

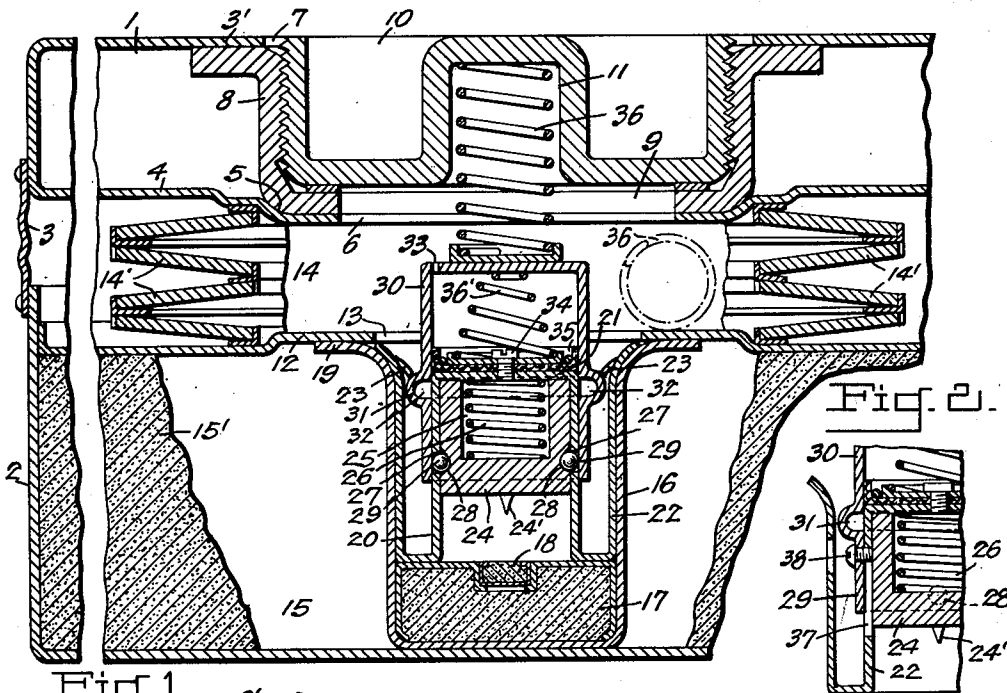
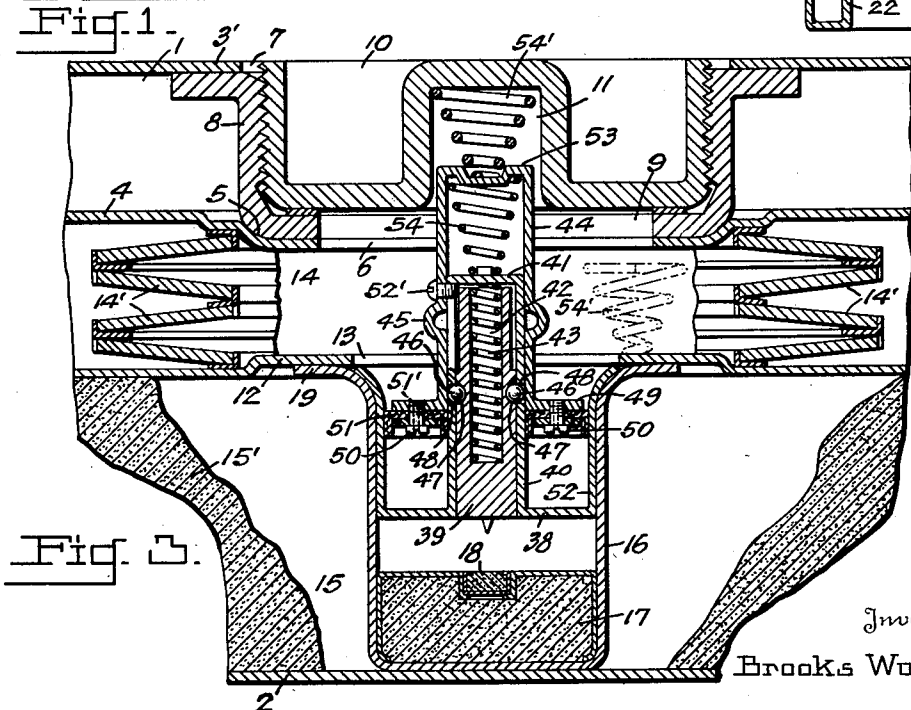
May 18, 1954

