



- (51) **International Patent Classification:**
A63H 33/18 (2006.01) *F41B 11/60* (2013.01)
- (21) **International Application Number:**
PCT/US2014/048640
- (22) **International Filing Date:**
29 July 2014 (29.07.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/859,585 29 July 2013 (29.07.2013) US
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(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

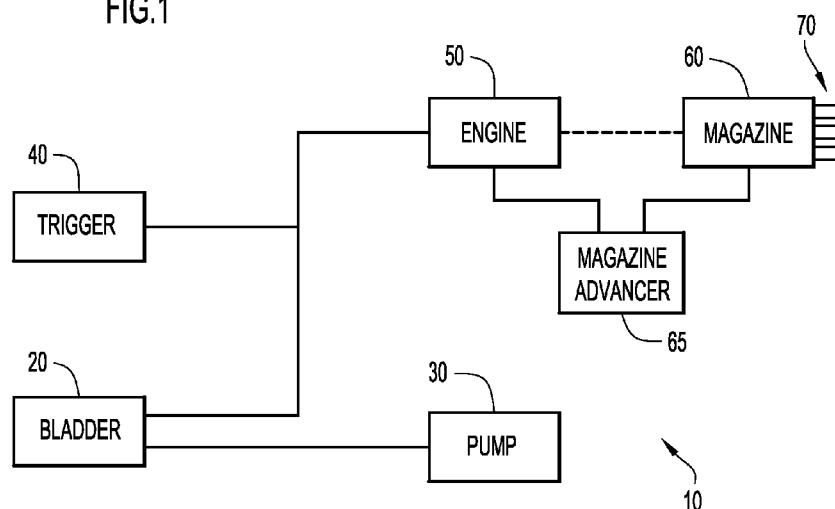
(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) **Title:** PROJECTILE LAUNCHER

FIG.1



(57) **Abstract:** A projectile launcher includes a bladder that is formed of a resilient material. The bladder can be pressurized with fluid using a pump or pump mechanism. The projectile launcher includes an engine that is operated to launch projectiles from the launcher. The projectile launcher also includes a trigger that is operatively located between the bladder and the engine. The pressurized fluid from the bladder is supplied to the engine. The engine includes a reciprocating valve assembly that controls the discharge of pressurized fluid from the engine.

PROJECTILE LAUNCHER

RELATED APPLICATION

[0001] This application claims priority to US Provisional Patent Application No. 61/859,585, filed July 29, 2013, entitled "Projectile Launcher," the entire disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

[0002] This invention relates to a projectile launcher, and in particular, to a projectile launcher that includes an engine and a bladder.

FIELD OF THE INVENTION

[0003] A common way to play, whether for a child or an adult, is to launch projectiles. Conventional projectile launchers can be used to shoot one or more projectiles, such as toy darts. Often, a projectile launcher shoots one projectile and the user has to reload the launcher with another projectile before a second shot can be made. In addition, conventional projectile launchers lack the ability to launch projectiles in an efficient and rapid manner.

[0004] There is a need for a projectile launcher that can efficiently and rapidly fire projectiles. In addition, there is a need for an engine that can be used in a projectile launcher that can shoot multiple projectiles in succession from a single charge of a pressurized bladder.

SUMMARY OF THE INVENTION

[0005] The present invention is directed to a projectile launcher. In one embodiment, the projectile launcher includes a bladder that is formed of a resilient material. The bladder can be pressurized with a fluid, such as air, using a pump or pump mechanism. The projectile launcher

includes an engine that is operated to launch projectiles from the launcher using the pressurized air from the bladder.

[0006] The projectile launcher includes a trigger that is operatively located between the bladder and the engine. The pressurized fluid from the bladder can be supplied to the engine. In one embodiment, the pressurized fluid is supplied to the engine as long as a trigger on the projectile launcher is actuated.

[0007] The engine includes a valve that reciprocates between a sealed position and a released position. When the valve is in its sealed position, pressurized fluid from the bladder is stored or collected in the engine until the valve is released. In one embodiment, the pressurized fluid is stored in a diaphragm. When the valve is released, the pressurized fluid exits the engine in a burst. Upon the release of the pressurized fluid, the valve returns to its sealed position.

[0008] In one embodiment, the valve of the engine reciprocates quickly between its sealed position and released position, thereby creating a series of rapid fire sequential bursts of the pressurized fluid to launch several projectiles successively. The projectiles are stored in a magazine that is movably coupled to the launcher. The launcher includes a magazine advancing mechanism that is repeatedly engaged and advanced during the operation of the engine.

[0009] In one embodiment, a projectile launching device comprises a bladder, a pump for charging the bladder with a pressurized fluid, and an engine fluidly coupled to the bladder. The engine includes a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, and the reciprocating valve assembly includes an engine body, a diaphragm coupled to the engine body, and a valve movable relative to the engine body.

[0010] In an alternative embodiment, the diaphragm is expandable relative to the engine body.

[0011] In an alternative embodiment, the valve is located between the diaphragm and the engine body.

[0012] In an alternative embodiment, the engine body includes an inlet opening, a chamber, and a port, and fluid flows into the inlet opening, through the chamber, and exits the engine body through the port.

[0013] In an alternative embodiment, the valve is positionable to cover the inlet opening of the engine body.

[0014] In an alternative embodiment, the valve is movable between a first position and a second position. The valve prevents fluid from entering the chamber of the engine body when the valve is in the first position, and the valve allows fluid to enter the chamber of the engine body when the valve is in the second position.

