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Design and Construction of a Single Impulse Activated Grenade

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ABSTRACT

A single impulse activated grenade which is powered by an impulse has been designed, constructed and tested. The components used in the construction and the principles involved have been highlighted in this work. Its operation is electro-mechanically controlled. It was found that the grenade detonated in an impact, thus, it has the shortest detonating time.

Keywords: Grenade, Explosives, Detonation and Shock wave.

INTRODUCTION

Modern man has built gigantic bridges to span the seas and gargantuan buildings to kiss the skies but the invention of grenade marked the dawn of a new era in the science and technology world. A grenade, according to standard learners' English dictionary, is defined as a small bomb thrown by hand. Conventionally, grenades are small explosives or chemical missile used for attacking enemy troops, vehicles or fortified positions at close range. When designed to be thrown by hand they are called hand grenades. The term grenade was originally applied to any explosive shell fired from a gun. Also, grenades when adapted for lunching from riffle or carbine are called riffle grenades. "Grenades" is derived from French word for pomegranate because of resemblance to that fruit of early grenades shape. In later years, grenades were nicknamed "Pineapple" because of the bulbous and rough exterior of the type used in the World War 1, [1]. The diagram of a conventional hand grenade is as shown in the figure below.

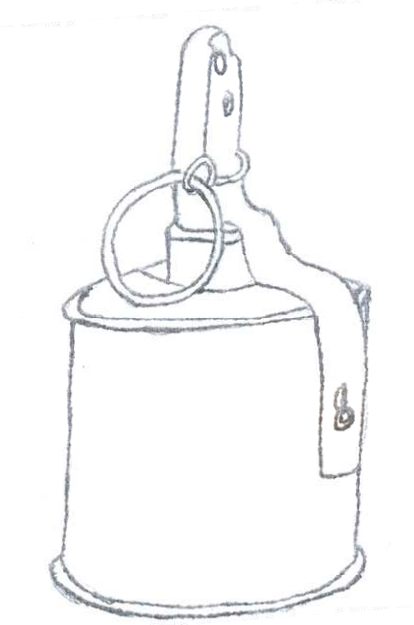


Fig.1a. Conventional grenade, [2,3].

So far as hand grenades are concerned, there are two types, "offensive" and defensive". The latter are designed to produce a large number of fragments of all sorts and thus to cause maximum damage, [4,5]. The former (offensive) grenades are design for use by assaulting infantry who can continue to move forward having thrown their grenades which produce a good blast effect and daze the defender without affecting the attacker much, if at all.

Grenades are of many brands, viz.

i. S53 smoke hand grenades (common in Germany)
ii. M 42 offensive hand grenades (common in Hungary)
iii. F1/n60 defensive riffle grenades (common in Poland)
iv. RG34 offensive hand grenades (common in Czechoslovakia)
v. RG4 offensive/defensive hand grenades (common in Czechoslovakia)
vi. S32 smoke hand grenades (common in Germany)
vii. RGD5 defensive hand grenades (common in USSR)
viii. RK G3/3M/3T anti-tank hand grenades (common in USSR)
ix. [RD-2 (and RDG-1) smoke hand grenades (common in USSR)
x. FI defensive hand grenades (common in USSR) [7-10]

USES OF GRENADES

It is obvious that international gorilla war is accepted as one of the means of combating the infantry soldiers and by virtue of this fact, coupled with other reasons, grenades have been found of importance in many areas, viz.

i. In military, grenades are used for the purpose of war and defense as follows;
- ♦ It is used in gorilla war as offensive and defensive weapon.
- ♦ It is used in marine war as torpedo to blow war ship and boats.
- ♦ It is used to combat soldiers in trenches.
- ♦ It is used in Amod cars as bullet for combat
- ♦ It is used in shelling.

ii Grenades are used as a safety measure by drug pushers, military dictators and sadists.
iii. It is used to remove or destroy hard structures.
iv. It is used in geophysics industry for oil exploration, [11-14]

MATHEMATICAL RELATION

The relationship between production of heat energy and flow of current is well expressed by a famous scientist called George Simeon Ohm. He stated that at constant temperature and pressure, the amount of current passing through a metallic conductor is proportional to the potential difference between its ends or terminal that is,

$V \alpha I$

$V = IR$ …….. (i)

From equation i, energy dissipated $E = 1^2 Rt$ …….. (ii)

In any system or device in which there is a flow of energy, power is involved. Therefore, power is the energy expended per unit time i.e.

$P = E/t$ ……. (iii)

In explosives like single impulse grenades and bigger bombs, high energies are expended with time which are dependent on the concentration and compactness of the substance (gun powder) inside the container. According to Eisteins formular, energy expended.

$E = \Delta MC^2$ …….. (iv)

Where ΔM = change in mass, C = speed of light.

