June 24, 1952 J. K. POPE 2,601,555

REPEATING TOY GUN

Filed April 18, 1949 2 SHEETS—SHEET 1

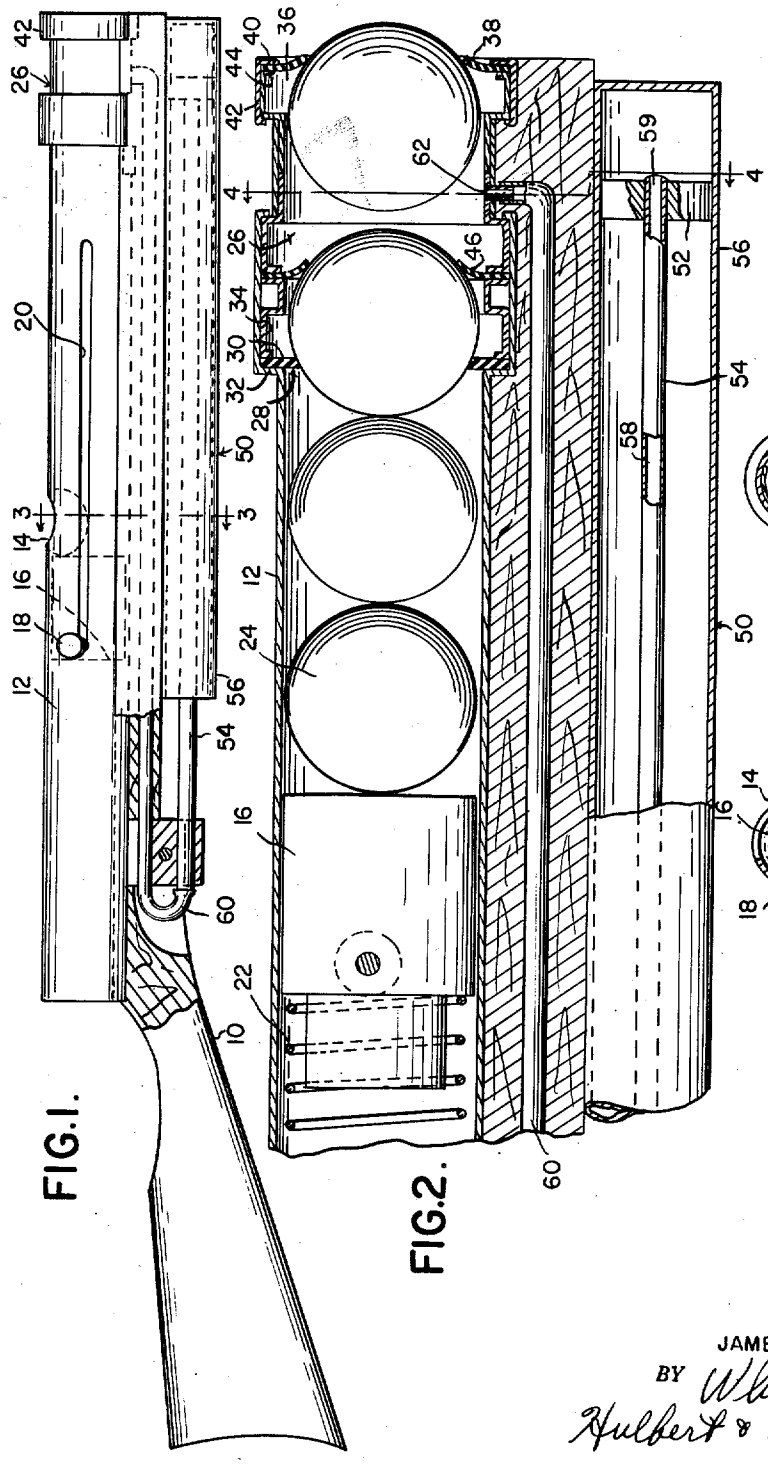


FIG. 1.

FIG. 2.

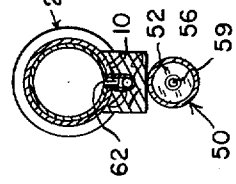


FIG. 4.

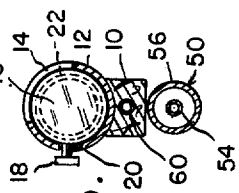


FIG. 3.

