

[54] AIR GUNS

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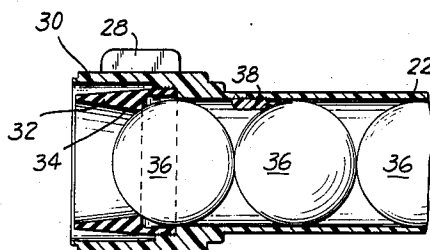
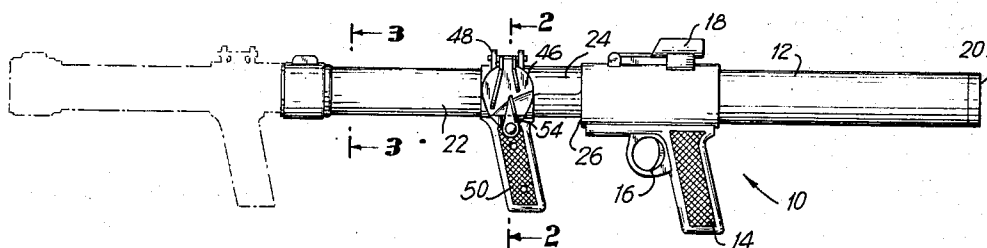
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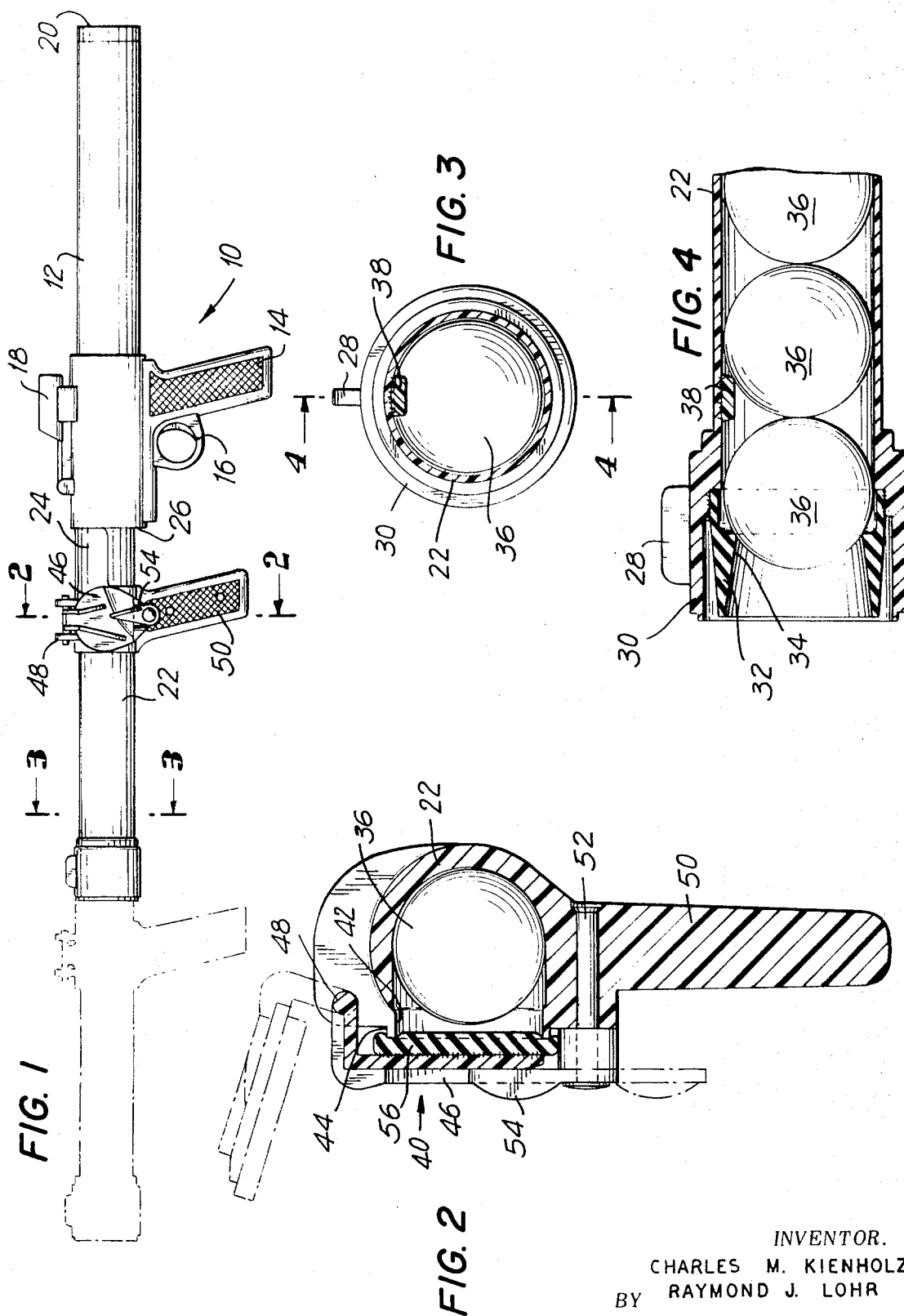
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ABSTRACT

