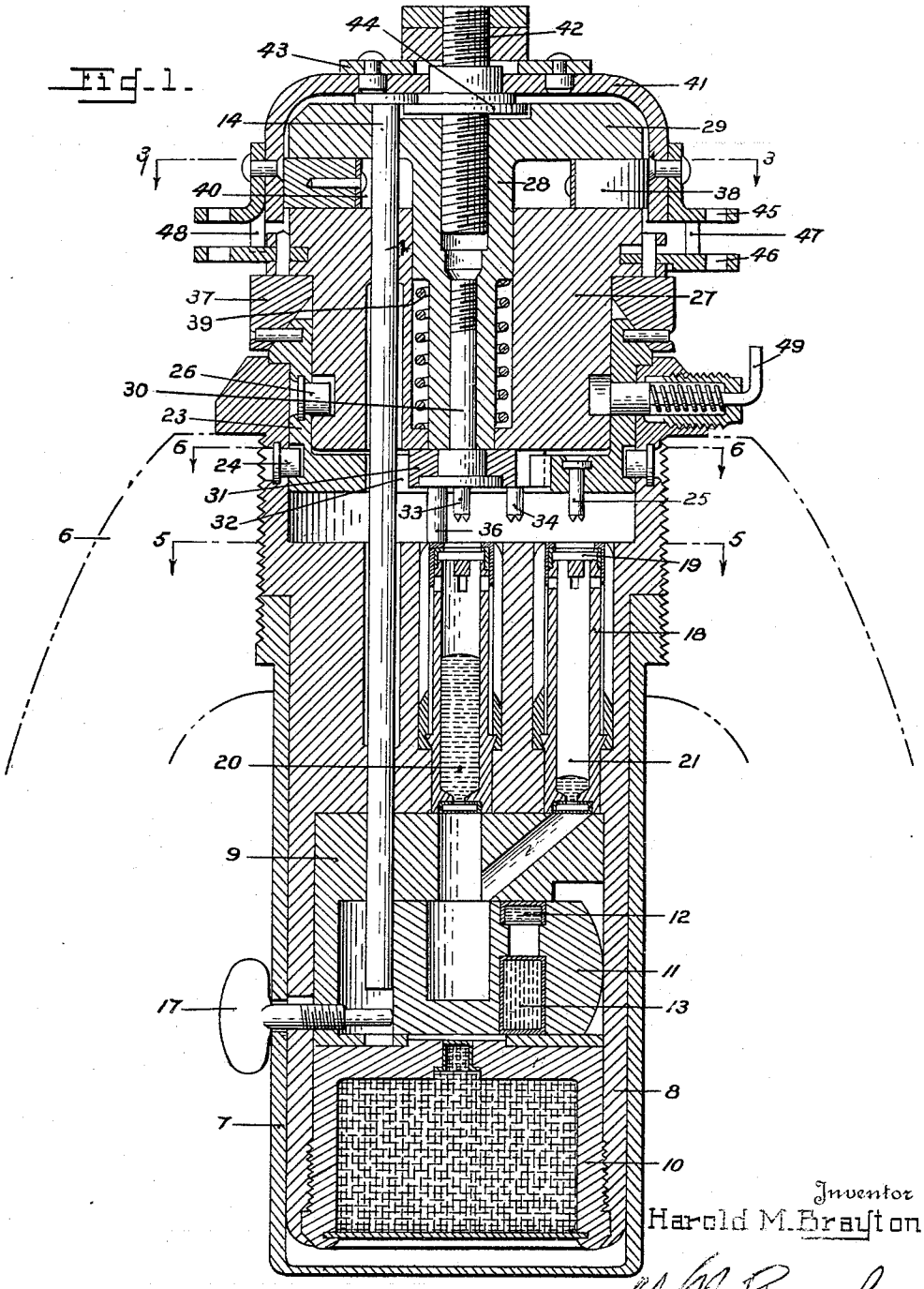
March 25, 1930. H. M. BRAYTON 1,751,616

COMBINATION FUSE

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Fig. 1.



