

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 234 650
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 87200240.7

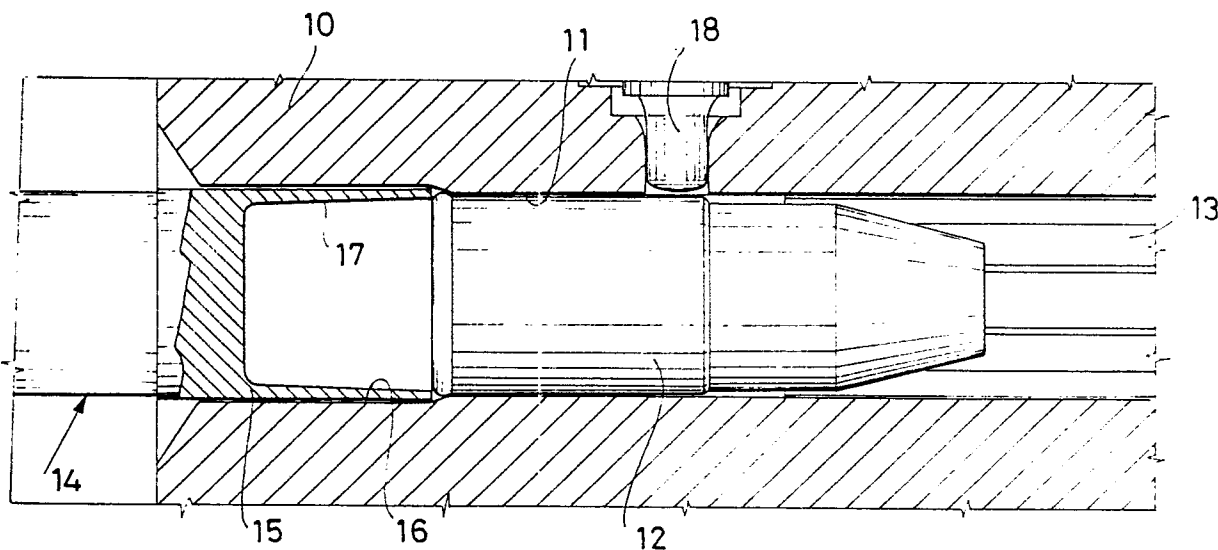
(51) Int. Cl.⁴: F41C 11/06 , F41D 11/30

(22) Date of filing: 16.02.87

(30) Priority: 28.02.86 IT 1958186

(43) Date of publication of application:
02.09.87 Bulletin 87/36(84) Designated Contracting States:
BE DE FR GB(71) Applicant: **Giulio Fiocchi S.p.A.**
Corso Matteotti 4
I-22035 Lecco (Como)(IT)(72) Inventor: **Fiocchi, Giuseppe**
Strada Statale n. 1
I-22054 Mandello del Lario(IT)(74) Representative: **Faraggiana, Vittorio, Dr. Ing.**
et al
Ingg. Guzzi e Ravizza S.r.l. Via Boccaccio, 24
I-20123 Milano(IT)(54) **Firearm with improved breech-block for caseless ammunition.**

(57) A breech-block for a firearm using caseless ammunition (12) embodies a forward portion in the form of a hollow piston (15), which portion is accepted by a matching seat (16) in the breech; the portion in the form of a hollow piston has a thin cylindrical wall produced by a cavity (17) which is open frontally so as to be subjected to the pressure generated by the explosive and to expand radially to provide a gas seal.



EP 0 234 650 A1

FIREARM WITH IMPROVED BREECH-BLOCK FOR CASELESS AMMUNITION

Caseless ammunition is known which consists of a projectile the front metallic part of which is the perforating part, the explosive charge being contained in the rear part of the projectile the base of which ruptures when detonation takes place and thus permits the gases to expand in the barrel and impart energy to the projectile. For detonation purposes a radial percussion has been proposed in view of this configuration.

The type of ammunition in question forms for example subject matter of Italian Patents No. 866111, 932381 and 972058 from which the relevant technology may be better understood.

Such ammunition, which is caseless, clearly requires that the breech of the firearm be satisfactorily sealed by a breech closure plug, since seal against the gases caused by detonation is left entirely to the breech-block closure plug.

For ready loading of the ammunition into the barrel, the breech-block closure plug must be easy to manage, must not jam and must also have the degree of reliability called for by rapid-fire repeater weapons.

A frontal seal in the breech does not appear to be satisfactory inasmuch as the forces set up by the detonation pressure on the breech-block tend to move closure plug away, and an even minimal movement of this kind causes gas-escape. For the purpose of seal improvement it has been proposed to embody a breech-block which enters the cartridge chamber piston-wise, the piston having minimal clearance so as itself to guarantee a satisfactory seal.

However, on account of charge combustion residues plus the high temperatures and pressures involved, this solution is not without disadvantages. In fact if between piston and chamber there is left a clearance sufficient to ensure free movement of the moving parts so as to avoid jamming of the weapon this leads to gas-escapes which foul the breech-block control mechanisms, cause corrosion and also a loss of efficiency of the ammunition due to the expulsion of gases and unburnt explosive charge.