An air gun where a series of spherical projectiles in a gun barrel are fired by air pressure one after the other out through the muzzle end of the barrel. The barrel has at its muzzle end a resilient sleeve through which each projectile will be propelled in response to the presence of sufficient air pressure behind each projectile to propel it through the resilient sleeve. This sleeve has a front end portion which is surrounded with clearance by the barrel to facilitate the movement of projectiles past it. Behind the resilient sleeve the barrel carries on one side of its interior a relatively small retarding block of resilient compressible material which engages the projectile next to the one which is about to be fired for retarding the movement of the series of projectiles toward the resilient sleeve, with the exception of that one projectile which is next to the sleeve to be next fired from the gun. This movement of the series of projectiles through the barrel is also caused by the air pressure behind the projectiles. Thus the same air pressure source behind the projectiles is utilized both for feeding the projectiles forwardly and for propelling the projectiles out of the gun.

9 Claims, 4 Drawing Figures





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AIR GUNS

BACKGROUND OF THE INVENTION

The present invention relates to air guns.

In particular, the present invention relates to that type of air gun in which a series of spherical projectiles similar to ping-pong balls are fired one after the other out of the barrel through the muzzle end thereof.

Air guns of this general type are known. However, the known air guns suffer from several drawbacks. Thus, it is desirable to arrange in the barrel of such a gun a series of projectiles which are to be fired one after the other out of the gun. However, since the air pressure builds up behind this series of projectiles in the barrel it is not always possible to accurately control the firing sequence since the entire series of projectiles are acted upon by the air under pressure which thus thrusts all of the projectiles toward the muzzle end of the barrel.

It is conventional to provide at the muzzle end of the barrel of such a gun a resilient sleeve which expands as the leading projectile is pushed therethrough by the air under pressure, but in spite of the fact that such sleeves have been constructed in a number of different ways some of which are quite complex, nevertheless up to the present time it has not been possible to accurately control the firing of the projectiles one after the other so that the operator of the gun can reliably operate it in such a way that only one projectile will be fired during one operation with the duration from this one firing to the firing of the next projectile being under the complete control of the operator.

In addition, conventional air guns of the above type are unavoidably encumbered with complexities which undesirably increase cost thereof and render the operation thereof unduly cumbersome. For example in order to load the conventional guns of the above type it is necessary to turn the resilient sleeve at the muzzle end of the gun inside out so that the projectiles can then be introduced into the barrel through the muzzle end thereof. This of course involves a considerable inconvenience and may in fact result in damage to the resilient sleeve. Furthermore it is essential for such construction that the resilient sleeve be situated at the exterior of the gun barrel so that it can be easily damaged by engaging foreign objects. Also, in order to assure movement of the projectiles up to the muzzle end of the barrel it has been proposed to provide in the barrel springs or other structure for continuously urging the projectiles forwardly toward the muzzle end of the gun, and of course these devices detract from the convenience and ease of operation since even if they do operate properly they make it difficult to load the gun through the muzzle end. Furthermore, as such a spring expands it exerts progressively smaller force on the projectiles, resulting in lack of uniform firing of the projectiles. Thus, with conventional air guns of the above general type it is also not possible to be assured that each projectile will be fired in precisely the same way.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide an air gun which will avoid the above drawbacks.

In particular, it is an object of the present invention to provide an air gun which will reliably control the fir-

ing sequence so that the operator will be assured that only one projectile will be fired at one time.

In addition it is an object of the present invention to provide an air gun of the above type which will assure firing of each projectile in precisely the same way even though a series of these projectiles are arranged one behind the other in a row along the interior of the barrel.

Furthermore it is an object of the present invention to provide for an air gun of the above type which will protect a resilient sleeve through which the projectiles are fired at the muzzle end of the barrel while at the same time achieving an extremely convenient loading of the projectiles into the barrel of the gun.

