

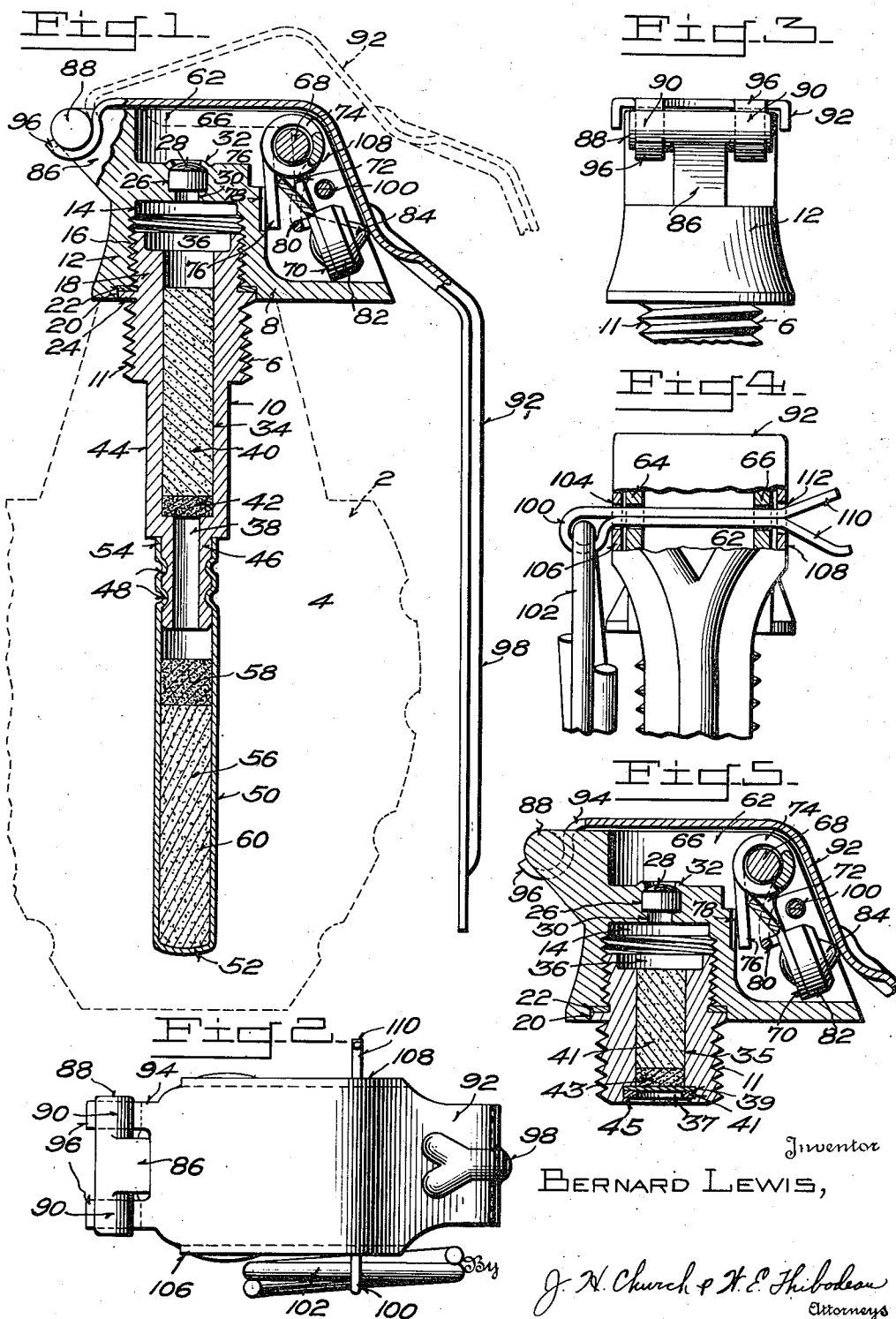
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GRENADE

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GRENADE

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

This invention relates to fuzes which may be used in grenades of the type commonly called hand grenades although they may be projected by other means than by hand, such as from a rifle or other small arm.

An object of the invention is to provide an improved grenade which is safer to handle and less likely to become operative prior to projection.

Another object of the invention is to provide a grenade which is silent before exploding and does not give off a trail of gases or smoke or sparks upon being actuated, and hence does not allow the location of the thrower to be readily detected.

