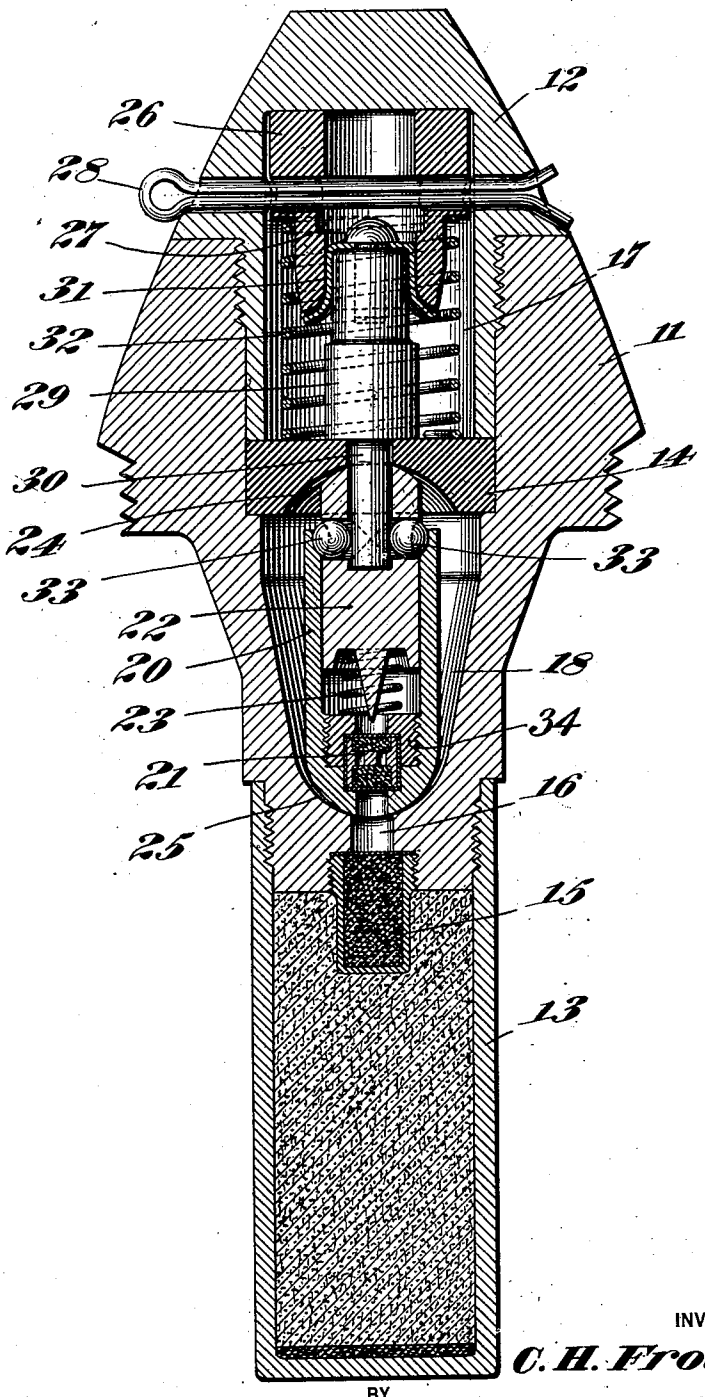
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FUSE FOR TRENCH MORTAR PROJECTILES

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FUSE FOR TRENCH-MORTAR PROJECTILES

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This invention relates to an improved design of impact fuses for projectiles. It relates more particularly to sensitive percussion fuses, which are intended to detonate an explosive charge contained in a trench mortar projectile, on impact of the projectile with its objective, irrespective of the striking position of the former.

Fuses susceptible of operation in any striking position of the projectile are already known, and are defined in the art as "all ways" fuses. Such fuses as a rule, embody a sensitive percussion device consisting of a detonator and striking member in telescopic relation to each other in the fuse, together with some form of intercepting safety device to prevent premature contact of these parts. However they suffer from the disadvantage that the safety devices employed, involve a complexity of parts, as for example, those having locking devices releasable by centrifugal force, or those having safety members forced from a locking to an inoperative position under the influence of the shock of discharge of the projectile from the gun or mortar.

