United States Patent

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[54] CYLINDRICAL BREECH WITH SLEEVED OBTURATOR

6 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **42/39.5,** 89/7, 89/26
[51] **Int. Cl.** **F41c 13/00**
[50] **Field of Search** 89/1, 7, 24, 26, 1.804; 42/39.5

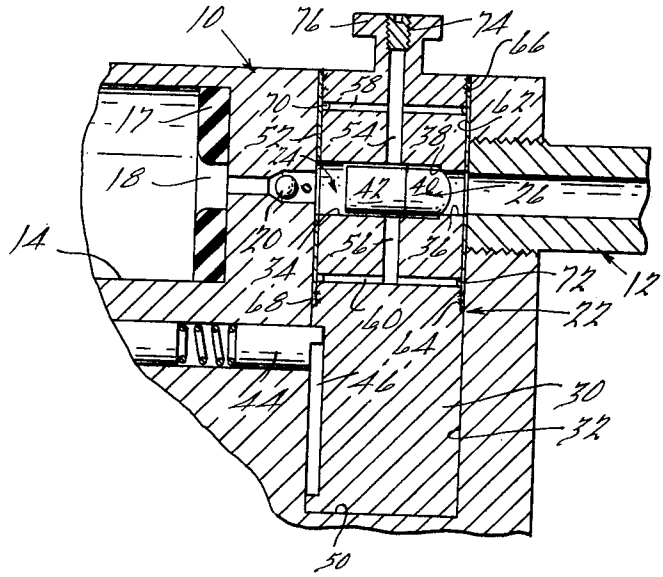
[56] **References Cited**

UNITED STATES PATENTS

2,790,353	4/1957	Bird	89/1.704
3,302,523	2/1967	Van Langenhoven et al.	89/7
3,354,780	11/1967	Ramsay	89/26

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ABSTRACT: There is herein disclosed an air rifle and/or an air ignition system firearm having a movable breech in the form of a cylindrical plug with an expandable and contractable thin walled obturator jacket to obturate the firing chamber by expansion of the obturator jacket by application of force from high-pressure air and/or propellant gases.



