Oct. 21, 1952 T. M. SHELTON 2,614,551

TOY GUN

Filed June 14, 1946 4 Sheets-Sheet 1

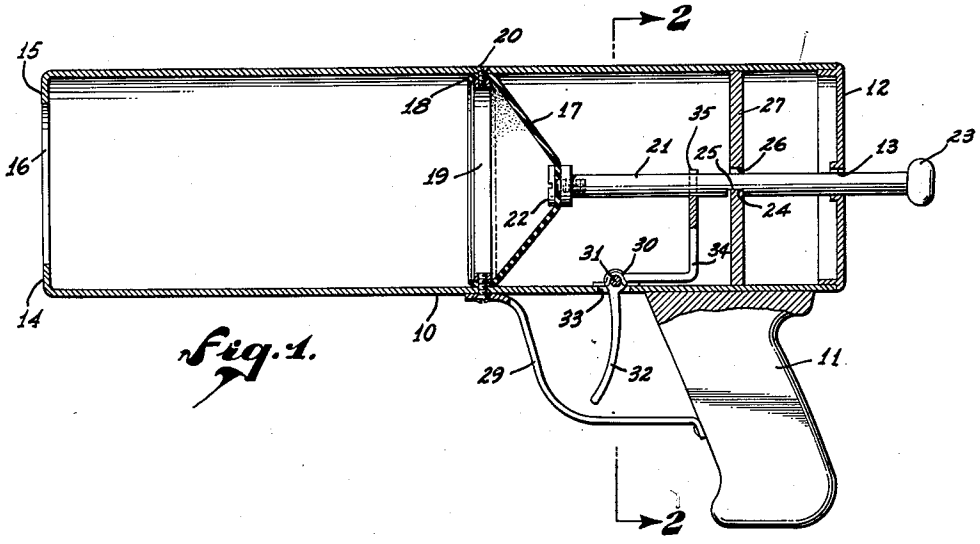

Fig. 1.

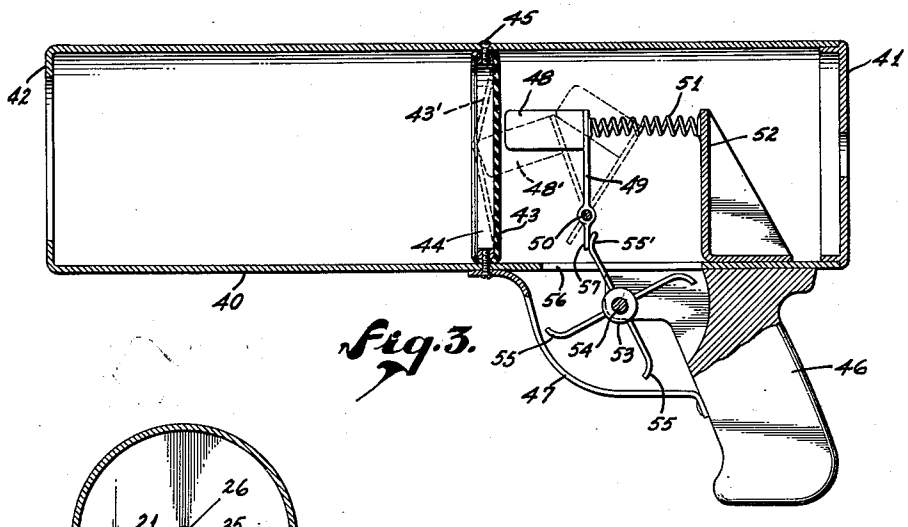

Fig. 3.

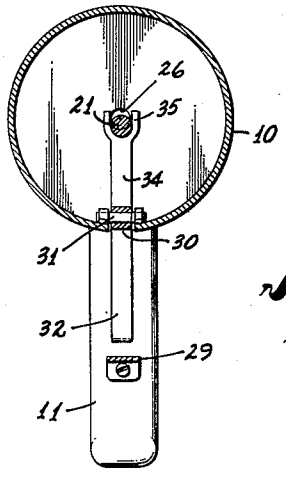

Fig. 2.

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TOY GUN

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Fig. 4.

