June 25, 1963 W. E. ANTHONY 3,094,934

PRACTICE MORTAR SHELL AND FUSE ASSEMBLY

Filed July 29, 1960

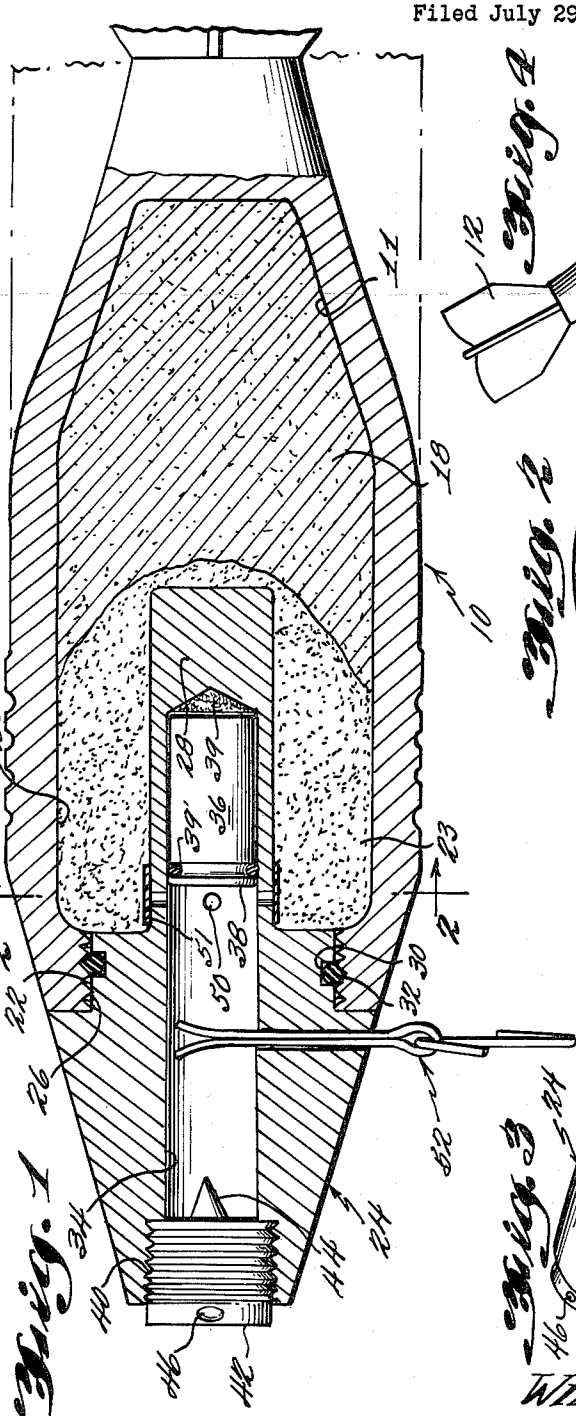


Fig. 1

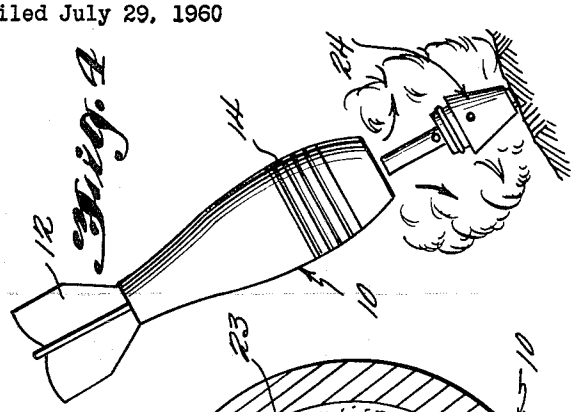


Fig. 2

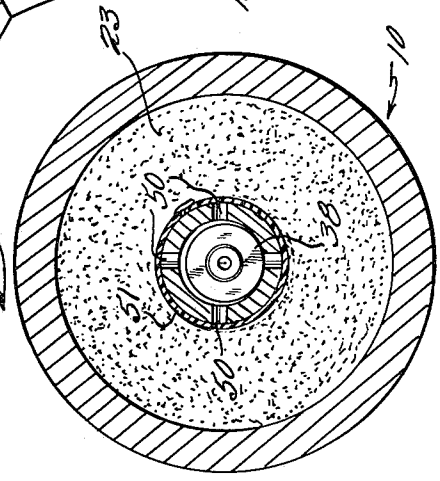


Fig. 3

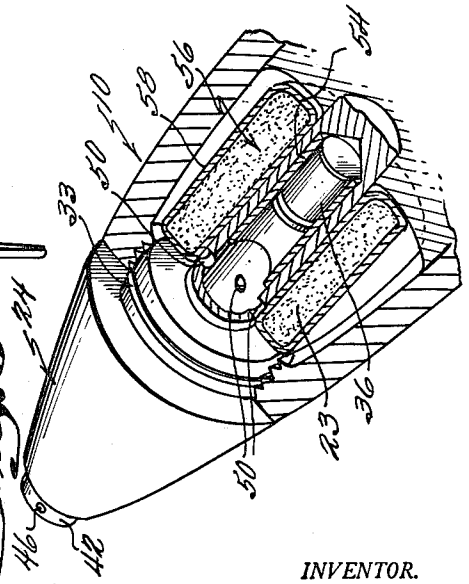


Fig. 4

INVENTOR.
WILLIAM E. ANTHONY
BY
Cushman, Darby & Cushman
ATTORNEYS

United States Patent Office

3,094,934
Patented June 25, 1963

3,094,934

PRACTICE MORTAR SHELL AND FUSE ASSEMBLY

William E. Anthony, Box 2485, Gastonia, N.C.

Filed July 29, 1960, Ser. No. 46,181
16 Claims. (Cl. 102—41)

This invention relates to mortar shells and has particular reference to a new and improved mortar training shell and fuse assembly wherein the components of the assembly are not destroyed upon firing, but may be salvaged and used time and again.

The experience gained in training of military personnel in the use of mortar weapons has resulted in a well defined need for devices which simulate service or battle conditions, as actual service rounds are unsafe, expensive, and otherwise impractical to use for this purpose. To be truly worthwhile, such training devices should impart a sense of reality to personnel undergoing training, stimulating a high degree of interest and enthusiasm.

While mortar training devices have been developed in the prior art, numerous shortcomings are apparent when consideration is given to economic, as well as other factors. Financial considerations necessarily limit the extent to which such training devices may be used, due to the extremely large number of military personnel being trained in the different countries, and the resulting large number of rounds consumed per year. Additionally, to properly train military personnel in the use of mortar weapons, the shell must approach as nearly as possible, the actual trajectory of a service shell, while being inexpensive and safe to use.