[0015] In an alternative embodiment, the diaphragm defines a chamber, and fluid is directed to the chamber to fill the chamber.

[0016] In an alternative embodiment, the diaphragm is expandable as fluid is directed into the chamber.

[0017] In an alternative embodiment, the reciprocating valve assembly includes a moving plate coupled to the diaphragm, and the valve is coupled to the moving plate.

[0018] In an alternative embodiment, the diaphragm defines a chamber and is expandable as fluid is directed to the chamber, the moving plate moves with the diaphragm relative to the engine body as the diaphragm expands.

[0019] In an alternative embodiment, the movement of the moving plate causes the valve to move relative to the engine body.

[0020] In an alternative embodiment, the movement of the moving plate a sufficient distance relative to the engine body moves the valve out of engagement with the engine body, thereby allowing fluid from the chamber of the diaphragm to enter the engine body.

[0021] In an alternative embodiment, the release of fluid from the chamber of the diaphragm into the engine body reduces the fluid pressure in the chamber, thereby allowing the diaphragm to retract.

[0022] In an alternative embodiment, the moving plate moves toward the engine body as the diaphragm retracts, thereby allowing the valve to engage the engine body and prevent additional fluid from traveling from the chamber of the diaphragm to the engine body.

[0023] In an alternative embodiment, the diaphragm defines a chamber, and the engine body includes a passageway extending through the engine body from a port to the chamber.

[0024] In an alternative embodiment, the fluid traveling through the passageway causes the diaphragm to expand.

[0025] In an alternative embodiment, the expansion of the diaphragm moves the valve away from the engine body, thereby allowing air in the chamber of the diaphragm to enter the engine body and launch a projectile.

[0026] In another embodiment, a projectile launching device, comprises a bladder; a pump for charging the bladder with a pressurized fluid; and an engine fluidly coupled to the bladder, the engine including a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, the reciprocating valve assembly including an engine body, a diaphragm coupled to the engine body, the diaphragm being expandable relative to the engine body between a retracted configuration and an expanded configuration, a plate coupled to the diaphragm and movable therewith, the plate including a spring therein, and a valve engaged with

the spring, wherein movement of the diaphragm relative to the engine body causes movement of the valve relative to the engine body, thereby allowing pressurized fluid to escape the engine body to launch a projectile.

[0027] In an alternative embodiment, the plate defines a chamber, the spring is located in the chamber of the plate, and a portion of the valve is located in the chamber of the plate.

[0028] In another embodiment, a projectile launching device, comprises a bladder; a pump for charging the bladder with a pressurized fluid; and an engine fluidly coupled to the bladder, the engine including a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, the reciprocating valve assembly including an engine body, a diaphragm coupled to the engine body and movable relative thereto, the diaphragm defining a chamber for pressurized fluid, and a valve movable relative to the engine body, the valve being movable between a first position in which the valve is engageable with the engine body to seal the engine body from the chamber of the diaphragm and a second position in which the valve disengages from the engine body to allow pressurized fluid to move from the chamber of the diaphragm to the engine body to launch a projectile.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] FIG. 1 is a schematic view of a device for launching a dart or projectile in accordance with an exemplary embodiment of the present invention.

[0030] FIG. 2 is a cross-sectional schematic view of an embodiment of an engine according to the present invention in an initial state or configuration.

[0031] FIG. 3 is a cross-sectional schematic view of the engine of FIG. 2 in an inflating state or configuration.

[0032] FIG. 4 is a cross-sectional schematic view of the engine of FIG. 2 in an inflation limit state or configuration.

[0033] FIG. 5 is a cross-sectional schematic view of the engine of FIG. 2 in an exhaust state or configuration.

[0034] FIG. 6 is a side view of an embodiment of some components of an engine according to the present invention.

[0035] FIG. 7 is an end view of an embodiment of an engine according to the present invention.

[0036] Like reference numerals have been used to identify like elements throughout this disclosure.

DETAILED DESCRIPTION

[0037] As used herein, the terms “launcher,” “gun,” and “toy gun” are used interchangeably to refer to a device that propels or launches an object, such as a toy dart or projectile.

[0038] Referring to FIG. 1, a toy, device, toy blaster or gun or apparatus 10 for launching a toy projectile according to an embodiment of the present invention is illustrated. In this embodiment, the toy gun 10 includes a bladder 20 that is made of an elastic or elastomeric material such that the bladder 20 can stretch and expand as a fluid, such as air, is pumped into the bladder 20. The inflation of the bladder 20 can be referred to alternatively as charging the bladder. Toy gun 10 includes a pump 30 that can be used to inflate the bladder 20 by pumping air into it. The pump 30 may be manually operated such that the user of the toy gun 10 can move the pump 30 in a reciprocating manner to inflate the bladder 20. A manually operated pump 30 may include a handle with a shaft that can be reciprocated. In an alternative embodiment, the pump 30 may be operated by a motor that is internal or external to the toy gun 10.

[0039] Toy gun 10 also includes an engine 50 that is driven by the pressurized fluid in the bladder 20. In some embodiments, the engine 50 is a pneumatically operated engine that functions with pressurized air, as described in detail below.

[0040] A trigger 40 is located between the bladder 20 and the engine 50 to control the flow of pressurized air from the bladder 20 to the engine 50. Proximate to the engine 50 is a magazine 60 that has one or more chambers in which projectiles 70 may be located. The magazine 60 is removably mounted to the housing of the toy gun 10 so that pressurized fluid discharged from the engine is directed to a chamber of the magazine 60, thereby launching a projectile 70 therefrom. The magazine 60 can be advanced by a magazine advancer 65, such as a pawl and rack or gear combination, that is operatively coupled to the engine 50 and the magazine 60.

