

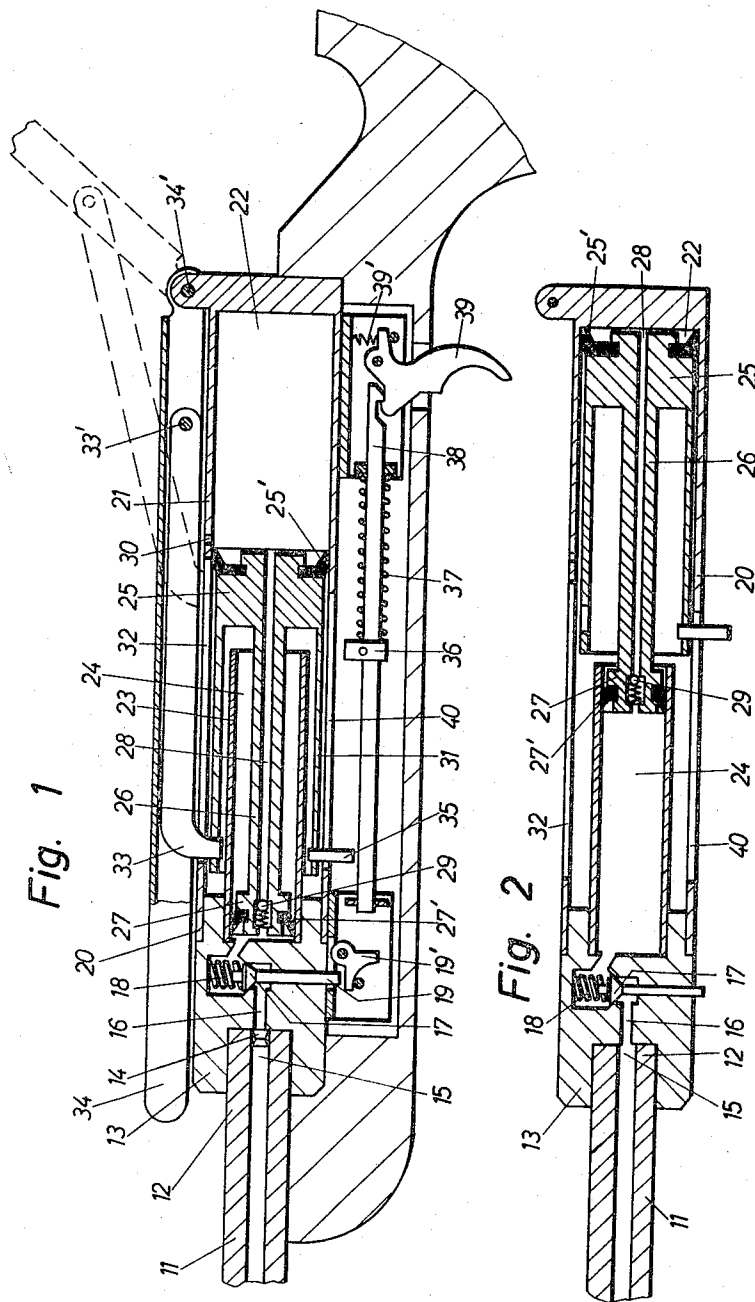
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PROJECTILE PROPELLING DEVICE OPERATED BY COMPRESSED AIR

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PROJECTILE PROPELLING DEVICE OPERATED
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This invention is concerned with a compressed gas gun and particularly with a gun of this type employing compressed air.

Compressed air guns, such as pistols and rifles are known and operate on the principle of employing highly compressed air for driving a pellet or projectile from the barrel of the weapon.

It is known in connection with such weapons to compress air by air pumps or the like and to store the air in a storage container from which air is withdrawn when needed for driving the pellet from the gun barrel. In guns of this type complicated regulating devices are employed for controlling the amount and pressure of the air delivered on each shot. Furthermore, because of the complexity of such devices, the performance thereof is not precise and uniform from one shot to the next.

