

[54] AIR GUN MECHANISM ARRANGEMENT INCLUDING TRIGGER SAFETY

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[52] U.S. Cl. 124/15; 124/40; 124/41;

124/50

[51] Int. Cl.² F41B 11/00; F41C 17/02

[58] Field of Search 124/15, 40, 41, 45, 49, 124/50

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Primary Examiner—Richard J. Apley

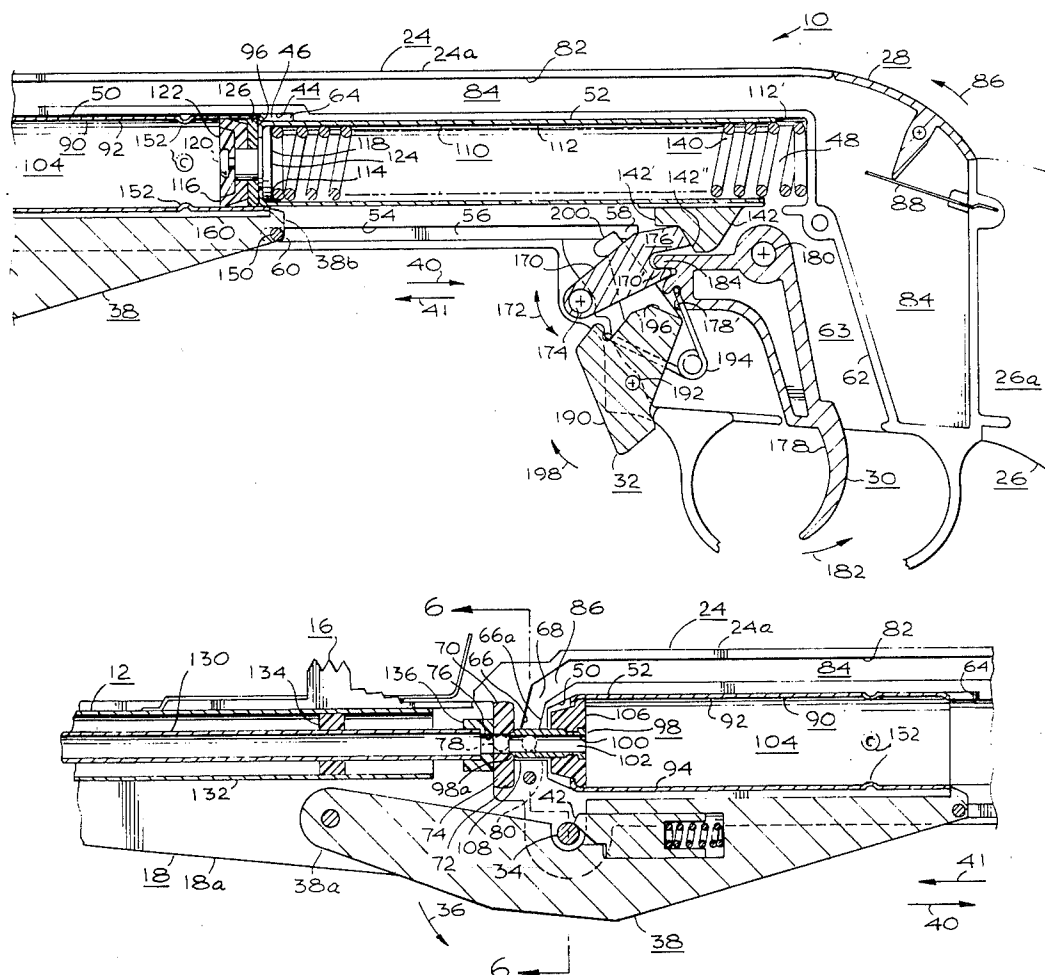
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[57] ABSTRACT

An improved air operated gun mechanism in which the transfer rod which moves a projectile into a position to be fired and the plunger, acting as a piston in a cylinder connected to the transfer rod are independently movable and actuated. The transfer rod is in sealing engagement with the pad holding the projectile to be fired and is restrained in such a position during firing of the projectile. The plunger, moving as a piston, compresses air in front of it which air exits through the transfer rod to propel the projectile. All air thus compressed is forced to exit through the transfer rod providing a high degree of efficiency. A safety is incorporated to prevent actuating the trigger unless the safety is in the OFF position. The safety mechanism and trigger are operatively interconnected and cooperate with the cocking mechanism to ensure that, regardless of the position of the safety, each time the gun is cocked the safety is moved to the safe position.

