PATENT SPECIFICATION (11) 1 228 027

1 228 027

DRAWINGS ATTACHED

(21) Application No. 18436/68 (22) Filed 18 April 1968

(31) Convention Application No. 104 372 (32) Filed 27 April 1967 in (33) France (FR)

(45) Complete Specification published 15 April 1971

(51) International Classification F 41 f 17/10

(52) Index at acceptance F3C 64 66E

(72) Inventor ARNO STEN DONNER

(54) IMPROVEMENTS IN AND RELATING TO MUZZLE LOADING MORTAR BARRELS

(71) We, OY TAMPELLA AB, a Company Incorporated under the laws of Finland, of Tampere, Finland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to muzzle-loading mortar barrels.

Since a mortar is a muzzle loader, it is necessary to leave a small space between the projectile and the wall of the barrel in order that the captive air may escape. In current practice the diameter of the projectile is slightly smaller than that of the barrel, which results in a lack of symmetry on the firing of the projectile. This causes irregular movements of the insufficiently guided projectile, which leaves the muzzle in an inclined position. These disadvantages are still further increased by the blast of combustion gases against the inclined projectile during the very first portion of its trajectory.

It is an object of the present invention to minimise these disadvantages by providing effective guiding of the projectile in the course of its movement in the barrel and/or during the phase at which combustion gases are blown out of the barrel.

According to the present invention there is provided a muzzle-loading mortar barrel having on its inner face elongated projections parallel to or inclined relatively to the axis of the barrel and extending over part of its length, and a smooth length portion located at the muzzle end of the barrel said projections and smooth length portion defining a circular gauge passage (as hereinafter defined) along the barrel.

For the purposes of the present specification the expression "circular gauge dimension" of an element is to be understood as meaning the circle of minimum diameter circumscribed around said element, and by "circular gauge passage" is to be understood the circle of maximum diameter which is inscribable in said passage.

In the above mentioned mortar barrel the projectile is effectively guided by the parts in relief on the inner face, and the hollow parts situated therebetween form with the surface of the projectile outlets permitting the air contained in the barrel to be discharged during the loading of the weapon.

If desired the mortar barrel may at the discharge end thereof be provided with an extension having discharge apertures for the combustion gases and effecting the guiding of the projectile during the discharge of said gases.

In one application, an extension of this kind is an attached piece fastened to the barrel and provided with gas escape apertures.

In order that the invention may be clearly understood embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 illustrates a mortar barrel having helical grooves,

Fig. 2 is a partial view in section along line II-II of Fig. 1, and

Fig. 3 illustrates a helically grooved mortar barrel in combination with a spindle shaped finned mortar projectile.

Referring to Fig. 1 and Fig. 2 the mortar barrel 1 is provided with internal helical grooves 2, which cover a part of said barrel and are continued on an extension 3 at the discharge end of the barrel and the extension 3 is laterally perforated by apertures 4, the rear portion 5 of the barrel near the breech being smooth. As can be seen from Fig. 1, the helical grooves 2 are situated partly in the region of and partly to the rear of the perforations 4 leaving a smooth length portion 11 located at the muzzle end of the barrel. The helical form of the grooves

2 provides the advantage that the rectilinear tail fins of certain projectiles cannot penetrate therein and may be dimensioned to slide on the faces in relief between the grooves, thus enabling them to contribute towards the guiding of the projectile. The extension 3 may be a part attached to the discharge end of the barrel.

The faces 6 form projections which are situated between the grooves 2 and which form slides adapted to provide effective guidance for any projectile having an overall radius very slightly smaller than R (R being the radius of the barrel measured on faces 6).

By way of example, the grooves between projections may have a total cross-section amounting to between 1% and 3% of the cross-section of the bore of the mortar barrel.

The devices according to the invention, which are adapted to provide effective guiding of the projectile, particularly during the critical phase of the blowing of the combustion gases, enable the projectile to be loaded when in any axial orientation and to be provided with such guidance without rotation with a gyroscopic effect.

In a combination of mortar according to the invention and projectile the circular dimension gauge of which is inscribed in the inside face of the mortar barrel, the barrel and projectile come mutually into sliding contact in order to effect the guiding of the projectile, while forming discharge outlets for the air tending to be imprisoned between the projectile and the breech.

As shown in Fig. 3 a spindle-shaped projectile 7 slides by its body portion, and by fins 8, on helically inclined faces 9 in a mortar barrel 10.