A further object of the invention is to provide an improved grenade fuze, and to avoid any transverse stress on the delay train as a result of crimping during assembly.

Another object of the invention is to provide a fuze construction permitting easy removal of the safety pin when desired.

Other objects and advantages of the invention will become apparent from the following description as illustrated in the accompanying drawings and in which,

Figure 1 is a sectional elevation of a grenade according to the invention,

Figure 2 is a plan view of the grenade illustrated in Figure 1,

Figure 3 is a view of the upper portion of the fuze as seen from the left of Figure 1,

Figure 4 is a view of the upper portion of the fuze as seen from the right of Figure 1, and

Figure 5 is a sectional elevation of a modified form of grenade fuze according to the invention.

In the use of grenades for projection by hand, rifle or otherwise, experience has shown that the construction heretofore normally employed for many years has a number of disadvantages. In same instances, severe injury to using personnel has resulted from premature actuation of the grenade prior to projection thereof. By means of the present construction, which has been standardized for use by the United States Army, the grenade has been made safer and more effective and certain in operation.

As illustrated, a hollow grenade body 2 has a chamber 4 which may contain an explosive charge. The body 2 has a threaded opening 6 through which a fuze 8 may be threaded with its lower extension 10 extending inside the cham-

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ber 4 as shown. The fuze head 12 has a central bore 14 threaded at 16 to receive the threaded end portion 18 of lower extension 10. The bore 14 is enlarged at 20 to receive an annular gasket or washer 22 made of lead or other suitable soft metal, a collar 24 on lower extension 10 also being receivable in enlarged bore 20 and serving to tightly compress the washer 22 in the bore to make a tight seal.

The bore 14 is reduced at 26 to receive a percussion primer 28, the bore being constricted at 30 to form a seat for the primer and also a flash passageway leading from the primer in bore 26 to enlarged bore 14. The upper lips 32 of bore 26 are crimped to seal in the primer, a suitable sealing compound being also applied over the joint to make it gas proof and tight.

The lower extension 10 is thus easily removable from the fuze head 12 by merely unscrewing it. The extension 10 has external threads at 11 for engaging the threads of the opening 6 in the grenade body. The extension 10 has a central bore 34 which is enlarged at its upper end 36 and reduced at its lower end 38. A delay charge element 40 of suitable non-gaseous composition may be located in the bore 34 and a relay charge located at 42, the reduced bore 38 serving as a flash passageway.

The extension 10 is reduced in external diameter at 44 and is further reduced at 46, the latter portion being provided with several external annular grooves 48. A hollow cylindrical detonator case 50 having thin walls and formed of soft metal such as aluminum or other suitable material, has its lower end 52 closed and is open at its upper end 54. The detonator case 50 has an inside diameter sufficiently large to allow it to fit snugly over the reduced end 46 of lower extension 10. The detonator case 50 may contain a suitable detonating charge 56 including for example lead azide at 58 and pentaerythrite tetranitrate at 60. The case 50 may then be crimped into the annular grooves 48, and a suitable sealing composition may be applied to the joint to make a tight seal. If an igniting fuze is desired rather than a detonating fuze, the case 50 may contain black powder instead of a detonating charge.

The fuze head 12 has a recess 62 which is open at the top and right hand side as seen in Figure 1, and which has two opposite side walls 64 and 66. A pivot pin 68 bridging the recess 62 extends through and is supported in aligned holes in walls 64 and 66. A striker 70 is pivotally supported on pin 68 in any suitable manner, such as, for ex-

ample, by two lugs 72 on the striker bent over and pierced to provide aligned holes through which the pin 68 passes transversely to permit the striker to pivot about pin 68. A spring 74, coiled around the pin 68, has one end 76 bearing against the wall 78 of recess 62 and the other end 80 bearing against the striker so as to press the striker in a counterclockwise direction about pivot pin 68. The striker has riveted to it a disk-like striker point support 82 having a conical striker point or firing pin 84 protruding from one face thereof as shown. The apex of the conical striker point is preferably made blunt as shown, with an included angle of about 90 degrees, thus avoiding use of a sharp point and preventing the point from piercing the primer and a consequent escape of gas from inside the fuze. The exact striker point dimensions will depend considerably upon the strength of spring 74 and the design of the primer, but in any case piercing of the primer is to be avoided.