7 Claims, 7 Drawing Figures



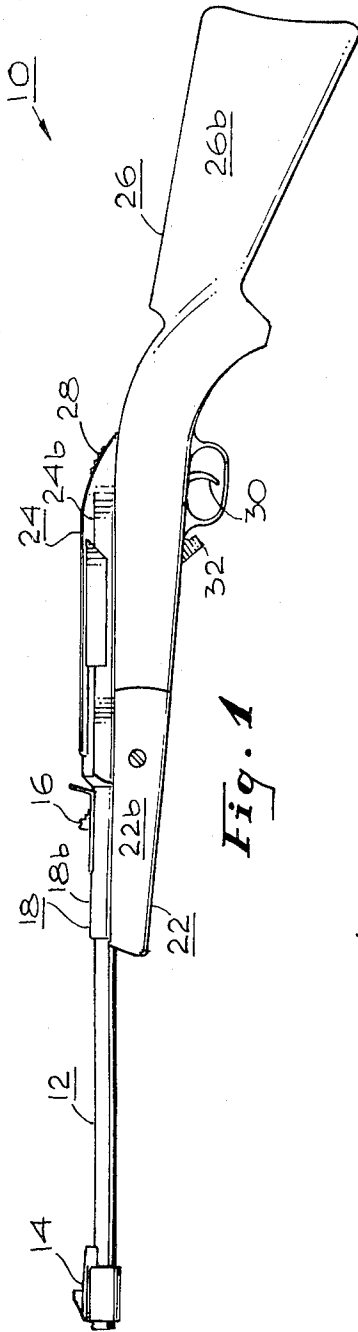


Fig. 1

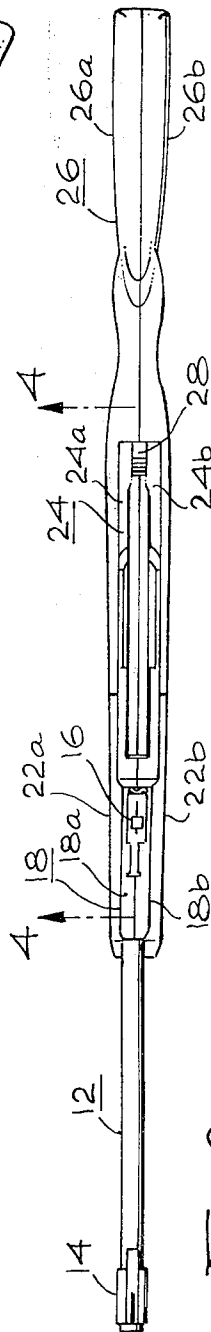


Fig. 2

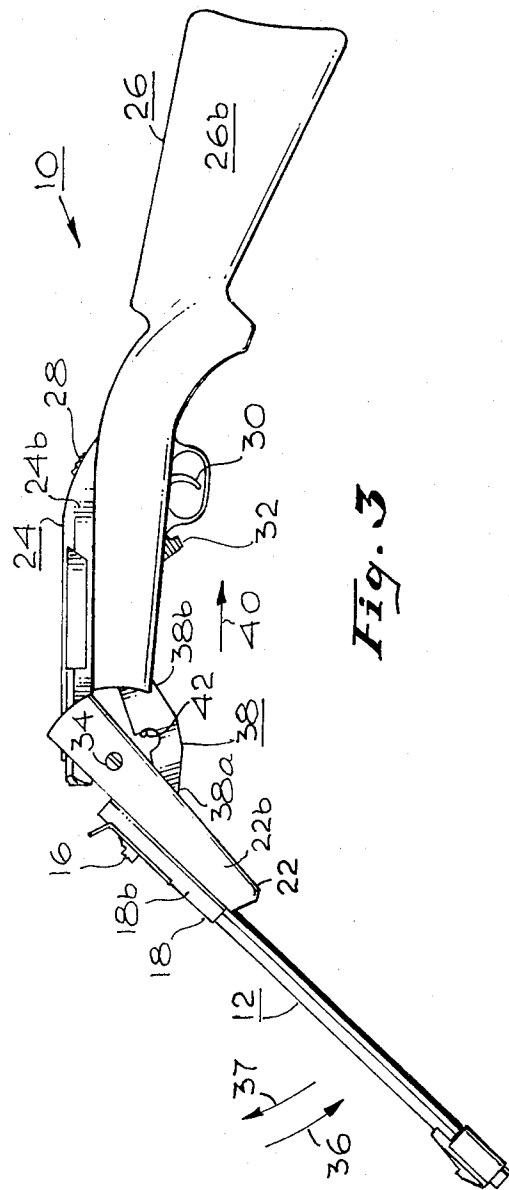
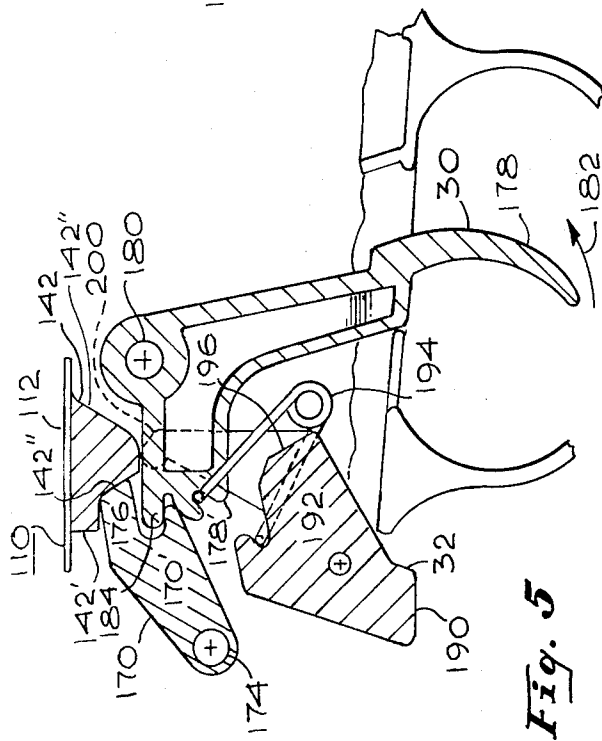
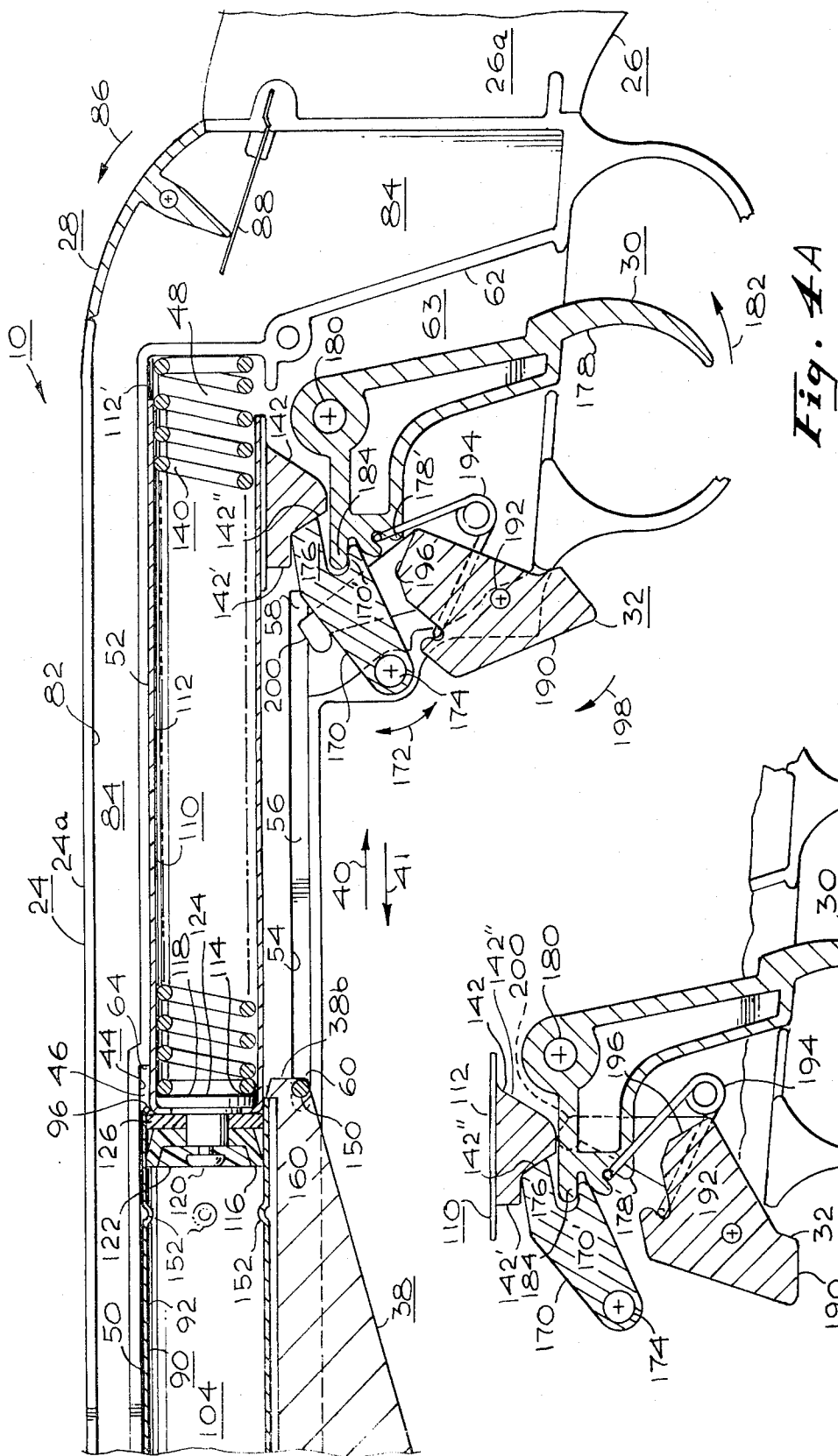


