July 20, 1943. B. P. JOYCE ET AL 2,324,846

LAND MINE AND FUSE

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Fig. 1.

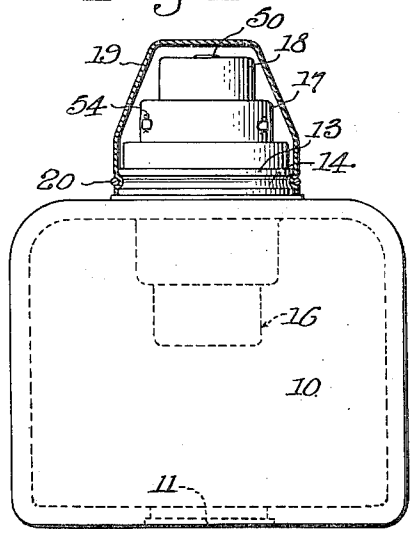


Fig. 7.

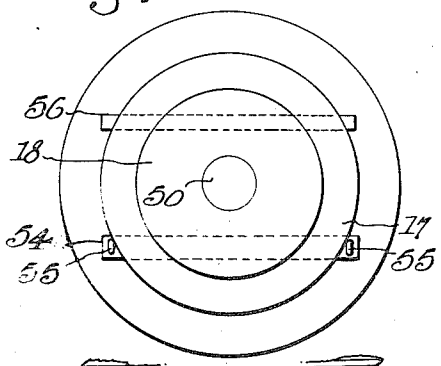


Fig. 8.

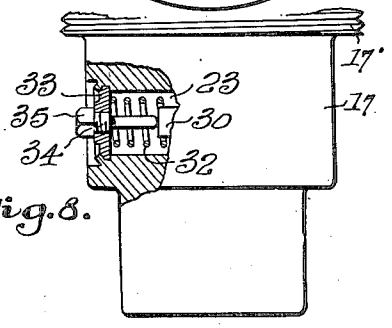


Fig. 5.

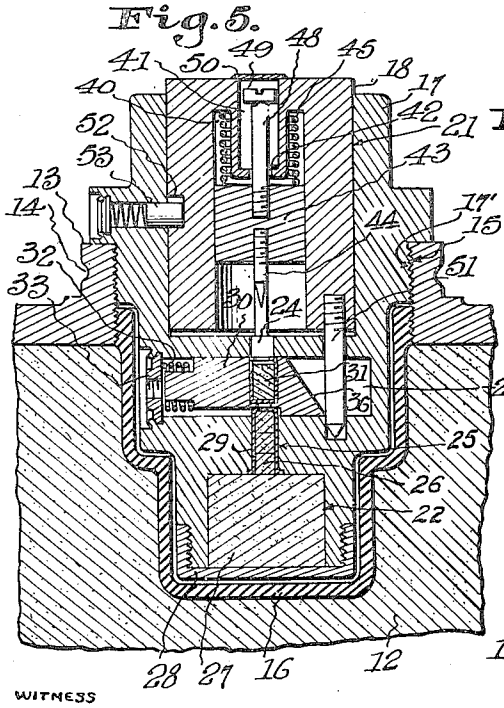
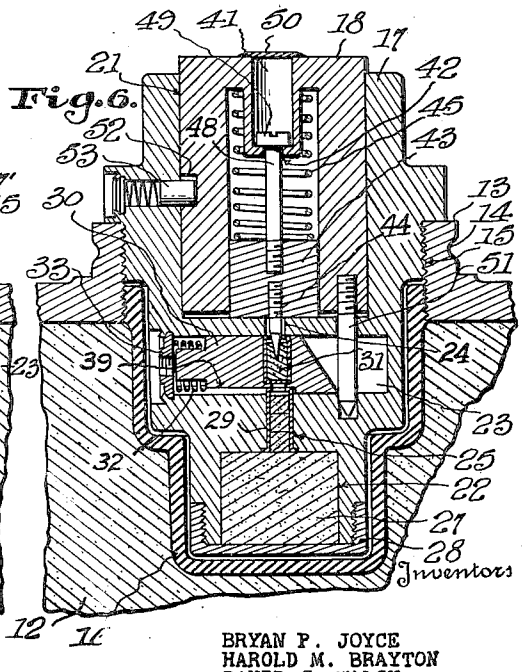


Fig. 6.



