

[54] **MECHANICAL-PYRIC DEVICE
UTILIZABLE IN THE TYPE OF ANTI-MAN
MINES WITH A WIDE ACTION RANGE
AND GUSHING OUT FROM THE GROUND**

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[51] Int. Cl. **F42b 23/10**

[58] Field of Search..... **102/2, 7.2, 8, 70 R**

[56] **References Cited**

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Primary Examiner—Samuel W. Engle

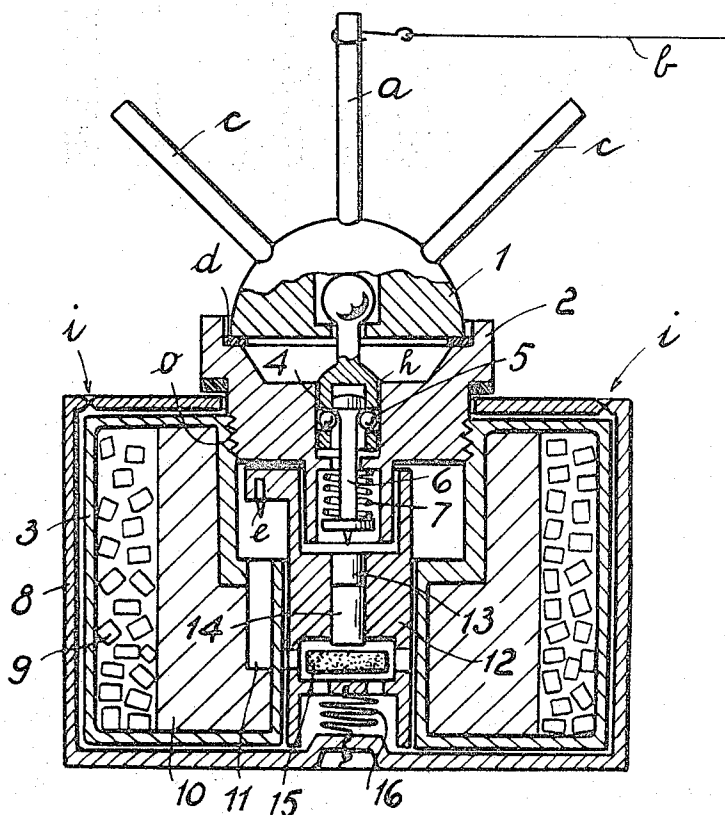
Attorney, Agent, or Firm—McGlew and Tuttle

[57] **ABSTRACT**

The mechanical device may be applied to anti-

personnel mines of the type ejected from the ground by a throw-charge and deflagrated in the air by an explosive charge to cover a wide action range. The device comprises an igniter operable by either pressure or traction, and a throw bowl concealable in the ground and enclosing an ejectable body containing all the other components of the mine including a throw charge, an explosive charge, a firing pin for the throw charge, and a firing pin for the explosive charge. The igniter is disengageably connected to the ejectable body, and the firing pin for the throw charge is connected to the igniter and is operable to ignite the throw charge responsive to pressure or traction on the igniter. A detonator is provided for the explosive charge, and the ejectable body encloses a mounting member, mounting the firing pin for the explosive charge in a stable position spaced substantially from the detonator and a substantial distance out of alignment with the detonator. A flexible tensile member interconnects the mounting member and the throw bowl. When the throw charge is ignited to eject the body from the throw bowl, the tensile member exerts a restraining force on the mounting member which causes the firing pin for the explosive charge to be moved into alignment with the detonator and then impacted against the detonator when the ejectable body is a pre-selected distance above the throw bowl.