Fig. 3



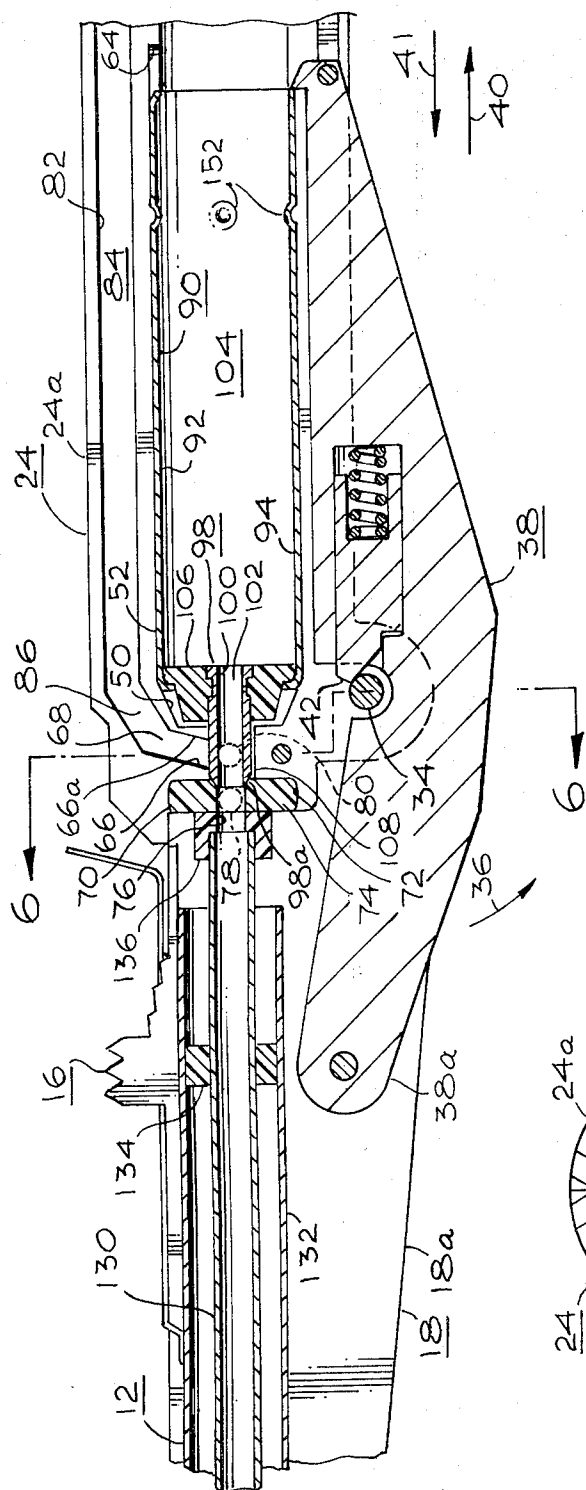


Fig. 4B

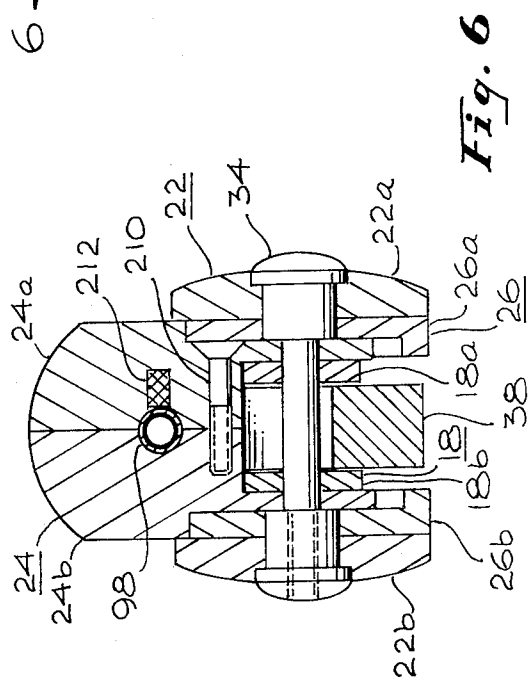


Fig. 6

AIR GUN MECHANISM ARRANGEMENT INCLUDING TRIGGER SAFETY

This is a division of application Ser. No. 362,421, filed May 21, 1973.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the weapons art and more particularly to an improved air operated gun mechanism.

2. Description of the Prior Art

Air operated guns and the mechanisms therefor have long been known and utilized. In general such mechanisms for air operated guns are powered by a spring which is compressed by manual actuation of the mechanism and retained in the compressed position until the gun is to be fired. When the gun is fired the spring drives a plunger-type mechanism which, acting in a manner similar to a piston compresses air during its powered movement under the influence of the spring. The compressed air exits through a comparatively small aperture adjacent to the projectile to be fired. The force of the compressed air acting on the projectile fires the projectile. Many such mechanisms also incorporate a transfer rod, particularly those utilized in repeater-type air operated guns, for positioning the projectile to be fired prior to actuation of the trigger mechanism for releasing the plunger. However, many prior art air gun mechanisms incorporated the transfer rod as part of the plunger mechanism and therefore the transfer rod was not positionable independently of the plunger. Examples of such devices are shown in U.S. Pat. Nos. 1,766,179; 1,323,640 and 2,196,732. By coupling the transfer rod directly to the plunger it very often was difficult to position accurately the pellet to be fired and, further, such a construction did not lend itself to providing a high efficiency whereby virtually all the air compressed by the plunger was utilized to propel the projectile.