According to the invention the barrel of the gun carries a series of spherical projectiles and has at its muzzle end a resilient sleeve means through which the projectiles are sequentially fired by the air under pressure. Behind this sleeve means there is located in the barrel a retarding means for engaging the projectile next to the one which is about to be fired so as to retard the movement of the projectiles toward the muzzle end of the barrel and thus assure the desired sequence of firing of the projectiles out of the gun.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawing which form part of this application and in which:

FIG. 1 is a side elevation of a gun according to the invention, FIG. 1 showing the gun barrel in phantom lines in its extended position with respect to the gun's stock, illustrating the manipulation of the gun during pumping of air behind the projectiles in the gun barrel;

FIG. 2 is a transverse section taken along line 2—2 of FIG. 1 in the direction of the arrows and particularly showing details of a loading means of the invention;

FIG. 3 is a sectional transverse elevation taken along line 3—3 of FIG. 1 in the direction of the arrows and showing the retarding means of the invention; and

FIG. 4 is a longitudinal fragmentary sectional elevation taken along line 4—4 of FIG. 3 at the muzzle end region of the gun for further illustrating the structure of the gun at this region thereof.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, there is illustrated therein an air gun 10 having a rear stock 12 provided with a handle 14 and a simulated finger guard 16, although there is no trigger in the space around which the guard extends. Above the handle 14 the rear stock 12 carries a rear sight 18.

The rear stock 12 has an elongated hollow interior which is closed off from the outer atmosphere at the end 20 of the stock 12, and this elongated tubular stock 12 slidably receives in its interior the elongated barrel 22 which can be axially shifted with respect to the stock 12 between the solid and dot-dash line positions indicated in FIG. 1. In order to limit the outward movement of the barrel to the dot-dash line position shown in FIG. 1 any suitable coacting stops are carried by the barrel 22 and the stock 12, while in order to limit inward movement of the barrel 22 the latter has a shoulder portion 24 which strikes against the front end 26 of the stock 12. In response to movement of the barrel 22 axially between the solid and dot-dash line positions shown in FIG. 1 with respect to the stock 12, pressure builds up in a known way in the interior of the barrel

22 behind projectiles therein so as to propel these projectiles one after the other with the air under pressure. Thus, the elongated tubular rear stock 12 forms a means cooperating with and operatively connected to the barrel for building up therein the air pressure required to propel the projectiles.

Thus, the open rear end of the barrel forms a single inlet for air under pressure, this air pressure which can enter the barrel only through the open rear end thereof being utilized both for feeding the projectiles forwardly and for propelling the projectiles.

As is apparent from FIGS. 1 and 4, the front muzzle end region of the barrel 22 is provided with a front sight 28. At its muzzle end 30 the barrel is provided with a resilient sleeve means 32 in the form of a circular relatively short tube of rubber or the like fixed at its rear outer surface in any suitable way to the inner surface of the barrel in the manner shown in FIG. 4. This resilient sleeve means 32 is formed at its interior with an annular shoulder 34 smaller than the diameter of each of the projectiles 36 which may take the form of ping-pong balls, for example. As the pressure builds up in the barrel 22 behind these projectiles, the projectile 36 directly next to and engaging the shoulder 34 is pushed through the shoulder 34, expanding the latter so that the projectile will then be driven forwardly from the gun.

In order to control the movement of the several projectiles 36 in sequence to the firing position shown for the left projectile 36 in FIG. 4, the barrel 22 has fixed to the interior thereof a yieldable retarding means 38. This yieldable retarding means takes the form of a relatively small block of resilient compressible material such as foam rubber or other elastomeric material. This yieldable retarding means 38 may be fixed to the inner surface of the barrel in any suitable way as by being glued thereto, and of course the same type of gluing may be provided for fixing the resilient sleeve means 32 to the barrel 22. As is apparent from FIGS. 3 and 4, the yieldable retarding means 38 is of an exceedingly small size having dimensions axially and circumferentially of the gun barrel which are only a small fraction of the diameter of the barrel. Thus, this yieldable retarding means 38 in actual practice may have a dimension which is less than one-fourth the diameter of the gun barrel, or in other words less than one-half the radius thereof.

