

March 26, 1968

H. GAWLICK ET AL

3,374,738

PRACTICE AMMUNITION FOR MORTARS

Filed March 18, 1966

2 Sheets-Sheet 1

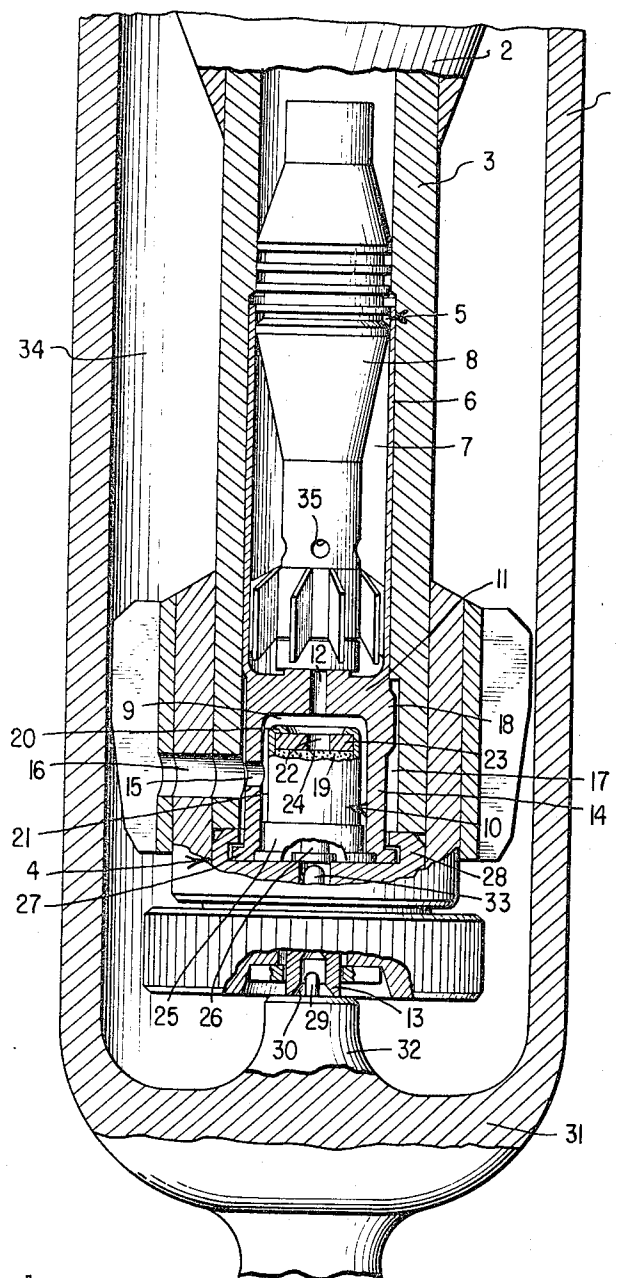


FIG. 1

INVENTORS

HEINZ GAWLICK  
RUDOLF STAHLMANN  
ERICH MAUER

BY

*Liske & Craig*

ATTORNEYS

March 26, 1968

H. GAWLICK ET AL

3,374,738

PRACTICE AMMUNITION FOR MORTARS

Filed March 18, 1966

2 Sheets-Sheet 2

FIG. 3

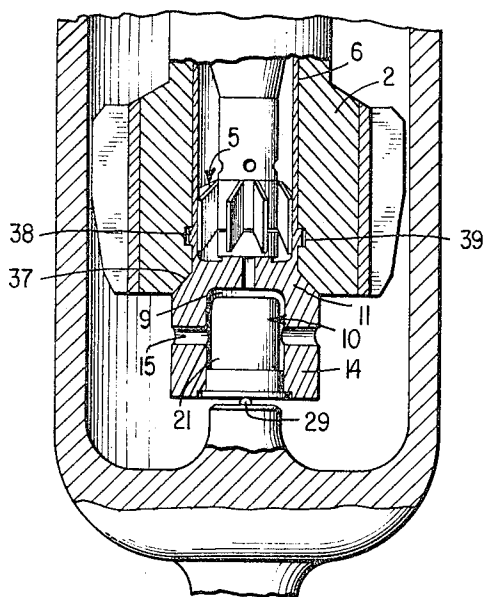


FIG. 2

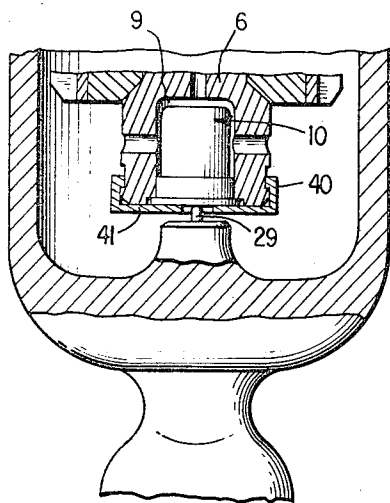
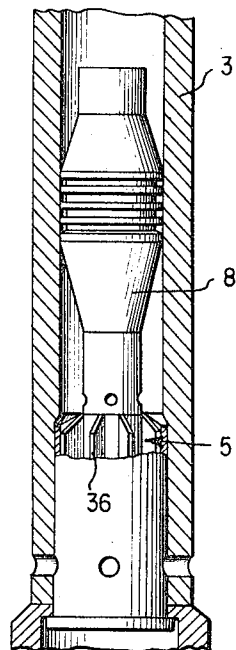


FIG. 4

INVENTORS.

HEINZ GAWLICK  
RUDOLF STAHLMANN  
ERICH MAUER

BY

*Licke & Craig*

ATTORNEYS

1

3,374,738

**PRACTICE AMMUNITION FOR MORTARS****Heinz Gawlick and Rudolf Stahlmann, Furth, and Erich Mauer, Cologne-Weidenpesch, Germany, assignors to Dynamit Nobel A.G., Troisdorf, Germany****Filed Mar. 18, 1966, Ser. No. 535,565****Claims priority, application Germany, Apr. 9, 1965,****D 46,999****10 Claims. (Cl. 102—49.1)****ABSTRACT OF THE DISCLOSURE**

Practice ammunition of a mortar wherein a dummy projectile resembling the live projectile includes an inset barrel for firing therefrom a practice projectile. The practice projectile is held within a practice cartridge case having a bottom piece and a rearwardly opening central chamber rearward of the bottom piece for receiving therein an ejection charge that is ignitable to eject the dummy projectile from the mortar.

*Background of the invention*

For practice-firing with mortars, practice ammunition is known in the prior art which is kept considerably smaller in caliber than the corresponding live ammunition and is fired out of an inset barrel. It is thereby also known in the prior art to construct this practice ammunition in the form of a cartridge in which the practice projectile, properly speaking, together with the propellant charge and ignition charge accommodated therein and possibly also with a signalling and/or marker charges together with the associated impact primer are arranged in a cartridge case. These cases are inserted for purposes of firing into the rear portion of the inset barrel and are retained therein by means of a closure means whereby the inset barrel is oftentimes arranged and constructed as projectile dummy reproduced in the shape and dimensions thereof to a corresponding live projectile. After