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IMPACT SWITCH

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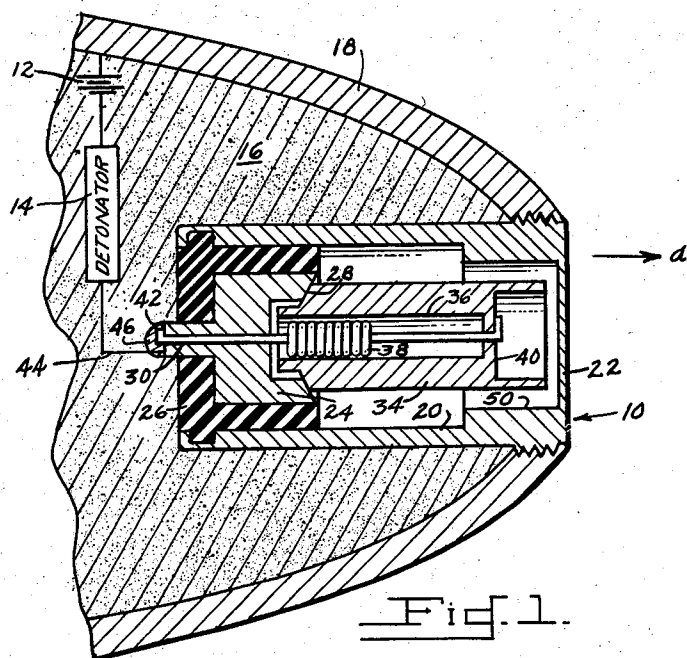


Fig. 1.

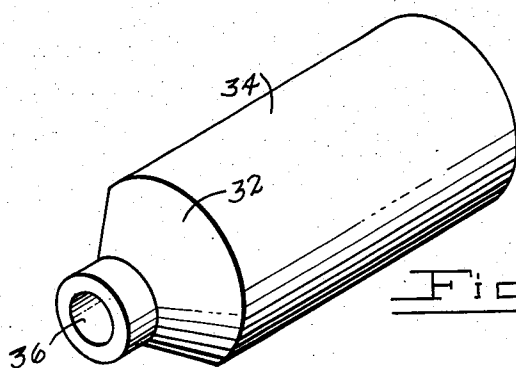


Fig. 2.

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## IMPACT SWITCH

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1 Claim. (Cl. 102—70.2)

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

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to switches and more particularly to impact switches for ordnance projectiles.

In ordnance projectiles, switches which are sensitive to acceleration or impact are often used to complete a circuit having a power supply and an electrical detonator, so that an explosion is initiated when the switch closes. These impact switches may be sensitive to impact from a single direction for direct impact or from many directions for graze impact—i. e., impact at an angle to the axis of the projectile. Difficulty is experienced with sensitive impact switches closing as a result of normal flight vibrations, particularly in rockets.

This invention provides a sensitive impact switch which will not close in response to vibrations ordinarily encountered. It is most sensitive to impact in a plane at a right angle to its axis but also has some sensitivity to impact in one direction along its axis. Therefore with its axis parallel to the projectile axis it is well adapted for graze impact, or with its axis normal to the projectile axis it is well adapted for projectiles expected to have only direct impact.

An object of this invention is to provide a switch that has relatively low sensitivity to vibration and relatively high sensitivity to acceleration from many directions.

Another object is to provide a switch with a long shelf life.

Further objects are to achieve the above with a device that is sturdy, simple, and reliable, yet cheap and easy to manufacture.

The specific nature of the invention as well as other objects, uses, and advantages thereof will clearly appear from the following description and drawing in which:

Fig. 1 is an axial sectional view of a switch in accordance with this invention in combination with parts of an ordnance projectile, certain of the parts being shown schematically.

Fig. 2 is a perspective view of the arm of the switch shown in Fig. 1.

As shown in Fig. 1, switch 10 is oriented so that upon graze impact it completes the circuit of power supply 12 and electrical detonator 14. This will initiate the explosive material 16 within shell body 18. The switch will also close upon direct impact in the direction of arrow *a*, but it is not as sensitive in this direction.

The switch 10 includes a case 20 in the form of a cylindrical cup of conductive material closed at the forward end 22. At the rear of the case is conductive base 24 affixed or held in place by insulating material 26. The forward surface of the base is in the form of a seat 28 of generally conic shape and is coaxial with case 20. A coaxial bore 30 extends through the base.

Seat or surface 32 at the rear of conductive arm 34

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mates with seat 28. The arm is generally cylindrical with coaxial bore 36 extending throughout its length. Spring 38, also of conductive material, extends from ledge 40 at the forward end of bore 36 through bore 36 and bore 30 of base 24 to the rear edge 42 of base 24. The spring is under tension, thereby biasing the arm 34 against the base 24. Electrical lead 44 is connected to spring 38 and base 24 by a spot of solder 46 at the rear of bore 30. This solder hermetically seals the switch so as to increase its shelf life.

If the projectile impacts in the direction of arrow *a* the arm 34 will have a translational movement in this direction and electrical contact will be made by the forward end of the arm against the forward end 22 of the case. Upon graze impact the arm 34 will pivot on seat 28 to contact side wall 50 of the case. Factors affecting the threshold of acceleration at which the switch will close include the physical dimensions and mass of the arm and the tension on the spring 38. A factor affecting the time required for the switch to close is the distance the arm must travel to contact the case.

The switch is not highly sensitive to vibration because there will be little or no movement of the arm until the threshold acceleration occurs. As the arm will not move it cannot set up multiplying sympathetic vibrations.

As the conventional safety and arming rotor, switches, booster, etc., form no part of this invention, they have not been shown or described.

It will be apparent that the embodiment shown is only exemplary and the various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claim.

I claim:

An improved impact switch for insertion into the nose of a projectile comprising: a cylindrical cup having its longitudinal axis substantially perpendicular to the rotational axis of the projectile, said cup being composed of conductive material and provided with a closure at the nose end and an opening at the end opposite said nose end, a conductive base and insulating means within the circular walls of said cup, said base fixed to said end opposite said nose end by said insulating means, the surface of said base nearest said nose end having a conical seat, a cylindrical conductive arm having first and second ends within said cup, the first end of said arm being substantially conical and adapted to mate with the conical seat of said base, a coaxial bore extending through said base and arm, said bore also coaxially positioned with respect to the longitudinal axis of said cup, a spring extending through said bore and attached to the second end of said arm so as to resiliently restrain said arm against tilting movement relative to said base, said spring also serving as an electrical lead, the second end of said arm being spaced from said closure and from the walls of said cup and forming an electrical contact for said spring between said cup and arm, said projectile upon receiving a grazing impact causing said second end of said arm to tilt in said base against the restraining action of said spring thereby making contact with the wall of said cup, and said projectile upon receiving a nose impact causing said second end of said arm to contact said closure of said cup against the restraining action of said spring, contact between said second end of said arm and said cup causing detonation of the projectile.

### References Cited in the file of this patent

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