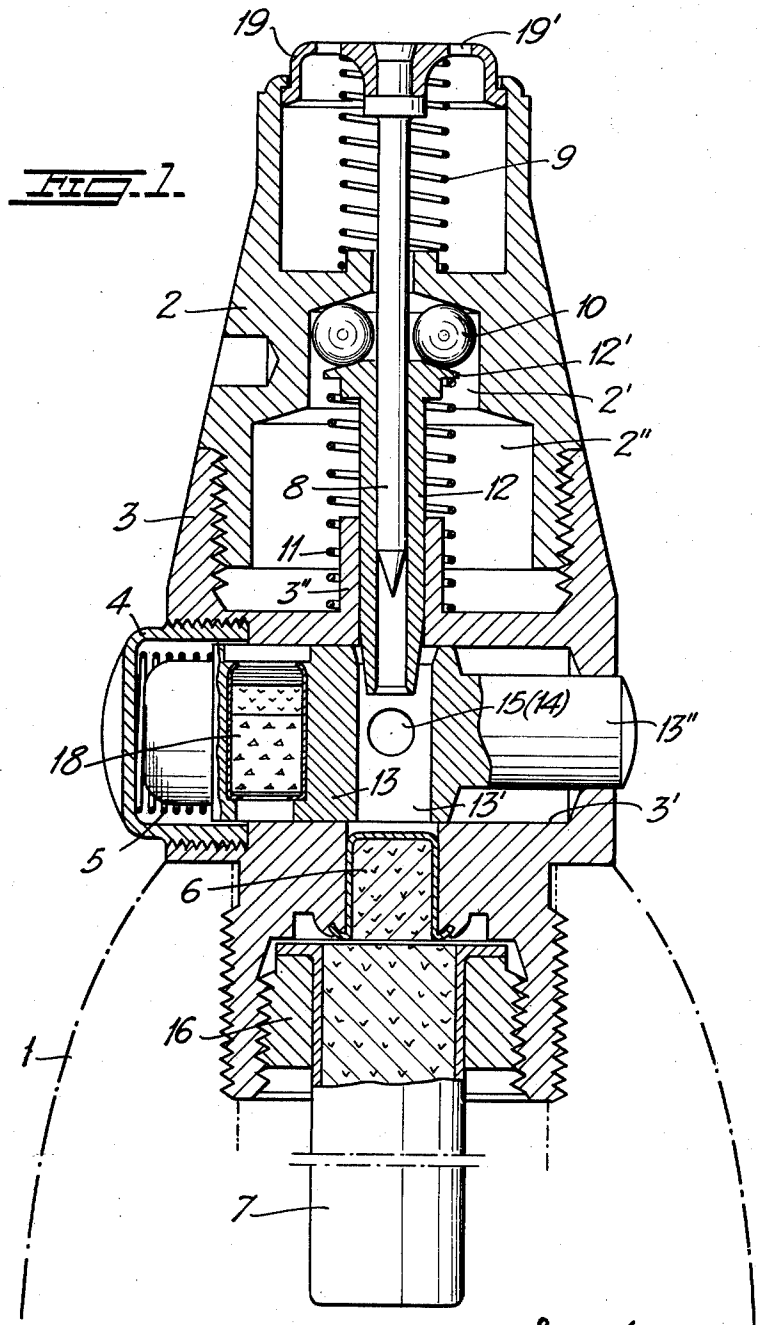
Jan. 27, 1959 A. E. SALORANTA ET AL 2,870,713

FUSE FOR SHELLS

Filed June 9, 1955 2 Sheets-Sheet 1

FIG. 1.