It has been found in practice that with such a construction as each projectile is fired from the gun, the yieldable retarding means 38 will act to permit the next projectile to move up to the resilient sleeve means 32 but will very reliably prevent firing of the next projectile. Furthermore it has been found that because of the action of the yieldable retarding means 38 each projectile 36 will be fired in precisely the same way. The air pressure itself feeds the projectiles one after the other up to the firing position in a fully controllable manner which assures that only one projectile will be fired during one operation of the air gun. It is unnecessary to provide any springs or the like for urging the projectiles up to the firing position. The yieldable retarding means 38 is compressed by each projectile as each projectile moves past the yieldable retarding means 38 to the firing position, and experience has shown that through this simple expedient it becomes possible to provide full control of the sequential firing of the projectiles and complete uniformity in the trajectories of each pro-

jectile so that irrespective of whether the barrel is loaded with a large number of projectiles or has only one or two projectiles therein, precisely the same operations are achieved with each projectile.

It will be noted from FIG. 4 that the resilient sleeve means 32 is fully protected by the barrel 22 at the front muzzle end thereof. This muzzle end 30 of the barrel 22 completely surrounds the resilient means 32 which is situated just to the rear of the front edge of the barrel shown at the left in FIG. 4, so that a complete protection is provided for the resilient sleeve means 32. It will be noted that this resilient sleeve means has an exterior surface spaced inwardly from the inner surface of the barrel at its muzzle end 30 so that it is possible for the resilient sleeve means 32 to expand outwardly while a projectile 36 is driven therethrough by the air under pressure.

In order that the resilient sleeve means 32 may be maintained undisturbed at the front end of the barrel in the manner shown in FIG. 4, a side-loading means 40 is provided as shown in detail in FIG. 2. Thus, this side-loading means includes a left side wall portion of the barrel 22 which is formed with an opening 42. This opening terminates in an outer lip 44. The loading means 40 includes a swingable cover member 46 which is hinged at 48 to the exterior of the barrel so that the cover 46 can be swung from the closed position shown in solid lines in FIG. 2 to the open position shown in dot-dash lines in FIG. 2.

The lower part of the barrel 22, where an operating handle 50 is located, has a pin 52 extending transversely therethrough and serving to pivotally support a releasable lock member 54 which may be swung around the pin 52 into a holding position overlapping the cover 46 and pressing the latter inwardly toward the axis of the barrel. The cover member 56 is provided at its inner surface with a sealing layer of foam rubber 56 or the like so that when the lock member 54 overlaps the cover 46 it compresses the sheet material 56 against the lip 44 to assure a fluid-tight closure of the barrel at the opening 42 thereof. However, when the lock member 54 is swung to the unlocking position shown in dot-dash lines in FIG. 2, the cover 46 of the loading means 40 can be swung up to the dot-dash line position shown in FIG. 2, and now a series of projectiles 36 can be introduced one after the other into the barrel with these projectiles moving in both directions along the barrel so as to entirely fill the latter, if desired. Once the barrel is loaded with such a series of projectiles the loading means 40 is returned to its closed position shown in solid lines in FIG. 2, and now the firing operations can proceed in the manner described above.

It is to be noted that because of the presence of this loading means 40, it is completely unnecessary to introduce the projectiles into the barrel through the muzzle end thereof, so that compression and expansion of the retarding means 38 and the sleeve means 32 takes place only during the actual operation of the gun during firing of projectiles therefrom.

What is claimed is:

1. In an air gun for firing spherical projectiles, an elongated barrel having a front muzzle end through which spherical projectiles arranged in a row in the barrel are adapted to be projected under the force of air pressure one by one, said barrel having a single inlet for air under pressure, and said single inlet being situated at a rear portion of the barrel behind the row of projec-

tiles therein, means operatively connected with said barrel for providing said air pressure at said single inlet behind the row of projectiles to urge the latter forwardly in the barrel, resilient sleeve means carried by said barrel at said muzzle end thereof for preventing the firing of each projectile until the air pressure behind each projectile is sufficiently great to drive the projectile through and beyond the resilient sleeve means, and retarding means carried by said barrel in the interior thereof behind said resilient sleeve means at a distance therefrom for engaging the projectile next to the projectile which engages said sleeve means for yieldably retarding movement of all of the projectiles in the barrel toward said sleeve means under the force of said air pressure with the exception of that one projectile which is directly next to said sleeve means.

2. The combination of claim 1 and wherein said retarding means is in the form of a body of resilient compressible and expandable material fixed to the inner surface of the barrel to be compressed by each projectile as it moves in the barrel past said retarding means to said sleeve means.

3. The combination of claim 1 and wherein a rear stock extends rearwardly from said barrel and a loading means is carried by the barrel at a substantial distance rearwardly of said muzzle end thereof forwardly of said rear stock for loading projectiles into the barrel through an opening formed in the wall of the barrel, said loading means having a closed position fluid-tightly closing said opening and an open position uncovering said opening for admitting projectiles into the barrel.

