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EXPLOSIVE LAND MINE

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Fig. 1.

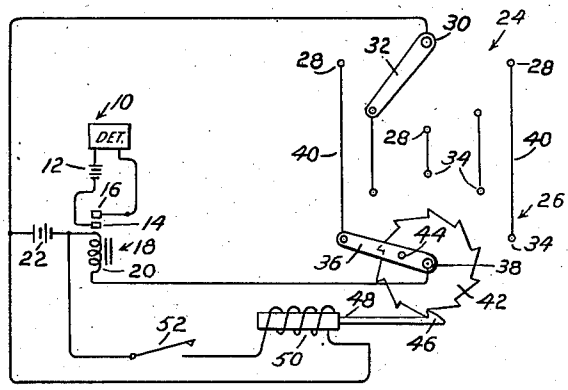
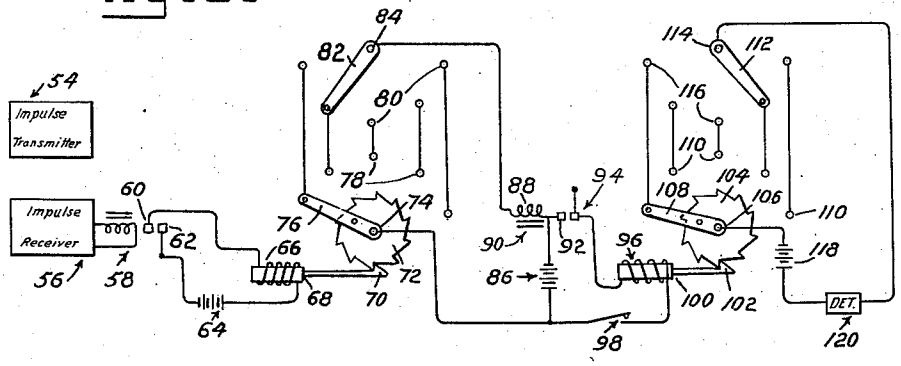



Fig. 2.




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## EXPLOSIVE LAND MINE

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1 Claim. (Cl. 102—8)

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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 explosive land mines.

A purpose of the invention is to provide a mine which will explode only after a predetermined number of vehicles have passed over the mine.

Another purpose of the invention is to provide a remote control means of placing said mine in operative condition by means of radio wave operated devices.

Other purposes will become apparent from the following description of the invention.

I attain these objects by mechanism illustrated in the accompanying drawings in which:

Figure 1 is a schematic diagram of a delayed action device for detonating a mine, and

Figure 2 is a schematic diagram of a combination of impulse transmitter, impulse receiver and delayed action mine detonating device.

To add to the effectiveness of mine fields in areas where armored vehicles will not be preceded by engineers with magnetic or induction mine detection devices, it is desirable to try to keep the mines from being exploded until a number of vehicles have entered the mine field. According to this invention, each mine is equipped with an electric detonator actuated by a pressure receiver. Between the pressure receiver and the detonator there is placed a device so arranged that a predetermined number of enemy vehicles can pass over the mine before the mine is exploded. Thus, the first of a series of ten mines is set to explode when the tenth of a column of ten vehicles is passing over it, the second mine is set to explode when the ninth vehicle is passing over it, and the succeeding mines are each set for a correspondingly decreasing number of vehicles, the tenth mine being set to explode when only one vehicle depresses its pressure receiver. If this is done, it would be possible for ten vehicles to pass along a mined road, each vehicle passing over a number of mines without exploding them, and then when the vehicles have arrived at the positions where each is over the proper mine, all ten mines explode under the vehicles last actuating them.

As shown in Figure 1, each mine is equipped with an electric detonator 10 for detonating the explosive charge. The detonator 10 is connected to an electric battery 12 and the electric contacts 14 and 16 in a series circuit, so that when the contacts are brought together the detonator is set off, exploding the mine. The contacts 14 and

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16 are part of a relay 18 having an iron core and a coil 20. The coil 20 is connected in a series circuit with a battery 22 and a pair of selector switches 24 and 26, as shown in the drawing. The selector switch 24 has a series of spaced contact points 28 arranged along the arc of a circle with its center at 30. A manually movable contact arm 32, pivoting on the center 30 is adapted to engage any selected contact point 28. The selector switch 26 has a similar group of spaced contact points 34 and a movable contact arm 36 pivoting on a center 38. Corresponding contact points of the two switches are connected together by wires 40. A ratchet wheel 42, also rotating about the center point 38, is secured to arm 36 by a pin 44 so that the wheel 42 and the arm 36 rotate together. It is thus seen that current from the battery 22 will flow in the coil 20 when both contact arms 32 and 36 are on connected contact points. Hence, if arm 32 is set on the second contact point 28 as shown in the drawing, it is necessary to rotate the ratchet wheel 42 and the contact arm 36 keyed to it in a clockwise direction until the arm 36 is on the second contact point 34 which is connected to the second contact point 28, thus completing the said series circuit.