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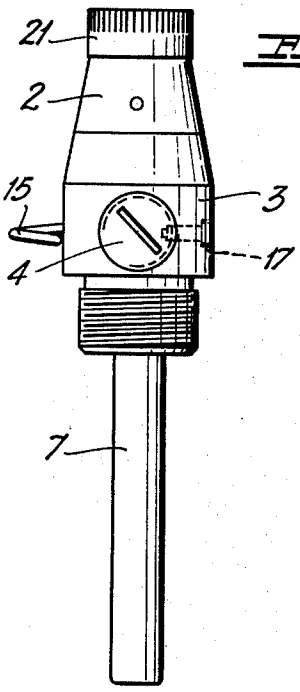
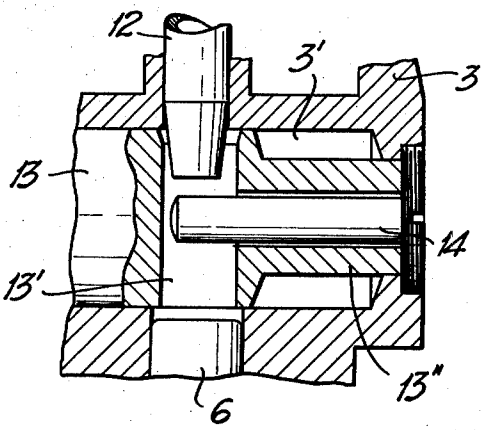


FIG. 2.

FIG. 4.



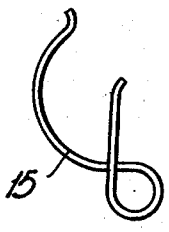


FIG. 3.

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FUSE FOR SHELLS

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8 Claims. (Cl. 102—78)

This invention relates to a fuse for shells, especially for shell throwers (mortars), of the class comprising a body having a head portion in which a firing pin with a striker is mounted for sliding movement in the axial direction of the fuse, and a bottom portion which is adapted for connection with a shell and in which a booster is provided, a priming cartridge being carried by a slider mounted in the fuse body between the firing pin and the booster, for sliding movement in a transverse direction from safety position to armed position, a lock-bolt for holding the slider in safety position mounted in the fuse body for sliding movement in the axial direction, said slider when in safety position holding the cartridge beside the path of the axially movable firing pin and when in armed position holding the cartridge in alignment with the firing pin and in communication with the booster.

The object of the invention is to improve especially the loading safety and the barrel safety of fuses of the kind referred to and, at the same time, to ensure a high sensitivity and a reliable function of the movable parts.

A further object of the invention is to provide a point-detonating fuse in which the function of the mechanism is rendered more secure by arranging the firing pin and the lock-bolt of the slider to perform a rearward movement upon firing.

A related object of the invention is to improve further security, not only by arranging the firing pin and the lock-bolt of the slider to perform a rearward movement upon firing, but, also, by arranging the slider to perform a slight displacement upon firing through a wedge-like action exerted by the lock-bolt upon the slider.

Features of the invention refer to the provision of an axially extending hole in the transversely movable slider for accommodating the rear end of the lock bolt and allowing a frictional engagement of the lock bolt with one side of said hole, both lock bolt and firing pin moving rearwards upon firing, the firing pin being guided by the lock bolt, release elements or balls well-known, per se, normally holding the lock bolt in locking position, but upon the rearward movement of the lock bolt, allowing disengagement of the lock bolt from the locking position in the slider, the lock bolt and the firing pin being provided each with an individual support spring, said lock-bolt preferably having a conical rear end for wedge-like or camming engagement with the axially extending hole in the slider during the rearward movement of said lock bolt so as to cause a displacement of the slider during said rearward movement.

Thus, the firing pin and its support spring may be very light and designed exclusively with respect to the high sensitivity required, while the lock bolt and its support spring may be heavier and designed substantially with respect to the safety desired, the last-mentioned spring being of such dimensions that the lock bolt when in safety position is held between its support spring and release balls but upon firing to begin with, on account of its inertia, performs a relative movement rearwards for releasing said balls and then, when the acceleration decreases, is by its support spring moved forward from the engagement with the slider for releasing the same. Both the firing pin and the lock bolt move rearwards when the firing occurs, and, since camming engagement between the lock bolt and the slider is provided for, the slider performs a slight transverse displacement.

Further objects and features of the invention will appear from the following description of an embodiment by way of example illustrated in the accompanying drawings in which:

Fig. 1 is an axial longitudinal section of the fuse and the adjacent section of a shell;

Fig. 2 is a side view of the fuse, as seen from the left of Fig. 1 and on a smaller scale;

Fig. 3 shows a transport safeguard member for the lock bolt, as used according to Figs. 1 and 2;

Fig. 4 illustrates a modified transport safeguard device for the lock bolt.

