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[56] **References Cited**
UNITED STATES PATENTS
 2,486,362 10/1949 O'Brien 102/70.2
 2,967,217 1/1961 Alpert 102/70.2 X
 3,168,866 2/1965 Edmands 102/70.2 X
 3,527,907 9/1970 Schwab 102/70.2 X
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[54] **FUSE WITH PRIMER SAFETY COMPRISING A ROTOR**
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76, 78

ABSTRACT: A fuse safety device for a nonspinning shell containing a primer such as a squib, located in a spring-loaded rotor that is turned from a safety position to an armed position after the shell has left the barrel, the fuse having a safety means comprising a short tube partly inserted in the rotor, said tube being able, upon acceleration, to pierce a central hole in a thin resilient disc fitted to the bottom of the rotor casing. The squib is electrically connected to the base of the fuse by means of a spring-loaded ball. Another safety means comprises a gross acceleration sensitive friction-operated tube contained in the rotor.

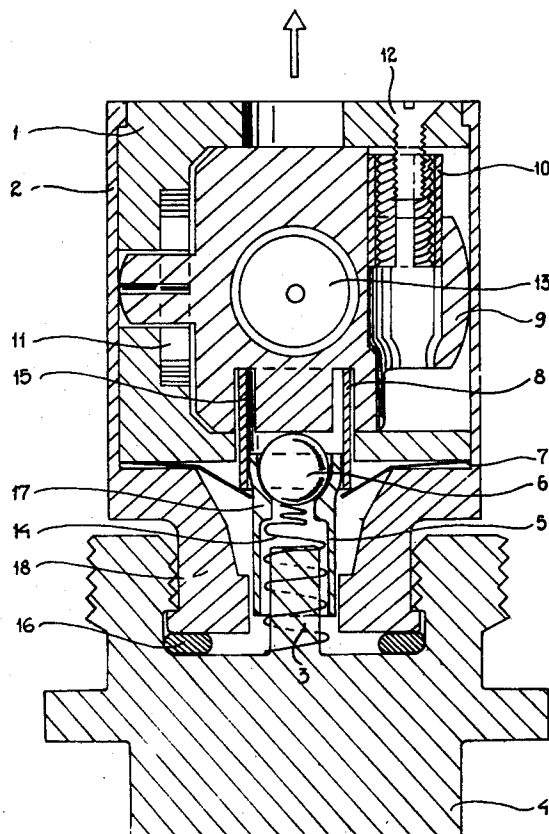
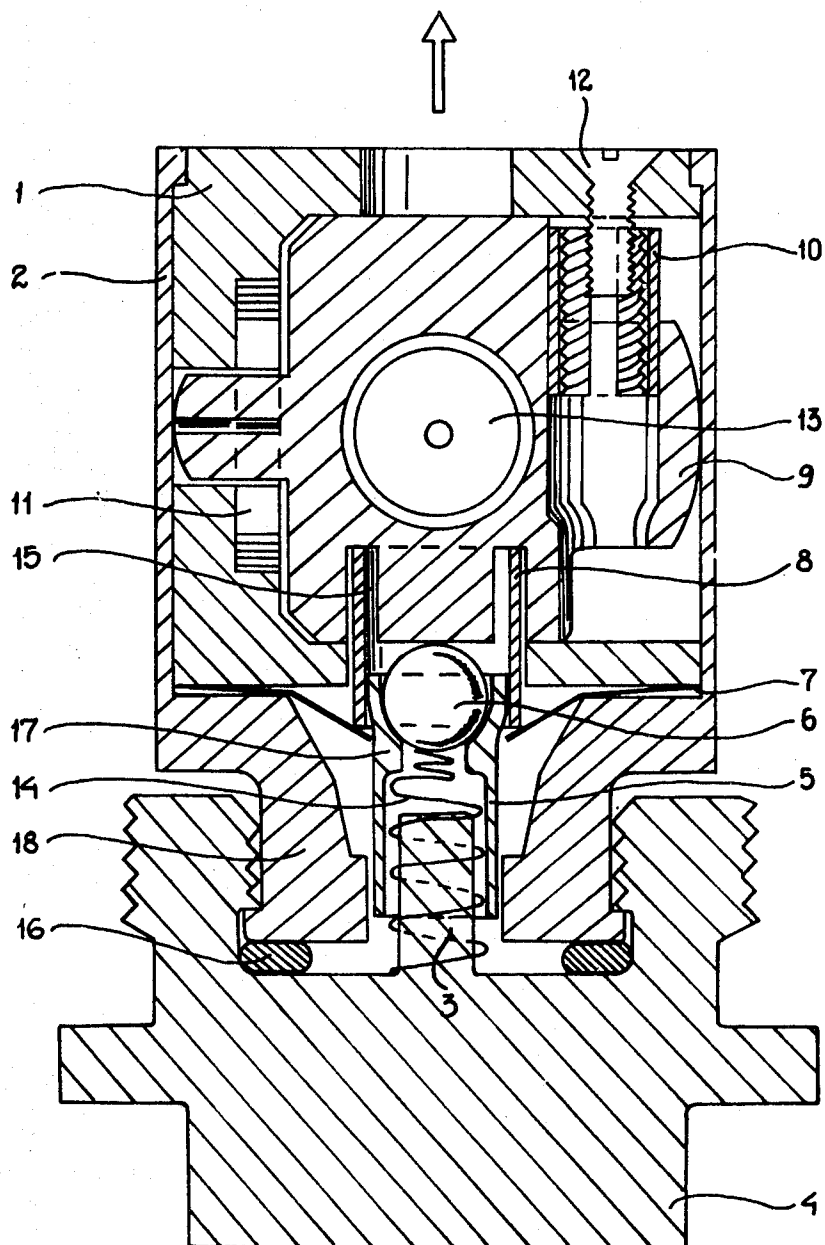
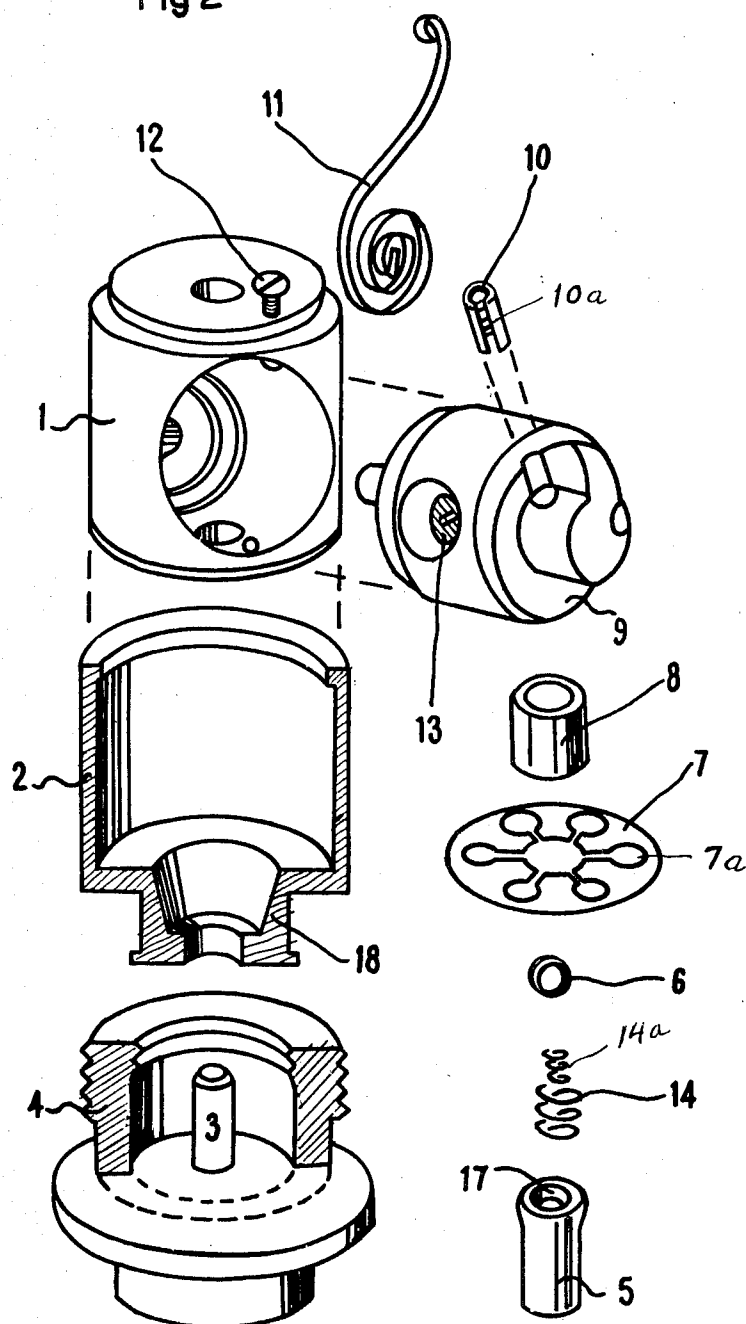