6 Claims, 3 Drawing Figures



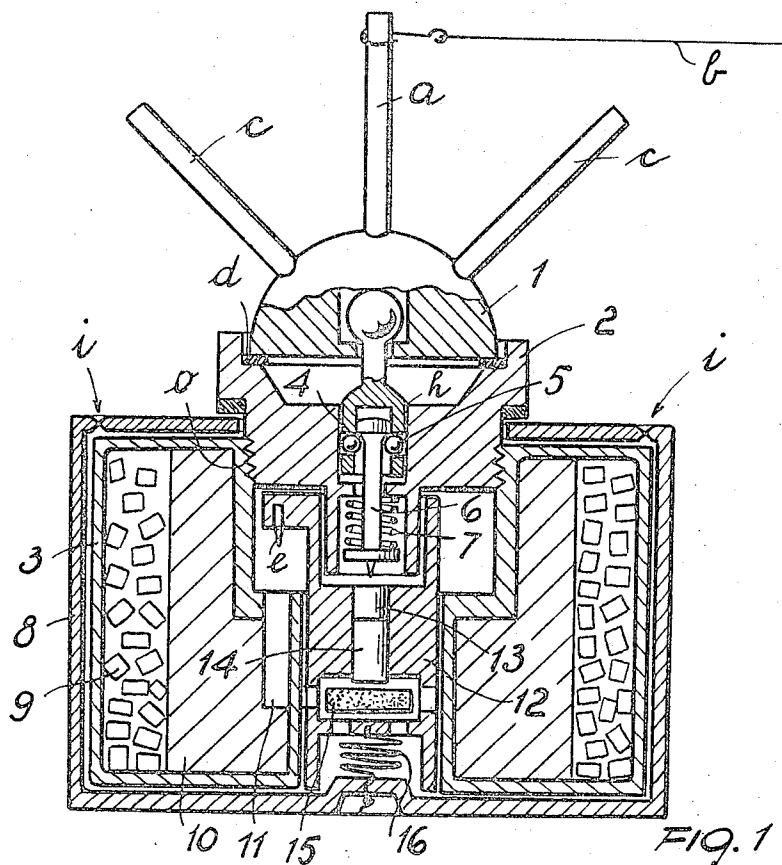


FIG. 1

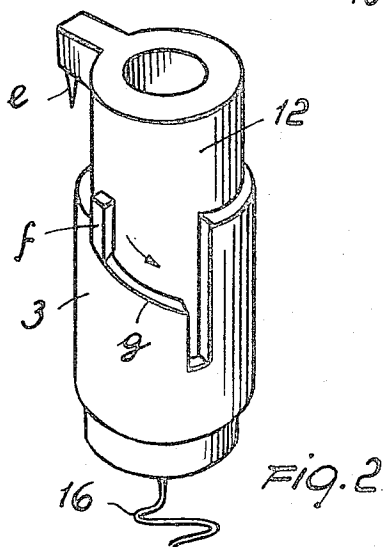


FIG. 2

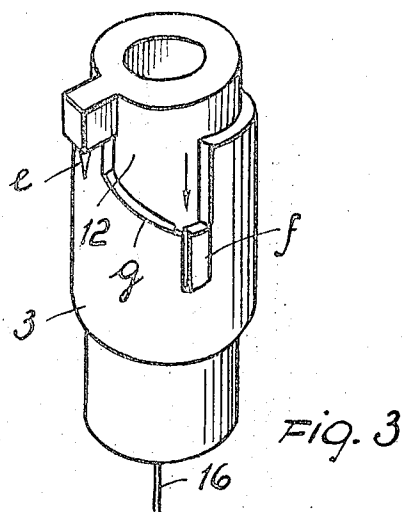


FIG. 3

MECHANICAL-PYRIC DEVICE UTILIZABLE IN THE TYPE OF ANTI-MAN MINES WITH A WIDE ACTION RANGE AND GUSHING OUT FROM THE GROUND

The present invention relates to a mechanical-pyric igniter device suitable for being applied to anti-personnel mines with a wide action range of the kind termed "gushing out from the ground," that is to say mines which are ejected out from the soil by a throw charge before they are deflagrated by an explosive charge to cover a wide action range in the air.

