Nov. 15, 1949 C. H. MacFARLAND 2,487,818

ANTITANK MINE

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Fig. 1.

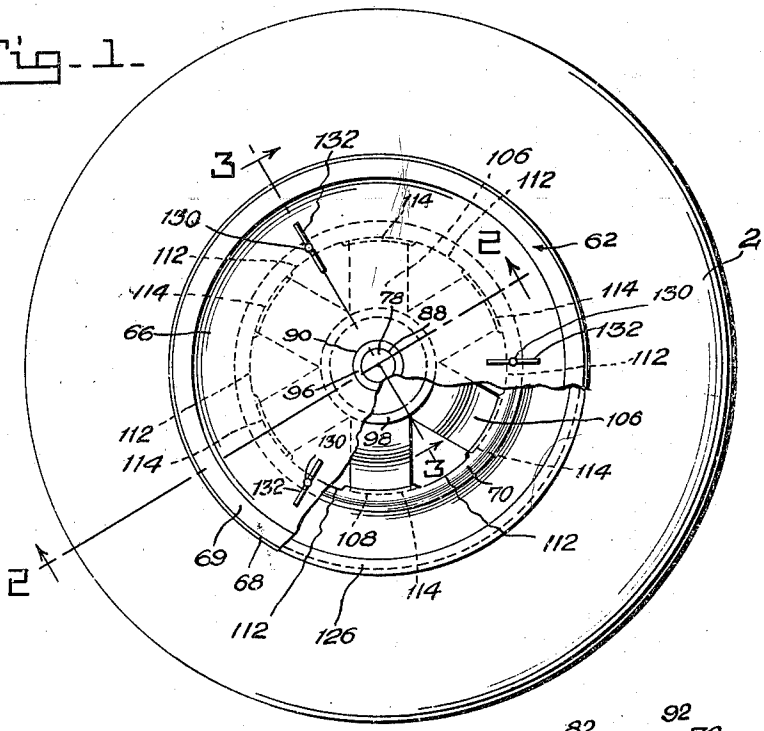


Fig. 2.

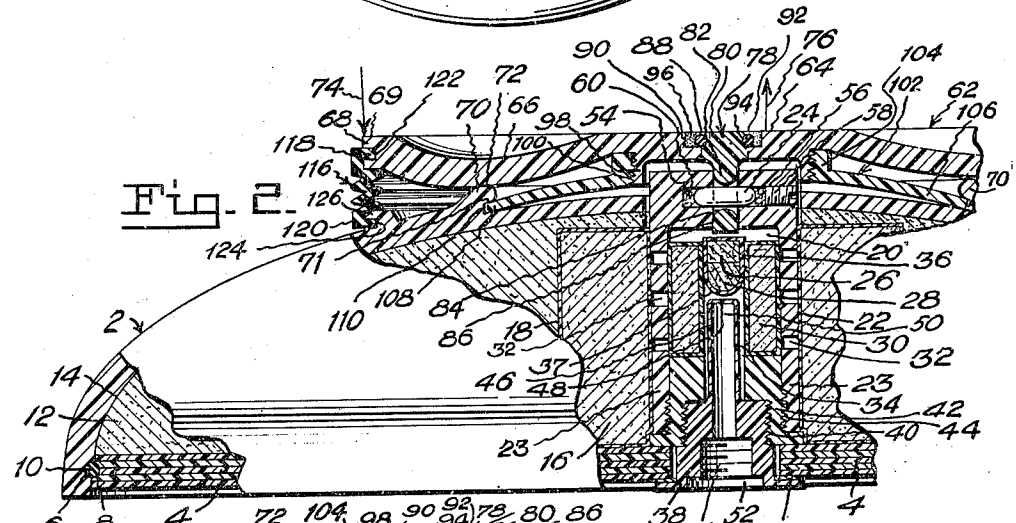


Fig. 3.

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ANTITANK MINE

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5 Claims. (Cl. 102—8)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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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 land mines.

A purpose of the invention is to provide a land mine the pressure plate of which will not be actuated by ground shock or air waves resulting from explosions near the mine, but only by actual mechanical pressure from a passing vehicle or the like.

Another purpose of the invention is to provide a land mine which reduces the tendency for dirt, and gravel to obstruct the efficient functioning of the mine.

