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(54) **GAS BLOCK FOR FIREARM**

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(71) Applicant: **WHG Properties, LLC**, North Wales, PA (US)

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(72) Inventor: **William H. Geissele**, Lower Gwynedd,
PA (US)

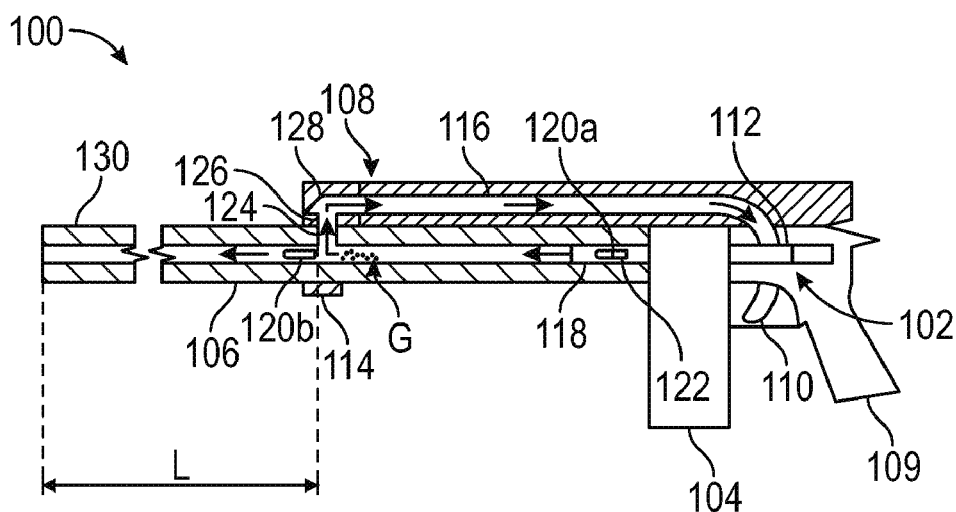
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(57) **ABSTRACT**

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A gas block which operates to reduce the effects of erosion of a firearm barrel gas port is described herein. Reducing the effects of this erosion limits irregular cycling of the firearm action. The gas block has a gas port with a cross-sectional dimension that is not smaller than the cross-sectional dimension of the firearm barrel gas port.



