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

(75) Inventor: **Michael J. Wood**, Newnan, GA (US)

Correspondence Address:
VOLPE AND KOENIG, P.C.
UNITED PLAZA, SUITE 1600
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103 (US)

(73) Assignee: **National Paintball Supply, Inc.**, Sewell, NJ

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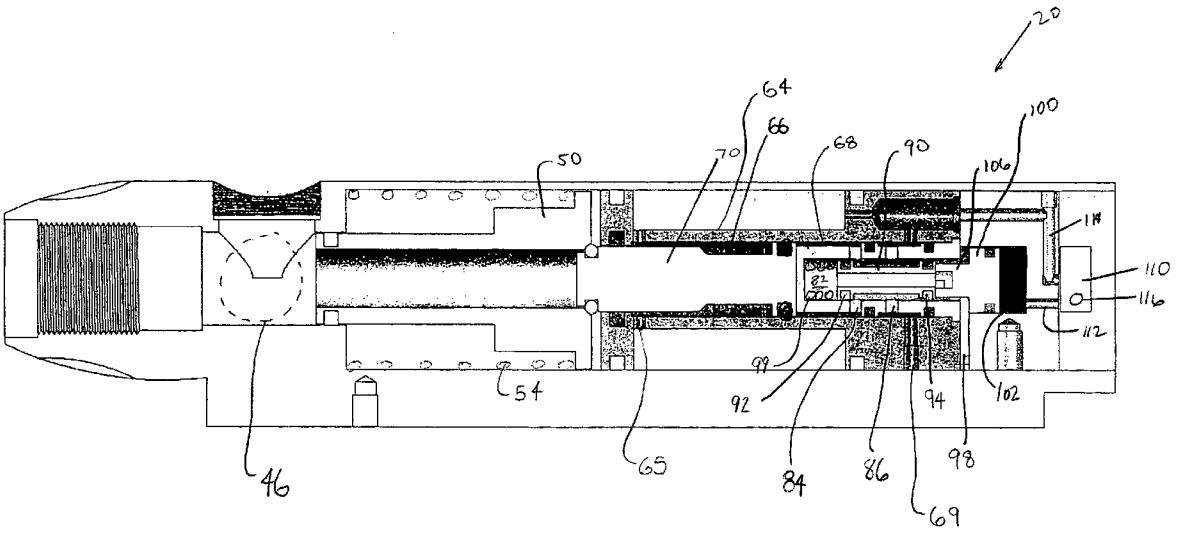
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(57) **ABSTRACT**

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.