B. WALKER
LAND MINE FUSE

2,678,604

Filed Feb. 1, 1945

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

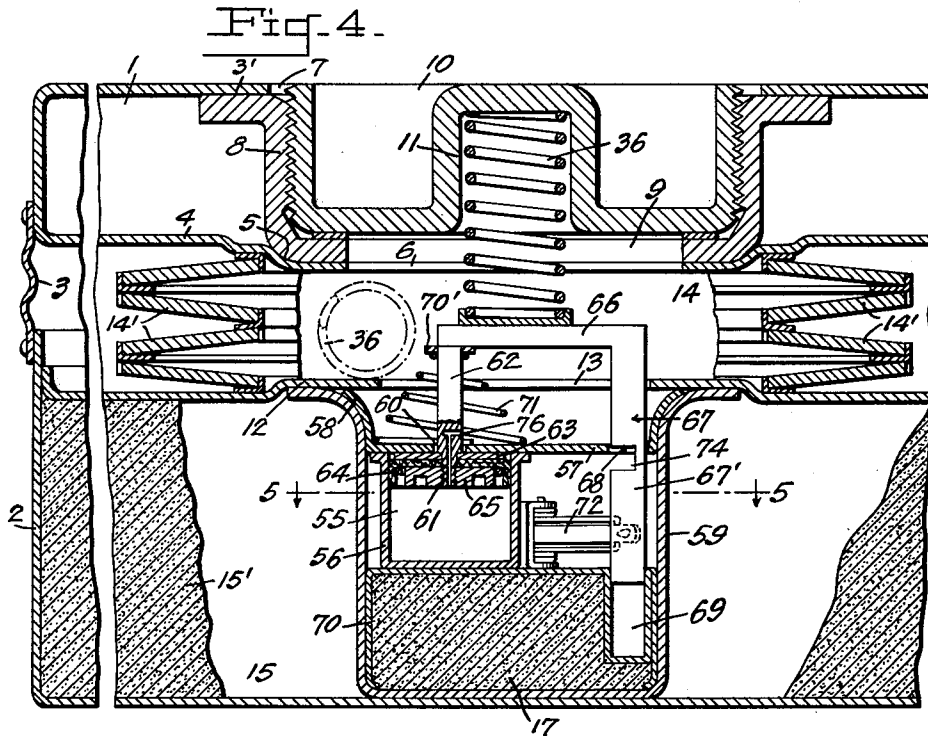


Fig. 5.

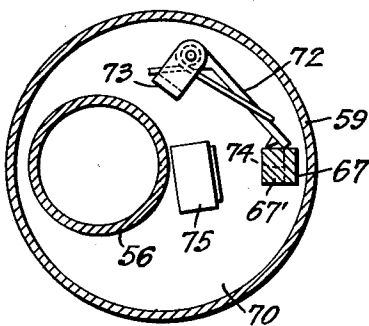
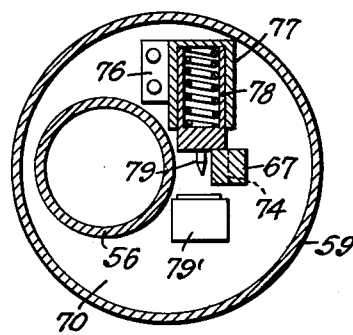


Fig. 6.



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LAND MINE FUSE

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sec. 266)

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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 a land mine fuse.

The invention contemplates a fuse that will respond effectively only to a substantially predetermined weight or pressure applied to the mine for a considerable and substantially predetermined time, that is to say, for instance a heavy pressure applied for a very short time will not operate the fuse, whereas the same pressure applied for a sufficiently long time will effect operation. With such a fuse the mine will not be exploded by the shock of enemy shells or bombs exerting a quick though great pressure, or by shocks resulting from the explosion of mine clearing expedients wherein the explosive force of the expedient is depended upon for exploding an enemy mine.

In the drawings illustrating the invention:

Figure 1 is a vertical central section through the fuse and mine casing, parts being broken away;

Figure 2 is a detail fragmentary section, showing a slightly different means for limiting the upward movement of the operating cylinder from that shown in Figure 1;

Figure 3 is a central section of a modified form of fuse;

Figure 4 is a central section of still another form;

Figure 5 is a section on the line 5-5 of Figure 4;

Figure 6 is a similar view showing a modified form of striker.