It is also known to provide several cylinders in a gun of this nature in which the air can be compressed in steps, such cylinders being arranged inside movable levers and in similar parts with channels interconnecting the cylinders and including portions extending through the joints of the levers. An arrangement of this nature obtains high pressure of the compressed air but is expensive and unreliable because of inevitable leakages of air at the joints of the compressed air system.

It is also known to construct a compressed air operated weapon in which a piston is connected with a cocking lever and is moved inside a cylinder by the lever with a single motion thereof. When the piston is in one end position it entraps air in one end of the cylinder, and this air is admitted to the end of the barrel for firing a shot. It has been found that with this type of weapon the results are uniform from one shot to the next and relatively high pressures can be obtained by the arrangement. Such a device however is substantially limited to use in connection with pistols because a relatively limited amount of compressed air is available.

The present invention proposes an arrangement wherein a large volume of highly compressed air is established with the air being uniform from one shot to another and of sufficient quantity to operate a rifle and to produce uniform range results thereof from one shot to another.

A particular object of this invention is the provision of a compressed air rifle in which uniform results of firing are always obtained.

Another object of this invention is the provision of an air compressing system for use with a compressed air gun which will always yield substantially the same amount of air at substantially the same pressure so that uniform firing results will be had.

A still further object of this invention is the provision of a compressed air gun in which the expelling of the pellet from the gun barrel occurs substantially immediately upon the release of the trigger mechanism. This last-mentioned objective is of particular benefit as compared to the type of compressed air gun in which a piston is spring loaded preparatory to firing and is released by the trigger mechanism so that the energy in the spring drives the piston and the piston, in turn, compresses air which expels the projectile from the gun barrel.

Still a further object of this invention is the provision

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of a compressed air operated gun in which a large volume of air at high pressure is developed by cocking of the gun, but wherein the cocking of the gun is relatively easy.

These and other objects and advantages of this invention will become more apparent upon reference to the following specification taken in connection with the accompanying drawings, in which:

FIGURE 1 is a longitudinal sectional view through a compressed air gun constructed according to the present invention showing the mechanism in cocked position preparatory to firing a shot, and

FIGURE 2 is a view like FIGURE 1 but showing only the rear end of the barrel and the piston and cylinder mechanism of the compressed air mechanism, and with the piston illustrated in the position that they occupy when the cocking operation is half completed.

General arrangement

According to the present invention, an air compressing system is provided for gun in which two or more cylinders are provided located in axial alignment and with pistons in the cylinders which are coupled together so that during the intake stroke of one piston, the other piston accomplishes a compression stroke. The pistons are arranged to be effective in both directions of movement so that cocking of the gun is easier and the amount of air compressed is more accurately measured.

The piston and cylinder containing the highest pressure is located immediately at the rear of the gun barrel and a short valved passage connects the last mentioned cylinder with the barrel so that upon opening of the valve, the compressed air strikes the pellet with impact like force and drives the pellet rapidly from the gun barrel.

The pistons are of different diameters, reducing in the direction toward the gun barrel and compressing the air up to about 60 atmospheres gauge so that extremely high pressures are available for impelling the pellet from the gun barrel.

High pressures can, of course, be obtained by compounding more cylinders, but I have found that two pistons and two cylinders are generally adequate and will develop the 60 atmospheres gauge referred to.

According to the invention, the two pistons are connected by a common piston rod which has a passage therethrough interconnecting the cylinders of the pistons and with the passage having a check valve adjacent the smallest piston, and which is adjacent the gun barrel so that the compressed air is confined to the smallest possible space in the air compressing mechanism.

I prefer a lever pivoted to the gun for moving the pistons during the cocking operation, but it will be evident that any suitable device can be employed for moving the pistons in the cylinders.