[0041] Regarding the bladder 20, the bladder 20 is resilient and its body expands to accommodate pressurized fluid. The expanded body provides a constant force on the pressurized fluid therein and is biased to contract to its initial state. As the pressurized fluid exits the bladder 20, the constant force applied by the walls of the bladder 20 ensures that the fluid supplied to the engine 50 from the bladder 20 is supplied at a constant rate and pressure. These characteristics ensure a more consistent operation of the engine 50 because the pressure of the fluid that is used to launch the projectiles is consistent between the first launch and the last launch.

[0042] Referring to FIG. 2, an embodiment of an engine according to the present invention is illustrated. For simplicity, many of the components of the toy gun in which the engine can be used are not shown in FIG. 2. The engine is configured to fire projectiles from the toy gun in a repeated and sequential manner. As described in greater detail below, the components of the engine cycle rapidly, which results in quick and short bursts of pressurized fluid from the toy gun.

[0043] The engine 100 is illustrated in its initial or rest state 102 in FIG. 2. This initial state 102 corresponds to the beginning of a cycle of operation, with each cycle resulting in the launching of a projectile from the toy gun. Engine 100 includes an engine body 150, a diaphragm 130 coupled to the engine body 150, a moving plate 110 coupled to the diaphragm 130, and a valve 180 that controls the flow of fluid from the diaphragm 130 to the engine body 150, as described in detail below.

[0044] In this embodiment, the moving plate 110 has a distal end 112 and a proximal end 114 opposite the distal end 112. The proximal end 114 includes an opening 116 formed therein. The moving plate 110 also includes an inner wall 118 that defines a chamber 120. The moving plate 110 can be referred to alternatively as a valve travel limiting assembly.

[0045] The diaphragm 130 is coupled to the proximal end 114 of the moving plate 110. The diaphragm 130 includes a body portion 132 with an opening 134 formed therein that is aligned with opening 116 of the moving plate 110. The diaphragm 130 also has a side wall portion 136 that extends from body portion 132 and that is generally cylindrical. The body portion 132 and the side wall portion 136 define a chamber 145 into which pressurized fluid can flow. Along the inner surface of the side wall portion 136 is a ridge or tab 138 that is coupled to the engine body 150 to seal the chamber 145 of the diaphragm 130. The diaphragm 130 is illustrated in its initial or rest configuration 140 in FIG. 2. In this configuration 140, the diaphragm 130 is in a collapsed state.

[0046] The engine body 150 includes an inner wall 152 that defines a chamber 154 and an end 162 that defines a portion of chamber 145 with the diaphragm. End 162 includes an inlet opening or port 162A through which air can flow from chamber 145 into chamber 154. A port 156 is in fluid communication with the chamber 154. As described in greater detail below,

pressurized air that is in the chamber 145 of the diaphragm 130 can flow into chamber 154 and through the port 156 to exit the engine body 150 and launch a projectile. The engine body 150 includes a passageway 158 that extends through the engine body 150 from a port 160 to the chamber 145. Pressurized fluid from the bladder of the toy gun can flow from a pressurized bladder through the passageway 158 to the chamber 145.

[0047] As mentioned above, the engine 100 also includes a valve 180 located in the chamber 145 of the diaphragm 130. The valve 180 is flush with the end surface 162 of the engine body 150, thereby forming a seal with the engine body 150 to prevent any fluid in the chamber 145 from entering the engine body 150. The valve 180 is seated in its sealed position due to the strength of the natural resting state of the collapsed diaphragm 130.

[0048] In this embodiment, the valve 180 includes a plunger 170 with a shoulder or head 172 and a stem 174 to which the valve 180 is coupled. As shown in FIG. 2, the stem 174 extends through openings 116 and 134. A spring 185, also referred to as a valve assisting spring, is located in the chamber 120 of the moving plate 110. The spring 185 engages the proximal end of the moving plate 110 and the shoulder 172 of the plunger 170, thereby applying a biasing force on the plunger 170 along the direction of arrow "A." The initial configuration 122 of the spring 185 is illustrated in FIG. 2. In this embodiment, valve 180 is formed of rubber. The rubber valve 180 is seated due to the strength of the natural resting state of the collapsed state of the diaphragm 130.

[0049] Referring to FIG. 3, the partial inflation and operation of the engine is illustrated. This illustrated configuration 104 is referred to as an inflating state of operation of the engine 100. Pressurized fluid 155 is introduced to the engine 100 by traveling along the direction of arrow "B" through passageway 158 to the chamber 145 of the diaphragm 130. As pressurized fluid

155 is introduced to the chamber 145, the diaphragm 130 expands along the direction of arrow “C” and the moving plate 110 moves in the same direction. A partially inflated configuration 142 of the diaphragm 130 is illustrated in FIG. 3.

[0050] Coupled to the moving plate 110 is a pawl that advances the magazine to align the next chamber in the magazine with the output port of the engine 100 so the next projectile to be launched is properly positioned.

[0051] The distance that the moving plate 110, which can be referred to alternatively as a sled, can travel is determined by the location of the shoulder 172 on the valve stem 174. This distance also corresponds to the volume of fluid required in the chamber 145 of the diaphragm 130 to fire a projectile as the chamber 145 is emptied of its pressurized fluid when the valve 180 is opened, as described below.

