Feb. 2, 1954 L. C. COOK 2,667,838

NONMETALLIC MINE FUSE

Filed June 9, 1950

Fig. 4.

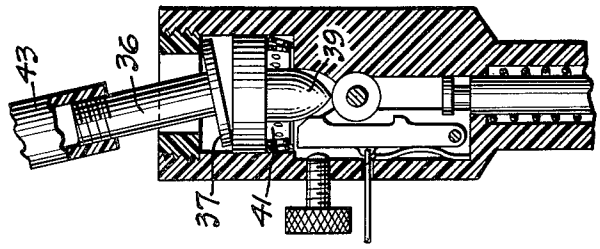


Fig. 3.

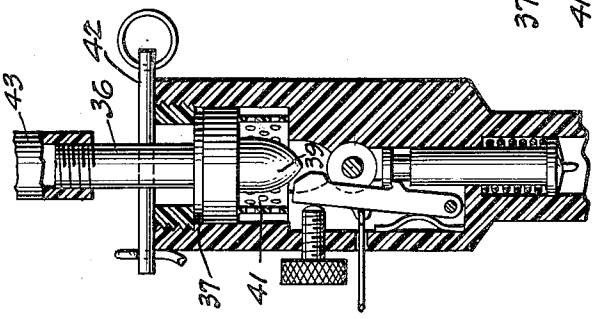


Fig. 5.

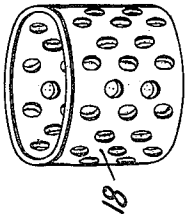


Fig. 2.

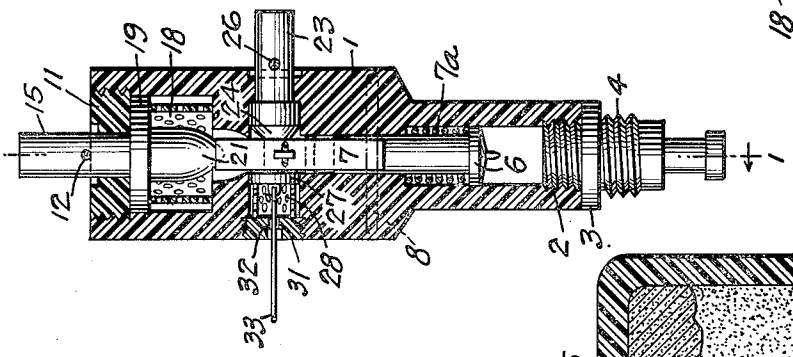
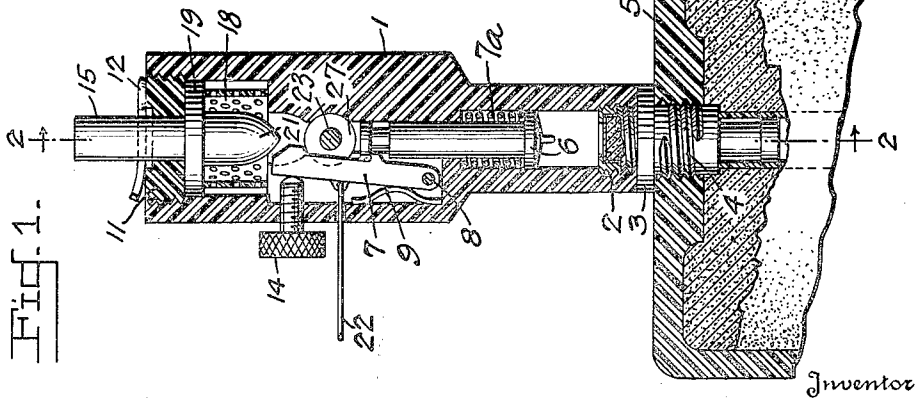


Fig. 1.



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NONMETALLIC MINE FUSE

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3 Claims. (Cl. 102—70)

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

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

This invention relates to a fuse for setting off mines such as anti-personnel and anti-tank mines, and has for its primary purpose the provision of such a fuse having substantially no metal parts, so that it shall be undetectable by metallic mine detectors. Such a fuse is of course intended to be used with non-metallic mines.

Non-metallic mine fuses have been made with chemical vials, crushed upon actuation of the fuse to produce detonation by chemical action. Such fuses may be subject to variable action at low temperatures and are thus less reliable than a mechanical fuse; they are also more expensive to manufacture, and require elaborate testing procedure to insure uniformity of operation.

It is an object of my invention to provide a mechanical non-metallic mine fuse which is simple and inexpensive in construction, reliable in operation and unaffected by temperature changes within any practically encountered range. Another object is to provide a fuse which may be assembled from a plurality of small plastic parts, each of which can be made by an inexpensive and simple molding operation according to known techniques.

Other objects and advantages of my invention will be apparent from the following description, together with the figures of the drawings, in which,

Figure 1 is a longitudinal sectional view of a fuse constructed in accordance with my invention, taken on line 1—1 of Figure 2.

Figure 2 is a cross-sectional view taken at right angles to Figure 2, on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1, showing a modification whereby my fuse may be set off by tilt actuation instead of straight pressure or pull actuation.

Figure 4 is a view similar to Figure 3, showing the tilting feature in operation.

Figure 5 is a perspective view of the crushable, perforated plastic shell.