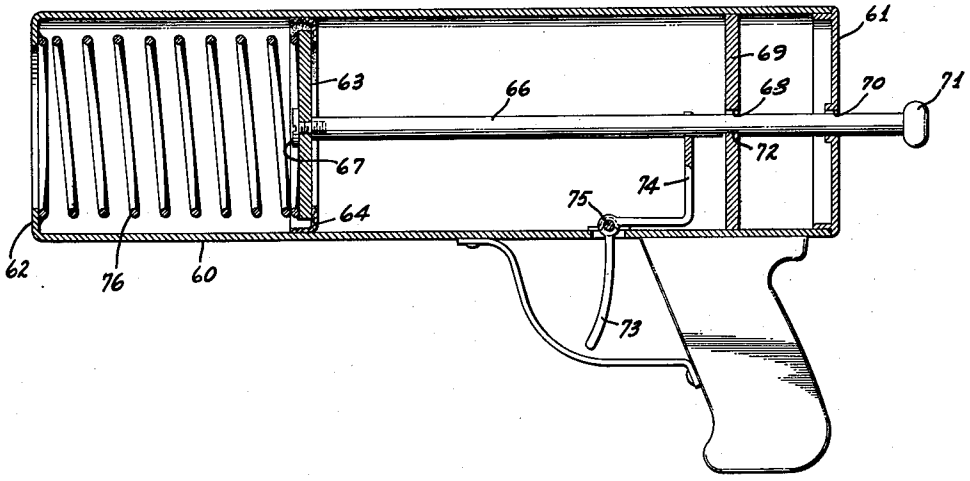


Fig. 5.

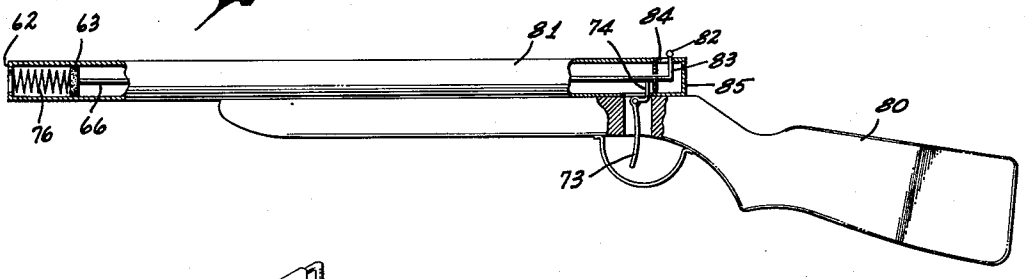
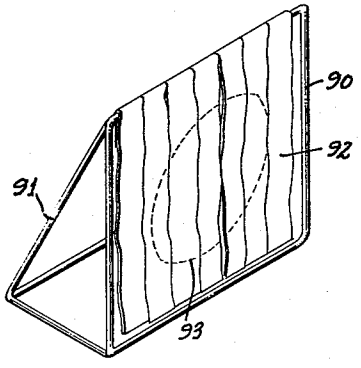


Fig. 6.



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TOY GUN

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Fig. 7.

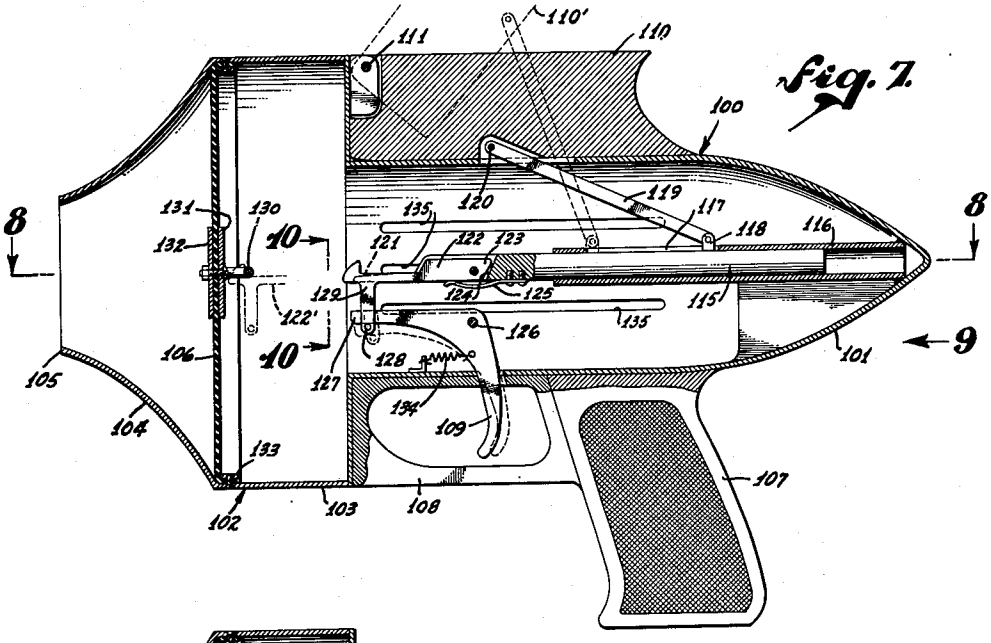


Fig. 8.