In this regard, the prior art fails to solve these problems, even though various training shells have been designed which serve to simulate actual firing conditions to some degree. For example, a type of dummy mortar shell have been developed wherein is disposed a subcaliber barrel which is adapted to retain and fire a subcaliber projectile. Necessarily, a true mortar trajectory is not provided because of the obvious differences in the size and design of the projectile. The expense is also relatively high in this type of training device. Thus, while the problem has been recognized in the prior art, the developments available fail to completely solve the problems involved.

The shortcomings of the prior art are further borne out by the fact that in present mortar training practice a standard service assembly with a low order explosive replacing the HE explosive is utilized. Thus, while a spotting charge is supplied, the relatively expensive and dangerous service fuse detonates the spotting charge to simulate battle conditions.

It is accordingly an object of this invention to provide a mortar training shell and fuse assembly wherein the component parts are not destroyed or unduly damaged upon firing and subsequent impact with the ground, but may be reclaimed, assembled, and used time and again.

A further object of this invention is to provide a mortar shell which has a fuse head secured to the mortar shell body by frangible means, so as to be separated from the shell body upon impact with the ground, while providing a spotting charge which may be easily seen from the firing area.

Still another object of this invention is to provide a simple, durable fuse for a mortar training shell which ignites a spotting charge within the shell body, by a conventional small arms cartridge so disposed to detonate within the fuse.