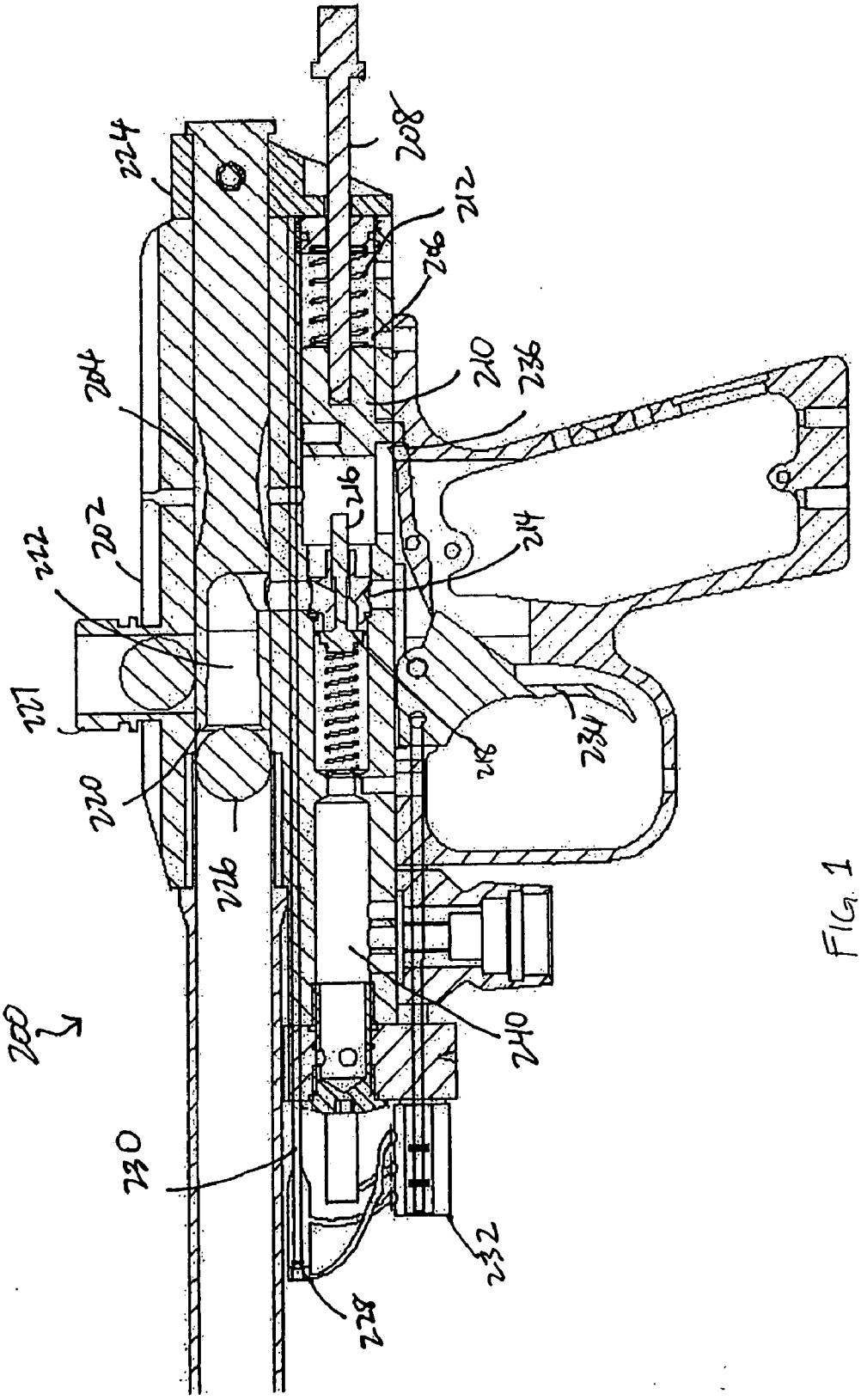


FIG. 1
(PRIOR ART)