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COMBINATION FUSE

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Fig. 2.

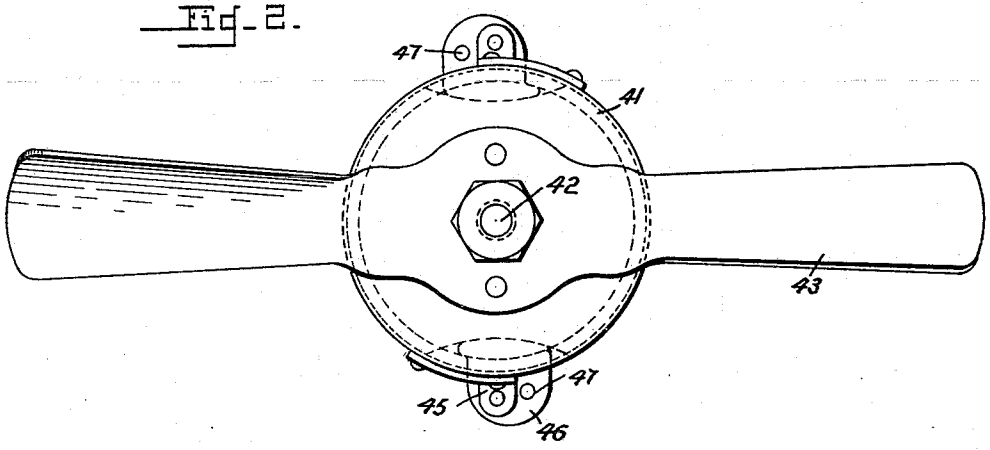


Fig. 3.

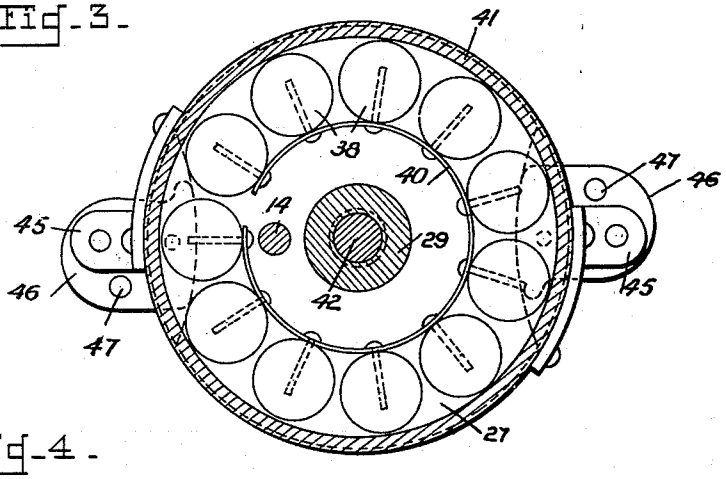
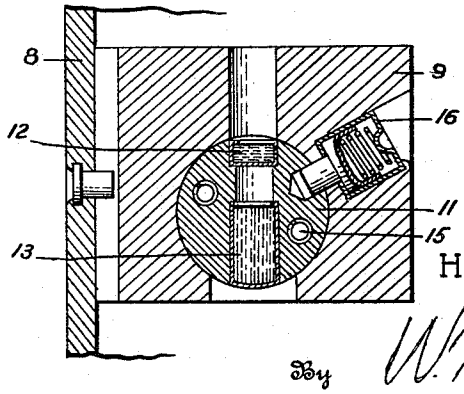


Fig. 4.



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Fig. 5.

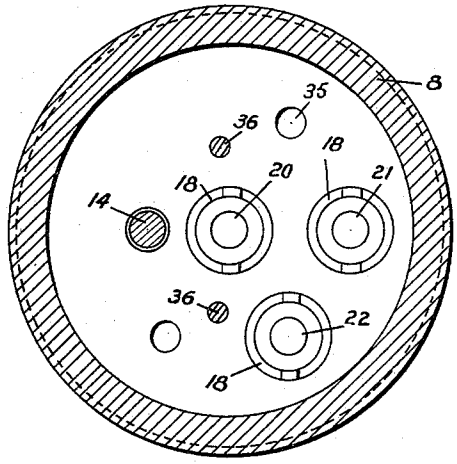


Fig. 6.