4. The combination of claim 3 and wherein said loading means includes a cover swingably carried by said barrel at the exterior thereof and having a closed position closing said opening and an open position uncovering said opening.

5. The combination of claim 4 and wherein a releasable lock means forms part of said loading means for releasably locking said cover in said closed position thereof.

6. In an air gun for firing spherical projectiles, an elongated barrel having a front muzzle end through which spherical projectiles arranged in a row in the barrel are adapted to be projected under the force of air pressure one by one, means operatively connected with said barrel for providing said air pressure behind the row of projectiles to urge the latter forwardly in the barrel, resilient sleeve means carried by said barrel at said muzzle end thereof for preventing the firing of each projectile until the air pressure behind each projectile is sufficiently great to drive the projectile through and beyond the resilient sleeve means, and retarding means carried by said barrel in the interior thereof behind said resilient sleeve means at a distance therefrom for engaging the projectile next to the projectile which engages said sleeve means for yieldably retarding movement of all of the projectiles in the barrel toward said sleeve means under the force of said air pressure with the exception of that one projectile which is directly next to said sleeve means, said retarding means being in the form of a body of resilient compressible and expandable material fixed to the inner surface of the barrel to be compressed by each projectile as it moves in the barrel past said retarding means to said sleeve means, said retarding means being in the form of a relatively small block of resilient compress-

ible material extending through only a short distance circumferentially and axially of the barrel, said block having axial and circumferential dimensions which are a small fraction of the diameter of the barrel.

7. The combination of claim 6 and wherein said dimension is less than one-fourth the diameter of the barrel.

8. In an air gun for firing spherical projectiles, an elongated barrel having a front muzzle end through which spherical projectiles arranged in a row in the barrel are adapted to be projected under the force of air pressure one by one, means operatively connected with said barrel for providing said air pressure behind the row of projectiles to urge the latter forwardly in the barrel, resilient sleeve means carried by said barrel at said muzzle end thereof for preventing the firing of each projectile until the air pressure behind each projectile is sufficiently great to drive the projectile through and beyond the resilient sleeve means, and retarding means carried by said barrel in the interior thereof behind said resilient sleeve means at a distance therefrom for engaging the projectile next to the projectile which engages said sleeve means for yieldably retarding movement of all of the projectiles in the barrel toward said sleeve means under the force of said air pressure with the exception of that one projectile which is directly next to said sleeve means, said retarding means being in the form of a body of resilient compressible and expandable material fixed to the inner surface of the barrel to be compressed by each projectile as it moves in the barrel past said retarding means to said sleeve means, said resilient sleeve means being situated in the interior of and surrounded by the barrel at the muzzle end thereof, said resilient sleeve means having a rear end portion fixed to the barrel and having an elongated portion extending forwardly from said rear end portion and surrounded with clearance by the barrel, said resilient sleeve means being fixed to the barrel only at said rear end portion thereof, so that said sleeve means can freely expand in said barrel at the muzzle end thereof during propelling of a projectile out through said sleeve means.

9. In an air gun for firing spherical projectiles, an elongated barrel having a front muzzle end through which spherical projectiles arranged in a row in the barrel are adapted to be projected under the force of air pressure one by one, means operatively connected with said barrel for providing said air pressure behind the row of projectiles to urge the latter forwardly in the barrel, resilient sleeve means carried by said barrel at said muzzle end thereof for preventing the firing of each projectile until the air pressure behind each projectile is sufficiently great to drive the projectile through and beyond the resilient sleeve means, and retarding means carried by said barrel in the interior thereof behind said resilient sleeve means at a distance therefrom for engaging the projectile next to the projectile which engages said sleeve means for yieldably retarding movement of all of the projectiles in the barrel toward said sleeve means under the force of said air pressure with the exception of that one projectile which is directly next to said sleeve means, said sleeve means having a rear end portion fixed to the barrel and extending forwardly from said rear end portion an elongated portion surrounded with clearance by the barrel so that said sleeve means can freely expand in said barrel at the muzzle end thereof during propelling of a pro-

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jectile out through said resilient sleeve means, said resilient sleeve means being fixed to said barrel only at said rear end portion of said resilient sleeve means and said resilient sleeve means having at its interior in the region of said rear end portion thereof an annular 5

shoulder smaller than the diameter of each of the projectiles, said sleeve means having a thickness which gradually diminishes from said annular shoulder forwardly to a front free end of said sleeve means.

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