April 23, 1957 H. ROSENTHAL 2,789,467

SMOKE PROJECTILE WITH DELAY FUSE

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Fig. 1.

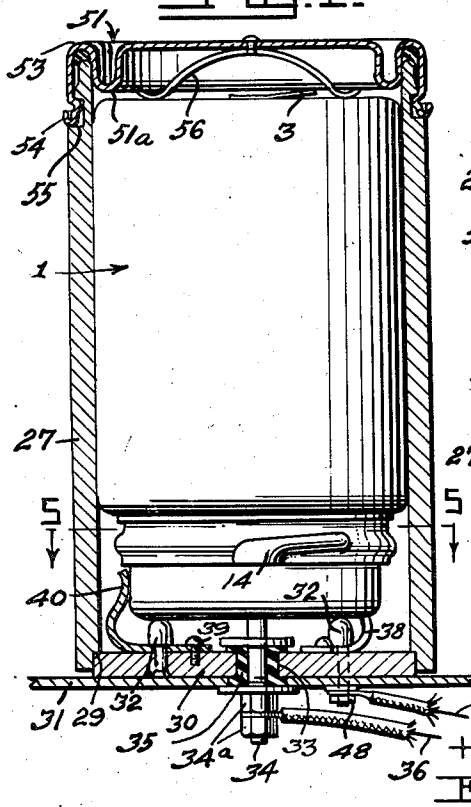


Fig. 2.

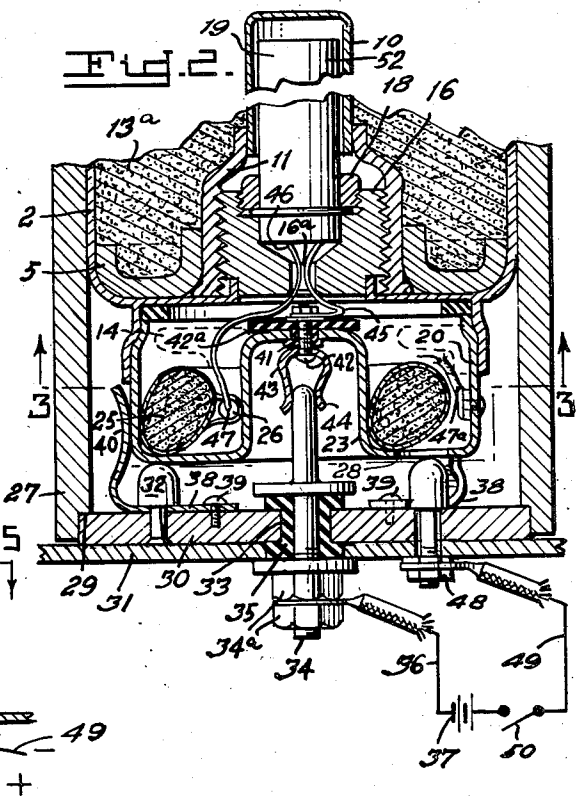
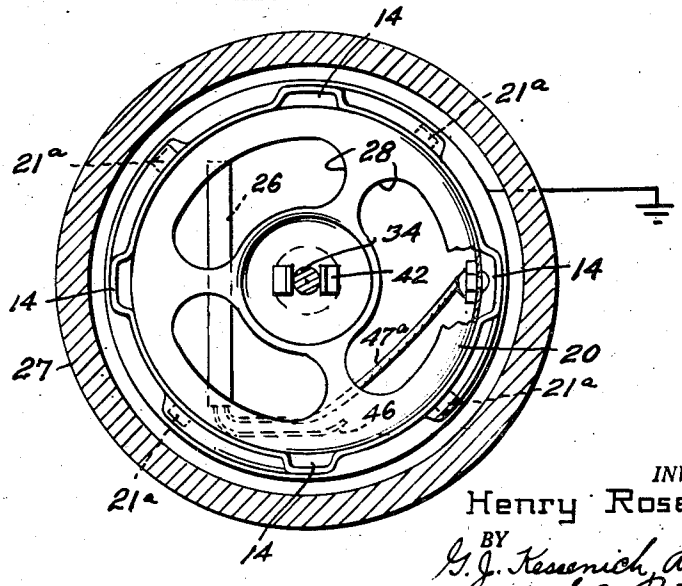


Fig. 3.



INVENTOR.
Henry Rosenthal
BY
G. J. Kesenich, A. W. Dew
and S. J. Rotondi, Jr.
ATTORNEYS.

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Fig. 4.