The mine comprises in the main two parts, an upper section 1 comprising a pressure plate and a lower section 2 constituting the casing proper, the upper section being connected with the lower by a flexible connection 3, which may be a band of leather, canvas or other sufficiently strong and flexible material to allow relative movement between the two sections. The band is attached to the edges of the sections in such a way, and by such means that it may be readily unfastened when it is desired to separate the sections for handling and shipping the mine, or for arming the fuse.

The upper section comprises a top or pressure plate 3' and a lower plate 4, the lower plate being provided with a central depression or sump 5 having centrally located therein an extensive opening 6. The top plate 3' has a central opening 7 below which and firmly secured to the under

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side of the plate is a cup-shaped member 8 having an opening 9 registering with the opening 6 in the plate 4. The member 8 is internally threaded to receive the externally threaded closure 10 having, as a part, an open-bottom dome 11 for the reception of a fuse element which will more particularly be referred to in the further description of the invention.

A suitable distance below the upper edge of the casing proper 2 there is a stationary plate 12, having a central opening 13. This plate with the upper plate 4 forms a chamber 14 in which there is a strong spring 14' which may be of the Belleville type, for yieldingly separating casing sections 1 and 2. Below the stationary plate 12 is the chamber 15 for the main explosive charge 15'.

In adapting the casing for the fuse assembly, which will now be described in detail with special reference to Figure 1, there is interposed between the stationary plate 12 and the bottom of the casing proper a cylindrical casing 16 which incloses the booster charge 17 and other elements of the fuse, including a centrally positioned primer 18. The bottom of the booster charge casing rests on the bottom of the lower mine section and its upper edge is flared laterally to form an annular flange 19 secured by any suitable means, to the under side of the stationary plate 12.

Numerals 20 designates the cylindrical striker housing which is closed at its top as indicated at 21. The central portion of the housing is continued laterally and upwardly to form a wall 22 whose upper end is shaped to conform to the upper end of the booster charge casing 16. Adjacent the upper end of the wall 22 there is struck therefrom a number of narrow somewhat resilient detents 23, for a purpose that will presently become apparent. The numeral 24 designates the striker which carries the striker pin 24'. An open top bore 25 is formed in the striker and terminating short of its bottom to form a seat for the prestressed firing spring 26 which is interposed between said seat and the under side of the top 21 of the striker housing 20. The wall of the striker housing is provided with a number of holes 27 normally opposite equally spaced pockets 28 in the striker for the occupancy of a number of balls 29 normally resting partly in the pockets and partly in the holes. Telescoping over the housing is the operating dashpot cylinder 30 whose skirt extends below the balls 29 and holds them normally in place in the pockets. About midway of the dashpot cylinder there is an annular rib 31 having therein an annular

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groove 32 into which the balls are crowded at the time of the explosion of the mine, and at no other time, for reasons that will appear later on. The top of the dashpot cylinder is closed with exception of a breather hole 33, and secured to the top of the housing 20 by a screw 34 is a cup-leather dashpot piston 35, between which and the top of the cylinder 30 is a conical return or elevating spring 36' normally maintaining the cylinder in raised position and adapted to return it to such position from any position it might reach in telescoping over the striker housing short of that in which the mine is operated, or short of that position wherein the balls are cammed out of the pockets in the striker and into the groove 32 in the rib 31, the pockets in the striker being inclined upwardly and outwardly as shown, to effect the camming action at the time the striker spring 25 is released.

Within one end in the dome 11 and abutting the under side of the top thereof, is the arming spring 36 whose lower end rests in a shallow cup on the top of the dashpot cylinder. This spring is the intermediary between the top and bottom sections of the mine casing and without this spring the fuse will not operate. The extent of movement of the dashpot cylinder by the arming spring, for a given force acting for a given time is governed by the size of the breather ports or apertures in the dashpot. Provided for the convenient removal and replacement of the springs is the readily detachable flexible band 3 which connects the top and bottom sections of the mine casing.

