April 25, 1950 H. H. MOORE 2,505,000

BOMB FUSE

Filed Oct. 8, 1941 2 Sheets-Sheet 1

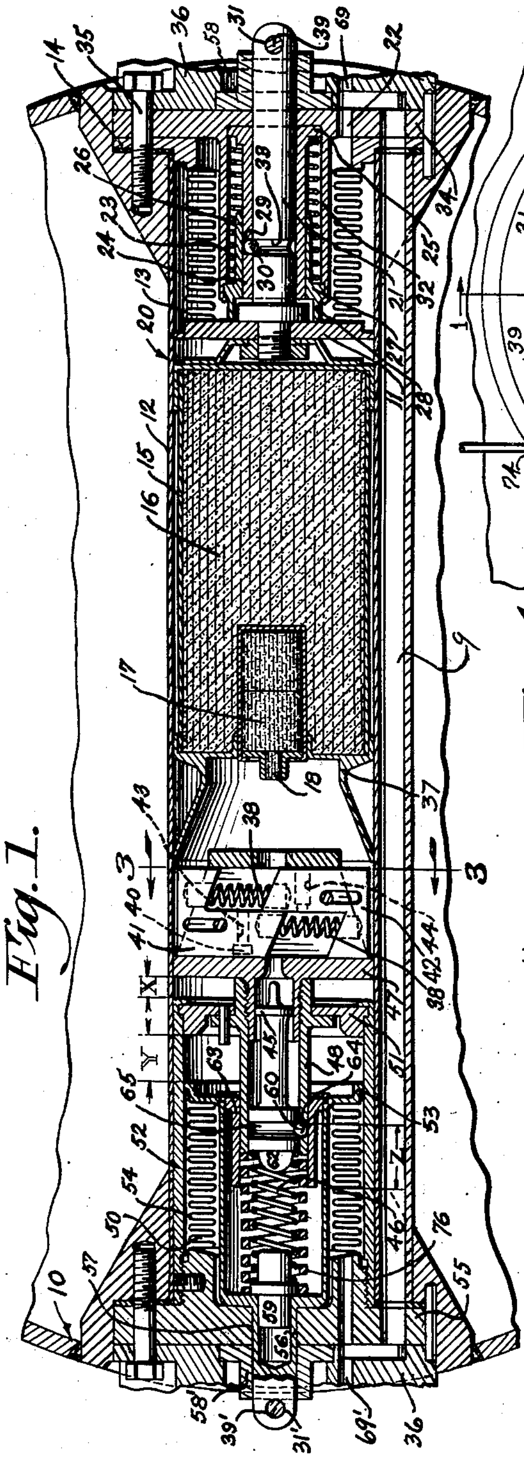

Fig. 1.

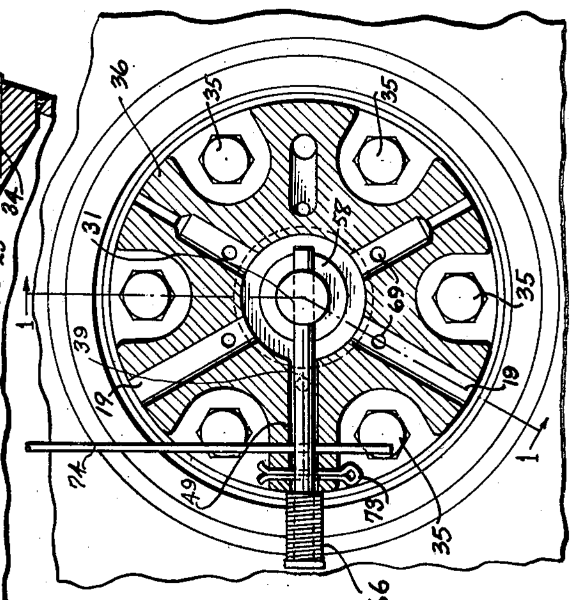

Fig. 4.

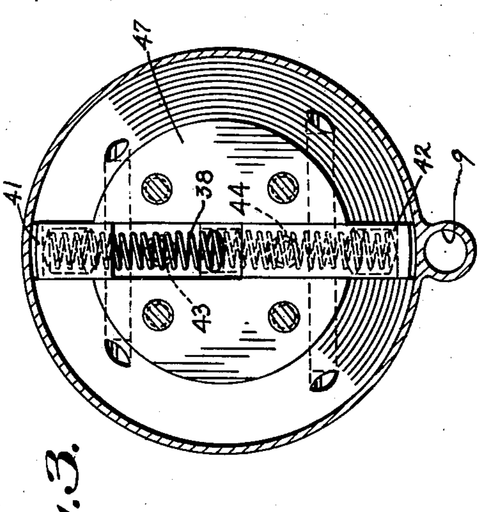

Fig. 3.