A further purpose of the invention is to provide an improved land mine which may be made of non-metallic materials.

Other purposes and advantages of the invention will become apparent from the following description of a preferred embodiment of the invention and which is illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of the improved land mine, partly broken out;

Figure 2 is a fragmentary sectional view taken along line 2—2 of Figure 1, and

Figure 3 is a fragmentary sectional view taken along line 3—3 of Figure 1.

In the employment of explosive land mines intended for causing damage to or for destruction of hostile vehicles such as tanks, armored cars, mobile artillery and materiel and personnel carriers, it has been found that explosion of a single mine in a mine field may, by such effects as sympathetic detonation or the force of the air set in motion by the explosive blast, cause one or more nearby mines to explode.

Thus the sudden increase in air pressure may depress the pressure plate or spider on a nearby mine, causing it to explode and in turn possibly exploding other mines, the result being the possible destruction of a whole mine field or considerable portion thereof in consequence of merely exploding one mine in the field. This invention is intended for preventing the above mentioned explosion of nearby mines by depression of their pressure plates or spiders as a result of a pressure wave caused by explosion of a nearby mine.

To this end, means are provided whereby a relatively even pressure over the surface of the pressure plate, such as may be caused by a sudden increase in air pressure, will not set off the mine and in which it is necessary for pressure to be

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applied to only a portion of the rim of the mine to actuate it.

As illustrated, the mine comprises a hollow casing or mine housing 2 which is preferably made of a molded phenolic plastic material or other suitable material. The housing 2 is closed at the bottom by a base disk 4 which may be made of resin bonded plywood or other suitable material. As seen in Fig. 2, matching circular grooves 6 and 8, half-round in cross section, are formed in the abutting surfaces of housing 2 and base disk 4 and in the annular space formed when the matching grooves 6 and 8 are aligned with each other is located an annular seal ring 10 made of rubber or other suitable material for effecting a water-tight joint between members 2 and 4. The joint may also be cemented if desired.

A charge 12 of TNT or other suitable high explosive material is located inside the mine in the explosive chamber 14 formed between the inside wall of casing 2 and the base disk 4. A booster charge 16 is located in a booster charge chamber 18 formed in and surrounded by the charge 12. The booster charge chamber 18 has a central opening or fuse chamber 20 formed therein in which is disposed a mine fuse 22 having a cylindrical side wall 23 made of molded phenolic plastic material. The fuse 22 may be a chemical type fuse of the kind in which a sealed glass or plastic vial or ampoule 24 containing liquid sulphuric acid is disposed above a dry mixture 26 of potassium chlorate and sugar. When the vial 24 is broken, the released acid flows to and comes in contact with the mixture 26, causing it to burst into flame which ignites and explodes the heat sensitive explosive 28, located next to or just below the mixture 26 and which in turn explodes the surrounding annular shaped explosive booster charge 30. The resulting flame and blast passes through vent holes 32 formed in side wall 23, into contact with booster charge 16, exploding it and resulting in the explosion of the main TNT charge 12. As illustrated, the charge 30 is annular in shape and has a central bore 34 in which is disposed a cylindrical housing 36 rounded at its lower end 37 and containing the mixture 26 and the explosive 28, all the mixtures and explosives being sufficiently separated from each other by being surrounded by or enclosed in suitable materials such as are well known in the art.

The fuse 22 is closed at its lower end by a hollow elongated plug 38 which is threaded at 40 into an annular base member 42 which in turn is threaded at 44 into the lower end of the fuse side wall 23. The plug 38 has a hollow upward pro-

jecting portion 46, closed at its upper end 48 so that a cylindrical recess 50, threaded at 51 and open at the bottom 52 is provided, and into which an anti-lift or pull type fuse may be inserted in any usual manner for causing the mine to explode if lifted. The members 38 and 42 are preferably made of plastic material or other suitable non-metallic material. A seal washer is located at 53 as shown.

The fuse 22 is closed at its upper end by a horizontal top wall 54 which is thicker than the side walls of the fuse. A horizontal cylindrical recess 56 is formed in top wall 54 to receive the ampoule 24, a plug 58 being threaded into the open end of the recess 56 to close it. Felt packing 60 packed around the ampoule 24 serves to protect the ampoule against breakage due to looseness in the recess 56.