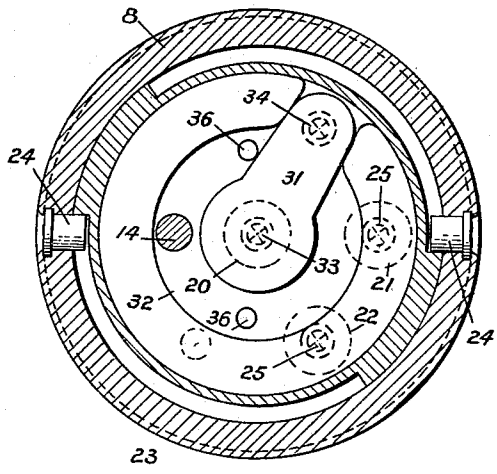


Fig. 7.

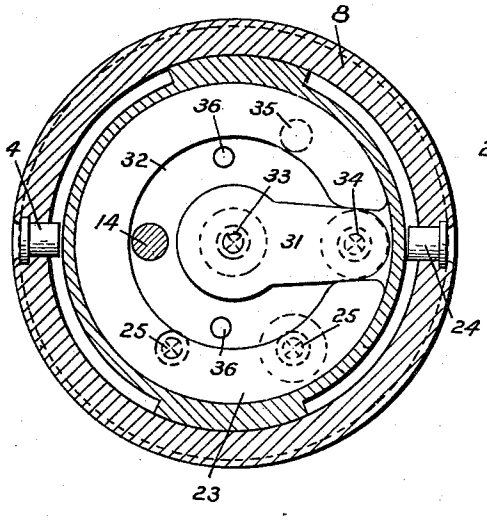
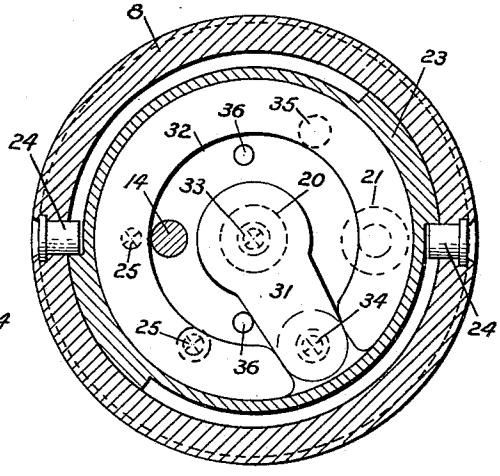


Fig. 8.



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UNITED STATES PATENT OFFICE

HAROLD M. BRAYTON, OF DOVER, NEW JERSEY, ASSIGNOR TO SECRETARY OF WAR OF THE UNITED STATES OF AMERICA

COMBINATION FUSE

Application filed March 2, 1925. Serial No. 12,784.

(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 combination fuse, especially designed as a nose fuse for drop bombs but not restricted thereto.

In carrying out bombing operations, the nature and character of the target together with the object to be sought controls the type of fuse to be employed. Because of the different actions which must be provided for, it is obviously a considerable convenience and advantage in fabrication and distribution to combine in a single fuse elements which may be selectively adjusted to meet varying conditions.

According to the present invention, the fuse is provided with a plurality of powder trains adapted to produce instantaneous or selective delay action while the functioning of the igniting elements is further governed by the nature and degree of the impact.

Other objects and advantages are: to produce a fuse which is capable of functioning on light impact at low velocity by providing a plate which is held in the armed position by a spring sufficient in strength to oppose the air pressure tending to drive the plate inwardly; to provide a transversely disposed bolt carrying a detonating element which is held in unarmed position until the vane assembly is removed in flight whence the bolt is free to be moved to armed position and locked in place; to provide an arrangement of stops whereby the vane assembled may be readily unscrewed during flight without interferring with the stops.

