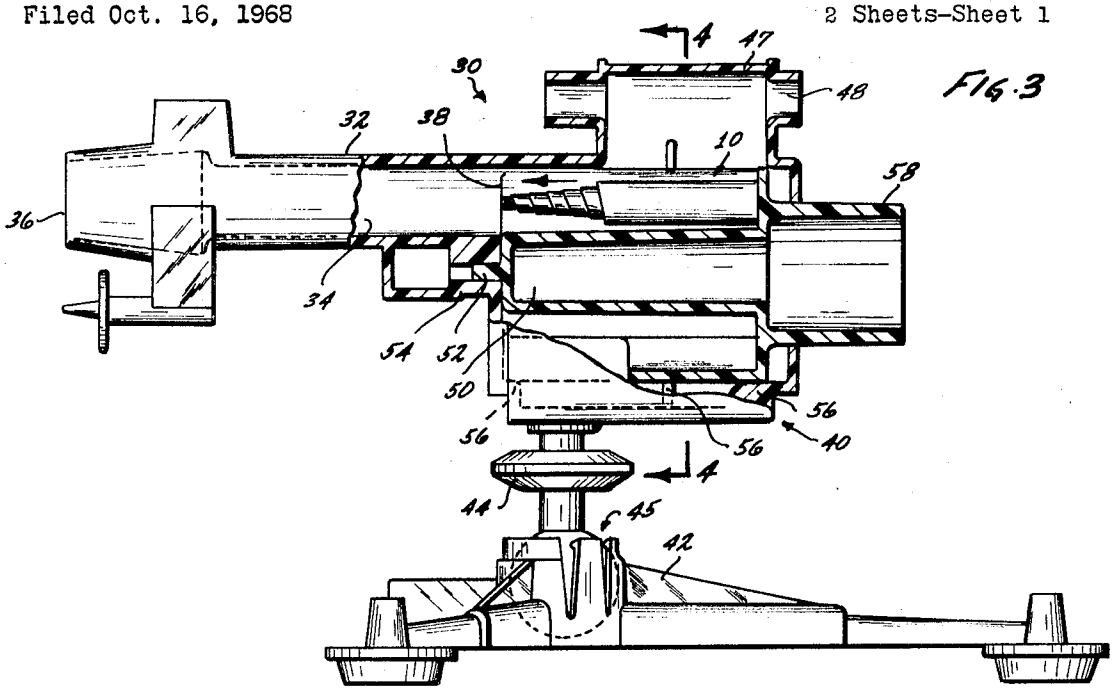

FIG. 3

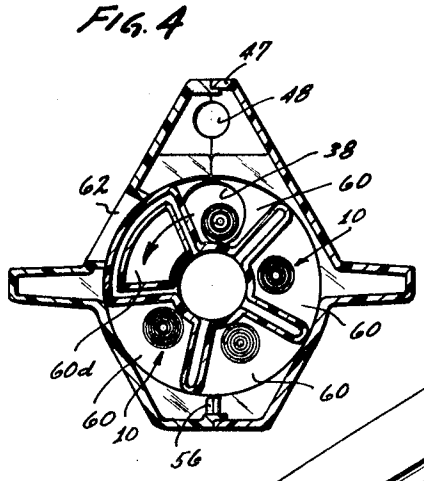

FIG. 4

FIG. 1

FIG. 2

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FIG. 5

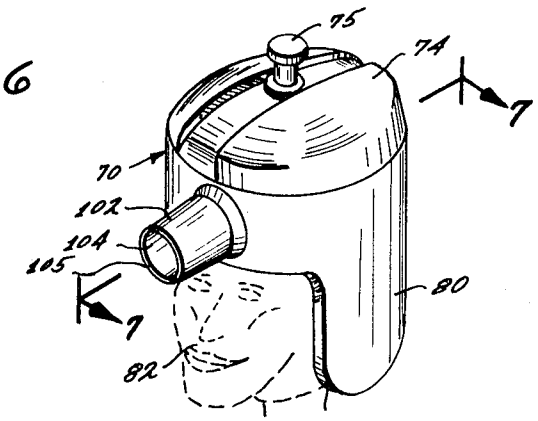
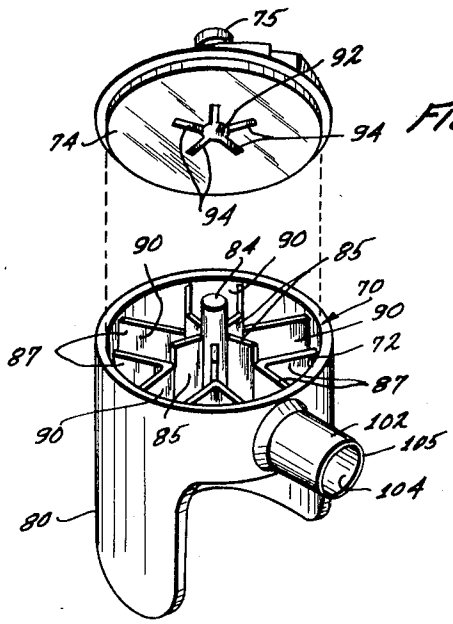


FIG. 6



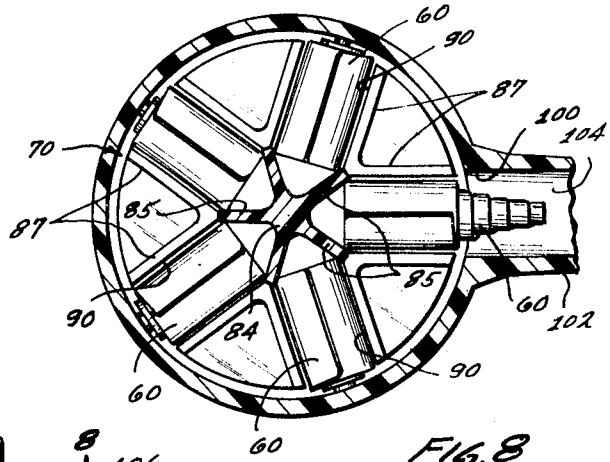


FIG. 8

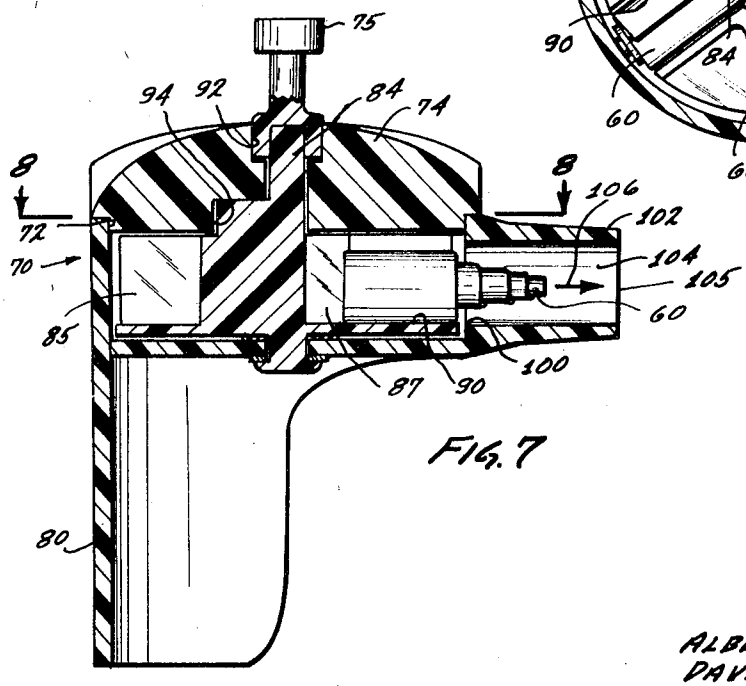


FIG. 7

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PROJECTILE FIRING GUN TOY

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U.S. Cl. 124—19 7 Claims

ABSTRACT OF THE DISCLOSURE

A gun toy of the type including a multi-chamber rotatable cylindrical magazine, in which each chamber is adapted to hold an energy-storing projectile. The energy stored in each projectile causes the projectile to be ejected up to several feet out of the toy's barrel when the projectile chamber is aligned with the barrel's bore. The energy-storing projectile comprises a helical, spirally wound strip of a resilient material, e.g. Mylar. Energy is stored in the spiral strip by compressing it endwise and then inserting it into a chamber of the magazine.

