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PNEUMATIC RIFLE WITH ADJUSTABLE VALVE

Filed Aug. 20, 1965

Sheet of 3

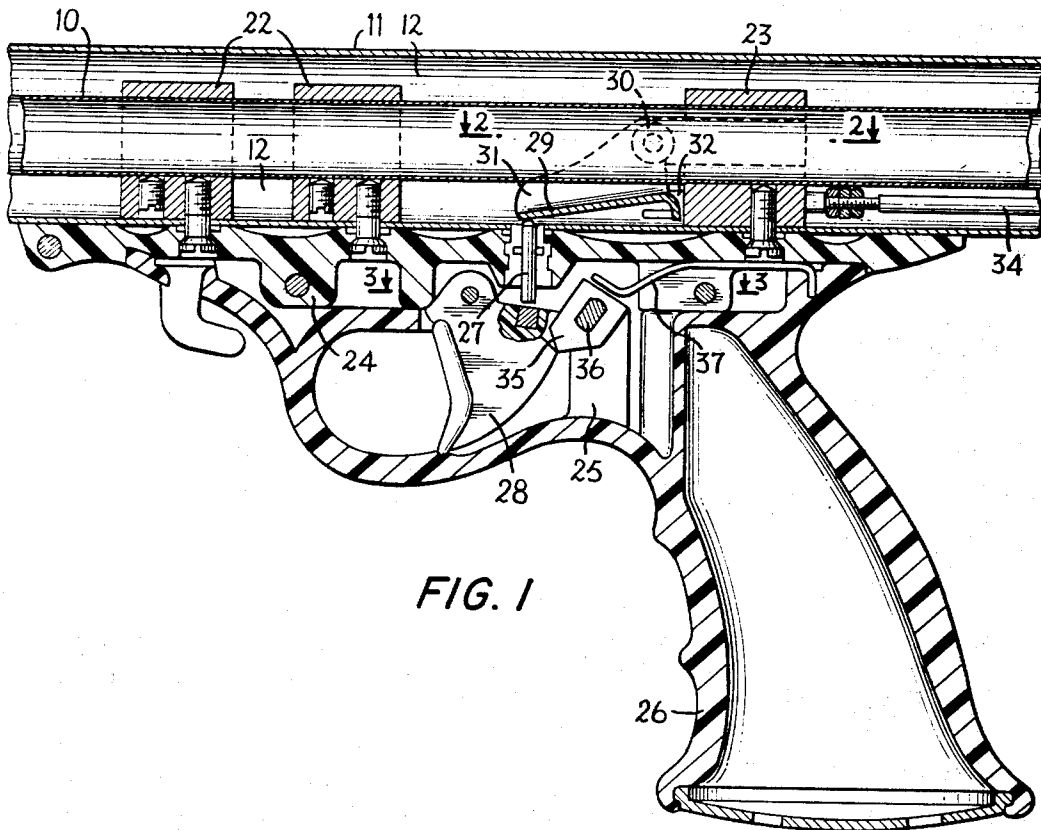


FIG. 1

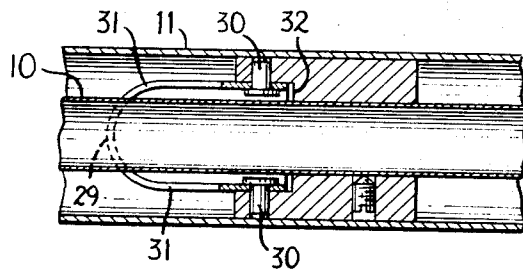


FIG. 2

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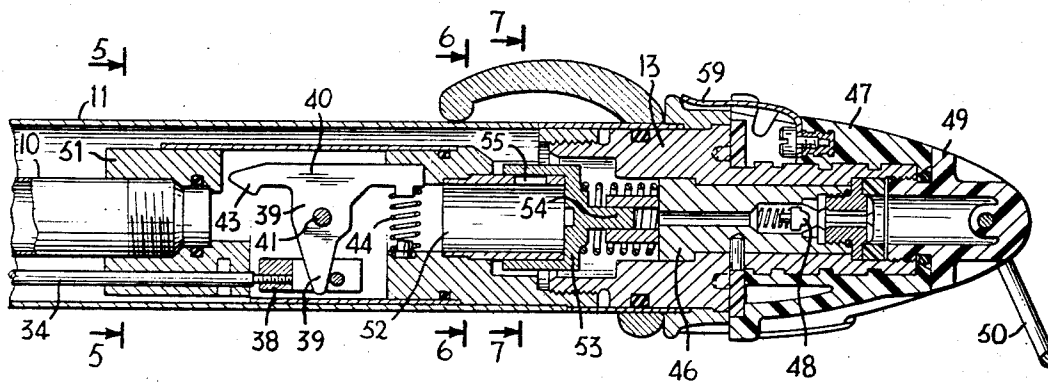


FIG. 4

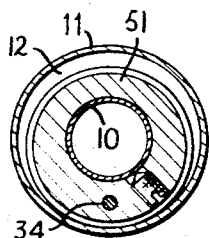


FIG. 5

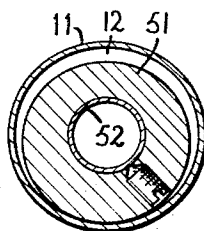


FIG. 6

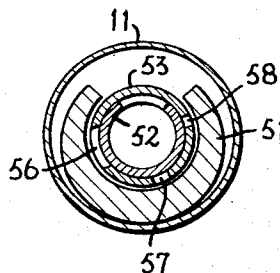


FIG. 7

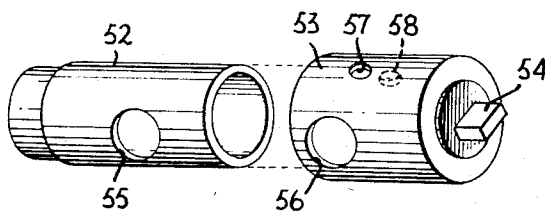


FIG. 8

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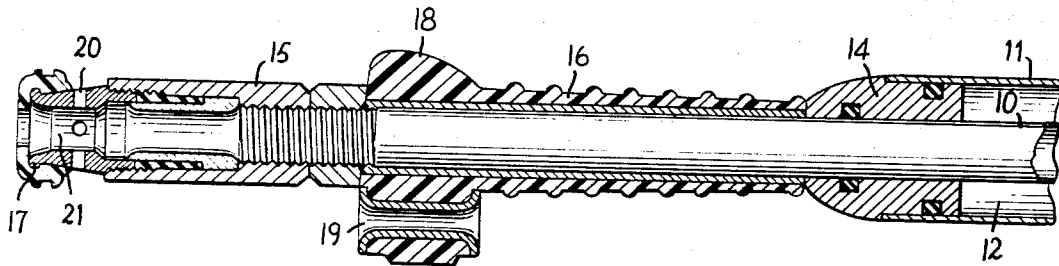