Devices of this general character have hitherto not proved entirely satisfactory for use with trench mortar projectiles. In the first place trench mortar projectiles do not attain any substantial degree of rotation during flight, such as might be utilized for the centrifugal release of a safety device. In the second place, the comparatively low initial velocity of the projectile must be counteracted by a substantially massive inertia member in the fuse, if the effect of gun discharge is to be effectively utilized for the mechanical withdrawal of a safety device.

Furthermore the conditions of firing trench mortars are such that the useful effect of an inertia member in respect to a safety device responsive to it, should preferably be resolved into movements of the parts in a direction along or parallel to the axis of the fuse and not in a direction radial thereto. It has been found that fuses using locking bolts, or devices equivalent thereto, disposed radially in the fuse have not been satisfactory for trench mortar projectiles, owing to their uncertainty in action under the influence of the low inertia forces available to displace them by indirect means.

It has also been proposed to provide withdrawable safety means, responsive to the burning of a powder pellet, said pellet having been ignited on the initial firing of the gun or mortar. Devices of this character have also been shown to be unsuitable and unreliable in operation, owing to the deterioration of the powder pellet during a prolonged period of storage.

An object of my present invention is therefore to provide a fuse suitable for use with trench mortar projectiles, which shall possess the known advantages of an "all ways" percussion device but shall be rendered secure from premature ignition by a simple safety device, positive in action.

A further object of my invention is to provide a fuse, wherein all the operating parts are disposed axially in the fuse.

A further object of my invention is to provide a fuse of simple design comprising parts which are easy to manufacture and assemble.

In the drawing, I show one embodiment of my invention, wherein the fuse is shown in sectional elevation. Referring to this drawing, I show a fuse body 11 suitably threaded for attachment to the nose end of a projectile, a chambered fuse cap 12, a gaine 13, the latter secured rearwardly of the fuse body by screw threads. The fuse body 11 is suitably bored out to receive a diaphragm or division plate 14, which is retained in position in the fuse body by the screw cap 12. Rearwardly of the division plate the fuse body is chambered to an internal taper so as to terminate in a spherical seat 25. The rear end of the fuse body is suitably bored and threaded for the attachment thereto of a detonator-holder 15, which communicates with the chamber of the fuse by a suitable channel 16.

From the above, it will be seen that the interior cavity of the fuse is divided by the plate 14 into two separate chambers, an upper chamber 17 for the safety device and a lower chamber 18 for the percussion device.

The percussion device is of that general

type, well known in the art, which includes a striking member and a detonating member in yielding telescoping relation to each other and susceptible of movement in a lateral plane. As is usual in such devices, this telescopic combination is disposed between bearings so that any lateral movement of the parts result in a pinching effect on the telescoping members, thereby forcing the striking member into contact with the detonating member. Accordingly, I show in the drawing a detonating sleeve member 20, designed to include a detonator cap 21 suitably retained in position by a securing plug 34 in the usual manner. I also show a striker 22 slidably disposed in the detonating sleeve 20, and a light creep spring 23 in between the striker and the detonator cap. The rear face of the plate 14 is recessed to form a spherical seat 24 of suitable radius, and, as previously set forth, a similar spherical seat 25 is provided at the rearward extremity of the chamber 18. The extremities of the percussion device are of suitable spherical shape.

I also show in the upper chamber 17 an inertia sleeve 26 having an internal annular groove 27, a safety pin 28 passing through the fuse cap and the inertia sleeve; a locking plunger 29 having a portion 30 projecting rearwardly through the division plate 14, and entering the striker 22. A stirrup spring 31 is suitably secured to the forward extremity of the plunger 29 by a rivet or by any other suitable means. The inertia sleeve 26 normally rests on the extremities of the stirrup spring 31 being retained in its forward position in the chamber by split pin 28 and by a compression spring 32.

As indicated above, the striker 22 is axially bored to receive the rearwardly projecting portion 30 of the plunger 29. It is also bored radially to accommodate the two safety balls 33. The detonator-holder 1 may be filled with any suitable detonating composition and the gaine 13 may be loaded with a booster explosive as for example with trinitrotoluol or with tetryl.