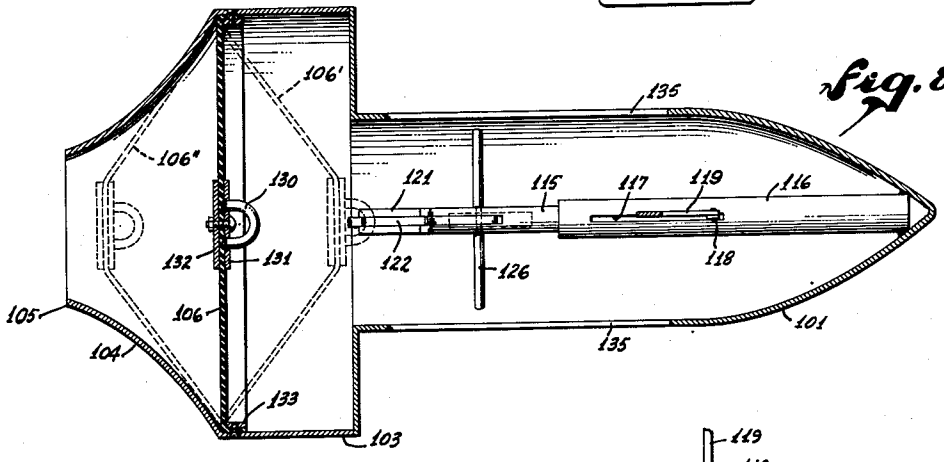


Fig. 9.

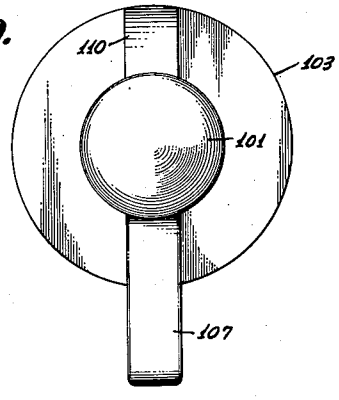
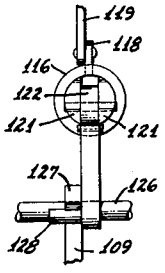


Fig. 10.



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TOY GUN

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Fig. 11.

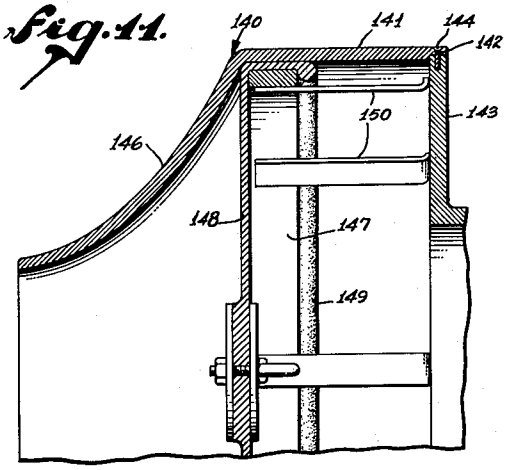
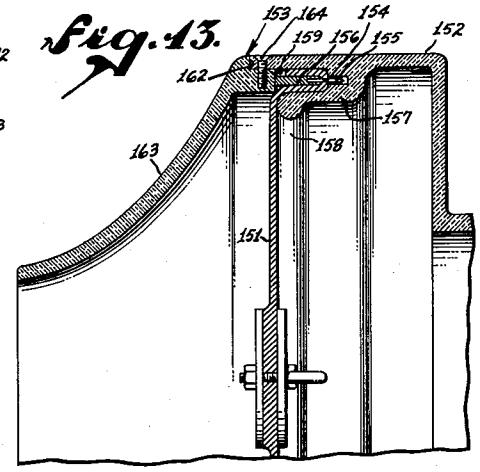


Fig. 13.



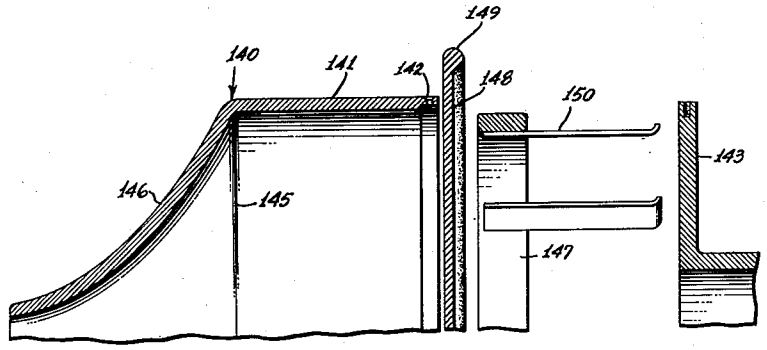


Fig. 12.