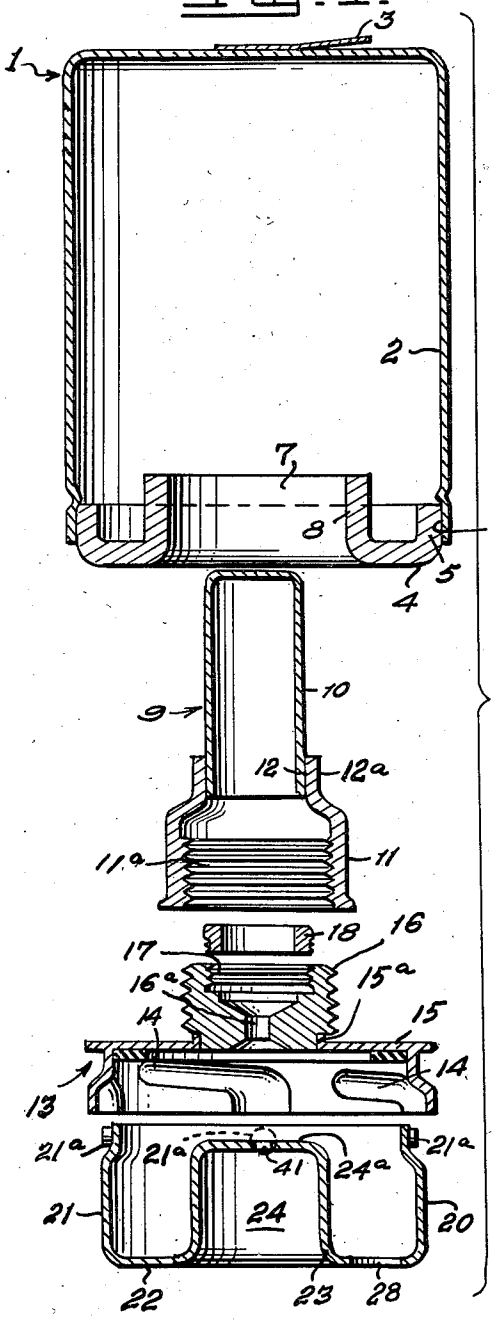
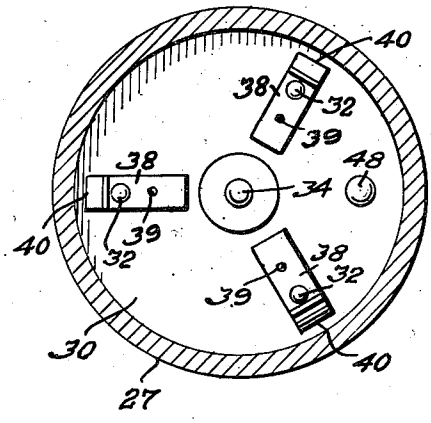


Fig. 5.



INVENTOR.
Henry Rosenthal
BY
G. J. Kessenich, A. W. Dew
and S. J. Rotondi, Jr.
ATTORNEYS.

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SMOKE PROJECTILE WITH DELAY FUSE

Henry Rosenthal, Crestwood, N. Y., assignor to the United States of America as represented by the Secretary of the Army

Application May 22, 1952, Serial No. 289,420

5 Claims. (Cl. 89—1)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described in the specification and claims may be manufactured by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The present invention relates to a smoke projectile. More particularly the present invention relates to a smoke projectile to provide smoke cover for a combat vehicle for any maneuver in which the vehicle may be participating.

Previous smoke grenades developed to provide a quick "get away" for combat vehicles, and to insure sufficient smoke protection during maneuvering were found to be inadequate for screening purposes, due to the excessive time required for the projectile to produce the desired volume of smoke.

It is accordingly an object of this invention to provide a smoke projectile which establishes an effective smoke screen within a very short time interval after initiation of the charge.

It is also another object of this invention to provide a smoke projectile in which means to detonate the propellant charge, and a delay fuse to initiate the smoke charge, are series connected to be simultaneously set off by a remote control firing switch located within the safe confines of the combat vehicle.

It is still another object of this invention to provide a smoke projectile which is simple in construction, light in weight, easy to assemble, and easy to load in a projector or launching tube.

With these and other objects in view which will become apparent as the following specification develops, reference is made to the accompanying drawing wherein:

Figure 1 is a view in elevation of the smoke projectile in place in a launching tube.

Figure 2 is a fragmentary detail of the lower end of the launching tube and smoke projectile, including the wiring connections from a power source to the propellant squib and delay fuse.

Figure 3 is a transverse section taken on line 3—3 of Figure 2.

Figure 4 is an exploded longitudinal view of the smoke projectile showing details of assembly.

Figure 5 is a section taken on line 5—5 of Figure 1 with the smoke projectile removed.