Yet another object of this invention is to provide a mortar training shell which is completely safe to use, providing a minimum hazard, even to relatively inexperienced personnel.

Related objects of this invention are to provide a mortar training shell and fuse assembly which faithfully follows the trajectory of an actual service round, is of unusually simple construction, and is inexpensive to use.

Further objects and advantages of this invention will become apparent in the foregoing description and appended drawing, wherein:

FIGURE 1 is a longitudinal sectional view of a mortar training shell body and fuse assembly embodying this invention.

FIGURE 2 is a sectional view taken along the lines 2—2 of FIGURE 1.

FIGURE 3 is a fragmentary perspective view, partially broken away, of a fuse and shell body showing a modified form of the invention.

FIGURE 4 is a perspective view showing the separation of the components of the assembly upon impact.

In accordance with this invention a mortar training shell is provided which has a novel fuse secured to a conventional shell body by frangible or otherwise separable means, so as to separate from the shell body upon impact with the ground and explosion of a spotting charge disposed within the mortar shell body.

Referring now to the drawing, a conventional mortar shell body **10** has a tail assembly **12** and mortar barrel engaging rings **14**. The mortar shell is generally fired by detonating a cartridge disposed at the rear end of the shell body, which in turn ignites powder bags which are clipped to the rear edge of the tail fins. This conventional mortar propelling means is not disclosed herein because it forms no part of my invention.

The shell body **10** has an explosive chamber **11** therein, closed at the rear and open at the front and which for the purpose of this invention may be partially filled with a filler material **18**, such as plaster of Paris or any other suitable material, to leave a small spotting-charge-received cavity **20**. The open forward end of the shell body **10** is of conventional construction and normally has interior screw threads **22** for the reception of a conventional complicated and expensive fuse (not shown) for detonating a charge of high explosive (not shown) normally carried in the cavity **11**. Disposed within the small cavity **20** is a spotting charge **23** which is black powder, or an otherwise suitable explosive material.

A fuse head **24** is shown disposed in abutment with the forward end of the shell body **10**, extending through the open forward end thereof, and terminating within the spotting charge cavity **20**. The fuse head **24** is shown as being of generally frusto-conical construction at its forward end, with the section rearwardly thereof having a smooth cylindrical portion **26** snugly received within the threads **22**, and terminating in an elongated portion **28**. The fuse head **24** preferably is a unitary cast aluminum structure, suitably machined to provide the necessary refinements thereto. The cylindrical portion **26** of the fuse head **24** has a circumferential groove **30** therearound, and a retainer and sealing member **32** is disposed within the groove **30**.

The retainer member **32** may be of various types of construction. FIGURE 1 shows a resilient O-ring member **32**, while in FIGURE 3, a bead of frangible plastic cement **33** is shown within the groove **30**. Various well-known types of cementitious materials which become rather brittle when allowed to set are quite well suited for use herein. One such material is marketed under the name "Plastic-Steel."

Additionally, the retainer member **30** may be of numerous modified construction. The member **30** need not necessarily be sheared completely upon impact as would be the case with a cement, as the member **30** serves to hold the fuse head **24** in normal engagement with the shell body **10** and to permit separation of the fuse head

24 from the shell body 10 when the spotting charge is exploded, as will be explained hereinafter.

The fuse head 24 has a longitudinal coaxial cartridge passage 34 extending rearwardly thereinto and terminating in a closed rear end. A small arms center-fire blank or service cartridge 36 is slidably disposed within cartridge passage or bore 34, having its detonating or cap end 38 facing forward. A dab of grease 39 placed on the front end of the cartridge 36 causes it to be maintained in a normally rearward position in cartridge passage 34. A rubber band or split ring disposed in the usual circumferential extractor groove of the cartridge 36 has also proven quite effective in frictionally maintaining the latter at the bottom of the bore 34. Depending, of course, on the conventional cartridge in use in a given country, the cartridge passage may be of such size to accommodate any standard cartridge, as for example, .45 caliber, .30 caliber carbine, 9 mm. Luger, and the like. At its forward end the passage 34 is provided with an interiorly threaded counterbore 40 for the reception of an exteriorly threaded plug 42 provided with a fixed inwardly facing firing pin 44. The plug 42 has suitable means thereon, such as the spanner holes 46, for engagement by a suitable wrench (not shown) to tighten the plug in place.

