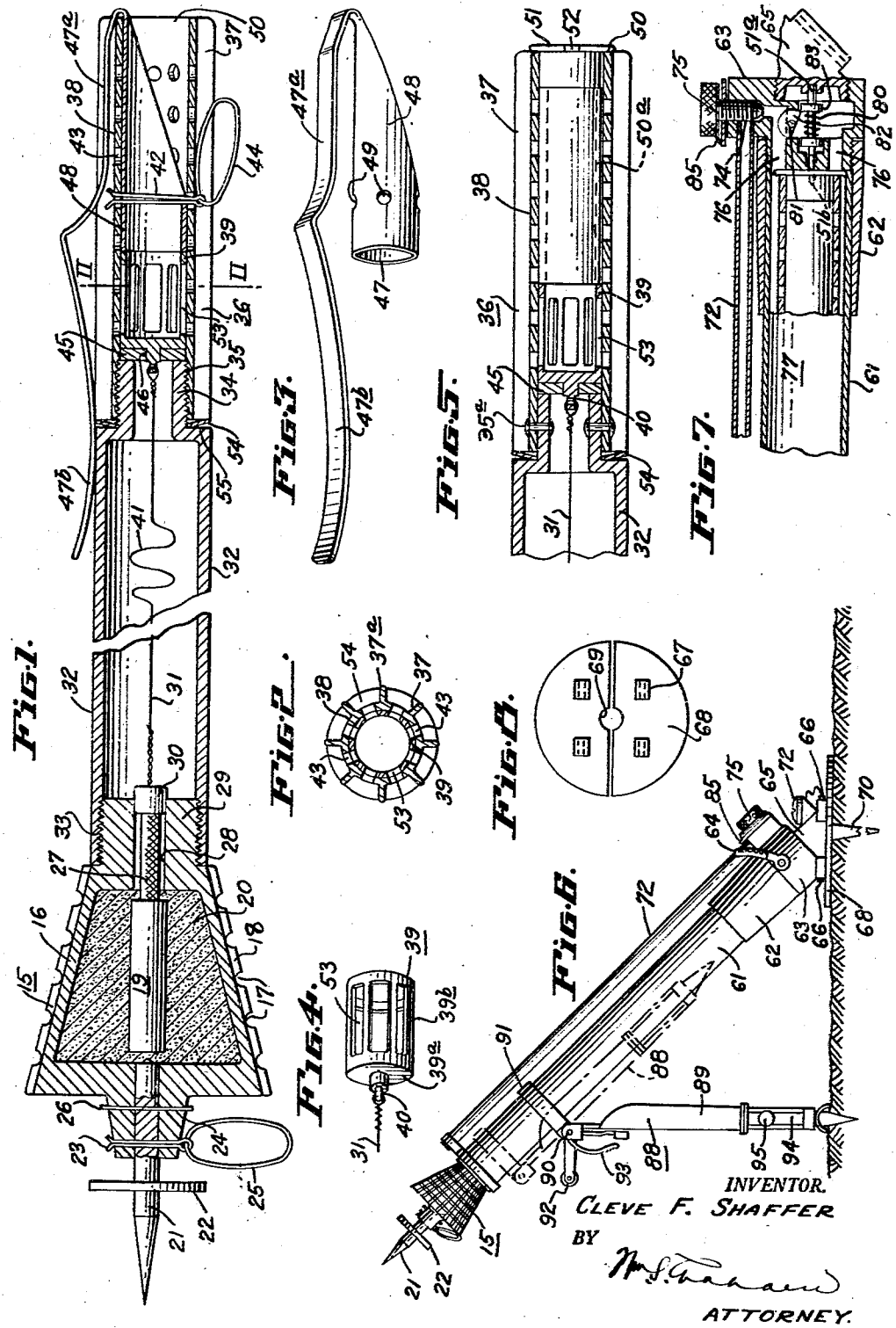
June 19, 1945. C. F. SHAFFER 2,378,735

GRENADE

Filed May 10, 1941



Patented June 19, 1945

2,378,735

UNITED STATES PATENT OFFICE

2,378,735

GRENADE

Cleve F. Shaffer, San Francisco, Calif., assignor of thirty per cent to Martin C. Mogensen, Martinez, thirty per cent to Herbert W. Erskine, Piedmont, five per cent to Herman J. Fanger, Oakland, and five per cent to Henry Gruenhagen, Oakland, Calif.