Fig. 1



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Fig 2



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FUSE WITH PRIMER SAFETY COMPRISING A ROTOR

A general problem with all fuses is how to develop simple safety combinations having one member that will withstand minor impacts or drops during transport, and another member that will not arm the fuse fully until the shell is approximately 20-40 feet or so away from the muzzle of the gun barrel. It is rather difficult to accomplish a satisfactory safety to nonrotating armor-piercing hollow charges in a simple manner. A known fuse-arming mechanism comprises a rotor, the axis of which is perpendicular to the flight direction of the shell. A squib or primer is kept in a safety position by one or more members which are usually released by inertia-operated balls or other bodies, the latter being released under influence of the linear acceleration of the projectile.

The present invention relates to a fuse of the kind mentioned, and in which the safety mechanism has a first member consisting of a thin metal disc fitted to the bottom of the rotor housing. The disc is provided with a central hole, the edge of which has several radially directed slits forming a number of resilient tongues. The tongues will allow the leading end of a short tube, the other end of which is engaged in an annular recess in the rotor wall, to pass through the said hole, but will prevent it from slipping back again due to a wedge effect exerted by the tongues and which are angularly bent. Relocking of the rotor safety is thus prevented. The electrical contact from the bottom of the socket of the fuse to the squib is attained by means of a conducting coil spring that pushes a small metal ball against the wall of the rotor. The other safety means is a cutup tube that is inserted in a narrow hole in the rotor. This safety releases only during substantial acceleration over a long period.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed,

FIG. 1 is a sectional view taken along the axis of the rotor, and

FIG. 2 shows an exploded view of the essential parts, some of which are partly in section.

In the drawings is shown a cylindrical rotor housing 1, having a bore disposed at right angles to its axis and containing a rotor 9, the one end of which is provided with a flat coil spring 11 attached to the rotor housing. The rotor 9 has one bore containing an electric squib 13 constituting a spark gap igniter and another bore displaced 90 degrees in rotational sense and containing a short, internally threaded tube 10 provided with a slit 10a along its jacket surface and parallel to its axis. The walls of the tube have such a thickness that the tube will pass into the rotor bore with a slight radial, resilient friction. A stop screw 12 is introduced into the top wall of the rotor casing so that its end projects into the open end of the tube 10, the interior of which is threaded. An annular recess 15 (FIG. 1) is located on the rotor jacket surface and is displaced 180° in relation to the bore for the tube 10. The depth of the recess 15 is such that a small tube 8 can be introduced into it approximately midway, leaving the free end of the tube 8 to project through a bottom hole in the rotor casing 1 into a neck portion 18 of an insulating outer case 2 that surrounds the rotor casing. The rim of a thin metal disc or gasket 7 is clamped to the outside of the casing 1 and the disc has a central hole provided with edges which are split radially so that a number of resilient tongues are formed. The spring action of these tongues is weakened or reduced by punching a number of round holes 7a adjacent to the rim of the disk as shown in FIG. 2. The outer case 2 has a neck portion 18 that is inserted into a bottom socket 4 having a central guide pin 3 for a short tube 5 of insulating material and which is provided with an internal seat 17 for the reception of a coil spring 14 that pushes the tube 5 upwardly. The upper end of the seat 17 supports a small metal ball 6 that is kept into contact with the jacket surface of the rotor 9 by means of a smaller coil spring 14 such spring 14a constituting a continuation of the spring 14, passing from the end of the pin 3 through a hole in the seat 17. The ball 6 and the double coil spring 14, 14a will reduce the friction to the

rotor considerably during the arming movement and the ball establishes good contact with the rotor and the central conductor of the squib 13. A shock-absorbing O-ring 16 is inserted between the bottom socket 4 and the neck portion 18 of the outer case 2 not only for tightening purposes but also to eliminate the action of transients or retardation from impacts or shocks during handling of the ammunition. These transients might otherwise release the split tube safety.

