

PATENT SPECIFICATION (11)

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(54) MORTAR FOR FIN-STABILISED PROJECTILES

(54) We, OY TAMPELLA AB, a Finnish Company, of Lapintie 1, 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 a mortar for fin-stabilised projectiles.

In general, the angle of elevation of the barrel of a mortar is relatively steep so that the weapon is muzzle-loaded. The projectile slides to the base or breech where the propellant charge is ignited by a firing-pin mechanism located at the base.

As the calibre employed increases, the barrel lengthens in proportion so that difficulties arise in employing muzzle-loading where the barrel is set at a relatively high elevation. In order to facilitate loading, the practice is already known of dividing the barrel at approximately mid-length. In such cases the breech barrel portion is swivelable for disengagement about a transverse axis in the area of the closed breech; the two barrel portions are locked together by an outer guide means and also by a releasable gas-tight coupling mechanism. In this type of construction the mortar is loaded through the open end of the breech barrel portion. Thus, when the mortar barrel is inconveniently long, loading may be carried out comparatively easily.

The projectile does not require to be raised above normal hand-height so that, in addition, the mortar may be loaded more quickly. The normal system of loading is however retained, that is to say, when it is loaded, the projectile slides down to the breech whereupon, after engagement of the barrel portions, the firing-pin mechanism is actuated. In such an arrangement there is a risk of premature ignition, that is to say, a failure in the firing-pin mechanism might lead to detonation of the propellant charge event before the barrel portions are engaged and still remain in the outwardly-swivelled or disengaged position. Such a premature detonation is much more serious than in the case of an integral mortar barrel

because the prematurely ignited bomb would be projected at the division in the barrel and would strike the muzzle barrel portion which lies at an angle to the breech barrel portion, resulting in the mortar becoming totally unserviceable.

The object of the invention is to provide a mortar in which the advantages of greater length of barrel are retained, together with more convenient loading, by constructing the barrel in two parts in such a manner that the disadvantage of premature ignition of the projectile when the two parts are disengaged is obviated.

According to the present invention there is provided a mortar for fin-stabilised projectiles, comprising a mortar barrel, a base plate on which the barrel is mounted, and a stand on which the barrel is pivotally supported between its extremities, the barrel being divided at approximately mid-length into muzzle and breech barrel portions which may be disengaged from one another by swivelling the muzzle barrel portion away from the breech barrel portion about a transverse axis located on the stand in the vicinity of the pivot connection between the barrel and the stand, the breech barrel portion being firmly secured to a linkage which is pivotally connected to the stand and an operating device being provided on the muzzle barrel portion to disengage said muzzle barrel portion from said breech barrel portion, the muzzle barrel portion serving for loading with a projectile from the end of the muzzle barrel portion facing the breech barrel portion and having at the said end a releasable securing mechanism for retaining the inserted projectile in the muzzle barrel portion until the barrel portions are locked in alignment.

This construction enables the mortar to be loaded by way of the muzzle barrel portion and not from above but from beneath. The fin-stabilised projectile is inserted nose first into the open breech end of the muzzle barrel portion in the normal manner in which bombs are loaded, that is to say at hand-height, and is retained in the muzzle portion by the securing mechanism. Only after the two portions have been engaged

into realignment is it possible for the projectile to slide down into the breech portion to the breech where the firing-pin can become effective. If, during the sequence, a premature ignition should occur, i.e. the firing-pin mechanism acts prematurely, the two barrel portions are in the closed position. The projectile thus leaves the barrel as in the case of a normal integral barrel, except that the event is premature in that, for example the laying of the weapon may not have been completed. This does not involve any unpleasant consequences for the mortar team. An essential feature is that the possibility of an ignited projectile leaving the barrel with the portions disengaged is eliminated. A further advantage is that the breech portion does not require to be swivelled away at the base plate to disengage the two parts but forms a rigid whole with the stand. It is also less expensive to produce a mortar with swivellable muzzle barrel portion than is the case where the breech barrel portion is disengaged. Moreover, the present arrangement permits the use of mortar barrels of much greater length and of much larger calibres, for example, in excess of 120 mm. Thus, the advantages are now obtained of a long-barrelled mortar in which relatively slow-burning powders can be used, higher muzzle-velocities are possible, and the rate of fire may be increased.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Fig. 1 shows a mortar according to the invention with a barrel divided approximately at mid-length; the mortar is shown diagrammatically in side elevation including a stand; the barrel portions being in the engaged position;