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REPEATING TOY GUN

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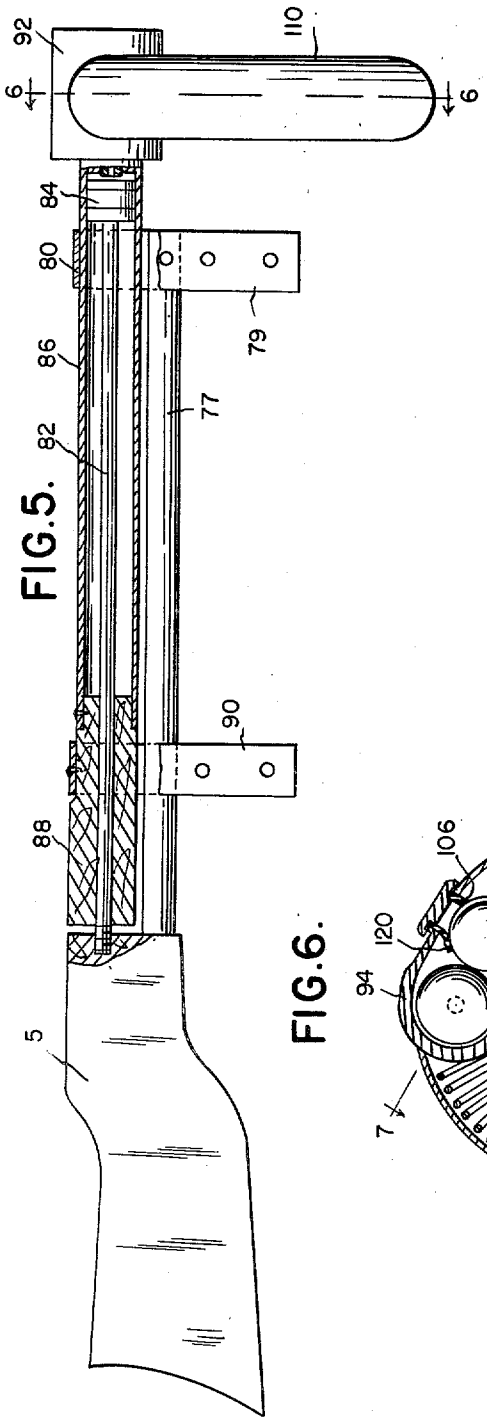


FIG. 5.

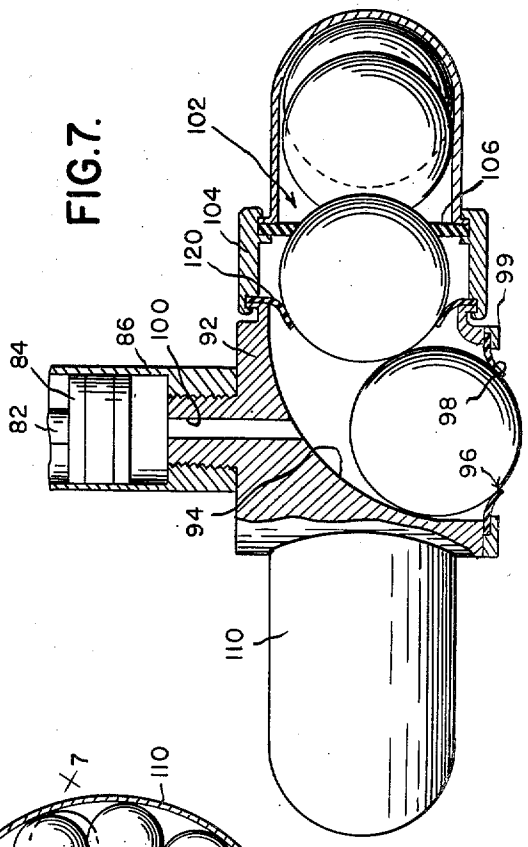


FIG. 7.