The combination of sliding contact faces and air escape outlets makes it possible to provide between said faces just sufficient clearance to permit the sliding of the projectile in the barrel and the effective guiding of said projectile, without hindering its downward travel in the barrel. The clearance thus left naturally depends on specific cases, and may be selected as desired without affecting the loading of the weapon, that is to say the discharge of air.

In a device according to the invention the projectile is therefore guided positively during its movement in the barrel by contact faces forming slides. Two neighbouring slides are separated by a hollow, groove, or notch, the purpose of which is to permit the escape of the air imprisoned behind the projectile.

In various examples of construction of this device the slides are provided inside the barrel and form an integral part of the latter, while the projectile is smooth.

When the cylindrical inside surface of the barrel is grooved, the grooves have an adequate cross-section to permit the escape the imprisoned air. These grooves are longitudinal or helical or otherwise inclined to the direction of axis of the barrel, and the parts in relief left between these grooves constitute slides on which the projectile is supported and slides, by means of its finned tail in the case of a projectile guided on its trajectory by a tail equipped with fins. The grooves extend at least to the portion of the barrel where the compression of the imprisoned air would resist the downward movement of the projectile. It is not necessary for them to extend as far as the bottom of the barrel, beyond the position occupied by the body portion, or portion of maximum cross-section, of the projectile on loading. Thus at the breech end of the barrel there may be provided a smooth length portion having the same internal diameter as the muzzle end smooth portion. The direction of the grooves may be selected as desired. Their width and number, the width of the slides, and in the case of helical grooves the pitch of the helix will be so selected that, for example, any longitudinal rib or fin which may be formed on the projectile is supported on at least one slide. The profile of the grooves will advantageously be amply rounded at the corners in order not to present a sharp angle to the sliding parts, and the same is done at the bottom of the groove where a sharp angle would cause a concentration of stresses in the barrel wall. Thus, the parts in relief between the grooves constitute straight, helical, or like slides which positively guide the projectile and resist its random movements.

It is advantageous for the total cross-sectional area of the grooves not to be too large, since this would cause excessive loss of propulsive gas, or too small in order not to retard the downward movement of the projectile excessively; in one embodiment this surface amounts to about 1 to 3% of the total cross-sectional area of the circular gauge passage of the barrel. The depth of the grooves will depend on their width in relation to that of the slides, the calibre, etc. The height of the grooves may be between 0.2 mm and 2mms, for example, for a calibre of 120 mm and grooves and slides of equal width, a height of from 1 to 1.5 mm is adequate.

The barrel may have a front extension the inside face of which is adapted to come into sliding contact with the projectile and to guide it positively, while the combustion gases escape through grooves formed in said inside face or through lateral holes passing through the wall of the extension, or else through such holes provided at the bottom of grooves. An extension having a smooth or grooved inside face is capable of being

used either with a smooth projectile or with a projectile provided with projections forming slides.

Where the mortar barrel has lateral perforations at its muzzle end and the projections are situated partly in the region of and partly to the rear of the perforations, the projections may be more closely spaced at the rear of the perforations than at the front.

If desired, a barrel and its extension may both have slides, which may be of the same shape or else of different shapes. Depending on application, these slides are independent or else are integral with one another in order to provide a single guide device extending through at least part of the barrel proper and also its extension.

In a variant of this last application, some of the slides (for example one out of two) are omitted in the extension, so as to obtain numerous narrow grooves in the barrel and wider but fewer grooves in the extension.

In the examples described, the circular gauge passage of the slides, which is lower than but substantially equal to the circular gauge passage of the barrel, is slightly larger than the maximum overall radius of the projectile, so that the hollows between slides form air discharge channels or outlets by co-operation with the surface of the projectile body and the inside face of the barrel, which may or may not be smooth.

WHAT WE CLAIM IS:—

1. A muzzle-loading mortar barrel, having on its inner face elongated projections parallel to or inclined relatively to the axis of the barrel and extending over part of its length and a smooth length portion located at the muzzle end of the barrel, said projections and said smooth portion defining a circular gauge passage (as hereinbefore defined) along the barrel.

2. A mortar barrel according to Claim 1, having a smooth length portion located at the breech end of the barrel, said smooth length portion having the same internal diameter as the muzzle and smooth portion.

3. A mortar barrel according to Claim 1 or Claim 2, having lateral perforations at the muzzle end thereof.

4. A mortar barrel according to any of Claims 1 to 3, wherein the projections are situated partly in the region of and partly to the rear of the perforations.