Fig. 2 is a view similar to Fig. 1, but showing the muzzle barrel portion swivelled away from the breech barrel portion;

Fig. 3 is a front elevation view partly in section of the linkage between the muzzle barrel portion and the stand, where the linkage is designed as a recoil-absorber, and also the pivot mounting on which the muzzle barrel portion is swivelled;

Fig. 4 is a side elevation view of the linkage unit of Fig. 3;

Fig. 5 shows the actuating means for swivelling of the muzzle barrel portion;

Figs. 6 and 7 provide part-views in section, showing a system of engagement between the muzzle barrel portion and the breech barrel portion when in the closed position; and

Figs. 8 and 9 are plan and side elevation views respectively of the device for retaining the projectile inserted into the muzzle barrel portion.

A mortar 1 comprises a barrel 2, the

breech portion of which terminates in a ball 3 cooperating with a socket 4 provided in a base plate 5. The barrel 2 has a stand 6 terminating at its lower pointed extremity 7 in a plate-like collar. Between the barrel 2 and stand 6 a pivot axis 8 is provided.

The barrel 2 comprises a muzzle portion 9 and a breech portion 10. The breech portion 10 is connected to the stand by a linkage 11 comprising columns 12, 13. A collar 14 embraces the muzzle portion of the barrel 2 and is rigidly secured to the ends of columns 12 and 13 nearer base plate 5. The other ends of the columns 12, 13 are also provided with a collar 15 an extension of which encloses the pivot pin 8 of the stand 6. Thus the breech portion 10 is pivotally connected to the stand 6.

The columns 12 and 13 are interconnected at their part remote from the base plate 5 by a cross-traverse 16 which is fitted by means of sleeves 17 and 18 over the columns. The cross-traverse 16 is provided with an extension 19 carrying a cross-sleeve 20 in which a pin 21 is mounted. The pin 21 serves as a pivot on which the muzzle barrel portion 9 swivels. Accordingly, a collar 23 embracing the muzzle portion 9 carries a forked bearing 24 which is swivel-mounted on the pin 21. Thus the muzzle portion 9 can be swivelled away from the linkage 11 upon the pin 21 serving as swivel-point.

Controlling the swivel action of the muzzle barrel portion 9 is an operating device 25 with a bell crank 26 pivotally secured at 27. A link 28 is pivotally connected to a shorter arm 26a of the bell crank 26 and engages a toggle 29 pivotally mounted at 30 on a fixed bracket 31 integral with the collar 32 embracing the muzzle portion 9. The link 28 is provided with a cross-pin 33 engaging in a slotted hole 34 in the bracket 31. To the apex of the toggle 29 a rod 35 is connected which carries at its end nearer the base plate 5 a catch 36 secured by a pin 37 and under tension of a compression spring 38. The catch 36 engages a fixed stop 39 and has a bevelled shoulder 36a so that it automatically slides into engagement over the stop 39 when the muzzle portion 9 is swivelled into engagement with the breech portion 10. The action of the spring 38 is contained by the collar 35a on the rod 35. The other arm 26b of the bell crank lever 26 is intended as a hand-lever and is pressed towards the base plate 5 to engage the muzzle portion 9 with the breech portion 10 after having been swivelled away therefrom. The muzzle portion 9 is thus drawn towards the linkage 11 until the catch 36 snaps into engagement with the stop 39 so that the muzzle portion 9 in the engaged position has been brought into alignment with the breech portion 10 and is secured in this position.

To release this locking action the lever 26 is moved slightly away from the base plate 5 so that the rod 35 with its terminal catch 36 is moved away from the base plate 5 against the tension of the spring 38 by means of the toggle 29. This releases engagement between the catch and the stop 39; as the lever 26 is moved further away from the base plate 5, the muzzle portion 9 then swivels away from the breech portion 10.

The end of the muzzle portion 9 nearer the base plate 5 carries a locking sleeve 40 which may be rotated by means of a manually-operable stud 41. On the part of the locking sleeve 40 remote from the base plate 5 encircling grooves 42 and rings 43 are provided which engage corresponding rings 44 and grooves 45 on a half-shell 46 when the muzzle portion 9 is in the engaged position. The two barrel portions 9 and 10 are thus locked in the correct axial position. The half-shell 46 is secured to the columns 12 and 13 of the linkage 11 by means of sleeves 47 and 48. When the upper portion 9 is closed, the locking stud 41 engages in a notch 49 on the lateral face of the half-shell 46. The stop 39 for the catch 36 is also fitted to the half-shell 46.