This device comprises, substantially, an igniter which may be acted on through pressure or through traction, a throw bowl to be placed in the ground, containing all the other elements of the mine and having a cover connected thereto by a peripheral line of easy breakage, and two firing pins, one for the throw charge and the other for the explosion charge. The firing pin for the explosive charge is normally stably mounted at a position spaced substantially from, and which is a substantial distance out of alignment with, a detonator for the explosive charge. Responsive to ejection of the mine from the ground, the firing pin for the explosive charge is moved into alignment with the detonator for the latter and then moved to impact the detonator.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the Drawing:

FIG. 1 is a diagrammatic sectional view of a mine equipped with one embodiment of a mechanical-pyric device in accordance with the invention; and

FIGS. 2 and 3 are perspective views of the firing pin for the explosive charge and its supporting and guiding members, FIG. 2 illustrating the firing pin for the explosive charge in its normal stable position and FIG. 3 illustrating the firing pin for the explosive charge in its detonator impacting position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As may be seen in FIG. 1, the igniter is made up of a semi-spherical cap 1, on which there are rigidly fastened some rods, such as those indicated at *a* and *c* in the drawing, and of which the central one *a* has its top end, protruding from the soil, connected to a trip wire *b*, while the ends of the peripheral rods *c* also protrude from the soil.

Cap 1 rests on the seat *d* of a bearing 2 which, at its lower portion, is formed with a thread 0 or another fast coupling device, for securing it to an ejectable body 3 of the mine, located in a throw bowl 8.

Bearing 2 is formed with a central or axial bore providing chambers containing a short rod 4 having a ball-form upper end engaged in cap 1, with its lower end being formed as a cage containing balls or ball bearings 5 which connect a firing pin 6 with the cage. A spring 7 normally biases firing pin 6 into a position where its upper head is engaged with the balls 5.

The throw bowl 8 contains an ejectable body 3 in which there are placed fragments 9 of the explosive 10 and a detonating capsule 11.

In a central chamber of the ejectable body 3 there is placed a cylindrical body 12, carrying, on a lateral or

radial projection, a second firing pin *e*. Body 12 contains, along its vertical axis, a fuse igniting capsule 13, a pyric delay element 14 comprising generally a length of fuse of a slow combustion, and a throw charge 15 comprising, granules of black powder enclosed in a small box of inflammable material. This body 12 is connected to the throw bowl 8 by means of a short flexible rope, for instance a metallic cord 16, for the purpose of restraining cylindrical body 12 when the ejectable body 3 is being thrown out of the ground. Thereby, as shown in FIGS. 2 and 3, the body 12, guided by a tooth *f* thereof which slides along a helical guide *g* in the wall of the central chamber of body 3, at first rotates through 90°, bringing the second firing pin *e* into vertical alignment with the detonating capsule 11, and thereafter firing pin *e* is moved axially or longitudinally relative to capsule 11, which is moving upwardly with ejectable body 3, to impact the capsule.

The described arrangement eliminates the necessity for a spring for the functioning of the firing pin, and this assures a simpler and more positive functioning of the parts. It further makes possible the introduction of the detonating capsule followed by activating the mine from the top after having previously removed cap 1 with the bearing 2, as the second firing pin *e*, in its initial or stable position, is offset angularly 90° with respect to the detonating capsule 11.

There is thus; an absolute safety inasmuch as, as long as the body 3 has not been ejected, the cylindrical body 12 resting, on the bottom of the throw bowl 8, is so positioned that firing pin *e* can not strike incidentally the capsule 11 because it is axially spaced and 90° offset with regard to the capsule.

The functioning of the device disclosed above and diagrammatically shown in the drawing, is as follows:

when, by drawing the wire *b* or through pressure exerted vertically on the peripheral rods *c*, there is brought about a tilting of the cap 1, so that cap 1 necessarily rises, dragging with itself the small rod with cage 4 and the firing pin 6, which is engaged with the cage through the small balls 5. In this manner the helical spring 7 is tensioned. This continues until the balls 5 reach the edge *h* inasmuch as, when the balls have gone beyond the edge, they go out of the cage of the small rod 4, releasing the firing pin 6 which, pushed by the spring 7, strikes the fuse igniting capsule 13.

The capsule, igniting itself, ignites in turn the slow combustion fuse 14 which, after two or three seconds, ignites the black powder 15.

The pressure of the gas produced by the combustion of the powder breaks the weakened line *i* of the throw bowl 8 and the ejectable body 3, with all its contents, is hurled upwardly unwinding the cord 16. When this cord is tensioned, it holds the cylindrical body 12 while the body 3, complete, continues its rising, for a short length. In this manner the side firing pin *e* as already set forth, goes from the position shown in FIG. 2 into the position shown in FIG. 3 and strikes the detonator 11 bringing about the deflagration of the explosive 10 and the ejection of the fragments 9 to the outside.

