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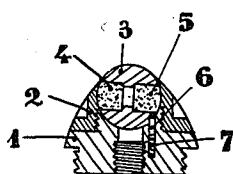
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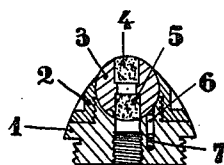
SAFETY DEVICE FOR PROJECTILE FUSES

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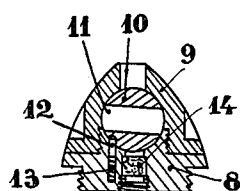
**Fig. 1.**



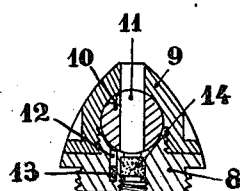
**Fig. 2.**



**Fig. 3.**



**Fig. 4.**



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## UNITED STATES PATENT OFFICE

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## SAFETY DEVICE FOR PROJECTILE FUSES

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3 Claims. (Cl. 102—39)

It is known that in the fuses for projectiles adapted for firearms, the safety device comprises usually masses whose centre of gravity is located at a certain distance from the axis of rotation of the projectile, so that after the shot, they may be displaced outwards towards the periphery, into suitable recesses, thus causing the fuse to be rendered active.

In certain cases, more especially when it is the case of a fuse provided with an outer detonator on its head and bursting upon direct impact on the target, or of fuses for projectiles of small caliber, it is not possible, for want of space, to provide the fuse with the recesses necessary for housing the safety masses when they are displaced outwards on the periphery of the projectile, and in such case the masses are caused to be projected outwards.

This solution is not free from danger, as the masses are projected with a considerable velocity, and they may do harm to the serving staff and to the material, more especially when the weapons are installed on board of an aircraft.

The object of the present invention is to provide a safety device on fuses for fire arms, in which the necessity of projecting outwards the safety masses, as well as their displacement towards the periphery is avoided.

The device according to the invention comprises a mass, the centre of gravity of which is preferably placed on the axis of rotation of the projectile, or at a small distance therefrom, which maintains its distance from it unaltered both before and after the shot.

The movement necessary for passing from the position of safety to the free position, is obtained by assigning to the mass itself a form and structure such as to cause, under the action of the centrifugal force (or eventually of the pressures of inertia of the shot) a rotating couple tending to cause its rotation round the centre of gravity, thus bringing it into a well determined position with respect to the axis of the projectile, which corresponds to the active or non-safety position.

The safety mass therefore has no radial displacement as in the ordinary fuses, but rotates round its own centre of gravity.

According to the present invention, the form and the structure of the safety mass is such that, considering in it two axes of rotation passing through the centre of gravity, which, for example, may be two axes of symmetry normal to each other, the centrifugal force generated by the rotation round one of said axes, may be greater

than the centrifugal force which would be produced by the rotation around the other axis.

In these conditions, supposing that at the moment of the shot the axis to which the greater centrifugal force corresponds, does not coincide with the axis of rotation of the projectile, the mass will have a tendency to rotate so as to cause the two axes to coincide through the action of the rotation couple generated by the asymmetric centrifugal forces.

According to the device of the present invention, this movement is utilised to pass from the safety to the active positions.

In the annexed sheet of drawings, two forms of embodiment of the device are shown by way of example;

Fig. 1 shows in the position of safety in longitudinal section a fuse of the type in which an outer detonator is provided, which operates by direct impact on the target, provided with a safety device according to the invention.

Fig. 2 shows the same form of device shown in Fig. 1, in the active position obtaining after the shot.

Fig. 3 shows the position of rest (before the shot) of the system of safety according to the invention, applied to an ordinary fuse, and

Fig. 4 shows the same form of device as shown in Fig. 3, in the active position (after the shot).

In the figures showing the same example of the invention in different positions, the various parts are indicated with the same reference numerals.

Referring to Figures 1 and 2 showing the first example of the invention, 1 is the body of the fuse, which together with the head 2 thereof, form a spherical cavity in which a sphere 3 is housed, provided with a hole containing two detonators (or detonating charges) 4 and 5. A pin 6 is pushed by the spring 7 into the corresponding hole of the sphere 3, so as to keep it locked in the position of rest shown in Fig. 1.

In order to obtain the asymmetry of the centrifugal force on which the operation of the device according to the present invention is based, the material of which the sphere is made, must have a specific weight differing (greater or lower) from the mean specific weight of the material placed in the central hole, so as to generate a couple of rotation.

Supposing that the mean density of the material contained inside the hole is less than that of the material forming the sphere, the working of the device is as follows:

Before the shot the sphere 3 is fixed in the

position shown in Fig. 1 by means of the spindle 6, and the detonators are fully protected by the fuse head 2.

Soon after the shot, before the projectile has left the gun barrel, the pin 6 unlocks through the inertia the sphere 3 by compressing the spring 7; the sphere however, does not rotate as the friction due to the pressure of inertia is greater than the rotating couple.

When the pressure of inertia has ceased to operate as soon as the projectile has issued from the gun barrel or at a little distance from the gun mouth, the couple of rotation produced by the asymmetry of the centrifugal forces, causes the rotation of the sphere, bringing it up to the position shown in Fig. 2.

One of the detonators is thus brought to the end of the fuse head, so that it operates when said fuse head strikes the target.

It is obvious that, instead of using two detonators, only one may be used.

In the example of the invention in the device shown in Figures 3 and 4, the numerals 8 and 9 indicate two parts of the fuse body which determine the spherical cavity in which the sphere 10 with its central hole 11 is located. The locking pin 12 and the corresponding spring 13, operate similarly as described in the preceding example.

The detonator 14 (or other detonating charge) is placed below the sphere, while the upper hole may be empty (like the fuses operating aerodynamically) or may contain the striker.

The operation is similar to that described in the example of the invention in the device shown in Figures 1 and 2. Also in this case, the movement of rotation of the sphere in passing from the safety position shown in Fig. 3 to the active position shown in Fig. 4, takes place owing to the asymmetry of the centrifugal forces produced by providing hole 11.

In the case of fuses operating aerodynamically, the safety sphere may be placed at the end of the fuse head as shown in Figures 1 and 2.

It is to be understood that the two forms of realization of the device above described, have only been given by way of example, so that the various details of the shape, construction and respective position of the various parts may be varied in practice without thereby departing from the principle of the invention.

Having now fully described my invention, I claim:

1. A fuse for a projectile including a fuse body having a spherical bore therein, a spherical member in said bore having a diametrical passage extending entirely therethrough, the spherical surface of said member and the spherical bore of the fuse body constituting a universal mounting for said member, said spherical member being located with its center disposed substantially on the longitudinal axis of the projectile, whereby when the projectile is fired the centrifugal force of rotation of the projectile will cause the spherical member to take a position wherein the diametrical passage is aligned with the longitudinal axis of the projectile.

2. A fuse as in claim 1, the diametrical passage being partially filled with explosive material, said explosive material being of a lesser specific gravity than the material of which the spherical member is composed.

3. A fuse as in claim 1, the fuse body having a detonator below the spherical bore and a passage between said spherical bore and said detonator, said last mentioned passage and detonator being disposed substantially on the longitudinal axis of the projectile, whereby the detonator is uncovered upon the positioning of the spherical member so that the diametrical passage is aligned with the longitudinal axis.

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