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Fig. 2.

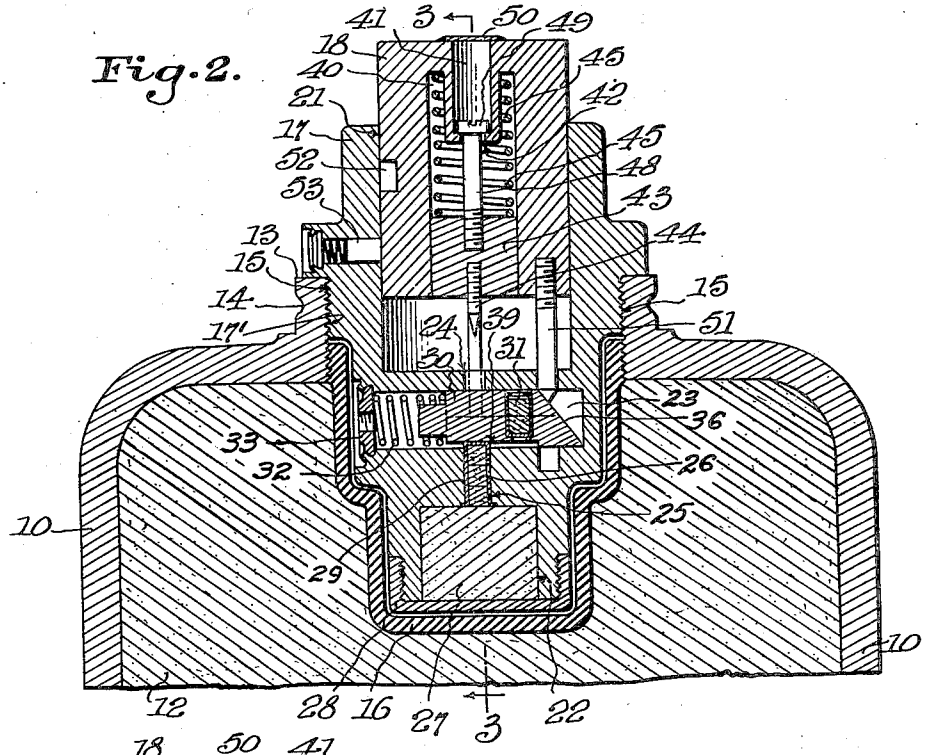


Fig. 3.

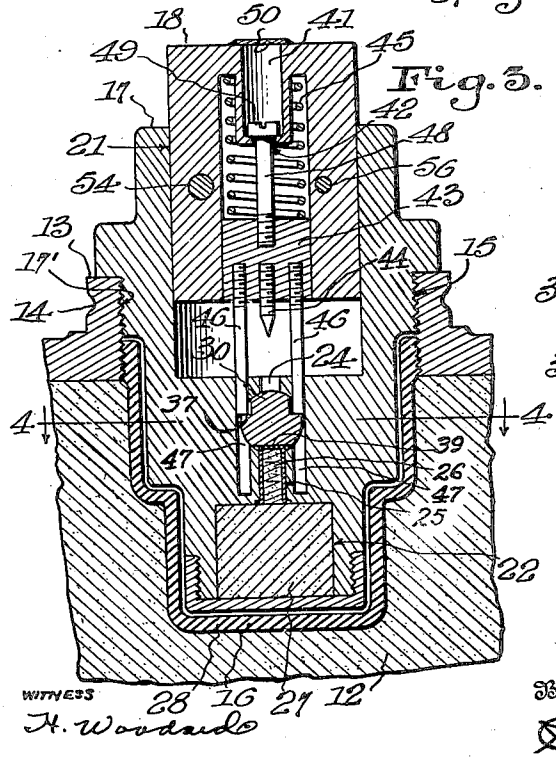
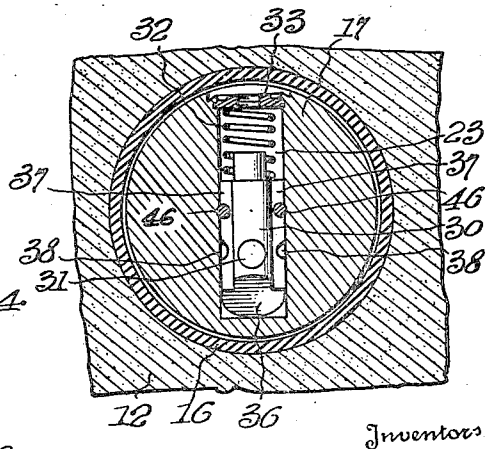