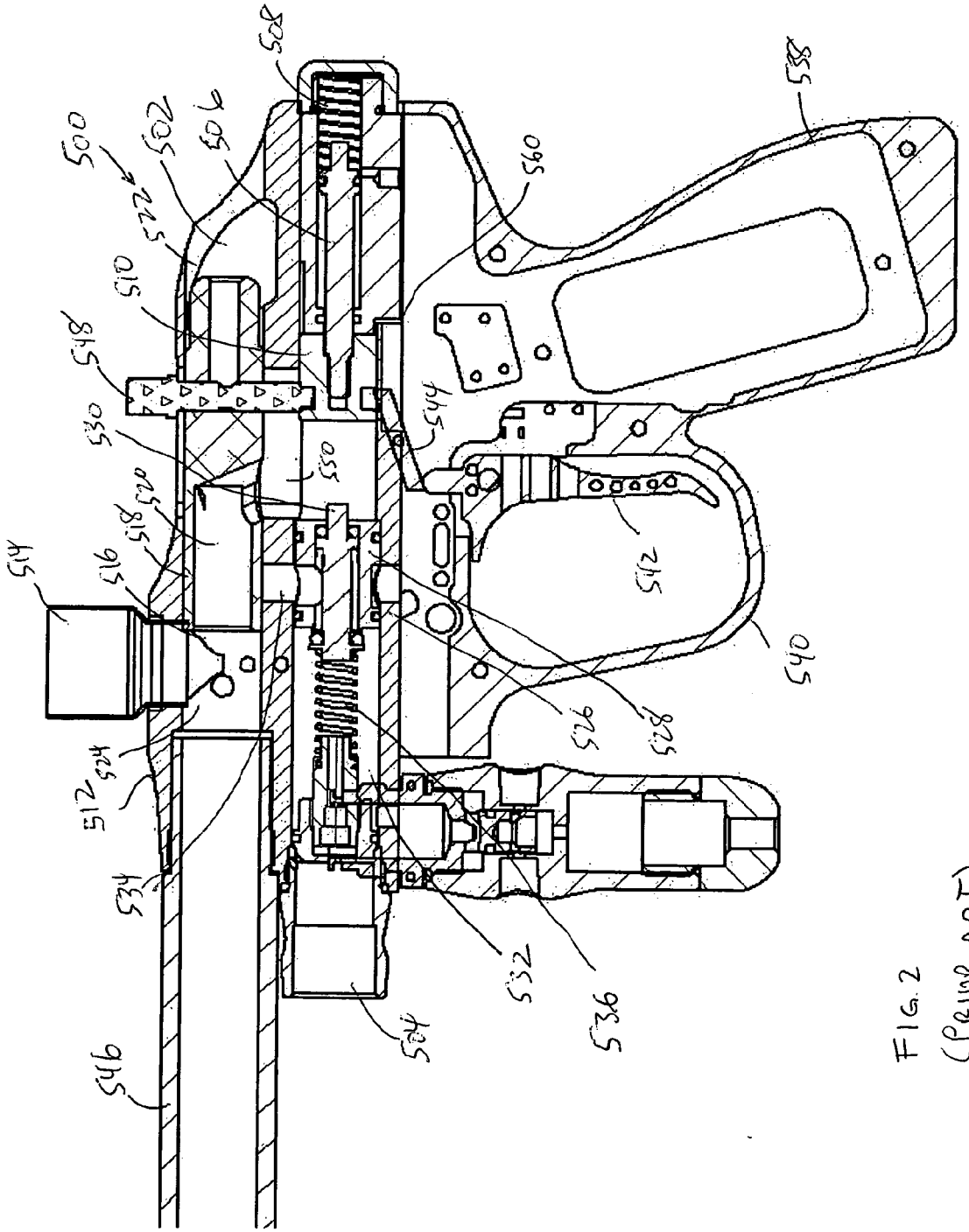


FIG. 2
(PRIOR ART)