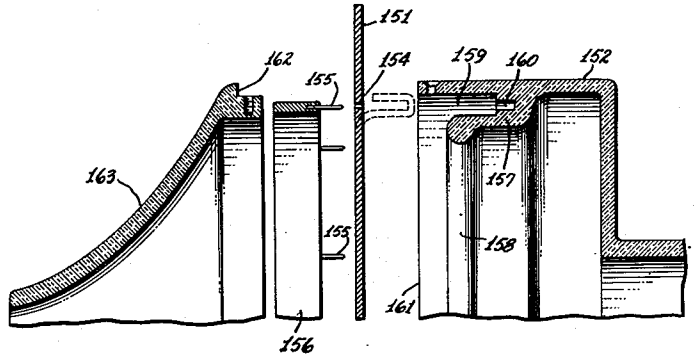


Fig. 14.

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Patented Oct. 21, 1952 2,614,551

UNITED STATES PATENT OFFICE

2,614,551

TOY GUN

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Application June 14, 1946, Serial No. 676,657

6 Claims. (Cl. 124—1)

1

The invention relates to toy guns and particularly to toy guns adapted to expel a concentrated charge of air or gas.

It is among the objects of the invention to produce a new and improved toy gun which is practical and harmless but at the same time capable of being directed toward and shot at a target with a considerable degree of accuracy.

Another object is to provide a new and improved toy gun which is capable of shooting any number of charges at a target without the necessity of replenishing the gun with ammunition.

Still another object is to provide a new and improved toy gun which is safe from all standpoints, which is positive acting and which incorporates a relatively minimum number of parts, of rugged construction, serving to produce a toy that will give lasting pleasure for an extended period of time.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in the claims and illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal, sectional view of a preferred embodiment of the invention.

Figure 2 is a cross-sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a longitudinal, sectional view of a modified form of the invention.

Figure 4 is a longitudinal, sectional view of still another modified form of the invention.

Figure 5 is a longitudinal view partly in section showing a manner in which the barrel can be adapted to a gun having a different type of stock.

Figure 6 is a perspective view of a type of target with which the gun is highly effective.

Figure 7 is a side view partially in section of a particular form of the device.

Figure 8 is a plan view in section taken on the line 8—8 of Figure 7.

Figure 9 is a right end view of Figure 7.

Figure 10 is a fragmentary, cross-sectional view on the line 10—10 of Figure 7.

Figure 11 is a fragmentary, longitudinal, sectional view showing in detail a means for fastening the diaphragm.

Figure 12 is a fragmentary, sectional, exploded view showing the parts which comprise the fastening means of Figure 11.

Figure 13 is a fragmentary, longitudinal, sectional view of a modified type of fastening means for the diaphragm.

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Figure 14 is a fragmentary, sectional, exploded view of the parts comprising the fastening means of Figure 13.

In the construction of children's toys one of the most important factors is to make the toy preferably safe for a child to handle. When toy guns are contemplated they must naturally be provided with some device which can be shot from them if they are to be used against a target. Almost any hard object which is expelled from a gun, even at low velocity, is quite apt to do damage when carelessly used even when the object might be as soft, for example, as the commonly used cork in a pop gun. In some cases, as in the familiar pop gun, the cork is tied to a string so that it cannot be shot too far. Confining means such as this are disadvantageous in that the gun has no accuracy and cannot be directed satisfactorily at a target.

The ring of the invention can be likened to a smoke ring, and it has been found that if the air is expanded rapidly enough and is of sufficient volume in relation to the exit opening, a ring will travel outwardly at a sufficient velocity to carry the ring a necessary distance to produce satisfactory results.

In the invention herein described the object projected from the gun is nothing more than a compact ring of compressed air and can do no more damage than a strong gust of wind. The ring of air, however, is sufficiently compact so that it is adapted to travel considerable distances and is capable of impinging with considerable force upon a properly designed target. By reason of the fact that air finds its way into the gun through the normal openings there is no necessity for recharging the gun at any time since air as ammunition is always present.

In one embodiment chosen for the purpose of illustration there is shown as in Figure 1 a toy gun comprising a barrel 10 of relatively large diameter having a pistol grip 11, a breech end 12 substantially closed except for a central aperture 13 and a muzzle end 14. At the muzzle end is a flange 15 which extends inwardly and which at the center has an opening 16 of diameter somewhat smaller than the diameter of the inside of the barrel 10.

Within the barrel and intermediate the two ends is a diaphragm 17 which may be of rubber or some similar flexible material secured at the rim 18 by a confining means such, for example, as a ring 19. The ring is fastened in position in the embodiment shown by screws 20.

For flexing the diaphragm there is provided

a rod 21 fastened by a screw 22 to the center of the diaphragm. The rod extends toward the breech end of the gun through the aperture 13 and has a knob 23 providing a hand-hold at the outside end.

In the rod is a notch 24 comprising one element of a temporary detent for holding the rod and diaphragm in extended position as shown in Figure 1. The notch is adapted to receive within it one edge 25 of an aperture 26 within a vertical brace 27 which extends between the top and the bottom of the barrel.