In U.S. Pat. No. 2,151,676 the transfer rod for feeding the pellet is movable but not independently of the plunger. Other patents such as U.S. Pat. No. 1,477,770; 2,194,142 and 2,630,795 all show various types of air operated gun mechanisms. However, none of the above-mentioned patents show the independent positioning of the transfer rod and the substantially air tight sealing of the mechanism so that virtually all the air compressed is utilized to propel the projectile.

Further, in general none of the above-mentioned prior art patents illustrate a safety mechanism for the gun that prevents trigger actuation except when the safety mechanism has been manually moved to the release position.

Additionally, none of the above-mentioned prior art patents show a structure that allows repeating action, firing of projectiles such as "BB"s and single shot firing of projectiles such as darts and/or pellets.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved air operated gun mechanism.

It is another object of the present invention to provide an air operated gun mechanism in which substantially all the air compressed during firing of the gun is effectively utilized to propel the projectile.

It is yet another object of the present invention to provide an air operated gun mechanism in which the

transfer rod for positioning the projectile to be fired may be moved independently of the plunger utilized to compress the air for firing the projectile.

It is yet another object of the present invention to provide a safety mechanism associated with the trigger mechanism which requires manual activation from the safety to a release position to allow trigger actuation and firing of the gun and which is always automatically put into the safety position each time the gun is cocked.

It is yet another object of the present invention to provide an air operated gun mechanism that allows repeating action firing of projectiles such as "BB"s and single action firing of projectiles such as darts and/or pellets.

The above and other objects of the present invention may be effectively utilized in air operated gun mechanisms of either the rifle or pistol type. Therefore, the preferred embodiment of the present invention, for generality, describes and illustrates the present invention as utilized in a repeating rifle. However, it is apparent that the same mechanism may equally well be utilized in a single shot rifle, in pistols and in virtually any type of air operated gun.

The preferred embodiment of the present invention, as incorporated in a repeating rifle, generally is provided with a housing having a generally cylindrical aperture therein. A compression tube means slidably mounted in the cylindrical aperture adjacent the forward end thereof and moves reciprocatingly in axial directions therein. The compression tube has a tubular body member and the forward end of the tubular body member is provided with an axially aligned transfer rod coupled thereto extending forwardly therefrom. The transfer rod is also tubular and, in a firing position of the compression tube the forward end of the transfer rod is in substantially air tight sealing engagement with a resilient projectile holding pad. The projectile to be fired is positioned in an aperture in the resilient projectile holding pad and the forward end of the transfer rod is in substantially air tight sealing engagement in the firing position with the walls defining the aperture in the pad. A plunger means is also slidably mounted in the cylindrical chamber of the housing and the forward end of the plunger means projects into the tubular body member of the compression tube and is in substantially air tight sliding sealing engagement therewith with a predetermined frictional force therebetween. A spring means is intermediate the housing and the plunger for resiliently resisting movement of the plunger away from the forward end of the compression tube and providing driving force for driving a plunger in the compression tube when the gun is fired.

A cocking means is provided and is movably mounted with respect to the compression tube and plunger means for moving the plunger against the spring. A trigger means including a sear is also provided to restrain the plunger means when the spring has been compressed after a predetermined travel of the plunger means. The predetermined frictional force between the plunger means and the compression tube moves the compression tube into the retracted position thereof during the movement of the plunger means against the spring. When the cocking means is moved forwardly it engages the compression tube and moves it relative to the restrained plunger into the firing position. During the time period when the compression tube is in the retracted position, in a repetitive firing gun utilizing the present invention projectiles move, under the force of

gravity, from a projectile storage chamber into a projectile feed chamber adjacent to the forward end of the transfer rod. When the compression tube and the transfer rod is moved forwardly by the cocking means into the firing position the transfer rod moves the projectile into the resilient projectile holding pad and the end of the transfer rod is in substantially air tight sealing engagement with the resilient projectile holding pad and axially aligned with the projectile to be fired therein. The only opening into the compression tube is through the transfer rod.

When the trigger is actuated the sear releases the plunger and the spring drives the plunger in the compression tube compressing air in front of it during such movement. The only exit for the air from the compression tube is through the tubular transfer rod and the air thus propels the projectile through the barrel of the gun for firing the projectile.

Single shot firing of projectiles such as darts or pellets may also be accomplished by manually placing such projectiles into a resilient barrel pad in the barrel adjacent the projectile holding pad.

A safety means is incorporated adjacent to the trigger means and prevents trigger actuation when in the safety position. The cocking lever moves the safety means and the trigger mechanism during the compression of the spring to provide that after the spring is compressed and restrained by the sear the safety lever is always in the safe position regardless of whether it was in the safe or released position at the beginning of the cocking motion.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other embodiments of the present invention may be more fully understood from the following detailed description taken together with the accompanying drawings wherein similar reference characters refer to similar elements throughout and in which:

FIG. 1 is a side elevational view of a preferred embodiment of the present invention;

FIG. 2 is a top plan view thereof;

FIG. 3 illustrates the embodiment shown in FIGS. 1 and 2 when the embodiment is being cocked;

FIG. 4A and 4B is a sectional view along the line 4—4 of FIG. 2;

FIG. 5 is a sectional view illustrating the trigger mechanism and safety mechanism in the release position thereof for firing actuation of the trigger mechanism; and

FIG. 6 is a sectional view along the lines 6—6 of FIG. 4B.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As noted above the present invention may be utilized in air-powered rifles, pistols or any other type of gun. However, for generality in order to explain the principles of operation of the present invention the preferred embodiment described herein illustrates the utilization of the improved air-operated gun mechanism in a repeating rifle. However, such illustration and description is not limiting to the invention.

Referring now to the drawings there is illustrated in FIG. 1 and FIG. 2 a preferred embodiment of the present invention, generally designated 10 as incorporated in a repeating rifle of the type adapted to fire repetitively projectiles such as BBs, and to fire single shots, non-repetitively, pellets and darts. The rifle 10 is gener-

ally comprised of the barrel means 12 having a forward sight 14 and a rear sight 16. The rear sight 16 is mounted on a barrel housing means 18 which, in the preferred embodiment 10 is comprised of right hand barrel housing 18a and left hand barrel housing 18b split along center plane 20. The forearm 22 is also comprised of a left hand forearm 22a and a right hand forearm 22b split along the center plane 20.