the firing of the practice projectile, the projectile dummy has to be removed at first out of the mortar barrel for purposes of removal the case, reloading of a new case and renewed installation thereof into the motor barrel. It is known for this purpose to secure at the projectile dummy a chain extending forwardly out of the mortar barrel, by means of which the dummy is pulled out of the mortar after firing of the practice projectile. However, it has also been proposed already heretofore to arrange and to secure in the closure piece an ejection charge in the form of a cartridge case filled with a propellant charge and provided with a fuse or primer, by means of which the projectile dummy is automatically ejected out of the mortar barrel directly after the firing of the practice projectile.

Whereas the first-described method of pulling the projectile dummy out of the barrel by means of a chain is complicated and time-consuming, the second method of the ejection of the projectile dummy by means of an ejecting charge entails the disadvantage that for purposes of loading and reloading a relatively large number of parts have to be assembled, disassembled, and reassembled. As a result thereof, this latter method, in the final analysis, also becomes complicated and time-consuming to a certain extent. Furthermore, the danger of losing parts becomes greater the larger the number of the individual parts, especially in the case when the handling thereof is necessary during the execution of battle-like practice firing in the field and, for example, under more difficult conditions.

*Summary of the invention*

In connection with mortar practice ammunition having a practice projectile of small caliber arranged in a car-

2

tridge case and provided with a propellant charge for the firing out of an inset barrel of a projectile dummy, with an ejection charge being provided for the ejection of the projectile dummy out of the mortar barrel together with the cartridge case, the present invention proposes, for purposes of eliminating the aforementioned disadvantages, to provide the cartridge case with a rearwardly open, central, preferably cylindrical hollow space for the accommodation of the ejection charge by means of an extension of the cartridge case stem extending rearwardly beyond the case bottom.

