DESIGN AND DEVELOPMENT OF PYROTECHNIC DELAY DETONATOR AND STUDY OF VARIOUS PARAMETERS AFFECTING BURNING RATE OF PYROTECNIC DELAY COMPOSITIONS.

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DEDICATED TO

My mother, wife and sons

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Abstract

Delay detonator is an explosive device used in various systems including sophisticated missiles, weapons and warheads. Delay detonators provide required delay time before certain effect is produced. Delay detonators are classified according to means of initiation. Bridge wire or hot wire delay detonator is a type of delay detonator which is initiated thermally by electric pulse. Required current is passed through the resistive wire which heats up and provides requisite energy for pyrotechnic composition to initiate. Delay time is one of the most important performance parameter of sophisticated missiles, warheads and weapons. It is critical when accurate delay time is required for some effect to occur in missile / weapons i.e. to perform some chemical/ mechanical operation after a certain delay time.

The objective of this work is to design and develop an accurate and reproducible electrically initiated pyrotechnic delay detonator and to determine the effect of various parameters (Confinment, Obturation, Venting etc) of delay body on burning rate of pyrotechnic delay composition in delay detonators. Nichrome wire has been used as a hot wire bridge to provide desired energy to initiate the igniting charge. The delay time was measured on a set-up comprising, inter alia, an oscilloscope. The work includes experimental study of various ignition, delay composition, secondary charge and design of delay body as well as detail study of different parameters affecting burning rate of delay compositions in delay detonators and their remedial actions.

The study reveals that the delay time is greatly affected by confinement, obturation and venting of delay body. It has been further observed that when the delay composition is initiated in confined body, the results show that the

time is considerably reduced as compared to unconfined and obturated delay body.

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