A main housing 24 is provided and is also, in the preferred embodiment 10, split into a left and housing 24a and a right hand housing 24b which are divided along the center plane 20. A stock 26 is also split along the center plane 20 into the right hand stock 26a and a left hand stock 26b.

A fill door 28 is provided in the main housing 24 which permits filling a predetermined number of BB projectiles in the embodiment 10, as described below in greater detail. A trigger means 30 for firing the rifle 10, as described below in greater detail, is also provided as is a safety means 32.

The embodiment 10 is cocked by rotating the barrel means 12, barrel housing 18 and forearm 22 about main pivot pin 34 that extends through the stock 26 and main housing 24. Cocking is illustrated in FIG. 3 wherein it is shown that rotation of the barrel 12 in the direction indicated by the arrow 36 moves a push rod 38 having a first end 38a pivotally coupled to the barrel housing 18 and a second end 38b, as explained below in greater detail, slidably mounted in the main housing 24. During such cocking motion the second end 38b moves in the barrel housing 24 in the direction indicated by the arrow 40. The push rod 38 is also provided with a latch means 42 that provides latching of the push rod 38 to the main pivot pin 34 when the rifle 10 is in the closed position as illustrated in FIG. 1 and 2. FIGS. 4A and 4B illustrate a sectional view along the line 4—4 of FIG. 2 in which, as shown on FIG. 2 is along the center plane 20.

As shown in FIGS. 4A and 4B the housing 24 is provided with first walls 44 defining a cylindrical chamber 46 having a first end 48 and a second end 50. The cylindrical chamber 46 has a first portion 52 adjacent the second end 50 thereof that has a larger diameter than a second portion 52 adjacent the first end 48 thereof.

The housing 24 is also provided with second walls 54 defining a track means 56 having a first end 58 in regions adjacent the first end 48 of the cylindrical chamber 46 and a second end 60 spaced a preselected distance from the first end 58 thereof. The track means 56 is spaced from and substantially parallel to the cylindrical chamber 46.

Third walls 62 are provided in the housing 24 to define a trigger means accepting cavity adjacent the first end 48 of the cylindrical chamber 46 and the first end 58 of the track means 56.

Fourth walls 64 are provided in the cylindrical chamber 46 defining a detent means spaced from the first end 48 of the cylindrical chamber 46 and intermediate the first end 48 and second end 50 thereof.

In the embodiment 10, as noted above, the present invention is illustrated in the repeating rifle embodiment adapted to repetitively fire projectiles such as BBs. Accordingly, fifth walls 66 are provided in the housing 24 to define a projectile feed cavity 68 communicating with the first end 50 of the cylindrical chamber 46. The projectile feed cavity 68 is proportioned to allow singular feed of the preselected projectiles, such as BBs therethrough. That is, only a single BB at a time

may pass therethrough.

Sixth walls 70 are provided in the housing 24 to define a projectile holding cavity 72 communicating with the projectile feed cavity 68. A projectile holding means 74 is positioned in the projectile holding cavity 72 and comprises a resilient pad means. The resilient pad means 74 has walls 76 defining a projectile holding aperture therethrough for holding a projectile to be fired resiliently therein. As explained below in greater detail, the projectile to be fired 78 is moved from the position shown in FIG. 4B at 80 from the projectile feed cavity 68 into its resiliently held position indicated at 78 in the projectile receiving aperture 76 of the resilient pad means 74.

In order to provide repetitive feeding of projectiles the housing 24 is provided with seventh walls 82 defining a projectile storage chamber 84 communicating with the projectile feed cavity 68 and having a neck portion 86 therebetween and the neck portion 86 is proportioned to allow singular feed of the projectiles from the projectile storage cavity 84 into the projectile feed cavity 68. Projectiles may be fed into the projectile storage cavity 84 by rotating the feed door 28 in the direction indicated by the arrow 86 against release spring 88 and pouring the projectiles into the opening thus provided. The resilient action of the release spring 88 automatically closes the door 28 when the desired number of projectiles has been stored in the projectile storage chamber 84.

A compression tube means 90 is slidably mounted in the first portion 50 of the cylindrical chamber 46 for reciprocating motion therein in axial directions indicated by the arrows 40 and 41. The compression tube 90 moves in the direction indicated by the arrow 40 until it engages the detent 64 wherein it is in a retracted position and in the direction indicated by the arrow 41 until it engages the second end 50, which is the position illustrated in FIGS. 4A and 4B, where it is in the firing position thereof.

The compression tube means 90 is generally comprised of a tubular body member 92 having a forward end 94 in regions adjacent the second end 50 of the cylindrical chamber 46 and a back end 96 in regions adjacent the detent 64. Thus, the detent 64 engages the back end 96 of the compression tube 90 to stop the motion thereof in the direction indicated by the arrow 40 towards the first end 48 of the cylindrical chamber 46. A tubular transfer rod 98 is coupled to the forward end 94 of the compression tube 90 and has walls 100 defining an air passageway 102 therethrough. The air passageway 102 communicates with the cylinder 104 defined by the tubular body member 90. In the embodiment 10 the transfer rod means 98 is coupled to the forward end 94 of the compression tube means 90 by a resilient pad 106 and the transfer rod means 98 has a forward portion 108 extending forwardly of the forward end 94 of the tubular body member 92. The air passageway 102 is axially aligned with the projectile receiving aperture 76 in the resilient projectile holding pad means 74 and, for the compression tube means 90 in the firing position shown in FIG. 4B the forward end 98a of the transfer rod 98 is in substantially air tight sealing relationship with the projectile receiving aperture 76 in the resilient pad means 74. When the compression tube means 90 is moved from the firing position shown in FIG. 4A and 4B in the direction indicated by the arrow 40 to the retracted position wherein the back end 96 of the tubular body member 92 is in en-

gagement with the detent 64 the first or forward end 98a of the transfer rod 98 is moved free of the resilient pad means 74 and is adjacent the back wall portion 66a of the wall 66 defining the projectile feed chamber 68 to allow movement of a projectile from the neck portion 86 into the projectile feed cavity 68. Thus, the transfer rod 98 moves the projectile to be fired from the position indicated at 80 to the position indicated at 78 when the compression tube means 90 is moved in the direction indicated by the arrow 41 from the retracted position to the firing position shown in FIG. 4.