BACKGROUND OF THE INVENTION

Field of the invention

This invention is generally related to toys and, more particularly, to a gun toy, capable of discharging bullet-like projectiles.

Description of the prior art

The toy art is replete with gun toys of all types, including those intended to simulate real machine guns, rifles, pistols, revolvers and the like. The design and fabrication of toy housings which look like real guns have not encountered particular difficulties, especially with modern machinery and the availability and the use made of various plastics. However, the design of a mechanism for use in such toys to discharge safely, bullet-like projectiles or pellets in order to simulate the performance of a real gun, has encountered many problems, not all of which have been overcome by the prior art.

Typically, gun toys capable of discharging bullet-like projectiles, incorporate a complex mechanism, adapted to apply a force to one or more projectiles in the gun. Upon the application of a propelling force to a projectile in a firing position, the projectile is discharged through the bore of the gun's barrel. In many of the prior art gun toys, biasable springs are used to apply the necessary propelling forces to the projectiles. Two such prior art gun toys, which are typical of the present state of the art, are shown and described in U.S. Pats. Nos. 2,509,552 and 2,962,017.

As seen from these patents, in the toys described therein, a separate compressable spring is provided for each projectile. A release or triggering mechanism is associated with each spring, designed to release the spring which is biased against a projectile in a firing position. The forces or energy stored in the spring return the spring to its normal length, thereby applying a forward force to propel or discharge the projectile from the gun. Such multi-spring mechanisms are quite complex, which increases the likelihood of toy malfunction and, as importantly, the toy production cost which is reflected by the increased price of such toys, a marked disadvantage in the competitive toy industry.

Also, the use of springs to provide propelling forces for the projectiles is often disadvantageous from a safety point of view, which is of primary importance since the toys are directed for use by children, who do not practice good

safety habits as a matter of course. Springs tend to lose their resiliency with repeated use. Consequently, the force with which the projectiles are discharged varies with use. To insure sufficient propelling forces even after considerable use, springs with relatively high spring constants, are used when manufacturing the toys. Consequently, when the toy is new, the projectiles tend to be discharged with excessive forces, often hazardous to the playing children. Thus, a need exists for a new gun toy which, though capable of discharging or propelling projectiles, is not characterized by prior art disadvantages.

OBJECTS AND SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a new improved gun toy.

Another object of the invention is to provide a new gun toy, from which a new type of projectile is dischargeable, without resorting to complex mechanisms.

A further object of the invention is to provide a relatively inexpensive gun toy from which projectiles are safely dischargeable.

Yet another object is to provide a simplified multi-chamber gun toy, in which a plurality of energy-storing projectiles are positionable for sequential discharge, the gun toy being characterized by the absence of a mechanism for propelling the projectiles, and each projectile being characterized by its inherent capability of being propelled out of a toy while the energy stored therein is released.

These and other objects of the invention are achieved by providing a projectile comprising a strip of resilient material which is wound to form a helical spiralling spring. The projectile is compressable so that its length is substantially equal to the width of the strip from which it is made. When compressed, the projectile stores energy which is sufficient to self-propel the projectile out of a gun toy as soon as the forces, which maintain the projectile in the compressed state, are removed and it is free to expand and return to its uncompressed or quiescent state. By proper selection of the projectile's material, the strip width and thickness, and the number of turns of the helical spring, the maximum force with which the projectile exits a toy, may be controlled, so as to provide a safe, yet reliable toy. Also, by choosing a material which maintains its resiliency despite repeated use, the propelled projectile may be used over and over.

