United States Patent [19]

Harnau

[11] **3,842,742**

[45] **Oct. 22, 1974**

[54] **ELECTRICAL IGNITER WITH A CERAMIC OR QUARTZ ELEMENT AS SOURCE OF ELECTRICAL ENERGY FOR SHELLS OR MISSILES, AND PARTICULARLY FOR SMALL-CALIBER SHELLS**

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[22] Filed: **June 29, 1973**

[21] Appl. No.: **374,920**

[30] **Foreign Application Priority Data**

June 30, 1972 Germany 2232051

[52] **U.S. Cl.** ..... **102/70.2 GA**

[51] **Int. Cl.** **F42c 11/02**

[58] **Field of Search** ..... 102/70.2 GA, 70.2 R

[56] **References Cited**

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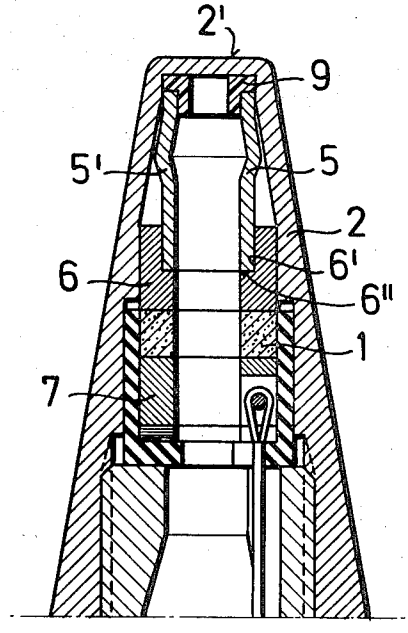
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Attorney, Agent, or Firm—Ernest G. Montague; Karl F. Ross; Herbert Dubno

[57] **ABSTRACT**

An electric ignition device, which comprises ceramic means having a piezo effect to constitute a source of electrical energy for small-caliber shells, and the ceramic means is formed as a ring.

3 Claims, 2 Drawing Figures



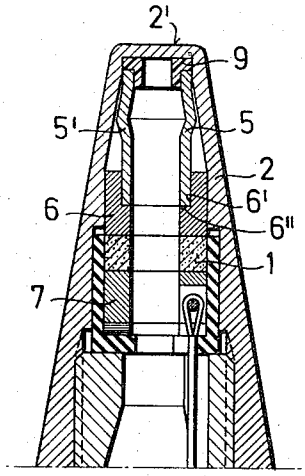


FIG. 1

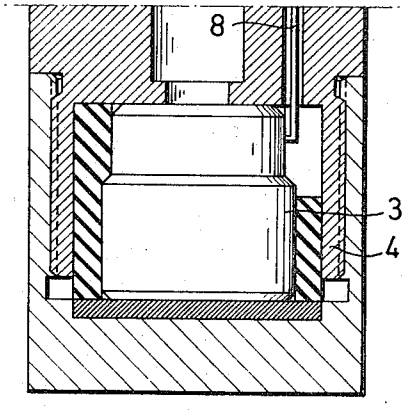


FIG. 2

ELECTRICAL IGNITER WITH A CERAMIC OR QUARTZ ELEMENT AS SOURCE OF ELECTRICAL ENERGY FOR SHELLS OR MISSILES, AND PARTICULARLY FOR SMALL-CALIBER SHELLS

Electrical igniters and ignition devices are known in which ceramic or quartz elements of a piezo effect are used as source of electrical energy.

In the case of shells or missiles in which — as, for instance, in the case of hollow-charge shells — the column of explosive is initiated from the rear, the igniter is arranged in the bottom of the shell, provided that with this arrangement, known as an inertia igniter, the ignition is introduced sufficiently rapidly corresponding to the speed of impingement of the shell. In shells of high speed of impingement, an inertia igniter can no longer be used.

In order that the hollow-charge projectile is developed in due time in the case of high speeds of impingement, the ignition must be introduced only a few microseconds after the tip of the shell has touched the target. This requirement is fulfilled by arranging the source of energy as a rule directly in the tip of the shell, while the safety system is arranged in the detonator in the bottom of the shell. These two assemblies, namely source of energy and safety system, are connected with each other in electrically conductive fashion.