FIG. 9

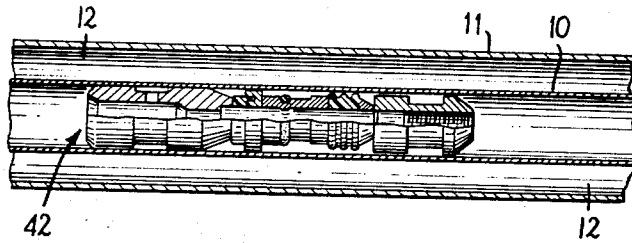


FIG. 10

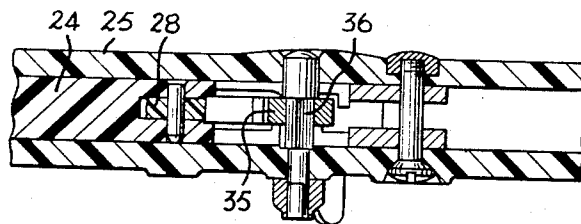


FIG. 3

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PNEUMATIC RIFLE WITH ADJUSTABLE VALVE
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 U.S. Cl. 124—11
 Int. Cl. F41b 11/00

4 Claims

ABSTRACT OF THE DISCLOSURE

A pneumatic rifle having a pressure chamber within a tubular housing surrounding part of the rifle barrel with a valve establishing communication between the pressure chamber and the end of the rifle barrel, and means for varying the size of the passage through the valve to regulate the firing power.