The ejection charge can be inserted thereby directly into the rear extension of the case stem or even more appropriately may be inserted in the form of a correspondingly constructed pre-assembled cartridge into the same which permits, on the one hand, to make, store, and transport the ejection cartridge by itself and therewith to simplify the manufacture of the practice ammunition as well as to render more safe the handling thereof, and on the other hand, to provide the possibility to combine the ejection cartridge at a more or less early point of time prior to the use of the ammunition with the cartridge case and the practice projectile into a unit which can be handled in a simple and easy manner during the practice firing and in particular which dispenses with a separate part for the accommodation of the ejection charge.

It is proposed according to another feature and further appropriate development of the present invention to connect with each other the hollow space for the ejection charge with the hollow space for the practice projectile by way of a central, axial bore formed in the case bottom, whereby the flame produced during the ignition of the ejection charge can be utilized for the ignition of the projectile propellant charge so that the arrangement and construction of a second fuse or ignition device for the projectile propellant charge can be dispensed with.

Particularly in order to achieve the re-usability of the cartridge case, provision is made according to a further feature in accordance with the present invention to construct the wall thickness of the extension part extending beyond the cartridge bottom several times greater than the wall thickness of the case part accommodating the projectile, and to accommodate in the wall of the extension part one or also several gas apertures distributed evenly over the circumference so that this case part, on the one hand, is sufficiently strong to withstand the gas pressure of the ejection charge and, on the other, the gas pressure cannot exceed a predetermined value.

Accordingly, it is an object of the present invention to provide a practice ammunition for mortars which obviates by simple means the shortcomings encountered with the prior art constructions.

It is another object of the present invention to provide a practice ammunition for mortars which eliminates the complicated and time-consuming handling necessitated by the prior art constructions.

Still another object of the present invention resides in a practice ammunition for mortars which reduces the need for assembling, disassembling and reassembling numerous parts during practice firing.

A further object of the present invention resides in a practice ammunition for mortars which permits practice firing in the field, simulating actual battle conditions to a much greater extent than realizable heretofore.

A still further object of the present invention resides in a practice ammunition for mortars provided with an ejection charge for the projectile dummy in which the ejection charge is accommodated within a self-contained cartridge that can be manufactured, stored, and transported separately from the remaining parts of the practice ammunition.

Another object of the present invention resides in a practice ammunition for mortars of the type described above which can be readily preassembled prior to actual use.

Still another object of the present invention resides in a practice ammunition for mortars which greatly simplifies the fuse structure thereof.

#### *Brief description of the drawing*

These and further objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein

FIGURE 1 is an axial cross-sectional view through one embodiment of a practice ammunition in accordance with the present invention which is retained in the projectile dummy by means of a closure mechanism having an auxiliary striker pin and which is installed together therewith into the mortar;

FIGURE 2 is a partial axial cross-sectional view, on a reduced scale, illustrating a modified embodiment of a practice ammunition according to the present invention, similar to that of FIGURE 1;

FIGURE 3 is a partial axial cross-sectional view through a still further modified embodiment of a practice ammunition for mortars of the present invention, in which the cartridge case abuts against the rear end of the shell dummy by means of a conically shaped shoulder; and

FIGURE 4 is a partial axial cross-sectional view through still another modified embodiment of a practice shell in accordance with the present invention, similar to that of FIGURE 3.

#### *Detailed description of the drawing*

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGURE 1, reference numeral 1 designates therein the mortar barrel of which only the rear portion is shown. The dummy projectile 2 of which also only the rear portion is shown and which is constructed in its external shape and outer dimensions to a corresponding live mortar projectile, is arranged together with the inset barrel 3 thereof in the mortar barrel 1. The practice cartridge generally designated by reference numeral 5 is retained in the rear portion of the inset barrel 3 by means of the closure mechanism generally designated by reference numeral 4 and provided with the auxiliary striker pin 13. The practice cartridge 5 contains in the forward hollow space 7 of the cartridge case 6 the practice projectile 8 of under-size caliber and constructed in its shape in correspondence to that of the live mortar ammunition, as well as in the rear hollow space 9 the ejection cartridge generally designated by reference numeral 10. The bottom 11 separating the two hollow spaces 7 and 9 is provided with the central axial connecting bore 12. The portion 14 of the case 6 projecting rearwardly beyond the case bottom 11 is constructed considerably thicker than the forward case stem and is provided with the radial gas discharge apertures 15. The gas discharge aperture or apertures 16 are formed in the inset barrel 3 and in the projectile dummy 2 in extension of the gas discharge aperture or apertures 15. In order to make certain that the bores 15 and 16 as well as possibly still further bores 15 and 16 are arranged in mutual alignment in extension thereof, there is formed in the cartridge chamber or in the inset barrel 3 and/or in the projectile dummy 2 the recess, groove or the like 17 into which the cartridge case 6 engages fittingly with its nose or the like 18.