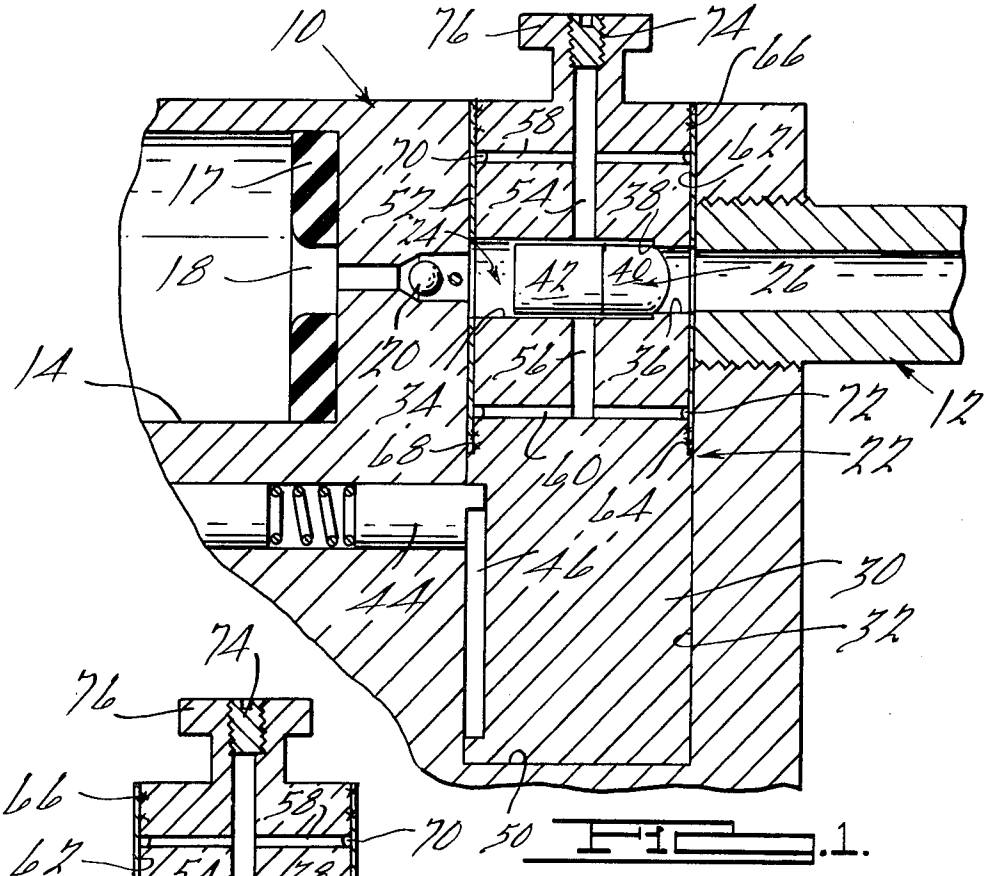


FIG. 1.

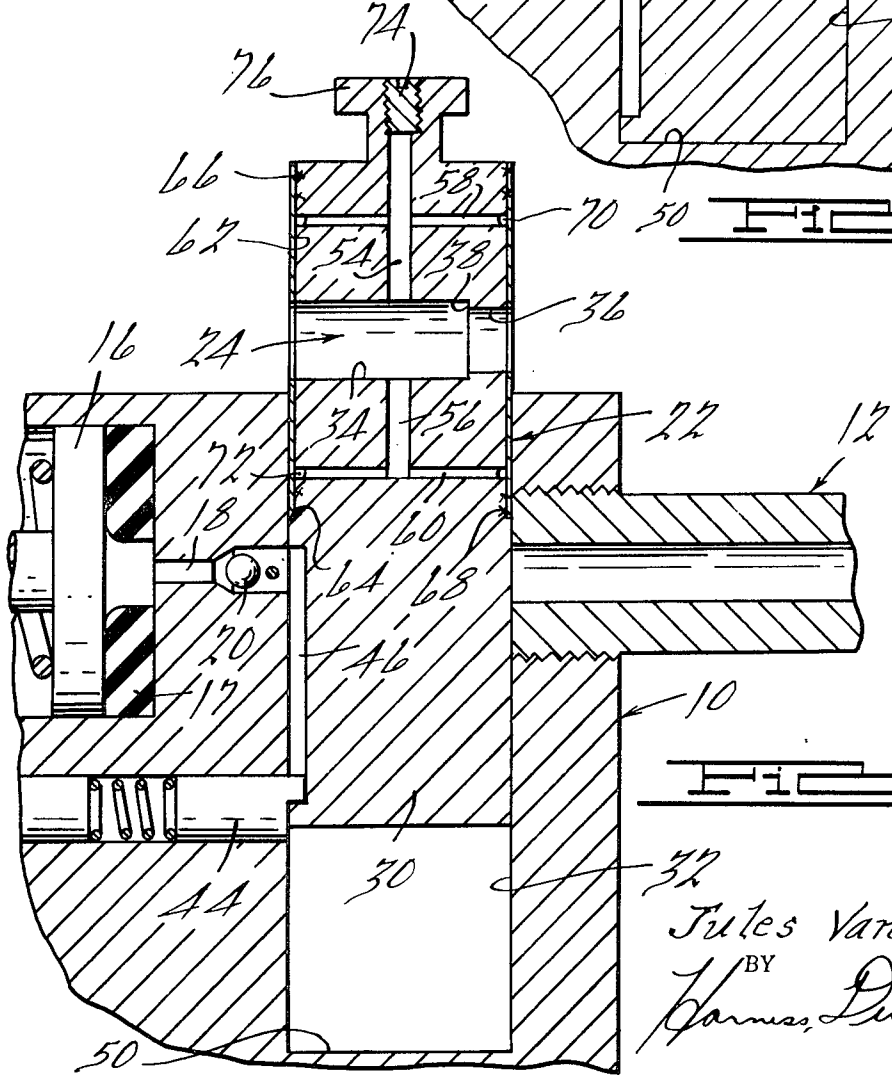


FIG. 2.

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CYLINDRICAL BREECH WITH SLEEVED OBTURATOR

BACKGROUND OF THE INVENTION

This invention is related to air rifles and/or air ignition system firearms of the type utilizing caseless ammunition and, more particularly, to air ignition system firearms of the type disclosed in my prior application Ser. No. 473,556 the disclosure of which is specifically incorporated herein by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

The inventive principles are illustrated in a presently preferred embodiment as shown in the accompanying schematic drawings in which:

FIG. 1 is a cross-sectional view of a portion of a gun showing a movable breech in a firing position and

FIG. 2 is another cross-sectional view of a portion of a gun showing a movable breech in a loading position.