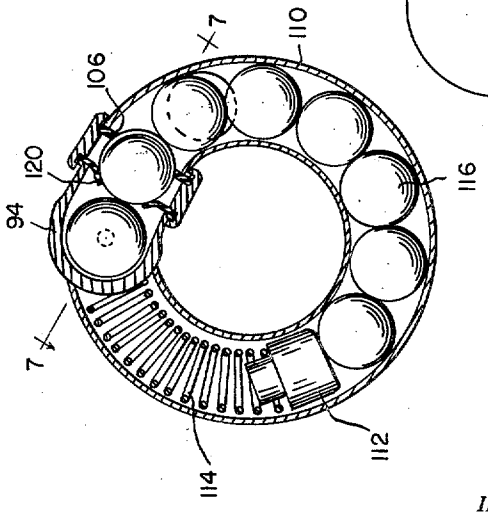


FIG. 6.

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REPEATING TOY GUN

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Application April 18, 1949, Serial No. 88,151

11 Claims. (Cl. 124—13)

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The present invention relates to a repeating toy gun.

According to the present invention a gun is provided which is capable of projecting a series of projectiles such for example as table tennis balls, without the necessity of reloading the gun after each discharge. In general terms, the gun is provided with a magazine which advances the balls serially to a discharge chamber. This chamber is of a size sufficient to receive a plurality, and preferably two, of the projectiles. The chamber is provided with a charging port and a discharge port and sealing means are provided to seal the foremost projectile at the discharge port and to seal the rearmost projectile at the charging port. An air inlet port is provided into the chamber intermediate the charging and discharge ports. When air is admitted under pressure into the chamber it forces the rearmost projectile rearwardly into sealing relation with sealing means provided at the charging port. Thereafter, as the pressure in the chamber increases the foremost ball is expelled through the discharge port. The discharge port is provided with a resilient sealing ring which opposes movement of a projectile therethrough.

In accordance with the foregoing general description it is an object of the present invention to provide a toy gun having associated therewith a manually operable pump for effecting discharge of a series of balls or other projectiles without requiring the necessity of reloading the gun after each discharge.

It is a further object of the present invention to provide a toy gun having associated therewith a magazine for receiving a plurality of projectiles, the discharge of the projectiles being effected by repeated operation of a manually operable pump.

It is a further object of the present invention to provide a toy gun having associated therewith a generally annular magazine for the reception of a plurality of projectiles which are discharged serially by repeated operation of a manually operable pump.

It is a feature of the present invention to provide a toy gun having an elongated chamber therein provided with spaced charging and discharge ports, each of which is provided with resilient sealing rings engageable with a projectile located within the chamber and adjacent the respective ports.

It is a further feature of the present invention to provide a gun having a chamber of the type described which is provided further with an intermediate sealing ring which remains in

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sealing engagement with the rearmost projectile in the chamber between limits of movement of the projectile which are determined by seating of the foremost projectile on the sealing ring adjacent the discharge port with the projectiles in contact and by seating of the rearmost projectile on the sealing ring adjacent the charging port.

Other objects and features of the invention will become apparent as the description proceeds, especially when considered in conjunction with the accompanying drawings, wherein:

Figure 1 is a side elevation of a toy gun with parts in section.

Figure 2 is an enlarged sectional view of the discharge end of the gun.

Figure 3 is a sectional view on the line 3—3, Figure 1.

Figure 4 is a sectional view on the line 4—4, Figure 2.

Figure 5 is a side elevation partly in section of a somewhat different embodiment of gun.

Figure 6 is a section on the line 6—6, Figure 5.

Figure 7 is an enlarged sectional view on the line 7—7, Figure 6.

Referring now to Figures 1 through 4, the gun is illustrated as comprising a stock or frame 10 on which is mounted a tubular magazine 12 provided with a loading port 14 through which projectiles may be introduced. While projectiles of different shape may be employed, excellent results are obtained when table tennis balls are employed therefor.

Located within the magazine 12 is a plunger 16 having an operating finger piece 18 extending laterally therefrom through an elongated slot 20 provided in the magazine. A compression spring 22 is provided at the rear of the plunger 16 and urges the same forwardly, thus urging a sequence of projectiles such as indicated at 24, forwardly of the gun.

At the forward end of the magazine 12 is provided a chamber indicated generally at 26. The rear end of the chamber is open to provide a charging port indicated at 28. In actual practice the rear end of the chamber 26 is illustrated as formed by an enlarged portion of the forward end of the magazine 12 although obviously other constructions could be employed.