The cartridge passage 34 has a plurality of gas ports 50 extending radially outwardly therefrom and opening into the spotting charge cavity 20. The outside surface of the elongated portion 28 of the fuse head 24 has a rupturable strip 51 wrapped thereabout to seal the gas ports 50 from the spotting charge 23, as shown in FIGURES 1 and 2. Such material as "Scotch tape" and the like, is well suited for this purpose. As a safety feature, passing radially through the fuse head 24 and projecting into the bore 34 between the firing pin 44 and the cartridge 36 is a cotter pin 52 which normally prevents the cartridge 36 from sliding into engagement with the firing pin 44.

FIGURE 3 illustrates a slight modification of the mortar shell and fuse assembly wherein a magnetic sleeve 54 is disposed within cartridge passage 34. Inasmuch as practically all modern conventional cartridges are steel jacketed, the magnetic sleeve 54 will normally retain the cartridge 36 at the rearward end of the cartridge passage 34.

Replacing the strip 51 and loose spotting charge 13 in FIGURES 1 and 2 is a pre-packaged, generally annular spotting charge 56, which is enclosed in a rupturable package 58 of such material as "Cellophane." Such a pre-packaged spotting charge allows for measuring and packaging in quantity prior to assembly. In its simplest form, package 56 may be an oblong, cylindrical package, having the spotting charge loosely placed therein, so as to allow the package to be wrapped loosely about the elongated portion 28, and yet permitting the package to be placed through the open end of the shell body 10 and into the explosive chamber 20.

The mortar shell and fuse are assembled as follows: The filler material 18 is first placed within explosive chamber 11 of the shell body 10 followed by the spotting charge 23. The cartridge 36 is placed within the passage 34, the cotter pin 52 is placed within the fuse head 24, and the plug 42 is screwed into the fuse head. The rupturable member 32 is placed about the cylindrical portion 26 of fuse head 24. The O-ring or cementitious material is then placed in the groove 30 and the fuse head 24 forced into the open fuse-receiving end of the shell body to complete the assembly. The fuse head 24 is thus retained in position on the shell body 10 solely by the retainer member 32.

In operation, the cotter pin 52 is removed and the mortar shell assembly is dropped within a conventional mortar barrel, after having been suitably provided with propelling means. The propelling charge is detonated and the mortar shell 10 leaves the barrel. The cartridge

36 is maintained in its normal rearward position within the passage 34 due to the forward momentum of the shell 10. When the fuse head hits the ground, tree or the like, on impact of the shell some distance away from the firing location, the cartridge 36 is driven to the forward end of cartridge passage 34 due to the continuing momentum of the cartridge 36 after the impact. The cartridge 38 is then fired by the pin 44, the hot gases passing through gas ports 50 rupture the covering strip 51 and ignite the spotting charge 23. The explosion of the spotting charge 23 forcibly separates the shell body 10 from fuse head 24, by shearing or otherwise overcoming the resistance of the retaining member 32, thus separating the shell body 10 from the fuse head 24. Due to the separation of the shell body 10 from the fuse head 24 in this manner, no appreciable damage is done to the component parts; yet, a visible spotting charge is observable from the firing location.

After a number of rounds have been fired, it is only necessary for personnel to gather the separated fuse heads and shell bodies, and reassemble them as previously described for subsequent use.

The trajectory of the training shell thus is substantially identical to that of a service round, because the only major substitution thereto is the fuse head, the spotting charge, and the filler material.

While the preferred embodiment of my invention has been described, it is obvious that numerous modifications may be made thereto without departing from the scope of the invention.

The cotter pin 52 is another exemplary embodiment of a typical means to separate the cartridge from the detonating pin during the normal handling and numerous modifications are obvious to one skilled in the art. For example, while aluminum preferably is used in the fabrication of the fuse head, the latter could be molded of such material as polyethylene and the like.