The source-of-energy assembly for the hollow-charge projectile represents an additional mass, which must be penetrated, as a result of which the penetration power of the hollow charge in the target proper is reduced.

While this reduction of power is only slight from a percentage standpoint in large-caliber shells, it has a very strong effect in the case of small-caliber shells, such as, for instance, of 20 – 40 mm. In addition to this is the fact, that in small shells, the diameter of the tip of the shell is also very small.

If one assumes that a given ignition energy must be produced, then a given minimum volume results, when calculating the ceramic or quartz element. While this volume is obtained by means of a relatively thin disk in the case of large-caliber shells and thus also with larger diameter of the shell tip, on the other hand, in the case of small-caliber shells, there results a cylinder of small diameter and correspondingly large length, which arrangement has an even more unfavorable effect on the penetration power of the hollow charge. For the complete ignition circuit furthermore, a cylindrical ceramic element is also less favorable than a disk-shaped element, since the voltages produced become higher and the self-capacities smaller in accordance with the length (height).

It is one object of the present invention, to provide an electric igniter which eliminates the above stated drawbacks. This is done by developing the ceramic or quartz element in the shape of a ring. This developing of the ceramic or quartz element in the shape of a ring has the advantage, when it is arranged in the shell tip of hollow-charge shells, for instance, that due to its flatness it leads to smaller voltages and thus the problems of insulation are also reduced. On the other hand, no power-reducing mass stands in the way of the hollow-charge projectile.

By this formation of the source of energy, base igniters can also be developed more favorably, since as a rule the detonator cap is arranged in the center of the igniter, which now becomes free due to the ring-shaped development of the ceramic element. The structural height of the igniter can thus be reduced.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawing, in which:

FIG. **1** is an axial section of the front part of a small-caliber shell; and

FIG. **2** is an axial section of the rear part of the small-caliber shell.

Referring now to the drawing, an igniter with annular ceramic or quartz element **1** in the tip **2** of a small-caliber shell is shown in the drawing. Since this is a hollow-charge shell, the safety device **3** with detonator cap is arranged in the bottom **4** of the shell. Upon impingement on a target, the tip of the shell is deformed and the pressure wave thereby released is transmitted via a pressure transmission tube **5** and an annular pressure piece **6** to the ceramic or quartz ring **1.** In this connection the pressure piece **6** sits flat on the upper annular surface of the ceramic or quartz element ring **1.** The ceramic ring in its turn is supported by a ring **7,** to which a wire **8** which produced the electrically conductive connection to the safety device is fastened. The pressure transmission tube **5** is preferably widened in its central portion **5'**, so that it expands upon impingement against a stable target, and in this way the bore remains dependably free for the hollow-charge projectile.

The pressure piece **6** has a milling **6'** to form an inner supporting edge **6''** for the inserted end of the pressure transmission tube **5.** Upon impact on a target from a slight angle, the pressure transmission tube **5** is bent away laterally, but transmits the pressure to the ceramic ring via the upper edge of the pressure piece.

Directly below the impingement surface **2'** of the shell point **2** there is arranged an annular damping member **9,** so that no premature ignition can be released by small, brief blows, such as, for instance, the striking of raindrops.

The annularly developed ceramic or quartz element can generally be used in ignition devices of shells and missiles and to particular advantage, to be sure, in small - caliber shells.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense.

I claim:

1. An electric ignition device, comprising

ceramic means having a piezo effect constituting a source of electrical energy for small-caliber shells,

said ceramic means is formed as a ceramic ring,

said ceramic ring being disposed in a tip of a shell and having an upper annular surface,

an annular pressure piece,

a pressure transmission tube provided in said tip of said shell and resting on said annular pressure piece,

said pressure piece being seated flat on said upper annular surface of said ceramic ring,

another ring supporting said ceramic ring from a bottom of the latter,

a safety device,

a wire means fastened to said another ring for producing an electrically conductive connection with said safety device, and

said pressure piece having a milling forming an inner supporting edge for the inserted end of said pressure transmission tube.

2. The elctric ignition device, as set forth in claim **1**, wherein

said pressure transmission tube is widened in its central portion.

3. The elctric ignition device, as set forth in claim **2**, wherein

an annular damping member is placed in front of said pressure transmission tube in the shell tip under the impact surface.

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