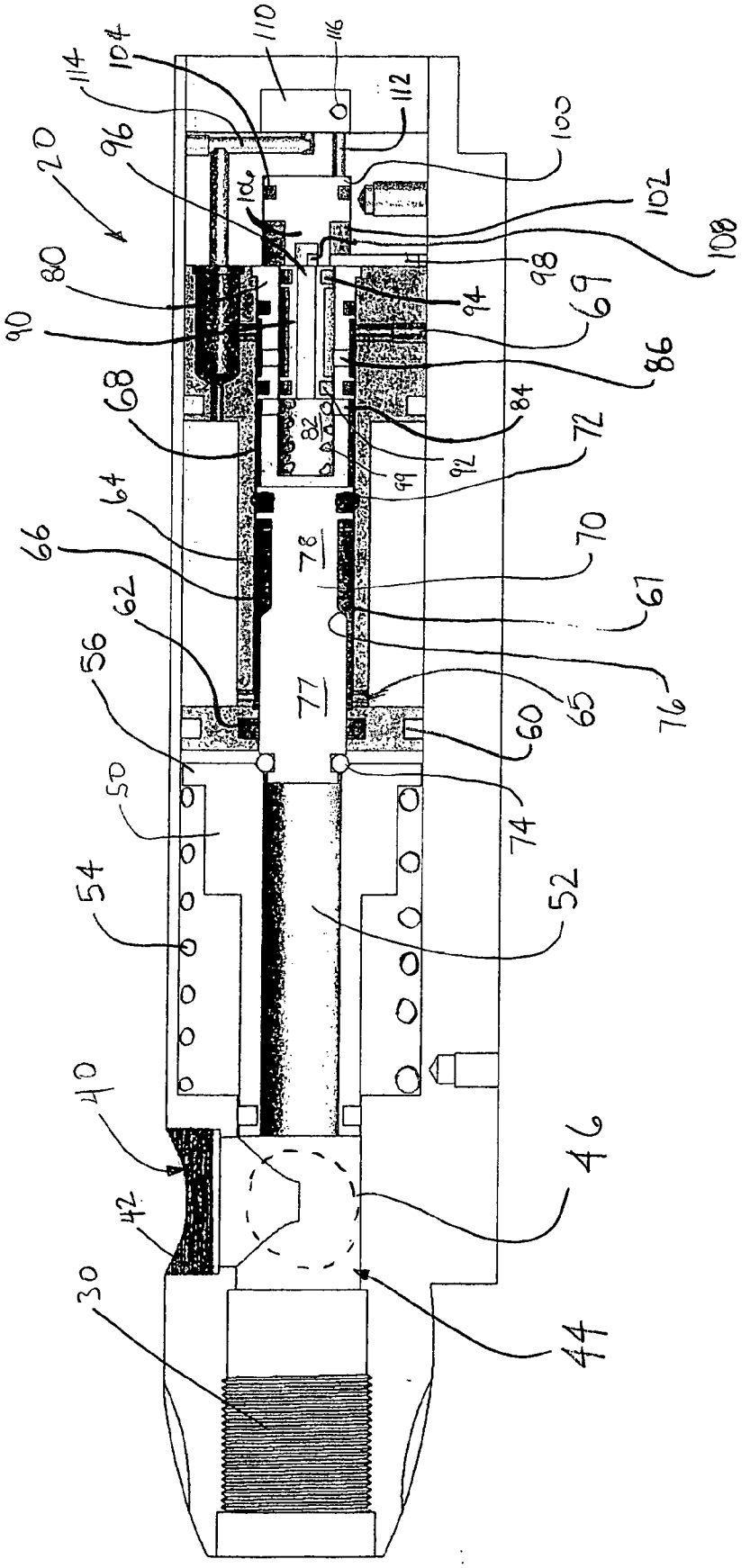

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FIG. 3

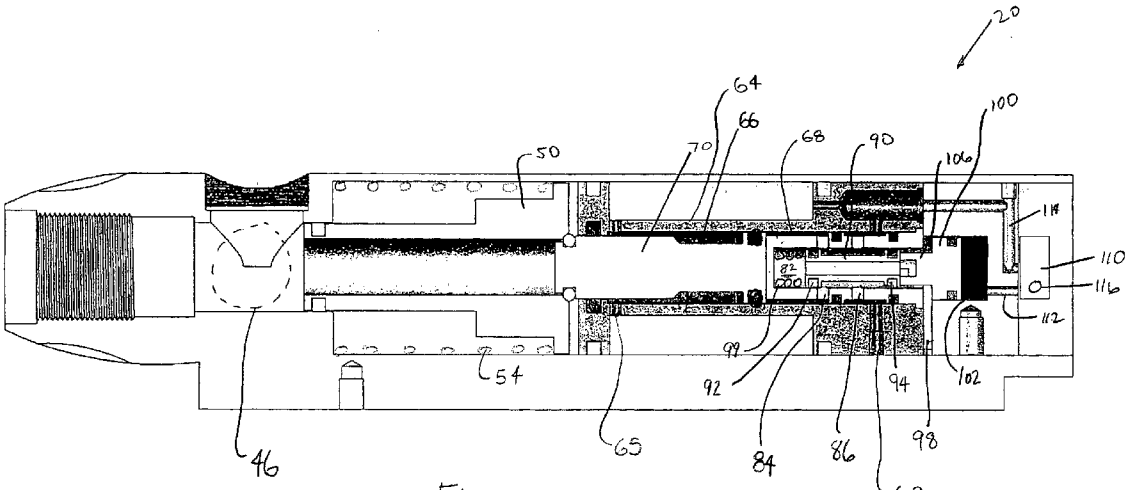