As best seen in Figures 2 and 3 the fuze head has an extension 86 which carries a transverse pivot pin 88 supported at its central portion and, extending laterally to each side are the end portions 90 of the pin 88. The pin, extension 86 and fuze head 12 are preferably cast integral, as shown, for ease of manufacture.

A safety lever 92 has a bifurcated end 94 straddling the extension 86 and includes two downwardly arcuate extensions 96 curved to pivotally engage beneath a portion of the curved surface of extensions 90 of pivot pin 88. The safety lever 92 has a contour corresponding to the upper surface contour of the fuze head as shown and serves to cover the open top and side of recess 62, thereby engaging the point 84 of the striker and serving to keep the striker retracted until the safety lever is released. The safety lever has a downward extension 98 which is held close to the grenade body by the grasp of the operator. A safety pin 100 having a pull ring 102 at one end extends through aligned transverse holes at 104 extending through the walls 64 and 66 of the fuze head and also through overhanging portions 106 and 108 on each side of safety lever 92. The safety pin 100 is in the form of a cotter pin, the split ends 110 of which are spread apart by an included angle sufficient to permit the pin to be readily pulled out when desired, but not to be readily accidentally dislodged. It has been found that making the hole 112 of a slightly greater diameter than the rest of the holes 104, 64, 66, permits easier withdrawal of the safety pin 100 when desired since bending the ends 110 apart does not then result in indenting the surfaces of the ends 110 which are in immediate contact with the edge of hole 112. Such nicks if present would hinder easy withdrawal of pin 100 when desired.

It is thus to be noted that by means of the construction shown, withdrawal of the safety pin 100 will not permit the striker to be prematurely released so long as the operator holds safety lever end 98 in place, since the bifurcated end 94 of the safety lever so engages the pivot pin 88 as to prevent disengaging motion of the bifurcated end 94 from the pin 88 in any direction except rotation of the lever 92 in a counterclockwise direction about pin 88, and such rotation is prevented by the grasp of the operator. Hence the striker 70 is positively held retracted until the safety lever 92 is actually released by the operator, whereupon the safety lever 92, acting under pressure from the spring pressed striker, is rotated counterclockwise to a position as indicated by the dotted

lines in Figure 1, releasing the striker which thereupon strikes the primer, and actuates the fuze. With prior constructions, it was possible, once the safety pin was pulled, for the end of the safety lever corresponding to 94 in the new construction, to accidentally become disengaged from the corresponding lip of the fuze head formerly used, thereby preventing effective holding of the safety lever and thus releasing the striker prior to the desired time. The present construction has eliminated this danger.

In the use of hand grenades prior to the present invention, gases escaped from the grenade fuze after it was projected, the resulting trail of smoke being visible and giving the enemy a good idea of the location of the soldier throwing the grenade. Also, the prior fuzes with the vented primer gave off a quite visible flash of flame and considerable noise as soon as the striker struck the primer, the thrower being thus readily locatable particularly at night. In the new construction with the sealed-in primer this flash and noise are eliminated. In addition, once the grenade had fallen to earth, the tell-tale smoke and noise of escaping gases allowed the enemy to easily locate the grenade even in brush, and to pick it up and quickly toss it back at the original thrower. This was due to the fact that these prior types of grenades usually employed a black powder delay train element which gave off a considerable amount of gases, and the old type fuzes could not be made with the primer and delay fuze sealed in because the internal pressure would increase rapidly and cause the black powder delay train to burn through with practically no delay effect at all, thus causing a premature explosion of the grenade.

But the present construction employs a gasless powder delay fuze which gives off substantially no gas during its burning and whose burning rate is not very much affected by pressure. Hence it is possible to seal in the delay fuze element since no such dangerous rise in pressure will occur inside the fuze. The only gases will arise from the actuation of the primer 28, and this gas should be provided with an ample expansion space located between the primer 28 and the upper surface of the delay charge 40 as seen in Figure 1. The enlarged bore portion 36 together with the unfilled upper portion of bore 14 just above bore portion 36 should have a volume of at least about 0.025 cubic inch which space should be sufficient to allow the gases from the primer to expand without undue rise in pressure, where the primer 28 incorporates a charge consisting of Western Cartridge Company No. 793 primer mixture or other mixture with similar semi-gasless properties. This will permit the gases to be sealed within the fuze by making a tight seal at all points where gas might escape as already explained.

