Aug. 26, 1930. W. SUMMERBELL 1,774,043

PERCUSSION FUSE

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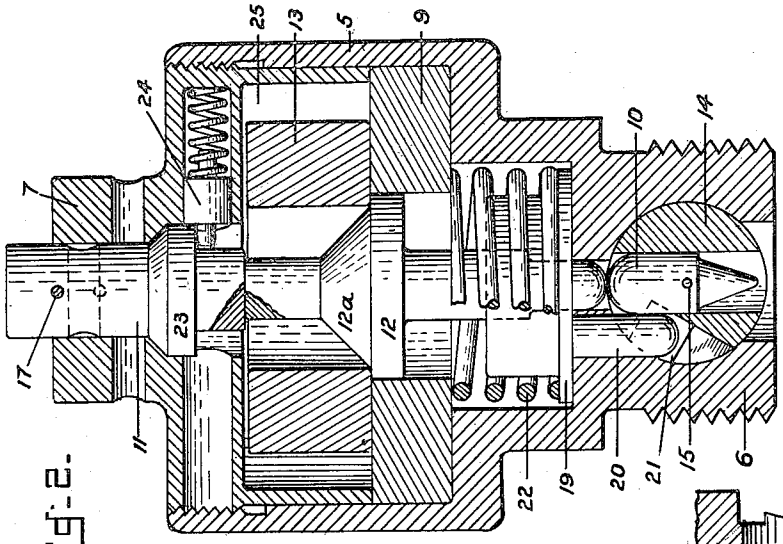


Fig-2.

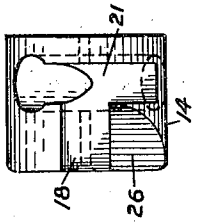


Fig-4.

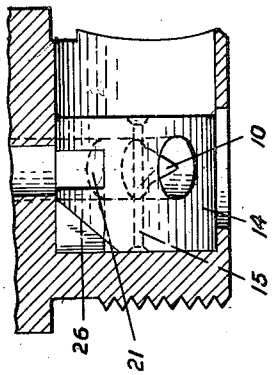


Fig-3.

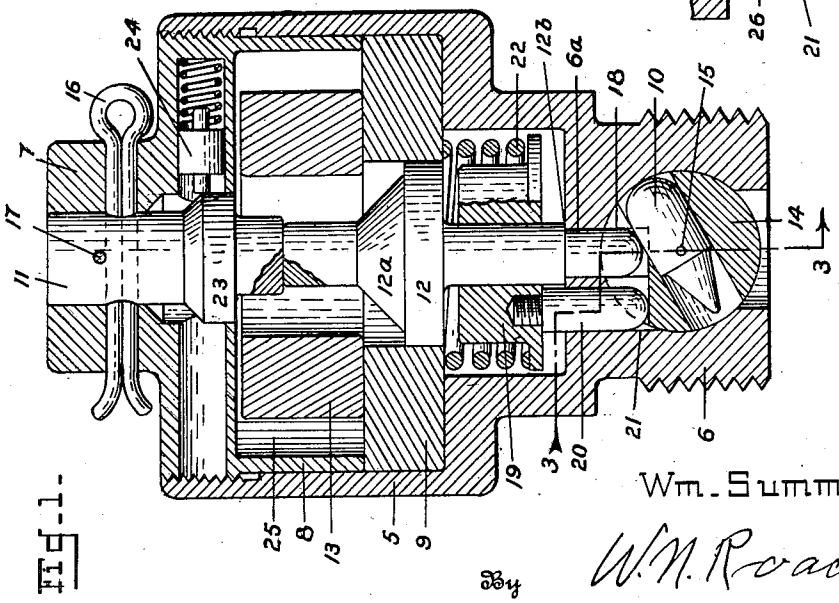


Fig-1.

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Fig. 6.