The upper part of the breech-block itself overheats as a result of the leakage of the hot gases. On the other hand, even if an over-small clearance between piston and chamber solves the seal problems, it reduces the dependability of the weapon in that the coupling is easily jammed owing to thermal effects and to combustion residues wedged between the sliding surfaces.

To avoid these difficulties it might be thought possible to embody a breech-block having a truncated-cone shaped piston in its terminal part so as to ensure a correct seal coupling within a seat of matching shape in the base of the chamber. But this solution, too, would have serious practical disadvantages: if the angle of the apex of the cone is small, the breech-block tends to jam in the seat and if the said angle is large there occur all the disadvantages of a substantially frontal seal of the chamber.

The present invention overcomes the said disadvantages by embodying a breech-block for chambers for caseless ammunition of the type in question that provides a satisfactory seal without penalizing the movement of the breech-block, and also provides a very high degree of dependability.

According to the invention, in a weapon using rear-loading radial percussion caseless ammunition, the chamber cooperates in its rear part with an axially movable breech-block which has a piston-shaped front portion adapted to be inserted into the rear portion of the chamber, characterized in that the said piston-shaped portion has formed in it a frontally open cavity which means that the cylindrical wall of the front part of the piston is a thin wall, the elastic radial expansion of the said thin-walled front portion of the piston under the action of the pressure of detonation being such as to eliminate the radial clearance between the piston-shaped front portion and the rear portion of the chamber that accepts it.

The objects and characteristics of the invention will become more apparent from an examination of the following illustrative and not limiting description of one embodiment thereof with reference to the appended diagrammatic drawing showing a diametrical section of the rear part of the barrel of a firearm featuring a breech-block according to the invention.

As can be seen in the Figure, the numeral 10 indicates the rear part of the barrel of a firearm (not shown) in which is formed a seat 11 which accepts caseless ammunition 12. The seat 12 extends in its forward part into the barrel proper, the initial part of which is indicated by 13. In its rear part the chamber 12 is closed by a breech-block 14 featuring in its front portion a piston 15, which enters a seat 16.

According to the invention, the piston 15 is characteristically provided with an inner cavity 17 open frontally towards the interior of the chamber, which means that the wall of the piston 15 is a relatively thin wall. The metallic material from which

the breech-block is constructed must be relatively elastic, i.e. must remain elastic also at the temperatures and under the deformations undergone during operation, as hereinafter described.

The drawing illustrates also a firing pin 18 which acts radially on the ammunition, operated by control elements forming part of the firearm which are not shown.

The clearance between the front piston-shaped portion 15 of the breech-block and the seat 16 is such as to allow free sliding, without interferences, of the parts so that the breech-block movement is smooth and free from jamming. Solely by way of example, the said clearance can be maintained at between 0.05 and 0.1 mm.

On detonation, the sudden pressure increase, of the order of hundreds of atm, affects the interior of the cavity 17 causing an expansion of the thin wall of the piston, and this assures that the clearance between it and the seat 16 accepting it is taken up, with a resulting total seal. When the piston 15 is expanded by the pressure within the cavity 17 the friction set up between seat 16 and piston 15 cooperates in checking the axial thrust for as long as there is high pressure in the chamber.

The elasticity of the metallic material from which the piston-shaped portion of the breech-block is constructed assures that this will resume its original size on expulsion of the projectile, so that the breech-block can be moved in a freely sliding manner, in accordance with the objects of the invention.

It is noteworthy that in the constructional solution according to the invention the breech-block-cum-piston takes on a quasi-cartridge-case function for the caseless ammunition used in the type of firearm in question. Thus the piston wall can be embodied, as to dimensions and configurations, according to the general principles known to persons with ordinary skill in the art relating to case construction.

In particular, the cylindrical wall of the piston can be given a slightly tapered configuration towards its free end. Generally speaking, the thicknesses and other dimensions will be selected to ensure that the radial expansion of the thin wall of the piston on detonation will cause a deformation of the material that will assuredly fall within the range of elastic deformation of the material from which the piston is constructed. This expansion should be sufficient to take up the clearance for which provision is made between the thin-walled portion of the piston and the seat that accepts it.

Given that, as mentioned heretofore, the clearance in question is slight, choice of such material is not critical and for example normal steels can be selected, provided that they are appropriately al-

loyed and treated high-quality steels. The depths of the cavity 17 will of course be such that the thin cylindrical wall of the piston can, at least at its free edge, expand substantially as a result of tensile stresses, i.e. that the outward deflection stress will be negligible, this being due to the fact that the diameter of the cavity proximal to its base does not substantially change. Solely by way of example, the width of the thin wall of the piston will preferably be at least one third of that of the bore.

The breech-block-cum-piston according to the invention has showed itself to possess a very high degree of dependability, ability to provide a more than satisfactory seal in that gas-escape is negligible and thus also the total combustion residues that can foul both the piston surface and the firearm mechanisms proximal to the point of entry of the chamber into the breech. The problem which the present invention set itself to solve thus finds its solution.