In accordance with the teachings of the present invention, a gun toy is provided which is capable of storing or holding a plurality of such compressed projectiles. Each projectile automatically propels itself from the gun toy as soon as it is aligned with the bore of the gun's barrel, thereby enabling the energy stored therein to be released so as to expand the projectile and restore it to its length in its quiescent or unloaded state.

The novel features of the invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 are isometric views of a novel projectile in a quiescent and an energy-storing state, respectively;

FIG. 3 is a side and cross-sectional view of one embodiment of a gun toy for use with the novel projectile shown in FIGS. 1 and 2;

FIG. 4 is a cross-sectional view along lines 4—4 in FIG. 3; and

FIGS. 5–8 are different views of another embodiment of a novel gun toy for use with the novel projectile shown in FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to FIGS. 1 and 2 which represent two isometric views of a novel projectile **10** shown in an expanded quiescent state and in a compressed energy-storing state, respectively. Briefly, in accordance with the teachings of the present invention, a projectile, for use in a gun toy, is provided comprising an elongated strip of resilient material **12** of a width represented by arrow **14**. The strip is wound to form a spiralling helix in which each convolution further removed from the helix base, designated by **16**, towards the vertex **18**, is of smaller diameter. Due to the resiliency of material **12**, after being wound it in essence forms a strip spiral helical spring.

As is appreciated and shown in FIG. 2, the projectile may be compressed to be of a length equal to the strip's width **14** by applying a force, represented by arrow **22**, to its vertex **18**. As a result, energy is stored in the projectile **10** to a force equal and opposite to the force applied thereto. To maintain the projectile in equilibrium or a steady state with respect to a stationary member such as wall **24**, equal and opposite forces are applied by the projectile **10** to the wall and vice versa. The force applied by the wall is represented by arrow **26**.

As is appreciated, as long as force **22** is applied to the projectile's vertex, the projectile remains in the compressed energy-storing state, as shown in FIG. 2. However, once the compressing force **22** is removed, the energy stored in the projectile expands it to its normal length in the quiescent state and, with the force **26** applied thereto, propels the projectile in a direction substantially aligned with its longitudinal axis, away from the fixed wall **24**. The distance which the self-propelled projectile travels is clearly a function of the energy stored therein and its weight. The energy storable in the projectile is a function of the length of the strip of material **12** and its resiliency or its spring constant value. Thus, by proper selection of the material **12**, and its dimensions, the propellable distance of the projectile is controlled.

In one embodiment, actually reduced to practice, a projectile was constructed of a strip of polyester film of polyethylene terephthalate, for example, the film sold by the Du Pont Corporation under the trademark Mylar. The strip was about one inch wide, 13 inches long and approximately 0.003 inch thick. The strip was wound to produce a spiralling helix which in the expanded or unloaded state designated by arrow **28** in FIG. 1, was about 6.5 inches, with base **16** having a diameter in the range of 0.375 inch. To enhance the appearance of the projectile, so as to simulate a bullet, the strip side forming the outer projectile surface was provided with gold or brass-like color. Such a projectile was successfully self-propelled out of a gun toy to a distance of several feet, thus producing the desired effect of a bullet being discharged from a gun.

The novel projectile of the present invention may be incorporated in any gun toy in which the projectile may be held in a compressed or loaded state until it is discharged or fired. The firing is achieved by enabling the projectile to expand to its normal length in means, such as the bore of a barrel, through which the projectile may exit the gun. It should be pointed out that such a gun toy does not require an energy-providing projectile-propelling mechanism since the projectile itself is adapted to store the energy necessary to propel or discharge it from the gun. The elimination of the need of such a mechanism greatly simplifies the required gun construction and, therefore, accounts for a significant reduction in its fabrication cost. Thus, one of the major disadvantages of the prior art is overcome with the present invention. Also, since each projectile, unlike prior art hard pellet-like elements, is spring-like, made of a resilient but relatively soft material such as Mylar, the danger of injury to playing children is greatly reduced. Any impact between a propelled projectile and a child compresses the projectile rather than injuring the child.