Fig. 4.



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LAND MINE AND FUSE

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Application January 30, 1941, Serial No. 376,680

14 Claims. (Cl. 102—70)

The invention aims to provide a thoroughly modern land mine for use against tanks and other vehicles which may pass over a planted mine field, said mine being of unusually light weight, yet rugged and highly effective.

In carrying out the above end, a further object is to provide a mine thoroughly impervious to moisture and thus capable of being emplaced for a long period with no danger of impairing its effectiveness.

A still further object is to provide a simple, inexpensive and efficient mine fuse construction and one which possesses novel safety features preventing accidental discharge even if the mine is roughly handled, accidentally dropped, etc.

With the foregoing and other objects in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawings.

Figure 1 is a side elevation of the assembled mine and fuse, illustrating the moisture excluding cap in section.

Fig. 2 is an enlarged vertical sectional view through the fuse and the upper end of the mine, illustrating the parts in unarmed position.

Fig. 3 is a vertical sectional view on line 3—3 of Fig. 2.

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 3.

Fig. 5 is a smaller view similar to Fig. 2 but illustrating the parts in armed position.

Fig. 6 is a view similar to Fig. 5 but showing the firing pin depressed to its detonator-firing position.

Fig. 7 is a top plan view of the fuse before connecting it with the mine body.

Fig. 8 is a fragmentary side elevation partly broken away and in section illustrating the manner in which the detonator carrier of the fuse is positively held in unarmed position prior to connection of the fuse with the mine body.

Features of construction have been illustrated which have proven highly effective and desirable, and they will be rather specifically described, with the understanding, however, that variations may be made within the scope of the invention as claimed.

The mine 10 is preferably of cast iron with a plugged opening 11 in its bottom to facilitate loading with cast explosive 12, the explosive being preferably TNT. The upper end of the body 10 is provided with a boss 13 having a continuous peripheral groove 14, and said body is formed with a threaded opening 15 opening through said boss. Threaded into the lower portion of this opening 15 is a cup 16 of Bakelite or other desired material forming a well to receive the major portion of the fuse body 17, said fuse body being provided with screw threads 17' threaded into the outer end of the opening 15. The outer end of the fuse body 17 and the striker 18 project outwardly beyond the boss 13 when the fuse and mine body are in assembled relation, and these parts are covered and protected by a cap 19 of rubber or the like. The lower end of the cap side wall fluid-tightly surrounds the boss 13, and by means of a spring wire collar 20, said side wall is distorted into fluid-tight engagement with the groove 14 of said boss. Thus, moisture is entirely excluded from the interior of the fuse and from the interior of the mine body and consequently the assemblage may remain buried in the ground for long periods of time without affecting its effectiveness in any manner.

The fuse body 17 is provided with an outer relatively large bore 21 opening through its outer end, with an inner comparatively small bore 22 opening through its inner end, and with a transverse bore 23 between said bores 21 and 22. A small central opening 24 is formed in the body to place the lower end of the bore 21 in communication with the transverse bore 23, and another central opening 25 is formed in said body from said bore 23 to the bore 22. This latter opening 25 receives a lead 26 preferably of tetryl, and the bore 22 receives a booster charge 27 also preferably of tetryl, said booster charge being held in said bore 22 by means of a screw cap 28. The tetryl lead 26 is enclosed in an appropriate capsule 29, the upper end of which projects slightly into the transverse bore 23.