The rotation of the ratchet wheel 42 is accomplished by means of a pawl 46 attached to a plunger 48 passing through a solenoid coil 50 which is connected in a series circuit with the battery 22 and a normally open pressure actuated switch 52. The latter is depressed by the pressure plate of the mine each time a vehicle passes over the mine, the resulting current flow in the coil 50 drawing in the plunger 48 and the pawl 46, rotating the ratchet wheel 42 by one notch, and throwing the contact arm 36 on to the second contact 34. This closes the series circuit causing current to flow in the coil 20 of the relay 18, drawing contact 16 against contact 14, causing current from battery 12 to actuate the electric detonator 10, exploding the mine. By setting the contact arm 32 on any other contact point, the number of vehicles which must pass over the mine before exploding it can be predetermined in the above manner. After the vehicle has passed over the mine, the switch 52 returns to its normally open position releasing the solenoid plunger 48, the plunger 48 and pawl 46 being returned to their original position by means of a compression spring or any other convenient method. When the next vehicle passes over the mine, the above steps are repeated, the arm 36 thus advancing in step by step fashion until it touches a contact point connected to the arm 32,

whereupon the mine is exploded as explained above.

For resetting the contact arm 36 to its zero position, the pressure plate or spider of the mine may be depressed a sufficient number of times. If this requires too much pressure, an easily depressible portion of the switch 52 may be left exposed for this purpose, or an additional manually operable switch included in the circuit.

For use in occupied terrain which affords only narrow and limited roads for passage of vehicles, the device above described may be used in conjunction with an impulse transmitter and receiver for arming the mine by remote control. Thus a friendly vehicle carrying an impulse radio transmitter, and pursued by a column of enemy vehicles, could arm the mines by radio impulses as it passes across the mine field, thus placing them in readiness for being exploded by the pursuing tanks in the manner already described for Figure 1. Each mine would be equipped with an impulse receiver and the arming and firing mechanism as shown in Figure 2.

In Figure 2, an impulse transmitter 54 is mounted in a control vehicle. The radio transmitter 54 may have a radio frequency oscillator circuit feeding an antenna and keyed by a telephone dial mechanism of a type similar to those used on automatic dial telephones so that any desired number of impulses may be keyed automatically. Since the control vehicle will normally be very close to the mines being armed, the transmitter 54 may be of very low power output. The impulse radio receiver 56 may be of any usual form of detector-amplifier circuit, of the type commonly used for remotely controlled receivers such as those employed in some radio receivers, a thyratron output circuit being used to cause each impulse received to release sufficient output current to actuate the relay 58 causing the normally separated contacts 60 and 62 to be brought together.

This causes current from the battery 64 to flow through the solenoid coil 66, drawing in the plunger 68 having a pawl 70 attached to it. The movement of the pawl 70 causes the ratchet wheel 72 to rotate about its center 74 and advance a distance equal to one notch of the ratchet 72. The contact arm 76 being fastened or keyed to the ratchet wheel 72, is also caused to advance from one of the contact points 78 to the next contact point in the series of spaced contact points 78 arranged along the arc of a circle defined by the traverse of the outer end of the contact arm 76, as already explained for Figure 1. A series of spaced contact points 80 is arranged along the arc of a circle, and each contact point 80 is connected to the corresponding contact point 78 as shown in Figure 2.