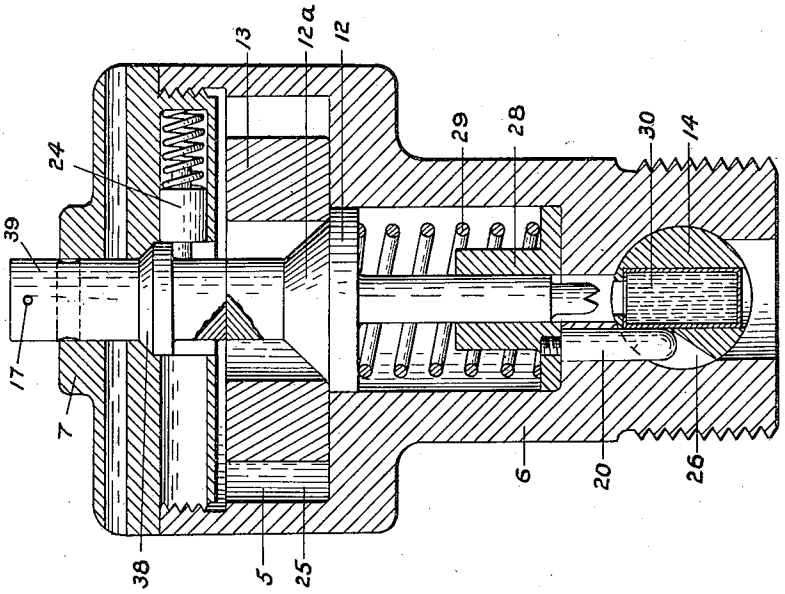
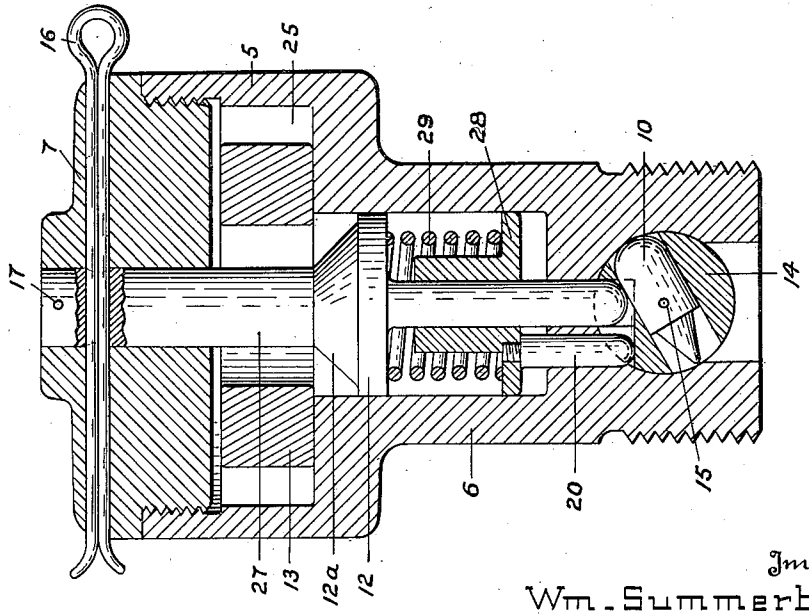


Fig. 5.