A trigger guard 29 shields the finger grip 32 of a trigger 30. The trigger has a shape somewhat like a bell crank lever with the mid-portion secured pivotally by a pivot pin 31 to the inside of the barrel adjacent the pistol grip. The finger grip 32 extends downwardly through an aperture 33 in the barrel into position within the trigger guard 29 and forward of the pistol grip in the same manner as the trigger of a real gun or pistol. At the opposite side of the pivot pin the trigger extends as a right angular shaped lever 34, a forked portion 35 of which extends upwardly to a position surrounding the rod 21, as best seen in Figure 2.

When the gun is to be used the operator first cocks the gun by pulling upon the knob 23 until the notch 24 slips into position over the edge 25. Due to the fact that the diaphragm is resilient, the rod and the diaphragm will be under tension. To release the gun it is then necessary only to pull the trigger a sufficient distance so that the right angular lever 34 moves upwardly high enough to dislodge the notch 24 from its position on the edge 25. As soon as this is accomplished, the resilient diaphragm will snap sharply forward toward the muzzle end with sufficient force and a sufficient distance to drive a charge of air forward toward the muzzle of the gun.

By a principle sometimes referred to as the vortex principle the sudden charge of air partially compressed by action of the diaphragm in combination with the flange 15 causes a compact ring of compressed air to be projected outwardly from the muzzle end of the barrel. Experience has taught that the compressed ring of air travels straight in an axial direction with respect to the barrel for a considerable distance many times the length of the barrel without any appreciable dispersion of the air which makes up the compressed ring. The ring of air has such force and compactness that it is capable of dislodging a paper target shot at from distances as great as the length of an average size living room.

The gun action can be repeated just as many times as may be desired by merely again cocking the gun and squeezing the trigger. Each time the gun is cocked sufficient air is drawn through the muzzle end to fill the space within the barrel forward of the diaphragm, and a part of this air is driven outwardly in the form of a compressed ring every time the gun is discharged.

Although in the embodiment first referred to the resiliency of the diaphragm is depended upon for driving the diaphragm forward, it will be appreciated that other resilient means may be added if a greater impact is desired. The effectiveness of the charge of compressed air driven from the gun can be ascertained if the forward portion of the barrel is partially filled with smoke or dust, and it is contemplated that for added effect a charge of dust, smoke or gas may be placed within the gun barrel and a portion of it picked up each time the gun is dislodged.

In a modified form of the device illustrated in Figure 3 a barrel 40 of the usual dimensions has been provided having a customary closed breech end 41 and a flange 42 at the muzzle end. A diaphragm 43 is stretched taut within the barrel intermediate the ends and held in place by a ring 44 and screws 45. A pistol grip 46 and trigger guard 47 are likewise provided.

In this instance, the means for actuating the diaphragm is incorporated in a hammer 48 which is mounted upon a lever arm 49 pivoted by means of a pin 50 extending in a transverse direction within the barrel. The hammer is held in position by a coiled compression spring 51 which is mounted upon a bracket 52 likewise within the barrel. For actuating the hammer there is provided a trigger 53 pivotally supported upon a pin 54 at the forward portion of the grip beneath the barrel. A plurality of finger grips 55 extend radially outwardly from the center of the trigger and are adapted to rotate within the pistol grip and through a slot 56 in the bottom of the barrel.

The arrangement illustrated and described in connection with Figure 3 is a repeating arrangement. In operation one of the finger grips will always extend downwardly within the trigger guard in a position to be pulled by the operator. At the same time another of the finger grips will occupy a position 55' in contact with a lower extension 57 of the lever 49. As the trigger is pulled the last mentioned finger grip will be pressed forward from the position 55' and will force the hammer 48 rearwardly against the tension of the compression spring 51. As soon as the tip end of the finger grip has been pulled past the lower extension of the lever, tension built up in the spring 51 will snap the hammer suddenly forward to a position 48' where it will impinge against the diaphragm and drive the diaphragm forwardly to a position 43'.

The spring 51 may be one selected having sufficient force and with a sufficient number of windings so that the hammer is driven through a distance forward far enough to push the diaphragm well into the barrel cavity at the forward end of the gun. The action is sufficiently rapid and made with sufficient force to compress a quantity of air between the diaphragm and the flange 42 into the form of a ring of air and send it out of the barrel of the gun in the same manner as was described in connection with Figure 1. The spring will then immediately return the hammer to its initial position.

In this embodiment no cocking of the gun is needed since as soon as one of the finger grips has been pulled through a distance sufficient to discharge the gun the next finger grip is in place and another finger grip opposite thereto will likewise be in place against the lower extension of the lever 49. In this arrangement the gun is immediately ready to be discharged a second time, and repeated shots can be made with the gun as fast as the operator can pull the trigger.

