July 30, 1946. W. F. ERRIG ET AL 2,405,023

FUSE

Filed April 20, 1942

Fig. 1.

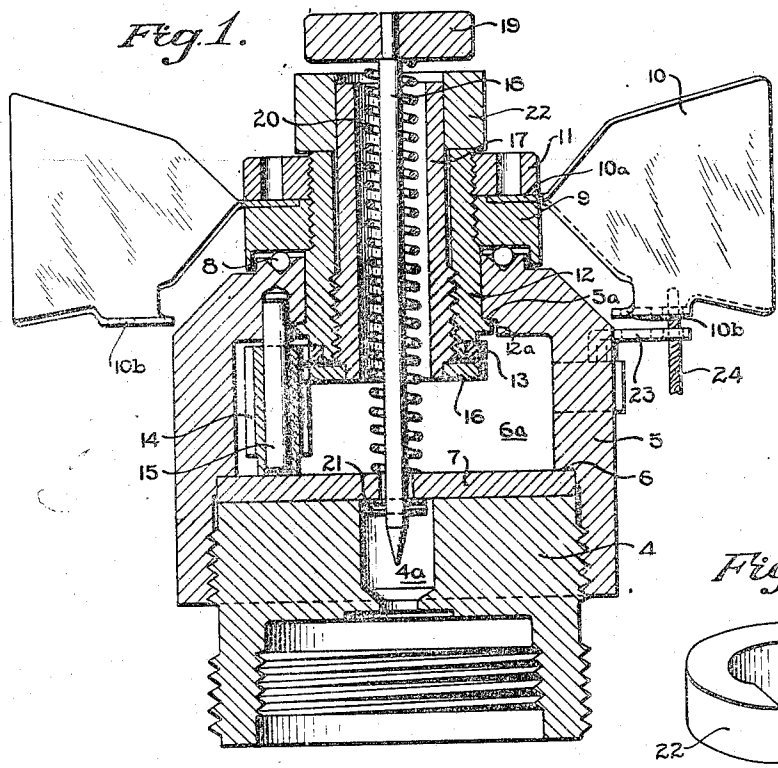


Fig. 3.

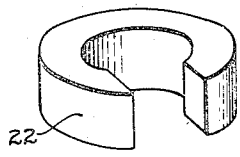
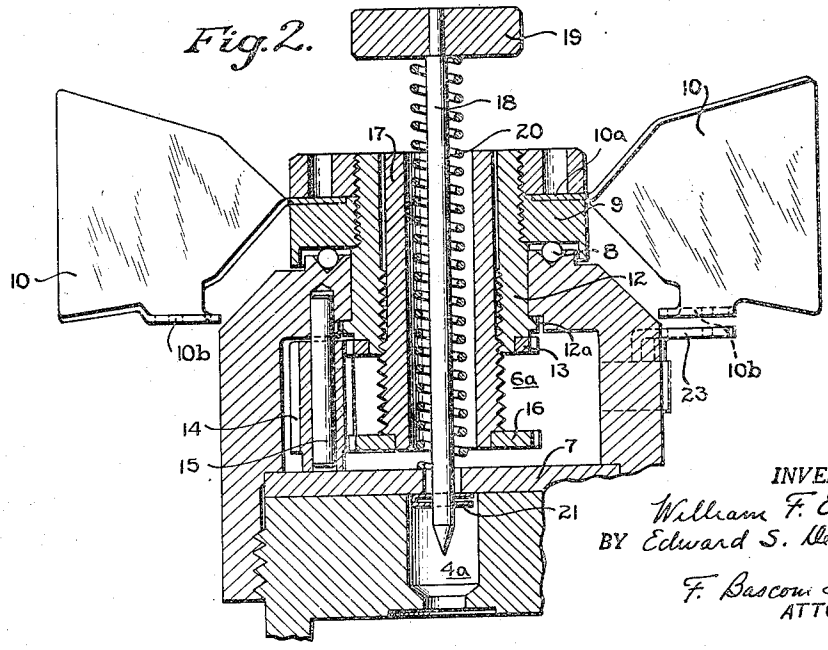


Fig. 2.



