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(54) **PAINTBALL MARKER WITH BALL VELOCITY CONTROL**

(52) **U.S. Cl. 124/73**

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(57) **ABSTRACT**

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A paintball marker has a firing mechanism with at least a bolt, spool poppet valve, and vent. The bolt is slidable within a firing chamber and has a channel therethrough. The spool poppet valve has a large cross section portion and a smaller cross section portion, the larger cross section portion providing a seal against the bolt's channel. The smaller cross sectional portion has an O-ring that separates a channel, in which the spool poppet valve is slidably movable, into a front portion and a rear portion. Compressed gas enters the spool poppet valve's channel, in both the spool poppet valve's separated front and rear portions, and pushes the spool poppet valve towards the bolt, which in turn moves with the spool poppet valve. Finally, a vent through which the spool poppet valve channel's rear portion can vent to atmosphere, and upon such venting, the compressed gas in the spool poppet valve channel's front chamber drives the spool poppet valve away from the bolt, breaking the seal between the spool poppet valve and the bolt's channel, and compressed gas in the spool poppet valve channel's front portion and compressed gas in the firing chamber exits through the bolt's channel to drive a paintball from the marker.

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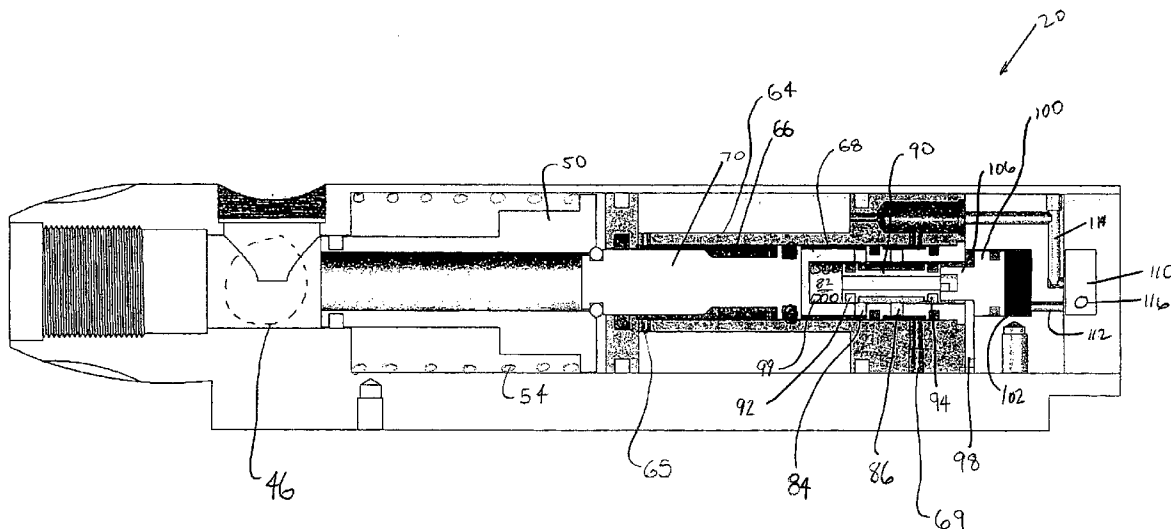
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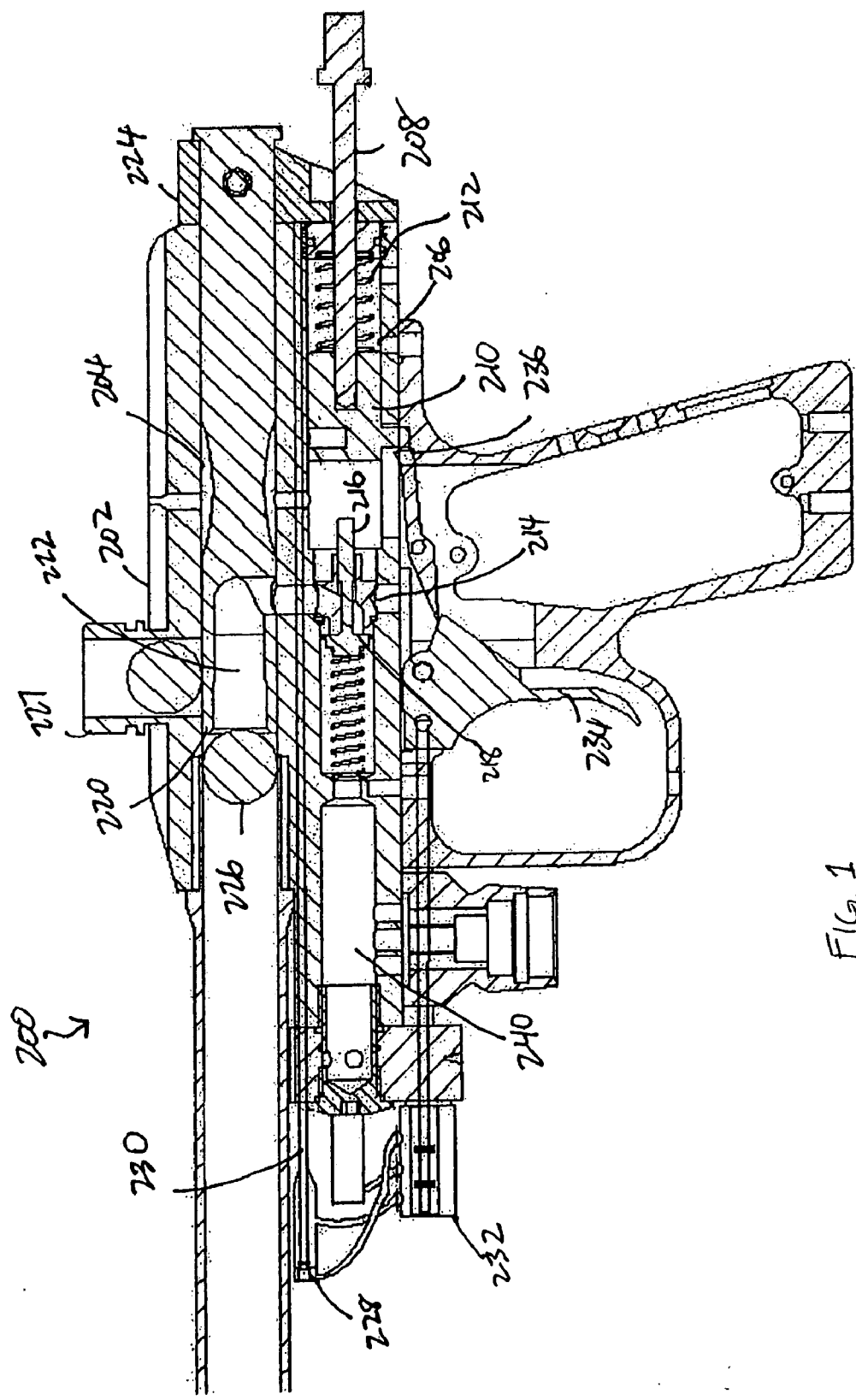


FIG. 1
(PRIOR ART)