Application May 10, 1941, Serial No. 392,878

3 Claims. (Cl. 102—64)

This invention relates to grenades of the type used in military operations and particularly to grenades adapted for use either by the manual throwing thereof or the firing or shooting thereof by explosive force from an instrument of armament such as a mortar or gun. As is well known a grenade is a form of explosive bomb, relatively small in size as compared with long range shells, which latter are employed in large calibre armament. The grenade is especially adapted for short range distances and is of great value in military operations where opposing forces are in close proximity. The use at present made of the hand grenade is the manual throwing thereof by troops. The hand grenade during the World War of 1917–1918 was generally elliptical in longitudinal section, approximately five inches long and two and one-half inches transversely and was manually thrown in the manner of a ball and exploded by a time fuse. In later years the explosive or bomb portion of the grenade has been attached to one end of a handle member to secure greater leverage in the throwing and for its better guidance in flight. The grenade being heavy and the handle being relatively light and long, the handle serves as a guiding shaft in flight in the same manner as the shaft of an arrow.

The present invention has as an object the providing of a grenade which has all of the advantages of the manually thrown, handle-mounted grenade and the additional advantage that it may be explosively propelled for longer ranges or distances by armament such as a mortar which is relatively light in weight and easily transportable by one man, small mechanized mobile equipment, by animal pack, or by marching or parachute troops. Another object is to provide a grenade adapter whereby the grenade may be employed either as a hand grenade for throwing or in barrelled armament. A further object is to provide an explosive grenade projectile adapted for either manual or explosive propulsion which is light in weight, safe to handle until ready for use, can be set up, aimed, loaded and fired by one man when used in a mortar, and quickly and easily adapted for either of the aforesaid purposes of use; a further object is to provide a grenade having the foregoing advantages, which is economical in manufacture and efficient in its operation.

With the foregoing and other objects in view, all of which will be more apparent as this description proceeds, the invention is exemplified in one form in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawing, and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion, size and details of construction of the apparatus may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

To more clearly comprehend the invention, reference is directed to the accompanying drawing wherein like reference characters indicate corresponding parts.

Fig. 1 is a broken, longitudinal transverse section of the grenade of the invention.

Fig. 2 is a lateral, transverse section on line II—II of Fig. 1.

Fig. 3 is a perspective of a belt hook member.

Fig. 4 is a perspective of plummet member.

Fig. 5 is a longitudinal section broken away, showing a slight modification of attaching adapter to a handle member and selective replacement of belt hook member by an explosive shell.

Fig. 6 is a side elevation of a suitable mortar device.

Fig. 7 is a fragmentary enlarged detail in longitudinal vertical section of mortar breech mechanism.

Fig. 8 is a plan view of mortar ground plate.

Referring to Fig. 1, the grenade is provided with a bomb head generally indicated 15 which is a recognized and well-known type comprising a hollow shell body 16 of any suitable shape, but shown herein as having substantially the shape of an inverted conical frustum in axial section, the side walls of which are circumferential relative to the axis and are scored or grooved circumferentially as at 17 and longitudinally as at 18 providing weakened lines to facilitate the breaking of the bomb head into many small portions upon the explosion thereof. Within the hollow of the shell 16 is mounted a detonator 19 and the remainder of the hollow body is filled with an explosive 20. The detonator is exploded by either of two hereinafter described methods, depending on the manner in which the grenade is used.

A pointed percussion pin 21 is slidably mounted through the shell body at the forward end of the grenade, and has a disc plate 22 mounted adjacent its free end, the purpose of which is to provide an impact surface in case the grenade strikes in soft or muddy ground. A safety lock, here represented as a cotter pin 23, is mounted through a protuberant lug 24 of the grenade

body and having a ring 25 through the eye thereof to facilitate its removal when the grenade is to be used by propelling it by a mortar or when its firing by impact is desired in hand throwing. This pin 23 may also be removed when the grenade is manually thrown. A shear pin 26 of relatively small diameter is inserted through the lug 24 and the percussion pin 21, the shear pin 26 being for the purpose of holding the percussion pin 21 out of accidental contact with the detonator after removal of cotter pin 23, and to hold percussion pin against the "set back forces" or inertia when the grenade is propelled by explosive force of mortar firing. The landing impact of the propelled grenade drives the percussion pin against the detonator to explode the latter.