To these and other ends, my invention consists in the construction, arrangement, and combination of elements, described hereinafter and pointed out in the claims forming a part of this specification.

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

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

Fig. 2 is a plan view thereof;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view through the bolt in armed position;

Fig. 5 is a sectional view on the line 5—5 of Fig. 1 showing the position of the powder trains;

Fig. 6 is a sectional view on the line 6—6 of Fig. 1, showing the heavy impact firing pins set in line with the outer powder trains and the central light impact firing pin in functioning position; and

Figs. 7 and 8 are sectional views on line 6—6 of Fig. 2 illustrating other settings of the firing pins.

Referring to the drawings by numerals of reference:

According to the invention the nose of a bomb 6 is formed with an opening for threadedly receiving a liner 7 and a fuse body 8, the latter within the former and both extending into the interior of the bomb.

In a cavity in the inner end of the fuse body are placed in order a block 9 retained by a booster container 10. Mounted for slidable movement in the block perpendicular to the axis of the fuse is a bolt 11 containing a primer 12 and a detonator 13. The bolt is normally held in the unarmed position by means of a rod 14 which is withdrawn during the flight of the bomb, as will be described hereinafter. When the rod has been withdrawn, the bolt is urged to armed position by springs 15 where it is held by the engagement of a spring pressed pin 16 mounted in the block. As an additional precaution in transportation, a thumb screw 17 may be provided to hold the bolt in the unarmed position.

Arranged in the main portion of the fuse body 8 are a plurality of thimbles 18, each carrying a primer 19 and a powder train of varying burning intervals, the determination of which may be within wide limits. Passages are provided leading from the powder trains to the detonator in the bolt and the trains are so arranged and protected that ignition of one is not communicated to the remainder. As shown, the central or axial train 20 is designed to afford an interval of

1.2 seconds and the outer trains 21 and 22 respectively, are designed to provide a delay 0.1 seconds and instantaneous action.

Rotatably mounted in the mouth of the fuse body is a cup-shaped carrier 23 supported by pins 24 so as to be spaced from the primers 19. Secured to the carrier are two fixed heavy impact firing pins 25—25 positioned when properly set to strike the primers of the outer trains 21 and 22.

Similarly mounted in the carrier by means of pins 26 is a fuse head 27 within which is the stem 28 of a pressure plate 29. The stem carries in its rear portion the threaded spindle 30 of an arm 31 which is disposed in an aperture 32 in the carrier, as clearly shown in Figures 1 and 6 so as to be capable of longitudinal movement independently of the carrier but rotatable in unison with it. In this arm are fixed a pair of light impact firing pins, the central pin 33 adapted to strike the primer of the central powder train 30 and the outer pin 34 adapted to selectively strike the primer of either of the outer trains 21 and 22 or to enter a blind cavity 35 in the fuse body. Rotational movement of the arm is limited by stops 36 fixed in the fuse body and protruding through the aperture 32 in the carrier while the rod 14, which holds the bolt in unarmed position also passes through this aperture.

Interposed between the flange of the fuse head 27 and the rim of the carrier 23 is a resistance ring 37 which is crushed on heavy impact allowing the head to be driven in to sheer the bottom of the carrier and force the heavy impact firing pins 25 inwardly to fire any primers which may be underneath them at the time. The light impact firing pins 33 and 34 which are movable with the pressure plate 29 are held from contact with the primers when the fuse is unarmed by means of a group of spacers 38 interposed between the pressure plate 29 and the fuse head 27, and, when the fuse is armed, they are held in spaced relation to the primers by a spring 39 which is just strong enough to hold the pressure plate in normal assembled position against air pressure. The spacers 38 are connected by a flat spring 40 which ejects them from under the pressure plate when the vane assembly has unscrewed in flight and dropped clear of the bomb.