In the drawings, **1** indicates a portion of a shell for which the fuse is intended to be used, **2** the head portion of the fuse body and **3** the bottom portion of said body. The firing pin **8** is disposed centrally in the head portion and supports on its front end a striker **19**, the support spring **9** of the firing pin being held under tension between the striker and an abutment in the head portion. In the rear end of the bottom portion **3** the booster is provided, which comprises a principal booster **7** held by the screw **16**, and a pre-booster **6**, both booster elements consisting of a safety explosive, such as tetryl. In front of the booster and behind the firing pin, the bottom portion **3** is provided with a diametrically extending cylindrical recess **3'** in which the cylindrical slider **13** is rectilinearly guided by means of a guide pin **17**, inserted through the bottom portion **3** (Fig. 2). The slider is provided with an axially through-going cavity which houses the cartridge **18** comprising a highly sensitive primer and a detonator. A screw cap **4** together with a support spring **5** is provided for setting the slider. The sleeve-shaped lock bolt **12** normally engaging in an axially through-going hole **13'** in the slider, is guided exclusively in a boss **3''** formed on the front side of the bottom portion **3**, the firing pin **8** being guided substantially by the surrounding lock bolt. Normally the lock bolt is held between its support spring **11** and the release balls **10**. The reference numeral **15** indicates a transport safeguard for the lock bolt, made as a split pin, while **14** indicates a transport safeguard made as a screw pin. Finally, **21** indicates a protective cap over the striker **19**, for reducing the sensitivity of the same.

Fig. 1 shows all parts in safety position. By means of the spring **11** the head **12'** of the lock bolt is pressed upwards against the release balls **10** which thereby are kept within their recess **2'** inside the head portion **2**. The rear (lower) end of the lock bolt **12** projects into the through-going bore **13'** passing through the slider **13** in the longitudinal direction of the fuse axis, the priming cartridge **18** normally lying laterally to the path of the central firing pin **8**. During transport, the transport safeguard **14**, or **15** respectively, of the slider **13** is inserted into and through the bottom portion **3** in such manner that, in safety position, it also blocks the lock bolt **12** against rearward movement (downward movement) allowing release of the balls **10**. This means, in other words, that the end of the safe guard **14** or **15** lies behind the rear end of the lock bolt **12**, as shown in the middle of the bore **13'** in Fig. 1. When using a screw pin **14** as transport safeguard, the arrangement could possibly be such that the screw pin is inserted in the longitudinal direction of the slider **13**, through an elongation **13''** of the same, extending through an opening provided in the surrounding wall of the fuse body, said

screw pin having a screw head hermetically closing said opening, as shown in Fig. 4.

Upon removal of the transport safeguard, the slider 13 moves a little under the pressure of its spring 5, until one side of its through-going bore 13' comes up against the projecting end of the lock bolt 12, so that a certain friction resistance is attained counteracting any rearward movement of the lock bolt and release of the balls 10 while the shell is handled up to the end of loading. Upon discharge of the shell, the bolt, owing to its inertia, executes at first a relative movement rearwards inside the fuse body countrary to the pressure of the spring 11, whereupon the balls 10 drop into the recess 2'' in the head portion or in the body. In order to further counteract any rearward movement of the lock bolt 12 up to the end of the loading, the rear end of the lock bolt may be conical. Thus, the lock bolt would have to displace the heavy slider when tending to move rearwards. Of course, the conicity will also increase the friction resistance against rearward movement of the lock bolt. On account of said provisions for counter-acting the rearward movement of the lock bolt, the spring 11 may be made weaker, so that it may be possible for the lock bolt to rise slowly, as desired. The resistance against rearward movement of the lock bolt may naturally be adjusted by the angle of the conicity.