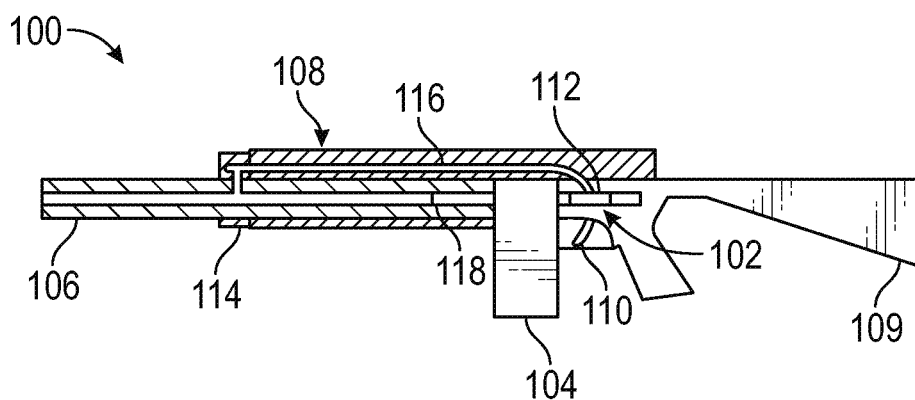


FIG. 1

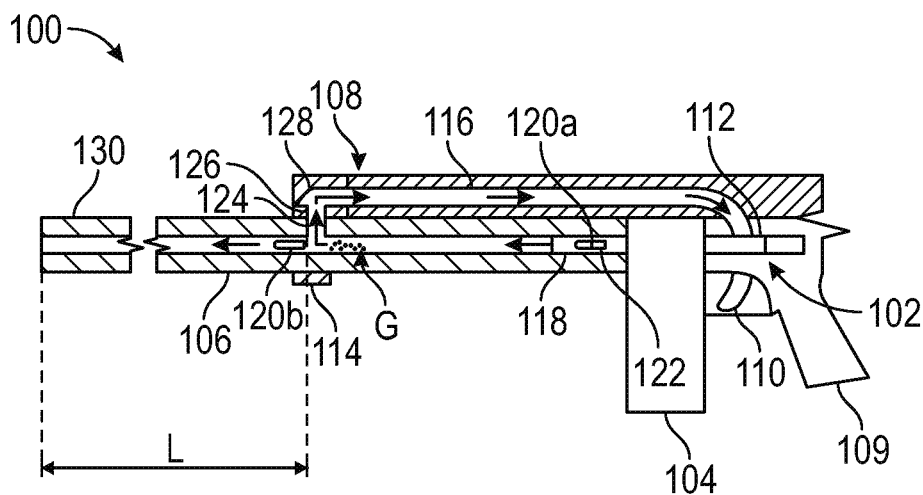


FIG. 2

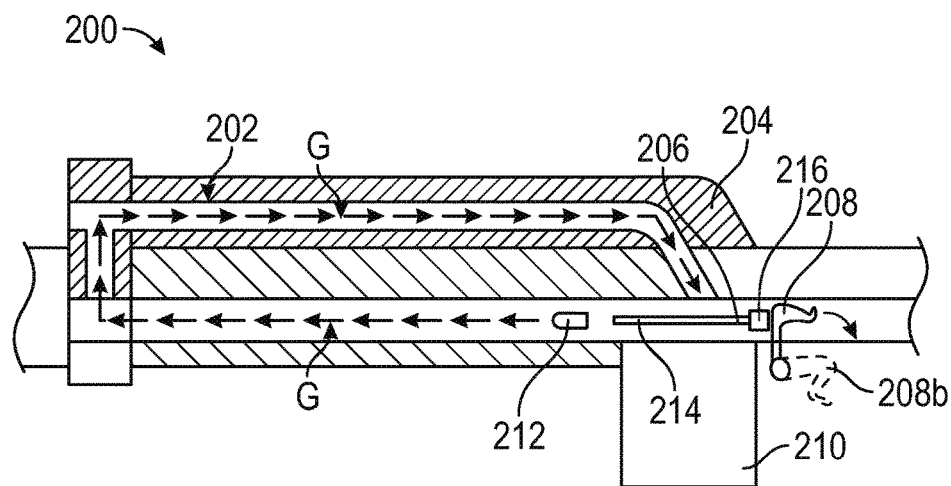


FIG. 3

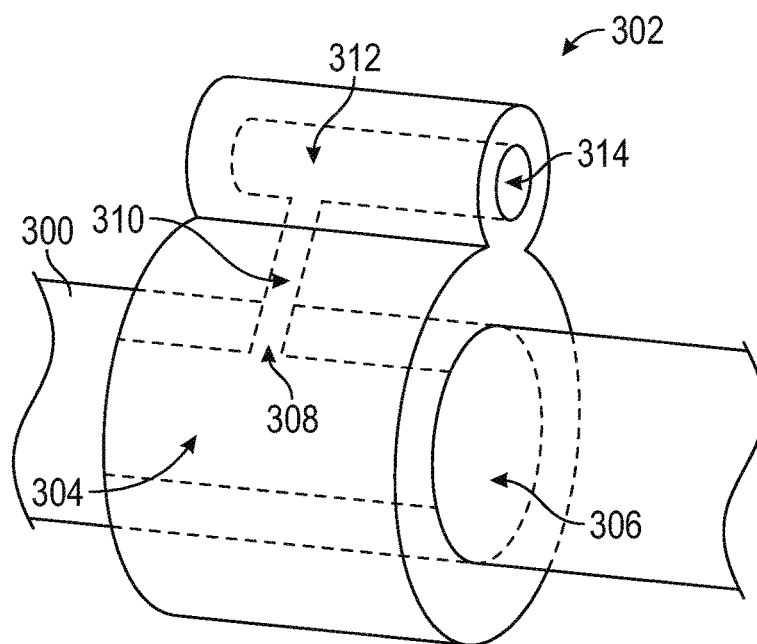


FIG. 4

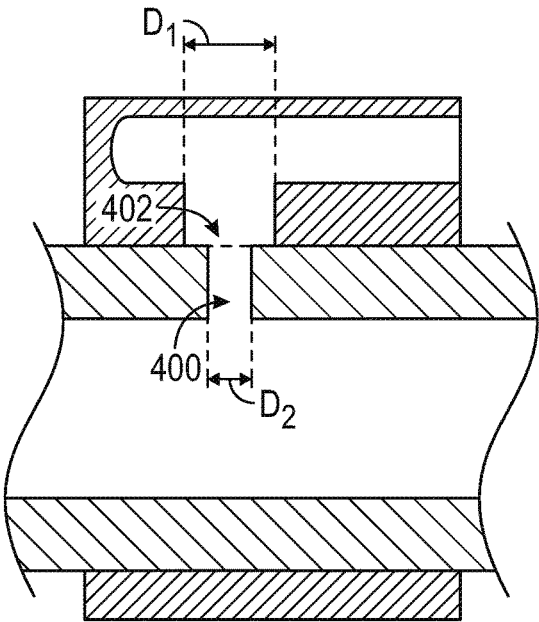


FIG. 5A

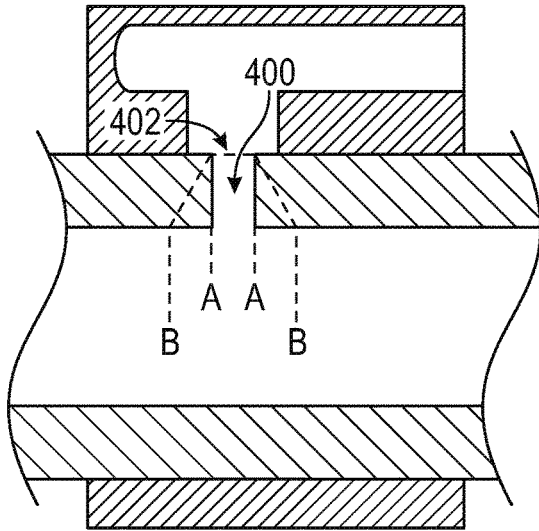


FIG. 5B

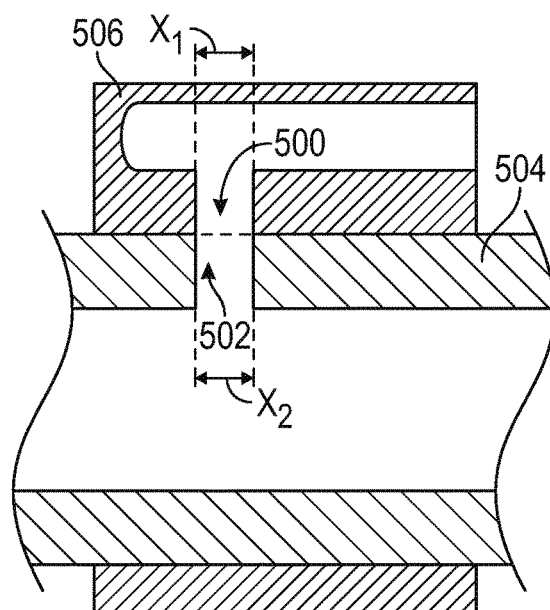


FIG. 6

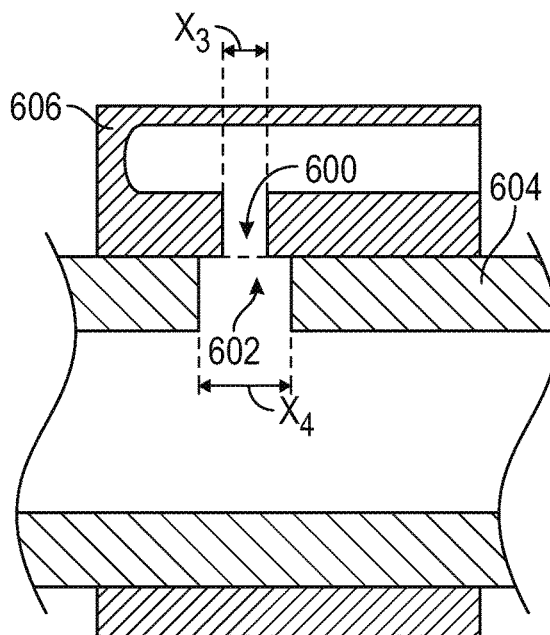


FIG. 7

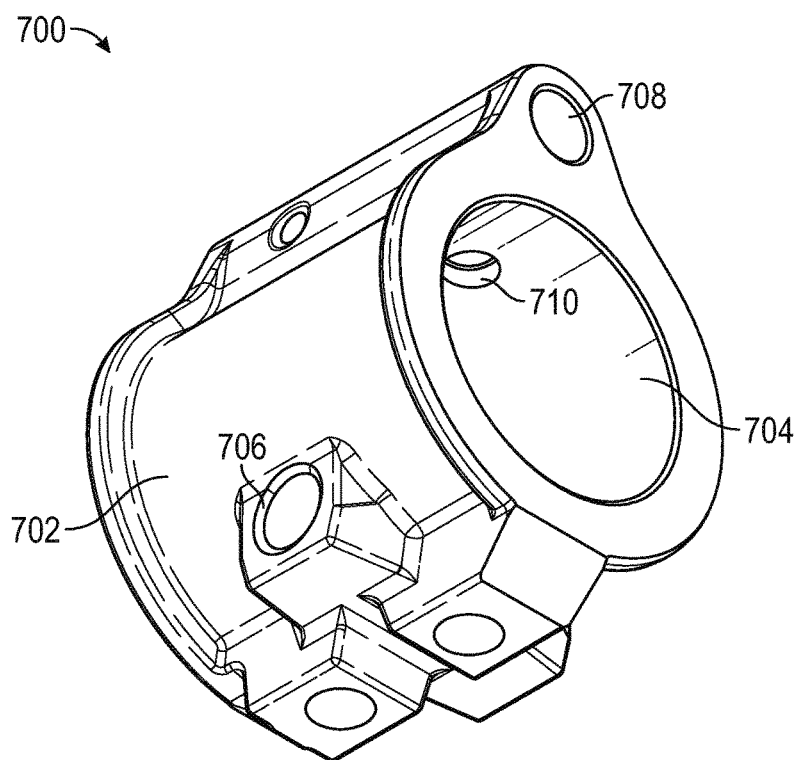


FIG. 8

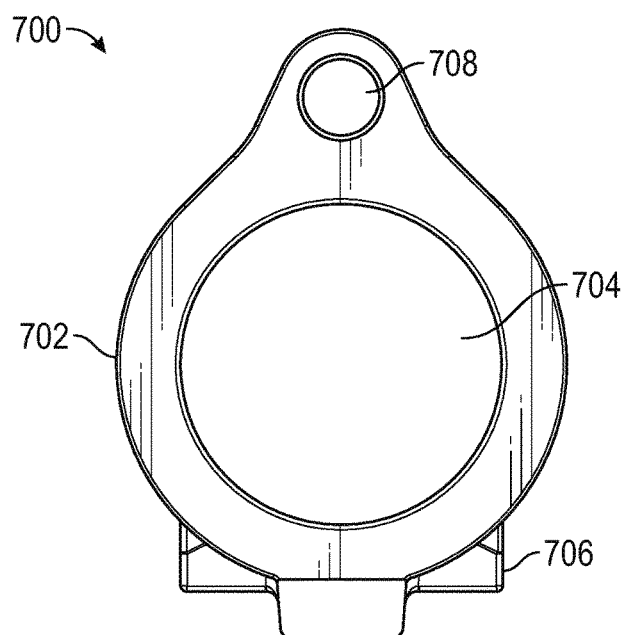


FIG. 9

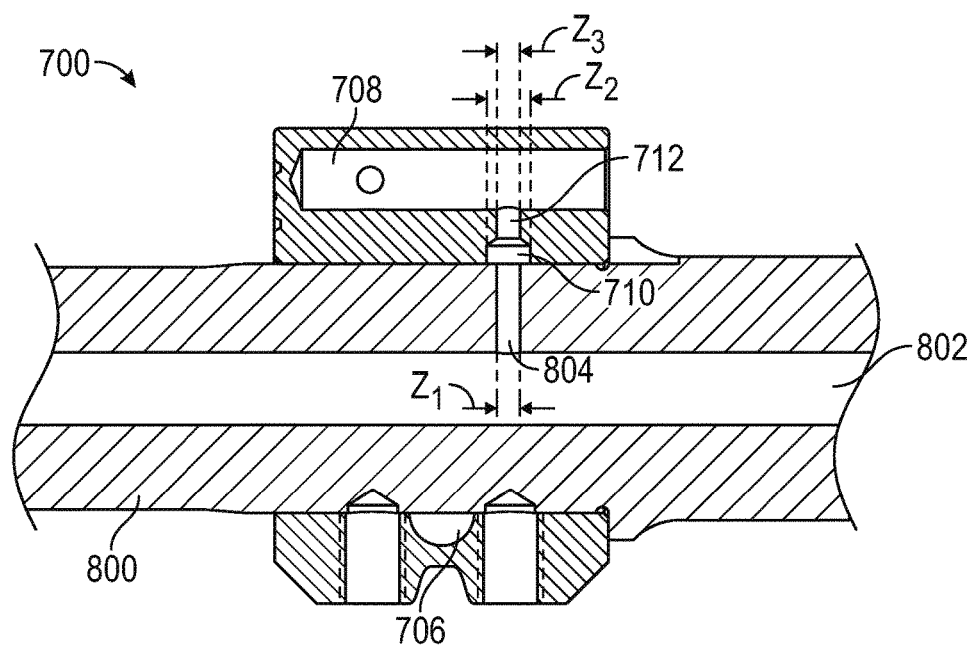


FIG. 10

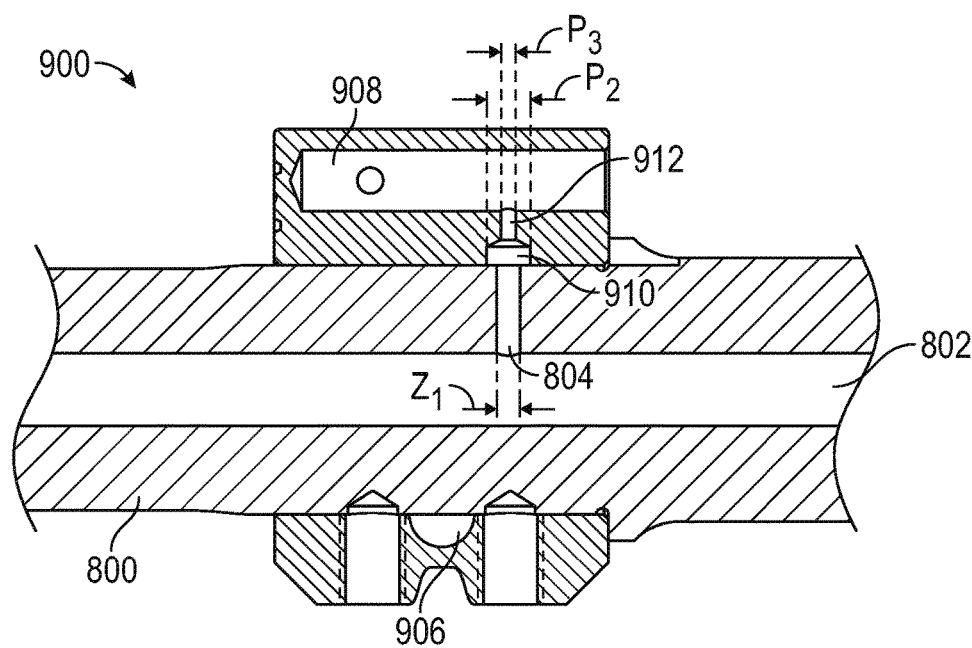


FIG. 11

GAS BLOCK FOR FIREARM

BACKGROUND

[0001] When a firearm is fired, high pressure gas is generated that rapidly propels a bullet (or other projectile) through and out of the barrel. In some types of firearms, a portion of the energy from the high pressure gas is captured and used for ejecting the spent cartridge and reloading the firearm with a fresh cartridge. The parts of the firearm that capture the portion of the gas and use the energy to reload the firearm are sometimes collectively referred to as a gas system. In order to capture the gas, the barrel of such a firearm typically includes a small aperture, referred to as a gas port. When the cartridge is fired, some of the high pressure gas is diverted through the gas port where it is then directed through a gas tube and back to the receiver, where the gas is then used for reloading the firearm.

SUMMARY

[0002] This disclosure generally relates to a gas block for a firearm. In some embodiments, and by non-limiting example, the gas block operates to reduce the effects of erosion of the firearm gas port. Various aspects are described in this disclosure, which include, but are not limited to, the following aspects.

[0003] In one aspect, an apparatus comprises a gas block for operational alignment with a firearm barrel, the firearm barrel having a firearm barrel gas port defined by a firearm barrel gas port cross-sectional diameter of 0.063 in to 0.096 in, the gas block comprising a gas block gas port for operational alignment with the firearm barrel gas port, the gas block gas port being defined by a gas block gas port cross-sectional diameter that is not greater than the firearm barrel gas port cross-sectional diameter. In another aspect, the gas block gas port cross-sectional area diameter is equal to the firearm barrel cross-sectional area diameter. In another aspect, the gas block gas port cross-sectional diameter is smaller than the firearm barrel cross-sectional diameter. In another