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PERCUSSION FUSE

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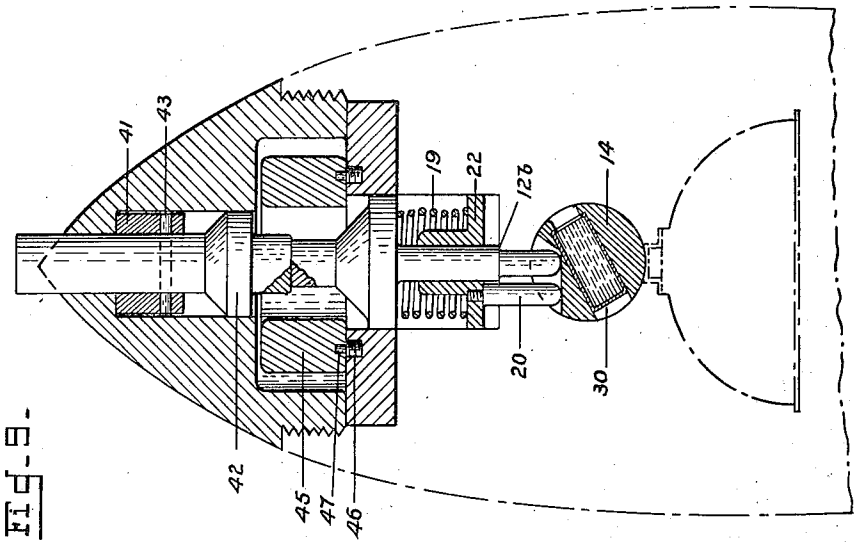


Fig-5-

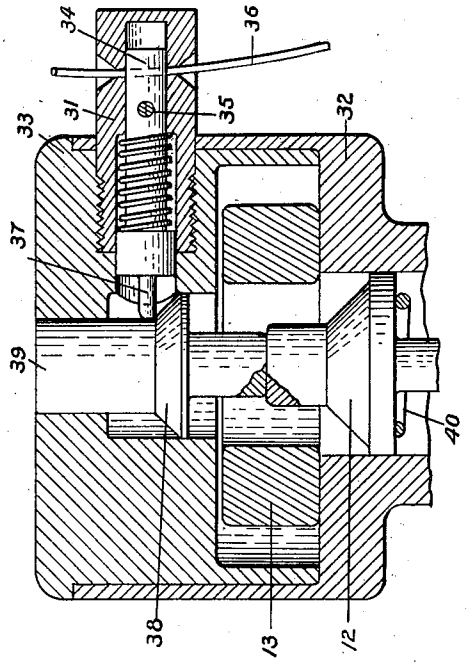


Fig-7-

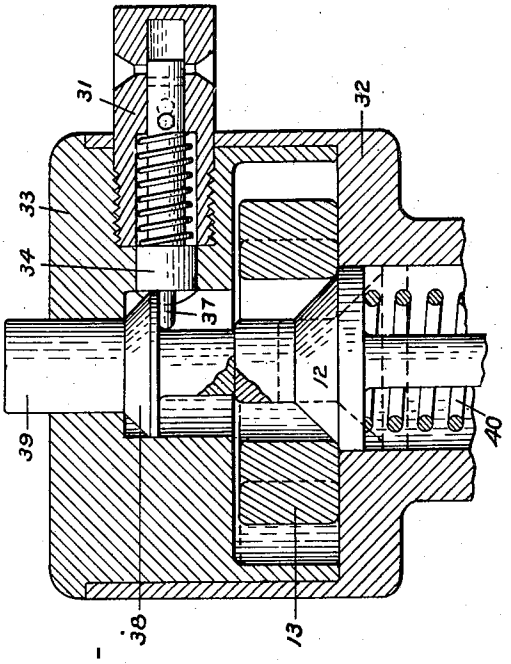


Fig-8-

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Patented Aug. 26, 1930 1,774,043

UNITED STATES PATENT OFFICE

WILLIAM SUMMERBELL, OF WATERVLIET, NEW YORK

PERCUSSION FUSE

Application filed September 26, 1927. Serial No. 223,104.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The subject of this invention is a percussion fuse.

Fuses of the "all-ways" type which are designed to function irrespective of the position in which a projectile or bomb strikes on impact usually employ double percussion plungers which are confined between cam seats and require to be displaced from an axial position in order to telescope and effect their operation. The disadvantages of this arrangement reside in a non-uniformity of action and in the necessity for employing involved safety features because the plungers must function upon the slightest lateral displacement in order to insure transmission of the igniting flame to the booster.