As soon as acceleration of the shell has decreased to such a degree as enables spring 11 to overcome the inertia of the lock bolt, the latter moves again forward but now until its head 12' rests against the bottom of recess 2' which previously contained the balls 10. The elastic force of spring 11 should be adjusted in such a manner that the spring may not overcome the inertia of the lock bolt so long as the shell moves inside the barrel, but only after the shell has left the barrel. When the lock bolt thereupon rises into its forward position, its conical rear end moves entirely out of the hole 13' of the slider. The latter, by means of the pressure of its spring 5, moves now into the armed position, the priming cartridge 18 then lying centrally in the fuse, viz. in the middle between the firing pin 8 and the booster 6, 7. The weight of the slider may be distributed in such manner as may effect its movement into the armed position by the centrifugal force from the rotary motion of the shell inside the barrel.

The firing pin 8 is likewise arranged in such manner that, upon firing of the shell, it executes owing to its inertia a movement rearwards into hole 13' of the slider and is moved back by its spring 9 not before it has passed outside the muzzle of the barrel. Hereby, an additional barrel safety is attained. The fact that the firing pin is capable of being moved rearwards affords also a protection against explosion inside the barrel in case of the so-called double loading of shell throwers when a second shell is lowered from above on to a shell inside the barrel that has not been fired. This second shell prevents the striker and the firing pin of the first shell from moving up and out of its engagement with the slider. Additional security may be obtained by the arrangement that the slider 13, which is guided in the transversal recess 3' in the fuse body, projects with an elongation 13'' from the outer surface of the fuse body whenever the slider with its priming cartridge is moved into the armed position. Then it may be seen as well as felt whether the fuse is in proper condition so that an accidental premature arming of the fuse is easily observed. For reasons of security, it will be useful to choose a substantial thickness of the material in the fuse body below the priming cartridge when the latter is in safety position.

By means of this invention and by simple constructive means, a multiple protection against premature explosion of the shell is obtained though the fuse is a highly sensitive instantaneous fuse or a delayed instantaneous fuse. Upon impact, the point of the firing pin strikes into the priming cartridge which, in its turn, ignites the booster and the principal booster. A particularly high sensitivity may be obtained by providing the striker 19 with several through-going holes 19' so that the difference in air pressure between the front and rear (inner) side of the striker becomes small and the spring 9 of the firing pin might be made very weak. In case firing with reduced sensitivity is desired, there may be put over the striker and the point of the fuse a protective cap 21, made of somewhat elastic material and of a certain stiffness according to the lower sensitivity as desired. Thus, different caps of different stiffness may be used according to the requirements.

The invention is not restricted to the embodiments illustrated and described but may be modified within the scope of the appendant claims.

What we claim is:

1. A fuse for shells, comprising a body having a head portion, a firing pin having a striker, said firing pin being mounted in said head portion for sliding movement in the axial direction of said fuse body, said body having a bottom portion which is adapted for connection with a shell, a booster charge mounted in said bottom portion, a slider mounted in said fuse body between said firing pin and said booster and carrying a priming cartridge, said slider being mounted in said bottom portion for sliding movement in a direction transverse of the axis of said body from safety position to armed position, said slider when in safety position holding said cartridge, to one side of the path of movement of said axially movable firing pin and, when in armed position, holding said cartridge in the path of movement of said firing pin and in communication with said booster charge, a lock bolt for holding the slider in safety position mounted in the fuse body for sliding movement in the axial direction of the fuse body, said slider having an axially extending hole for accommodating the rear end of said lock bolt, said firing pin and said lock bolt being mounted in guiding engagement with each other and being provided with independent forwardly acting support springs allowing said firing pin and lock bolt to move rearwardly upon firing, and release elements normally holding said lock bolt in locking position in said hole in said slider but upon the rearward movement of said lock-bolt allowing disengagement of said lock bolt from said locking position in said slider.

2. A fuse for shells, comprising a body having a head portion, a firing pin mounted in said head portion for sliding movement in the axial direction of said fuse body, said firing pin having a striker, said body having a bottom portion which is adapted for connection with a shell, a booster charge mounted in said bottom portion, a slider mounted in said fuse body between said firing pin and said booster, for sliding movement in a direction transverse to the axis of said body from safety position to armed position, a priming cartridge carried by said slider, said slider, when in safety position, holding said priming cartridge out of the path of said axially movable firing pin and when in armed position holding the cartridge in the path of movement of said firing pin and in communication with said booster charge, a sleeve-shaped lock bolt for holding said slider in safety position mounted in said fuse body for sliding movement in the axial direction of said fuse body and surrounding said firing pin for guiding the same, said slider having an axially extending hole for accommodating the rear end of said lock-bolt and allowing frictional engagement of said lock-bolt with one side of said hole, said firing pin and said lock bolt being provided with independent support springs, and both being provided for rearward movement upon firing, and release balls normally holding the lock bolt in locking position in said hole in said slider but upon the rearward movement of said lock-bolt allowing disengagement of said lock-bolt from said locking position in said slider.