5. A mortar barrel according to Claim 4, wherein the projections are more closely spaced to the rear of the perforations than in the region thereof.

6. A mortar barrel according to any one of Claims 3 to 5, wherein the perforations are formed on an attached part fixed to the muzzle end of the barrel.

7. A mortar barrel according to any of the preceding Claims, wherein the projections have a height between 0.2 and 2mm.

8. A mortar barrel according to any of the preceding Claims, wherein the total cross-sectional area of the grooves is between 1% and 3% of the total cross-sectional area of the circular gauge passage of the barrel.

9. A mortar barrel according to any one of the preceding Claims, wherein the projections together form trapezoidal grooves widening in the internal radial direction.

9. A muzzle-loading mortar barrel substantially as herein described with reference to Figs. 1 and 2 of the accompanying drawings.

10. A combination of a muzzle-loading mortar barrel according to any one of the preceding Claims and a mortar projectile, the projections in the mortar barrel being adapted to come into sliding contact with said projectile and to form with it passages for the escape of air during the loading of said projectile in the barrel.

11. A combinaion of a muzzle-loading mortar barrel and a mortar projectile according to Claim 10, substantially as hereinbefore described with reference to Fig. 3 of the accompanying drawings.

PAGE, WHITE & FARRER,
Chartered Patent Agents,
27, Chancery Lane,
London, W.C.2.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1971
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

used either with a smooth projectile or with a projectile provided with projections forming slides.

Where the mortar barrel has lateral perforations at its muzzle end and the projections are situated partly in the region of and partly to the rear of the perforations, the projections may be more closely spaced at the rear of the perforations than at the front.

If desired, a barrel and its extension may both have slides, which may be of the same shape or else of different shapes. Depending on application, these slides are independent or else are integral with one another in order to provide a single guide device extending through at least part of the barrel proper and also its extension.

In a variant of this last application, some of the slides (for example one out of two) are omitted in the extension, so as to obtain numerous narrow grooves in the barrel and wider but fewer grooves in the extension.

In the examples described, the circular gauge passage of the slides, which is lower than but substantially equal to the circular gauge passage of the barrel, is slightly larger than the maximum overall radius of the projectile, so that the hollows between slides form air discharge channels or outlets by co-operation with the surface of the projectile body and the inside face of the barrel, which may or may not be smooth.

WHAT WE CLAIM IS:—

1. A muzzle-loading mortar barrel, having on its inner face elongated projections parallel to or inclined relatively to the axis of the barrel and extending over part of its length and a smooth length portion located at the muzzle end of the barrel, said projections and said smooth portion defining a circular gauge passage (as hereinbefore defined) along the barrel.

2. A mortar barrel according to Claim 1, having a smooth length portion located at the breech end of the barrel, said smooth length portion having the same internal diameter as the muzzle and smooth portion.

3. A mortar barrel according to Claim 1 or Claim 2, having lateral perforations at the muzzle end thereof.

4. A mortar barrel according to any of Claims 1 to 3, wherein the projections are situated partly in the region of and partly to the rear of the perforations.

5. A mortar barrel according to Claim 4, wherein the projections are more closely spaced to the rear of the perforations than in the region thereof.

6. A mortar barrel according to any one of Claims 3 to 5, wherein the perforations are formed on an attached part fixed to the muzzle end of the barrel.

7. A mortar barrel according to any of the preceding Claims, wherein the projections have a height between 0.2 and 2mm.

8. A mortar barrel according to any of the preceding Claims, wherein the total cross-sectional area of the grooves is between 1% and 3% of the total cross-sectional area of the circular gauge passage of the barrel.

9. A mortar barrel according to any one of the preceding Claims, wherein the projections together form trapezoidal grooves widening in the internal radial direction.

9. A muzzle-loading mortar barrel substantially as herein described with reference to Figs. 1 and 2 of the accompanying drawings.

10. A combination of a muzzle-loading mortar barrel according to any one of the preceding Claims and a mortar projectile, the projections in the mortar barrel being adapted to come into sliding contact with said projectile and to form with it passages for the escape of air during the loading of said projectile in the barrel.

11. A combinaion of a muzzle-loading mortar barrel and a mortar projectile according to Claim 10, substantially as hereinbefore described with reference to Fig. 3 of the accompanying drawings.

PAGE, WHITE & FARRER,
Chartered Patent Agents,
27, Chancery Lane,
London, W.C.2.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1971
Published at the Patent Office. 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