A detonator carrier 30 is slidably received in the transverse bore 23, the detonator carried by said carrier being shown at 31. When the fuse and the mine body are assembled, this carrier 30 is yieldably held in the unarmed position shown in Fig. 2 by means of a coiled spring 32, the outer end of which abuts a disk 33 which closes the outer end of the bore 23. Prior to assembly of the fuse to the mine body, however, the carrier 30 is positively held in unarmed position by means of the screw 34 shown in Fig. 8, said screw being threaded through an opening in said disk 33. The screw head 35 projects from the fuse body 17 to such an extent that said body cannot be inserted into the cup 16 until the screw is removed and there is thus no danger of relatively assembling fuse and mine with the detonator carrier positively held against subse-

quent movement to the armed position shown in Fig. 5.

The end of the carrier 30 remote from the spring 32, is provided with an inclined cam 36, and opposite sides of said carrier have upwardly facing longitudinal shoulders 37, each interrupted by a notch 38 (see Fig. 4) for cooperation with other elements hereinafter described. The lower side of the carrier 30 is also provided with a flat 39 which slidably contacts with the projecting upper end of the capsule 29 to hold said carrier against tilting about its longitudinal axis.

The striker 18 is formed with an inner relatively large and long bore 40, with an outer shorter and smaller bore 41, and with an opening 42 placing said bores in communication with each other. The plunger 43 of a firing pin 44 is slidably mounted in the lower end of the bore 40, said firing pin 44 being in alinement with the opening 24 in the fuse body 17. A coiled compression spring 45 is housed in the bore 40 with its inner end disposed against the plunger 43 and with its outer end reacting against the striker 18, said spring being adapted to depress the firing pin after the detonator carrier 30 has been moved to the armed position. The spring 45 while normally under some degree of compression, is compressed to a fully operative state by the depression of the striker 18, the firing pin being held against starting down under the action of said spring until this spring has been properly compressed and until the detonator carrier 30 has moved to the armed position of Fig. 5, at which time the means for holding the firing pin against descent, is automatically released, whereupon the firing pin is forced down under the full strength of the compressed spring 45 to fire the detonator (see Fig. 6), the result being that the detonator fires the lead 26, this lead fires the booster charge 27, and the latter explodes the mine charge 12.

In the present disclosure, the means for holding the firing pin against descent until the proper time has arrived for such descent, consists partly of the shoulders 37 on the carrier 30, and partly of two vertical rods 46 which are secured to the firing pin plunger 43 and rest on said shoulders 37 until the carrier 30 has moved to the armed position of Fig. 5. When the carrier has reached this position, however, the notches 38 of the shoulders 37 (Fig. 4) have arrived under the pins 46 with the result that these pins are released, permitting descent of the firing pin. During this descent, the lower ends of the rods 46 simply move downwardly in the bores 47 (Fig. 3) in which said rods are received.

As a precaution against the firing pin being forced down by the spring 45 in case the detonator carrier 30 should be jarred to armed position (releasing the pins 46), we connect the plunger 43 with the striker 18 by means of an appropriate suspender 48, which suspender will prohibit descent of the firing pin until the striker 18 has been depressed with respect to said firing pin, as will be clear by a comparison of Figs. 3 and 5, for example. By the time the parts have reached the Fig. 5 position, the pins 46 have been released and the firing pin can then be forced down by means of the spring 45.

The suspender 48 is preferably in the form of a screw which passes through the opening 42 of the striker, the lower end of said screw being threaded into the firing pin plunger 43 while the head 49 of said screw is received in the outer bore 41 of the striker. As the striker descends to compress the spring 45 and move the detonator carrier 30 to armed position, the screw 48 simply slides in the opening 42. To prevent any moisture or foreign matter from entering through this opening and the communicating bores 41 and 40, the outer end of said bore 41 is suitably sealed as shown at 50.