INVENTORS.
William F. Errig
BY Edward S. McHart
F. Bascom Smith
ATTORNEY

Patented July 30, 1946 2,405,023

UNITED STATES PATENT OFFICE

2,405,023

FUSE

William F. Errig and Edward S. De Hart, Philadelphia, Pa., assignors to Peco Manufacturing Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Application April 20, 1942, Serial No. 439,614

2 Claims. (Cl. 102—81.2)

1

This invention relates to fuses and more particularly to a nose fuse for bombs.

Dive bombing makes it necessary to provide bomb fuses which can be armed at speeds up to 600 miles per hour. It is also desirable to make bomb parts of less expensive, readily available materials, such as low grade steel. Bomb fuses heretofore employed are found unsatisfactory at the high speeds of modern warfare. These fuses usually embody an air driven vane for arming the firing mechanism. In one well-known fuse of this type, the vane is adapted to rotate three sectors forming an annular safety member that is adapted to restrict movement of a striker and firing pin. Normally, the sectors are held in safety or unarmed position by a sleeve which extends into grooves cut in the sectors. Rotation of the vane is effective to withdraw this sleeve whereupon the sectors are released and are thrown radially by centrifugal force to arm the firing mechanism.

The sectors heretofore used were formed of aluminum to reduce the centrifugal forces and were so constructed as to require a large hole in the outer end of the arming sleeve so that the sectors could be telescoped over said sleeve and held thereon. When bombs fitted with this type of fuse were dropped from a dive bomber, each safety sector was subjected to a very high centrifugal force and tended to move outwardly, thereby exerting a strong pressure radially on the arming sleeve and causing drag on the arming sleeve. Frequently the gearing actuated by the vane for retracting the sleeve was stripped, due to this drag, thereby rendering the fuse inoperable. Any attempt to form the sectors of cheaper material, such as low grade steel, increased the centrifugal forces and rendered the device inoperative at diving speeds in excess of 100 miles per hour.

One of the objects of the present invention is to provide a novel fuse which will overcome the above difficulties.

Another object is to provide novel means for positively retaining the firing mechanism of a nose fuse in unarmed position until the bomb is released.

Further objects are to provide a bomb fuse of inexpensive but rugged construction, and one which will arm at the high speeds employed in modern warfare.

The above and other objects will appear more fully hereinafter in the written description, which is to be read with the accompanying drawing wherein like reference characters refer to like

2

parts throughout the several views. It is to be expressly understood, however, that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims. In the drawing,

Fig. 1 is a longitudinal section through a bomb nose fuse embodying the present invention;

Fig. 2 is a longitudinal section showing the parts in armed position, and

Fig. 3 is a perspective of the safety block which is preferably employed.

In the form illustrated, the fuse comprises a body member 4 adapted to be threaded into the nose of a bomb, not shown. Preferably this body portion is made of steel rather than aluminum, as has heretofore been the general practice, and is recessed at the inner end thereof to receive the usual booster charge. A recess 4a is centrally disposed in the outer portion of body 4 to receive the usual primer, not shown. Threaded to body portion 4 is an outer body portion 5 provided with an interior shoulder 6 to receive an end plate 7, that separates the gear chamber 6a from the primer recess. The outer end of body portion 5 is formed as an inner ball race for balls 8, the outer race 9 serving as the hub for a two bladed vane 10. The vane has a circular hub portion 10a which is clamped between outer race 9 and a nut 11 threaded onto the outer end of arming hub 12. Preferably, member 5, outer race 9 and nut 11 are formed of steel, while the arming hub 12 is of brass or bronze. Outer race 9 is threaded to arming hub 12 and the inner end of the arming hub extends into the gear chamber 6a and carries, at the extremity thereof, a ring gear 13. Outward movement of arming hub 12 relative to body portion 5 is prevented by means of a shoulder 12a formed on said hub for engagement with an inner shoulder 5a formed on body member 5. The vane 10, outer race 9, nut 11, hub 12 and gear 13 thus rotate as a unit.

Gear 13 meshes with an elongated pinion 14 positioned in the gear chamber 6a and rotatably held in operative position by means of a pin 15 which extends through the pinion, the outer end of said pin extending into a recess formed in body member 5. Pinion 14 also meshes with a movable ring gear 16 secured to the inner end of an arming sleeve 17 which extends through the longitudinal circular opening in arming hub 12. Gear 16 has more or less teeth than gear 13 so that rotation of pinion 14 will produce angular movement of said gears relative to each other in a direction to

move said arming sleeve axially inward relative to hub 12. The arming sleeve is longer than the hub 12 and when the parts are in unarmed position the outer end of the sleeve extends for an appreciable distance beyond the outer end of hub 12. Preferably, the two gears 13 and 16, pinion 14, hub 12 and sleeve 17 are formed of brass or bronze, while all the remaining parts of the fuse are formed of steel.