In still another embodiment of the invention as shown in Figure 4 there is provided a gun having a barrel 60, a breech 61 and a flange 62 at the muzzle end. In this instance, the diaphragm is replaced with a piston 63 having a cup washer 64 at the edge positioned so that it can slide within the barrel of the gun. A rod 66 is attached by means of a screw 67 to the piston and extends rearwardly through an aperture 68 within a cross stick 69, an aperture 70 in the breech and thence outwardly terminating in a knob 71. The rod in this instance has a notch 72 adapted to fit over

the lower edge of the aperture 68 in the same manner as described in connection with Figure 1.

The gun in the embodiment illustrated in Figure 4 is released by the same trigger mechanism as described in connection with Figure 1 and incorporates a trigger grip 73 and an angular lifting lever 74 pivoted at the point 75.

In this latter instance, there is provided a large coiled spring 76 which is fastened to the inside surface of the flange 62 and to the adjacent surface of the piston 63. When the rod 66 is drawn rearwardly to a cocked position the spring is stretched. Thereafter, when the trigger is pulled the spring jerks the piston forward suddenly and with sufficient force to expel the compressed air ring in the manner previously described.

To vary the style of the gun it may be provided with a rifle stock 80 as shown in Figure 5, and the barrel of any one of the forms may be extended as indicated at 81 so as to fit over the rifle stock without altering the mechanical operation of the gun itself. If preferred, the rod may terminate in a knob 82 extending at right angles to the axis of the rod so as to give the effect of the characteristic loading bolt used on real guns. In this instance, the knob is at the end of a right angular lever 83 extending upwardly through a slot 84 at the top of the barrel. A wall 85 may be used to entirely close the breech. In other respects the mechanical arrangement of Figure 5 is similar to that of Figure 4.

By way of example, there is shown in Figure 6 a typical target which is effective with a gun of the type described. It may comprise a frame 90 supported in an erect position by means of brackets 91. Suspended from the upper horizontal portion of the frame may be a series of paper or other streamers 92 colored or marked so as to indicate a bull's-eye 93. If the streamers are permitted to hang freely, they will shake sufficiently to indicate a hit when the compressed ring of air discharged from the gun impinges upon the target.

It will be apparent from the foregoing description that there has been provided a toy gun which is particularly easy to operate and which by reason of shooting nothing other than the compressed ring of air can be operated freely about the house without fear of creating any undue damage.

In a particular form of the device which has been designed to suggest some of the so-called "modern weapons" there is shown in Figures 7, 8, 9 and 10 a voretex gun having substantially the same principles previously described.

The gun comprises a body 100 having a streamlined breech end 101 and a muzzle end 102. The muzzle end has an enlarged cylindrical portion 103 tapered abruptly along an inwardly curved line 104 to a muzzle orifice 105 which has a diameter substantially smaller than the diameter of the cylindrical portion 103. A flexible, resilient diaphragm 106 is mounted at the muzzle end of the cylindrical portion and in the course of operation is adapted to be moved between positions 106' and 106''.

As is customary, the gun is provided with a pistol grip 107, a trigger guard 108, a trigger 109 and a cocking bar or lever 110, the cocking lever being pivoted at the point 111 to the rear face of the cylindrical portion 103.

In order to operate the gun, means must be provided for pulling the diaphragm rearwardly to the position 106' and suddenly releasing it so

that due to its inherent resilience it snaps quickly forward to the position 106''.

In this embodiment the operating mechanism consists of a bolt 115 which slides freely within a bushing 116 located in the body axially with respect to the center of the diaphragm. The bushing is provided with a long slot 117 which is adapted to accommodate a bracket 118 connected by means of a link 119 to a pivot point 120 on the cocking bar. It should be noted in this connection that the center line between the bracket 118 and the pivot point 111 is over center with regard to the pivot point 120 when the cocking bar is in closed position. By virtue of this arrangement the cocking bar is snapped and held in a cocking position until the diaphragm can be released.

At the inner end of the bolt 115 is a forked portion 121 having two tines between which is pivotally mounted a hooked element 122. The hooked element has a base 123 cut on the bias so as to abut against a bias shoulder 124 at the end of the bolt. A leaf spring 125 attached to the underside of the bolt acts against the hooked element tending always to raise it to the position shown in Figure 7 above which the hooked element is prevented from moving by the bias shoulder 124.

The trigger 109, pivoted at the point 126, has a forwardly extending portion 127 which is adapted to slide over a pin 128 which is attached by means of an extension 129 to the forward end of the hooked element. A U-shaped eyelet 130 is attached by means of washers 131 and 132 to the center of the diaphragm. The diaphragm may be stretched and held in place by a ring 133 which bears outwardly against the inside wall of the cylindrical portion 103.