The locking sleeve 40 is connected by means of a connecting rod 50 to the collar 23 embracing the muzzle portion 9, which collar 23 carries the fixed swivel point 21. The muzzle portion 9 may be displaced to a limited extent within the collar 23 and locking sleeve 40 in order to ensure a tight joint between the two barrel portions in the engaged position. The collar 23 has a slotted hole 51 in which a stud 52 affixed to the muzzle portion 9 engages.

Figs. 6 and 7 illustrate the sealing of the muzzle portion 9 against the breech portion 10. On its end face the muzzle portion 9 is provided with a raised rim 9a which engages a corresponding annular groove 10a in the breech portion 10. A sealing ring 53 is set into the breech portion 10. After the two portions 9 and 10 have been caused by the swivel-operating device 25 to return to alignment, continued pressure on the bell crank 26 towards the base plate 5 beyond the point of contact produces a certain longitudinal displacement of the portion 9 through the collar 32 so that the raised rim 9a is pressed into engagement with the annular groove 10a and behind the sealing ring 53. In this way the two end faces of the barrel portions 9, 10 are tightly coupled together. The rings 43 of the locking sleeve 40 engage in the annular grooves 45 on the half-shell 46 so that the locking stud 41 enters the notch 49 in the half-shell 46. When the projectile is fired, the tightness of the seal is reinforced.

To disengage the muzzle portion 9, the bell crank 26 is raised so that, firstly, the

raised rim 9a of the muzzle portion 9 is retracted from the annular groove 10a of the breech portion 10; further pressure on the lever 26 away from the base plate 5 disengages the catch 36 and the muzzle portion 9 is then swivelled away from the breech portion 10.

At the end face of the locking sleeve 40 a device is provided for retaining the projectile after it has been inserted nose first into the muzzle portion from the end thereof facing the breech portion. The device comprises a claw 54 which projects into the interior of the muzzle portion 9. The claw 54 has a spring action and is pivotally mounted in a flange 55 in the locking sleeve 40. When the muzzle portion 9 reaches the closed position, the claw 54 is pressed back against the pressure of the spring 56 so that, when the two barrel portions 9, 10 are locked together, the claw 54 no longer projects into the interior of the barrel. The projectile which has been loaded can now slide down into the breech barrel portion and to the base.

The columns 12 and 13 preferably act as recoil-absorbing elements. For this purpose the columns 12, 13 are of tubular construction and each contain a further tube 57 displaceable telescopically within the column. The tube 57 acts upon a shock-absorbing spring 58 resting on a fixed abutment 59.

WHAT WE CLAIM IS:—

1. A mortar for fin-stabilised projectiles, comprising a mortar barrel, a base plate on which the barrel is mounted, and a stand on which the barrel is pivotally supported between its extremities, the barrel being divided at approximately mid-length into muzzle and breech barrel portions which may be disengaged from one another by swivelling the muzzle barrel portion away from the breech barrel portion about a transverse axis located on the stand in the vicinity of the pivot connection between the barrel and the stand, the breech barrel portion being firmly secured to a linkage which is pivotally connected to the stand and an operating device being provided on the muzzle barrel portion to disengage said muzzle portion from said breech barrel portion, the muzzle barrel portion serving for loading with a projectile from the end of the muzzle barrel portion facing the breech barrel portion and having at the said end a releasable securing mechanism for retaining the inserted projectile in the muzzle barrel portion until the barrel portions are locked in alignment.
2. A mortar according to Claim 1, wherein the muzzle barrel portion carries a catch for interacting with a fixed stop on a half-shell mounted on the linkage, the catch being provided with a rounded portion for



To release this locking action the lever 26 is moved slightly away from the base plate 5 so that the rod 35 with its terminal catch 36 is moved away from the base plate 5 against the tension of the spring 38 by means of the toggle 29. This releases engagement between the catch and the stop 39; as the lever 26 is moved further away from the base plate 5, the muzzle portion 9 then swivels away from the breech portion 10.