[0052] As shown in FIG. 3, the motion of the expanding diaphragm 130 along the direction of arrow “C” compresses the spring 185 between the proximal end 114 of the moving plate 110 and the shoulder 172. The movement of the shoulder 172 in the direction of arrow “C” also starts to pull the valve 180 away from the engine body 150.

[0053] Referring to FIG. 4, another configuration, 106, of engine 100 during the operation cycle is illustrated. Configuration 106 can be referred to as an inflation limit configuration because the pressurized fluid provided to the engine is at its maximum volume before the valve is opened. Pressurized fluid is continuously traveling through passageway 158 of the engine body 150 to the chamber 145 of the diaphragm 130, provided that the trigger of the toy gun is continuously pulled to allow the pressurized fluid to exit the bladder.

[0054] As the pressurized fluid enters the chamber 145, the diaphragm 130 continues to expand along the direction of arrow “D,” which moves plate 110 along the same direction. The diaphragm 130 is expanded to an enlarged configuration. The movement of the diaphragm 130 and the moving plate 110 compresses valve assisting spring 185 between the shoulder 172 and the proximal end 114, as shown. When the diaphragm 130 is expanded to the limit of the shoulder 172 on the valve stem 174, the spring 185 is completely compressed. When this limit is reached, the spring 185 exerts sufficient force on the shoulder 172 to start to move the valve 180 away from end 163 of the engine body 150. As the stem 174 is moved along the direction of arrow “D,” the seal between the valve 180 and the engine body 150 begins to break.

[0055] Referring to FIG. 4, the deformation of the valve 180 due to the tension of the valve stem 174 on the valve 180 is illustrated. The face 182 of the valve 180 has been pulled away from the engine body 150 and the periphery 184 still remains in contact with the end 163 of the engine body 150. However, the periphery 184 will eventually separate as well from the engine body end 163, thereby resulting in the seal of the valve 180 being broken. The elastic characteristics of the valve 180 assist in the rapid breaking of the seal between the valve 180 and the engine body 150.

[0056] Referring to FIG. 5, the exhaust configuration of the operation cycle of the engine is illustrated. This configuration 108 illustrates the state of the components of the engine 100 with the seal between the valve 180 and the engine body 150 being broken. The seal is completely broken when the valve stem 174 has been moved a sufficient distance to cause valve 180 to disengage from the engine body 150 and move to its released position.

[0057] Once the seal is broken, the spring 185 continues to apply a force on the shoulder 172, moving it in the direction of arrow “E.” The force applied by the spring 185 ensures that the

valve opens fully. Once the seal is broken, the pressurized fluid in chamber 145 of diaphragm 130 exits the chamber 145 through chamber 154 and port 156 along the direction of arrow “F.” The spring 185 also functions to extend the amount of time that the valve 180 stays open, which allows the pressurized fluid to escape the chamber 145. This allows all or nearly all of the pressurized fluid to be ejected from the diaphragm 130. Preferably, the amount of fluid ejected is sufficient to launch a projectile at a desirable speed.

[0058] As the pressurized fluid exits the chamber 145, the diaphragm 130 deflates and retracts along the direction of arrow “G” to return to its original state as illustrated in FIG. 2. At the same time as the diaphragm 130 is deflating, the spring 185 starts to extend and the distance between the shoulder 172 and the proximal end 114 of the moving plate 110 increases. The diaphragm 130 eventually returns to its natural state or configuration 102, thereby forcing the valve 180 to its closed position and moving the moving plate 110 to its start position (see FIG. 2). In this position, the pawl coupled to the moving plate 110 is in position to push the next ratchet tooth on the magazine 60 to advance the magazine 60.

[0059] The result of the operation of the engine 100 described above is that it is a high speed and short stroke cycle, which reduces the amount of space that the engine needs in the toy gun. The high speed characteristic allows the engine to operate repeatedly during one pressurized bladder cycle. The distance that the system described above travels directly corresponds to the distance needed to advance the magazine one chamber on the magazine.

[0060] Referring to FIGS. 6 and 7, an embodiment of an engine according to the present invention is illustrated. Referring to FIG. 6, a portion of the engine 300 is shown. A diaphragm 310 is coupled to a moving plate 320 and a valve 330. The valve 330 includes a valve stem 332 that moves relative to a shoulder 312 of the diaphragm 210.

[0061] Referring to FIG. 7, a different view of the engine 300 is illustrated. As shown, the engine 300 includes an engine body 350 that has a shooting nozzle 370 through which pressurized fluid flows from the diaphragm 310 to launch a projectile. In addition, the engine body 350 also includes an inlet 360 through which pressurized fluid enters to fill the diaphragm 310.

[0062] The bladder and engine assembly described herein and shown in the attached drawings can be used with any type or configuration of a projectile launcher. In other words, the variety of shapes or sizes of projectile launcher with which the bladder and engine assembly of the present invention is not limited.

[0063] It is to be understood that terms such as “left,” “right,” “top,” “bottom,” “front,” “end,” “rear,” “side,” “height,” “length,” “width,” “upper,” “lower,” “interior,” “exterior,” “inner,” “outer” and the like as may be used herein, merely described points or portions of reference and do not limit the present invention to any particular orientation or configuration. Further, terms such as “first,” “second,” “third,” etc., merely identify one of a number of portions, components, and/or points of reference as disclosed herein, and do not limit the present invention to any particular configuration or orientation.