As mentioned above, the embodiment described is an illustrative exemplifying embodiment intended to clarify the general principles on which the invention is based, in accordance with which persons with ordinary skill in the art can introduce variants necessary to conform the breech-block-cum-piston according to the invention to the characteristics of the firearm and ammunition specifically involved.

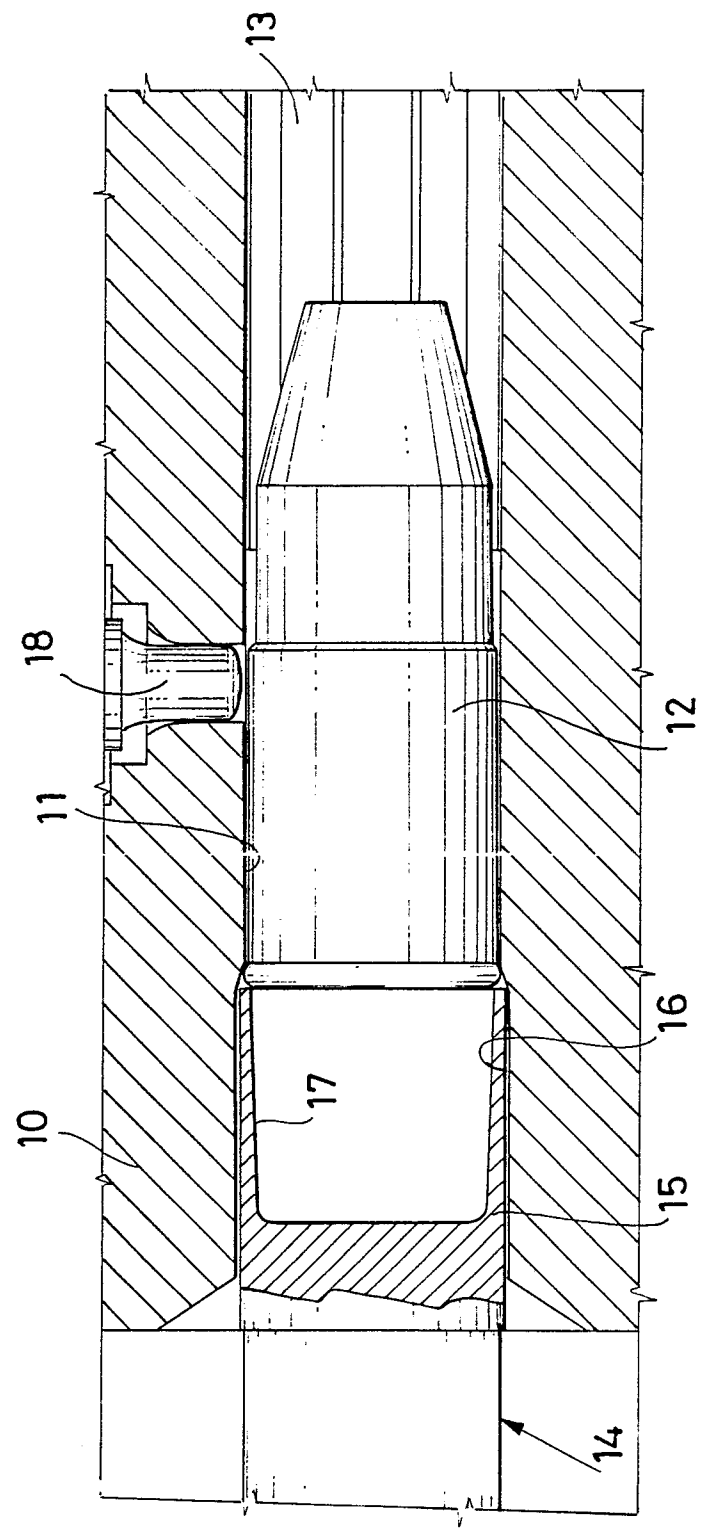
Claims

1) Firearm employing rear-loading, radial percussion caseless ammunition, in which the rear part of the cartridge chamber cooperates with an axially movable breech-block featuring a front piston-shaped portion adapted to enter the rear portion of the chamber, wherein there is formed in the piston-shaped portion a frontally open cavity giving rise to a thin-walled cylindrical piston wall, the elastic radial expansion of said thin wall under the action of the detonation pressure of the ammunition being such as to take up the radial clearance between the piston-portion and the rear portion of the chamber that accepts it.

2) Firearm as described in claim 1, wherein the cavity is tapered proximally to its end so as to form a cylindrical part of the piston having decreased thickness proximal to its free edge.

3) Firearm as described in claim 1, wherein the depth of the said cavity is at least one third and preferably at least half on the firearm bore.

4) Firearm as described in claim 1, wherein the said radial clearance between the piston portion and the rear portion of the chamber that accepts it is preferably between approximately 0.05 and 0.1 mm.





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-3 008 258 (JOHNSON) * Column 1, lines 28-34, 52-72; column 2, lines 27-49; figure 1 *	1, 3, 4	F 41 C 11/06 F 41 D 11/30
X	CH-A- 93 842 (LUDORF) * Whole patent *	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			F 41 C F 41 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15-06-1987	Examiner VAN DER PLAS J.M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	