Surrounding the charging port 28 is a resilient rubber sealing ring 30. As best seen in Figure 2, the side of the sealing ring 30 opposite to the chamber 26 is engaged by a radial portion 32. The inner side of the ring 30 is engaged by an annular member 34. The annular surface 32 engages the side of the ring 30 throughout a zone

which extends closer to the inner edge of the ring than does the member 34. Accordingly, the projectiles 24 may pass through the charge port into the chamber 26 with a minimum of resistance. However, the dimensions of the portion 32 are such that return movement of the projectiles through the charging port is effectively prevented. Thus for example, the dimensions of the parts may be such that actual compression of the rubber material of the ring 30 would be required for return movement of he projectile. On the other hand, movement of the projectile from the magazine into the chamber merely results in flexing and stretching of the ring 30.

The forward end of the chamber 26 is provided with a discharge port 36 which is provided with a sealing ring 38. In this case the sealing ring 38 may be formed of rubber or other resilient materials. It is supported at its outer surface by a radial portion 40 of a ring 42, and at its inner surface by a short radially extending flange 44. Again, the radial portion 40 which engages the outer surface of the ring 38, extends to a point substantially closer to its inner edge than does the flange 44. Accordingly, the ring 38 offers a substantial force opposing discharge of the ball or projectile through the discharge port. The dimensions of the parts may be such that actual compression of the rubber material of the ring 38 is required to permit passage of the projectile therethrough.

In any event, the construction of and the supports for the sealing rings 30 and 38 are such that as air pressure is built up in the chamber 26, discharge movement of the foremost ball in contact with the ring 38 will take place, while return movement of the rearmost ball 24 is effectively prevented by the ring 34.

A third resilient sealing ring 46 is provided in the interior of the chamber 26 and is arranged to maintain sealing contact with the rearmost ball 24 in the chamber 26 throughout its limit of motion. The limit of motion of the rearmost ball is determined in the first instance by engagement of the foremost ball or projectile 24 with the ring 38 while the rearmost ball 24 is in contact therewith. The other limit of motion takes place when the rearmost ball is forced rearwardly by air pressure into sealing engagement with the sealing ring 30.

A pump indicated generally at 50 is provided which includes a fixed piston 52 mounted on a piston rod 54, and a longitudinally slidable cylinder 56. The piston rod 54 is of a hollow section as indicated at 58 and communicates with a central opening 59 through the piston 52. Accordingly, as the cylinder 56 is moved to the left as seen in Figure 2, air is compressed to the right of the piston 52 and is forced through the piston rod 54. The rear end of the piston rod 54 is connected by suitable tubing 60 to an inlet port 62 which leads into the interior of the chamber 26, and specifically between the sealing rings 46 and 38 thereof.

The operation of the toy should be apparent from the foregoing description but for completeness it will be reviewed. The strength of the spring 22 is selected such that the plunger 16 urges the projectiles in the magazine forwardly until the foremost projectile is seated against the ring 38. The ring 38 opposes further movement of the projectiles forwardly with sufficient force to resist the forward movement of the balls until air pressure has been applied. The sealing rings 30 and 46 may flex to the right as seen in Figure 2 under the force applied by the spring 22. Before discharging the first projectile the rearmost projectile within the chamber 26 is thus in sealing engagement with the relatively light flexible sealing ring 46 and is in contact with the foremost projectile. It is therefore spaced forwardly from the rear sealing ring 30. As air under pressure is admitted through the port 62 its first effect is to move the rearmost ball in the chamber 26 rearwardly into sealing engagement with the resilient stop ring 30. In some cases it may be possible to omit the relatively light sealing ring 46 and to depend upon a substantial flow of air to force the rearmost projectile rearwardly into engagement with the ring 30. However, better results are obtained when the sealing ring 46 is employed since loss of air flowing out of the chamber 26 past the rearmost ball is thus avoided. After the rearmost ball has been seated on the stop ring 30 the further introduction of air under pressure into the chamber builds up forces tending to move the foremost ball outwardly against opposition afforded by the sealing ring 38. When a sufficient air pressure has been built up the foremost projectile 38 is expelled with considerable force and with a noise which is particularly pleasing to the juvenile users of the toy. As soon as the foremost ball has thus been expelled from the chamber the spring 22 moves the entire series of balls forwardly so that the ball which formed a sealing closure for the rear of the chamber during expulsion of the first ball, now moves forwardly into engagement with the sealing ring 38. Thereafter the operation may be repeated as rapidly as desired until the supply of balls has been expended. It will be observed of course that one ball will remain in the chamber 26 since it is necessary for two balls to be in this chamber to effect expulsion of the first ball.