PIEZO-ELECTRICITY

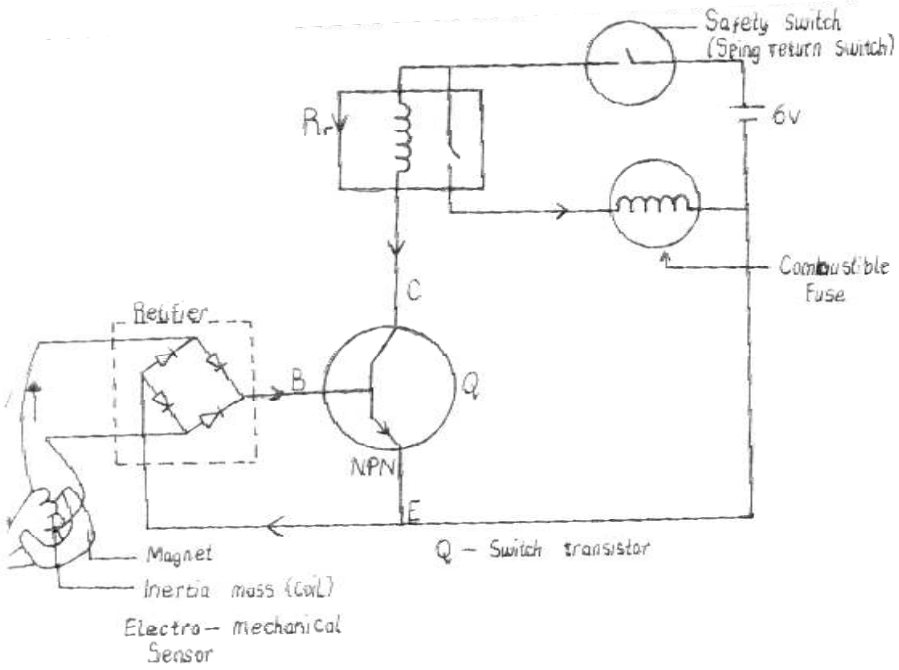
Piezo electricity or electric polarity results from the application of mechanical pressure on a dielectric crystal, [15]. The application of mechanical stress produces in certain dielectric (electrically non conducting) crystals an electric polarization (electric dipole moment per cubic metre) which is proportional to this stress. The necessary condition for piezoelectric affect is the absence of a centre of symmetry in the crystal structure. In this work ` used electro-mechanical sensor, [18].

SHOCK WAVE

Shock wave is a fully developed compression wave of large amplitude. Shock wave arises from sharp and violent disturbances generated from a lightening stroke, bomb blast or other form of intense explosion and from steady supersonic flow over bodies, these surfaces of abrupt change in fluid properties are called Shock waves or shock fronts, [17]. Shock waves are characterized by an abrupt, nearly discontinuous change in the characteristics of the medium. Across a shock there is always an extremely rapid rise in pressure, temperature and density of the flow [18].

EXPLOSION/BOMB BLAST

When energy is suddenly released into a fluid in a concentrated from, such as by a chemical or nuclear explosion, the local temperature and pressure may rise instantly to such high values that the fluid tends to expand at supersonic speed. When this occurs, a blast wave forms and propagates the excess energy from the point of explosion to distant parts of the fluid. If the point of explosion is far, the blast wave assumes the form of an expanding spherical shock wave followed by a radially expanding fluid originating from the point of detonation. The continuous expansion and finite amount of energy available from the expansion both the strength of the shock and the specific energy of the expanding fluid must decay with time, [16].



Circuit representation of the single impulse activated grenades

COUPLING OF THE UNITS

The coupling of the units was done in line with the grenades circuit arrangement. This was done by mounting the rectifiers and electronic switches and the coil in the appropriate places.

RESULTS

The testing was done behind the University of Calabar library just very close to the stream. We discovered that the grenade was capable of detonating on an impact thus the research objective for constructing a practical grenade that explodes on impact was achieved.

CONCLUSION

The construction of the single impulse grenades was made with the used of the relevant components shown on the circuit diagram. It detonated on an impulse as against convectional grenades thereby making it good weapon for the military warfare and tricksters.

REFERENCES

[1] Brophy J.J, *Basic Electronic for Scientists,* 4th Ed, **1983**, pp. 23
[2] Bylander E.G, *Electronic displays*,**1976**, pp. 10.
[3] Chikazumi S, Charap S.H, *Physics of Magnetism*, **1964**, pp. 54.
[4] Comer D.J, *Modern Electronics for Scientists.* 4th Ed, 1976, pp. 35
[5] Dhake A.M, *Television Engineering*, **1980**, pp. 8**.**
[6] Dick R.A, Fletcher L.R, Andrea D.V, U.S Bur Mines I.C 89/25, **1983,** 5
[7] Fickett, W, Davis W. C, Hand book on Denotation, **1976**, 12.
[8] Fink D.G, Schristiansen D, Electronic Engineers Handbook, 2nd Ed, **1982**, pp.9.
[9] Glaser A.B, Subak-sharpe, *Integrated Circuit Engineering*, **1977**, 15.
[10] Glasstone S, Dolan P.J, The Effort Of Nuclear Weapon, **1977**, 3
[11] Johnsson C.H, Persson P.A, Detonics of High Explosive, **1990**, 17
[12] Lewis B, Von Elbe G, *Combustion Flame and Explosions of*
[13] *Gasses*, 2nd Ed, **1961**, pp. 20.
[14] Lytel A.H, Solid State Power Supplies and Converters, **1965**, 22
[15] Mc Graw-Hill, *Encyclopedia of Science and Technology*, Mc Graw Hill Books company, U.S.A, **1992**, pp.123.
[16] Menkiti A.I, Abumere O.E, *Introduction To Electronics*, Spectrum Books, Lagos, **1996**, pp.25.
[17] Tom D, *Electronic for Today and Tomorrow*, John Murray, London, **1985**, pp. 28.
[18] Seitz F, Tunbull, D, *Solid State Physics Vol*.2, 1956, pp. 36.
[19] Anderson J. D. Jr, *Fundamentals of Aerodynamics*, 3rd ed, McGraw-Hill Books Company, U.S.A, **2001**, pp. 68.
[20] Scoles G, Hand Book of Rectifier Circuits, **1980**, 11