A contact arm 82 pivoting on a center 84 is adapted to make contact with any selected contact point 80 by manual adjustment of contact arm 82. It is thus seen that if contact arm 82 is set on the second of the contact points 80 as shown in Figure 2, it will be necessary to move contact arm 76 in a clockwise direction until it is touching the second of the contact points 78 before contact arms 76 and 82 are electrically connected together. The two contact arms are connected in a series circuit with a battery 86 and the coil 88 of a relay 90 having a fixed contact 92 and a movable contact 94 mounted on an iron armature in the usual manner, whereby current in coil 88 causes contacts 92 and 94 to be brought together. Thus, when contact arms 76 and 82 are touching connected contact points, current flows in the coil 88, actuating the relay 90, and bringing contacts 92 and 94 together. The battery 86 is connected in a series circuit with the contacts 92 and 94, a solenoid coil 96 and a normally open pressure actuated switch 98 which is depressed when the pressure plate or spider of the mine is depressed, through any convenient type of mechanical linkage, causing current to flow in the coil 96, drawing into the coil a plunger 100 having an extension forming a pawl 102 which is adapted to engage the teeth on a rotatable ratchet wheel 104, mounted on a center pivot 106. A contact arm 108 rotatably mounted on the pivot 106 is keyed to the ratchet wheel 104 so they rotate together. Along the arc traversed by the outer end of the contact arm 108 is placed a series of spaced contact points 110, so that the said contact arm may touch any of the said contact points.

A contact arm 112 rotatably mounted on a pivot 114 traverses an arc along which is a series of spaced contact points 116 and the contact arm 112 may be manually rotated to touch any selected contact point 116. The contact points 110 are each connected to corresponding contact points 116 as shown. The two sets of contact points 110 and 116 and the contact arms 108 and 112 are connected in a series circuit, as shown, with a battery 118 and an electric detonator 120 adapted to explode the main charge of the mine.

The procedure for using the device shown in Figure 2, may now be summarized briefly as follows. The mines each containing the impulse receiver and the selective stepper mechanism described above, are to be placed under the terrain or road to be traversed by the retreating friendly vehicle carrying the impulse transmitter 54. The first group of mines is set to be armed by one impulse, as shown in Figure 2, contact arm 82 being set to the position shown. Then a single impulse from the transmitter 54 as it passes over the first group of mines, causes the contact arm 76 to be moved over one notch to the second of the contact points 78, closing the series circuit, actuating relay 90 and drawing contacts 92 and 94 together. The effect is to place the mine in operative condition, that is, the mine is then in readiness to explode when the third of a column of hostile vehicles has passed over its pressure plate, the three vehicles having thus depressed the switch 98 a total of three times. If contact arm 112 were on the fifth of the contact points 116 instead of the fourth as shown in the drawing, then four hostile vehicles would actuate the switch 98 before the mine would explode.

Different groups of mines could be set to be armed by different numbers of impulses by suitably adjusting contact arm 82 to the desired contact point 80.

If mines are too closely spaced there is a possibility of an impulse intended for one mine causing the ratchets 72 of other mines to advance. To offset this, it may be desirable to equip the ratchet wheels 72 with a simple mechanical spring arrangement for returning them to their zero position when any series of impulses does not proceed far enough to cause current to flow in the coil 88, this being an indication that the impulses were not intended to arm that mine. If electric means are desired for resetting to zero, one of the types of mechanisms at present commonly used in phonograph reproducers which are remotely controlled by radio may be employed.

While the foregoing specification sets forth the invention in specific terms, it is to be understood

that numerous changes in the shape, size, arrangement and materials may be resorted to without departing from the spirit and scope of the invention as claimed herein.

I claim:

In an explosive mine having a main charge, an electric circuit comprising an electric detonator for exploding said main charge, a battery connected to the detonator for exploding the same, and switch means in said circuit for closing the same thereby actuating said detonator, said switch means comprising a pair of terminals, the first terminal connected to a pivot, a manually operable contact arm rotatably mounted on said pivot and electrically connected thereto, a plurality of spaced contact points disposed along the arc of a circle traversed by the outer end of said contact arm, said contact arm being rotatably adapted to touch any selected contact point, a second pivot electrically connected to the second terminal of said switch means, a second contact arm rotatably mounted on said second pivot and electrically connected thereto, a second plurality of spaced contact points disposed along the arc of the circle traversed by the outer extremity of said second contact arm and equal in number to the



first plurality of contact points, corresponding contact points in said first and second pluralities of points being connected together in pairs, electromagnetic means engaging said second pivot for stepwise unidirectional rotation, a source of electric potential for energizing said electromagnetic means for a single impulse, and pressure operated switch means for closing the circuit to said electromagnetic means.

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