What is claimed is:

1. A projectile launching device, comprising:
a bladder;
a pump for charging the bladder with a pressurized fluid; and
an engine fluidly coupled to the bladder, the engine including a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, the reciprocating valve assembly including an engine body, a diaphragm coupled to the engine body, and a valve movable relative to the engine body.
2. The projectile launching device of claim 1, wherein the diaphragm is expandable relative to the engine body.
3. The projectile launching device of claim 2, wherein the valve is located between the diaphragm and the engine body.
4. The projectile launching device of claim 3, wherein the engine body includes an inlet opening, a chamber, and a port, and fluid flows into the inlet opening, through the chamber, and exits the engine body through the port.
5. The projectile launching device of claim 4, wherein the valve is positionable to cover the inlet opening of the engine body.

6. The projectile launching device of claim 5, wherein the valve is movable between a first position and a second position, the valve prevents fluid from entering the chamber of the engine body when the valve is in the first position, and the valve allows fluid to enter the chamber of the engine body when the valve is in the second position.
7. The projectile launching device of claim 2, wherein the diaphragm defines a chamber, and fluid is directed to the chamber to fill the chamber.
8. The projectile launching device of claim 7, wherein the diaphragm is expandable as fluid is directed into the chamber.
9. The projectile launching device of claim 1, wherein the reciprocating valve assembly includes a moving plate coupled to the diaphragm, and the valve is coupled to the moving plate.
10. The projectile launching device of claim 9, wherein the diaphragm defines a chamber and is expandable as fluid is directed to the chamber, the moving plate moves with the diaphragm relative to the engine body as the diaphragm expands.
11. The projectile launching device of claim 9, wherein movement of the moving plate causes the valve to move relative to the engine body.

12. The projectile launching device of claim 11, wherein movement of the moving plate a sufficient distance relative to the engine body moves the valve out of engagement with the engine body, thereby allowing fluid from the chamber of the diaphragm to enter the engine body.

13. The projectile launching device of claim 12, wherein the release of fluid from the chamber of the diaphragm into the engine body reduces the fluid pressure in the chamber, thereby allowing the diaphragm to retract.

14. The projectile launching device of claim 13, wherein the moving plate moves toward the engine body as the diaphragm retracts, thereby allowing the valve to engage the engine body and prevent additional fluid from traveling from the chamber of the diaphragm to the engine body.

15. The projectile launching device of claim 1, wherein the diaphragm defines a chamber, and the engine body includes a passageway extending through the engine body from a port to the chamber.

16. The projectile launching device of claim 15, wherein the fluid traveling through the passageway causes the diaphragm to expand.

17. The projectile launching device of claim 16, wherein the expansion of the diaphragm moves the valve away from the engine body, thereby allowing air in the chamber of the diaphragm to enter the engine body and launch a projectile.

18. A projectile launching device, comprising:

a bladder;

a pump for charging the bladder with a pressurized fluid; and

an engine fluidly coupled to the bladder, the engine including a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, the reciprocating valve assembly including an engine body, a diaphragm coupled to the engine body, the diaphragm being expandable relative to the engine body between a retracted configuration and an expanded configuration, a plate coupled to the diaphragm and movable therewith, the plate including a spring therein, and a valve engaged with the spring, wherein movement of the diaphragm relative to the engine body causes movement of the valve relative to the engine body, thereby allowing pressurized fluid to escape the engine body to launch a projectile.

19. The projectile launching device of claim 18, wherein the plate defines a chamber, the spring is located in the chamber of the plate, and a portion of the valve is located in the chamber of the plate.

20. A projectile launching device, comprising:
- a bladder;
 - a pump for charging the bladder with a pressurized fluid; and
 - an engine fluidly coupled to the bladder, the engine including a reciprocating valve assembly that controls the flow of pressurized fluid from the engine to launch a projectile, the reciprocating valve assembly including an engine body, a diaphragm coupled to the engine body and movable relative thereto, the diaphragm defining a chamber for pressurized fluid, and a valve movable relative to the engine body, the valve being movable between a first position in which the valve is engageable with the engine body to seal the engine body from the chamber of the diaphragm and a second position in which the valve disengages from the engine body to allow pressurized fluid to move from the chamber of the diaphragm to the engine body to launch a projectile.