The mine has a pressure plate 62 formed of ceramic or plastic material. The pressure plate 62 is substantially circular in plan view as shown in Figure 1, and has its central top surface flat as at 64 and the remaining rim portion formed with an annular hollow depression in its upper surface as at 66, the outer edge 68 of the rim having its top surface 69 coplanar with the central surface 64 of the pressure plate. As best seen in Figures 2 and 3, the mine casing 2 has an annular upstanding elevated portion or bead 70 upon which is supported the lowermost portion of the underside of the depressed portion 66 of the rim as at 72. It will thus be noted that downward pressure at any point on the outer edge 68 of the rim as in the direction of the arrow 74 in Figure 2, will be necessary to tilt the pressure plate, in which case the bead 70 will serve as the fulcrum, and the central portion 64 of the pressure plate will rise substantially in the direction of the arrow 76 shown in Figure 2.

To cause pressure on a point on the rim as at 74 to break the glass ampoule 24 thereby liberating its contents and setting off the mine, an ampoule breaking member 78 is provided as shown in Figures 2 and 3. The member 78 has an upper substantially cylindrical portion 80 and a lower ring like portion 82 as best seen in Figure 3, the lower portion 82 having a transverse aperture 84 therethrough, through which the ampoule 24 extends and which thus encircles the ampoule with a small amount of clearance between the outer ampoule surface and the inner surface of the hole 84. The top portion 54 of the fuse 22 has an appropriate vertical aperture 86 formed therethrough to allow the lower portion 82 to extend into the hole 86 with clearance around it. The upper portion 80 of ampoule breaking member 78 extends through a vertical cylindrical aperture 88 in the pressure plate, the aperture 88 being enlarged at 90. A snap ring 92 disposed partly in an annular peripheral groove 94 on portion 80, serves to prevent the member 78 from moving further downward into hole 86, and pitch or other sealing material 96 located in the surrounding space, serves both as a seal and for preventing upward motion of member 78 apart from the pressure plate.

As seen in Figures 2 and 3, the pressure plate has a downwardly projecting hollow cylindrical extension 98, large enough in inside diameter to fit over the upper portion 54 of fuse 22 with adequate clearance, the extension having external threads at 100. A snap spring 102 made of phenolic plastic or other suitable material, has a central hollow cylindrical portion or hub 104 threaded to the extension 98 of the pressure plate. The snap spring 102 also has six spaced fingers 106 radiating from its cylindrical hub 104 as best seen in Figures 1 and 2, the distal ends 108 of the fingers 106 being receivable in an annular notch 110 formed in the upper surface of casing 2 under the inner side 71 of bead 70 as shown in Figure 2.

To allow the six radiating fingers 106 of the spring 102 to enter the notch 110, the overhanging portion 71 of the bead 70 is cut away as shown in Figure 3 at six corresponding spaced intervals indicated at 112 in Figure 1, thus leaving the overhanging portions 71 of the bead 70 only between the six cut away intervals 112. Thus, to allow the radiating fingers 106 to get beneath the overhanging portions 71, the entire spring is first placed with the fingers 106 in registry with the cut out intervals 112 and allowed to drop into the notch 110 as seen clearly in Figure 3. Then the spring 102 is given a one-twelfth revolution whereby each spring finger 106 is thus rotated from a location 112 to a location 114 to bring its distal end 108 beneath an overhanging portion 71 of the bead 70 as in Figure 2, thus retaining the end 108 of each spring finger 106 in the notch 110.

Since the pressure plate 62 is supported on the bead 70, it is apparent that the spring fingers 106 are under no stress until the pressure plate is tilted on bead 70 as a fulcrum. Accordingly the spring fingers 106, not having any initial stress cannot take any permanent set. The snap action can be controlled by regulating the thickness of section and shape of the spring fingers 106. A large clearance hole is provided in the yoke so no load whatever is put on the ampoule 24 until the snap spring releases. This means that the load required to break the ampoule need not be considered in computing the rim load at which the mine operates. Phenolic material laminated with kraft paper is recommended as suitable for use in making the spring 102.