The vane assembly consists of a cup 41, stem 42, and vanes 43 which function in the usual manner during flight of the bomb and fall clear to expose the pressure plate. The stem 42 which is threaded in the pressure plate is formed with an annular flange 44 disposed under the head of the rod 14 so that as the stem is unscrewed it effects withdrawal of the rod to permit the bolt 11 to be moved to armed position. To prevent the vane assembly from turning prior to release of the bomb the usual sets of ears 45 and 46 are respectively provided on the cup 41 and fuse head 27 through which passes a safety wire (not shown) connected to a release mechanism in the plane. By reference to Figure 1, it will be noted that the right hand ear 46 is set on a different plane from the left hand ear and that this ear is provided with a stop pin 47 spaced from the outer wall of the fuse head and against which the vane ear 45 will be brought to rest in assembling the vane unit. In the left hand set of ears a stop 48 is integral with the vane ear and is adapted to be brought up against the left hand ear 46 of the fuse head. By this arrangement interference in unscrewing the vane cup is eliminated as the stop 48 will pass between the stop 47 and the fuse head and will also clear the right hand ear 46.

The entire head assembly of the fuse is normally held against rotation by means of a spring pressed bolt 49 mounted in the exposed portion of the stationary fuse body and engageable in a recess in the carrier.

To accomplish setting of the fuse, the bolt 49 is withdrawn and the entire head assembly is rotated to the desired position which may be conveniently indicated by graduations on the carrier and fuse body. Rotation of the vane cup 41 acting through the vane stem 42 rotates the pressure plate 29 which carries with it the firing arm 31 and the carrier 23 in which the arm is disposed. It is, therefore, possible to swing the firing arm carrying the light impact firing pins, and also the carrier in which are mounted the heavy impact firing pins, about the axis of the fuse and the following settings respectively, as shown in Figures 6, 7 and 8, may be obtained, remembering that the central firing pin 33 actuating the primer of the 1.2 seconds delay train always functions under either light or heavy impact.

1. 1.2 second delay on light impact instantaneous, .1 second, and 1.2 second on heavy impact.

2. .1 and 1.2 second on light impact instantaneous, .1, and 1.2 second on heavy impact.

3. Instantaneous and 1.2 second delay on light impact, instantaneous and 1.2 second delay on heavy impact.

Obviously the shortest delay element which is functioned will set off the detonator in the slidable bolt. In case a light impact is first obtained and a heavy impact occurs before the expiration of the set delay, instantaneous action will result when the fuse is set according to (1) and (2) above.

In light impact when the bomb strikes a yielding surface at a low velocity, the pressure plate will be forced inwardly moving the firing arm longitudinally of the fuse and causing the light impact firing pins carried thereby to prime the primer of either one or two of the delay trains depending on the setting.

If a heavy impact is encountered, either before or after the light impact, the resistance ring 37 is crushed and the fuse head is driven in, shearing the bottom of the carrier and causing the heavy impact firing pins to prime any of the primers that are in line with them. The structure although shown applied to a bomb may equally well be employed in other types of projectiles.

I claim:

1. A nose fuse for drop bombs including a body, a plurality of powder trains respectively affording instantaneous and varying delay actions arranged in the fuse body, one train being axially disposed and adapted to produce the longest delay interval and to be ignited under all settings of the fuse, a carrier rotatably supported by the body, firing pins mounted in the carrier, said carrier adapted to be sheared on heavy impact to enable its firing pins to strike the outer powder trains, a fuse head supported by the carrier, a resistance ring interposed between said head and carrier and adapted to be crushed on heavy impact, a pressure plate having a stem disposed in the fuse head and mounted for longitudinal movement with respect thereto, a spring for holding the plate outwardly against air pressure when the fuse is armed, spacers for absolutely preventing inward movement of the plate when the fuse is unarmed, a firing arm carried by the plate and normally disposed for longitudinal movement in an aperture of the carrier, firing pins mounted in said arm, and a vane assembly mounted in the pressure plate and adapted to be unscrewed therefrom to arm the fuse in flight and means for releasably holding the carrier against rotation.