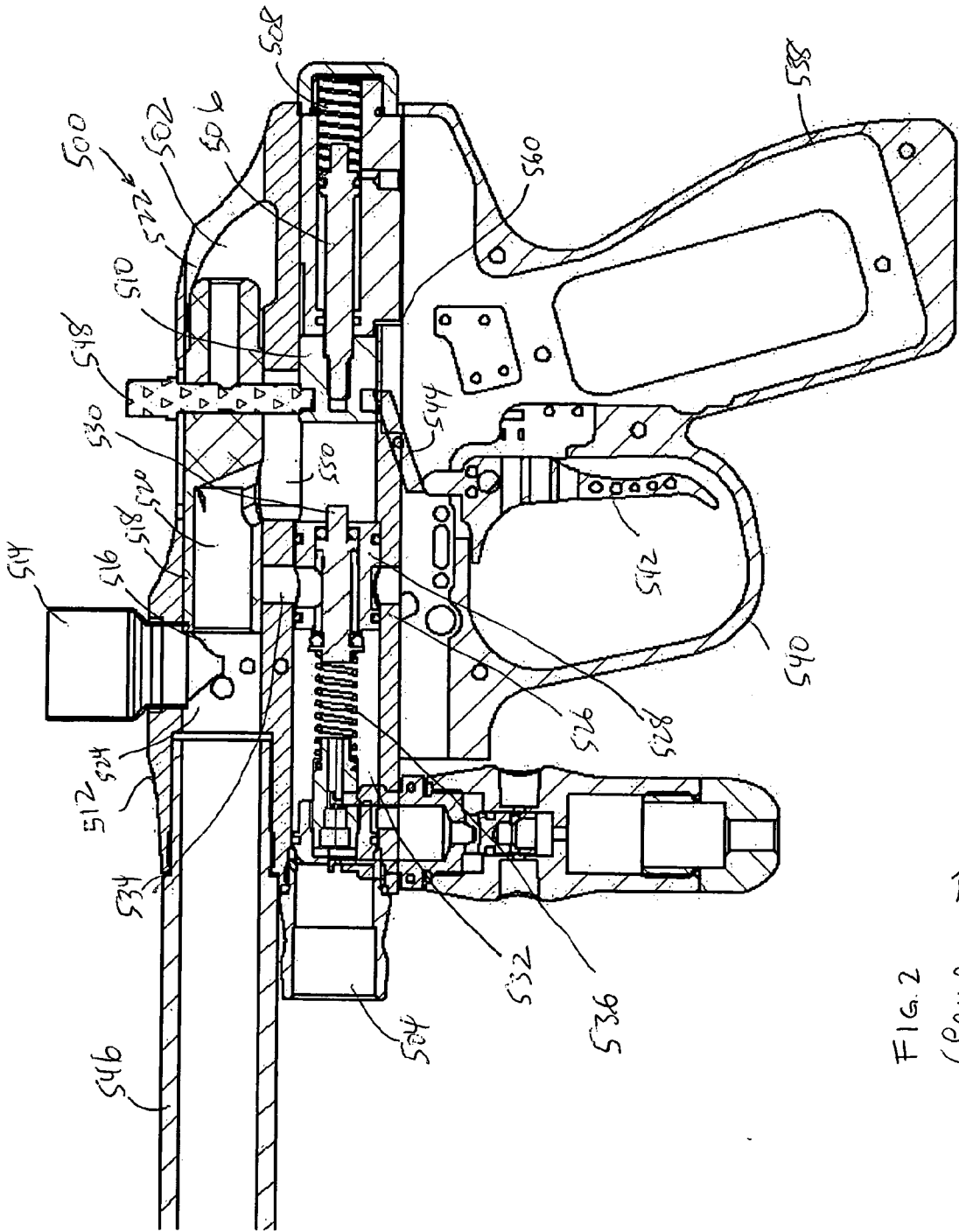
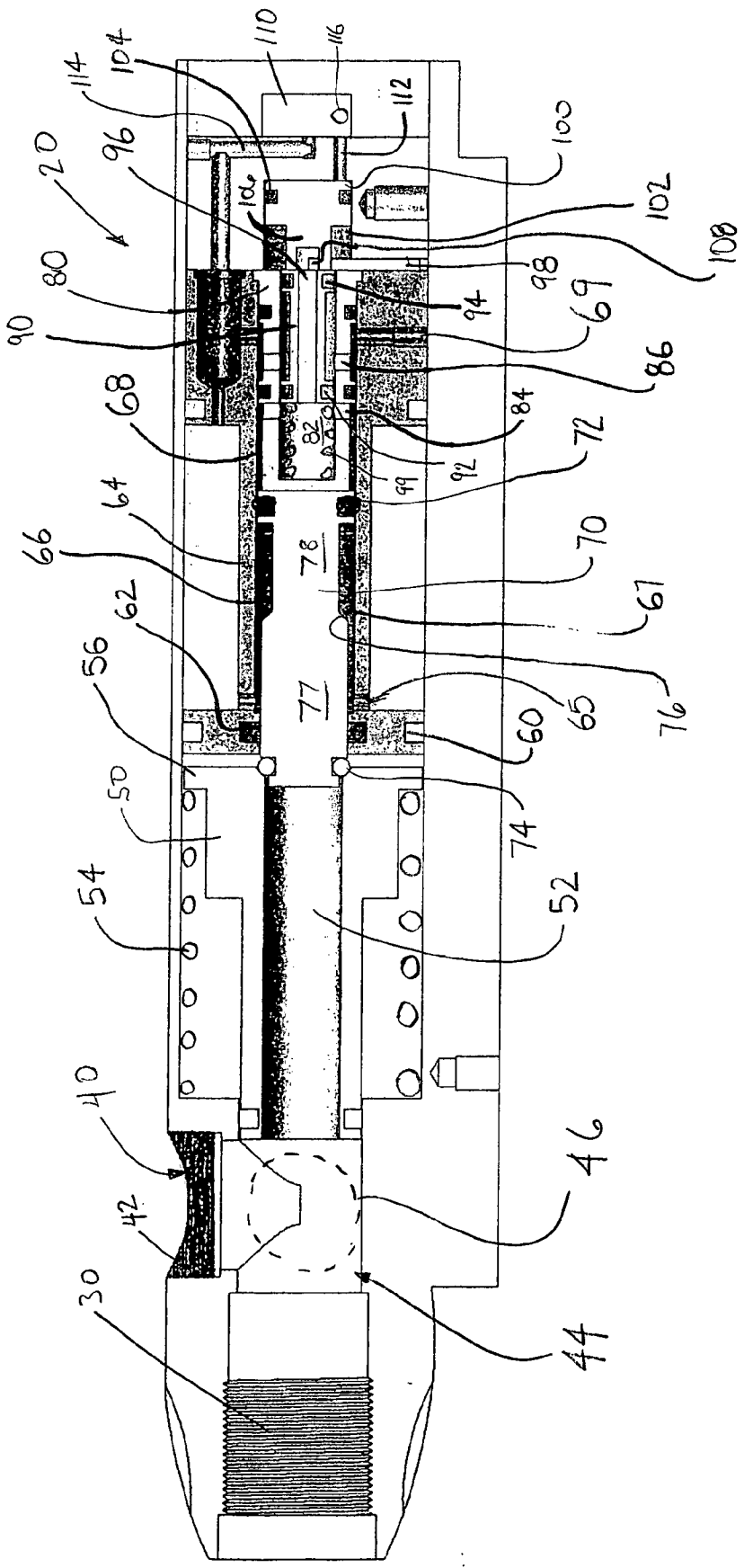