The second method of exploding the grenade bomb is particularly for its use in the manual throwing thereof, and consists of a friction fuse member 27 which extends through an opening 28 of a block portion 29 at the apex end of the inverted conical frustum. One end of the friction fuse 27 is attached to the detonator and the opposite end mounts a friction block 30 which upon being pulled from the end of the fuse ignites the fuse, the fuse being timed for approximately three to five seconds, in order to permit the grenade to be thrown after the friction fuse is ignited at its free end. The friction block 30 has a cord 31 attached thereto, the latter extending through an elongated tube handle member 32, which is threadedly connected at one end to the bomb body as at 33.

At its opposite end the handle 32 is reduced in diameter as at 34 to mount a mortar adapter, generally indicated 36 which may be connected to the handle end by any suitable means, such as threads 35 in Fig. 1 or rivets 35a in Fig. 5. The mortar adapter 36 is a tubular body elongated in form, preferably an extruded shape of light metal, having relatively circumferentially spaced longitudinal axially disposed fins 37 which extend radially outwardly from the adapter body sufficiently so that the radially outward edge 37a of the fins lie in the plane of a circle of substantially the same diameter as the outer diameter of the handle 32, as best shown in Fig. 2. The fins 37 serve several purposes. They provide a handgrip means by which the grenade may be manually thrown; they also serve to reinforce the tubular body of the adapter against the explosive force; they also serve to enlarge the tubular body of the adapter 36 so that its outer diameter is uniform with the handle 32 when the grenade is inserted in a mortar barrel; they also provide space longitudinally between them for the expansion of explosive gases when the mortar is fired, the explosive gases reacting against mortar breech and metal sealing gasket 54, hereinafter referred to; likewise, the fins serve as a guiding means to stabilize the grenade in flight in the same manner as feathers or vanes at the end of an arrow.

The tubular body 38 of adapter 36 slidably mounts therein a hollow elongated plummet 39 having an outer diameter to fit snugly, but readily slidably, within the tubular body 38. The upper end of the plummet 39 is closed by a disc 39a of relatively thick body material upon which is mounted an eyelet 40 to which one end of the string 31 is securely attached, the string 31 having a surplus of material within its length as indicated 41. The depending side walls 39b of the plummet are preferably relatively thin and are provided with openings or fenestrations 53. The plummet 39 is normally maintained within the tubular body of the adapter by the tubular retroverted end 47 of a belt hook 48, to be further described, the latter having a holding means such as cotter pin 42 mounted through oppositely disposed holes or openings 43 in tubular body 38, and openings 49 in the tubular portion of belt hook 47.

The tubular adapter body 38 slidably mounts therein a tubular portion 47 of a belt hook 48 by which the grenade may be carried on the belt of a trooper or hung on a wire in a type of military trap; the spring-metal belt-engaging clip portion 47a being retroverted upon and substantially parallel to the tubular portion 47, and having an elongated resilient tongue 47b which bears against the exterior of handle 32 to prevent the grenade from becoming inadvertently detached from the belt and also serves to shield the garment of a trooper from chafing against the edges of fins 37. It will be noted that the tubular portion 47 of the belt hook 48 has openings 49 therethrough, through which, (as well as through openings 43 of the adapter body), there is engaged by the cotter pin 42 to hold the tubular portion of the belt hook within the tubular body of the adapter. It is preferred that the pin 42 shall be sprung slightly when mounted in openings 43 so that its bar presses the tubular portion of the belt hook and the plummet together upwardly and into contact with a relatively soft washer 45 which has a hole 46 centrally therein to receive the eyelet 40 of the plummet, and thus seal the hollow handle member 32 and the friction fuse 27 against entry of moisture or the pressure of explosion when fired in a mortar. The belt hook is removable from the tubular body 38 upon pulling the ring 44 to remove the pin 42 from its engagement in the respective openings 43, and 49 of the adapter body and belt hook member.

When the trooper desires to manually throw the grenade he immediately pulls out the cotter safety pin 42 by means of ring 44, at which time he is supposed to be holding the grenade in a somewhat vertical position with its explosive bomb head upwardly. The removal of the cotter pin 42 will cause the tubular part 47 of belt hook 48 to drop out of the tubular body 38 of the adapter, whereupon the plummet 39 will also loosely slide out of the open end 50 of the tubular adapter body by reason of its weight and the surplus cord 41, whereupon the plummet may be forcibly jerked by hand, thus acting upon the friction block 30 to ignite the friction fuse 27, after which the trooper must immediately throw the grenade as it will explode in from three to five seconds due to the timing of the friction fuse 27. If, however, the grenade is to be used in a mortar of suitable type, the cotter pin 42 and likewise the safety lock 23 are removed while holding the head of the grenade downwardly. The belt hook may then be removed while the plummet 39 remains in the adapter body. A shell 51, which may be of the paper-bodied, shotgun type, is then inserted into the open end 50 of the adapter body as shown in Fig. 5, the parts being so arranged, and the shell being of such diameter and length that, upon removal of pin 42 the open end of the shell touches or approximately touches upon the lower end of plummet 39, with the shell having a sufficient degree of snugly slidable frictional resistance in the tubular body 36 so that the plummet and shell will not drop