The ejection cartridge 10 containing the ejection charge 19 is provided at its forward end with the disk 23 retained by the flanged rim 20 of the case 21 and pro-

vided with the central bore 22. In the direction toward the ejection charge 19, the bore 22 is covered by means of foil 24 or the like. The primer 26 of conventional construction is arranged in the bottom piece 25 of the cartridge 10.

In the preparation for firing, one proceeds in the following manner:

The practice cartridge 5 with inserted ejection cartridge 10 is placed with its rim 27 underneath the claws 28 of the closure means 4 and is thereupon inserted by means of the same from behind into the inset barrel 3 or into the cartridge chamber of the projectile dummy 2. After the locking or any other conventional securing of the closure means 4 onto the end of the projectile dummy 2, the device is ready for firing.

For purposes of firing, the projectile dummy 2 together with the practice cartridge 5 and the ejection cartridge 10 is inserted from in front into the mortar barrel 1. During the downward sliding in the mortar barrel 1, the auxiliary striker pin 13 abuts at first with its rearward, ring-shaped rim 30 extending over the mortar striker pin 29 against the anvil 32 formed at the mortar bottom 31 whereby the auxiliary striker pin 13, during the further downward sliding movement of the projectile dummy 2, is displaced from the rearward into the forward end position and after the elimination of the axial play between the auxiliary striker pin tip 33 and the primer 26, which is the condition of the parts illustrated in FIGURE 1 of the drawing, is driven with its tip 33 into the primer 26 and thus initiates the ignition of the ejection charge 19.

As a result of the pressure of the developing gases of the ejection charge 19, at first the case 21 thereof is perforated within the area of the gas discharge aperture 15 so that the gases can flow out through the apertures 15 and 16 into the interior space 34 of the mortar barrel 1. Simultaneously therewith, as a result of the developing gases of the ejection charge 19, also the cover foil 24 is perforated within the area of the bore 22 of the disk 23 so that a jet of the hot flame gases of the ejection charge 19 is able to penetrate through the bore 22 and the ignition channel 12 and is able to ignite the propulsion charge of the projectile (not shown), possibly by way of an ignition transmitting capsule (not shown) arranged approximately at the rear end of the projectile propulsion charge in extension of the ignition channel 12.

As a result of the gases discharged through the bore 35, a pressure builds up rapidly in the space 7 of the cartridge case 6 which propels the practice projectile through the inset barrel 3 of the projectile dummy 2 and out of the mortar barrel 1. In the meantime, a correspondingly high pressure has also been built up in the space 34 of the mortar barrel 1 dammed up or closed up in front by the head of the projectile dummy 2 so that the projectile dummy 2 together with the case of the practice cartridge 5, the case of the ejection cartridge 10, and the closure means 4 starts to move now also in the forward direction and is thrown out of the mortar barrel 1. The conditions are, of course, so selected that the projectile dummy 2 falls to the ground already shortly in front of the mortar barrel mouth.

After picking up the projectile dummy 2, the closure means 4 is now unlocked and by means thereof or by means of the claws 27 thereof, the case 6 of the practice cartridge 5 and therewith also the ejection cartridge 10 is pulled out of the cartridge chamber. The empty cases of the cartridges 5 and 10 are taken out of the closure means 4 whereupon the projectile dummy 2 is prepared in the manner already described above for a new round of firing.

The same conditions exist in principle in the embodiment of FIGURE 2, in which only the inset barrel 3 is shown of the projectile dummy 2, as were illustrated and described in detail already in connection with FIG-

FIGURE 1. The sole difference with respect to FIGURE 1 consists practically in that the case of the practice cartridge 5 only extends up to the forward end of the guide means 36 of the practice projectile 8 and the cartridge chamber is also constructed to correspondingly shorter dimension.

In the embodiment of FIGURE 3, a closure means such as the closure mechanism 4 of FIGURES 1 and 2 is dispensed with and in lieu thereof the extension 14 of the cartridge case 6 receiving the ejection cartridge 10 is further reinforced whereby the transition to this reinforced portion takes place within the area of the bottom 11 by means of the conical enlargement 37 which serves simultaneously for the support of the cartridge 5 and the case 6 against the rear end of the projectile dummy 2. The securing of the practice cartridge 5 in the cartridge chamber of the projectile dummy 2 takes place in this embodiment by means of the projections 38 formed along the outside of the case 6 which during insertion of the cartridge 5 into the projectile dummy 2, slide at first in axial grooves (not shown) and are thereupon retained by a more or less great rotation of the cartridge 5 in the manner of a bayonet-type closure mechanism in the annular groove 39.

