

Mine to be buried for use in war

The present invention relates to a mine to be buried for use in war, comprising a mine body having a detonator and a firing pin for exploding it.

It is known that mines for use in war are buried in positions such that they are concealed from view. It is also known that the detonation of such mines is caused by the action of a firing pin on a detonator. This firing pin may in its turn be controlled in various manners: for example, electrically, in which case the command arrives along buried cables whereby nothing projects above the ground, or mechanically, one or more taut wires being placed close to the ground and leading to a rod which is connected to the firing pin and projects from the ground, forming a so-called trip device.

When a suitable signal (electrical or mechanical) arrives, the mine explodes in the position in which it has been buried. The fact that the mine is buried considerably influences the explosion because of the soil surrounding it laterally; indeed, the presence of soil around the mine in practice causes the effect of the explosion to develop in the form of an inverted cone having its vertex in the mine.

Thus, the problem arises of making a mine which can act horizontally and which, at the same time, does not have parts visible above ground once it is emplaced.

In the prior art this problem is resolved by causing the mine to be expelled vertically from the ground before exploding. For this purpose, an expelling charge is located beneath the mine. The electrical or mechanical external control acts on the charge the ignition of which causes the expulsion of the entire mine out of the ground in a vertical direction before it explodes. The explosion of the mine thus occurs above the

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ground and its effect may therefore extend in a horizontal direction.

Such mines are not wholly satisfactory, however; in fact, they have problems of reliability, the explosion being linked to any pyric delays in the detonation chain or to complex constraints which make the explosion occur as a function of the height reached by the mine. In these cases, the attitude and hence the effectiveness of the mine in a plane which it is difficult to render horizontal (parallel to the plane to be saturated with splinters) is frequently compromised.

The object of the present invention is to solve this problem by providing a mine for burial, which can act in a horizontal sense, and which is very reliable in operation, does not require a complex control system for its detonation, and does not require a very deep excavation for its emplacement.

Accordingly, the present invention provides a mine of the aforesaid type, in which it further includes a frame for providing a substantially horizontal rest plane, on which the mine body is rotatably supported about a horizontal axis of rotation, means for automatically operating the firing pin only when the mine body is in an explosion position at a predetermined angle of rotation to the plane of the frame, and means for causing, on command, the rotation of the mine body through an angle at least equal to the predetermined angle from a rest position substantially parallel to the plane of the frame.

One embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a partially-sectioned view of a mine according to the invention emplaced and in its rest position;

Figure 2 is a partially-sectioned view of the mine of Figure 1 in its position of explosion;

5 Figure 3 is a section taken on the line III-III of Figure 2, and

Figure 4 is a partially-sectioned view of a detail of the mine of Figure 1.

A mine according to the invention comprises a mine body 1 and a frame 2 defining a substantially horizontal rest plane 3. The
10 mine body 1 contains a main charge and a booster 5 and has an appendage 6 at one end which defines an internal chamber 7.

Within the chamber 7, in front of the booster 5, is housed a detonator 8 mounted on a detonator carrier 9. A firing device, generally indicated 10, is arranged in front of the detonator
15 8. This firing device 10 includes a fixed part 11 comprising a cylindrical skirt 12 which carries a firing pin 13 slidable internally thereof and a movable cylinder 14 slidable externally thereof. Between the firing pin 13 and the cylinder 14 is a spring 15 housed in respective seats 16, 17, in the
20 firing pin 13 and the cylinder 14. A transverse hole 18 is formed in the cylindrical skirt 12 of the fixed part 11 and acts as a seat for a ball 19 of a diameter greater than the thickness of the skirt 12. Another seat 20 for the ball 19 is formed in the cylinder 14 slidable externally of the skirt
25 12 in a position such that it is located opposite the hole 18 when the movable cylinder 14 is fully displaced towards the detonator 8, and is of a depth greater than the difference between the diameter of the ball 19 and the thickness of the movable cylinder 14. Externally of the movable cylinder 14, and coaxial therewith, is fixed a feeler 21 with an end 22.
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which projects from the firing device 10.

The mine body 1, the appendage 6 and the feeler 21 are aligned on an axis 23 which, in the rest position, is parallel to the rest plane 3.

5 The mine body 1 is attached to the frame 2 by the appendage 6 for rotation about a horizontal axis 24 perpendicular to the axis 23. This rotary attachment is achieved by a horizontal pin 25 fixed rigidly to the frame 2 by supports 26; the pin 25 is inserted in holes 27 formed transversely in the appendage
10 6 close to the end of the appendage 6 itself, in conformity with the axis 24.