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FIG. 4

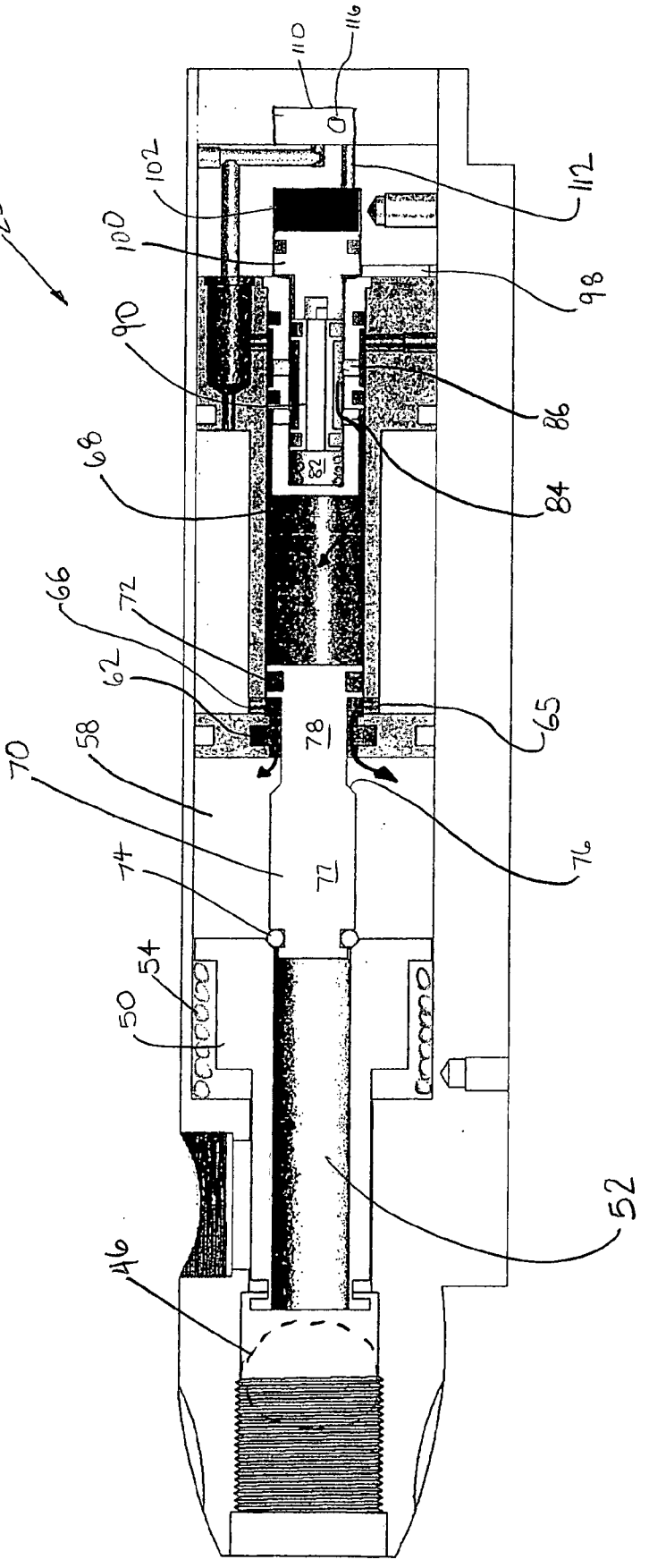

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FIG. 5