The device operates in the following manner:

When a round of ammunition is introduced into the barrel of the gun, the slit tube 10 is almost entirely out of its rotor bore so that the screw 12 projects into it without touching its walls. The rotor is therefore held in a safety position only by the tube 8 projecting into the annular recess 15 in the rotor jacket surface. During the acceleration upon launching (about 25,000 g.) the tube 8 is pulled through the central hole in the disc 7 due to its inertia and the rotor is thus released. It cannot move, however, as long as the acceleration goes on. On account of the abruptly falling relating power of the resilient disc when the tube end passes the central hole, the safety 7, 8 will release rather quickly at about 2000 g. and the tube 8 cannot relock because of the wedge action of the resilient tongues of the disc. The slit tube 10 starts to move at about the same time but it needs greater acceleration (5000g.) for a longer time in order to overcome the friction against the walls of its hole and this friction power is rather independent of how far the tube 10 has moved into its hole. When the slit tube 10 has moved so far that there is clearance between its end and the end of the screw 12 and when the projectile is out of the muzzle, the rotor will be given about a three-quarter turn until a stopping heel on the rotor strikes against the screw 12 just when the center conductor of the squib 13 is in contact with the steel ball 6 and the socket 4. The turning motion takes about 0.02 to 0.03 seconds corresponding to the trajectory safety of 7-15 m. or 20 to 40 feet from the gun muzzle.

If the shell during handling should be subject to such treatment during transport or loading operations that the safety 7, 8 is released, or if the spring disc 7 is broken or there is some other defect, the screw 12 will catch the slit tube 10 that as previously mentioned, is in its drawn-out position before firing. Its inside wall is threaded to increase the friction and make the grip even stronger. Considerable force is therefore needed in order to move the mechanism and the fuse is not even armed if it is fired in a shell. If such unintended release is suspected the shell or fuse should be set aside and be sent to a work shop or repair camp where it can be easily brought into working condition again.

The double safety according to the present invention could also be used in mechanical fuses where, for example, an axially moving hammer replaces the guiding pin 3 in the socket 4.

What we claim is:

1. A fuse having a primer safety comprising, a rotor casing provided with a transverse bore lodging a rotor containing a primer such as an electrical squib, resilient means for turning the rotor from a safety to an armed position wherein the squib is exposed to a contact member characterized in that the rotor has an annular recess directed along a rotor radius at approximately right angles to the squib, said rotor having an opening for safety means, a short tube fully inserted into said annular recess, said tube having a free end projecting through a hole through the bottom of the rotor casing, a thin, resilient disc attached to the outside of the bottom of the rotor casing and having a hole with the same axis as the short tube, the hole in the disc being of smaller diameter than the short tube, thereby enabling the edge of the hole in the disc to urge the short tube into the bottom of said annular recess, said edge having several radially directed slits ending near the peripheral edge of the disc.

2. A fuse according to claim 1 wherein the rotor casing is attached to a bottom socket that fixes the fuse to the shell body, said socket having a central bore into which is inserted a neck portion of an insulating case that surrounds the rotor housing, the bottom of said bore having a central guide pin receiving an

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open tube of insulating material, said tube having such a diameter that it is able to pass through the first short tube, said tube also having an internal seat for a small metal ball that is urged into contact with said rotor, resilient means for urging the ball into contact with the rotor and acting upon the bottom of said seat and said ball.

3. A fuse according to claim 1, wherein the rotor has a second radially directed bore near its one end and approximately at right angles to the axis of the squib, said bore con-

taining a third internally threaded, short tube having a slit along its jacket surface and extending parallel to its axis, enabling said tube to pass with resilient friction into said bore, and stop means introduced through the top wall of the rotor casing, and having a free end projecting into the slit tube with some clearance to the sides when the latter is in a fully drawn-out position before a shell is fired.

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