Referring now to Figures 5 to 8 there is illustrated a somewhat different embodiment of the invention. In this case, the toy comprises a stock 75 which is provided with a forwardly extending member 77. At the forward end of the member 77 is a handle 79 which is provided at its upper end with a guide loop 80. Also extending forwardly from the handle or stock 75 is a fixed piston rod 82 carrying at its forward end a piston 84. Slidably associated with the piston rod 82 is a cylinder 86 closed at its rear end by a plug 88 to which is also secured an operating handle 90. With the parts in the relationship illustrated in Figure 5 the operating handle 90 may be moved forwardly thus moving the cylinder 86 forwardly with respect to the fixed piston 84. Thereafter return movement of the handle 90 compresses the air in the cylinder 86 to the right of the piston 84.

At the forward end of the cylinder 86 is a body 92 having a chamber 94 therein. At the forward end of the chamber 94 is a discharge port indicated generally at 96 which is surrounded with a rubber sealing ring 98. The sealing ring as in the embodiment previously described, is preferably supported at its outer surface by a ring 99 which is dimensioned to require actual compression of the rubber as the ball is expelled. Accordingly, the ring 98 is designed to afford substantial opposition to movement of a projectile outwardly from the chamber 94 therethrough. An air inlet port 100 connects the forward end of the cylinder 86 with the chamber 94.

Member 92 is provided with a charging port

indicated at 102 which is provided by an annular member 104 secured to the body 92. Surrounding the charging port 102 is a sealing stop ring which is preferably formed of rubber or the like, and which is so designed and so supported as to permit movement of a projectile therepast into the chamber 94 but to prevent return movement of a projectile out of the chamber 94. For this purpose the ring 106 is preferably supported at its outer surface to a point more closely adjacent its inner edge than it is at its inner surface, as clearly seen in Figure 7.

A magazine 110, which is preferably of annular shape, is provided and has one end thereof connected to deliver projectiles serially to the chamber 94. The magazine 110 includes a follower 112 and a spring 114 for urging the follower into engagement with the projectile 116. The effectiveness of the spring 114 is so selected in accordance with the design and support of the sealing rings 98 and 106, that in the absence of air pressure the foremost ball will be retained in sealed engagement against the sealing ring 98 which surrounds the discharge port. The second or rearmost ball in the chamber 94 will at this time be in engagement with the foremost ball and will be spaced somewhat inwardly from the sealing ring 106.

Intermediate the rings 98 and 106 there is preferably provided a relatively thin flexible sealing ring 120 which is effective to remain in sealing engagement with the rearmost ball 116 whether it is in its forward position in contact with the foremost ball in the chamber 94, or whether it is in its rearmost position in contact with the sealing stop ring 106.

The operation of this embodiment of the invention is substantially identical with that previously described. When the magazine 110 has been charged and the plunger 112 released to advance the series of balls to the chamber 94, the first two balls of the series enter the chamber. Forward motion of the foremost ball is arrested when it engages the sealing ring 98. At this time the rearmost ball in the chamber 94 is in sealing engagement with the flexible ring 120 and is spaced somewhat forwardly from the stop ring 106. As air under pressure is introduced through the passage 100 its first effect is to move the rearmost ball rearwardly against the force supplied by the spring 114 until the ball seats on the ring 106. Thereafter, increase in pressure within the chamber 94 results in expulsion of the foremost ball against the resistance afforded by the ring 98. As soon as air pressure is released by discharge of the foremost ball, the spring 114 advances the series of balls so that the first two balls of the series are located within the chamber 94.

Instead of providing a coil compression spring of the type illustrated at 114 in Figure 6, it will be understood that any other type of spring, such for example as a phonograph type spring, could be employed. It will further be understood that instead of providing the magazine 110 in the form of an annulus the same could be provided in the form of a helix so that the number of balls contained therein could be substantially increased.