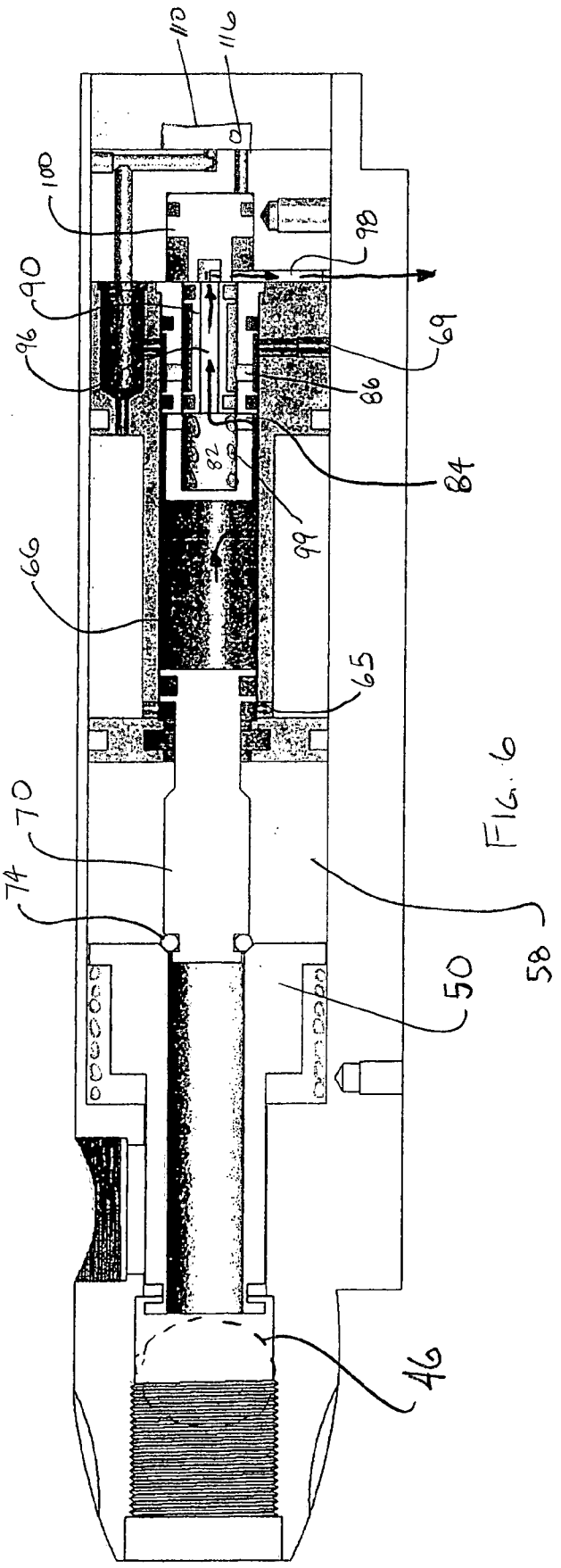


FIG. 6

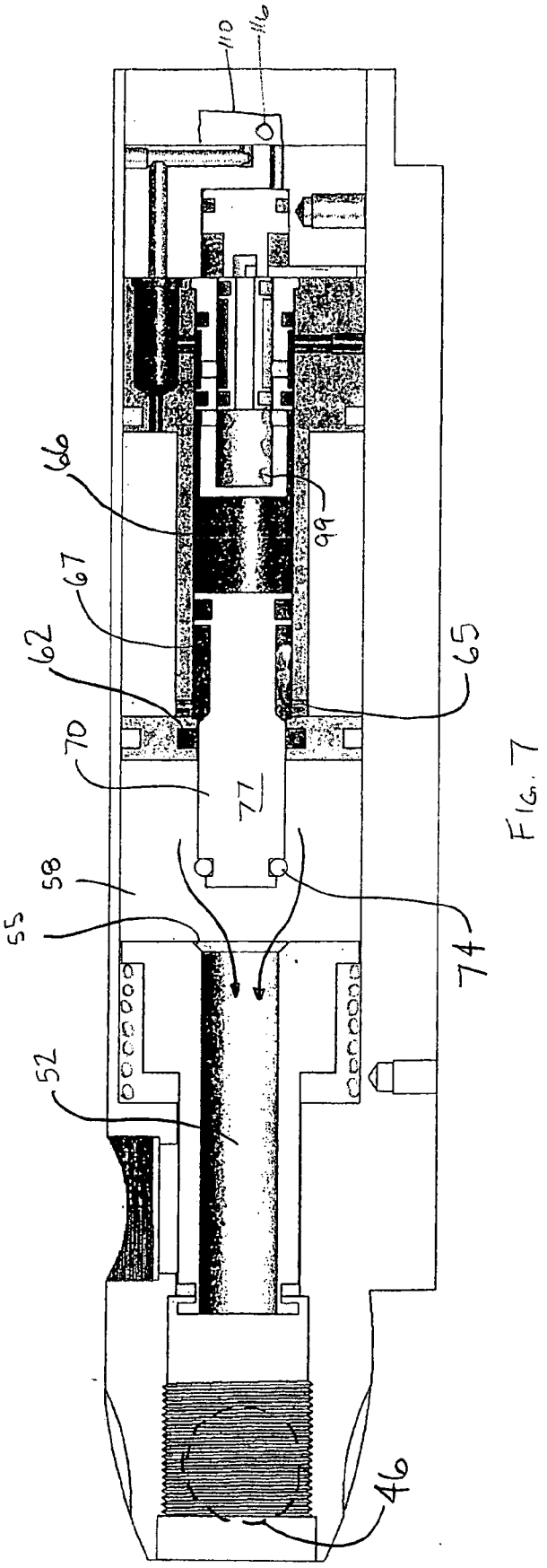


FIG. 7

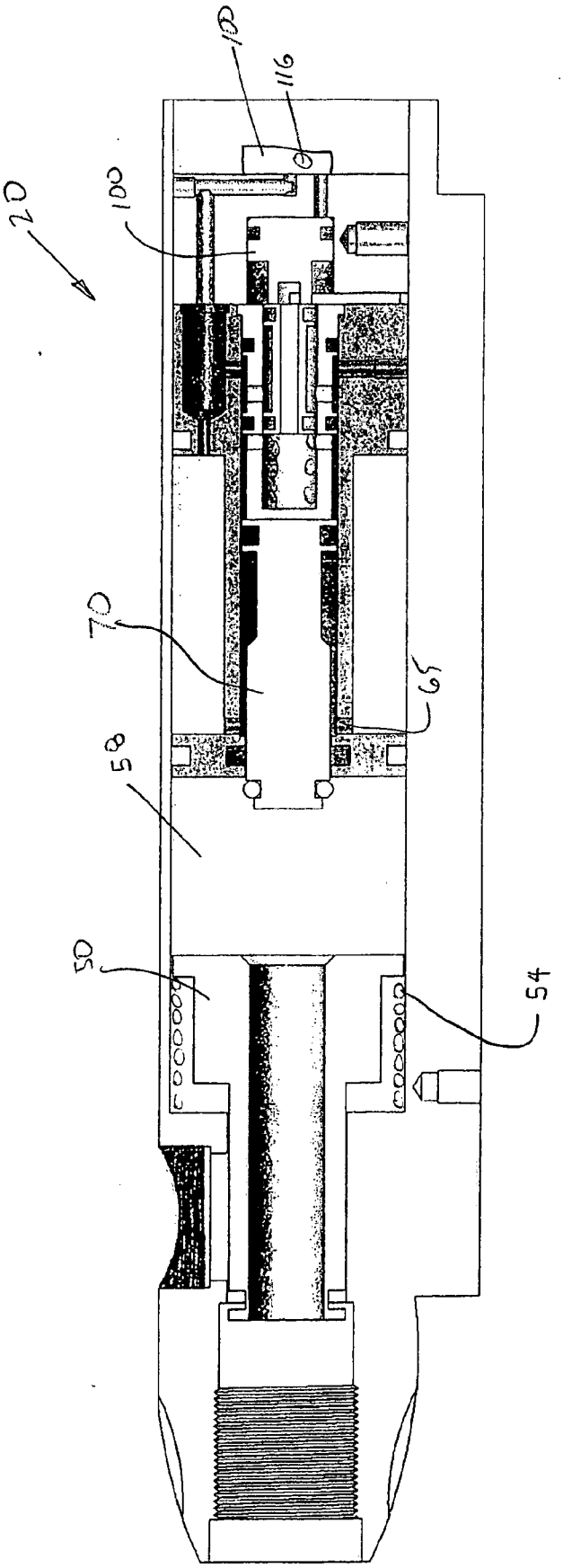