out when the grenade handle and adapter are dropped, (adapter end first), into the open barrel end of a mortar. The mortar is presumed to be in an inclined position so that its barrel is tilted to an angle of slidability for the grenade handle and adapter, usually at substantially 43 to 84 degrees, depending on the desired range for flight of the grenade. The mortar has a firing-pin 51a at its breech which comes in contact with the explosive cap 52 of the shell, thereby exploding same, whereupon the exploding and expanding gases may pass through the openings 43 and enter into the spaces between the fins 37 and propel the grenade forwardly by expanding between the breech block of the mortar and a soft metallic skirt, gasket or packing gland 54 which is interposed between the connected end of the adapter body 36 and the shoulder 55 of the handle portion. The purpose of the soft metal gasket or washer 54 is that it may be spread by the explosive force to make a seal against the inner wall of the mortar barrel. Normally, the gasket 54 is deformed from a plane to a somewhat convexo-concave shape so that it will lie within the outer diameter of the perimeter of the handle 32 and the fins 37, yet, when explosive force from the shell is exerted upon the gasket it will be deformed radially outwardly so as to afford a seal against the mortar barrel to prevent passage or escape of the expansion of the explosive gases when the grenade is used in a mortar. In this connection, it may properly be added that the side walls 39b of the plummet 39 are made relatively thin compared to top wall 39a, not only to save weight but also in order that they will not be thicker than the wall 50a of paper shell 50; thus the plummet side wall will not overlie the explosive charge of the explosive shell and the explosive force will be against the thick upper wall 39a. The fenestrations 53 permit the explosive gases to pass therethrough and thus through the openings 43 in that portion of the body 38 which parallelly overlies the side wall of the plummet.

The invention herein is not limited to a particular type of mortar in detail, but a satisfactory type of mortar is illustrated in Figs. 6 and 7 in diminished scale as compared with Figs. 1 to 5, inclusive, and which will be briefly described.

Figs. 6 and 7 disclose a suitable type of mortar having an elongated barrel 61 reinforced at its breech end by an external sleeve 62 and having a breech block 63 which mounts on the outside thereof a trigger member 64. The breech block is buttressed on a breech support or bastion block 65 which has hinged mounted on pintles or pins 66, the latter being mounted through longitudinally spaced lugs 67 on a ground-plate 68. The ground-plate 68 has an opening at its center 69 which receives a spade peg 70 for insertion in the ground. The base plate 69 may be a single integral plate, or may be divided into two semi-circular sections, each of which pivot on similar pins 66 at opposite sides of the barrel so that the two semi-circular sections may be folded upwardly to lie close to the breech portion of the barrel, reducing the transverse width of the base structure and affording protection to the mechanism at the breech when the mortar is not in use. The bastion block 65 also mounts a spirit level member 72.

A gas escape tube 73 is mounted parallel with the barrel 61 and extends from the breech block 63 preferably to the forward open end of the barrel. This gas escape tube 73 has at the breech end an opening 74 controlled by an adjustable vent valve 75 which controls the exhaust of explosive gases from a breech tube 76 which extends through the breech block and communicates with the explosion chamber 77 of the mortar. Within the breech block the firing pin 51a is suitably mounted in supporting blocks and is actuated forwardly by a trigger spring 80. The trigger 64 is fixedly mounted upon a rotatable trigger shaft 81 which mounts within the chamber of the breech, a deformed circular cam 82 having one flat side, the cam 82 riding upon a collar 83 which is fixed to the firing pin 51a. It is obvious that upon rotation of the trigger 64, and thereby the cam 82, the circular side of the cam will press the collar 83 and firing pin 51a rearwardly until the flat side of the cam disengages the collar 83 at which time the trigger pin will snap forward under tension of spring 80.