DETAILED DESCRIPTION

A portion of an illustrative air rifle and/or air ignition system gun incorporating the inventive principles is shown to comprise a receiver means **10**, a barrel means **12**, an air compression cylinder **14**, a spring driven air compression piston **16**, a piston cushion **17**, air passage means **18**, valve means **20**, and movable breech means **22** between the barrel means **12** and cylinder **14** and providing a firing chamber **24** in which lead pellet or a round of caseless ammunition **26** is held prior to firing the gun. In addition, the gun includes a conventional piston cocking mechanism and a piston releasing trigger-sear mechanism (not shown). The relative sizes of the gun parts are not shown in true perspective, the breech means **22** having been enlarged relative to the other gun parts for purposes of illustration.

The breech means **22** is in the form of cylindrical block **30** slidably mounted in a cylindrical slide chamber **32** for transverse movement relative to the barrel means **12** between a firing position (FIG. **1**) and a loading position (FIG. **2**). The firing chamber **24** comprises a stepped bore extending parallel to the barrel means with a relatively long rearwardly opening enlarged portion **34** connected to a relatively short barrel connecting bore portion **36** by a shoulder **38**. The caseless ammunition **26** includes a metallic projectile portion **40** of lead or the like and a propellant portion **42** ignitable by hot air delivered through passage means **18** from air cylinder **14**. The projectile portion is slightly larger than the bore portion **36** so that shoulder **38** provides a shot start and obturation seat for the projectile portion. The length of the firing chamber is greater than the length of the ammunition so that the breech means is movable between the loading position and the firing position with a round of ammunition carried therebetween in the firing chamber. Suitable stop means are provided to locate the movable breech means in the firing position and the loading position. A spring-loaded detent **44** mounted in the receiver means cooperates with a slot **46** in the breech means to limit movement of the breech means to the loading position and to hold the firing chamber and bore in alignment with the barrel means. In the firing position the bottom of the breech means may be seated on the receiver as at **50**.

In order to obturate the firing chamber, obturation means are provided in the form of a relatively thin wall expandable and contractable metallic sleeve means **52** of copper, or phosphor bronze or like material, and pressure passage means **54, 56, 58, 60**. The thickness of the sleeve wall may be approximately 0.5 millimeters for high pressure applications and approximately 0.1 to 0.2 millimeters for low pressure applications. The sleeve means **52** is mounted on a cylindrical seat **62** of reduced diameter and a transverse shoulder **64**. The sleeve means provides an inner pressure applying surface circumjacent the breech means and an outer obturating surface circumjacent slide chamber **32**. The cylindrical seat extends beyond and surrounds all sides of the firing chamber and the bore portions **34, 36**. The ends **66, 68** of the sleeve means are sealingly fastened on the cylindrical seat as by soldering or the like. Soft lead solder is generally satisfactory for low pressure applications while silver or brass solder is preferred for high pressure applications. Longitudinal passages **54, 56** are located along the central longitudinal axis of the breech means and connect the firing chamber **34** to transverse radially extending passages **58, 60** which terminate in peripheral grooves **70, 72** located between the firing chamber and the sealed ends of the sleeve. The passages **54, 56** intersect the enlarged bore portion **34** a substantial distance from shoulder **38**. The relative lengths of the projectile and propellant portions **40, 42** of the round of ammunition are such that the exposed rear end of the lead projectile portion is axially spaced from the intersection of the passages **54, 56** with bore portion **34** toward the shoulder **38** a distance sufficient to prevent lead from being forced into the passages after ignition of the propellant. The grooves **70, 72** and the adjacent space between the inner pressure applying surface and the cylindrical seat **62** provide pressure chamber means in which the high pressure air and/or propellant gases are effective to expand the tin wall sleeve means. The number and location of the passages may be varied as necessary or desirable but particularly satisfactory results have been obtained in a gun having a 4.5 millimeter barrel bore with two centrally located longitudinal passages **54, 56** of 2 millimeter diameter and two transverse passages **58, 60** of 1 millimeter approximately 0 millimeters, the diameter of the bore portion **36** is 4.6 millimeters while the diameter of the ammunition is approximately 4.75 millimeters. Passages **54, 56** are closed by the threaded plug **74** mounted in a handle portion **76** by which the breech means is manually movable between the loading position and the firing position. It is contemplated that automatic means may be provided to move and to load the breech means.

