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DELAY TRAIN FOR FUZE

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Fig. 2.

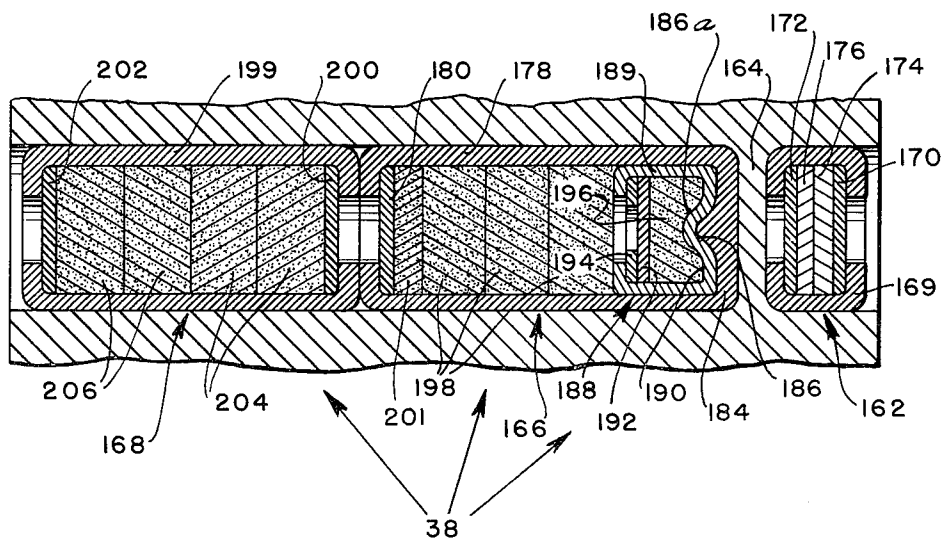
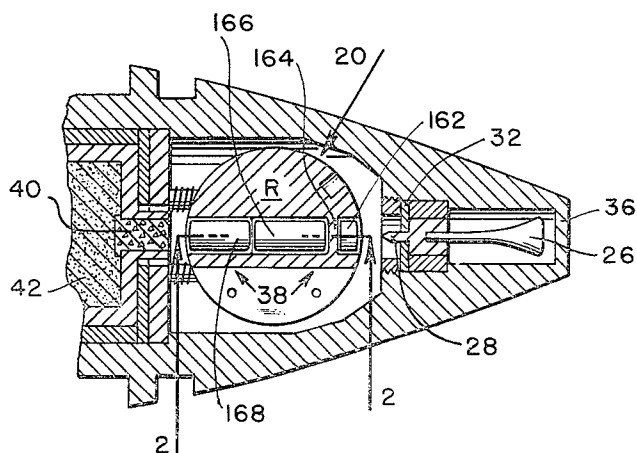


Fig. 1.



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DELAY TRAIN FOR FUZE

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1 Claim. (Cl. 102-85)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to improvements in pyrotechnic delay trains for fuzes.

One of the objects of the invention is to provide a delay train of short functioning time for use with missiles, such as rockets, which will permit the missile to penetrate a target, such as an airplane, before the main explosive charge carried by the missile is detonated.

Another object is to provide a delay train in accordance with the foregoing object which may be disposed within a relatively small space and which will have a substantially predetermined functioning time.

Another object is to provide a delay element or capsule of obturated design which will withstand high build-up pressures without rupturing.

Another object is to control the rate of burning of the delay element by employing a delay mixture which produces a minimum of gas.

Another object is to provide a delay train incorporating a wall separating brisance of a primary primer from a secondary primer incorporated in a delay element.

Further objects, advantages, and salient features will become more apparent from the description to follow, the appended claim and the accompanying drawing in which:

FIG. 1 is a longitudinal central section through the nose portion of a missile, such as a rocket, and

FIG. 2 is a greatly enlarged section taken on line 2-2, FIG. 1.

Referring in detail to the drawing, FIG. 1 illustrates one application of the invention wherein the delay train 38, which constitutes the subject of the invention, is disposed within an arming unit 20 having a rotor R, the forward end of the train, upon rotation of the rotor to armed position, as shown, being adapted to move into alignment with a hammer 26 and firing pin 28 and the rearward end into alignment with a lead-in 40 of a booster charge 42. The details of the rotor and mechanism for moving it to armed position form no part of this invention, these details being the invention of Winfred F. Sapp, disclosed in U.S. patent application Serial No. 342,039, filed March 12, 1953.