Referring to Figure 1, the fuse has a casing 1, internally hollow and threaded at 2 to accommodate a threaded member 3 containing a detonator which may be in the form of a standard percussion cap. The thin brass shell of the percussion cap is the only piece of metal to be found in my fuse when in use, and is of too small size to be detected at any practical distance by any mine detector now in use, or believed practicable to construct. Member 3 has an external thread 4 whereby the fuse may be screwed into a standard fuse well of any standard mine, as indicated at 5.

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A firing pin 6, which may be made of any suitable hard plastic material is urged into contact with the detonator by a spring 7a, which is preferably of glass (suitable springs of this material have been developed during the recent war), which has the property of being highly resistant to fatigue and aging. Pin 6 is restrained by a sear 7, pivoted at 8 and urged into locking position by a flat plastic sear spring 9. The engagement between the sear and pin is preferably slightly undercut so that once the two are engaged, a definite force is required to free the firing pin by pivoting the sear upward. This insures proper operation of the fuse even if sear spring 9 should subsequently weaken.

Sear 7 is held in safety position by safety set-screw 14, so made that it requires at least two full turns to back it up sufficiently to release the sear for operation. This is of course done when the fuse is to be armed for service. An end pressure plunger 15 fits loosely in a bore in nut 11 and is provided with a safety cotter pin 12 which is withdrawn when the fuse is armed. The cotter pin may be a plastic friction pin if desired, or may be an ordinary metal cotter pin in which case it must always be removed before the fuse is put into service.

Plunger 15 has an integral collar 19 and a pointed interior end 21 designed to act as a cam surface against sear 7 when the plunger moves in from its initial position shown. The plunger is restrained from so moving by an annular plastic sleeve 18, provided with a multiplicity of perforations so that it will collapse when a predetermined pressure (for example 35 pounds) is exerted on the plunger 15. When sleeve 18 collapses, plunger 15 moves suddenly inward and its end 21 cams sear 7 (safety set-screw 14 having been screwed out of the way) to release the firing pin to detonate the fuse.

I provide several alternative ways to set off or trigger the fuse. A trip wire 22 which constitutes one of the several trigger mechanisms may be fastened to the sear as shown so that 3 to 7 pounds of pull will release the firing pin. I also provide as a second trigger device a side pressure plunger 23, arranged to cam sear 7 by the sloping shoulder 24, another cotter or friction pin 26 being provided as a safety device, similar to pin 12 of the end plunger 15. A flat disc 27 is integral with side plunger 23 and bears upon perforated plastic sleeve 28, similar to sleeve 18 and also

arranged to collapse at 35 pounds pressure. A nut 31 retains sleeve 28 and side plunger 23 in place. This nut is perforated at 32 to receive trip wire 33. Thus the device may be conveniently used in any of a number of positions for both pressure actuation and booby trapping or other pull actuation.

Figure 3 shows an alternative use of the device for tilt actuation. End pressure plunger 15 is replaced by tilt rod 36, which has an integral plate 37. Piston cam 39 is axially slidable in the smooth bored end of casing 1, its base bearing against plate 37 of plunger pin 36. The assembly of 37 and 39 are held in position by a crushable perforated plastic sleeve 41. A safety bolt 42 is provided similarly to cotter pin 12 of Figure 1. An extension rod 43 may be provided if desired. Tilting rod 36 will force piston cam 39 down after sleeve 41 is crushed, to actuate sear 7 as before, as shown in Figure 4. It will be noted that axial pressure on rod 36 will also actuate the fuse as in Figure 1.

It will be understood that all of the aforedescribed elements are made of plastic material, and it will be apparent that the parts may be readily made by standard molding processes. The fuse will obviously be unaffected by temperature within any practicable range and will be undetectable by metallic mine detectors.

I claim:

1. A fuze comprising a one-piece casing having a longitudinal axis and a passageway therethrough generally coincident with said axis, a firing pin mounted in the lower end of said passageway for axial reciprocation from an upper retracted position to a lower firing position, spring means urging said pin into firing position, a sear pivoted at its lower end in said casing on an axis transverse to and offset from said longitudinal axis and having a projection intermediate its ends engageable in a sear notch in said firing pin to maintain the pin in retracted position, a pressure plunger mounted in the upper end of the passageway in said casing for axial reciprocation along said longitudinal axis, said plunger having a lower end formed as a cam surface of revolution about said axis and a coaxial circular flange thereabove, and a foraminous sleeve of frangible material surrounding said plunger and interposed between said flange and an abutment in said casing to hold said cam surface upwardly out of contact with said sear, whereby crushing of said sleeve in response to a downward axial thrust on said plunger causes said cam surface to engage the free end of said sear and pivot the same free of said firing pin and release the same to the action of said spring means.

2. A fuze as recited in claim 1, a safety screw threaded through the wall of said casing and releasably engaging said sear to hold its projection within the notch in said firing pin, and a second pressure plunger reciprocably mounted in said casing transversely of said axis between said firing pin and first pressure plunger, said second plunger having an inner end adapted to engage said sear and cam the same free of said firing pin in response to pressure against the outward projecting end of said second plunger.

3. A fuze as recited in claim 1, said casing being axially counterbored at its upper end to slidably receive said plunger, a collar threaded into said counterbore and forming a downwardly-facing shoulder spaced from said abutment, a tilt rod having a stem and a circular plate on its lower end of about the same diameter as said flange and in face-to-face contact with the same, said sleeve holding the rim of said plate against said collar and said stem passing loosely through said collar, whereby said plunger is forced downwardly to release said sear in response to both tilting and downward axial translation of said stem.

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