The operation of my fuse is as follows:

Before entering the fused projectile into the bore of a trench mortar, the gunner removes the split pin 28. On shock of discharge the inertia sleeve 26 sets back, overriding the intercepting ends of the stirup spring 31 and compressing the spring 32. In the rearward position of the inertia sleeve 26, the extremities of the stirrup spring engage the internal groove 27 of the inertia sleeve, with the result that any forward movement of the sleeve due to the reaction of the compression spring will be communicated to the plunger 29. After acceleration of the projectile has ceased, the compression spring 32 reacts upon the inertia sleeve 26, and withdraws the plunger from its engagement with the striker 22, thereby permitting the lateral movement of the percussion device and also releasing the safety balls 33 to a position in the plate 14 from their locking position.

On impact of the projectile with the objective irrespective of the position of the former, the striker 22 is forced into contact with detonator 21, thereby initiating the detonation of the explosive charge. If the projectile strikes the objective head foremost, the detonator 21 is thrown forwardly into contact with the striker; on the other hand, if it strikes base foremost, the striker advances into contact with the detonator. Should the point of impact be on the side of the projectile, the complete percussion device is displaced laterally in respect to the axis of the projectile and, owing to the concavity of the bearing surfaces 24 and 25, this lateral displacement results in a pinching effect, whereby, the striker and detonator are brought into contact one with the other.

The function of the safety balls 33 is to prevent premature contact of the striker with the detonator; but the balls only remain in a locking position as long as the projecting portion 30 of the plunger is within the bore of the striker and opposes any movement of the balls inwardly towards the axis of the fuse, under the telescopic action of the striker 22 and the detonator-holder 20.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a fuse for projectiles, the combination of striking and detonating members disposed in telescopic relation one to the other, means interposed between the aforesaid members to prevent the premature approach of one member to the other, a locking member to prevent movement of said means from their effective position, an inertia sleeve surrounding the locking member, said sleeve having an internal groove therein, a deformable stirrup carried by the locking member, said stirrup being adapted to be deformed upon rearward movement of the inertia sleeve and to engage the annular groove of the latter when the sleeve is in its rearmost position, and a compression spring shouldering on the sleeve to return it to a forward position, whereby the locking member may be withdrawn from its locking position after the projectile has left the gun.

2. In a fuse for projectiles the combination of, a fuse body, a chamber therein, a division plate dividing the chamber into up-

per and lower portions, inertia responsive means in the upper portion, a percussion device operable at any angle of incidence disposed in the lower portion, means to lock the latter in a nonoperative position, means associated with the inertia means to render ineffective the locking means, and a detonating device attached rearwardly of the fuse body.

3. In a fuse for projectiles the combination of, a fuse body, a chamber therein, a division plate dividing the chamber into upper and lower portions, an inertia responsive device in the upper portion, said device including an inertia sleeve and a compression spring, a percussion device operable at any angle of incidence disposed in the lower portion, a locking plunger to retain the percussion device in an inoperative position, means to connect the inertia sleeve with the plunger upon rearward movement of the former so that the latter may be withdrawn to an ineffective position, and a detonating device attached rearwardly of the fuse body.

4. In a fuse for projectiles the combination of, a fuse body, a chamber therein, a division plate dividing the chamber into upper and lower portions, an inertia responsive device in the upper portion, said device including an inertia member and a stirrup spring, a percussion device operable at any angle of incidence disposed in the lower portion, said percussion device including striking and igniting members in telescopic relation one to the other, a locking plunger to retain the members in an inoperative position, a compression spring cooperating with the inertia member to withdraw the locking plunger from its effective position, and a booster attached rearwardly of the fuse body.