This invention relates to a novel pneumatic rifle and, more particularly, to a pneumatic rifle of the type used by underwater swimmers for discharging a harpoon, spear or dart.

One feature of the pneumatic rifle of the present invention is that the chamber for the air or gas under pressure is in the form of a long tubular housing which surrounds and accommodates therein a substantial part of the length of the rifle barrel. This particular structure makes it possible to provide a pressure chamber having a volume many times the volume of the barrel, preferably in a ratio in the range of from 4 to 8, whereby greater firing power and smoother loading are attained.

Another feature of the pneumatic rifle of the present invention is that it embodies means for regulating the firing power by providing an adjustable valve intermediate the pressure chamber and the barrel of the rifle. This valve is adjustable to vary the size of the passage connecting the barrel with the pressure chamber so that firing power can be regulated in progressive gradations.

The pneumatic rifle of the present invention is shorter than comparable pneumatic rifles of the same power and accommodates a harpoon rod of the same dimensions as longer rifles. The rifle is also more easily handled than conventional pneumatic rifles due in part to the fact that the gripping handle is located at substantially the center of balance of the rifle so that one end counterbalances the other end. All of these advantages combine to make the pneumatic rifle of the present invention a more effective weapon and give the underwater swimmer greater protection and maneuverability.

For a more complete understanding of the present invention, reference may be had to the detailed description which follows, and to the accompanying drawings, in which:

FIGURE 1 is a cross-sectional elevation view of an intermediate section of the underwater rifle of the present invention;

FIGURE 2 is a horizontal cross-sectional view taken along the line 2—2 of FIGURE 1 looking in the direction of the arrows;

FIGURE 3 is another horizontal cross-sectional view taken along the line 3—3 of FIGURE 1 looking in the direction of the arrows;

FIGURE 4 is a cross-sectional elevation view of the rear section of the underwater rifle;

FIGURES 5, 6 and 7 are cross-sectional views taken along the lines 5—5, 6—6 and 7—7, respectively, of FIGURE 4 looking in the direction of the arrows;

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FIGURE 8 is an exploded, perspective view of two of the elements shown in FIGURE 4;

FIGURE 9 is a cross-sectional elevational view of the forward section of the underwater rifle; and

FIGURE 10 is a fragmentary cross-sectional view of the barrel of the rifle showing a movable piston therein.

The underwater rifle of the present invention includes a relatively long tubular housing 11 having a handle 26 mounted thereto. The body 25 of the handle is at the center of balance of the underwater rifle so that the weight of the front end of the rifle is counterbalanced by the weight of the rear end thereof. The tubular housing contains a barrel 10 having blocks 22 and 23 mounted thereon, and the upper bracket portion 24 of the handle is affixed by screws to the blocks 23 and 24.

The barrel 10 of the rifle is of smaller diameter than the tubular housing 11, and it extends from near the rear end of the tubular housing 11 and projects beyond the front end of the tubular housing. The extreme rear end of the barrel 10 is threaded in a housing 51 adjacent an end sleeve 13 at the rear end of the tubular housing 11. The barrel 10 is also supported at the front end of the tubular housing by an annular mounting 14. The portion of the barrel 10 which projects beyond the tubular housing 11 carries a cylindrical bushing 15 near the extreme end thereof and a grip 16 intermediate the cylindrical bushing and the tubular housing. The grip 16 has an upstanding sight 18 formed integrally therewith and a lower projection which has a channel 19 therein for the retention of a cord attached to the harpoon or spear.

The extreme forward end of the barrel 10 has a plurality of radial perforations 20 therein through which water occupying space in the barrel in front of the harpoon or spear can be ejected. A protective piece made of flexible material is retained by a beaded formation 17 on the extreme end of the barrel 10.