The smoke grenade per se consists of a canister for receiving a smoke producing charge of white phosphorus and steel wool and a bursting charge, and a propelling charge case for receiving an igniter and a propellant charge. Referring more particularly to Figure 4 the grenade canister 1 is a cup shaped thin-walled steel member having a downwardly depending wall 2. The top wall of the canister is provided with a metal tab 3 which may be bent out and used as a handle to pull the grenade free of the launcher, if necessary. The lower open end of the canister 1 is provided with a closure plug 4 which is a heavy-walled metal member having its circumferential edge turned upwardly through 90° to form a short leg 5 for peripherally engaging the inner

wall of canister 1 adjacent its lower edge as at 6. Leg 5 is secured in any convenient manner, as by welding or brazing, to canister 1. The central portion of closure 4 is blanked out to form an aperture 7, defined by a vertically upstanding reentrant leg 8 of the closure plug, for receiving the burster well assembly 9.

The burster well assembly comprises a cup shaped, elongated, thin walled steel well member 10 approximately one half the height of canister 1 and of a diameter smaller than aperture 7, and a heavy walled sleeve member 11 which is provided with an upper reduced portion 12*a*, the inner surface of which peripherally engages, as at 12, and is secured to the outer wall of well member 10 adjacent its lower edge. In assembling the smoke grenade, well member 10 and sleeve member 11 are inserted into aperture 7 so that the burster well assembly extends into canister 1. The outer diameter of sleeve member 11 is the same as the diameter of aperture 7 so that a snug, tight fit is provided between reentrant leg portion 8 of closure plug 4 and the outer peripheral surface of sleeve 11, wherefore a smoke producing agent 13*a* such as white phosphorus and steel wool, or any similar substance having pyrophoric properties, placed in canister 1, is prevented from spilling out.

The propelling charge case assembly comprises a lid 13 which is formed as a shallow downwardly depending cup member with a plurality of grooves 14 formed in the vertical wall thereof and extending first upwardly and then circumferentially to provide the well known interrupted bayonet type thread. The flat upper surface 15 of lid 13 is centrally apertured, as at 15*a*, for fixedly receiving an upwardly extending externally threaded plug 16, which in turn is provided with an internally threaded bore 17 for screw threadedly receiving a bushing 18. The inner wall of burster sleeve 11 is provided with threads 11*a* to mate with the external threads on plug 16 when the parts are assembled, and after the upper portion of bursting charge container 19 is received in the upwardly extending well 10, and the lower portion in bushing 18 (see Fig. 2). The bursting charge 52 is a delay, special booster type electrical detonator having a high explosive of sufficient intensity to fracture and explode both the burster well and canister. When the burster charge is detonated, the burster well and canister are fragmentized to expose the white phosphorus to atmosphere, whereupon it ignites spontaneously to produce smoke. The propellant container is an annular cup shaped member 20 having an upwardly extending wall 21, and a bottom wall 22 provided with an upwardly extending reentrant portion 23 to form a recess 24, having an upper flat wall 24*a*, for receiving parts of the electrical connection subsequently to be described. The upper edge of wall 21 is provided, externally thereof, with a plurality of equiangularly spaced lugs 21*a* equal in number to the bayonet grooves and cooperating therewith to provide a secure latching means, when the lugs are inserted into the bayonet grooves and after cup member 20 is given a slight twist, as is well known. The propellant in cup member 20 comprises a toroidally shaped main charge 25 (see Fig. 2) encased in long paper cartridge which encircles the upright wall of recess 24, and a smaller vented electrical squib 26 which is made to adhere to the main propellant, and which when electrically ignited sets off the main propellant charge to eject the smoke projectile from the tube 27 of a launcher or projector. The lowermost wall of cup member 20 is provided with a plurality of gas exhaust ports 28, as plainly seen in Figures 3 and 4.

The projector or launcher consists of a battery of six launching tubes (one only shown), a pulser assembly (not shown), and control switches (not shown). Re-

ferring more particularly to Figures 1 and 2 the tube 27 is an elongated, comparatively heavy walled metal cylinder provided, adjacent its lower edge with a cylindrical recess or shoulder 29 onto which is fitted a base plate 30, and which is secured to the combat vehicle frame 31 by means of a plurality of socket screws (not shown). The base plate 30 is centrally apertured, as at 33, to receive an elongated, upwardly extending contact plug 34, which is insulatingly separated from plate 30 by virtue of a collar 35 of suitable dielectric material. The lower end of plug 34 is threaded and provided with nuts 34*a* which are used to connect plug 34 with one end of a wire 36, extending to one side of a power source 37.