Referring to Figure 2, which is a fragmentary section of a slight modification of the dashpot cylinder and closely associated parts, the striker housing is provided with a slot 37 entered by the shank of a screw 38 carried by the dashpot cylinder to limit the upward movement of said cylinder under the influence of the return spring. These screws perform the same function as the detents 23 of Figure 1, and for better balance of movement between the parts there will preferably be a slot and screw on each side of the assembly.

In the modification shown in Figure 3, the dashpot cylinder is formed as a part of the striker housing. Its bottom is closed as indicated at 38 and its outer side walls fit snugly against the inner wall of the casing 16. In this form the striker 39 is elongated and housed in the cylindrical housing 40, the latter being open at its lower end and closed at its upper end, as indicated at 41. Like the striker in Figure 1, this striker has a bore 42 terminating short of its bottom and forming a seat for a prestressed spring 43, which bears at its upper end against the closed end of the striker housing. Telescoping over the striker housing is an operating cylinder 44, like, in many respects, the operating dashpot cylinder 30 of Figure 1. The cylinder is provided with an annular rib 45 having an annular groove therein to receive balls 46 resting normally partially in pockets 47 and partially in holes 48 in the striker housing, the arrangement, so far as these elements are concerned being substantially like their corresponding parts in Figure 1. The operating cylinder 44 has a laterally extending flange 49 at its lower end to the under side of which is secured by screws 50, a cup-leather piston 51 reciprocable in the dashpot cylinder 52. The dashpot will have appropriately sized breather holes, and in the construction illustrated in this figure these are made

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through one or more of the screws that attach the piston to the flange 49, as indicated at 51'. To limit the upward movement of the operating cylinder 44 relative to the striker housing, the housing is provided with a vertical groove entered by a screw 52' carried by the cylinder. This cylinder is closed at its top as at 53, and between the under side of said top and the top of the striker housing is interposed the return spring 54 functioning precisely like the spring 36' in Figure 1. Between the top of the operating cylinder and the under side of the dome 11 is the arming spring 54' serving the same purpose as the spring 36 in Figure 1.

It will doubtless have been observed that forms of Figures 1 and 3 differ mainly in the dimensions of the various parts and in the locations of the dashpots, the dashpot in Figure 1 being wholly above the striker, and that in Figure 3 being laterally disposed with respect to the lower portion of the striker, the operation in both instances being substantially the same.

The forms of the fuse shown in Figures 4, 5 and 6 differ somewhat from the other forms. In this case the dashpot is arranged eccentrically of the axis of the mine casing. It is indicated by the numeral 55 and comprises the cylinder 56, whose upper end is secured to the under side of a plate 57 whose curved peripheral flange 58 is secured to the similarly shaped flange of the outer casing 59 secured to the under side of the stationary plate 12 in the lower section of the casing. There is an aperture 60 that is eccentrically positioned in plate 57 for the passage of the threaded shank 61 of the piston rod 62, which shank passes through a disc 63 and through a flanged leather dashpot piston 54 into a member 65 between which and the disks the piston is clamped. The rod 62 extends upwardly through the central opening 13 in the plate 12 into engagement with the horizontal arm 66 of a control bar 67 whose vertical arm 67' extends downwardly through an opening 68 in the plate 57 and into a well 69 formed in the booster casing 70, in which opening and well the control rod is guided in its vertical movements.

The arming spring 36 is interposed between the arm 66, and the under side of the dome 11. A flange 70' is provided at the upper end of the rod 62 and between this flange and the plate 57 is interposed a cone-shaped spiral return spring 71.

The firing means of the fuse just above described, is of the grenade type and comprises a spring urged horizontally swingable striker 72 pivoted in a bracket 73 secured to the top of the booster charge casing. In cocked position the firing pin end of the striker engages the vertical portion 67' of the control bar, thus holding the striker cocked. Cooperating with the striker 72 is a notch 74 in the control bar, which, when said bar is depressed sufficiently, allows the striker arm to pass through it and reach the primer 75 attached to the top of the booster casing to detonate the booster charge.

In Figure 6, there is shown a modification of a firing mechanism. In this case there is a bracket 76 mounted on the booster casing and formed with an open cylinder 77 for reception of a plunger 78 carrying firing pin 79, there being a spring in the plunger urging the plunger out of the cylinder and against the control arm 67 adjacent the notch 74, and ready to be forced through the notch by the spring when the control arm has been sufficiently depressed to allow such

movement. On the opposite side of the control arm from the plunger, is a primer 79' appropriately positioned relative to the booster charge to ignite the charge at the proper time.