A chamber 12 for air or gas under pressure is defined within the tubular housing 11 surrounding the portion of the rifle barrel 10 within the housing. This particular structure makes it possible to provide a pressure chamber having a volume many times the volume of the barrel, preferably in the ratio in the range of from 4 to 8. The pressure chamber 12 can be charged with air or other gas from a pump or compressor through the valve 48 and a passage through the valve housing 46 which communicates with the pressure chamber 12. The valve housing 46 in turn is accommodated for rotation within the end sleeve 13 at the rear end of the rifle. The valve 48 is spring-urged so that it will open under the pressure of the incoming air or gas and close to seal the air or gas within the pressure chamber.

The barrel 10 of the rifle has a movable piston 42 (see FIGURE 9) therein which is capable of traveling from one end of the barrel to the other. When the shank of the harpoon or spear is inserted in the barrel 10 the piston is pushed to the rear end of the barrel where it is engaged by the latching arm 43 of a pivotal latch 40. The latch 40 is mounted on a shaft 41 in the housing 51, and the latching arm is urged into latching engagement with the piston by a compressed spring 44.

The latch 40 is released to fire the spear or harpoon by pulling a trigger 28 which is pivotally mounted in the body 25 of the handle. The trigger 28 is connected to the latch 40 through a vertically movable firing pin 27 in the upper bracket portion 24 of the handle, a bifurcated lever 29 having arms 31 which straddle the underside of the barrel 10 and pivotally mounted by pins 30 to the block

23, a movable connecting rod 34 connected at its front end to a depending lip 32 of the pivotal lever 29, and a coupling 38 connecting the rear end of the rod to a depending arm 39 of the pivotal latch 40. The connecting rod 34 is guided for longitudinal movement in the lower portion of the block 23 and in the lower portion of part of the housing 51. When the trigger 28 is pulled, the pin 27 lifts the pivotal lever 29, pulling the rod 34 forwardly to release the latch 40. The compressed air in the pressure chamber 12 drives the piston 42 through the barrel discharging the harpoon or spear therefrom. The forward motion of the piston 42 is stopped by the restricted portion of the barrel at the extreme forward end so that the piston is retained within the barrel and the pneumatic fluid is retained within the pressure chamber 12. The reduction of the pressure in the chamber 12 resulting from the movement of the piston from the rear end to the forward end of the barrel is restored when the rifle is reloaded and the piston is returned to its latched position at the rear end of the barrel.

A safety device is provided to prevent accidental firing of the rifle. A hand rotated safety lock 35 is mounted on a shaft 36 in the body of the handle. In its locking position shown in FIGURE 1, the safety lock 35 engages a notch in the trigger 28. The safety lock is maintained in its locking position by the pressure of a leaf spring 37 acting against a flat portion of the safety lock. The safety lock can be pivoted to inoperative position out of the path of the trigger before firing the rifle.

The underwater rifle provides means for regulating the firing power of the rifle by the adjustment of the relative positions of annular cylindrical elements 52 and 53 of a valve through which the pressure chamber 12 communicates with the barrel 10. The valve element 52 is mounted to the housing 51, and the valve element 53 is rotatably mounted on the stationary valve element 52 in telescoping relationship therewith. The stationary valve element 52 has a single port 55 therein which is in communication with the barrel 10 through the housing 51. The rotatable valve element 53 has three ports 56, 57 and 58 of diminishing size. The port 55 of the stationary valve element 52 is at least as large as the largest port 56 of the rotatable valve element 53, and preferably the ports 55 and 56 are of the same size. The port 57 is smaller than the port 56 and is spaced approximately 90° apart from the port 56. The smallest port 58 is diametrically opposite to the port 56 and spaced 90° from the port 57.

Since the pressure chamber 12 communicates with the portion of the barrel 10 behind the movable piston 42 through the valve 55, 56, the firing power of the rifle can be regulated by the selection of the port 56, 57 or 58 which is brought into registry with the port 55. The ports of the rotatable valve element, therefore, provide progressive gradations of firing power.