As previously pointed out, the novel projectile of the present invention may be used in any gun toy in which the projectile can be held in a compressed state until it is to be fired. Firing may be accomplished by enabling the projectile's vertex to expand away from its base, and by providing an opening through which the projectile can exit and be discharged from the gun toy, such as a barrel's bore. Projectiles of the present invention may, for example, be loaded in separate cavities in a rotary cylindrical magazine of the type used and forming part of a toy revolver or machine gun. Each projectile is automatically fired by aligning its cavity with an aperture which defines the breech end of the bore of the barrel, whose other end represents the gun's muzzle.

Reference is now made to FIG. 3 which is a combination side and cross-sectional view of one embodiment of a gun toy designed for use with the novel projectile of the present invention. FIG. 4 is a cross-sectional view along lines 4—4 in FIG. 3. The gun shown therein and designated by numeral **30**, represents a machine gun having a barrel **32** defining a bore **34**, with a muzzle end **36** and a breech end **38**. The barrel forms an integral part of a cylindrical-magazine support structure **40**, which is supported above a base **42** by a pivotal member **44**, coupled to the base at a ball and socket unit **45**. Structure **40** further includes a sight barrel **47** with a sight bore **48**, paralleling and above the barrel's bore **34**.

Supported in structure **40** for rotation therein, is a multi-cavity cylindrical magazine, hereafter referred to as cylinder **50**, having a spindle **52** positioned in a boss **54** of structure **40**. The cylinder periphery is supported on circular ridges **56** extending upwardly from the bottom side of structure **40**. Extending from cylinder **50** through structure **40** is an exposed knob **58** which, when manually rotated, causes the rotation of cylinder **50**, about its longitudinal axis **60** which is parallel to the longitudinal axis of the barrel's bore **34**. The rotation of the cylinder **50** results in the successive alignment of loadable cavities **60** (FIG. 4) with the bore **34** and, more importantly, with the breech end **38** thereof.

As seen from FIGS. 3 and 4, each cavity **60** extends in a direction parallel to the cylinder's longitudinal axis. Also each cavity is open at the cylinder's periphery so that when the cavity, other than a dummy cavity **60***d*, is in a position, aligned with a loading opening **62** (FIG. 4) in structure **40**, a projectile **10**, in the compressed state, may be inserted therein, with the base **16** of each projectile **10** pressed against the closed end **64** of each cavity. The cavity end **66** opposite end **64** is open. However, the loaded projectiles remain in their compressed states, since they are prevented from expanding to their quiescent lengths by a solid rigid wall **68** of structure **40**, which extends perpendicular to the cylinder's axis of rotation.

However, as soon as a loaded cavity **60** is aligned with the breech end **38**, the projectile **10** is no longer inhibited by wall **68** from expanding. Consequently, the energy stored in the projectile causes it to expand while propelling it forward through the barrel's bore and out the muzzle end thereof. Thus, the projectile is self-propelled or fired without resort to complex biasing and releasing mechanisms which characterize prior art like toys.

Since the cylinder **50** contains a plurality of loadable cavities **60**, the position of the dummy cavity **60***d* in the cylinder may be used as a reference loading point for sequentially loading the projectiles in the cavities **60**. Once the cylinder **50** is fully loaded the projectiles can be fired in succession by merely rotating or turning knob **58** to successively align the loaded cavities **60** with the breech end **38** through which the projectiles are self-propelled or fired. Knob **58** may be rotated either by direct application or a manual force or by means of any simple trigger-actuated mechanism. However, since

such mechanisms are well known in the art, such a mechanism will not be detailed.

In the foregoing described embodiment the cavities **60** extend in a direction perpendicular to the cylinder's longitudinal axis and near the cylinder's periphery. Thus, the cavities may be thought of as peripheral cavities. It should, however, be apparent that the novel projectile of the present invention may be incorporated in a novel toy in which cavities radially extend from the cylinder's center towards its periphery. Such an embodiment is diagrammed in FIGS. 5–8 to which reference is made herein.