Three double duty leaf springs 38, are secured as at 39 to the upper face of base plate 30, and are provided with upwardly extending curved resilient fingers 40 for grasping the outer peripheral surface of propellant cup member 20, and to make ground contact with the propelling charge case. To complete the electrical connection, top wall 24*a* of cup member 20, is centrally apertured as at 41 for receiving a screw and nut assembly 42, insulatingly spaced from the propellant case by dielectric bushing 42*a*, to secure to the under side of wall 24*a*, a downwardly extending U-shaped spring clip 43 with reversely curved ends 44. To the upper end of screw and nut assembly 42, is secured one end of an electrical wire 45, which extends through a central aperture 16*a* in plug 16 to make a first connection 46 with the delay fuse in the burster charge, and a series connection 47 with the propellant squib. Lead 47*a* provides a ground connection between the squib and propellant case. Base plate 30 is provided with a screw and nut connection 48 to which is secured a lead 49 which is connected to the other side of the power source 37 to complete the circuit. A main fire control switch 50 is also provided in the circuit which is hand actuated to off the smoke projectile when it is in place in the launching tube.

The assembly of the smoke projectile will be apparent from the above description. The projectile is loaded into the muzzle end of the launcher tube with the propellant case end first, and the resilient fingers 40 are so located that they readily make contact with and grasp the propellant case when the required pressure is applied to the top end of the canister. A plurality of stops 32 secured as by rivets to the upper surface of base plate 30, make contact with the bottom surface of the propellant case to vertically position the smoke projectile in the launching tube. As these stop rivets pass through apertures in spring 38, they also assist in securing the latter to the plate. When the projectile is in the tube, plug 34 and spring clip 43 are in vertical alinement, and the upper end of plug 34 is forced into and is grasped by curved ends 44 of the clip to make the necessary connection to the firing circuit. A launching tube cover 51 is then forced over the end of each launching tube to keep out moisture and dirt. Cover 51 is a dish-shaped member having a downwardly depending side wall outwardly curved reversely through 180° as at 51*a*, and then curved reversely again through 180° as at 53 to form a resilient loop for receiving the upper end of the launching tube 27. The extreme peripheral end of the cover is then curved first inwardly and upwardly at 54 to form a resilient member adapted to be forced into an annular recess 55 formed in the outer surface of tube 27 adjacent the upper end thereof. A bow spring 56 is riveted to the under side of cover 51 adapted to have its spreading legs press against the top of the smoke projectile to maintain the projectile within resilient fingers 40 and in contact with stops 32.

Preparatory to loading the projectile into the tube all necessary precautions must be taken to see that a safety connecting plug in the instrument panel (not shown) is disconnected and the main fire control switch is turned off. When the vehicle is in safe location for firing and when its hatches are closed, the plug on the instrument panel is first connected, and then the firing switch is closed. Simultaneously the propellant and the delay fuse are ignited, and according to tests, an effective smoke screen is established within a maximum of five seconds after initiation. This smoke screen will persist for at least 2 minutes, providing ample time for maneuvering to safe position, and for a quick "get away."

Numerous other modifications and alterations of the structure which has been disclosed herein for purposes of illustration will be apparent to one skilled in the art, and it is obvious that the same may be made without departing from the spirit and scope of the invention as defined in the following claims.

I claim:

1. A smoke projectile comprising a canister having a centrally apertured bottom wall, a closure plug for said aperture, said closure plug comprising a hollow elongated sleeve extending axially into said canister and having a closed upper end forming a well to receive a burster charge, said burster charge having associated therewith a delay train fuse, a pyrophoric smoke producing agent in said canister, a lid for said burster charge well, said lid comprising a flat plate, an upwardly extending boss secured to the upper surface of said flat plate having external threads to screw-threadedly mate with threads formed on the inner surface of said hollow sleeve adjacent its lower end, and a downwardly depending circumferential wall secured to the lower surface of said flat plate, said wall having formed therein a plurality of bayonet threads, an annular propellant case having a circular horizontal plate peripherally joining and integral with the upper edge of the inner wall forming said annular case, a toroidal propelling charge in said propellant case, a squib in said case for detonating said propellant charge, and circuit means series connecting said delay train and said fuse, including a power source consisting of a contact plug extending through a hole in the closed end of said tube adapted to be releasably engaged by U-shaped spring-clip members having reversely curved ends extending downwardly from said lid and hand operated switch mounted externally of said propellant case, for simultaneously initiating said propellant charge and said burster charge.