1/6

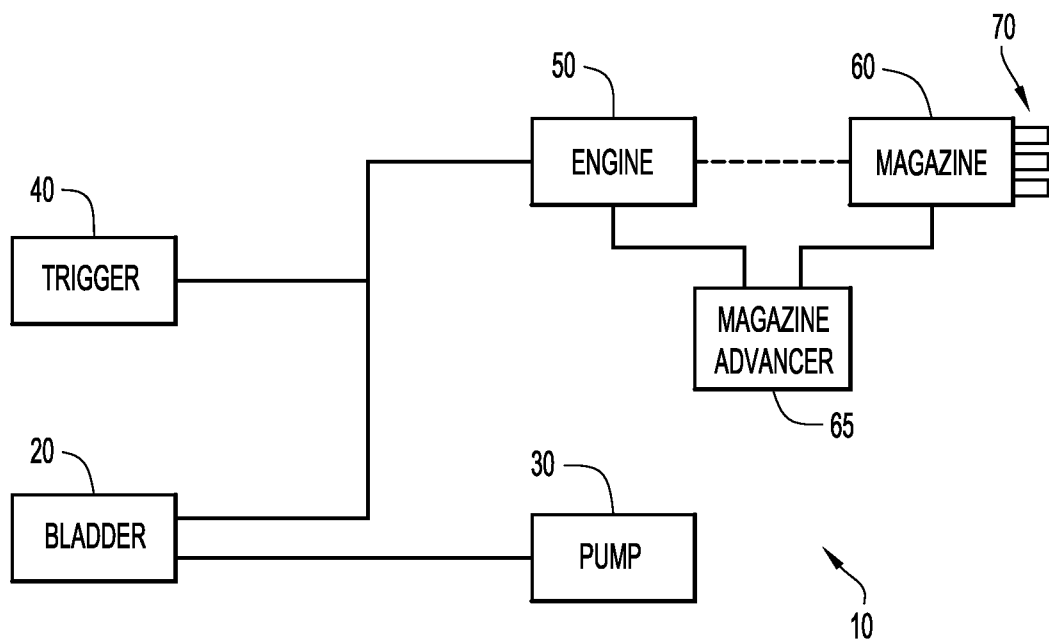


FIG.1

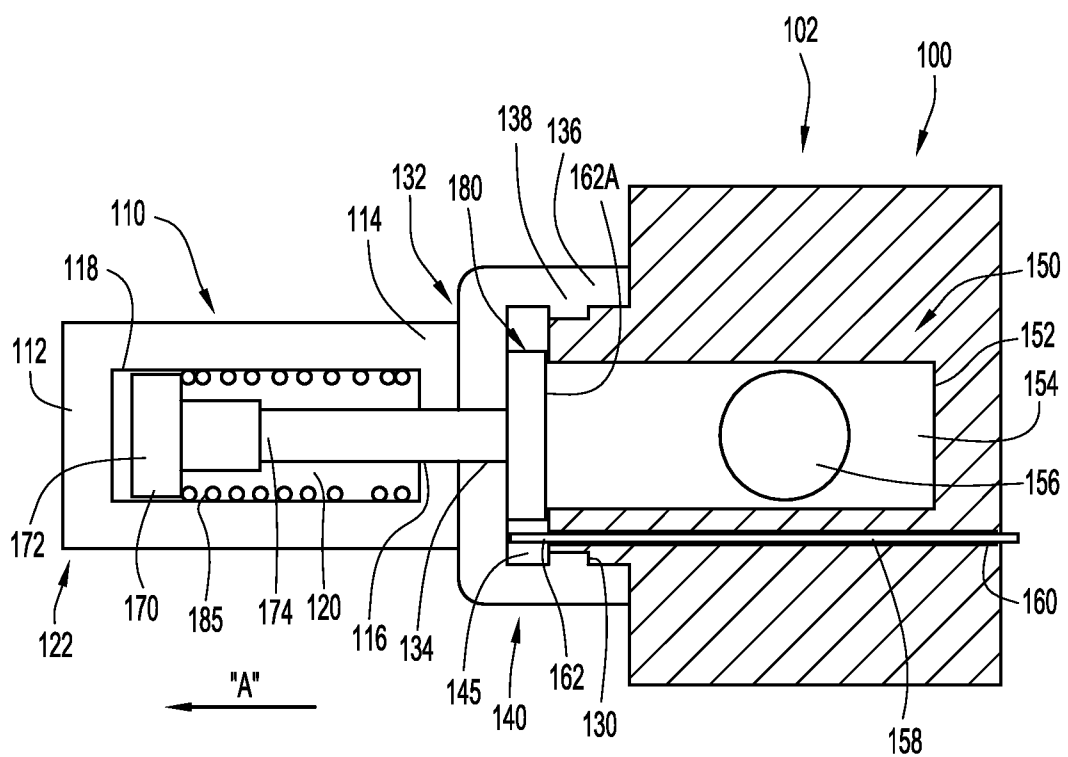


FIG.2

3/6

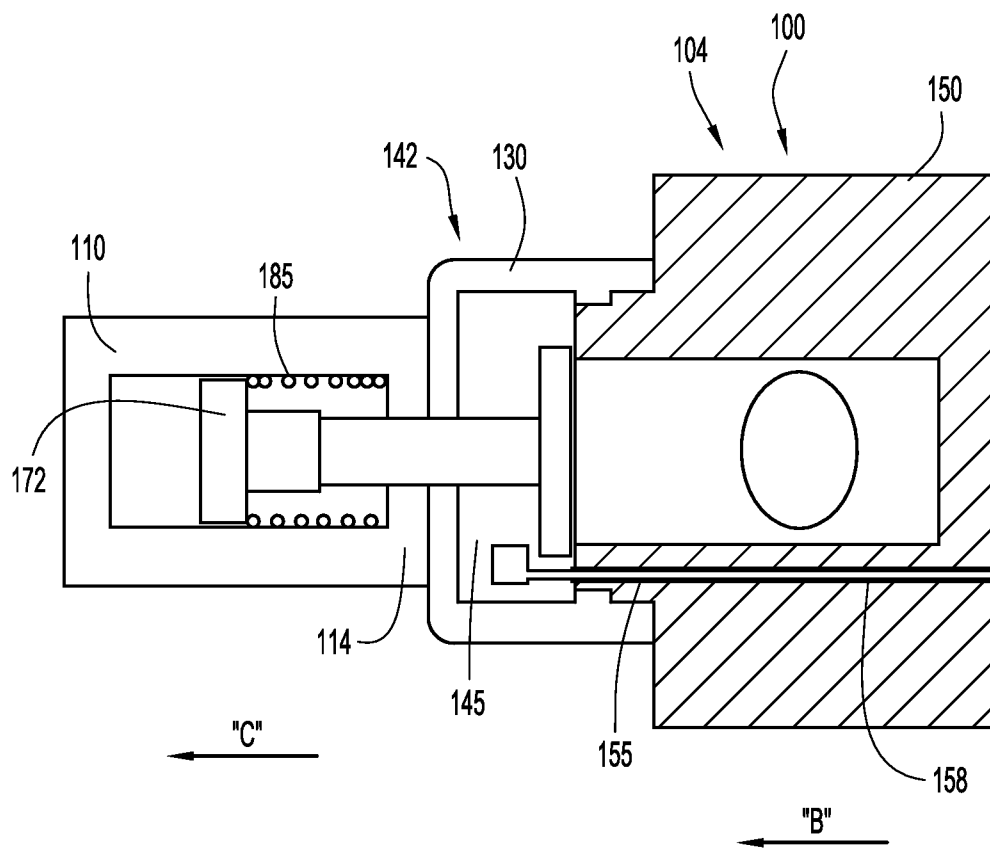


FIG.3

4/6

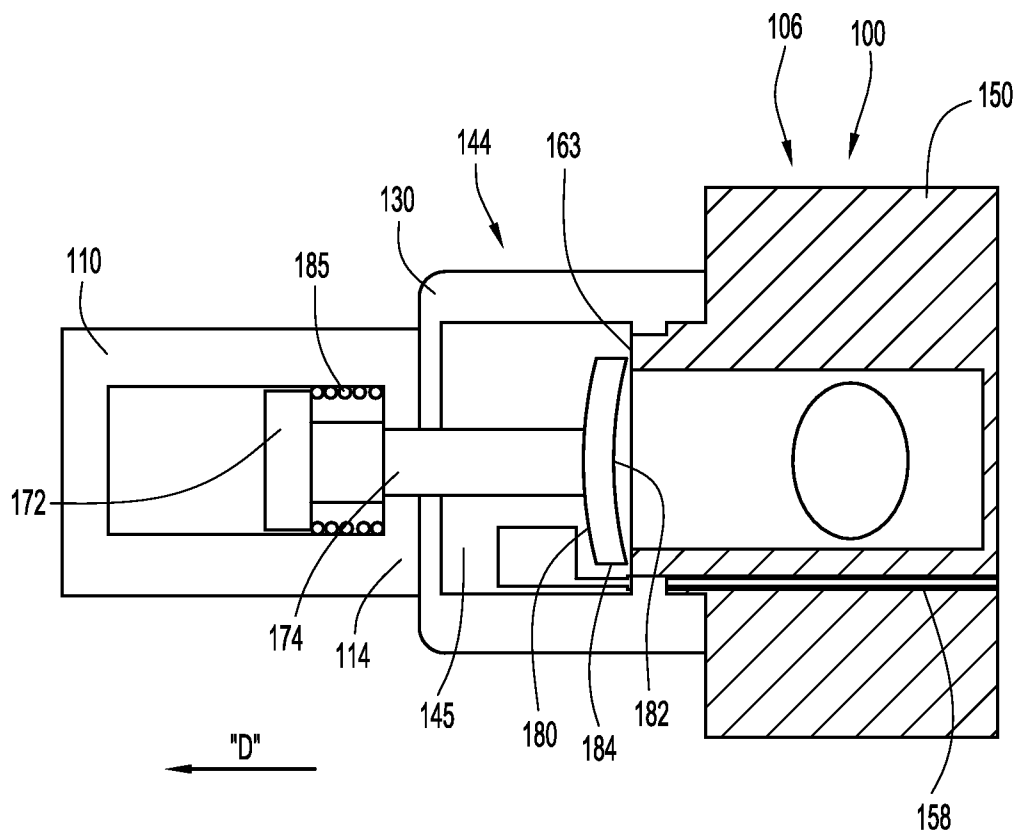


FIG.4

5/6

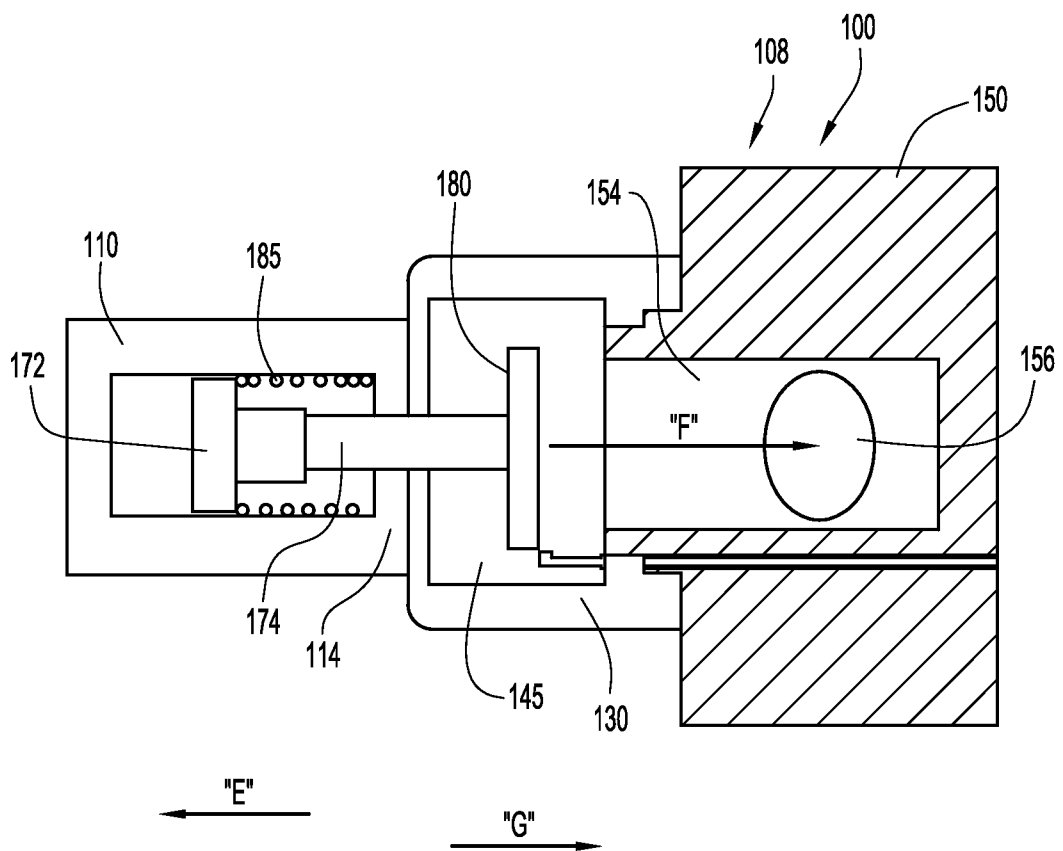
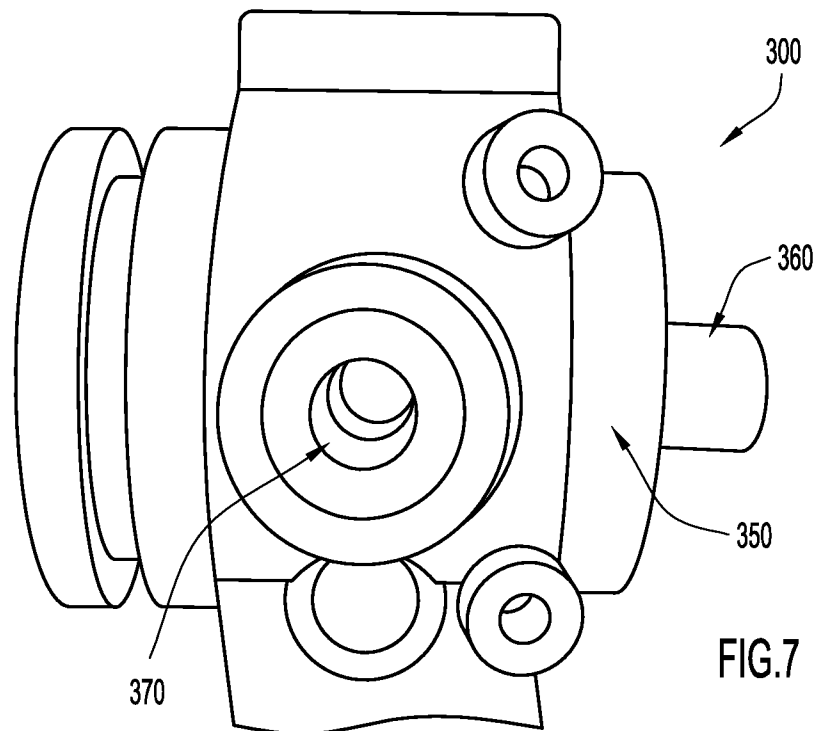
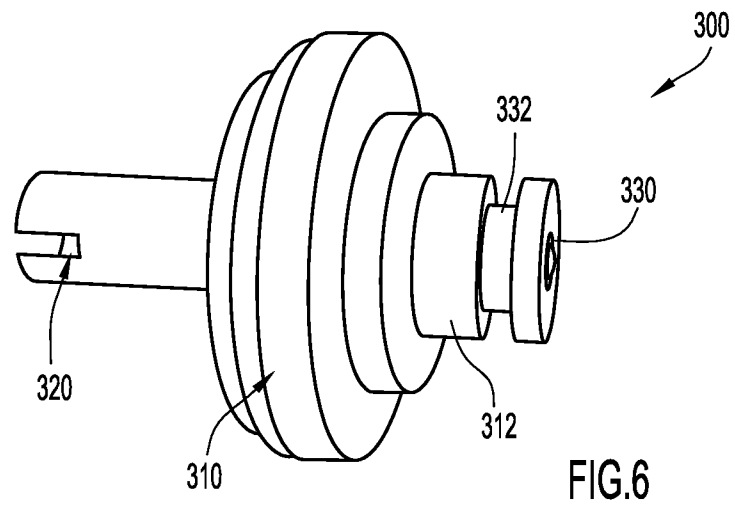


FIG.5

6/6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/048640

A. CLASSIFICATION OF SUBJECT MATTER

A63H 33/18(2006.01)i, F41B 11/60(2013.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63H 33/18; F41B 11/32; A63H 3/18; F41B 11/12; F41B 9/00; F41J 3/02; F41B 11/00; F41B 11/60

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: projectile launching device, bladder, pump, engine, reciprocating valve assembly, and diaphragm

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010-0307472 A1 (WITZIGREUTER, JOHN) 09 December 2010 See paragraphs [0029]-[0036] and figures 3-4,5A,6.	1,9,11-12,15
A		2-8,10,13-14,16-20
A	KR 10-0908669 B1 (PARK, SEON BAE) 21 July 2009 See paragraphs [0037]-[0042] and figures 1,2a-2b.	1-20
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

19 November 2014 (19.11.2014)

Date of mailing of the international search report

19 November 2014 (19.11.2014)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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