The end of the muzzle portion 9 nearer the base plate 5 carries a locking sleeve 40 which may be rotated by means of a manually-operable stud 41. On the part of the locking sleeve 40 remote from the base plate 5 encircling grooves 42 and rings 43 are provided which engage corresponding rings 44 and grooves 45 on a half-shell 46 when the muzzle portion 9 is in the engaged position. The two barrel portions 9 and 10 are thus locked in the correct axial position. The half-shell 46 is secured to the columns 12 and 13 of the linkage 11 by means of sleeves 47 and 48. When the upper portion 9 is closed, the locking stud 41 engages in a notch 49 on the lateral face of the half-shell 46. The stop 39 for the catch 36 is also fitted to the half-shell 46.

The locking sleeve 40 is connected by means of a connecting rod 50 to the collar 23 embracing the muzzle portion 9, which collar 23 carries the fixed swivel point 21. The muzzle portion 9 may be displaced to a limited extent within the collar 23 and locking sleeve 40 in order to ensure a tight joint between the two barrel portions in the engaged position. The collar 23 has a slotted hole 51 in which a stud 52 affixed to the muzzle portion 9 engages.

Figs. 6 and 7 illustrate the sealing of the muzzle portion 9 against the breech portion 10. On its end face the muzzle portion 9 is provided with a raised rim 9a which engages a corresponding annular groove 10a in the breech portion 10. A sealing ring 53 is set into the breech portion 10. After the two portions 9 and 10 have been caused by the swivel-operating device 25 to return to alignment, continued pressure on the bell crank 26 towards the base plate 5 beyond the point of contact produces a certain longitudinal displacement of the portion 9 through the collar 32 so that the raised rim 9a is pressed into engagement with the annular groove 10a and behind the sealing ring 53. In this way the two end faces of the barrel portions 9, 10 are tightly coupled together. The rings 43 of the locking sleeve 40 engage in the annular grooves 45 on the half-shell 46 so that the locking stud 41 enters the notch 49 in the half-shell 46. When the projectile is fired, the tightness of the seal is reinforced.

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The columns 12 and 13 preferably act as recoil-absorbing elements. For this purpose the columns 12, 13 are of tubular construction and each contain a further tube 57 displaceable telescopically within the column. The tube 57 acts upon a shock-absorbing spring 58 resting on a fixed abutment 59.

WHAT WE CLAIM IS:—

1. A mortar for fin-stabilised projectiles, comprising a mortar barrel, a base plate on which the barrel is mounted, and a stand on which the barrel is pivotally supported between its extremities, the barrel being divided at approximately mid-length into muzzle and breech barrel portions which may be disengaged from one another by swivelling the muzzle barrel portion away from the breech barrel portion about a transverse axis located on the stand in the vicinity of the pivot connection between the barrel and the stand, the breech barrel portion being firmly secured to a linkage which is pivotally connected to the stand and an operating device being provided on the muzzle barrel portion to disengage said muzzle portion from said breech barrel portion, the muzzle barrel portion serving for loading with a projectile from the end of the muzzle barrel portion facing the breech barrel portion and having at the said end a releasable securing mechanism for retaining the inserted projectile in the muzzle barrel portion until the barrel portions are locked in alignment.

2. A mortar according to Claim 1, wherein the muzzle barrel portion carries a catch for interacting with a fixed stop on a half-shell mounted on the linkage, the catch being provided with a rounded portion for



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automatically sliding into engagement over the stop during swivelling movement of the muzzle-barrel portion into engagement with the breech barrel portion.

- 5 3. A mortar according to Claim 2, wherein the catch is mounted in a collar firmly connected to the muzzle barrel portion, and said collar, under the effect of the operating device causes longitudinal displacement of the muzzle barrel portion relative to the breech barrel portion to produce a gas-tight seal between the barrel portions.
- 10 4. A mortar according to Claim 2 or 3, wherein the operating device comprises a bell-crank mounted between two columns of the linkage and a link interconnecting the bell-crank and the catch.
- 15 5. A mortar according to Claim 4, wherein the two columns of the linkage are

designed as recoil-absorbers for the mortar.

6. A mortar according to Claim 2, 3, 4 or 5, wherein the half-shell accommodates the lower end of the muzzle barrel portion and surrounds the same in the engaged position of the muzzle barrel portion with the breech barrel portion and has peripheral rings and grooves for interengagement with corresponding grooves and rings on the muzzle barrel portion.

7. A mortar for fin-stabilised projectiles, substantially as hereinbefore described with reference to the accompanying drawings.

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