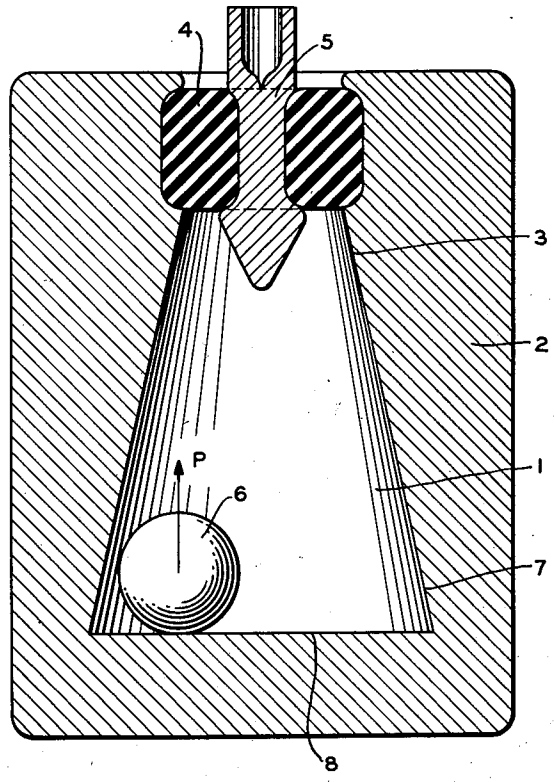
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SWITCHING DEVICE FOR CONTROLLING THE IGNITION CIRCUIT OF AN EXPLOSIVE PROJECTILE

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SWITCHING DEVICE FOR CONTROLLING THE IGNITION CIRCUIT OF AN EXPLOSIVE PROJECTILE

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The present invention relates to a switching device for controlling the ignition for the explosive charge of a projectile spinning when and while in flight.

One of the objects of the present invention is to provide a novel and improved switching device of the general type above referred to, which is highly sensitive to even a slight retardation or deceleration experienced by the projectile during its flight.

Another object of the invention is to provide a novel and improved switching device of the general type above referred to, the dimensions of which are very small so that it can be conveniently mounted in the nose or fuse of the projectile.

Still another object of the invention is to provide a novel and improved switching device of the general type above referred to, the weight of which is very low, generally in the order of a few grams. Such a low weight is obviously highly desirable for a switching device of the kind and for the purpose here envisaged.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and set forth in the appended claims forming part of the application.

The afore and subsequently described features and advantages of a switching device according to the invention render the device highly suitable for use in connection with electrically actuated proximity fuses.

In the accompanying single figure of the drawing a preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

The figure shows a section of the switching device proper which should be visualized as being installed in the nose or fuse end of a projectile having an explosive charge and fired from a rifled barrel of a suitable weapon so that the projectile is spinning about its axis when in flight. It should further be visualized that the switching device is installed in axial alignment with the rotational axis of the projectile, or with its axis parallel to the rotational axis of the projectile.

The switching device comprises a rigid preferably one piece member 2 which is hollow to form a generally frusto-conical chamber 1. The narrow end of the chamber faces forwardly and member 2 is open at this forward end. A contact pin 5 is centrally fitted in the open end of the member, slightly protruding into the chamber. Pin 5 is held in position and electrically insulated from member 2 by an insulation ring 4 fitted for this purpose in a groove provided in the respective wall portion of member 2.

Pin 5 constitutes one stationary contact of the switching device. A second contact is formed by the wall of member 2 which to this end is made of metal or other electrically conductive material. It is of course also possible to make member 2 of insulation material and to provide as second stationary contact a metal part disposed adjacent to the protruding end of pin 5.

The two stationary contacts formed by pin 5 and member 2 should be visualized as switch contacts included in the ignition or detonating circuit of the projectile which is so arranged that the detonation of the explosive charge is initiated when the two stationary contacts are interconnected. The ignition circuit proper does not constitute part of the invention and suitable ignition circuits are so well known in the art that a detailed description or illustration thereof is not essential for the understanding of the invention.