All of the dashpots have breather holes and these are of a size to permit egress of air at a rate corresponding to the pressure exerted by the arming spring when a weight or pressure depresses the upper section of the mine casing by contact with the pressure plate 3'. In Figure 4, a hole 76 is shown drilled through the dashpot piston rod 62 and communicating at one end with the dashpot and at the other with the space above the plate 57, or with the space above the piston as the piston descends, as the case may be. It will be understood that breather holes may be located in any suitable part of the dashpot cylinders or their pistons, the idea being to permit the escape of air from the dashpot and to replace it, according to the movement of the pistons shown in the several views.

To arm the fuse and the mine, the arming spring 36 in the forms of Figures 1 and 4, and 54' in Fig. 3, must be in place between the depressible top section of the mine casing and the dashpot assemblies.

It is believed that a description of the operation of the mechanism shown in Figure 1 will suffice for the other forms, since in all of them are obvious equivalents that function in the same manner. Pressure upon the top plate 3' of the upper mine casing section will be communicated to the arming spring 36, and in a degree to the heavy spring 14'. This pressure will be communicated through the arming spring to the dashpot operating cylinder, which will be depressed against the conical return spring 36' in the dashpot, forcing the cylinder to telescope over the striker housing against the resistance of the return spring and the column of air in the dashpot. Weight applied for a shorter time duration than that for which the mine is adapted by size of its aperture, depresses the operating cylinder to a certain extent through the instrumentality of the arming spring and when such pressure is relieved the return spring 36' will return the operating cylinder to normal position, but when the weight is sufficient and applied for a sufficient time duration, the arming spring will be depressed sufficiently to exhaust all, or enough of the air from the dashpot to allow the operating cylinder to be moved down to a point where the balls in the pockets in the striker and in the holes in the striker housing come opposite the annular groove 32 in the dashpot cylinder when the striker will be released and driven by spring 26 into contact with the primer to explode the mine.

As stated, all of the dashpots have breathing ports or apertures. These will be of a size to permit egress of the air from the dashpots at a rate proportionate to the pressure exerted by the arming spring 36. The rate at which the air is let out under the pressure of the arming spring is such that the striker will not be released if the pressure plate 3' and arming spring are depressed only momentarily, as is the case while, for instance, the mine is subjected to the blast effect of an explosion. However, a long duration of pressure, such for instance as created by the passage of heavy wheels or tracks will expel enough air from the dashpot to release the firing mechanism. Any part of movement of the dashpot piston which may be caused by blast effect or other

transient force will be compensated for by the return spring.

It will be noted, therefore, that the essence of my invention resides in a means for releasing the firing mechanism of the mine in response to depression of the contact or pressure plate, which means includes a spring and a dash-pot in series. Thus, pressures of relatively short duration act only to stress the spring without substantial movement of the dash-pot elements and without releasing the striker. On the other hand, the same pressures, when acting for longer periods stress the spring and cause the dash-pot to move into position releasing the firing mechanism.

In handling the mine or in shipment, safety is assured so long as the arming springs are absent from their appropriate places, at which time the springs may be conveniently stored in the spaces between the plates 4 and 12, where they are shown in dotted lines in Figures 1, 3 and 4.

I claim:

1. In an explosive mine comprising a casing proper for the reception of the main charge and a pressure plate yieldingly supported with respect to the casing proper, said pressure plate constituting a pressure contact operated element, a fuse in said casing in pressure receptive relation with said element including firing means, a dash pot comprising a cylindrical member closed at one end with the open end slidably embracing a firing means housing and interposed between said pressure plate and said firing means housing, having resilient operative connections with said pressure plate and with said firing means, means for normally locking the firing means, said locking means being responsive to dashpot movement to release the locking means only upon the application of a substantial pressure applied for a substantially predetermined delay period to the contact pressure element, and means for returning the dashpot to normal operative position from any position short of that in which the locking means is released.

2. The invention of claim 1 characterized in that there is a means for limiting the dashpot return movement from the point short of that in which the firing means is released.