From the foregoing description, it will be clear that the present invention presents many advantages over prior art arrangements for the same purpose. Thus, it will be understood that the firing pin *e* which controls the explosion of the mine, works without any spring. Normally, such a firing pin is inclined to deteriorate and thereby produce a degree of danger, a disadvan-

tage which is obviated by the arrangement of the invention as shown more particularly in FIGS. 2 and 3. Finally, the entire assembly is very simple and sturdy, as well as being very inexpensive.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What I claim is:

1. A mechanical pyric device, usable with anti-personnel mines of the type ejected from the ground by a throw-charge and deflagrated in the air by an explosive charge to cover a wide action range, said device comprising, in combination, an igniter operable either by pressure or traction; a throw bowl concealable in the ground and enclosing an ejectable body containing all the other components of the mine including a throw charge; an explosive charge, a first firing pin for said throw charge and a second firing pin for said explosive charge; said igniter being disengageably connected to said ejectable body; said first firing pin being connected to said igniter and operable to ignite said throw charge responsive to pressure or traction on said igniter; a detonator for said explosive charge; means mounting said second firing pin for moving toward and into impact relation with said detonator, said mounting means normally maintaining said second firing pin in a stable position spaced from and out of alignment with said detonator; and means connected to said second firing pin and operable, responsive to ejection of said body from said throw bowl into the air, to move said second firing pin into alignment with said detonator and then to impact said detonator.

2. A mechanical-pyric device, as claimed in claim 1, in which said igniter comprises a substantially hemispherical cap carrying rods projecting radially therefrom and operable either by pressure or traction; a bearing supporting said cap for tilting movement; a support mounted in said bearing for sliding movement axially thereof, and having a head forming a universal joint connection with said cap whereby, upon tilting of said cap, said support is moved axially of said bearing; means disengageably connecting said first firing pin to said support and releasing said first firing pin responsive to a predetermined axial movement of said support; and spring means operatively associated with said first firing pin and operable, responsive to such release

of said first firing pin, to move the same axially into igniting relation with said throw charge.

3. A mechanical-pyric device, as claimed in claim 2, in which said support includes a cage containing balls engaging beneath an upper head of said first firing pin; said cage normally being axially positioned such that said balls are below a planar surface of said bearing; said balls, upon upward movement of said support by said igniter moving outwardly onto said planar surface to disengage the upper head of said first firing pin.

4. A mechanical-pyric device, as claimed in claim 1, including a cylindrical element having a radially projecting arm carrying said second firing pin; a cylindrical sleeve in said ejectable body, slidably mounting said cylindrical element and having a helical guide whose lower end communicates with an axial slot spaced angularly from the upper end of said helical guide; a lug on said cylindrical element spaced angularly from said second firing pin and normally positioned at the upper end of said helical guide to maintain said second firing pin in said stable position in which said cylindrical element rests on a bottom wall of said throw bowl; said means connected to said second firing pin comprising a flexible cord connected between said cylindrical element and the bottom wall of said throw bowl and, responsive to ejection of said ejectable body from said throw bowl into the air, restraining upward movement of said cylindrical element so that said lug moves downwardly along said helical guide and drops into said axially extending groove to displace said second firing pin angularly into alignment with said detonator and to engage said second firing pin with said detonator.

5. A mechanical-pyric device, as claimed in claim 4, in which said cylindrical element is axially aligned with said first firing pin and contains said throw charge, a fuse igniting capsule engageable by said first firing pin and a delay element ignitable by said capsule and operable to ignite said throw charge.

6. A mechanical-pyric device, as claimed in claim 1, in which said throw bowl comprises a bottom wall, a peripheral wall integral with said bottom wall, and a top cover overlying said ejectable body and integral with said peripheral wall at a peripheral line of a predetermined weakness whereby, upon ignition of said throw charge, said cover breaks away from said peripheral wall at said peripheral line to provide for ejection of said body into the air from said throw bowl.

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