In both of the embodiments described operation of the gun is entirely automatic with the exception that it requires repeated operation of a manually operable pump. It will be evident from the foregoing disclosure however, that the device is adapted to operate in a fully automatic manner if a continuous air supply is introduced into the ball receiving chamber. Thus when one ball has been discharged air pressure in the chamber is released and the series of balls moves forwardly until the next ball is seated on the foremost sealing ring. Immediately that this occurs, the rearmost ball in the chamber moves rearwardly completing the seal of the chamber and resulting in the discharge of the foremost ball. This operation will continue automatically until all but one of the balls have been discharged.

It will be obvious that the essential requirement is the provision of means simultaneously arresting rearward movement of the second ball or projectile and affecting an air seal therewith so that the introduction of air under pressure between the two foremost balls will result in forcible expulsion of the foremost ball. Obviously, this result can be accomplished without the provision of the rear sealing ring 30 (as seen in Figure 2) or the sealing ring 106 (as seen in Figure 7). Instead, mechanical means may be provided for permitting one-way passage of the balls therepast and the air seal may be accomplished by independent means such for example as the flexible sealing ring 120.

The present application is a continuation-in-part of my prior copending application, Serial No. 738,286, now Patent No. 2,505,428.

The drawings and the foregoing specification constitute a description of the improved repeating toy gun in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A repeater toy gun for projecting a series of projectiles therefrom without requiring reloading which comprises an air compression chamber provided with a discharge opening having a first yieldable sealing ring resisting movement of a projectile outwardly therefrom, an inlet opening in said chamber having a second yieldable sealing ring surrounding said inlet opening and permitting entry of a projectile into said chamber, said rings having internal diameters smaller than the diameter of a projectile, means associated with said second ring preventing return movement of a projectile out of said chamber, a magazine for presenting a series of projectiles to said chamber, said chamber being dimensioned to receive at least a pair of projectiles simultaneously, and means for admitting air under pressure to said chamber to seat one projectile on said inlet opening and thereafter to expel the other projectile from said discharge opening.

2. A gun as defined in claim 1 in which said means associated with said second sealing ring is a rigid annular abutment of larger internal diameter than said second sealing ring at the side of said second sealing ring opposite to said chamber and engageable with said second sealing ring outwardly from its inner edge.

3. A gun as defined in claim 1 in which said second sealing ring is a flat rubber ring having an internal diameter smaller than the projectiles to be used in the gun, and said means associated with said second sealing ring to prevent return movement of a projectile out of said chamber is a rigid annular abutment engageable with the side of said rubber ring opposite to said chamber, said abutment having an internal diameter slightly larger than that of a projectile.

4. A repeater toy gun for projecting a series of balls therefrom without requiring reloading

which comprises an air compression chamber dimensioned to receive at least a pair of balls simultaneously, an inlet opening into said chamber, resilient means for advancing balls through said inlet opening, a first sealing ring around said inlet opening, means preventing return of balls through said opening, a discharge opening from said chamber, a second yieldable sealing ring opposing discharge of a ball therethrough, said rings having internal diameters smaller than the diameter of a projectile, and means for admitting air under pressure into said chamber.

5. A repeater toy gun for projecting a series of projectiles therefrom without requiring reloading which comprises an air compression chamber dimensioned to receive a pair of projectiles simultaneously, an inlet opening into said chamber, resilient means for advancing projectiles through said inlet opening, a first sealing ring around said inlet opening, means preventing return of projectiles through said opening, a discharge opening from said chamber, a second sealing ring opposing discharge of a projectile therethrough and means for admitting air under pressure into said chamber, a third sealing ring shaped to permit passage of a projectile therethrough under the impulse of said resilient means, said rings having internal diameters smaller than that of a projectile, said third ring being located intermediate said first and second sealing rings to remain in sealing engagement with the projectile last introduced into said chamber and to retain its sealing relation therewith as said projectile is moved rearwardly by air pressure against the force of said resilient means to seat against said first sealing ring.