aspect, the gas block gas port cross-sectional diameter is defined based on the location of the firearm barrel gas port on the firearm barrel. In another aspect, the gas block gas port is adapted to ensure a pressure range of a gas travelling from the firearm barrel gas port. In another aspect, the gas block further comprises a basin for direct engagement around the firearm barrel gas port. In another aspect, the basin comprises a cross-sectional area dimension that is greater than the gas block gas port cross-sectional area dimension.

[0004] In a further aspect, a firearm gas block for directing a high pressure gas, wherein the high pressure gas cycles a firearm action, comprises: a firearm barrel receiver; a gas tube receiver operationally connected with the firearm barrel receiver; and a gas port operationally connecting the firearm barrel receiver and the gas tube receiver, the gas port comprises a cross-sectional diameter of 0.063 in to 0.096 in, the gas block gas port is adapted to maintain a minimum pressure of the high pressure gas needed to cycle the firearm action. In another aspect, the gas block gas port is adapted to maintain the pressure of the high pressure gas at 10,000 psi to 15,000 psi. In another aspect, the gas block gas port cross-sectional diameter is not greater than a cross-sectional diameter of a firearm barrel gas port onto which the firearm gas block is operationally aligned. In another aspect, the

firearm gas block further comprises a basin operationally connected to the gas block gas port, the basin ensuring that the gas block gas port receives the high pressure gas. In another aspect, the basin comprises a larger cross-sectional dimension than the gas block gas port. In another aspect, the firearm gas block further comprises a firearm barrel receiver defined by a circumference, the gas port being oriented away from the circumference of the firearm barrel receiver. In another aspect, the firearm gas block further comprises a firearm barrel fastener.

[0005] In a further aspect, a method of designing a gas block comprises: determining a cross-sectional dimension of a firearm barrel gas port on a firearm comprising a barrel, a muzzle and an action, the firearm barrel gas port cross-sectional dimension being defined by a pressure range of a high pressure gas needed to cycle the action, the pressure range being defined by the length of the firearm barrel, the diameter of the firearm barrel and the distance of the firearm barrel gas port from the muzzle; and defining a gas block gas port with a cross-sectional