FIG. 2
(PRIOR ART)

FIG. 3



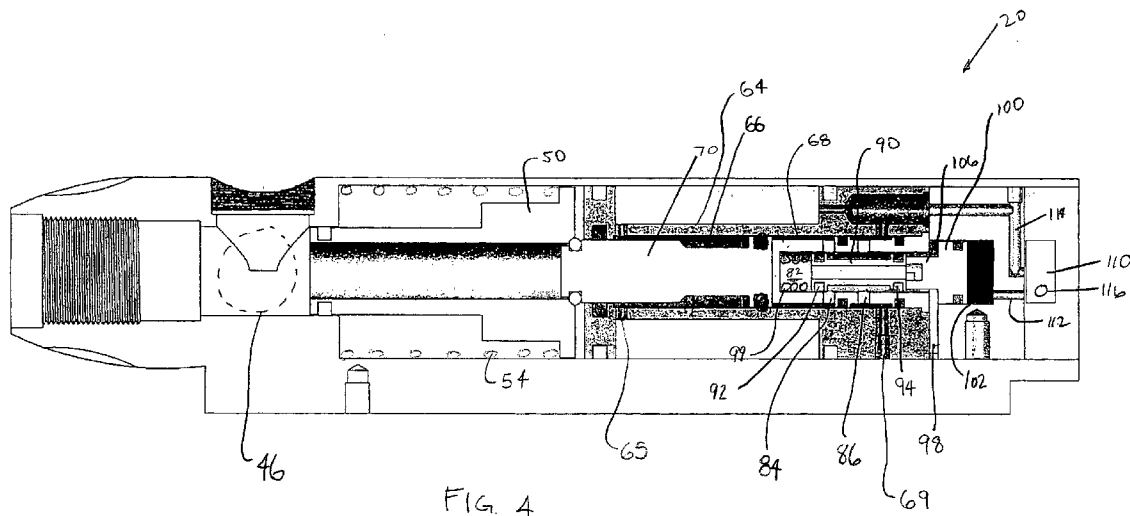
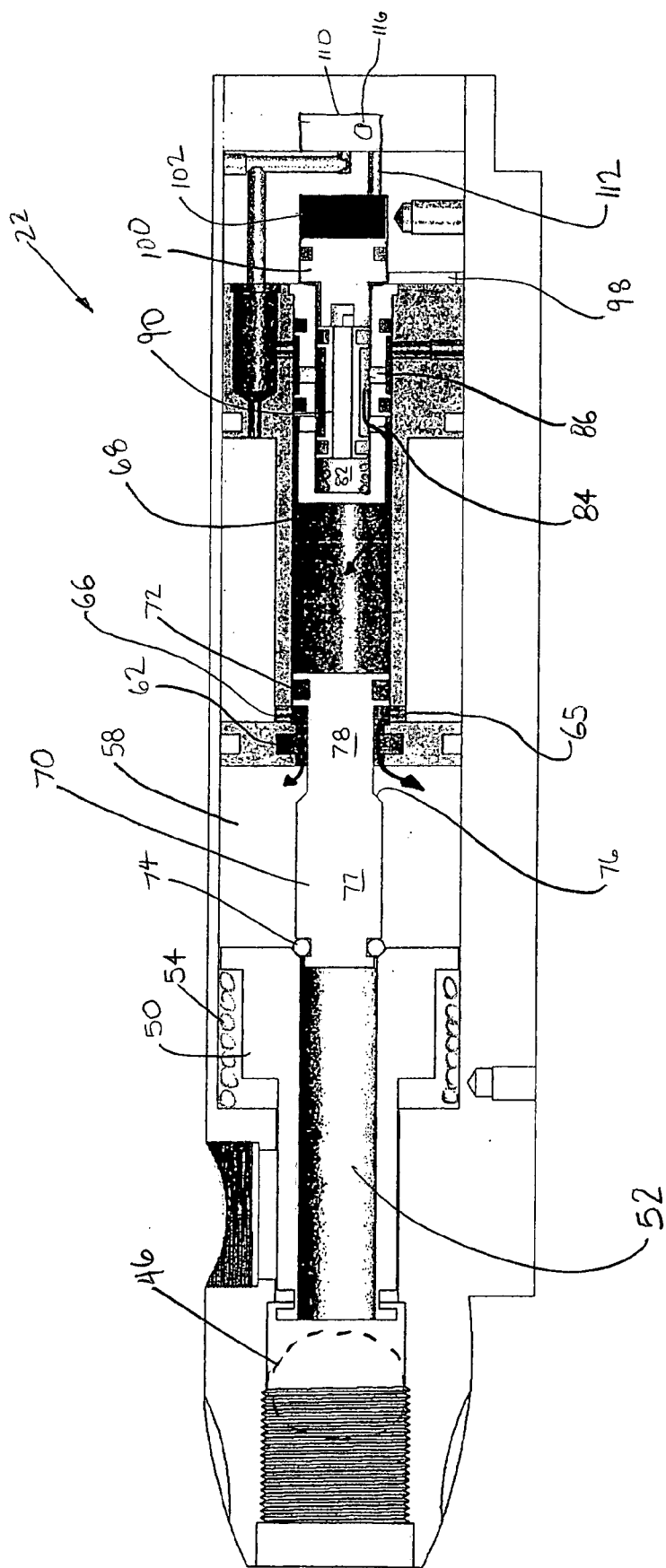
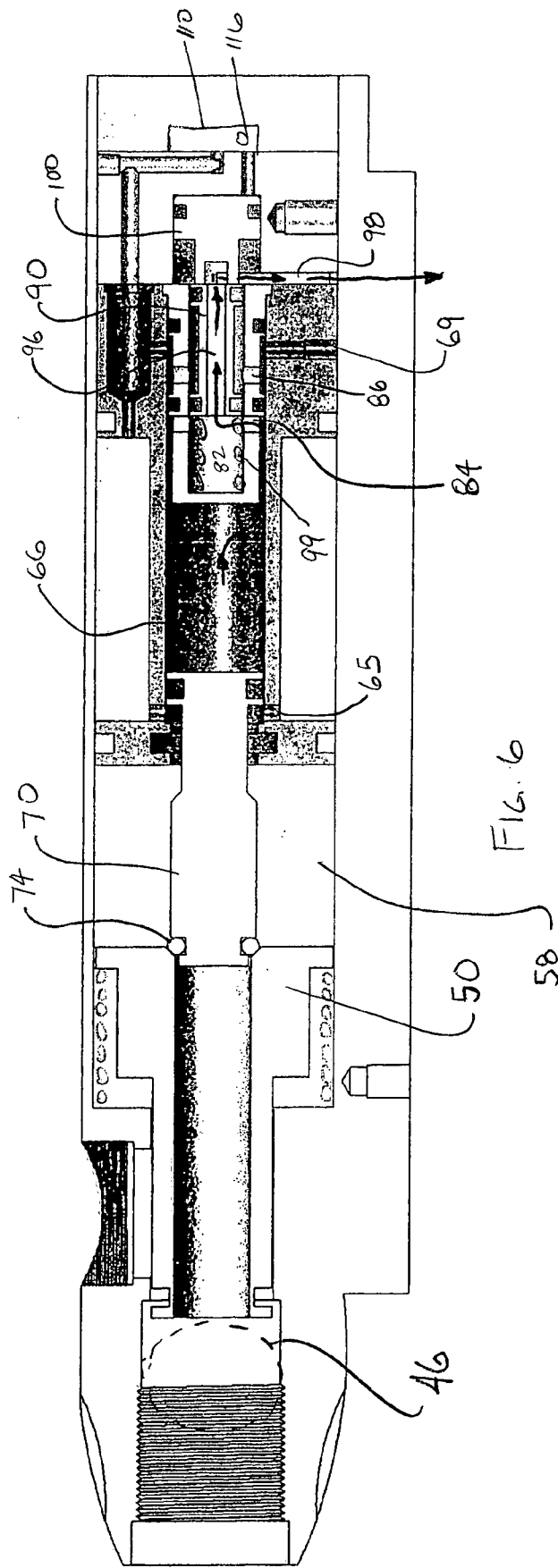