In these figures, numeral **70** designates a relatively shallow cylinder having an open top **72** (see FIG. 6). A cover **74** rotatably fits on the cylinder's open end. A knob **75** extends outwardly from cover **74**. The knob **75** is manually operable by a playing child to rotate the cover while covering the cylinder's open top. As shown, the cylinder **70** forms part of a helmet **80** mounted on the head **82** of a figure toy, such as a spaceman.

Extending along the cylinder's longitudinal axis is a shaft-like rod **84**. A plurality of radial walls **85** extend from the rod **84**. Each wall **85** is used to support a pair of walls **87**, which form side walls of two adjacent cavities **90**.

In the particular embodiment the five walls **85** and the ten walls **87** form five equidistantly spaced radial cavities **90**. In FIG. 8 each cavity is shown containing the novel projectile **60** in the compressed state.

As seen from FIGS. 7 and 6, the bottom end of rod **84** is rotatably supported by the bottom end of cylinder **80**, while the rod's top fits in a cavity **92** in the bottom side of cover **74**. A plurality (five) of radial cavities **94** extend from cavity **92**. The function of the latter is to accommodate the top ends of walls **85** when the cover **74** is in position. In operation, by rotating the cover **74** by means of knob **75**, walls **85** are caused to rotate thereby rotating the cavities **90** in the cylinder about its longitudinal axis.

The cylinder **70** defines a peripheral aperture **100**, so that as each cavity **90** passes by the aperture, the projectile **60** is free to expand (see FIG. 8). Consequently, the energy stored therein propels the projectile forward as it expands. Aperture **100** may form the breech end of a radially aligned barrel **102** having a bore **104** and a muzzle end **105** through which the expanding projectile outwardly propels, in a direction designated by arrow **106** in FIG. 7.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art and, consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:

1. In combination:

an energy storing projectile comprising a thin strip of resilient material configured to form a spiralling helix with each convolution thereof being slidably telescopically related to its adjacent convolutions, said projectile normally assuming an elongated conical shape having a tip end and a base end but being resiliently axially compressible to a length substantially equal to the width of said strip; and

confining means comprising relatively movable members defining an enclosed elongated chamber of a size to receive and confine said projectile in its

axially compressed state, one of said members defining an end wall of said chamber engageable with the tip end of said projectile to hold the same compressed, said one member including a barrel portion movable into alignment with said chamber to thereby permit said projectile to resiliently elongate and project itself through said barrel, said one member being provided with an opening alignable with a side of said chamber whereby such projectile may be axially compressed then inserted laterally through said opening into said chamber.

2. The combination defined in claim **1** wherein said material is a polyester film of a thickness of about .003 inch.

3. The combination defined in claim **1** wherein said members define a plurality of said chambers, the other of said members having a plurality of open-sided recesses, each recess having an open end and a closed end, said one member enclosing said other member and closing said open sides and said open ends, said barrel portion being alignable with said open ends, successively.

4. The combination defined in claim **3** wherein said other member is cylindrical and mounted for rotation relative to said one member about its cylinder axis, said recesses extending parallel to said axis and being open at the periphery of said cylinder, said opening in said one member being elongated and successively alignable with the open sides of said recesses, said barrel portion extending parallel to said cylinder axis and being successively alignable with said open ends.

5. The combination defined in claim **3** wherein said other member is cylindrical and mounted for rotation relative to said one member about its cylinder axis, said recesses extending radially of said axis and having open ends at the periphery of said cylinder, one side of each recess being open through an end of said cylinder, said barrel portion extending radial to said axis and being successively alignable with said open ends.

6. The combination as recited in claim **1** wherein said strip of material is formed of polyethylene terephthalate of a thickness in the range of several thousandths of an inch.

7. The combination as recited in claim **1** wherein the length and width of said strip and the diameter of the base of said helix and the uncompressed length thereof are about 13, 1, 0.375 and 6.75 inches, respectively.

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U.S. Cl. X.R.

124—48; 273—106.5