Structural arrangement

Referring more in detail to the drawings, FIGURE 1 shows a gun according to the present invention with the pistons in cocked position. In the drawings the barrel of the gun is indicated at 11 and its rear end 12 is received in a headpiece 13, preferably with suitable sealing means to prevent loss of compressed air at the back end of the barrel. The barrel, however, is movable relative to the headpiece, such as by being tiltable to receive a pellet or projectile 14 in a chamber 15 provided therefor at the back end of the barrel. The back end of the barrel communicates with a compressed air supply channel 16 within which channel is located a conical closure valve 17 urged into closing position by a spring 18. The valve can be moved to open position by upward movement thereof through the rod 19 which is adapted for being thrust upwardly by the pivoted actuator 19'.

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Headpiece 13 supports an outer casing member 20 extending axially from the headpiece in a direction opposite barrel 11. Casing 20 has a closed cylindrical portion 21 at the extreme right hand thereof defining a first stage cylinder 22. Also connected with headpiece 13 on the side opposite barrel 11 is a smaller casing member 23 and which defines cylinder 24 of the second stage of the air compressing mechanism.

A piston member 25 is slidably mounted in the first stage cylinder 22 and is sealed thereto as by the sealing member 25'. Piston 25 is connected by a rod portion 26 with piston 27 disposed in the secondary stage cylinder 24, and which last mentioned piston 27 is sealed in cylinder 24 as by the sealing means 27'.

A bore 28 leads completely through the rod 26 and the pistons 25 and 27, and at the end thereof adjacent piston 27 has a check valve 29 which will permit air to pass leftwardly only through bore 28.

The first stage cylinder 22 is also provided with a port 30 opening to the atmosphere and so located that it is uncovered by piston 25 only when the piston is in the extreme right hand position.

Piston 25 is likewise provided with an elongated skirt portion arranged telescopically about casing portion 23. The skirt portion 31 is adapted for engagement by the end of a cocking member 33, as will be seen in FIGURE 1, and which cocking lever is slidable along slot 32 provided in the wall of casing 20. The cocking member 33 is pivoted at 33' to a cocking lever 34 which is, in turn, pivoted at 34' to lug means on the right end of casing 20. Normally, the cocking lever and cocking member would be disposed on the slide of the gun, but in the drawings is illustrated as being mounted on the top thereof to simplify the showing.

The operation of the cocking lever 34 not only accomplishes compressing of air by the compressed air system, but also cocks a trigger mechanism preparatory to firing of the gun. The cocking of the trigger mechanism is accomplished by a pin 35 carried by skirt portion 31 of piston 25 and extending through another slot 40 in casing portion 20. Pin 35 is adapted to engage a collar 36 fixed to firing rod 38 and which rod is pressed leftwardly toward firing lever 19' by a compression spring 37. When pin 35 moves rightwardly upon actuation of lever 34 so that it picks up collar 36, the collar and rod are moved rightwardly and the extreme right end of the rod cams over trigger 39 and is latched thereto, the said trigger and rod being held in latched position by a spring 39'. Upon pulling trigger 39, rod 38 is released and is driven by spring 37 leftwardly into engagement with lever 19' which will push upwardly on rod 19 and open valve 17 against the thrust of spring 18.

In operating the device, lever 34 is moved from its full line position in FIGURE 1 back to its dotted line position, also shown in FIGURE 1, and this will move pistons 25 and 27 to their extreme right hand position as illustrated in FIGURE 2. During the first portion of the movement of the pistons, valve 17 remains open and air will pass therethrough to the left side of piston 27. Simultaneously, air is being compressed on the right side of piston 25, but is retained in cylinder 22 by the spring loaded check valve 29. At about the time the pin 35 picks up collar 36 to move rod 38 rightwardly and permit valve 17 to close, the pressure in first stage cylinder 22 becomes sufficient to open valve 29 and the compressed air in cylinder 22 commences to transfer to cylinder 24. By the time piston 25 bottoms in the right end of cylinder 22, substantially all of the air from cylinder 22 will be transferred into cylinder 24. Return movement of lever 34 to its full line position in FIGURE 1 will then be accompanied by compressing of the air in cylinder 24 up to about 60 atmospheres gauge. Lever 34, when in its full line position, is either on or is slightly over a dead center position, or is latched in

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place so that the pistons are firmly held in the position in which they are illustrated in FIGURE 1.