FIG. 8

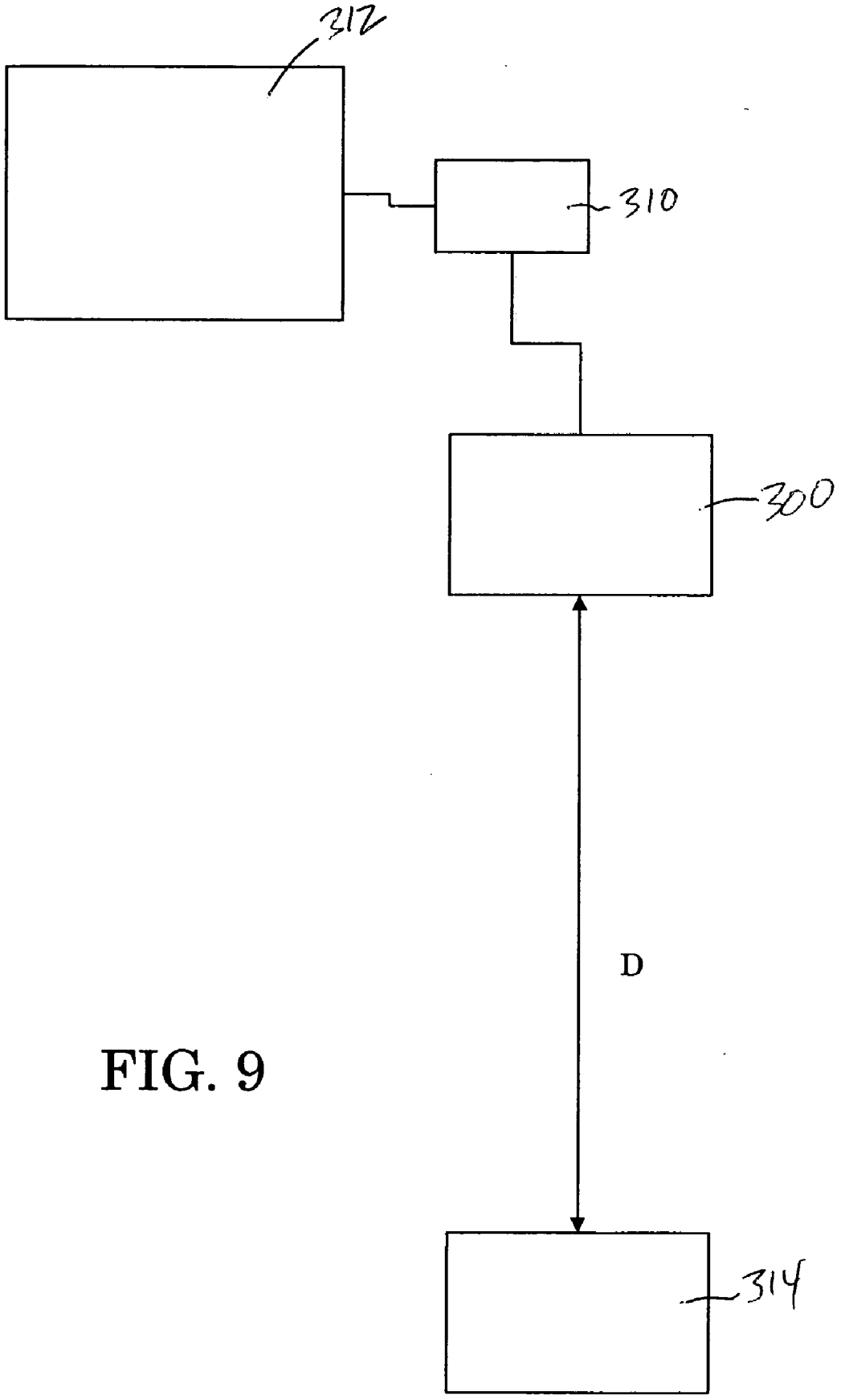


FIG. 9

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 chamber, 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 date 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.

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