A plunger means 110 is slidably mounted in the second portion 52 of the cylindrical chamber 46 for reciprocating motion therein in the axial directions indicated by the arrows 40 and 41. The plunger means 110 has a stem member 112 which, in the embodiment 10 illustrated in the drawing is generally tubular and has a forward end 114 in the cylinder 104 defined by the tubular body member 92 of the compression tube 90. A generally cup-shaped resilient pad means 116 is coupled to the forward end 114 of the stem member 112 by a rivet means 118 and having a forward end 120 engaging an insert 122 in the cup-shaped pad 116 and a second end 124 crimped into the forward end 114 of the stem member 112. A backup washer 126 is intermediate the cup-shaped resilient pad 116 and the forward end 114 of the stem member 110 for axial compressive support thereof in cooperation with the insert 122. The cup-shaped resilient pad means 116 has a sliding substantially air tight fit in the cylinder 104 defined by the tubular body member 92 of the compression tube 190 to provide a predetermined frictional force therebetween. Thus, the cup-shaped resilient pad means 116 acts as a piston in the cylinder 104. As shown the cylinder 104 is substantially free of any air passageways therefrom except the air passage 102 in the transfer rod 98. Thus, when the plunger means 110 moves in the direction indicated by the arrow 41 from the retracted position shown in FIG. 4A, 4B to the firing position wherein the cup-shaped resilient pad 116 is adjacent the resilient pad 106 of the compression tube means 90 substantially all the air compressed in the cylinder 104 is forced to exit therefrom through the air passage 112 in the transfer rod 98. Since the transfer rod 98 has a forward end 98a in substantially air tight sealing engagement with the resilient projectile holding pad means 74 and the air passage 102 is aligned with the projectile to be fired 78 substantially all of the air flowing therethrough is utilized to propel the projectile. The fired projectile leaves the projectile holding aperture 76 and is fired through an inner barrel 130 of the barrel means 12 that is spaced from an outer barrel 132 by spacers 134 of which is shown in FIG. 4B. A resilient barrel seal pad 136 may be provided intermediate the inner barrel 130 and projectile holding pad 74, and, preferably is in air tight sealing relationship therewith.

When it is desired to fire darts and/or pellets such projectiles may be manually placed in the cavity 136' of the barrel seal pad 136 when the rifle is in the position shown in FIG. 3. Operation of the embodiment 10 is as described herein during such single shot operation.

A main spring means 140 is intermediate the stem means 112 and the housing 24. In the embodiment 10 shown in the drawing the main spring means 140 is positioned in the tubular stem member 112 and yieldingly resists movement of the plunger means 110 in the direction indicated by the arrow 40 to the retracted position illustrated in FIG. 4A and 4B.

A tab means 142 is coupled to the stem member 112 of the plunger means 110 adjacent the second end 112' thereof and is aligned with the track means 56 in the housing 24. In the retracted position of the plunger means 110 the tab means 142 is in the trigger cavity 63 defined by the third walls 62.

Cocking of the embodiment 10 by movement as shown in FIG. 3 is utilized to move the compression tube means 90 from the firing position shown in FIG. 4 to the retracted position thereof and to move the plunger means 110 from the firing position thereof to the retracted position thereof. This is achieved through the cocking means comprising the push rod 38. The push rod 38 has a guide member 150 positioned in the track means 56 of the housing 24. When the plunger means 110 is in the firing position thereof a shoulder portion 142' of the tab means 142 is adjacent the second end 38b of the push rod 38. As the gun is cocked the guide member 150 of the push rod 38 slides in the track means 56 and the forward end 38b of the push rod 38 engages the shoulder portion 142' to move the plunger means 110 against the force of the main spring 140 and into the retracted position shown in FIGS. 4A and 4B. As the resilient cup-shaped pad means 116 slides in the cylinder 104 the predetermined frictional force therebetween causes movement of the compression tube means 90 from the firing position thereof towards the retracted position thereof in the direction indicated by the arrow 40. Such motion continues until the back end 96 of the tubular member 92 of the compression tube means 90 engages the detent 64. After such engagement the plunger means 110 moves relative to the compression tube means 90 and into the retracted position thereof. To ensure that the compression tube 90 is moved fully into the retracted position dimples 152 may be placed in the tubular body member 92 of the compression tube means 94 engagement with the resilient cup-shaped pad means 116. As the resilient cup-shaped pad means 116 engages the dimples 152 the compression tube is positively moved into the retracted position against the detent 64. The resilient pad means 116 deforms to move by the dimples 152 and into the retracted position shown in FIG. 4A. Movement of the barrel means 12 in the direction indicated by the arrow 37 on FIG. 3 moves the guide member 150 of the push rod 138 in the track means 56 of the housing 24 in the direction indicated by the arrow 41. A shoulder means 160 on the push rod 38 engages the back end 96 of the tubular body member 92 and compression tube 90 and moves the compression tube 90 from the retracted position in the direction indicated by the arrow 41 in FIG. 4A and 4B into the firing position as illustrated therein. Such movement is independent of the plunger means 110 and thus the compression tube 90 is positively positioned into the firing position by the push rod 38 each time the embodiment 10 is caught and returned to the position shown in FIGS. 1 and 2. This independent positioning of the compression tube means 90 in the firing position ensures that the proper sealing relationship between the transfer rod 98 and the projectile holding pad means 74 is obtained prior to any movement of the plunger means 110 in the direction indicated by the arrow 41 and thus ensures the high efficiency of air utilization and operation of the mechanism of the present invention. Further, the shoulder portion 160 not only moves the compression tube means 90 into the firing position but positively restrains the compression tube

in each firing position to ensure the continued proper seating relationship desired.

The trigger means 30 mounted in the trigger mechanism receiving cavity 63 of the housing 24 generally comprises a sear means 170 pivotally mounted for rotation in the direction indicated by the double-ended arrow 172 about sear pivot 174. In the position shown in FIG. 4A the seal 170 has a pad engaging portion 176 engaging a second shoulder 142' of the tab means 142 to restrain the plunger means 110 in the retracted position. The trigger means 30 also comprises a trigger lever 178 pivotally mounted on trigger pivot 180 for trigger actuation in the direction indicated by the arrow 182. The trigger lever 178 has a sear engaging portion 184 that engages the sear on portion 170' thereof when the trigger lever 178 is actuated by movement in the direction 182 the trigger lever 178 rotates about the trigger pivot 180 moving the sear 170 downwardly and away from engagement with the second shoulder 142' of the tab 142. When the sear is free of such engagement the plunger means 110 moves under the influence of the main spring 140 into the firing position thereof to fire the projectile to be fired 78.