2. A nose fuse for drop bombs including a body, a plurality of powder trains respectively affording instantaneous and varying delay actions arranged in the fuse body, one train being axially disposed and adapted to produce the longest delay interval and to be ignited under all settings of the fuse, a carrier rotatably supported by the body, firing pins mounted in the carrier, said carrier adapted to be sheared on heavy impact to enable its firing pins to strike the outer powder trains, a fuse head supported by the carrier, a resistance ring interposed between said head and carrier and adapted to be crushed on heavy impact, a pressure plate having a stem disposed in the fuse head and mounted for longitudinal movement with respect thereto, a spring for holding the plate outwardly against air pressure when the fuse is armed, a firing arm carried by the plate and normally disposed for longitudinal movement in an aperture of the carrier, firing pins mounted in said arm, and a vane assembly mounted in the pressure plate and adapted to be unscrewed therefrom to arm the fuse in flight.

3. A nose fuse for drop bombs including a body, a plurality of powder trains respectively affording instantaneous and varying delay actions arranged in the fuse body, a carrier rotatably supported by the body, firing pins mounted in the carrier, said carrier adapted to be sheared on heavy impact to enable its firing pins to strike the primers of certain of the powder trains, a fuse head supported by the carrier, a member interposed between said head and carrier for preventing inward movement of the head except on heavy impact, a pressure plate having a stem disposed in the fuse body and mounted for longitudinal movement with respect thereto, means for holding the plate outward until impact, an arm carried by the plate and normally disposed for longitudinal movement in an aperture in the carrier, firing pins mounted in said arm and a vane assembly mounted on the pressure plate and adapted to be unscrewed therefrom to arm the fuse in flight.

4. A nose fuse for bombs including a body, a plurality of powder trains of varying burning intervals arranged in the fuse body, a carrier rotatably supported by the body, firing pins mounted in the carrier, a fuse head supported by the carrier and adapted to shear the carrier on heavy impact, a plate having a stem disposed in the fuse body and mounted for longitudinal movement with respect thereto, an arm carried by the plate and normally disposed for longitudinal movement in an aperture in the carrier, firing pins mounted in said arm, and a vane assembly adapted to be unscrewed from the fuse in flight.

5. A fuse including a body, a plurality of powder trains of varying burning intervals arranged in the fuse body, means selectively adjustable to operative or inoperative position and functionable on heavy impact to ignite certain of the powder trains and selectively adjustable means operable on light impact for igniting certain of the powder trains, one of said latter means being constantly in alignment with one of the powder trains irrespective of its adjustment.

6. A fuse including a body, a plurality of powder trains of varying burning intervals arranged in the fuse body, means selectively adjustable to operative or inoperative position and functionable on heavy impact to ignite certain of the powder trains, and selectively adjustable means operable on light impact for igniting certain of the powder trains.

7. A fuse including a body, an axial powder train in said body, a plurality of powder trains disposed radially with respect to said axial train, all of said trains being arranged so that ignition is not communicated from one to the others, and selectively adjustable means for igniting certain of said trains on either light or heavy impact.

8. A fuse including a body, an axial powder train in said body, a plurality of powder

trains disposed radially with respect to said axial train, and selectively adjustable means for igniting certain of said trains on either light or heavy impact.

9. A fuse including a body, a plurality of powder trains in said body, and selectively adjustable means for igniting certain of said trains on either light or heavy impact.

10. A fuse including a body, an axial powder train in said body, a plurality of powder trains disposed radially with respect to said axial train, and means operable successively on light or heavy impact for igniting certain of said trains.

11. A fuse including a body, an axial powder train in said body, a plurality of powder trains disposed radially with respect to said axial train, and means operable on light or heavy impact for igniting certain of said trains.

12. A fuse including a body, a plurality of powder trains in said body, and means operable successively on light or heavy impact for igniting certain of said trains.

13. A fuse including a body, a plurality of powder trains in said body, and means operable on either light or heavy impact for igniting at least two of said powder trains.