After considering the foregoing description in conjunction with the annexed drawing, it is apparent that there is provided by this invention a device by which the various objects and advantages set forth herein are successfully achieved. Therefore, it is intended that the matter contained in the foregoing description and the accompanying drawing be interpreted as illustrative and not in a limiting sense, when consideration is given to the appended claims.

What is claimed is:

1. A mortar training shell and fuse assembly comprising: a shell body having an interior cavity provided with an open forward end for receiving a spotting charge disposed in said cavity; an impact fuse having a body; and means separate from said bodies for retaining said fuse body within said shell body at the open end thereof and operative in response to an explosion of the spotting charge within said shell body to separate said shell body from said fuse head without damage to either.

2. A training shell and fuse assembly as described in claim 1 wherein the explosive-releasable means comprises an O-ring.

3. The structure defined in claim 1 wherein the explosive-releasable means comprises frangible cement.

4. A training shell and fuse assembly as set forth in claim 1, wherein the fuse has a longitudinal bore provided with lateral gas ports, and including a small arms cartridge slidably disposed in said bore and a rearwardly facing firing pin at the forward end of said bore for engagement by said cartridge to fire the latter on impact of the assembly.

5. A training shell and fuse assembly as described in claim 4 including means for yieldably retaining said cartridge in a normally rearward position within said cartridge passage.

6. A training shell and fuse assembly as described in claim 5 in which the yieldable means includes a permanent magnet.

7. A training shell and fuse assembly as described in claim 5 wherein said cartridge has a circumferential ex-

tractor groove therearound and said yieldable retaining means includes a rubber band disposed in said groove.

8. A training shell and fuse assembly as described in claim 5 wherein said cartridge has a circumferential extractor groove therearound and said yieldable retaining means includes a split ring disposed in said groove.

9. A mortar training shell and fuse assembly comprising: a shell body having a forward and rearward end and a cavity therein for the reception of a spotting charge and also having an opening at said forward end communicating with said cavity; a fuse head securable within said forward body opening and including a portion projecting rearwardly into said cavity, said fuse head having a longitudinal bore extending into said portion and provided with at least one lateral gas port affording communication between said cavity and said bore; a small arms cartridge slidably received in said bore, cap end foremost, said cartridge having a peripheral groove about its exterior; means carried by said groove operative to yieldably retain said cartridge at the rearward end of said fuse bore, but upon impact of said fuse head with another surface, said means operative to allow movement of said cartridge, by inertia, forwardly within said bore; and closure means operative for removable engagement with the forward end of said fuse head to close said bore, said means including a rearwardly facing firing pin extending into said bore towards said cartridge, said cartridge thereby being detonated upon impact by forward movement within said bore against said firing pin.

10. The structure defined in claim 9 including means separate from said shell body and said fuse head for securing the fuse head to the shell body and operative in response to an explosion of the spotting charge within said shell body to separate said shell body from said fuse head without damage to either.

11. A mortar training shell assembly as described in claim 9 including rupturable means normally sealing said gas ports.

12. A mortar training shell and fuse assembly as defined in claim 9, including a rupturable package carrying a spotting charge.

13. Mortar training shell defined in claim 12 wherein said rupturable package is of generally cylindrical configuration and operative to be slidably received about the rearwardly projecting portion of said fuse head.

14. Mortar training shell and fuse assembly defined in claim 9 wherein said closure means is an exteriorly threaded plug received in said bore.

15. The structure defined in claim 9 including a filler material carried within said cavity to thereby occupy space within said cavity not occupied by a spotting charge.

16. A training shell and fuse assembly comprising a mortar shell body having an interior cavity provided with an open forward end for receiving a spotting charge disposed in said cavity; a fuse head constructed and arranged to be received in the open forward end of said shell body, and means separate from said shell body and fuse head for retaining said fuse head within said shell body and operative in response to a spotting charge explosion within said shell body to separate said shell body and fuse head without damage to either.

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