The suction created by cylinder 22 during rightward movement of piston 25 can be relieved by leakage of air past seal 25' or by admitting air into the cylinder through port 30 after the pistons reach their left hand position.

The same can be said of piston 27 except that inasmuch as air can enter cylinder 24 through valve 17 during the initial portion of the right hand movement of the pistons, the seal pertaining to piston 27 can be extremely effective to the point of permitting no leakage past the piston if so desired.

Once the gun is cocked, it is only necessary to operate trigger 39 to fire a shot.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions; and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. A compressed air gun having a barrel, and air compressing means at the rear end of the barrel for supplying compressed air thereto to drive a pellet through the barrel; said air compressing means comprising a pair of cylinders, pistons in the cylinders interconnected by a bored rigid rod to move said pistons in unison in the same directions in their cylinders, said cylinders including a smaller cylinder and a larger cylinder, said smaller cylinder being adjacent said barrel, a base in said rod forming a first passage leading from the larger cylinder to the smaller cylinder, a second passage leading from said smaller cylinder to said barrel, a one-way valve in said first passage responsive to a predetermined pressure in said larger cylinder for opening said first passage, and a normally closed valve in said second passage selectively operable to open said second passage to release air compressed in said smaller cylinder into said barrel.

2. A compressed air gun having a barrel, and air compressing means at the rear end of the barrel for supplying compressed air thereto to drive a pellet through the barrel; said air compressing means comprising a pair of coaxial cylinders of different diameter with the smaller cylinder adjacent said barrel, respective pistons sealingly mounted in each cylinder and a rod rigidly connecting said pistons wherein an axial bore extends through the rod so that upon movement of the pistons away from the barrel air will pass from the larger cylinder throughout the length of said bore into the smaller cylinder, a check valve in said bore to prevent air flow therein away from the smaller cylinder, a valved bore means connecting the smaller cylinder with the barrel whereby movement of the piston toward the barrel will compress air in said smaller cylinder, and means for opening the valve in said valved bore means to admit the compressed air into said barrel to drive a pellet therethrough.

3. A compressed air gun having a barrel, and air compressing means at the rear end of the barrel for supplying compressed air thereto to drive a pellet through the barrel; said air compressing means comprising a pair of coaxial cylinders of different diameter with the smaller cylinder having a closed end adjacent the rear end of the barrel, said larger cylinder being closed at the end thereof remote from the rear end of the barrel, a piston sealingly fitted in each cylinder, an axially bored rod rigidly interconnecting said pistons, a check valve in said bore operable to permit air flow from the larger cylinder to the smaller cylinder when the pistons are moving away from said barrel while preventing flow from the smaller cylinder to the larger cylinder when the pistons are moving toward said barrel, a short passage connecting the closed end of said smaller cylinder with the rear end of the barrel, a normally closed control valve in said passage, cocking means for first moving said pistons away from said barrel and then toward said barrel and for

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holding the pistons in said last mentioned position, and means for opening said control valve when the pistons are in said last mentioned position.

4. A compressed air gun according to claim 3 in which said check valve is at the end of said bore nearest the piston in the smaller cylinder.

5. A compressed air gun according to claim 4 in which said cocking means comprises a lever pivoted at one end adjacent said cylinders, and a link pivoted to said lever and engaging said pistons, said link and lever collapsing adjacent said cylinders into a position substantially over-center to effect the said holding of the pistons in said last mentioned position.

6. A compressed air gun according to claim 4 in which said control valve is moved to open position by spring loaded trigger operated means, said check valve being

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spring biased toward closed position, and said cocking means being arranged to engage and reset said spring loaded trigger operated means to close said control valve at about the time the pressure in said larger cylinder reaches the valve required to open said check valve.

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