dimension that is not greater than the firearm barrel gas port cross-sectional dimension to ensure that a high pressure gas exiting the gas block gas port comprises the pressure level needed to cycle the action of the firearm. In another aspect, the pressure range of the high pressure gas is 10,000 psi to 15,000 psi. In another aspect, the gas block gas port cross-sectional dimension comprises a diameter of 0.063 in to 0.096 in. In another aspect, the gas block gas port cross-sectional dimension is equal to the firearm barrel gas port cross-sectional dimension. In another aspect, the gas block gas port cross-sectional dimension is less than the firearm barrel gas port cross-sectional dimension. In another aspect, the method further comprises forming a basin in the gas block to ensure that the gas port receives the high pressure gas.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a cross-sectional schematic block diagram of an example firearm.

[0007] FIG. 2 is a cross-sectional schematic block diagram of the example firearm shown in FIG. 1, showing an example travel pathway of high pressure gas through an example gas system.

[0008] FIG. 3 is a cross-sectional side view of an example firearm, showing an example travel pathway of high pressure gas and the operation of an example action system.

[0009] FIG. 4 is a perspective view of an example firearm barrel extending through an example gas block, showing the internal geometries of each with dashed lines.

[0010] FIG. 5a is a cross-sectional view of an example firearm barrel and an example gas block, showing example gas ports of each in alignment.

[0011] FIG. 5b is a cross-sectional view of the example firearm barrel and example gas block shown in FIG. 5a, showing the effects of erosion by high pressure gas travelling through the gas ports of each.

[0012] FIG. 6 is a cross-sectional view of a firearm barrel and gas block according to an example embodiment of the disclosure.

[0013] FIG. 7 is a cross-sectional view of a firearm barrel and gas block according to another example embodiment of the disclosure.

[0014] FIG. 8 is a perspective view of a gas block according to another example embodiment of the disclosure.

[0015] FIG. 9 is a rear view of the gas block shown in FIG. 8.

[0016] FIG. 10 is a side cross-sectional view of the gas block shown in FIG. 8, showing an example firearm barrel extending therethrough.

[0017] FIG. 11 is a side cross-sectional view of a gas block according to another example embodiment of the disclosure, showing an example firearm barrel extending therethrough.