A cam 28 is fixed rigidly to the pin 25 within the chamber 7 in front of the end 22 of the feeler 21. The profile of the cam 28 includes a section 29 which faces horizontally towards
15 the end 22 of the feeler 21 when the mine is in the rest position, a section 30 facing upwardly, and a section 31 between the sections 29 and 30. The distance of the section 29 from the axis 24 is less than that of the section 30; the section 31 is a connecting section between the first two. The end 22
20 of the feeler 21 is kept against the profile of the cam 28 by the spring 15.

A device known in the armaments field as a powder motor is generally indicated 32 and is also fixed to the frame 2 on the opposite side of the mine body from the supports 26; this motor
25 includes a fixed part 33 rigid with the frame 2 and a movable part 34 located above the fixed part 33 and free to move vertically away from it under the force of an explosion of a charge located between the two parts. The movable part 34 and the part of the mine body 1 close to it are provided with respective means to
30 enable the movable part to draw the mine body with it; these

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means include, for example, an annular projection 35 on the part 34 and two brackets 36 on the mine body 1 which rest on the projection 35.

The powder motor 32 is controlled in a conventional manner, for example, electrically or, as shown in the drawings, by a rod 37 projecting from the ground and incorporated in an array of wires (not shown in the drawings) close to the ground, thus forming a trip device.

A mine as described above is buried with the plane 3 of the frame horizontal and the axis 23 of the mine parallel thereto, so that the mine lies on the frame just below the level T of the ground. In this position, the rest position, the end of the feeler 21 rests on the section 29 of the cam profile 28 and projects fully. At the other end, the brackets 36 of the mine rest on the projection 35 of the movable part 34 of the powder motor 32. Thus, as with the usual buried mine, the rod 37 may be the only part to project from the ground.

When the charge of the motor 32 is made to explode, for example, as a result of an impact against the wires of the trip device, the part 34 is propelled upwardly and draws the mine body 1 with it, making the latter rotate out of the ground. During this rotation, the end 22 of the feeler 21 follows the profile of the cam 28, first on the section 29, then on the section 31, and finally on the section 30; the cam profile, by protruding further and further, thrusts the end 22 into the firing device 10.

The protrusion of the section 30 is such that, when the end 22 is located thereon and the axis of the mine 23 is perpendicular to the plane 3, the movable cylinder 14 thrust by the feeler 21 is displaced fully towards the detonator 8, compressing the spring 15, until the seat 20 is no longer in front of the hole

18 and allows the escape of the ball 19 and the release of the firing pin 13, the firing pin 13 striking the detonator 8 and causing the mine to explode. The mine thus explodes automatically when it is in a vertical position completely out of the ground, its effect being directed horizontally.

From the present description, it will thus be clear that a mine according to the invention completely solves the problem discussed above; indeed, the reliability of a mine according to the invention is ensured by the fact that the explosion of the mine is governed by the reaching of a well determined geometrical position safely out of the ground, ensuring the correct orientation at the moment of the explosion. Moreover, the powder motor, as used in a mine according to the invention, does not need a very large firing charge in that it does not lift the entire mine but only makes it rotate. Furthermore, given the horizontal arrangement of the mine in the rest position, a fairly shallow hole suffices for its emplacement.

To advantage, the mine will have a safety device which prevents the accidental rotation of the mine relative to the frame (which could cause an explosion). This device may comprise, for example, a pin (of which only the axis is indicated schematically at 38) engaged in a first hole formed in a plate fixed to the mine body and in a second hole formed, in correspondence with the first, in the fixed part 33 of the motor 32. This pin will be removed only after emplacement.

To advantage, the frame 2 has lugs 39 which ensure better stability of the whole unit relative to the ground when the mine body has been rotated.

CLAIMS

1. A mine to be buried for use in war, comprising a mine body having a detonator and a firing pin for exploding it, in which it further includes a frame for providing a substantially horizontal rest plane, on which the mine body is rotatably supported about a horizontal axis of rotation, means for automatically operating the firing pin only when the mine body is in an explosion position at a predetermined angle of rotation to the plane of the frame, and means for causing, on command, the rotation of the mine body through an angle at least equal to said predetermined angle from a rest position substantially parallel to the plane of the frame.

2. A mine as claimed in Claim 1, in which the means for operating the firing pin include a feeler on the mine body which is kept in pressure contact with a cam fixed relative to the frame coaxial with the horizontal axis of rotation, the cam having a profile which comprises a first section closer to the axis of rotation and facing horizontally towards the feeler when the mine is in the rest position, a second section further from the axis of rotation and facing upwardly, and a third section connecting the first and second sections.

3. A mine as claimed in Claim 1 or Claim 2, in which the means for causing the rotation of the mine body include a powder motor having a fixed part attached to the frame and a movable part which engages the mine body on the opposite side from the axis of rotation by means of mating projections on the mine body and the movable part of the powder motor.

4. A mine to be buried for use in war, substantially as herein described with reference to , and as shown in, the accompanying drawings.