In normal operation, the firing pin 51a would remain at its forward position having the firing point thereof extending into the explosion chamber 77 as indicated by dotted lines 51b, in which position the mortar would be adapted to so-called "drop firing" wherein the grenade, having a shell 51 mounted in the tubular adapter 36 (as shown in Fig. 5), is merely dropped against the firing pin being thereby discharged. However, in case of failure to fire the shell, the trigger may be then employed, which eliminates the hazard of removing a grenade until all possibilities of failure of the shell to explode have been exhausted. Sometimes it may be desirable, especially when the mortar is fired at a very low angle of inclination to the ground to employ the trigger mechanism exclusively since the angle of slippage of the grenade might not furnish sufficient impact of shell and firing pin to satisfactorily permit "drop firing."

The range of the mortar may be regulated not only by the elevation of its open muzzle end, but also by regulating the gas valve 75 which, when closed, caused all the force of the explosive shell to be exerted into the barrel of the mortar, but which when opened in varying degrees permits a portion of the explosive gases to escape through the tubes 76 and through the escape tube 73.

A range-indicating pointer and a calibrated disc collectively indicated 85 are provided to indicate the extent to which the valve member 75 should be opened or closed to accomplish a given distance of flight for the grenade, by regulating the amount of explosive gases which are permitted to pass out through the tube 73.

Mechanical supporting means may be provided to elevate and maintain the forward or muzzle end of the barrel, and is here disclosed as a folding bipod generally indicated 88, having forked legs 89 pivotally mounted as at 90 to a longitudinally adjustable encircling band 91 about the muzzle end of the mortar. This bipod has a suitable traversing mechanism so that the barrel of the mortar may be adjusted laterally, the traversing mechanism being operated by manually turning a crank member 92. Since the bipod supporting mechanism may be of any suitable type, it is not described herein in all of its details, but merely to illustrate the foldability of the legs 89 against the mortar barrel as shown in Fig. 6, locking means generally indicated 93 being employed for locking the barrel with relation to the bipod at various positions. Each leg of the bipod may have a slidable foot 94 at its base which is adjustable for length by a clamping screw 95.

Having thus described my invention, I claim:

1. A combination grenade for selective manual throwing and mortar firing, comprising an explosive bomb head, means for exploding the bomb, a tubular handle member connected at one of its ends to the bomb, and having a shouldered base, a separate tubular adapter member connected to the base end of the handle, and a radially expandible gasket between said shoulder and adapter, said tubular member having removably and slidably mounted therein in spaced relation to the free end of the adapter, a manually manipulable plummet member provided with a connecting means through the handle to an exploding means of the bomb head, and releasable locking means for supporting the plummet member in the adapter body, the mounting of said plummet member in said adapter being sufficiently removed from the free end thereof so that an explosive propelling shell may be selectively inserted in said tube rearwardly of the plummet.

2. A combination grenade for selective manual throwing and mortar firing, comprising an explosive bomb head, means for exploding the bomb, a tubular handle member connected at one of its ends to the bomb, and having a shouldered base, a separate tubular adapter member connected to the base end of the handle, and a radially expandible gasket between said base and adapter, said adapter member having removably and slidably mounted therein in spaced relation to the free end of the adapter a manually manipulable plummet member provided with a connecting means through the handle to an exploding means of the bomb head, and a belt hook member removably mounted on the adapter and having a body portion extending into the tubular body of the adapter for supporting the plummet therein, and means for releasably securing said belt hook member in its supporting position, the mounting of said plummet member in said adapter being sufficiently removed from the free end thereof so that an explosive propelling shell may be selectively inserted in said tube rearwardly of the plummet when the belt hook member is removed.

3. A combination grenade for selective manual throwing and mortar firing, comprising an explosive bomb head, means for exploding the bomb, a tubular handle member connected at one of its ends to the bomb and having a shouldered base, a separate tubular adapter member connected to the base end of the handle, said adapter having its tubular body of lesser outer diameter than the handle and having axially longitudinal elongated fins circumferentially spaced therearound, and having perforations through its body area between the fins, a radially expandible gasket member between said shouldered base and the adapter, said tubular adapter member having removably and slidably mounted therein in spaced relation to the free end of the adapter, a manually manipulable plummet member provided with a connecting means through the handle to an exploding means for the bomb head, a releasable locking means for normally supporting the plummet in the tubular body, the plummet member being mounted in the tubular adapter sufficiently removed from the free end thereof so that an explosive propelling shell may be selectively inserted in said tubular portion rearwardly of the plummet.

CLEVE F. SHAFFER.