6. A repeater toy gun for projecting a series of projectiles therefrom without requiring reloading, which comprises an elongated air compression chamber capable of receiving a pair of projectiles and having a discharge port at one end, a charging port adjacent the opposite end, a first resilient sealing ring surrounding said discharge port and imposing substantial resistance to passage of a projectile therethrough, a second sealing ring surrounding said charging port, said rings having internal diameters smaller than that of a projectile, means at the side of said second sealing ring opposite said chamber to oppose outward deflection of said ring and effective to prevent movement of a projectile outwardly of said chamber therethrough, a magazine for presenting a series of projectiles to said charging port, resilient means effective to move said projectiles forwardly through said charging port and to position the foremost projectile in engagement with said first sealing ring, and an air inlet port in said chamber intermediate said charging and discharge ports through which air is admitted to first seat the rearmost projectile on said second ring and thereafter to expel the foremost projectile through said first ring.

7. A repeater toy gun for projecting a series of projectiles therefrom without requiring reloading, which comprises an elongated air compression chamber capable of receiving a pair of projectiles and having a discharge port at one end, a charging port adjacent the opposite end, a first resilient sealing ring surrounding said discharge port and having an opening therethrough smaller than said projectiles to impose substantial resistance to passage of a projectile therethrough, a second sealing ring surrounding said charging port, means at the side of said second sealing ring opposite said chamber to oppose outward deflection of said second ring and effective to prevent movement of a projectile outwardly of said chamber therethrough, a magazine for presenting a series of projectiles to said charging port, resilient means effective to move said projectiles forwardly through said charging port and to position the foremost projectile in engagement with said first sealing ring, a third sealing ring intermediate said first and second rings and effective to engage the rearmost projectile in said chamber and to maintain a sealed relation therewith for any position of said rearmost projectile in said chamber including a rearward position in which said rearmost projectile is seated on said second ring and a forward position in which said rearmost projectile engages the foremost projectile while said foremost projectile is seated on said first ring, all of said rings having openings therethrough smaller than said projectiles, and an air inlet port into said chamber located between said first and third sealing rings.

8. A toy gun comprising an elongated air compression chamber capable of receiving a pair of projectiles, a discharge port in said chamber, a first sealing ring around said port of smaller internal diameter than a projectile opposing movement of a projectile therethrough, a charging port in said chamber, a generally annular magazine for receiving a series of projectiles, one end of said magazine being in position to deliver projectiles serially into said chamber, a spring in said magazine for urging projectiles toward said chamber, an air inlet port into said chamber, and means for effecting a seal between the rearmost projectile in the chamber and the chamber.

9. A toy gun comprising an elongated air compression chamber capable of receiving a pair of projectiles, a discharge port in said chamber, a first sealing ring around said port of smaller internal diameter than a projectile opposing movement of a projectile therethrough, a charging port in said chamber, a magazine for receiving a plurality of projectiles, one end of said magazine being in position to deliver projectiles serially into said chamber, a spring in said magazine effective to force said projectiles into said chamber, means in said chamber for effecting a seal between the rearmost projectile in said chamber and said chamber, and an air inlet port into said chamber intermediate said projectiles.

10. A toy gun comprising generally tubular means for supporting a series of balls, a first sealing ring engageable by the foremost ball and shaped to oppose movement of said ball therethrough, a second sealing ring effective to permit passage of balls therethrough toward said first ring, said rings having internal diameters smaller than the diameter of a ball, means associated with said second ring to prevent return movement of balls therethrough, said second ring being located rearwardly of said first ring to cooperate with the ball next adjacent to the foremost ball of the series, resilient means urging the series of balls forwardly with a force sufficient to move said balls through said second ring and into engagement with said first ring, and an air inlet port located intermediate said rings to admit air under pressure intermediate the first two balls of the series.

11. A toy gun comprising generally tubular means for supporting a series of balls, a first sealing ring having an internal diameter smaller than a ball engageable by the foremost ball and shaped to oppose movement of said ball therethrough, sealing means cooperable with the sec-

ond ball of the series to permit one-way movement of said balls therepast toward said first sealing ring and to prevent return movement of said balls and to provide an air seal therewith, resilient means urging the series of balls forwardly with a force sufficient to move said balls forwardly to seat the foremost ball on said first ring, and an air inlet port located intermediate said sealing means and said sealing ring to admit air under pressure intermediate the first two balls of the series.

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