The principal objects of the present invention are to provide a simple "all-ways" percussion fuse in which the striker units are made to function as safety elements in maintaining the firing mechanism in unarmed position; to provide a construction whereby the sensitiveness of the fuse may be readily controlled; to restrict the strikers to axial movement and to insure safety in assembling.

With the foregoing and other objects in view, my invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A practical embodiment of the invention is illustrated in the drawings, wherein:

Fig. 1 is a longitudinal sectional view of a fuse constructed in accordance with the invention and shown in the unarmed position;

Fig. 2 is a similar view of the fuse in the armed position;

Fig. 3 is a detail sectional view on the line 3—3 of Fig. 1, the rotor shown in elevation;

Fig. 4 is a plan view of the rotor;

Figs. 5 and 6 are longitudinal sectional views of modified forms of the fuse respectively in unarmed and armed positions;

Figs. 7 and 8 are similar views of another modification;

Fig. 9 is a longitudinal sectional view illustrating the application of the invention to a projectile for guns.

Referring to Figs. 1 to 4 in which there is shown a fuse for drop bombs the fuse casing includes a hollow body 5 having a reduced rear portion 6 providing for threaded attachment to a projectile and being open at its forward end to permit introduction of the firing mechanism. This open end of the body is closed by a cap 7 having an annular extension 8 which serves to retain a washer 9.

The firing mechanism carried by the casing comprises a firing pin 10 and an axially mounted double percussion element, the foremost element consisting of an impact striker 11 mounted to be actuated on head-on impact and the rear element consisting of a cam striker 12 arranged to be actuated by a laterally movable inertia member 13 when the bomb strikes in any position other than head-on impact.

The firing pin 10, carried by a rotor 14, is held by a shear pin 15 and is normally maintained in the unarmed position out of axial alinement by means of the strikers 11 and 12, the former of which is fixedly secured to the cap by a split pin 16 and also by a release wire 17 which is associated in a well known manner with the launching apparatus of the airplane.

When the strikers are thus secured, the lower extremity of the cam striker 12 is disposed in a slot 18 in the rotor and prevents rotational displacement thereof. In the present showing the cam striker is illustrated as directly contacting the firing pin 10, but this arrangement is one of convenience in forming the rotor as the striker could just as well contact a cam surface of the rotor. When the split pin 16 and the release wire 17 have been removed the forward displacement of the two strikers to release the firing pin may readily be effected by a camming action exerted by the firing pin when the rotor is rotated.

For the purpose of rotating the rotor to secure the action just described there is provided an actuator in the form of a plunger 19 having a finger 20 which is parallel to the axis of the fuse and engages in a slot 21 which slot may be continuous with the slot 18 previously mentioned. The plunger embraces the rear stem of the cam striker serving as a guide therefor and its arming spring 22 is seated against the washer 9. When the plunger has reached the limit of its inward movement and assumes the position shown in Fig. 2 the finger 20 will act as a stop and maintain the firing pin in accurate axial alinement. The forward movement of the striker units is limited by the engagement of the cap 7 with a collar 23 on the impact striker.

With the impact striker in the armed position, extruding beyond the nose of the fuse, a plunger or plungers 24 mounted in the cap 7 and normally restrained by the collar is free to move behind the collar and establish a resistance element which must be sheared before the movement resulting from impact is sufficient to cause separation of the firing pin from its mounting in the rotor.

It will be noted from Fig. 2 that the release wire 17 can not be inserted when the striker is in the armed position as the openings are not alined and further the opening in the impact striker will be completely obstructed by the cap 7 so that the operator can not through error insert the release wire only through the striker.