2. In combination with a tubular launcher having a closed end, a smoke projectile adapted to be propelled from said launcher tube and comprising, a canister having a centrally apertured bottom wall, a closure plug for said aperture and having a hollow elongated sleeve extending axially into said canister, said plug having a closed upper end forming a well to receive a burster charge including a delay train fuse therefor, a pyrophoric smoke producing agent in said canister, a lid for said burster charge well, said lid comprising a flat plate, an upwardly extending boss secured to the upper surface of said flat plate and having external threads to screw-threadedly mate with threads formed on said hollow sleeve adjacent its lower end, and a downwardly depending circumferential wall secured to the lower surface of said flat plate, said wall having formed therein a plurality of bayonet threads, an annular propellant case having a circular horizontal plate peripherally secured to upper edge of the inner wall forming said annular case, a toroidal propelling charge in said propellant case, a squib in said case for detonating said propellant charge, a plurality of inwardly extending resilient fingers secured to the inner surface if the closed end of said launcher tube for releasably engaging said propellant case, and power means externally of said closed end comprising downwardly extending U-shaped spring-clip members having reversely curved ends adapted to receive and to make electrical contact with an upwardly extending member protruding through said flat plate and including circuit means extending through said closed end for series

connecting said propellant initiating means and said delay train.

3. In combination with a smoke projectile launcher comprising an elongated cylindrical tube having a closed end; a canister within said tube, a pyrophoric smoke producing agent within said canister, means including a delay train fuse within said canister detonatable to fragmentize said canister comprising a cup-shaped well member secured to the inner surface of the bottom of said canister, a burster charge in said well member, a delay train in said well member adapted to detonate said burster charge; means including a bayonet joint for releasably securing said cup-shaped member to the bottom of said canister comprising a plurality of resilient fingers secured to the inner surface of said closed end and extending inwardly into said tube to grasp said cup-shaped member, a propellant received within said cup-shaped member, a squib within said cup-shaped member adapted to initiate said propellant charge, a firing circuit comprising a contact plug extending through a hole in the closed end of said tube and insulatingly separated from said closed end, means extending through the bottom of said cup-shaped member comprising downwardly extending U-shaped spring-clip members having reversely curved ends releasably engaging said contact plug to make electrical contact therewith, a lead extending through the bottom of said canister connecting said contact plug engaging means successively with said squib and said delay train, and a hand operated fire control switch in said circuit externally of said launcher tube for simultaneously igniting said squib and said delay train.

4. In combination with a smoke projectile launcher comprising an elongated cylindrical tube having a closed end, a canister within said tube, a smoke-producing agent within said canister, a cup-shaped well member secured to the bottom wall of said canister and extending axially inwardly of said canister, a burster charge having a delay fuse received within said well, a propellant case, means secured to said closed end releasably engaging said propellant case to the outer surface of the bottom of said canister comprising a plurality of resilient fingers secured to the inner surface of said closed end, a propellant charge in said case means to initiate said propellant charge, a power source external of said launcher tube, electrical conduit means comprising a contact plug extending through a hole in the closed end of said tube and insulatingly separated from said closed end, means extending through the bottom of said propellant case comprising downwardly extending U-shaped spring-clip members having reversely curved ends releasably engaging said contact plug to make electrical contact therewith, a lead extending through an aperture in the bottom of said canister connecting said contact plug engaging means successively with said squib and said delay train, said electrical conduit means series connecting said delay fuse and said initiating means with said power source, and a fire control switch in said electrical conduit means.

5. In combination with a tubular launcher having one end closed, a smoke projectile adapted to be propelled from said launcher tube, said smoke projectile comprising a canister, a smoke producing agent within said canister, a cup-shaped well member extending axially inwardly of said canister and secured thereto, a burster charge having an electrically ignited delay fuse received within said well, a propellant case secured to the outer surface of the lower end of said canister, an electrically ignited propellant charge in said case, an electric igniter circuit series connecting said fuse and said propellant charge, said circuit including electric switch means and power source externally of said launcher and an electric contact comprising a U-shaped clip secured to the lower end of said canister and removably connected to an upwardly extending member protruding through the closed end of said launcher.

References Cited in the file of this patent

UNITED STATES PATENTS

950,956	Reed	Mar. 1, 1910
1,687,159	Gammeter	Oct. 9, 1928
1,937,191	Driggs	Nov. 28, 1933
1,947,834	Driggs et al.	Feb. 20, 1934
2,315,753	Long	Apr. 6, 1943
2,340,047	Dunn	Jan. 25, 1944
2,459,687	Decker	Jan. 18, 1949
2,459,833	McLain et al.	Jan. 25, 1949
2,459,854	Swift	Jan. 25, 1949

FOREIGN PATENTS

660,225	Great Britain	Oct. 31, 1951