A cylindrical rubber sealing bellows 116 has annular beads 118 and 120 adapted for being snapped into corresponding annular grooves 122 and 124 formed in the edge 68 of the pressure plate, and in an upstanding annular bead 126 on the mine casing as shown in Figure 2. The sealing bellows 116 thus serves to keep out dirt, water and other harmful material, while at the same time interposing no obstruction to upward or downward movement of the rim 68 of the pressure plate.

As a safety measure, means are provided to prevent the pressure plate from tilting relative to the mine casing until it is desired to arm the mine. For this purpose, as shown in Figure 3, three threaded holes 128 are formed in the bead 70, the holes being spaced by 120 degrees from each other and located within the portions 112 of the bead 70. Corresponding unthreaded holes 130 are formed through the abutting depressed portion of the pressure plate. When the holes 130 are in registry with the holes 128, thumb screws 132 may be inserted through holes 130 and tightly threaded into holes 128, thereby holding the pressure plate down firmly on bead 70 and preventing the pressure plate from tilting and exploding the mine. To arm the mine it is only necessary to remove the thumb screws 132.

For final assembly, the fuse assembly is first assembled, consisting of the chemical fuse booster pellet, primer mixture, upper and lower detonator charges, and ampoule 24 all mounted in the plastic cylinder threaded at the bottom

end as already explained, and the yoke 78, fitting loosely over the center of the ampoule in the slot 86 at the top end of the plastic cylinder. The fuse assembly is inserted into the proper cavity in the body portion and fixed in place by turning up the bottom center plug 38. This plug contains a cavity into which an anti-lift fuse may be inserted in the usual manner.

The next step is to place the top sub-assembly comprising the pressure plate and snap spring over the mine casing, centered so that the fingers 106 of the plastic spring will drop down to the level of the notch 110, being in positions 112. The top sub-assembly is then rotated one-twelfth of a turn to bring the spring fingers 106 into positions 114. This also results in aligning the thumb screw holes for insertion of the thumb screws.

Sealing of the mine is next accomplished by snapping the rubber seal bellows 116 into positions as shown in Figure 2. The final operation consists of installing the snap ring 92 over the top of the yoke into groove 94, and sealing the snap ring by filling the cavity around it with a plastic sealing compound.

While a preferred embodiment of the invention has been described in specific terms, it is to be understood that numerous changes may be made in the size, shape, materials, and arrangement without departing from the spirit and scope of the invention.

I claim:

1. A land mine comprising a hollow casing, an explosive charge in said casing, an annular upstanding ring carried on said casing, a circular pressure plate supported on said ring concentrically therewith, said plate having a substantially greater diameter than the ring, whereby unbalanced pressure on the thus overhanging rim of said pressure plate will cause the plate to pivot on the ring as a fulcrum thus elevating the center of the pressure plate, an annular hub concentrically secured to said pressure plate, a plurality of substantially arcuate spring arms radiating from said hub, interlocking means between the free ends of said spring arms and said annular upstanding ring, and primer means responsive to upward movement of any portion of the plate for igniting said explosive charge, said spring arms initially resisting such upward movement of the plate and then suddenly releasing such resistance upon said spring arms reaching a predetermined degree of stress.

2. In a land mine, a hollow casing having an external shape generally in the form of a segment of a sphere and having a normally vertical central axis, an upstanding ring fixed on said casing externally thereof and concentric of said axis, said ring being formed to provide a plurality of circumferentially-spaced inwardly-facing notches about the periphery thereof, a circular pressure plate of greater diameter than said ring, means securing said pressure plate to said casing in position resting on said ring, said means comprising a Belleville-type spring centrally secured to said pressure plate at the central under portion thereof and having radial arms whose ends engage in respective ones of said notches, and means responsive to upward movement of the center of said pressure plate as a result of downward pressure upon the rim thereof, to detonate a fuse in said casing, said spring acting to resist the upward movement aforesaid.

3. A mine as recited in claim 2, the diameter of the base of said casing being approximately twice the diameter of said pressure plate.

4. A mine as recited in claim 2, and safety means comprising a plurality of removable screws rigidly connecting said pressure plate to said ring at points circumferentially spaced about the periphery thereof.

5. A mine as recited in claim 2, said last-named means comprising an ampoule mounted centrally in said casing closely adjacent said pressure plate, and a ring secured to said pressure plate centrally therebeneath and encircling said ampoule.

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