The inertia member 13, which is designed to actuate the cam striker in all cases of impact other than axial, is an annular member embracing the forward stem of the striker and is mounted as a freely floating member in a chamber 25 located between the cap 7 and the washer 9. The inertia member is, of course, proportioned to act on the cam surface 12^a of the striker 12 with sufficient force to shear the pin or wire 15 holding the firing pin in the rotor. The sensitiveness of the fuse may be readily controlled by the mass of the inertia member or by the inclination of the cam surface. It will be noted that the cam striker is guided and constrained to axial movement by the washer 9, plunger 19, and the aperture 6^a in the fuse body and that in being actuated it has a point contact with the inertia member. When the projectile is in the horizontal position with the split pin 16 in place the inertia member will engage behind the collar 23 and thus supplement the split pin in preventing accidental inward movement of the impact striker.

The elements of the fuse have been designed with a view to securing safety in assembly and the arrangement is such that the rotor is the final unit to be assembled after the cap and impact striker carried thereby is secured in place. The rotor can only be inserted in the fuse body when the firing pin is out of axial alinement. This is controlled by the location of the cam surface 26 on the rotor which when the rotor is inserted causes the finger 20 to be elevated until it drops into the slot 21. The cam striker being in the position shown in Fig. 1 with its shoulder 12^b abutting against the fuse body will enter the slot 18 of the rotor. The primer detonator or the booster which are not shown in the drawings may therefore, because of this safety provision, be assembled to the rear portion of the fuse body.

In the modification shown in Figs. 5 and 6 the cam striker 27 and the rotor actuating plunger 28 are motivated by the same spring 29. This construction provides greater safety in substituting a primer detonator 30 for the firing pin mounted in the rotor as the spring will serve to maintain the striker and primer in spaced relation and the striker will function in the unarmed position to prevent axial alinement of the primer detonator. The striker may be in one or two parts as shown.

The modified structure shown in Figs. 7 and 8 functions in a manner similar to the device of Figs. 1 and 2. The variation resides in the novel form of release mechanism which comprises a plug 31 serving to hold the fuse body 32 and the cap 33 in fixed relation and housing a spring-pressed plunger 34. This plunger normally fixed with respect to the plug by a split pin 35 and a release wire 36 is provided with an axial stud 37 on its inner end arranged to engage the collar 38 of the impact striker 39 and hold the firing mechanism in unarmed position. When the split pin and release wire are removed the actuating spring 40 is free to move the striker elements forward thereby retracting the plunger 34 and enabling it to engage in rear of the collar 38. The stud is sheared on impact.

In order to prevent improper assembly of the fuse the impact striker is of greater diameter above the collar, restricting the penetration of the plunger and causing alinement of the openings in the plunger and plug for the insertion of the split pin and release wire.

Whereas in the fuse heretofore described the principle of the invention is shown as applied to a fuse for bombs, an illustration is given in Fig. 9 to demonstrate its applicability to fuses for artillery shells. In this character of fuse the firing mechanism may be held in unarmed position by means of a sleeve 41 secured to the impact striker 42 by a pin 43 which is sheared on set-back.

In order that the inertia member 45 may be removed from the influence of centrifugal force during flight shear pins 46 may be carried by the fuse body and be engaged in a recess 47 in the inertia member.

I claim:

1. A fuse including a casing, a rotor in the casing, a firing pin in said rotor, an actuator parallel to the axis of the fuse and normally tending to displace the rotor, secured co-axial strikers one of which normally engages the rotor to maintain the firing pin out of axial alinement, said strikers capable when released of being moved to armed position by the rotor, a shear pin engageable behind the forward striker when armed, and a transversely movable inertia member associated with the striker.

2. A fuse including a casing, a rotor in the casing, a firing pin in said rotor, an actuator normally tending to displace the rotor, secured co-axial strikers one of which normally engages the rotor to maintain the firing pin out of axial alinement, said strikers capable when released of being moved to armed position by the rotor, a shear pin engageable behind the forward striker when armed and a transversely movable inertia member associated with the rear striker.

3. A fuse including a casing, a rotor in the casing, a firing pin in said rotor, an actuator normally tending to displace the rotor, secured coaxial strikers one of which normally engages the rotor to maintain the firing pin out of axial alinement, said strikers capable when released of being moved to armed position by the rotor and a transversely movable inertia member associated with the rear striker.