DESCRIPTION

[0018] Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the appended claims.

[0019] FIG. 1 is a cross-sectional schematic block diagram of an example gas-operated firearm 100. In this example, the firearm 100 includes a receiver 102, a magazine 104, a barrel 106, a gas system 108, and a stock 109. The example receiver 102 includes a trigger mechanism 110 and an action 112. The example gas system 108 includes a gas block 114 and a gas tube 116. The example firearm 100 includes a chamber 118 into which a fresh cartridge is received before being fired.

[0020] The firearm 100 is a gun that fires one or more projectiles, such as a bullet, shot, and the like. In this example, the firearm 100 is a gas-operated firearm 100 in which a gas system 108 is used to capture energy from the firing of the projectile, which is then used to reload the firearm 100. Examples of firearm 100 include rifles, shotguns, and pistols. Gas-operated rifles include automatic and semi-automatic rifles, such as the AR-15 and M-16 with a Direct Impingement System. Gas-operated shotguns include semi-automatic 10, 12, and 20 gauge models. Gas operated pistols include semi-automatic pistols in a wide variety of types and models.

[0021] In this example the firearm 100 includes a receiver 102. In some embodiments the receiver 102 includes a housing that encloses the operating parts of the firearm. In this example, the receiver 102 includes the trigger mechanism 110 and the action 112.

[0022] The trigger mechanism 110 includes a trigger that is pulled by the shooter in order to initiate firing of the firearm 100. Before firing, the trigger mechanism typically operates to hold a hammer in a cocked position. The trigger mechanism prevents the hammer from moving until the trigger is pulled. Once the trigger is pulled a trigger mechanism releases the hammer, resulting in the firing of the firearm.

[0023] The action 112 is the portion of the receiver 102 that operates to eject a spent cartridge and reload the firearm with a fresh cartridge, for example with a bolt carrier group. In this example the action 112 is gas-actuated, such that it receives energy supplied by the gas system 108, and uses that energy to eject the spent cartridge and reload a new cartridge from the magazine 104. An example of the action 112 is an action operable with a Direct Impingement Gas System, such as an AR-15 or M-16 with.

[0024] An example of the magazine 104 is a standard ammunition magazine used with gas-operated firearms with a Direct Impingement Gas System, for example an AR-15 or M-16.

[0025] An example of the barrel 106 is a standard barrel used with gas-actuated firearms. For example, the barrel 106 can be similar to a barrel used with an AR-15 or M-16 with a Direct Impingement Gas System.

[0026] The example gas system 108 includes the gas block 114 and the gas tube 116. An example of the gas system 108 is illustrated and described in more detail with reference to FIG. 2.

[0027] An example of the stock 109 is a standard stock used with gas-operated firearms. For example, the stock 109 can be similar to a stock used with an AR-15 or M-16 with a Direct Impingement Gas System.

[0028] FIG. 2 is another cross-sectional view of the example firearm 100 shown in FIG. 1. The example firearm 100 includes the receiver 102, magazine 104, barrel 106, gas system 108, and stock 109. The example receiver 102 includes the trigger mechanism 110 and the action 112. The example gas system 108 includes the gas block 114 and the gas tube 116 that receive high pressure gas G from a barrel gas port 124 extending through the barrel 106. The gas block 114 includes the gas block gas port 126 and the gas tube receiver 128. The barrel 106 also includes a chamber 118 to house a cartridge 122. Before firing, the cartridge 122 includes a projectile 120. The projectile 120 is shown in a first position 120a in which it is housed in the chamber 118 with the cartridge 122 and in a second position 120b in which it is within the barrel 106 beyond the gas block 114 after the firearm 100 has been fired.

[0029] The example barrel 106 includes a barrel gas port 124 that extends therethrough at a predetermined location along the length of the barrel forward of the chamber 118. The barrel gas port 124 is positioned a predetermined distance L from the muzzle 130 of the barrel 106, as discussed in further detail herein. The gas port 124 in the barrel 106 can be a passageway that extends away, for example perpendicularly, from the pathway within the barrel.

[0030] The example gas block 114 includes a gas port 126 that aligns with, and receives high pressure gas G from the gas port 124 in the barrel 106. The gas port 126 can be a passageway that extends in alignment with the gas port 124 in the barrel 106. The example gas block 114 also includes a gas tube receiver 128 that receives the gas tube 116 therein. The gas tube receiver 128 can be a passageway that extends, away, for example perpendicularly, from the gas port 126 in the gas block 114.

[0031] In the example, a pre-firing cartridge 122 is chambered in the chamber 118 in front of the magazine 104 and action 112. When the firearm 100 is fired, the projectile 120 leaves the cartridge 122 and travels distally within the barrel 106 past the gas port 124 (to and past the second position 120b shown in FIG. 2). High pressure gas G is generated by the fired cartridge 122. The high pressure gas G travels behind the projectile 120 (at the second position 120b) to force the projectile out of the barrel 106. A portion of the high pressure gas G is directed up through the gas port 124 in the barrel 106 and through the gas port 126 and gas tube receiver 128 in the gas block 114 toward the gas tube 116. This high pressure gas then travels within the gas tube 116 proximally towards the receiver 102, where it is released to

activate the action **112** in order to eject the spent cartridge and chamber a fresh cartridge from the magazine **104** into the chamber.

[0032] FIG. **3** is another cross-sectional view of an example firearm **200** showing how an action works to reload the firearm once high pressure gas **G** is collected after firing the firearm **200**. The example firearm **200** includes a gas tube **202**, an action **206**, and a magazine **210**.

[0033] An example of the firearm **200** can be an AR-15 or M-16 with a Direct Impingement Gas System, similar to the example firearm described in FIGS. **1** and **2**.

[0034] An example of the gas tube **202** can be a gas tube that is used with a Direct Impingement Gas System similar to the example firearm described in FIGS. **1** and **2**. The gas tube **202** directs high pressure gas, as described in FIG. **2**, rearwardly toward a bolt carrier key **204** that directs the gas into an expansion chamber within the action **206**.

[0035] An example of the magazine **210** can be a magazine that is used with the example firearm described in FIGS. **1** and **2**.

[0036] An example of the action **206** can be an action that is used with the example firearm described in FIGS. **1** and **2**. The action **206** can include a bolt carrier with an elongated pin shape **214** extending forward and a tail **216** directed rearward. The elongated pin end **214** engages the firing end of a cartridge **212**. The tail **216** of the bolt carrier is positioned to engage the hammer **208**. The tail **216** creates a seal with, and can translate forward and rearward within the expansion chamber of the action **206**.