FIG. 4

FIG. 5





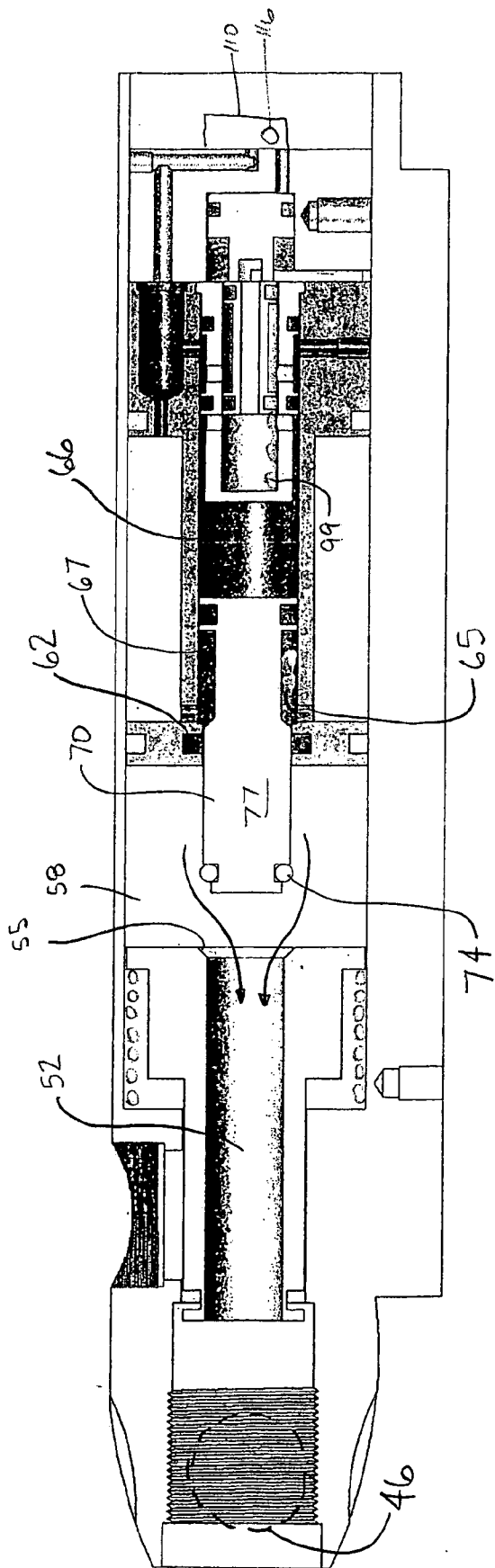


FIG. 7

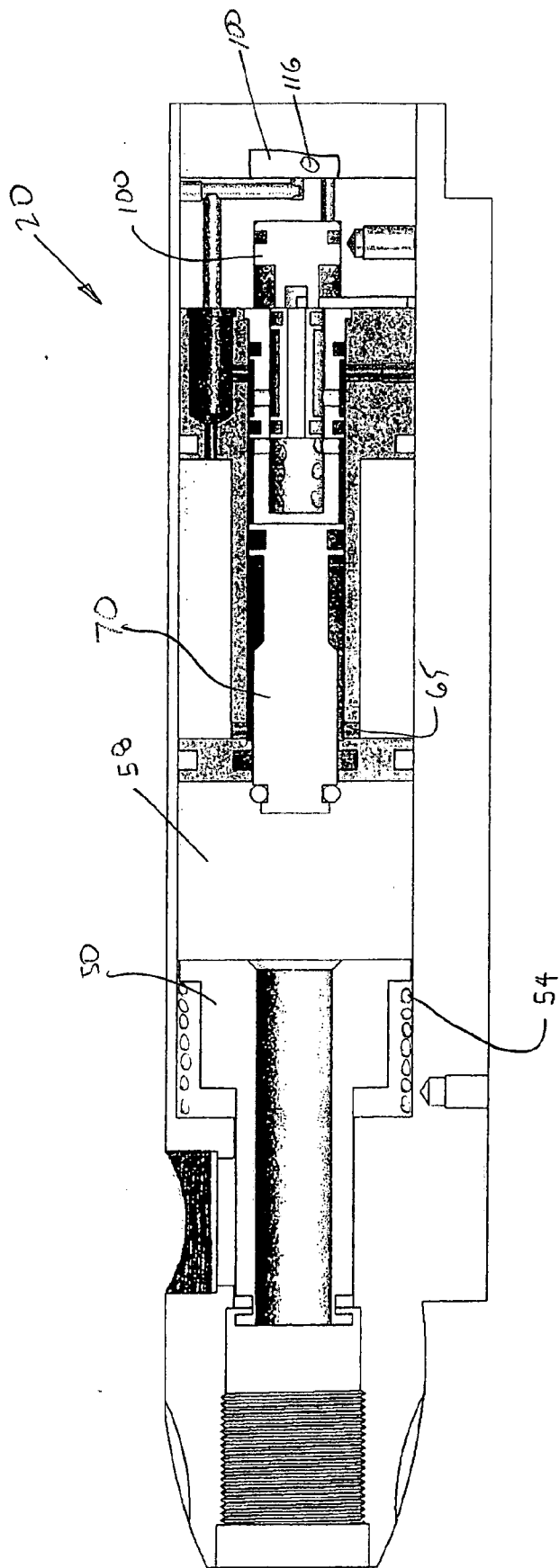


FIG. 8

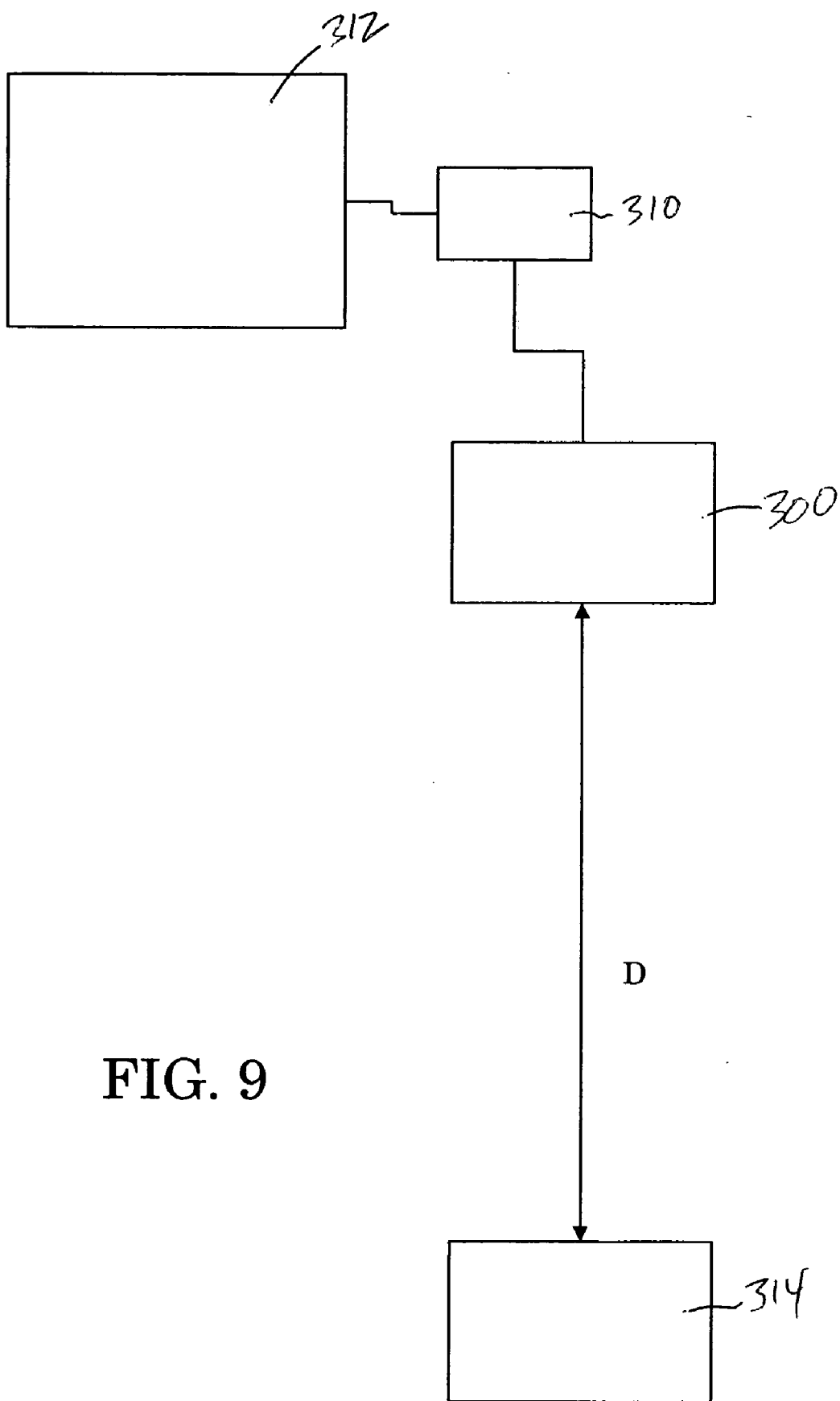


FIG. 9

PAINTBALL MARKER WITH BALL VELOCITY CONTROL

FIELD OF INVENTION

[0001] The present invention relates to a paintball marker or marker used in the sport of paintball.

BACKGROUND

[0002] Paintball is a sporting game having two teams of players usually trying to capture one another's flag. The sport is played on a large field with opposing home bases at each end. Each team's flag is located at the player's home base. In addition, all of the players have compressed gas markers, referred to herein as either "compressed gas markers" or "paintball markers" or simply "markers," that shoot projectiles commonly referred to as paintballs. These paintballs are generally frangible spherical gelatin capsules filled with paint. During play of the sport, the players on each team advance towards the opposing team's base in hopes of stealing the opposing team's flag, without being eliminated from the war game. A player is eliminated from the game when the player is hit by a paintball fired from an opposing player's marker. When the paintball hits a player, a "splat" of paint is left on the player.

[0003] Compressed gas markers (launching mechanisms or markers) using compressed gas or air for firing projectiles are well known. Paintball markers have two basic mechanisms working in conjunction for firing a paintball from the marker during a firing operation. One of these mechanisms is for loading a paintball in the breech of a paintball marker, and usually involves a bolt that reciprocates from a loading position, allowing a projectile into the breech, to a firing position. A valving system is employed to release compressed gas from a source of compressed gas to fire the projectile from the marker.

[0004] Paintball marker action falls into two categories: the "open bolt" action and the "closed bolt" action.