5. In a fuse for projectiles including a body member having a shouldered cavity, a cap member having a cavity and a diaphragm secured between said members to form upper and lower chambers in the fuse the combination of, a percussion device in the lower chamber, said device including striking and igniting members in telescopic relation one to the other, a locking plunger in the upper chamber having a portion projecting rearwardly through the diaphragm to engage a member of the detonating device, an inertia sleeve surrounding the locking member and shouldering forwardly on the cap member, deformable means engaging the sleeve and secured to the locking member to normally retain the latter in its effective position, said means being adapted to clutch the sleeve to the plunger when the latter has moved rearwardly on shock of discharge, and a compression spring seated on the diaphragm and shouldering on the sleeve to effect the withdrawal of the locking plunger from its effective position, after the projectile has left the gun.

6. In a fuse for projectiles the combination of, a body having a shouldered cavity terminating in a lower spherical seat, a diaphragm in the cavity supported by the shoulder, said diaphragm having its rear face recessed to form an upper spherical seat, a chambered nose cap secured to the fuse body so as to shoulder on the diaphragm, a percussion device disposed between the upper and lower spherical seats, said device including an ignition sleeve member and a striking member slidably disposed in the sleeve, means disposed rearwardly of the diaphragm to normally oppose movement of the percussion device, and means disposed forwardly of the diaphragm to render ineffective the aforesaid means after the projectile has left the gun.

7. In a fuse for projectiles, the combination of a fuse body having a cavity for a firing device and a diaphragm disposed forwardly of the cavity, the body and the diaphragm having a pair of oppositely concaved bearing surfaces normal to the fuse axis, a firing device disposed axially therebetween, said device adapted, when in its firing condition, for lateral movement and for the mutual telescopic approach of its parts, retaining means to normally prevent a displacement of the device from its axial position, safety means associated with the retaining means to normally oppose an approach of the parts aforesaid, and means responsive to the shock of gun discharge, but reactive upon retardation of the projectile during flight, to render ineffective the associated retaining and safety means, whereby the firing device may be rendered operable on impact in any position of incidence.

8. In a fuse for projectiles, the combination of a body member, a striker member, a detonator member disposed in telescopic relation to said striker member, a spacing member movably mounted in one of the two last mentioned members and interposed therebetween to prevent their mutual approach, means to retain the spacing member within the member in which it is mounted, a safety member movably mounted within the member containing the spacing member for normally preventing movement of the latter, and means for storing energy upon shock of discharge of the projectile from a gun to render said safety member ineffective.

9. In a fuse for projectiles, the combination of a body member, a striker member, a detonator member disposed in telescopic relation to said striker member, a spacing member interposed between the two last mentioned members to prevent their mutual approach, said spacing member being adapted to move toward the axis of the body member, a safety member normally preventing the movement of said spacing member, and

means for storing energy upon shock of discharge of the projectile from a gun to render said safety member ineffective.

10. In a fuse for projectiles, a body member having a chamber containing a percussion mechanism, said percussion mechanism comprising a striker member, a detonator member disposed in telescopic relation to said striker member, a movable spacing member interposed between the last two mentioned members to prevent their mutual approach, a safety member movably mounted in said body member and extending within said chamber to engage said percussion mechanism and to prevent movement of the spacing member, and means for storing energy upon shock of discharge of the projectile from the gun for withdrawing the safety member from its engagement with the percussion mechanism.

11. In a fuse for projectiles, a percussion mechanism comprising a striker member, a detonator member disposed in telescopic relation to said striker member, a movable spacing member contained within said percussion mechanism and interposed between the last two mentioned members to prevent their mutual approach, means to prevent the escape of said spacing member, a movable safety member normally preventing movement of said spacing member from its effective interposed relation with respect to the striker member and the detonator member, and means for storing energy upon shock of discharge of the projectile from a gun to render said safety member ineffective.

12. A fuse body having a chamber, a firing mechanism mounted within said chamber coaxial with said body, said firing mechanism comprising a striker member, a detonator member disposed in telescopic relation to said striker member, a movable spacing member interposed between the two last mentioned members to prevent their mutual approach, a safety member movably mounted in said body and disposed coaxial with said firing mechanism, means extending from said safety member to prevent the radial inward movement of the spacing member, and means for storing energy upon shock of discharge to a projectile from a gun to cause the movement of said safety member to render said means ineffective.

In testimony whereof I hereunto affix my signature.

CLARENCE HERVY FROELICH.