[0037] After the example firearm **200** has been fired, an amount of high pressure gas from the spent cartridge **212** travels rearwardly through the gas tube **202** and is released through the bolt carrier key **204** into the expansion chamber of action **206**. The entry of the high pressure gas into the expansion chamber ejects the spent cartridge **212** out of a breech of the firearm **200**. The high pressure gas applies force to the tail **216** of the bolt carrier in the action **206** to force the bolt carrier of the action **206** to translate rearwardly away from the spent cartridge **212**. This rearward movement of the bolt carrier of the action **206** forces the hammer **208** downward into a cocked position **208b** and ready for subsequent firing. A recoil spring (not shown) is compressed by the bolt carrier of the action **206** during rearward translation and subsequently pushes the bolt carrier forward after the high pressure gas has been vented from the expansion chamber. The forward translation of the bolt carrier of the action **206** strips and chambers a fresh cartridge from the magazine **210**. As a result, the high pressure gas from a spent cartridge **212** causes the hammer **208** to be re-cocked (in the cocked position **208b**), the spent cartridge to be ejected and a fresh cartridge to be chambered for subsequent firing. For this reason, it is essential to have a sufficient pressure of the gas travel rearwardly through the gas tube **202** toward the action **206**.

[0038] FIG. **4** is a perspective view of an example barrel **300** extending through an example gas block **302**, showing the inner geometry with dashed lines. The example barrel **300** can have an internal passageway **304** extending there-through, and a gas port **308**. The example gas block **302** can have a barrel receiver **306**, a gas port **310**, a gas tube receiver **312** and an aperture **314** for the gas tube receiver.

[0039] An example of the barrel **300** can be a barrel used with a Direct Impingement Gas System, similar to the example barrel described in FIGS. **1** and **2**. The illustrated

barrel **300** has an internal passageway **304** extending there-through for travel of a projectile that has been fired. The internal passageway **304** has a diameter that is narrower than the outer diameter of the barrel **300**.

[0040] The illustrated barrel **300** also has a gas port **308** extending between the internal passageway **304** and the outer diameter of the barrel. The gas port **308** can extend away from, for example perpendicular to, the orientation of the barrel **300** and internal passageway **304**. In use, for example as described in FIG. **2**, high pressure gas travels along the internal passageway **304** and upward through the gas port **308** to exit the barrel **300**.

[0041] An example of the gas block **302** can be a gas block used with a firearm and barrel that includes a Direct Impingement Gas System, similar to the example firearm and barrel described in FIGS. **1** and **2**. The illustrated gas block **302** includes a barrel receiver **306** through which the barrel **300** is inserted. The diameter of the barrel receiver **306** should be sufficiently similar to the outer diameter of the barrel **300** so that the barrel and the barrel receiver align with a near sealing engagement to contain airflow between them.

[0042] The illustrated gas block **302** also has a gas port **310** that extends away, for example perpendicularly, from the outer diameter of the barrel receiver **306**. When the barrel **300** is inserted through the barrel receiver **306** of the gas block **302**, the gas port **310** is aligned with the gas port **308** of the barrel. As a result, the high pressure gas that travels outwardly from the barrel **300** through the gas port **308** will then enter and travel through the gas port **310** in the gas block **302**.

[0043] The illustrated gas block **302** also has a gas tube receiver **312** extending therein and defined by an aperture **314** at the rear-facing end of the gas block. The gas tube receiver **312** can be oriented, for example perpendicularly, with respect to the orientation of the gas port **310** of the gas block **302**. The intersection of the gas port **310** of the gas block **302** and the gas tube receiver **312** is open so as to allow the high pressure gas to travel up through the gas port and into the gas tube receiver. An example gas tube, for example as described in FIGS. **1-3**, is into the gas tube receiver **312** through the aperture **314** so that the high pressure gas the enters the gas tube receiver then travels into the gas tube toward an action at the rear end of the example firearm. The outer diameter of the gas tube receiver **312** and the aperture should be substantially similar to the outer diameter of the gas tube to prevent leakage of gas between them.

[0044] FIGS. **5a** and **5b** are cross-sectional views of an example firearm barrel extending through an example gas block, showing inner cross-sectional dimensions of an example firearm gas port **400** and an example gas block gas port **402** with dashed lines. The illustrated firearm gas port **400** is aligned with the illustrated gas block gas port **402** similarly to the example described in FIG. **4**.

[0045] In FIG. **5a** the illustrated firearm gas port **400** can have a cross-sectional dimension, for example a diameter, **D2**. The illustrated gas block gas port **402** can have a cross-sectional dimension, for example a diameter **D1**. The dimension **D2** of the illustrated firearm gas port **400** can be smaller than the dimension **D1** of the illustrated gas block gas port **402**.

[0046] Through use, high pressure gas that travels upwardly through the firearm gas port **400** and the gas block gas port **402** can cause erosion of the cross-sectional dimen-

sion D2 of the firearm gas port. As specifically shown in FIG. 5b, the initial walls A-A of the firearm gas port 400 can be eroded by high pressure gas to have an irregular or undesirable cross-sectional dimension, for example as shown by walls B-B. Such erosion of the cross-sectional dimension of the firearm gas port 400 can affect the flow and pressure of high pressure gas that flows through the firearm gas port into the gas block gas port 402, and subsequently toward the firearm action as described in the examples shown in FIGS. 2 and 3. Such irregular flow and pressure of gas will affect the operation of the action in its intended capacity, as described with relation to FIG. 3.

[0047] FIG. 6 is a cross sectional view of an example firearm barrel 504 extending through an example gas block 506. The illustrated gas block 506 includes an example gas block gas port 500. The illustrated firearm barrel 504 includes an example barrel gas port 502.

[0048] The illustrated firearm barrel 504 can be a firearm barrel similar to the example barrel described in FIGS. 1 and 2. The illustrated barrel gas port 502 can extend through the firearm barrel 504 similarly to the gas ports described in FIGS. 2, 4, 5a and 5b. The illustrated barrel gas port 502 can have a cross-sectional dimension, for example diameter, defined by the distance X_2 .

[0049] The illustrated gas block 506 can be a gas block used with a Direct Impingement Gas System, similar to the example gas block described in FIGS. 1 and 2. The illustrated gas block gas port 500 can extend through the gas block 506 similarly to the gas ports described in FIGS. 2, 4 5a and 5b. The illustrated gas block gas port 500 can have a cross-sectional dimension, for example diameter, defined by the distance X_1 . As illustrated, the firearm gas port 502 aligns with the gas block gas port 500 to allow high pressure gas to flow through each as similarly described with reference to FIG. 2. As illustrated the distance X_1 defining the cross-sectional dimension of the gas block gas port 500 is equal to the distance X_2 defining the cross-sectional dimension of the barrel gas port 502.