In operation the parts of the gun will initially have the positions shown in Figure 7. To first cock the gun it is necessary to lift the cocking bar 110 to the dotted position 110'. This movement draws the bolt 115 forwardly until the hooked element occupies the position 122'. In this position the end of the hooked element springs downwardly upon contacting the U-shaped eyelet 130 and is then snapped upwardly by means of the leaf spring 125. After the bolt has thus engaged the diaphragm, the cocking bar is pressed downwardly to its original position, and this movement forces the bolt 115 rearwardly to a cocked position wherein it is locked by the over center relationship of the link 119. During this movement the bracket 118 slides along the slot 117. Meanwhile, a spring 134 or other appropriate means will hold the trigger up.

When the trigger is pulled, the forward portion 127 thereof moves downwardly to the dotted position shown in Figure 7. This pulls the hooked element downwardly and releases the eyelet and the diaphragm so that the diaphragm snaps abruptly forward, thus expelling air through the muzzle orifice.

It is important to note that the tines 121 extend sufficiently far forward so that the eyelet will rest upon the tines in an axial position while the hooked element is being released, thus maintaining the diaphragm in a centered balanced position so that it will drive forward in a straight, true line providing maximum efficiency in the discharge.

Repetition of the above described firing action can again be enjoyed each time the gun is cocked. It is likewise significant to note that the body is provided with ample ventilating louvers 135 which

permit an ample amount of air to flow in behind the diaphragm so that there is no tendency of a vacuum to be formed to inhibit the maximum amount of forward spring when the diaphragm is released.

While conventional means of one sort or another may be utilized to secure the diaphragm in proper position, due to the fact that the diaphragm is made of rubber and might need to be replaced from time to time a quick and easy means of mounting the diaphragm is desirable.

One such means is illustrated in detail in Figures 11 and 12. This consists of providing a barrel 140 having a cylindrical breech end 141 terminating in an edge 142 which is adapted to receive a plate-like section 143 for closing the breech end. The plate-like section may be retained in place by screws 144.

At the inside end of the cylindrical breech end there is provided a corner 145 at the junction of the cylindrical breech end with a curved portion 146. A ring 147 is provided having a diameter somewhat smaller than the inside wall of the breech end. A rubber disc 148 is adapted to be inserted into the breech end, the disc being provided at its perimeter with a bead 149. It will be noted that the diameter of the perimeter is somewhat larger than the inside diameter of the breech end. The corner 145 may be designated as a shoulder or retaining projection.

For inserting the rubber disc it is necessary only to place the disc evenly over the edge 142 and then press the ring 147 against the diaphragm, extending the ring and diaphragm until they engage the corner 145. Legs or spacers 150 are provided on the ring 147, and when the plate 143 is moved into position, the legs or spacers press the ring and disc against the corner holding the rubber disc taut. The disc is given such a diameter that the bead 149 rests snugly upon the rear edge of the ring when the device is assembled.

In a modified type of fastening means for the disc consideration is taken of the fact that ordinary sheet rubber may be available at times where it might not be feasible to mold a disc with a bead at the perimeter. Under such circumstances, a simple flat disc 151 of natural or synthetic rubber is formed having a perimeter substantially larger than the outside diameter of a cylindrical portion 152 which, when assembled, constitutes a portion of the breech end of a gun barrel 153. The rubber disc is provided with a series of holes 154 which are spaced and sized to fit pins 155 on a ring 156. The cylindrical portion 152 is provided with a molded inner ring 157 having an inner bead 158 and providing an annular recess 159 at the bottom of which are apertures 160. The bead 158 is spaced inwardly from an edge 161 which is adapted to fit into a recess 162 on a curved portion 163 of the barrel.

When this type of mounting for the rubber disc is utilized, the disc is first spread over the edge 161, and then the ring 156 is applied with the pins 155 extending through the holes 154. The ring is then pressed into the annular recess 159, and this assembly operation tends to stretch the rubber disc taut across the bead 158. The ring may enter the recess sufficiently so that the pins are actually received in the apertures 160. The ring is firmly and permanently anchored in place by application of the cylindrical portion 152 to the curved portion 163 of the barrel, and the parts are anchored together by a screw 164.

Both means of mounting the rubber disc are easy to disassemble so that the disc may be replaced and the parts reassembled with considerable ease. The arrangement likewise facilitates assembly in the first instance. Either type of mounting may constitute parts of molded material such as plastic or metal, whichever is most feasible from the point of view of manufacture. The object primarily is to provide a quick and easy means for replacing the rubber disc which for most efficient operation of the gun should remain reasonably taut.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent structures.

The invention having been herein described, what is claimed and sought to be secured by Letters Patent is:

1. A vortex gun comprising a hollow barrel of relatively large diameter having a breech end and a muzzle end, means forming a clear aperture of diameter substantially less than the inside diameter of the barrel at the breech end, the portion of said aperture of smallest diameter forming the outermost end of the muzzle, an inherently resilient diaphragm circumferentially attached to the barrel intermediate the ends of said barrel, having normally a released position, said barrel having a progressively decreasing diameter from the diaphragm to the muzzle end, a trigger mechanism connected to the barrel adjacent the breech including a finger grip and means between the diaphragm and the finger grip adapted to cock said trigger mechanism, said trigger mechanism being connected to the diaphragm in cocked position and wherein the diaphragm is withdrawn from the released position to a resiliently retained cocked position, said diaphragm upon release from the trigger mechanism being adapted to cause a rapid displacement of air from the diaphragm to the muzzle aperture thereby to create and eject an outwardly moving ring of air.