The extension 14 is provided also in this case with radial gas discharge apertures 15. Since the extension 14 extends beyond the rear end of the projectile dummy 2, corresponding gas discharge apertures in the projectile dummy 2 may be dispensed with in this arrangement whereby possibly also an oriented insertion of the cartridge chamber may be dispensed with accordingly.

The ejection cartridge 10 is to be secured in this case by means of a clamping or wedging fit in the extension 14 or in the space 9 thereof. As has already been proposed heretofore for such ejection cartridges the case 21 may be provided appropriately for that purpose with ribs (not shown) whose outer contact circle as measured along the circumference, is greater than the inner diameter of the cartridge chamber.

As can be readily seen from FIGURE 3, the initiation of the ignition takes place by means of the mortar striker pin 29. The operating phases which take place in this case correspond as to the rest exactly to those as already described in connection with FIGURE 1.

Mortar barrels of different manufacture are provided, as is known, with certain differences as regards striker pins. In order to assure that during firing of practice cartridges of one and the same construction out of different mortar barrels, always the same conditions are achieved, there may be secured on the rear end of the cartridge case 6, according to the partial cross section of FIGURE 4, the centrally apertured cap 40 by means of a bayonet-type connection, a threaded connection, a snap-type connection or the like whereby the thickness of the bottom 41 is, in each case, so selected in accordance with the height or length of the striker pin 29 that necessarily always the same penetrating depth of the striker pin 29 into the primer of the ejection cartridge 10 results. As can be readily seen from FIGURE 4, the task of an additional securing of the ejection cartridge 10 in the hollow space 9 of the cartridge case 6 may be assigned to the cap 40 if its bottom 41, as shown, overlaps more or less the bottom of the ejection cartridge 10. Of course, other solutions are within the scope of the present invention both for the regulation of the penetrating depth of the firing pin into the primer of the ejection cartridge as well as for the securing of the latter in the cartridge case 6.

While we have shown and described several embodi-

ments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art and we therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

We claim:

1. A mortar practice ammunition having a dummy projectile provided with an inset barrel, comprising; practice cartridge case means; practice projectile means of small caliber and arranged in said cartridge case means and including practice propellant charge means for the firing of the practice projectile means out of said inset barrel; said practice cartridge case means including a main case portion, a case bottom and an extension extending beyond said case bottom in the rearward direction, said extension being provided with a central hollow chamber means open toward the rear for accommodating an ejection charge to eject the dummied projectile out of the mortar barrel.

2. The combination according to claim 1, wherein said chamber means is cylindrical.

3. The combination according to claim 1, wherein said practice cartridge case means forms in effect a hollow space for the practice projectile means, said case bottom including an ignition channel connecting the hollow chamber means of said extension with the hollow space in said cartridge case means.

4. The combination according to claim 3, wherein said ignition channel is a central axial bore in said case bottom.

5. The combination according to claim 1, wherein the wall thickness of said extension is greater by a multiple than the wall thickness of the case main portion, said extension being provided with at least one substantially radial gas discharge aperture.

6. The combination according to claim 5, wherein a plurality of said gas discharge apertures are provided.

7. The combination according to claim 6, wherein said gas discharge apertures are located approximately in the center of the axial extent of the hollow space for the ejection charge means.

8. The combination according to claim 1, further comprising ejection charge means in said hollow space for ejecting the dummy projectile from the barrel of the mortar upon firing.

9. The combination according to claim 1, including bayonet-type connecting means performing the sole axial relative movement preventing connection between said dummy projectile and said practice cartridge case.

10. The combination according to claim 8, further comprising centrally apertured cap means for retaining said ejection charge means in said hollow chamber means and determining the penetration of the mortar firing pin into said ejection charge means and being readily removable for adapting the mortar practice ammunition to different types of mortars having varying length ignition pins by substituting apertured cap means of different effective thicknesses.

#### References Cited

#### UNITED STATES PATENTS

3,274,935 9/1966 Stadler et al. ----- 102-41

BENJAMIN A. BORCHELT, *Primary Examiner*.

V. R. PENDEGRASS, *Assistant Examiner*.