3. In an explosive mine comprising a casing proper for the reception of the main explosive charge including a pressure plate yieldingly supported with respect to the casing proper, said pressure plate constituting a pressure operated contact element, a fuse in the casing proper in pressure receptive relation with said element and comprising a booster and a primer for detonating it, a dashpot comprising a cylindrical member closed at one end with the open end slidably embracing a firing means housing and interposed between said pressure plate and said firing means housing, firing means controlled by said dashpot in response to the pressure applied to said dashpot, resilient means having operative connection with the contact pressure element and the dashpot through which pressure applied to the pressure element is communicated to the dashpot, means for locking the firing means in normal position away from the primer, and means responsive only to dashpot operation beyond a predetermined distance to release the firing means, and automatic means for returning the operative dashpot element to normal position from any position short of said predetermined distance.

4. In an explosive mine comprising a casing proper for the reception of the main explosive

charge and a pressure plate yieldingly supported with respect to said casing and forming a part thereof, said pressure plate constituting a pressure contact operated element, a fuse in said casing in pressure receptive relation with said element and comprising a booster charge and a primer for detonating it, a striker housing in said casing, a striker slidable in said housing, a closed top operating cylinder telescoping over said housing and forming with said housing a dashpot, releasable means interposed between the striker and the housing to normally prevent movement of the striker toward the primer, resilient means interposed between the pressure operated contact element and operating cylinder whereby pressure applied to said element is communicated to said cylinder to move the cylinder, said cylinder acting to release said locking means only when said cylinder has been moved by said yielding means a substantially predetermined distance against the column of air in the dashpot, and automatic means for returning the operating cylinder to normal position from any position short of that position in which the striker locking means is operated.

5. In an explosive mine comprising a casing proper for the reception of the main explosive charge and a pressure plate yieldingly supported with respect to the casing proper, said pressure plate constituting a pressure operated contact element, a fuse in the casing proper in pressure receptive relation with said element and comprising a booster charge and primer therefor, a closed top striker housing in the casing, a striker slidable therein, a pre-stressed firing spring between the top of the housing and the striker, a cylinder telescoping over the striker housing and forming with the top of said striker housing a dashpot, a spring interposed between said cylinder and the pressure operated element whereby when pressure is applied to said element it is communicated to said cylinder, striker locking means carried partly by the striker, partly by said housing and normally locking the striker away from the primer, means carried by the dashpot cylinder cooperating with the striker locking means to release said locking means only when the dashpot cylinder has been moved by said spring a substantially predetermined distance against the column of air in the dashpot, and means in the dashpot for returning the cylinder to normal position from any position short of that position in which the striker means is operated.

6. In an explosive mine comprising a casing proper for the reception of the main explosive charge, a pressure plate yieldingly supported with respect to the casing proper, said pressure plate constituting a pressure operated contact element, a booster charge in the casing and a primer therefor, a cylindrical fuse casing in the casing proper, a dashpot cylinder within the fuse casing and

formed with an open bottom centrally positioned cylinder constituting a striker housing, a striker in said housing, a pre-stressed firing spring interposed between the striker and said housing, means carried partly by the housing and partly by the striker for locking the striker in normal position away from the primer, an operating cylinder telescoping over said housing and carrying a dashpot piston on its lower end within said dashpot cylinder, a spring between the pressure operated contact element and said operating cylinder whereby when pressure is applied to said element it will be communicated to said cylinder, means carried by the operating cylinder cooperating with the striker locking means to release said locking means only when the dashpot piston is moved a substantially predetermined distance by a pressure applied to the contact pressure element for a substantially predetermined delay period, and means for returning the operating cylinder and striker piston to normal position from any position short of that in which the striker means is operated.

7. In a land mine, a casing, a primer in said casing, a striker housing fixed within said casing and having a cylindrical portion, a striker guided for movement in and along said portion, a pin on said striker and adapted to contact said primer to detonate the same when said striker is moved from a first to a second position in said cylindrical portion, a dash-pot cylinder fitting over said portion, a piston fitting said dash-pot cylinder and secured to said housing, first spring means urging said striker into said second position, releasable means normally locking said striker in said first position, said locking means being released in response to movement of said dash-pot cylinder from a first to a second position, yielding means urging said dash-pot cylinder into its said first position, a pressure plate on said casing, resilient means urging said plate outwardly of said casing, and a spring interposed between said pressure plate and dash-pot cylinder, whereby said cylinder is moved to its said second and striker-releasing position only in response to a predetermined minimum force acting upon said plate for a definite appreciable time.

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