Reference has above been made to the downward movement of the striker 18 moving the detonator carrier 30 to the armed position of Fig. 5. In the present disclosure, this is accomplished by the cooperation of the cam 36 on the carrier 30 and an arming rod 51 which is secured to and projects downwardly from the striker 18. The lower end of the rod normally contacts with the upper end of the cam 36 as seen in Figure 2 and as the striker is depressed, the rod and cam cooperate in forcing the carrier 30 to armed position, as will be clear from Fig. 5. The final downward movement of the striker 18 alines a recess 52 in its periphery with a spring-pressed bolt 53 carried by the fuse body 17, whereupon said bolt is projected as seen in Fig. 6 to lock the striker 18 in its completely lowered position. Ordinarily the pin 53 would not be required but it is advisable to provide same in case of any possible force depressing the striker and then releasing same so quickly that the parts could not act to fire the fuse.

Before emplacing the mine, the striker 18 is held in safety position by means of a safety rod 54 shown in Fig. 7, said rod being held against accidental removal by cotter pins or the like 55. When emplacing the mine, this safety rod is of course removed. Even then, however, the striker 18 is held against accidental depression by means of an appropriate shear pin 56. This shear pin is preferably such that it will not shear under less than 500 pounds weight upon the striker 18, thus protecting men walking over a planted mine field, yet insuring that passage of tanks, vehicles or cavalry over said field, shall depress the striker.

While the operation would probably be clear from the foregoing, it may be briefed as follows: The parts normally stand in the unarmed position shown in Fig. 2, said parts being then protected, however, by the cap 19 shown only in Fig. 1. Should the striker 18 be now depressed, its downward movement will cause 51 and 36 to move the detonator carrier 30 to the armed position shown in Fig. 5. During this descent of 18, the firing pin 43, 44 is held against descent by means of the rods 46 and the cooperating shoulders 37. By the time the detonator carrier 30 has moved to completely armed position (Fig. 5), however, the rods 46 are released and the spring 45 which was fully compressed by descent of the striker, acts to immediately force the firing pin downwardly, firing the detonator 31 and thus exploding the mine.

While during normal handling of the mine before and during emplacement, the spring 32 would hold the detonator carrier in the unarmed position of Fig. 2, there is of course the possibility that in case the mine should be dropped or otherwise violently jolted, said carrier might move to armed position. Were it not for the safety suspender 48, there might then be a possibility of the same shock causing the firing pin to fire the detonator. Due to the use of said suspender 48, however, the firing pin cannot descend until the striker 18 is forced down, and such movement of said striker is prohibited until

final emplacement of the mine, by means of the safety pin 54.

From the foregoing taken in connection with the accompanying drawings, it will be seen that novel and advantageous provision has been made for carrying out the objects of the invention, and while preferred features of construction have been illustrated, attention is again invited to the possibility of marking variations within the scope of the invention as claimed.

What is claimed is:

1. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position, depressible means carried by said body, means in said body actuated by said depressible means for moving said carrier to armed position, spring-actuated detonator-firing means in said body, and means controlled by said carrier for normally holding said spring-actuated firing means against operation and for releasing said spring-actuated firing means upon arrival of said detonator carrier at armed position.

2. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position, depressible means carried by said body, means in said body actuated by said depressible means for moving said carrier to armed position, detonator firing means in said body having an actuating spring stressed for operation by depression of said depressible means, and means released by movement of said carrier to armed position for holding said firing means against operation until said spring has been stressed to a fully operative extent.

3. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position and mounted for movement to armed position, a downwardly movable detonator firing pin above said carrier, a depressible striker carried by and projecting above said body, a spring interposed between said striker and said firing pin for operating the latter when compressed by depression of said striker, means actuated by depression of said striker for moving said carrier to armed position, and means released by movement of said carrier to said armed position for holding said firing pin against descent while said striker is compressing said spring.

4. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position and mounted for movement to armed position, a downwardly movable detonator firing pin above said carrier, a depressible striker carried by and projecting above said body, a spring interposed between said striker and said firing pin for operating the latter when compressed by depression of said striker, a vertical rod slidably mounted in said body in position to be downwardly pushed by said striker, a cam on said carrier in the downward path of said rod and cooperable with the latter for moving said carrier to armed position when said striker pushes said rod downwardly, and means released by movement of said carrier to armed position for holding said firing pin against descent while said striker is compressing said spring.

5. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position and mounted for movement to armed position, a downwardly movable detonator firing pin above said carrier, a depressible striker carried by and projecting above said body, a spring interposed between said striker and said firing pin for operating the latter when compressed by depression of said striker, means actuated by depression of said striker for moving said carrier to armed position, and a vertical rod supporting said firing pin and supported by said carrier for holding said firing pin against descent until said carrier occupies armed position, said rod being then released by said carrier.

6. A land mine fuse having a detonator carrier and means for moving same from a normally unarmed position to an armed position, a detonator firing pin, a spring for depressing said firing pin when stressed, a striker for stressing said spring, and means released by said carrier for holding said firing pin against descent until said carrier occupies armed position.

7. A land mine fuse having a detonator carrier and means for moving same from a normally unarmed position to an armed position, a detonator firing pin, a spring for depressing said firing pin when compressed, a striker for compressing said spring, and a vertically slidable rod supporting said firing pin and supported by said carrier for holding said firing pin against descent until said carrier occupies armed position.

8. A land mine fuse having a detonator carrier and means for moving same from a normally unarmed position to an armed position, detonator firing means having an actuating spring, a depressible member for stressing said spring for action, and means released by said carrier for holding said firing means against operation until said carrier occupies armed position.

9. A land mine fuse having a downwardly movable firing pin, a compression spring for actuating said firing pin, a depressible member for compressing said spring, a downwardly slidable vertical rod normally supporting said firing pin against descent, a movable support normally supporting said rod against descent, and means for moving said support to an inoperative position when said spring has been operatively compressed.

10. A land mine fuse having a detonator carrier and means for moving same to armed position, and detonator firing means under the control of said carrier and brought into play by movement of said carrier to armed position.

11. In a land mine fuse, a fuse body, a downwardly slidable firing pin in said body, a spring for operating said firing pin when compressed, a striker carried by said body for compressing said spring when said striker is depressed, a detonator carrier in said body and yieldable means normally holding it in unarmed position, means actuated by said striker for moving said carrier to armed position as said striker descends, means released by movement of said carrier to armed position for holding said firing pin against descent, and a suspender connecting said firing pin with said striker for preventing descent of said firing pin with respect to said striker if said carrier should prematurely release said firing pin holding means by accidental movement to armed position, said suspender being so connected that it will not interfere with descent of said striker with respect to said firing pin.

12. In a land mine fuse, a body having a portion for reception in an opening in a mine, a detonator carrier in said fuse body, and a safety device removably carried by said fuse body and normally abutting said carrier to hold the latter in unarmed position, said safety device having an outer end projecting outwardly beyond said portion of said fuse body in position to abut the

mine and prevent reception of said portion of said body in said opening, whereby said safety device must be removed before said portion of the fuse body can be inserted into said opening.

13. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position, depressible means carried by said body and projecting above the same for depression by means of a vehicle passing over the mine, means in said body establishing a positive operating connection from said depressible means to said carrier and actuated by said depressible means for moving said carrier to armed position, and normally held self-acting detonator firing means in said body under the control of said carrier and released for actuation by movement of said carrier to armed position.

14. In a land mine fuse, a body, a detonator carrier in said body normally occupying an unarmed position, depressible means carried by said body and projecting above the same for depression by means of a vehicle passing over the mine, means in said body establishing a positive operating connection from said depressible means to said carrier and actuated by said depressible means for moving said carrier to armed position, detonator firing means in said body having an actuating spring stressed for operation by depression of said depressible means, and automatically released means in said body controlled by said depressible means for preventing actuation of said firing means until said spring has been stressed to a fully operative extent.

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