The opening and closing of the stationary contacts and hence the opening and closing of the ignition circuit are controlled by a contact member 6 freely movable within the chamber. The contact member is shown as a metal sphere. Its diameter relative to the dimensions and the configuration of the chamber is such that sphere 6 may occupy a variety of positions spaced apart from one or both stationary contacts and also at least one position simultaneously engaging both, pin 5 and the adjacent wall portion of member 2 thereby interconnecting the two stationary contacts and hence closing the ignition circuit. The latter position is obviously the position in which the sphere is wedged in the annular space defined by the pin portion protruding into the chamber and the adjacent wall portion of member 2.

The function of the switching device as hereinbefore described, is as follows:

Let it be assumed that the projectile is fired and in flight, spinning together with the switching device about its rotational axis.

Due to the centrifugal force, sphere 6 will be forced against the side wall 7 of the chamber and due to the slope of this side wall against the bottom wall 8 of the chamber, or in other words the sphere will occupy a position in the lower corner of the chamber. The force with which the sphere is held in this position is obviously determined by the rotational velocity of the projectile and with it of the switching device and by the radial distance of the center of the sphere from the center axis of the switching device. When the projectile and with it the switching device begin to decelerate, the force P of inertia will cause the sphere to roll along the sloped wall 7 toward the contact pin. As soon as the sphere reaches a position in which it engages both, the contact pin and the adjacent wall portion of member 2, the two stationary contacts are bridged thereby closing the ignition circuit. The magnitude of the force P is obviously controlled by the rate of retardation, and also by the slope angle of wall 7.

Member 2 and chamber 1 therein have a rotation symmetric configuration. By selecting the generatrix determining the slope of wall 7, the rate of retardation to which at a given rotational velocity of the projectile the switching device will respond, can be conveniently controlled. For instance, when the slope of the generatrix relative to the rotational axis of the switching device is slight, the switching device will be very sensitive and respond to even comparatively slight retardations of the projectile. It is further apparent that by selecting a generatrix which produces a wall 7 more or less curved toward the narrow end of the chamber, the sensitivity of the device can be additionally controlled.

Finally, the shape of contact member 6 need not to be a sphere but various other shapes may be selected to control the sensitivity of the response of the device.

While the invention has been described in detail with respect to a certain now preferred example and embodiment of the invention it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications in the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A switching device for controlling the ignition circuit for the explosive charge of a projectile spinning while in flight, said device comprising a rigid member including a generally frusto-conical chamber, said member being adapted to be mounted in the nose of the projectile with the narrow end of the chamber facing forwardly, two contacts stationarily disposed at the narrow end of the chamber, and a rigid contact closing member disposed freely movable within each chamber, the configuration of said contact member in relation to the configuration of said chamber being such that the contact member is movable by the effect of the retardation experienced by the projectile when in flight, from a position spaced apart from said stationary contacts into a position engaging both said contacts thereby electrically connecting the same.

2. A switching device according to claim 1, wherein said movable contact member is in form of a metal sphere.

3. A switching device for controlling the ignition circuit for the explosive charge of a projectile spinning while in flight, said device comprising a metal member including a generally frusto-conical chamber, said member being adapted to be mounted in the nose of the projectile with the narrow end of the chamber facing forwardly, an electric contact stationarily mounted in the narrow end of said chamber electrically insulated from said metal member, the said member constituting a second stationary contact, and a rigid contact closing member disposed

freely movable within said chamber, the configuration of said contact member in relation to the configuration of said chamber being such that the contact member is movable by the effect of the retardation experienced by the projectile when in flight, from a position spaced apart from said stationary contacts into a position engaging both said contacts thereby electrically connecting the same.

4. A switching device according to claim 3, wherein the said metal member is open at its narrow end, the stationary contact mounted in the narrow end of the chamber being in form of a contact pin disposed within said open end of the metal member and protruding into the chamber, the protruding pin portion and the adjacent wall portion of the metal member defining an annular space accommodating said movable contact member for bridging said pin portion and said wall portion.

5. A switching device according to claim 4, wherein an insulation ring is fitted upon said pin to insulate the same electrically from said metal member and to retain the pin within the member.

6. A switching device according to claim 5, wherein said movable contact member is in form of a metal sphere.

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