In order to prevent inadvertent operation of the improved air operated gun mechanism a safety means 32 is provided in the trigger receiving cavity 63. The safety means 32 is shown in the safety position in FIG. 4A and comprises a safety lever 190 mounted for pivotal movement about safety pivot 192. An overcenter spring means 194 is provided operatively engaging the safety shown in FIG. 4A the overcenter spring means 194 forces the safety lever 190 into the position shown and the blocking shoulder 196 on the safety lever 190 engages the end portion 178' of the trigger lever 178 to prevent movement of the trigger lever 178 in the direction indicated by the arrow 182. Thus, the trigger lever 178 cannot be rotated to release the sear while the safety lever 190 is in the safe position.

In order to fire the embodiment 10 the safety lever 190 is moved in the direction indicated by the arrow 198 to the release position shown in FIG. 5. This movement from the safety position to the release position must be done manually and, as noted below, must be accomplished after each time the rifle is cocked.

As shown in FIG. 5 the safety lever 190 has been rotated in the direction indicated by the arrow 198. Such rotation against the tension of the center spring means 194 rotates the shoulder 196 away from engagement with the portion 178' of the trigger lever 178 and the trigger lever may then be actuated in the direction indicated by the arrow 182. Upon such actuation the portion 184 of the trigger lever 178 moves the sear away from engagement with the pad means 142 and the gun is fired. For the safety means 32 in the released position shown in FIG. 5 the overcenter spring means 194 restrains the safety lever 178 is actuated in the direction indicated by the arrow 182 relative movement of the trigger lever 178 with respect to the safety lever 190 moves the overcenter spring means 194 so that the force exerted between the trigger lever 178 and the safety lever 190 forces the safety lever 190 into the safe position shown in FIG. 4A. The overcenter spring means 194 in retracting between the safety lever 190 and trigger lever 178 also returns the trigger lever and sear 170 to the position shown in FIGS. 4A and 5 after actuation in the direction indicated by the arrow 102.

In order to ensure that the safety lever 190 is always moved in the safe position as shown in FIG. 4A regard-

less of the position thereof when the rifle is cocked, a tab portion 200 is provided on the safety lever 190 and, in the safe position, overlies the track means 56 in the housing 24 forwardly of the sear 170 which overlies the track means 56 adjacent the second end 58 thereof. When the embodiment 10 is cocked the back face 140''' of the tab means 142 on the plunger 140 moves in the direction indicated by the arrow 40 over the track means 56 and engages the tab portion 200 of the safety lever 190 to rotate the safety lever 190 in the direction opposite to that indicated by the arrow 198 about the safety lever pivot 192 and the shoulder 196 thereof is moved out of engagement with the portion 178' of the trigger lever 178. Further movement of the tab means 142 closes the backface 142'' thereof to engage the sear 170 and rotate the sear 170 about the sear pivot 174. This rotates the trigger lever 178 about the trigger pivot 180 in the actuation direction indicated by the arrow 182. This provides relative movement between the sear 170, trigger lever 178 and safety lever 190 substantially identical to actuation of the trigger lever 178 and thus, as described above, the overcenter spring means 194 forces the safety lever 190 into the safe position thereof. Thus, if the safety lever 190 is in the release position shown in FIG. 5 then the tab portion 200 is free of contact with the tab 142 and the backface 142'' thereof engages the sear 170 for rotation as described above which moves the safety lever 190 into the safe position. Therefore, regardless of the position of the safety lever when cocking of the gun is commenced when the plunger 110 is moved into the retracted position the safety lever is automatically moved into the safe position thereof.

The safety lever 190, of course, may be manually moved, as noted above, from the safety position to the release position thereof and, similarly, for the release position shown in FIG. 5 to the safety position shown in FIG. 4 if it is desired.

As noted above the housing 24 is preferably fabricated from two halves 24a and 24b which, as shown in FIG. 6, may be held together by screw means 210. In some embodiments of the present invention it may be desired to provide a holding force for holding the projectile to be fired in the projectile feed chamber 68 in the position shown at 80 in FIG. 4B. In order to achieve such temporary holding a magnet 212 may be positioned in the housing 24 adjacent thereto. The magnet 212, of course, will hold the projectile in the position indicated at 80 when the projectile is made of magnetizable material.

This concludes the description of the preferred embodiments of the present invention. From the above it can be seen that there has been provided an improved air operated gun mechanism in which the compression tube has a transfer rod for moving a projectile to be fired into a resilient pad that holds the projectile to be fired in a properly aligned position. The transfer rod is connected to the compression tube and is moved into the firing position thereof independently of movement of the plunger which moves reciprocally in the compression tube to compress air therein for firing the projectile to be fired. The only air passageway from the compression tube is through the transfer rod and thus substantially all of the air compressed by the plunger therein is utilized to propel the projectile. Safety means are also provided and the safety means are automatically moved in the safety position each time the gun is cocked regardless of whether the safety means was in

the release position or safety position thereof at the commencement of the cocking operation. The safety means, of course, is manually movable from the safe position to the release position and from the release position to the safe position thereof.

While the above-described preferred embodiment of the present invention illustrates utilization of the rifle it will be appreciated that the same mechanism may equally well be utilized in a manner apparent to those skilled in the art in hand guns as well as rifle embodiment. Similarly, if it is desired to utilize the above-described embodiment of a rifle for firing projectiles other than BBs or spherical projectiles which may be easily fed repetitively in the manner hereinabove described, projectiles such as pellets or darts may be placed directly into the barrel seal pad 136 of the end of the inner barrel 130 when the rifle is cocked. The same highly efficient operation of the mechanism then follows the utilization. However, there is not automatic feeding of such a projectile to be fired by the transfer rod 98.

Those skilled in the art may find many variations and adaptations of the present invention and the following claims are intended to cover all such variations and adaptations falling within the true scope and spirit thereof.