The arming sleeve 17 is hollow and extending therethrough is a firing pin 18 which has secured to the outer end thereof a striker 19 in the form of a disc. The inner end of the firing pin is pointed and extends through a central opening in end plate 7. A coil spring 20 surrounds the firing pin with the outer end of said spring abutting against the inner face of the striker and the inner end of the coil spring resting against the end plate 7. A transversely extending pin 21 is carried by the firing pin 18 adjacent the inner end in a position to engage the inner face of end plate 7 whereby the firing pin and striker are held against movement outwardly relative to the fuse body.

Novel means are provided to prevent accidental arming of the firing mechanism of the fuse, said means being so formed and mounted that the fuse will be automatically armed when the bomb in which it is fitted is released from the aircraft.

As illustrated, there is provided a one-part, safety block 22 which loosely surrounds the projecting end of arming sleeve 17 intermediate nut 11 and striker 19. As is shown more clearly in Fig. 3, the safety block is an annular member from which a parallel sided section has been cut, the width of the cut-out portion being greater than the maximum diameter of coil spring 20.

An apertured guide 23 is preferably secured to the side of body portion 5 by means of screws (not shown), and vane 10 may be provided with diametrically disposed tabs 10b, which tabs are also apertured similarly to guide 23. A sealing or arming wire 24 and an additional locking member (not shown), if desired, extends or extend through the apertures in the guide and tab whereby movement of the vane is positively prevented. When arming wire 24 is removed and the bomb is released from the airplane bomb rack, vane 10 rotates at high speed together with hub 12 and gear 13. Pinion 14 is now rotated as is the gear 16 secured to the arming sleeve. Due to the operation of gear train 13, 14 and 16 and the threaded connection between said sleeve and hub, the arming sleeve moves inwardly toward end plate 7 whereby the outer end of said sleeve is withdrawn from the safety block 22.

The rush of air past the nose of the fuse causes the interrupted annular member or safety block 22 to move upwardly relative to striker 19 and to bear against the outer end of the rotating hub and this frictional engagement is sufficient to cause rotation of the block at high speed. When the outer end of the sleeve moves inwardly to the point where it is flush with the outer end of the hub, the centrifugal force acting on block 22 is effective to throw said block outwardly clear of the spring and firing pin and the fuse is now armed. It will be apparent that the cut-out portion of the annular block unbalances the block so that centrifugal force is effective to insure that the block will be thrown outwardly clear of the spring and firing pin. In actual tests of the mechanism, it was found that the fuse would arm in one and two-tenths of a second at 450 miles per hour and in one second at 550 miles per hour. A successful test was also made at 600 miles per hour. The block may be made by cutting sections from a steel pipe which has a portion of the side wall thereof cut away. Even though the block is made of steel, arming of the fuse is certain because the centrifugal force is acting radially in one direction only rather than in three radial directions, as in fuses heretofore provided. Moreover, the unbalance of the block is such that the centrifugal action never becomes excessive even when the block is made of steel.

There is thus provided a novel bomb nose fuse which is certain in operation, which is economical to construct, and which is operative at the high speeds required for modern bombing planes. Due to the substitution of inexpensive and available material, the bomb may be more readily fabricated. Various changes may be made in the details of the mechanism without departing from the invention.

What is claimed is:

1. In a bomb fuse of the type having a body from which projects an arming sleeve adapted to be retracted into said body by an air driven vane and a headed firing pin extending through said sleeve, the combination with said sleeve and pin of a one-piece annular safety block having a cut-out portion of width less than the sleeve but of sufficient size for escape when the sleeve is retracted, said block being adapted to surround said sleeve, in its unarmed position, between the head of the firing pin and said body.

2. In a bomb fuse of the type having a body from which projects an arming sleeve adapted to be retracted by an air driven vane and a headed firing pin extending through said sleeve, the combination with said sleeve and pin of a one piece safety block adapted to embrace said sleeve between the pin and the body and having a gap too small to pass the sleeve but large enough to escape when the sleeve is retracted.

WILLIAM F. ERRIG.
EDWARD S. DE HART.