The adjustment of the rotatable valve element 53 is accomplished by the rotation of a knob or sleeve 47 mounted on the end piece 13 of the rifle. The rotatable knob 47 is connected with the rotatable valve element 53 through a plug 49, a rotatable valve housing 46 connected to the plug 49 and a coupling 54 which connects the valve housing with the end wall of the rotatable valve element 53. A compressed spring interposed between the ends of the valve housing 46 and the rotatable valve element 53 maintains the latter in the desired telescoping relationship with the stationary valve element 52.

The rotatable knob 47 carries a protruding leaf spring 59 affixed thereto which serves as an indicator for the adjustment of the rotatable valve element 53 and also as a means to lock the rotatable valve element in its adjusted position. The spring indicator 59 moves relative to a stationary sleeve which has markings thereon to indicate the positions of adjustment for progressive gradations of firing power, and the engagement of the spring

59 with a recess in each of these positions serves to lock the knob 47 in the desired adjusted position.

The plug at the extreme rear end of the rifle carries a ring 50 so that the gun can be conveniently attached and suspended with the discharge end of the rifle pointed downwardly.

When the pressure in the chamber 12 is built-up to the predetermined level, the rifle can be repeatedly fired because there is no escape of the pneumatic fluid from the rifle except for a minimal amount of leakage.

In operation, the safety lock 35 is moved to operative position and the spear or harpoon is inserted in the barrel until the piston 42 is engaged by the latch 40. The loaded rifle can be conveniently handled because the rifle is counterbalanced with respect to the handle. When it is desired to fire the gun, the knob 47 is set to the desired firing power, the safety lock is released, and the trigger is pulled, releasing the latch and permitting the fluid pressure to drive the piston through the barrel to discharge the spear or harpoon.

The invention has been shown and described in preferred form and by way of example, and many modifications and variations may be made therein without departing from the spirit of the invention. The invention, therefore, is not to be limited to any specified form or embodiment except insofar as such limitations are expressly set forth in the appended claims.

I claim:

1. A pneumatic rifle comprising a long tubular housing, a rifle barrel having at least a substantial part of its length accommodated within said housing and the discharge end of the barrel extending through one end of the housing, a pressure chamber within the tubular housing and surrounding the portion of the rifle barrel within the housing, a movable piston accommodated within the barrel for movement from a loaded position at the rear end of the barrel to a position near the discharge end of the barrel, said piston preventing the escape of compressed fluid in the pressure chamber when the rifle is fired, means for latching the piston in its loaded position, trigger actuated means for releasing the latching means to permit the compressed air to drive the piston to the opposite end of the barrel, adjustable valve means within the said housing and establishing communication between the pressure chamber and the barrel, and means for varying the size of the passage through the valve to regulate the firing power of the pneumatic rifle.

2. A pneumatic rifle comprising a long tubular housing, a rifle barrel having at least a substantial part of its length accommodated within said housing and the discharge end of the barrel extending through one end of the housing, a pressure chamber within the tubular housing and surrounding the portion of the rifle barrel within the housing, valve means within the housing and establishing communication between the pressure chamber and the end of the barrel within the said housing, and means for varying the size of the passage through the valve to regulate the firing power of the pneumatic rifle.

3. In a pneumatic rifle having a long tubular housing, a rifle barrel having at least a substantial part of its length accommodated within said housing and the discharge end of the barrel extending through one end of the housing, and a pressure chamber within the tubular housing and surrounding a portion of the rifle barrel within the housing, valve means within the housing and establishing communication between the pressure chamber and the end of the barrel within the said housing, said valve means comprising a pair of relatively movable valve elements, and a plurality of ports of different sizes in one valve element and a port in the other valve element, said ports in one valve element and said port in the other valve element comprising means for varying the size of the passage through the valve to regulate the firing power of the pneumatic rifle.

4. Valve means as set forth in claim 3 in which said

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means for varying the size of the valve passage includes
 means for rotating the valve elements to bring a selected
 port of one into registry with the port of the other.

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