3. A fuse for shells, comprising a body having a head portion, a firing pin mounted in said head portion for

sliding movement in the axial direction of said fuse body, said firing pin having a striker, said body having a bottom portion adapted for connection with a shell, a booster charge mounted in said bottom portion, a slider mounted in said fuse body between said firing pin and said booster charge, for sliding movement in a direction transverse of the axial direction of said body from safety position to armed position, a priming cartridge carried by said slider, said slider, when in safety position, holding said cartridge to one side of the path of said axially movable firing pin and when in armed position holding said cartridge in the path of movement of said firing pin and in communication with said booster charge, said cartridge being housed in an axially through-going cavity in said slider, a sleeve-shaped lock bolt for holding said slider in safety position mounted in said fuse body for sliding movement in the axial direction of said body and surrounding said firing pin for guiding the same, said slider being provided with an axially extending hole for accommodating the rear end of said lock bolt, and allowing a frictional engagement of said lock bolt with one side of said hole, said firing pin and said lock bolt each being provided with an individual support spring and both being provided for rearward movement upon firing, release balls normally holding said lock bolt in said hole in said slider but upon the rearward movement of said lock bolt allowing disengagement of said lock-bolt from said hole in said slider, and a spring provided for moving said slider from safety position to armed position.

4. A fuse for shells comprising a body having a head portion provided with a recess, a firing pin mounted in said recess, for sliding movement in the axial direction of said fuse body, said firing pin having a striker, said body having a bottom portion adapted for connection with a shell, a booster charge carried in said bottom portion, a slider mounted in said fuse body between said firing pin and said booster charge, for sliding movement in a direction transverse of the axial direction of said body from safety position to armed position, said slider having a priming cartridge mounted therein, said slider when in safety position holding said cartridge to one side of the path of the movement of said axially movable firing pin and when in armed position holding said cartridge in the path of movement of said firing pin and in communication with said booster charge, said slider having a through-going cavity extending axially thereof and in which said cartridge is housed, a sleeve-shaped lock bolt for holding said slider in safety position mounted in said fuse body for sliding movement in the axial direction of said fuse body and surrounding said firing pin for guiding the same, said slider being provided with an axially extending hole for accommodating the rear end of said lock bolt, said firing pin and said lock bolt each being provided with an individual forwardly acting support spring allowing rearward movement of said firing pin and lock bolt upon firing, said lock bolt having a conical rear end for camming engagement with said hole during the rearward movement of said lock bolt, release balls normally holding said lock bolt in said hole in the slider but upon rearward movement of said lock bolt allowing disengagement of said lock bolt from said hole in said slider, and a spring provided for moving said slider from safety position to armed position.

5. A fuse for shells as claimed in claim 4, and in which said bottom portion of said body is provided with a boss formed on its front face, said boss being provided with an opening in which said lock bolt is guided, while the firing pin is guided principally by the surrounding lock bolt.

6. A fuse for shells as claimed in claim 4, and in which a transport safe guard member is provided, extending into said axially extending hole in said slider, behind the rear end of said lock bolt.

7. A fuse for shells as claimed in claim 4, and in which said fuse body has an opening in its wall adjacent said slider and wherein said slider has an elongation extending through said opening, said elongation projecting from the outer surface of the fuse body when the slider is in the armed position, for indicating an accidental premature arming of the fuse.

8. A fuse for shells as claimed in claim 4, and in which said fuse body is provided with an opening in its wall adjacent an end of the slider, said slider being provided with an elongation extending through said opening, and a transport safe guard member comprising a screw pin inserted longitudinally through said elongation and hermetically closing said opening.

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