[0050] This consistency in cross-sectional area across the firearm gas port 502 and the gas block gas port 500 limits irregularity of flow and pressure of the high pressure gas traveling therethrough, and thus reduces the likelihood for inaccurate operation of the action of the firearm in its intended capacity, as described with relation to FIG. 3. The action of the firearm requires a certain pressure of the gas in order to function as intended. The cross-sectional dimension X_2 of the firearm gas port 502 is designed to maintain that certain pressure of gas. Thus, even if the firearm gas port 502 erodes, as described, the cross-sectional dimension X_1 of the aligning gas block gas port 500 acts as a backup to maintain that certain pressure.

[0051] FIG. 7 is a cross sectional view of an example firearm barrel 604 extending through an example gas block 606. The illustrated gas block 606 includes an example gas block gas port 600. The illustrated firearm barrel 604 includes an example barrel gas port 602.

[0052] The illustrated firearm barrel 604 can be a firearm barrel used with an AR-15 or M-16 with a Direct Impingement Gas System, similar to the example barrel described in FIGS. 1 and 2. The illustrated barrel gas port 602 can extend through the firearm barrel 604 similarly to the gas ports described in FIGS. 2, 4, 5a and 5b. The illustrated barrel gas port 602 can have a cross-sectional dimension, for example diameter, defined by the distance X_4 .

[0053] The illustrated gas block 606 can be a gas block used with an AR-15 or M-16 with a Direct Impingement Gas System, similar to the example gas block described in FIGS. 1 and 2. The illustrated gas block gas port 600 can extend through the gas block 606 similarly to the gas ports described in FIGS. 2, 4 5a and 5b. The illustrated gas block gas port 600 can have a cross-sectional area dimension, for example a diameter, defined by the distance X_3 . As illustrated, the barrel gas port 602 aligns with the gas block gas port 600 to allow high pressure gas to flow through each as similarly described in FIG. 2. As illustrated the distance X_3 defining the cross-sectional dimension of the gas block gas port 600 is narrower than the distance X_4 defining the cross-sectional area of the barrel gas port 602.

[0054] This consistency in cross-sectional dimension across the barrel gas port 602 and the gas block gas port 600 limits irregularity of flow and pressure of the high pressure gas traveling therethrough, and thus reduces the likelihood for irregular and/or ceased operation of the action of the firearm in its intended capacity, as described with relation to FIG. 3. The action of the firearm requires a certain pressure of the gas in order to function as intended. The cross-sectional dimension X_3 of the barrel gas port 602 is designed to maintain that certain pressure of gas. Thus, even if the barrel gas port 602 erodes, as described, the cross-sectional dimension X_4 of the aligning gas block gas port 600 acts as a backup to maintain that certain pressure.

[0055] FIG. 8 is a perspective view of an example gas block 700, manufactured and tested by the Applicant, that includes a body 702 that surrounds a barrel receiver 704, a fastener block 706, a gas tube receiver 708 and a basin 710 that provides access to a gas port described further below. The illustrated gas block 700 can be a gas block used with a firearm that includes a Direct Impingement Gas System, such as an AR-15 or M-16, similar to the example gas block described in FIGS. 1 and 2.

[0056] The illustrated fastener block 706 can be a fastener used with a firearm that includes a Direct Impingement Gas System, such as an AR-15 or M-16, to secure the gas block 700 to a firearm barrel. An example fastener block 706 can include a screw and nut tightening system.

[0057] The barrel receiver 704 has a dimension that is defined by the used with a firearm that includes a Direct Impingement Gas System, such as an AR-15 or M-16, inner surface of body 702 to snugly receive a firearm barrel, similarly to the example illustrated in FIGS. 1, 2 and 4.

[0058] The gas tube receiver 708 has a dimension that functions to receive a gas tube to carry high pressure gas toward a firearm action, similarly to the gas tube receiver described in FIGS. 2 and 4.

[0059] The basin 710 extends into the gas block body 702 from the outer surface of the barrel receiver 704. The basin 710 acts as an alignment mechanism to ensure that the gas block 700 is aligned over a firearm barrel gas port so as to receive high pressure gas travelling therethrough, as described in FIG. 2. The basin 710 directs high pressure gas into a gas block gas port, described further below, and then into the gas tube receiver 708.

[0060] FIG. 9 is a rear view of the gas block 700 from FIG. 8, illustrating the orientation of the body 702, barrel receiver 704, fastener block 706 and the gas tube receiver 708. In operation, the fastener block 706 is oriented below a firearm barrel and the gas tube receiver 708 is oriented above the firearm barrel.

[0061] FIG. 10 is a side cross-sectional view of the gas block 700 described in FIGS. 8 and 9, showing an example firearm barrel 800 extending therethrough. The gas block 700 illustrates the fastener block 706 oriented below the firearm barrel 800 and the gas tube receiver 708 oriented above the firearm barrel. The basin 710 is illustrated to be positioned between a barrel gas port 804 in the firearm barrel 800 and a gas block gas port 712 in the gas block 700.

[0062] The firearm barrel 800 can be a barrel used with a firearm that includes a Direct Impingement Gas System, for example an AR-15 or M-16. The illustrated barrel 800 includes an internal passageway 802, similar to that described in FIG. 4, through which a fired projectile travels. The illustrated barrel 800 also includes a barrel gas port 804 that extends, for example perpendicularly, between the internal passageway 802 and the outer diameter of the firearm barrel. The illustrated barrel gas port 804 can have a cross-sectional dimension Z_1 , for example defined as a diameter.

[0063] The illustrated basin 710 is oriented directly over the barrel gas port 804 as the gas block 700 is secured around the firearm barrel 800. The basin 710 can have a cross-sectional dimension Z_2 , for example a diameter, that is wider than the cross-sectional dimension Z_1 of the barrel gas port 804 to insure that any high pressure gas that is travelling upwardly through the barrel gas port is eventually received within the gas block gas port 712. An example cross-sectional dimension Z_2 of the basin 710 can be 0.140 in. The basin 710 can engage the firearm barrel 800 around the barrel gas port 804, and create a seal to insure that any loss of such high pressure gas is minimized when travelling from the barrel into the gas block 700.