In operation, to load the gun the breech is moved to the loading position shown in FIG. **2**. A lead pellet or a round of ammunition is placed in the firing chamber **34** with the front of the projectile portion **40** seated on the shoulder **38** and the rear of the propellant portion **42** located inside of the outer surface of the breech. Then the breech is moved to the firing position with bore connecting portion **36** aligned with the bore of barrel **12** and firing chamber **34** in communication with air passage **18**. After the gun is cocked and ready to be fired, actuation of the trigger releases the piston **16** to compress and heat air in cylinder **14**. The compressed and heated air flows through passage **18**, past valve **20**, and into the firing chamber **34** whereat the propellant is ignited by surface contact therewith and/or the projectile or pellet is driven through bore **12**. With a pellet in an air gun, the high pressure air flows through passages **54, 56, 58, 60** to grooves **70, 72** to expand the sleeve and obturate the firing chamber. With a round of ammunition, the burning propellant generates high pressure propellant gases which close the valve **20** and flow through passages **54, 56, 58, 60** to grooves **70, 72**. The propellant gases act upon the inner cylindrical surface of the sleeve **52** and cause it to expand into sealing engagement with the wall of chamber **32**. While the exact sequence of events with respect to the combined effect of the propellant gases and high pressure air is not presently known, it is a fact that no perceptible amounts of the high pressure air and/or propellant gases escape from the firing chamber. Thus, the high pressure air and/or the propellant gases are more effective in exerting pressure behind the projectile to drive the projectile into the barrel **12** after a predetermined shot start force level is reached in the firing chamber.

I claim:

1. In a gun, a movable breech means movable between a firing position and a loading position,

a firing chamber in said movable breech means, radially expandable and contractable sleeve means mounted on said movable breech means and having an inner cylindrical pressure applying surface and an outer cylindrical obturating surface and being movable radially relative to the breech means between a contracted position during

movement of the breech means and an expanded obturating position during firing of the gun, and

passage means connecting said firing chamber to said pressure applying surface of said sleeve means to carry high pressure gas from the firing chamber to the pressure applying surface and radially expand the sleeve means to the obturating position.

2. The invention as defined in claim 1 and wherein:

said breech means comprising a cylindrical seat extending beyond all sides of said firing chamber, and aid expandable sleeve means being mounted on said cylindrical seat.

3. The invention as defined in claim 2 and wherein said passage means comprises a centrally located passage means extending transversely from said firing chamber within said breech means, and cross passage means extending transversely to said centrally located passage means and opening on said cylindrical seat onto said expandable sleeve means.

4. The invention as defined in claim 3 and wherein said sleeve means being fixed to said breech means beyond said cross passage means.

5. In a gun,

barrel means through which the ammunition is fired,

a source of high pressure high temperature air,

a cylindrical slide chamber located behind said barrel means,

a movable breech means mounted behind said barrel means and being movable between a loading position and a firing position and having a cylindrical portion thereof located in alignment with said barrel means in the firing position and slidably supported within said slide chamber,

a firing chamber in said cylindrical portion of said movable breech means for holding a round of ammunition in a firing position in alignment with said barrel means,

radially expandable cylindrical sleeve means mounted on said movable breech means and being movable therewith between the loading position and the firing position and being movable relative thereto in the firing position between a transfer position substantially abutting said cylindrical portion and an obturating position sealingly engaging said cylindrical side chamber,

there being space circumjacent and between said cylindrical sleeve means and said movable breech means for introduction of high pressure gas providing a sleeve means expanding force, and

passage means connecting said firing chamber to said space to deliver high pressure gas thereto for outwardly expanding said sleeve means to the obturating position.

6. The invention as defined in claim 5 and wherein:

said firing chamber comprising an enlarged diameter bore portion next adjacent said source of air and a reduced diameter bore portion next adjacent said barrel means and a transverse shoulder connecting said enlarged diameter bore portion to said reduced diameter bore portion,

said passage means comprising transverse passage means intersecting said enlarged diameter bore portion at a location axially spaced from said transverse shoulder a distance sufficient to locate the exposed portion of the projectile to be fired from said firearm beyond said transverse passage means toward said barrel means whereby to prevent obstruction of said transverse passage means by the projectile.

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