4. A fuse including a casing, a rotor in the casing, an element of a firing mechanism in said rotor, an actuator normally tending to displace the rotor, a secured striker axially of the fuse and normally engaging the rotor to maintain it in unarmed position, said striker capable when released of being moved to armed position by the rotor and a transversely movable inertia member associated with the striker.

5. A fuse including a casing, a rotor in the casing, an element of a firing mechanism in said rotor, an actuator normally tending to displace the rotor, a secured striker axially of the fuse and normally engaging the rotor to maintain it in unarmed position, said striker capable when released of being moved to armed position by the rotor.

6. A fuse including a rotor, an element of a firing mechanism in said rotor and members movable longitudinally of the fuse in opposite directions for controlling the armed and unarmed positions of the rotor.

7. A fuse including a reciprocable firing mechanism and rotatably and reciprocably movable members cooperating to reciprocate the firing mechanism to armed position.

8. A fuse including a rotor, an element of a firing mechanism in said rotor, means for displacing the rotor to armed position, and striker means normally holding the rotor in unarmed position and movable by the rotor to operative position.

9. A fuse including a rotor, an element of a firing mechanism in said rotor, means for displacing the rotor to armed position and striker means movable by the rotor to operative position.

10. A fuse including a rotor, a plunger for displacing the rotor to armed position, and striker means normally holding the rotor in unarmed position.

11. A fuse including a rotor, a firing mechanism in said rotor, an actuator parallel to the axis of the fuse and normally tending to displace the rotor and axially movable means controlling release of the rotor and actuated by said rotor.

12. A fuse including a rotor, a firing mechanism in said rotor, an actuator parallel to the axis of the fuse and normally tending to displace the rotor and an axially movable means controlling release of the rotor.

13. A fuse including a firing pin pivotally mounted in the axis of the fuse, a striker normally holding said pin out of axial alinement and capable of being moved by said pin in position to drive the pin inward on impact and an actuator for displacing said firing pin to armed position and maintaining it there.

14. A fuse including a firing pin pivotally mounted in the axis of the fuse, a striker normally holding said pin out of axial alinement and capable of being moved by said pin in position to drive the pin inward on impact and an actuator for displacing said firing pin to armed position.

15. A fuse including a striker having a cam surface constrained to movement axially of the fuse and a transversely movable inertia member embracing the striker for actuating said striker on impact.

16. A fuse including coaxial strikers, means for moving the strikers outwardly until the forward striker is extruded and a transversely movable member for actuating the rear striker.

17. A fuse including a striker, a transversely movable shear pin securable in place to hold the striker in unarmed position, said pin when released re-engageable to hold the striker in armed position.

18. A fuse including a body, a cap for said body, an axial striker, means coupling the cap and body and a shear pin in said coupling means controlling movement of the striker.

19. A fuse embodying a rotor, a firing means carried by the rotor, means releasable upon launching of the fuse for holding the rotor in unarmed position, and means for simultaneously moving the first named means when released and rotating the rotor.

20. A fuse including a casing, a striker normally assembled in the fired position and a member carrying an element of a firing mechanism carrying member assembled to

the casing after the striker is in place and having a recess for said striker, said recess positioned to receive the striker only when said member is inserted in the unarmed position.

21. A fuse, including an element of a firing mechanism normally in unarmed position and a member mounted longitudinally on the fuse for moving said element to armed position.

22. In a fuse, a carrier, an element of a firing mechanism in the carrier, a striker normally opposing movement of the carrier to armed position, an actuator for moving the carrier to armed position and a spring confined between the striker and actuator.

23. In a fuse, a rotatable carrier, an element of a firing mechanism in the carrier, a striker normally holding the carrier against movement and a single spring for simultaneously moving the carrier and striker.

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