[0064] The illustrated gas block gas port 712 extends between the basin 710 and the gas tube receiver 708. High pressure gas travels through the gas block gas port 712 toward the gas tube receiver 708 where it is then directed through a gas tube toward a firearm action, as similarly described in FIGS. 2 and 3. The gas block gas port 712 can have a cross-sectional dimension Z_3 , for example a diameter, which is equivalent in width to the dimension Z_1 of the barrel gas port 804. An example dimension Z_1 of the barrel gas port 804, and thus correspondingly the dimension Z_3 of the gas block gas port 712, can be 0.073 inches. Alternative examples of the barrel gas port 804 dimension Z_1 , and thus correspondingly the dimension Z_3 of the gas block gas port 712, are described in Chart A below. As described similarly in FIG. 6, this common width of the barrel gas port dimension Z_1 and the gas block gas port dimension Z_3 maintains a consistent pressure of high pressure gas that travels toward the action of the firearm.

[0065] As illustrated, the basin dimension Z_2 can be wider than both the barrel gas port dimension Z_1 and the gas block gas port dimension Z_3 .

[0066] The dimension of the example firearm barrel gas ports X_2 , X_4 and Z_1 described in the embodiments above can vary depending on the barrel length, the barrel diameter and the distance from the muzzle. Established example relationships for a firearm with a Direct Impingement System, such as an M-16 and AR-15, as described in FIGS. 1 and 2, are shown in Chart A below.

Chart A

[0067]

Barrel Length (in)	Barrel Diameter (in)	Distance from Muzzle (in)	Min Port Size (in)	Max Port Size (in)
11.5	.625	3.850	.081	.089
11.5	.750	3.850	.086	.094
14.5	.625	8.375	.063	.078
14.5	.625	8.375	.070	.086
16	.625	8.375	.063	.078
16	.750	8.375	.070	.086
20	.625	6.875	.086	.093
20	.750	6.875	.093	.096

[0068] FIG. 11 is a side cross-sectional view of an example gas block 900 showing the example firearm barrel 800 extending therethrough. The illustrated gas block 900 can have the same external surfaces and geometric orientations as the example gas block described in FIGS. 8 and 9. The illustrated gas block 900 includes a fastener block 906 oriented below the firearm barrel 800 and a gas tube receiver 908 oriented above the firearm barrel. A basin 910 is illustrated to be positioned between the barrel gas port 804 in the firearm barrel 800 and a gas block gas port 912 in the gas block 900.

[0069] The firearm barrel 800 can be the same firearm barrel described in FIG. 10, with an internal passageway 802 and a barrel gas port 804 defined by a cross-sectional dimension Z_1 .

[0070] The illustrated basin 910 is oriented directly over the barrel gas port 804 as the gas block 900 is secured around the firearm barrel 800. The basin 910 can have a cross-sectional dimension P_2 , for example a diameter, that is wider than the cross-sectional dimension Z_1 of the barrel gas port 804 to insure that any high pressure gas that is travelling upwardly through the barrel gas port is eventually received within the gas block gas port 912. The basin 910 can engage the firearm barrel 800 around the barrel gas port 804, and create a seal to insure that any loss of such high pressure gas is minimized when travelling from the barrel into the gas block 900.

[0071] The illustrated gas block gas port 912 extends between the basin 910 and the gas tube receiver 908. High pressure gas travels through the gas block gas port 912 toward the gas tube receiver 908 where it is then directed through a gas tube toward a firearm action, as similarly described in FIGS. 2 and 3. The gas block gas port 912 can have a cross-sectional dimension P_3 , for example a diameter, which is narrower in width to the dimension Z_1 of the barrel gas port 804. As described similarly in FIG. 7, this narrower width of the gas block gas port dimension P_3 in comparison to the barrel gas port dimension Z_1 maintains a consistent pressure of high pressure gas that travels toward the action of the firearm.

[0072] As illustrated, the basin dimension P_2 can be wider than both the barrel gas port dimension Z_1 and the gas block gas port dimension P_3 .

[0073] In order to maintain proper operational functionality of the action of the firearm, as described above in FIG. 3, the pressure of the high pressure gas travelling through the gas port of the example firearm barrel gas ports X_2 , X_4 and Z_1 described in the embodiments above can be 10,000 psi to 15,000 psi, and more preferably 10,000 psi to 12,000 psi.

But the minimum pressure of the gas within the gas port should be 10,000 psi and the maximum pressure should be 15,000 psi.

[0074] Although specific examples of the disclosure have been described, numerous other modifications and alternative embodiments are within the scope of the disclosure. For example, any of the functionality described with respect to a particular device or component may be performed by another device or component. Further, while specific device characteristics have been described, embodiments of the disclosure may relate to numerous other device characteristics. Further, although embodiments have been described in language specific to structural features and/or methodological acts, it is to be understood that the disclosure is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as illustrative forms of implementing the embodiments. Conditional language, such as, among others, “can,” “could,” “might,” or “may,” unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments could include, while other embodiments may not include, certain features, elements, and/or steps. Thus, such conditional language is not generally intended to imply that features, elements, and/or steps are in any way required for one or more embodiments.

[0075] The various embodiments described above are provided by way of illustration only and should not be construed to limit the claims attached hereto. Those skilled in the art will readily recognize various modifications and changes that may be made without following the example

embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the following claims.

1-21. (canceled)

22. A gas block for operational alignment with a firearm barrel having a firearm barrel gas port defined by a firearm barrel gas port cross-sectional diameter of 0.063 in to 0.096 in, the gas block comprising:

a basin for direct engagement around the firearm barrel gas port, the basin being defined by a basin gas port cross-sectional diameter that is greater than the firearm barrel gas port cross-sectional diameter; and

a gas block gas port for operational alignment with the firearm barrel gas port, wherein the gas block gas port is operationally connected to the basin, the gas block gas port being defined by a gas block gas port cross-sectional diameter that is smaller than or equal to the firearm barrel gas port cross-sectional diameter.

23. The gas block of claim **22**, wherein the gas block gas port cross-sectional area diameter is equal to the firearm barrel cross-sectional area diameter.

24. The gas block of claim **22**, wherein the gas block gas port cross-sectional diameter is smaller than the firearm barrel cross-sectional diameter.

25. The gas block of claim **22**, wherein the gas block gas port cross-sectional diameter is defined based on the location of the firearm barrel gas port on the firearm barrel.

26. The gas block of claim **22**, wherein the gas block gas port is adapted to ensure a pressure range of a gas travelling from the firearm barrel gas port.

27. A firearm comprising the gas block of claim **22**.

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