I claim:

1. An air operated gun mechanism comprising, in combination:

a housing;

a compression tube means slidably mounted in said housing for reciprocating motion between a firing position and a retracted position, and having a forward end having first walls defining an air passage aperture;

a plunger means slidably mounted in said housing for reciprocating motion between a firing position and a retracted position, and said plunger means having a forward position slidably mounted in said compression tube means and having a predetermined frictional force therebetween, and said forward portion adjacent said forward end of said compression tube means for the condition of said plunger means and said compression tube means in said firing position thereof, and said compression tube means free of air passageways communicating with regions external thereof other than said air passage aperture intermediate said forward end of said compression tube means and said forward end of said plunger means;

cocking means movably mounted in said housing for moving said plunger means from said firing position to said retracted position by movement of said cocking means in a first direction, and said predetermined frictional force between said plunger means and said compression tube means being of such magnitude that when said plunger means is moved by said cocking means from said firing position of said plunger means to said retracted position thereof, said friction force moves said compression tube means from said firing position thereof to said retracted position thereof with said compression tube means free of engagement with said cocking means for said movement between said firing position of said compression tube means and said retracted position thereof, and said cocking means moving said compression tube means from said retracted position to said firing position

by movement of said cocking means in a second direction opposite said first direction;

spring means for resiliently resisting movement of said plunger means from said firing position to said retracted position, and said spring means in a compressed condition for the condition of said plunger means in said retracted position, and said spring means extendable to an extended position to drive said plunger means from said retracted position to said firing position;

trigger means manually actuatable for releasably holding said plunger means in said retracted position thereof to releasably hold said spring means in said compressed condition thereof, and actuating said trigger means releases said spring means to drive said plunger means into said firing position thereof, and said movement of said cocking means in said second direction moves said compression tube means into said firing position thereof free of spring forces thereon by said spring means;

projectile holding means on said housing means for holding a projectile to be fired adjacent said air passage aperture to said compression tube for the condition of said compression tube in said firing position, and

safety means movably mounted on said housing and operatively engaging said trigger means and manually movable from a safety position preventing trigger means actuation to a released position allowing trigger means actuation.

2. The arrangement defined in claim 1 wherein: said cocking means engages said compression tube means to restrain said compression tube means in said firing position thereof.

3. The arrangement defined in claim 2 wherein said compression tube means further comprises:

transfer rod means for positioning the projectile to be fired in said projectile holding means for movement of said compression tube means from said retracted position to said firing position thereof.

4. An air operated gun mechanism comprising, in combination;

a housing comprising:

first walls defining a cylindrical chamber having a first end and a second end;

second walls defining a track means spaced from and in parallel relationship to said cylindrical chamber and having a first end in regions adjacent said first end of said cylindrical chamber and a second end spaced from said first end;

third walls defining a trigger means accepting cavity adjacent said first ends of said cylindrical chamber and said track means;

fourth walls defining a detent means in said cylindrical chamber intermediate said first end and said second end thereof;

fifth walls defining a projectile feed cavity communicating with said second end of said cylindrical chamber; and

sixth walls defining a projectile holding cavity communicating with said projectile feed cavity;

compression tube means slidably mounted in said cylindrical chamber for reciprocating motion between said second end and said detent, and said compression tube means comprising:

a tubular body member having a forward end in regions adjacent said second end of said cylindrical chamber;

a back end adjacent said track means in regions adjacent said detent, and said back end engaging said detent to stop movement of said compression tube towards said first end of said cylindrical chamber;

a transfer rod having walls defining an air passage aperture therethrough coupled to said forward end of said tubular body member;

and said compression tube means movable from a firing position wherein said forward end of said tubular body member is adjacent said second end of said cylindrical chamber and said transfer rod is adjacent said projectile holding cavity, and a retracted position wherein said back end of said tubular body member is adjacent said detent and said transfer rod is positioned in said projectile feed cavity, whereby said transfer rod moves a projectile to be fired from said projectile feed cavity into said projectile holding cavity for the condition of movement of said compression means from said retracted position to said firing position;

a plunger means slidably mounted in said cylindrical chamber for reciprocating motion therein and comprising:

a stem member having a forward end slidably mounted in said compression tube and having a predetermined frictional force therebetween for substantially air tight reciprocating motion therein;

tab means coupled to said stem member and adjacent said track means;

and said plunger means movable from a firing position wherein said forward end of said stem means is adjacent said forward end of said compression tube means, and a retracted position wherein said forward end of said stem member is spaced from said forward end of said compression tube means, whereby air is compressed in said compression tube means for the condition of said plunger means moving from said retracted position to said firing position, and compressed air is expelled through said transfer rod to propel the projectile to be fired from said projectile holding cavity, and said predetermined frictional force between said plunger means and said compression tube means moves said compression tube means from said firing position to said retracted position for the condition of movement of said plunger means from said firing position to said retracted position thereof, and said compression tube means free of air passage apertures communicating with regions external said compression tube means other than said aperture in said transfer rod in regions forward of said forward end of said plunger means;

spring means intermediate said plunger means and said housing for resiliently resisting movement of said plunger means from said firing position to said retracted position and driving said plunger means from said retracted position to said firing position;

cocking means slidably mounted in said track means and said cocking means comprising:

a first portion for engaging said tab means on said stem member of said plunger means for movement of said cocking means towards said first end of said track means to move said plunger means to said retracted position thereof;

a second portion for engaging said back end of said body member of said compression tube means for movement of said cocking means toward said second end of said track means to move said compression tube means from said retracted position

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tion to said firing position thereof;
trigger means mounted in said trigger receiving
cavity of said housing and comprising:

a sear means for engaging said plunger means to
detachably hold said plunger means in said re-
tracted position thereof;

a trigger lever operatively engaging said sear means
and manually actuatable to move said sear means
from said detachably holding engagement with
said plunger means and to release said plunger
means for the condition of actuation of said trig-
ger lever; and

safety means movably mounted on said housing ad-
jacent said trigger means receiving cavity and
manually movable from said safety position in
locking engagement with said trigger lever to
prevent said trigger actuation to a released posi-
tion free of said locking engagement with said trig-
ger lever.

5. The arrangement defined in claim 4 wherein said
safety means further comprises:

a safety lever;

an overcenter spring means between said trigger
lever and said safety lever for biasing said safety
lever both in said safety position and said re-
leased position and yieldingly resisting move-
ment of said safety lever therebetween, said over-
center spring means moving said safety lever

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from said released position to said safety position
for the condition of actuation of said trigger
means.

6. The arrangement defined in claim 5 wherein:

said sear means overlies said track means;

said tab means on said plunger means engages said
sear means for movement of said plunger means
into said retracted position thereof to actuate
said trigger lever, whereby said safety lever is bi-
ased by said overcenter spring means into said
safety position.

7. The arrangement defined in claim 6 wherein said
safety lever further comprises:

an arm portion overlying said track means intermedi-
ate said sear means and said second end of said
track means for the condition of said safety lever in
said safety position thereof, and said tab means on
said plunger means engaging said arm on said
safety lever for movement of said plunger means
into said retracted position to move said safety
lever against said overcenter spring means from
said safety position to a position free of said locking
engagement with said trigger lever, whereby fur-
ther movement of said plunger means towards said
first end of said cylindrical chamber to provide said
engagement of said tab means with said sear means
to provide said actuation of said trigger lever.

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