2. An air vortex gun comprising a hollow barrel of relatively large diameter, a gun stock for the barrel, a breech end and a muzzle end on said barrel, said muzzle end having a clear aperture substantially smaller in diameter than the inside diameter of the barrel at the breech end and forming the outermost end of the barrel at the muzzle end, said aperture being of negligible length relative to the length of the barrel, an inherently resilient diaphragm mechanism in the barrel adjacent said breech end, said mechanism including a diaphragm and resilient drive medium adapted to rapid limited movement toward the muzzle end, trigger means in the barrel and associated therewith forming part of said mechanism, an interconnection between the diaphragm and the trigger means for cocking the diaphragm mechanism in a withdrawn position and then releasing the diaphragm mechanism for rapid displacement of air thereby in a direction toward the muzzle end, and a diaphragm shifter extending from a location of engagement with the diaphragm to the exterior of the stock adapted to shift the diaphragm to cocked position, said interconnection comprising a cocking element having a releasable engagement with the diaphragm in cocked position wherein the diaphragm is withdrawn under tension and a release member incorporated with the trigger means adapted to release the cocking element from engagement for

said displacement in a direction toward the muzzle end.

3. An air gun comprising a barrel having a muzzle end substantially smaller in diameter than the end opposite therefrom, a resilient diaphragm mounted transversely of said barrel, means for grasping and drawing said diaphragm rearwardly comprising an axially slideable bolt adapted to shift between a diaphragm engaging position and a diaphragm stretching position, a releasable diaphragm engaging latch connected to the bolt, a handle and a trigger adjacent the bolt and being in communication with the latch when the bolt and latch are in engagement with the diaphragm in diaphragm stretching position, said trigger when pulled being movable from a cocked position to a release position and adapted in release position to disengage the latch and release the diaphragm from the bolt.

4. An air gun comprising a barrel having a muzzle end substantially smaller in diameter than the end opposite therefrom, a resilient diaphragm mounted transversely of the barrel, means for grasping and drawing said diaphragm rearwardly comprising an axially slideable bolt, an engaging element attached to the bolt adjacent the diaphragm engageable with the diaphragm when the bolt is slid to a diaphragm engaging position, a cocking lever pivoted to the barrel at the upper side linked to the bolt and adapted to shift said bolt between a diaphragm engaging position and a diaphragm stretching position, a handle and a trigger adjacent said bolt, said trigger being engageable with the engaging element when said element is in diaphragm stretching position, said trigger being movable when pulled from a cocked position to a releasing position and adapted in releasing position to release the diaphragm from the bolt.

5. An air gun comprising a barrel having a muzzle end substantially smaller in diameter than the end opposite therefrom, said barrel having inwardly curved walls between the ends and a flexible resilient diaphragm adjacent the large end, means for grasping and stretching said diaphragm rearwardly comprising an axially slideable bolt having one end directed toward the diaphragm, an engaging element at the end of the bolt directed toward the diaphragm having one position of engagement with the diaphragm when the bolt is slid to its position nearest the diaphragm and another position released from engagement with the diaphragm, a cocking lever pivoted to the barrel at the upper side incorporating a link between an intermediate portion of the lever and the bolt adapted to shift said bolt between a diaphragm engaging position and a diaphragm stretching position, a handle and a trigger adjacent the end of the bolt directed toward the diaphragm, said trigger being engageable with the engaging element when said bolt is in diaphragm stretching position, said trigger being movable from an engaging position to a releasing position when pulled and adapted thereby to release the diaphragm from the bolt.

6. An air gun comprising a barrel having a muzzle end substantially smaller in diameter than the end opposite therefrom, said barrel having inwardly curved walls between the ends and a flexible resilient diaphragm adjacent the large end, means for grasping and drawing said diaphragm rearwardly, a bolt having an axially slidable mounting in the gun with one end of the bolt directed axially toward the diaphragm and a bolt shifter extending from the bolt to the exterior of the gun adapted to shift the bolt between a diaphragm engaging position and a diaphragm stretching position, said bolt having a temporary connecting portion for the diaphragm at the end thereof directed toward the diaphragm, a handle and a trigger adjacent the bolt and engageable with the bolt when the bolt is in diaphragm stretching position, said trigger being shiftable when pulled from an engaging position to a releasing position and in releasing position being adapted to release the diaphragm from the bolt.

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