

A PROJECTILE

The invention relates to a projectile in which an electronic ignition or detonation circuit is accommodated in a fuze housing 5 secured to a projectile jacket.

In the case of projectiles of this kind, generally tantalum capacitors are necessary in the electronic ignition circuit. It has become apparent that charged tantalum capacitors can lose part of 10 their charge as a result of operational shock loadings. This is unfavourable, because the charge of the tantalum capacitors is essential for the ignition functions of the projectile.

The task of the invention is to mount the ignition circuit in 15 such a way in the fuze housing that the effect of shock loadings on the components of the ignition circuit is damped.

In accordance with the invention there is provided a projectile having a jacket, casing or like outer member, a fuze housing secured 20 to said outer member, and an electronic ignition, detonation or like actuating circuit disposed in the fuze housing; wherein said circuit is embedded in a block of hardened (set) foam-plastics material; wherein said block is located between bodies which jointly substantially enclose the block; wherein each of the bodies comprises 25 a layer of an elastomeric material which is more resilient than the relatively stiffer foam-plastics material of the block; and wherein said layers are thinner than said block.

The block is preferably formed by foaming plastics material 30 around the circuit and allowing or causing the foam to harden or set with the circuit in situ to form the block, so that the circuit is intimately embedded in the set or hard-foam block.

The component parts of the ignition circuit are fixed in the 35 hard-foam block. This forms surfaces which are supported against the damping bodies. The hard-foam block is mounted "floating" in the fuze

housing. If a severe shock, for example upon impact on a hard ground, acts on the projectile, then this shock is propagated by way of the fuze housing and the damping bodies only in a damped manner onto the hard-foam block. This itself distributes the residual shock loading 5 to the components of the electronic circuit. The shock loading is thereby so reduced that tantalum capacitors do not discharge and also the danger does not exist of components coming loose from the circuit plate of the ignition circuit.

10 Since, in the case of the projectile, the shock loadings acting in the axial direction are greater than the shock loadings acting in the radial direction, in preferred development of the invention the damping bodies effective in the axial direction of the projectile are thicker than the radially effective damping bodies.

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Preferably the damping bodies are formed from a polyurethane elastomer. This material is in its cell structure compressible in volume, and is suitable for the production of damping bodies having a progressive characteristic compression curve.

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Further advantageous developments of the invention will become apparent from the following description of an exemplified embodiment. The drawing shows the tail region of a projectile in section.

25 Fastened to a projectile jacket 1 is a fuze housing 2 with a lid 3. This is held by means of screws 4 onto the fuze housing 2.

For the retention of the fuze housing 2 on the projectile jacket 1, this has a flanging 5 which engages over a flange 6 of the fuze 30 housing 2. Arranged on the circumference (periphery) of the projectile jacket 1 are secondary projectiles 7. An explosive 9 is accommodated in an inner case 8. Foamed into a circumferential groove of the fuze housing 2 is polyurethane foam 10, which reaches as far as the explosive 9.

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Inserted into the interior space of the fuze housing 2 is an

outer damping ring 11 which butts against the circumference of the fuze housing 2. Inserted into the damping ring 11 is a damping disc 12 which rests on the base 2' of the fuze housing 2. The damping disc 12 has an eccentric opening 12'. An inner damping ring 13 is inserted 5 into this opening 12' so as to be eccentric to the ring 11. Inserted into the space remaining between the outer damping ring 11 and the inner damping ring 13 is a polyurethane hard-foam block 14. Foamed into the hard-foam block 14 is an electronic fuze or ignition circuit which is not shown. Placed onto the hard-foam block 14 is a damping 10 disc 15 which is identical to the damping disc 12 and which has a opening 15'. The hard-foam block 14 is thus enclosed on all sides by the damping discs or respectively the damping rings.

The damping discs 12 and 15 and the damping rings 11 and 13 are 15 produced from a polyurethane elastomer. They form damping bodies having a progressive spring characteristic curve. The damping bodies are relatively thin and thus occupy little space in the interior of the fuze housing 2. The damping discs 12 and 15 are, for example, in each case 2mm thick. A thickness of 1mm is sufficient for the damping 20 rings 11 and 13.