Delay train 38 previously referred to is illustrated as a short delay train (approximately 300 microseconds) adapted to effect detonation of the main charge in the missile after the missile has penetrated the target. As best shown in FIG. 2, this train comprises, in general, a primary primer 162, a metal diaphragm 164, forming an integral part of the rotor, a delay element 166 and a flash detonator 168.

Primer 162 comprises a tubular metallic cup 169, inwardly crimped at opposite ends thereof, and closed at its end by thin plates 170, 172, such as metallic foil. The cup contains two pellets 174, 176 of compacted or consolidated particles. Pellet 174 is a stab action initiated type of lead azide primer mix consisting by weight of approximately 33% potassium chlorate, 33% antimony sulphide, 28% lead azide and 6% Carborundum, while pellet 176 is all lead azide.

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Delay element 166 comprises an indeformable tubular member 178 of relatively thick stainless steel inwardly crimped at one end thereof and closed by a thin steel disk 180, and closed at its other end by an integral wall 184 having an anvil 186 projecting therefrom. A secondary primer 188 for the delay element is disposed adjacent the anvil, this primer comprising a tubular metallic member 189 having an integral wall 190 with an anvil 186a abutting wall 184 and anvil 186 and crimped at its opposite end, the latter being closed by paper disk 192 abutting a steel washer 194. The primer is filled with a pellet 196 of consolidated particles consisting by weight of a 97% mixture and 3% tetracene, the mixture being approximately stoichiometric and consisting by weight of approximately 27% zirconium and approximately 73% lead peroxide. The remainder of delay element 178 contains three pellets 198 of consolidated particles consisting by weight of 35% alloy and 65% lead peroxide, the alloy consisting by weight of 70% nickel and 30% zirconium and one pellet 201 of lead azide.

Flash detonator 168 comprises a tubular metallic member 199 which is inwardly crimped at both ends thereof and closed by aluminum disks 200, 202. Two pellets 204 of consolidated lead azide particles and two pellets 206 of consolidated particles of tetryl fill this tubular member.

In operation, when firing pin 28 stabs primer 162 the shock wave produced through diaphragm 164 initiates forces which compact the material in primer 188 between anvil 186a and washer 194, initiating this primer, which in turn initiates the delay material in delay element 166, the latter initiating in turn the lead azide charge 201, the energy of which initiates the flash detonator 168, the latter initiating lead-in 40, main booster 42, and the main charge carried by the missile (not shown).

The delay train 38 is illustrated substantially to scale, delay element or capsule 166 being approximately .160" in diameter and approximately .4" in length.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed is:

A delay train comprising a supporting member having a bore therein; a diaphragm separating said bore into a first section and a second section; a primary primer in said first section comprising a tubular element having open ends closed by rupturable discs and having one end adjacent said diaphragm; a compacted charge of stab action initiated type primer mix in the area of the tubular element adjacent the open end of said first section, said mix consisting of approximately 33% potassium chlorate, 33% antimony sulphide, 28% lead azide and 6% Carborundum; a compacted charge of lead azide between said charge of primer mix and the rupturable disc closing the end of said tubular element adjacent said diaphragm; a delay element in the second section of said bore comprising a tubular member having a closed end and an open end; a rupturable disc closing said open end, said closed end being adjacent said diaphragm; an anvil on the internal side of said closed end; a secondary primer adjacent said closed end comprising a cup having a crimped open end and a closed end, the closed end of said cup nesting with the internal surface of the closed end of said tubular member and the open end of said cup being closed by a rupturable disc; a washer between said rupturable disc of the cup and its crimped open end having an internal diameter less than that of the open end of the cup; a primer composition in said cup consisting of 97% of a mixture and 3% of tetracene, the mixture consisting of

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approximately 27% zirconium and 73% lead peroxide; a relay charge consisting of compacted lead azide adjacent the inner side of the rupturable disc closing the open end of said tubular member; a delay charge between said relay charge and the open end of said cup, said delay charge having a composition of approximately 35% alloy and 65% lead peroxide, the alloy consisting by weight of approximately 70% nickel and 30% zirconium; a flash detonator in said bore comprising a tube having open ends, said ends being closed by rupturable discs, one end of said tube being adjacent the open end of said delay element; a lead azide charge in the section of said tube adjacent the delay element; and a tetryl charge between the rupturable disc closing the end of said tube removed from said delay element and the lead azide charge in said tube.

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