[0005] In the open bolt action, one or two chambers (upper and lower) are provided in a marker body. The upper chamber houses the bolt. The lower chamber houses a hammer and a valve, such as a pin type or poppet valve, also referred to as an exhaust or firing valve. The valve that controls the opening and closing of a flow passage between a high pressure chamber (not required for all open bolts), and the upper chamber and bolt. The bolt moves during firing and returns to the loading (open) position after firing, in most cases by "blow back" gas pressure, thus the term "open bolt." A spring biases the bolt and/or hammer forward. The bolt and hammer are sometimes connected by a mechanical linkage, thus moving together. When the bolt is cocked in the loading position, the hammer is held in place such as by a sear. Releasing the sear by actuation (pulling) of the trigger allows the hammer and bolt to move forward by spring force. The bolt, in the firing position, is in alignment with the flow passage of the valve. In the firing position, the hammer impacts the valve, releasing high pressure compressed gas. The compressed gas flow through the flow passage, through the aperture in the bolt, and fires the chambered projectile.

[0006] In the closed bolt action, the bolt and hammer are arranged to move independently, thereby allowing for less

"bounce" or "kick" when the marker is fired, since the bolt is not moving when the valve released compressed gas. The "closed bolt" action is referred to as such because the bolt is in the firing position, and paintballs are already chambered, prior to a mechanism such as a hammer opening the valve. In a closed bolt action paintball marker, a projectile is already chambered, and when the trigger is pulled, the hammer is released, striking the valve and sending gas through the bolt, thus firing a paintball.

[0007] A cross sectional side view of an illustrative prior art closed bolt mechanically cocking, or "automatically cocking," compressed gas marker 200 is shown in FIG. 1. A close bolt compressed gas marker 200 of the "automatically cocking" closed bolt action has a marker body 202, having an upper chamber or breech 204, and a lower chamber 206. The lower chamber 206 houses firing components, including a cocking rod 208 which projects rearwardly from the marker body, and has a hammer 210 at its forward end. The hammer 210 is biased forward by a cocking spring 212 in the rear of the lower chamber 206.