Inserted into the interior of the inner damping ring 13 is a part 16 of a three-part safety mechanism. The two other parts 17 and 18 substantially fill the residual interior space of the fuze housing 2. 25 Mainly the part 18 butts against the damping disc 15.

Arranged loosely inside the lid 3 is a compensating disc 19. This is so adjustable by means of tolerance compensating screws 20 that the parts 16, 17, 18 of the safety mechanism are seated without 30 play in the fuze housing 2. The part 18 presses in this respect onto the damping disc 15, so that also the hard-foam block 14 is held in an axially playless manner between the damping discs 12 and 15.

The ignition circuit foamed into the hard-foam block 14 is 35 connected electrically to components of the safety mechanism. The electrical connections (not shown in the drawing) are formed by

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flexible conductor webs. In this way the electronic circuit is decoupled mechanically from the safety mechanism.

Upon use of the projectile, shock loadings can occur which can amount to about 20 000 g. Such shock loadings do not take effect in full magnitude on the electronic ignition circuit. This is because the damping bodies 11, 12, 13 and 15 deform upon such loadings and thereby reduce such loading peaks. The polyurethane foam of the hard-foam block 14 alone could not achieve this, because it would break to pieces under such loadings. However, because the block is clamped between the damping bodies 11, 12, 13 and 15, the block enhances the effects of the bodies.

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CLAIMS

1. A projectile having a jacket, casing or like outer member, a fuze housing secured to said outer member, and an electronic ignition, detonation or like actuating circuit disposed in the fuze housing; wherein said circuit is embedded in a block of hardened (set) foam-plastics material; wherein said block is located between bodies which jointly substantially enclose the block; wherein each of the bodies comprises a layer of an elastomeric material which is more resilient than the relatively stiffer foam-plastics material of the block; and wherein said layers are thinner than said block.
2. A projectile as claimed in Claim 1 wherein the block is formed by foaming plastics material around the circuit and allowing or causing the foam to harden or set with the circuit in situ to form the block, so that the circuit is intimately embedded in the set or hard-foam block.
3. A projectile as claimed in Claim 1 or 2, characterised in that said block is a polyurethane hard-foam block.
4. A projectile as claimed in Claim 1, 2 or 3, characterised in that the damping bodies which are effective in the axial direction of the projectile are thicker than the radially effective damping bodies.
5. A projectile as claimed in any one of the preceding claims, in which a safety mechanism is arranged in the fuze housing, characterised in that one of the damping bodies is arranged between the safety mechanism and the block.
6. A projectile as claimed in Claim 1, 2, 3 or 4, characterised in that the damping bodies include an outer damping ring and an inner damping ring, the block being disposed between said rings.
7. A projectile as claimed in Claim 6, characterised in that a part of a safety mechanism is accommodated in the inner damping ring.



8. A projectile as claimed in Claim 6 or 7, characterised in that the inner damping ring is arranged eccentrically with respect to the outer damping ring.

5 9. A projectile as claimed in any one of the preceding claims, characterised in that the damping bodies are formed from a polyurethane elastomer.

10. A projectile as claimed in any one of the preceding claims, in
10 which the or a safety mechanism and the ignition circuit are connected electrically, characterised in that the electrical connection is formed by flexible conductor webs.

11. A projectile as claimed in any one of the preceding claims,
15 characterised in that arranged in the fuze housing is a compensating disc which causes one of the damping bodies to press against the block.

12. A projectile as claimed in Claim 11 as appended to Claim 5, 7 or
20 10, wherein the compensating disc urges part of said safety mechanism against said one of the damping bodies which is caused to press against the block.

13. A projectile including an electronic actuating circuit which is
25 supported and arranged substantially as hereinbefore described with reference to the accompanying drawing.

14. A projectile substantially as hereinbefore described with reference to and as shown in the accompanying drawing.