As an example of a successfully used gasless powder, I have employed a delay charge 40 weighing 25 grains packed in the bore 34 in three to six increments each compressed under a pressure of about 12,000 pounds per square inch, and a relay charge 42 for giving off an intense flash of flame to actuate the detonating charge and weighing about one grain and compressed in place in one increment under the same or even slightly higher pressure. The delay charge 40 may have a composition by weight of approximately 5% zirconium, 31% nickel, 42% barium chromate, and 22% potassium perchlorate. The relay or detonator igniting charge 42 may have a compo-

sition by weight of approximately 15.1% of nickel, 51% potassium perchlorate, 29.1% titanium, and 4.8% infusorial earth. The actual length of time the delay fuze 40 is to burn will of course depend upon the requirements of the user, and may be varied by changing the length of the delay fuze 40 or by changing its composition. The delay may of course be eliminated by merely omitting the delay charge 40.

In employing the delay charge or the relay charge of the compositions specified in the illustrative example given above, it is to be noted that the ingredient described as nickel should have the physical and chemical characteristics equivalent to nickel prepared as described, for example in United States Patent No. 1,893,879, for Metallic Catalyst, issued on January 10, 1933, to Joseph C. W. Frazer and Owen G. Bennett. All of the ingredients of the delay and relay charges should of course be in powder form of adequate granulation as is well understood in the art, to facilitate mixing and proper burning.

In Figure 5 is shown a modified form of fuze which may be employed if desired, for example, where only an igniting type of fuze is required. It will be noted that as illustrated, the construction is the same as that already described for Figure 1, except that the lower extension 10 of the fuze as shown in Figure 1 has the reduced portion 44 cut off, thus shortening the available length of bore 35 in lower extension 11 of the construction of Figure 5. A shorter length 41 of the same delay charge as 40 of Figure 1, is inserted in bore 35 as shown in Figure 5, and a relay charge 43 placed in the same bore beneath charge 41, the relay charge 43 being similar to charge 42 in Figure 1. Bore 35 is enlarged at its lower end 37 to allow an unperforated sealing disk 39 to be placed as shown, together with an annular washer 41', the mouth of the opening of bore 37 being then crimped over as at 45. The sealing disk 39 may be made of a pressure sensitive tape about .002 inch thick and consisting of thin metal foil such as aluminum or zinc foil with rubberized adhesive on one face. One type of such tape is known as "Metacel Tape." The washer 41' is preferably made of metal such as brass. The joint is sealed with a suitable waterproofing sealing compound to make it gas tight and waterproof such as NRC compound which has a nitrocellulose base. Thus, as already explained for the fuze shown in Figure 1, the fuze shown in Figure 5 is also sealed against escape of any gases or flame from the primer 28, thus eliminating dangers which might result from visible flame, smoke or noise of escaping gases.

Although the invention has been described in specific terms, it is to be understood that numerous possible variations and changes might be made in the sizes, shapes, materials and arrangement without departing from the spirit and scope of the invention as hereinafter claimed.

I claim:

1. In a grenade fuze in which the safety lever is secured to the fuze head by a cotter pin extending through aligned holes in the fuze head and the downhanging portions of the lever, the fuze head being between said downhanging portions, and a bifurcated end of the cotter pin protruding from said hole in one of said downhanging portions with the protruding halves of said end spread apart, the improvement comprising forming a diameter of the said hole in the downhanging portion, through which the bifurcated end of the pin protrudes, substantially greater than that of the adjacent hole in the fuze head, whereby withdrawal of said cotter pin without nicking is facilitated.

2. In a fuze for a hand grenade, a fuze body having a central bore, a hole of lesser diameter than said bore and having an outwardly-facing shoulder, said hole communicating with said bore and opening through the top of said body, a primer hermetically sealed in said hole and resting on said shoulder, the material of said fuze body around the top of said hole being crimped over said primer to hold the same on said shoulder, a tubular extension having a counterbored end secured in said bore, said extension projecting from the bottom of said bore, a gasless delay charge in said extension, said bore and extension cooperating to form a sealed expansion chamber between said primer and charge, a striker pivoted on said body for movement from a first retracted position to a second position striking and initiating said primer, spring means urging said striker into second position, and manually operable means secured on said head and releasably holding said striker in first position, said primer, striker, and spring means being so constructed and arranged that said striker initiates said primer without puncturing the same, whereby all gases therefrom are confined in said expansion chamber.

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