[0008] A firing valve 214 is provided in the lower chamber having a stem 216 facing the hammer 210, and a valve seat 218 on the opposite side of the firing valve 214. The firing valve 214 is normally of a spring-biased poppet valve, as is known in the art. A high pressure chamber 240 receives compressed gas under pressure from a compressed gas source (not shown) adjacent the seat 218. Generally, in the sport of paintball for example, the source of high pressure compressed gas is a compressed gas tank, as is well known in the art.

[0009] The upper chamber 204 houses a bolt 220 having an aperture 222 therethrough. The bolt 220 is attached to a back block 224. Projectiles 226, such as paintballs, are received in the upper chamber 204 via an infeed opening 227.

[0010] A ram 228 is provided as a means for reciprocating the back block 224. The ram 228 performs as a pneumatically operated piston, and is connected to the back block 224 via a linking rod 230. A valve 232, generally of the "three-way" variety, positioned at a forward portion of the marker 200, is used to control the supply compressed gas to move the ram 228. In mechanically operating markers, a trigger 234 housed in a trigger frame 248 is mechanically linked to the valve 232. Actuating (pulling) the trigger 234 mechanically operates the three-way valve 232, allowing compressed gas to move the ram 228 which in turn moves the linking rod 230 and back block 224 rearward, placing the bolt in a loading position.

[0011] The cocking rod 208 is additionally moved rearward by the movement of the back block 224, which catches the rear end of the cocking rod 208 during the back block's rearward movement. By movement of the cocking rod 208, the hammer 210 is placed in a "cocked" position, with sear 236 holding hammer 210 in a cocked position. When the trigger is pulled and the sear 236 is released, it operates the three-way valve, which allows compressed gas to contact the rearward portion of the ram. The back block 224 moves forward, biasing the bolt 220 to a firing position. Pulling (actuating) the trigger moves the sear 236 away from the hammer 210, the hammer 210 is now released for forward motion, the spring 212 biases the hammer 210 forward to hit the valve stem 216. Upon contact by the hammer 210, the

firing valve 214 opens to send compressed gas through the bolt 220, and the projectile 226 is fired. The bolt 220 will remain in the firing position (closed bolt) until the next firing operation is initiated by the trigger. A compressed gas marker 10 of the closed bolt "automatically cocking" closed bolt action type is described in detail in U.S. Pat. No. 6,763,822. While a mechanically operated paintball marker of the "automatically cocking" closed bolt type is shown, electronic closed bolt markers are available that operate with electronically operated trigger or valving systems.

[0012] An exemplary compressed gas gun 500 is illustrated in FIG. 2, of the "open bolt," "over/under," "stacked," or "two tube" type, having an upper chamber 502 and a lower chamber 504. The illustrative compressed gas gun 500 comprises a gun body 512 or frame which houses components of the compressed gas gun 500. The gun body 512 includes an upper chamber 502, and a lower chamber 504. An infeed tube 514 is positioned to feed projectiles, such as paintballs, to the breech 516 of the compressed gas gun 500. The compressed gas gun 500 may operate with a hammer 506 moveable by a hammer spring 508. The hammer 506 may alternately be moved by pneumatic force, such as by the application of compressed gas, or by a combination of the hammer spring 508 assisted by compressed gas. The hammer 506 may be formed having a hammer striker 510 at its forward end.

[0013] The upper chamber 502 includes a breech 516 portion that houses a bolt 518, having a bolt passage 520 therethrough. The bolt 518 is moveable from a first or loading position adjacent a first or rear end 522 of the breech 516, to a second or firing position adjacent the second or forward end 524 of the breech 516.

[0014] The gun body 512 further includes a lower chamber 504, positioned below and parallel to the upper chamber 502. The lower chamber 504 has a first or hammer portion 560. As shown in FIG. 2, the lower chamber 504 houses the hammer spring 508 and the hammer 506.

[0015] As shown in FIG. 2, the lower chamber 504 further includes a valve portion 526 housing a valve assembly 528. The valve assembly may be a poppet style, shuttle style, or other acceptable valve, with a valve stem 530 that can be struck by the hammer 506, opening the valve assembly 528 and allowing compressed gas to pass therethrough. The lower chamber 504 further includes a high pressure chamber 532, which receives compressed gas (gas under pressure) from a source of compressed gas (not shown) such as a CO2 tank, nitrous tank, or other compressed gas tank as is known in the art. A gas passage 534 is provided as a channel providing communication between the upper chamber 502 and lower chamber 504, and most specifically, providing communication between the valve assembly 528, and the bolt passage 520 of the bolt 518 when the bolt 518 is in the forward or firing position. The high pressure chamber 532 houses a valve return spring 536 for resetting and/or closing the valve assembly 528 after the hammer 506 has impacted the valve stem 530.

[0016] The lower portion of the compressed gas gun 500 further includes a grip frame 538 including a trigger guard 540 and a trigger 542. The trigger 542 may be adapted to contact a sear 544, for cocking the hammer 506. The trigger 542 may also be adapted to contact an electrical switch for initiating a firing operation. The forward portion of the

compressed gas gun 500 includes a detachable barrel 546 in communication with the breech 516. The hammer 506 is connected to the bolt 518 via a mechanical linkage 548 running through an opening 550 between the upper chamber 502 and the lower chamber 504, such that when the hammer 506 moves within the lower chamber 504 from a first or ready position to a firing position, the bolt 518 is moved from a loading position, to a firing position. The grip may house electronics, including a microprocessor, and a power source such as a battery, for controlling operations of the gun, such as a firing operation.

[0017] The above-described markers have the drawbacks that they fire a ball at the same velocity at all targets, no matter what their distance is from the marker. Their designs may make for large bulky markers. They can damage paintballs. In order to preserve compressed air, insure accuracy, improve rate of fire, and for safety reasons, there exists a need for a marker that would adjust the velocity of a paintball based on the distance between a marker and a target

SUMMARY

[0018] To that end, the inventive paintball marker has a firing mechanism with at least a bolt, spool poppet valve, and vent. The bolt is slidable within a firing chamber and has a channel therethrough. The spool poppet valve has a large cross section portion and a smaller cross section portion, the larger cross section portion providing a seal against the bolt's channel. The smaller cross sectional portion has an O-ring that separates a channel, in which the spool poppet valve is slidably movable, into a front portion and a rear portion. Compressed gas that enters the spool poppet valve's channel, in both the spool poppet valve's separated front and rear portions, and pushes the spool poppet valve towards the bolt, which in turn moves with the spool poppet valve. Finally, a vent through which the spool poppet valve channel's rear portion can vent to atmosphere, and upon such venting, the compressed gas in the spool poppet valve channel's front chamber drives the spool poppet valve away from the bolt, breaking the seal between the spool poppet valve and the bolt's channel, and compressed gas in the spool poppet valve channel's front portion and compressed gas in the firing chamber exits through the bolt's channel to drive a paintball from the marker.

BRIEF DESCRIPTION OF THE DRAWING(S)

[0019] FIGS. 1 and 2 show cross sectional views of a prior art marker.