14. A fuse including a body, a plurality of powder trains in said body, and means adjustable in unison and operable on light or heavy impact for igniting certain of said powder trains.

15. A fuse including a body, a plurality of powder trains in said body, a plurality of independently operable means adapted to function on light or heavy impact for igniting said trains, and means whereby said independent means are adjusted in unison.

16. A fuse including a body, a plurality of powder trains in said body, a plurality of independently operable means for igniting said trains, and means whereby said independent means are adjusted in unison.

17. A fuse including a body, an axial powder train in the body adapted to produce a long delay interval, a plurality of powder trains disposed radially with respect to said axial train and adapted to produce shorter delay intervals than said axial train, and selectively adjustable means operable on light or heavy impact whereby the axial train and one or more of the radially disposed trains are always ignited irrespective of the adjustment of said means.

18. A fuse including a body, an axial powder train in the body adapted to produce a long delay interval, a plurality of powder trains disposed radially with respect to said axial train and adapted to produce shorter delay intervals than said axial train, and means operable on light or heavy impact whereby the axial train and one or more of the radially disposed trains are always ignited.

19. A fuse including a body, an axial powder train in the body adapted to produce a long delay interval, a plurality of powder trains disposed radially with respect to said axial train and adapted to produce shorter delay intervals than said axial train, and means whereby the axial train and one or more of the radially disposed trains are always ignited.

20. A fuse including a body, a plurality of powder trains in said body, said trains adapted to produce varying delay intervals and adjustable means for igniting at least two of said trains, one of these being the train producing the longest delay interval.

21. A fuse including a body, a plurality of powder trains in said body, said trains adapted to produce varying delay intervals and means for igniting at least two of said trains, one of these being the train producing the longest delay interval.

22. A fuse including a body, a plurality of powder trains respectively affording instantaneous and variable delay intervals, adjustable means for obtaining any one of the above actions in the event of light impact, and means capable of producing instantaneous action in the event of heavy impact irrespective of the adjustment of said first named means.

23. A fuse for bombs including a fuse head, an impact plate mounted for longitudinal movement with respect thereto, spacers interposed between said plate and fuse head, a spring connecting the spacers, and a vane assembly adapted to prevent release of the spacers until the fuse is armed in flight.

24. A fuse for bombs including a fuse head, an impact plate mounted for longitudinal movement with respect thereto, a vane assembly carried by the plate and adapted to be removed therefrom during flight, and a safety means interposed between the plate and head and held against displacement by the vane assembly.

25. A fuse, ears carried on opposite sides of the fuse at different levels, a stop pin mounted in the ear farthest removed from the tip of the fuse, a rotatably mounted cap on the nose of the fuse, ears on opposite sides of said cap, and a stop integral with one of said ears and adapted on unthreading of the cap to clear the fuse ear and its stop pin.

26. A fuse, a rotatably mounted cap on the nose thereof, a pair of ears on both the fuse and cap, a stop pin carried by one ear of the fuse and a stop pin carried by the rotatably mounted cap and positioned to clear the fuse ear and its stop pin.

27. A fuse for bombs including a longitudinally movable impact plate, a vane assembly threaded in said plate and adapted to be unthreaded therefrom during flight and means removable with the vane assembly for

supporting the plate while the vane assembly is being removed.

28. A fuse for bombs including a body, a vane assembly removable from the body during flight, a transverse bolt slidably mounted in the body and containing an element of a firing mechanism, a rod normally holding the bolt in unarmed position and a head on the rod positioned between the vane assembly and the body and confined between elements of the vane assembly.

29. A fuse for bombs including a body, a vane assembly removable from the body during flight, a transverse bolt slidably mounted in the body and containing an element of a firing mechanism, a rod normally holding the bolt in unarmed position and a head on the rod confined between elements of the vane assembly.

30. A fuse for bombs, including a body, a vane assembly forming a cap for the body and removable during flight, a transverse bolt slidably mounted in the body and containing an element of a firing mechanism, and means secured to the inside of the cap normally holding the bolt in unarmed position.

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