[0020] FIG. 3 shows a cross-sectional view through the inventive paintball marker;

[0021] FIG. 4 shows a cross-sectional view through the inventive paintball marker;

[0022] FIG. 5 shows a cross-sectional view through the inventive paintball marker;

[0023] FIG. 6 shows a cross-sectional view through the inventive paintball marker;

[0024] FIG. 7 shows a cross-sectional view through the inventive paintball marker; and

[0025] FIG. 8 shows a cross-sectional view through the inventive paintball marker.

[0026] FIG. 9 is a schematic representation of how the marker works with the rangefinder.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0027] FIGS. 3-8 show sequential steps of firing a paintball marker 10 according to the present invention, as illustrated by showing the body 20 of the paintball marker 10. For the sake of focusing on the inventive features of the marker, the trigger, grip, source of compressed air, barrel, regulators, and any paintball loader or hopper are not shown. A paintball marker 10 having the operation of the present invention may be incorporated into either of the marker bodies shown in FIGS. 1 and 2, replacing the internal firing and valving components with those disclosed below. Within the body 20, the forward portion of the body has a threaded portion 30 that mates with a barrel (not shown). The ball loading area 40 has a threaded portion 42 as well, that mates with a loader (not shown). The breech 44 receives a projectile, such as a frangible paintball 46 that exits through the barrel on firing.

[0028] A bolt 50 has a channel 52 running therethrough. A spring 54 pushes the bolt's lip 56 to bias the bolt 50 towards a rearward position. FIG. 1 shows the bolt 50 in its rearwardmost loading position; FIGS. 7 and 8 show the bolt 50 in a forward firing position within the firing chamber 58.

[0029] A stop 60 divides the body 20 approximately in half, and contains a stop O-ring 62 that provides an airtight seal between itself and the spool poppet valve 70.

[0030] The stop 60 is preferably connected to a housing 64 that remains fixed in the body 22. The housing 64 contains an elongated channel 66 that is divided by the spool poppet valve's rear O-ring 72. The division is between a front chamber 67 and rear chamber 68. The housing 64 contains two openings 65, 69 that allow high pressure to enter the channel 66. These openings 65, 69 will be discussed in more in the "OPERATION" section below.

[0031] The spool poppet valve 70 has a rear O-ring 72, already discussed, and a front O-ring 74. A sloped portion 76 steps down the cross-sectional area of the spool poppet valve 70 from an area of larger cross section 77 that provides a seal with stop O-ring 62 to an area of smaller cross section 78. The spool poppet valve 70 moves within the housing 64 between a rear position shown in FIG. 3 and a forward position shown in FIGS. 5 and 6.

[0032] A pilot housing 80, with a pilot channel 82 extending therethrough, is fixed within the channel 66 and contains a pilot valve 90 that is slidably movable therein. The pilot housing 80 has several ports 84, 86 through which gas passes during operation.

[0033] The pilot valve 90 slides within the pilot channel 82 between a forward position (FIG. 5) and a rearward position (FIG. 3). In the rearward position, to which the pilot valve 90 is biased by spring 99, the pilot valve 90 abuts the piston 100. The pilot valve has front and rear O-rings 92, 94 that seal against the pilot channel 82. The pilot valve has a pilot valve channel 96 through which air passes on the way to the vent 98. The length of the section of the pilot valve 90 between the O-rings 92 and 94 is such that it can span the distance between ports 84 and 86 when the pilot valve is in its forward position.

[0034] The piston 100 is movable within a piston chamber 102 between rearward (FIG. 3) and forward (FIG. 5) positions. The piston 100 has a O-ring 104 and a narrow portion 106 that drives the pilot valve forward. The piston 100 has a pass through 108 that aligns with the vent 98 in the piston's rearward position, but the piston 100 blocks the vent 98 in the piston's forward position. The piston 100 is biased to its rearward position by spring 99, that acts on the piston 100 through pilot valve 90.

[0035] The piston's position is driven by a solenoid 110 that directs compressed gas through the channel 112 to push the piston 100 to its forward position. The solenoid is fed with compressed air through the channel 114. the solenoid 110 vents to atmosphere through vent 116.

OPERATION

[0036] In operation, a marker 312 may include a rangefinder 300 in communication with a microprocessor 310, shown schematically in FIG. 9. The rangefinder 300 is aligned such that it calculates the distance "D" between the marker 10 and the target 314 in the direction of barrel. That distance information is continuously updated to the microprocessor 310 when the rangefinder 300 is on. The rangefinder 300 may be provided as any known rangefinder device capable of calculating, ascertaining and/or providing target distance information, such as, for example, a rangefinder scope, a sensor and emitter arrange to send and receive a signal corresponding to the distance from the rangefinder 300 to a target 314, an electronic laser rangefinder affixed to the marker body, rangefinders such as, for example, those sold under the brand names BUSHNELL PRO SPORT 450 RANGE FINDER, SMALL TACTICAL OPTICAL RIFLE MOUNTED (STORM) MICRO-LASER and LASER ATLANTA PROSURVEY 1000, or a rangefinder such as those disclosed in U.S. Pat. Nos. 6,873,406 and 5,771,623 (the entire contents of which are incorporated herein by reference). The rangefinder 300 may be positioned on the body of the marker 312 at any location allowing it to site and measure distance to a target. The a microprocessor 310 may be provided anywhere in the body 20 or grip of the marker 312, and may be adapted to receive data from the rangefinder 300, process such data to determine firing conditions of the marker, and control operation of a marker according to the present invention, as discussed in greater detail below. The rangefinder 300 may be located on any portion of the marker, such as the body 20, barrel, or grip.

[0037] FIGS. 3-8 show the sequential operation of the marker. In operation, the marker includes a rangefinder (not shown) in communication with a microprocessor (Also not shown). The rangefinder is aligned such that it calculates the distance between the marker and the target in the direction of barrel. That distance information is continuously updated when the rangefinder is on.

[0038] FIG. 3 shows the body in the loading position. In this position, the bolt 50, spool poppet valve 70, pilot valve 90, and piston 100 are all in their rearward positions. In this position, a paintball 46 loads into the breech 44.

[0039] Upon the trigger pull, the microprocessor notes the current range to the target, and directs the solenoid 110 to allow compressed gas to pass through it to channel 112 for a certain period of time corresponding to the distance to the target.

[0040] As shown in FIG. 4, this compressed gas fills the piston chamber 102 behind the piston 100 which drives the piston 100 and pilot valve 90 forward, as the pressure within the chamber 102 overcomes the rearward bias of the compression spring 99. At the pilot valve 90's position shown in FIG. 4, the compressed gas from the channel 69 enters the pilot channel 82 in the area between the O-rings 92, 94 and exits through the port 84, to begin filling the rear chamber 68. Since compressed gas enters port 65 at a same pressure as that filling the rear chamber 68, the pressure on either side of the spool poppet valve's rear O-ring 72 quickly balances to become the same, at the state shown in FIG. 4.

[0041] As shown in FIG. 5, this high pressure build-up behind the spool poppet valve 70 drives it forward, overcoming the rearward bias of the spring 54 that acts on the spool poppet valve 70 through the bolt 50. As the bolt 50 shifts forward to its firing position, the paintball 46 also shifts forward. When the sloped portion 76 of the spool poppet valve 70 clears the stop O-ring 62, the compressed gas from the forward chamber 68 travels past the stop O-ring 62 to fill the firing chamber 58, which charges the firing chamber 58 with the compressed gas that will fire the paintball 46. As long as the pilot valve 90 is in the forward position, compressed gas will travel through port 65 into the firing chamber 58—the more compressed gas that enters the chamber 58, the greater the amount of compressed gas pressure that will fire the paintball 46.

[0042] At this stage, the solenoid 110 remains open, driving the piston 100 forward, for the time determined according to the range to the target. When the solenoid has been open for that predetermined time, it vents the air in the piston chamber 102 through vent 116.

[0043] As shown in FIG. 6, venting the piston chamber 102 allows the spring 99 to push the pilot valve 90 and piston 100 to their rearward positions. The movement of the pilot valve 90 rearward closes off the flow of compressed gas from the channel 69 through ports 86 to port 84. The compressed gas in chamber 66 vents through port 84, pilot valve channel 96, the piston 100, and vent 98, which ultimately releases to atmosphere.

[0044] FIG. 7 shows the result of the release of the compressed gas in chamber 66. As the chamber 66 drops to an atmospheric pressure, the spool poppet valve 70 is driven rearwards by the combination of the compressed gas in the firing chamber 58 and the compressed gas entering through port 65. The rapid rearward movement of the spool poppet valve 70 releases the seal between the spool poppet valve's forward O-ring 74 and the bolt's opening 55, and also creates a seal between the spool poppet valve 70's larger portion 77 and the stopper O-ring 62. The remaining compressed gas in the firing chamber 58 vents to atmosphere through the bolt 50's channel 52, driving the paintball 46 out of the marker through the barrel.

[0045] FIG. 8 shows the spool poppet valve 70 as it returns to its rearward position under bias from the compressed gas entering through port 65. At this point, the firing chamber 58 has vented to atmosphere and the spring 54 drives the bolt rearward to its position shown in FIG. 1.

[0046] The novel features of the present invention allow regulated compressed gas usage in a marker as a function of target distance. As used in a marker and/or rangefinder 300

in a compressed gas gun, the present invention provides that the shorter the duration that the solenoid 100 drives the piston 100 and pilot valve 90 forward, the less compressed gas enters the firing chamber 58 to fire the paintball 46. Less compressed gas in the firing chamber 58 will result in less compressed gas used for firing a projectile, a therefore a slower projectile velocity as the projectile leaves the marker, which is acceptable for closer targets. It will be appreciated that the firing chamber's 58 ultimate pressure cannot exceed the pressure of the compressed gas being fed from the source of such compressed gas, so that the paintball 46 has a maximum velocity corresponding to this pressure.

[0047] In one embodiment, the rangefinder 300 could insure that the solenoid remains in the vent position if the range to the target is too short, for safety reasons so that a person might not be struck with a paintball at short range. Further, it should be appreciated that one safety feature of using a rangefinder that decreases the velocity of the paintball 46 for short range targets is that the slower paintball will not be as likely to hurt the person being "marked." This might especially be appreciated by younger people playing paintball, or at least by their parents.

[0048] Although the marker has been described with reference to its application with a rangefinder 300, such a rangefinder 300 is not necessary, and the marker would function without such a rangefinder 300. A microprocessor 310 could be used to control the solenoid's 100 opened and closed times based on user input, or predetermined times, or any other programmable settings. A marker according to the present invention has the following advantageous features:

- [0049] the in-line, same axis alignment of the bolt 50, spool poppet valve 70, pilot valve 90, and solenoid 100 allows for a compact design and decreased "kick";
- [0050] it allows for fast recharge times because even as the projectile fires, gas pressure can be building in chamber 66; and
- [0051] the bolt 50 returns at low pressure in the firing chamber (minimizes chance of damaging or chopping a paintball).

What is claimed is:

1. A paintball marker with a compressed gas driven paintball 46 firing mechanism comprising:

- a bolt slidable within a firing chamber and having a channel therethrough;
- a spool poppet valve having a large cross section portion and a smaller cross section portion, the larger cross section portion providing a seal against the bolt's channel, the smaller cross sectional portion comprising an O-ring that separates a channel, in which the spool poppet valve is slidably movable, into a front portion and a rear portion;
- compressed gas that enters the spool poppet valve's channel, in both the spool poppet valve's separated front and rear portions, and pushes the spool poppet valve towards the bolt, which in turn moves with the spool poppet valve; and
- a vent through which the spool poppet valve channel's rear portion can vent to atmosphere, and upon such venting, the compressed gas in the spool poppet valve

channel's front chamber drives the spool poppet valve away from the bolt, breaking the seal between the spool poppet valve and the bolt's channel, and compressed gas in the spool poppet valve channel's front portion and compressed gas in the firing chamber exits through the bolt's channel to drive a paintball from the marker.

2. The marker of claim 1, wherein the bolt's channel and the spool poppet valve's channel are separated by a stopper O-ring that seals around the outside of the spool poppet valve's large cross-section portion, but through which the spool poppet valve's smaller cross-section portion freely passes, and wherein the firing mechanism has a firing chamber charging time during which compressed gas enters the firing chamber.

3. The marker of claim 2, wherein the compressed gas that enters the firing chamber enters through a port connected to the spool poppet valve's forward portion.

4. The marker of claim 2, further comprising a solenoid-driven pilot valve that controls the flow of compressed gas through a pilot valve into the spool poppet valve channel's rear portion, wherein the build-up of compressed gas in the spool poppet valve channel's rear portion drives the spool poppet valve towards the bolt; wherein the solenoid controls the vent by allowing compressed gas from inside the poppet valve channel's rear portion to release through the pilot valve to the vent.

5. The marker of claim 4, wherein the bolt, spool poppet valve, and pilot valve are coaxial.

6. The marker of claim 4, wherein the solenoid controls the pilot valve using a compressed gas driven piston.

7. The marker of claim 4, wherein the marker a forward direction is generally the direction of a barrel of the marker through which a paintball passes on firing, and a rearward direction is generally a direction opposite the barrel, wherein springs bias the bolt and the pilot valve in a rearward direction, and the marker uses compressed gas to overcome the bias in both springs.

8. The marker of claim 7, wherein compressed gas biases the spool poppet valve in a rearward direction when the pilot valve is not directing compressed gas into the spool poppet valve channel's rear portion.

9. The marker of claim 1, wherein the amount of compressed gas in the spool poppet valve channel's front portion and compressed gas in the firing chamber is controlled by a microprocessor.

10. The marker of claim 9, wherein the microprocessor controls the amount of compressed gas in reaction to data from a rangefinder that measures the distance between the marker and a target that the marker is aimed at.

11. A paintball marker comprising:

a rangefinder that detects the distance between the marker and a target and relays said distance to a microprocessor;

a microprocessor that controls the velocity of a paintball as it is driven from the marker based on the distance, wherein the marker fires the paintball at lower velocity for a shorter distance and a higher velocity for a further distance.

* * * * *