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BOMB FUSE

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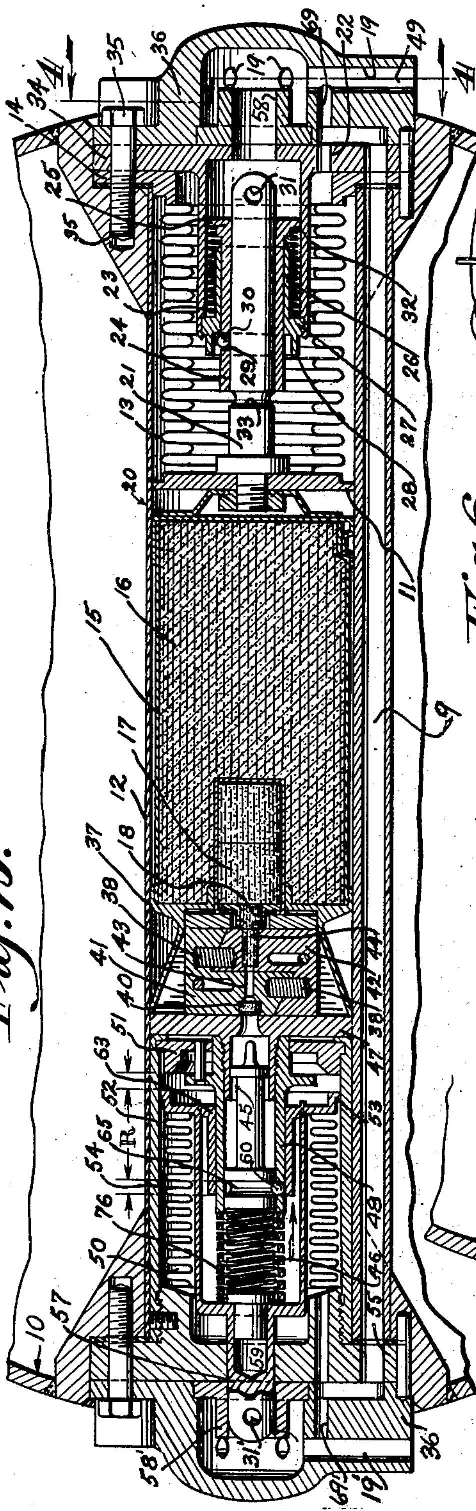

Fig. 2.

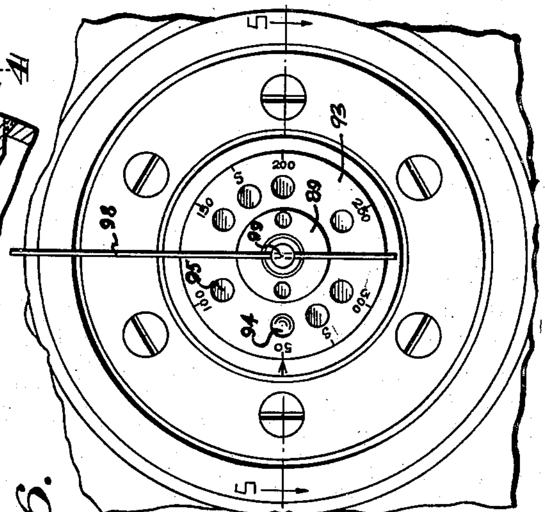

Fig. 6.

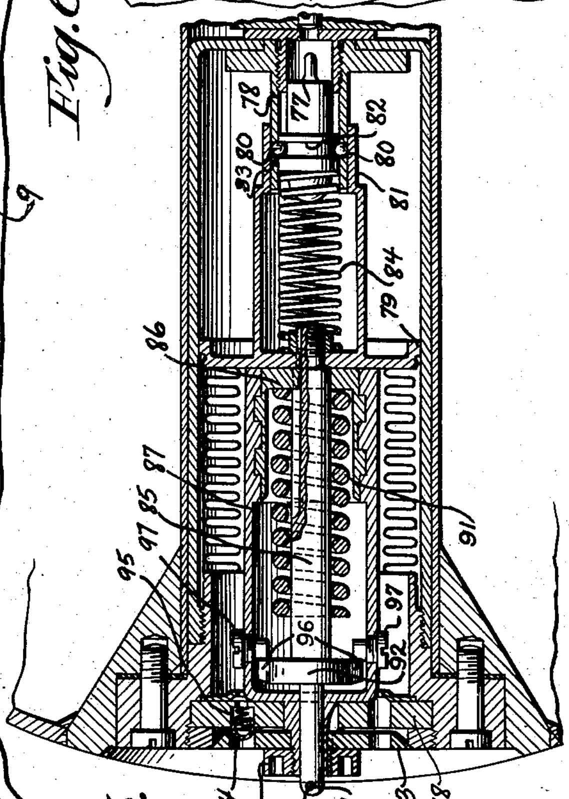

Fig. 5.

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Patented Apr. 25, 1950 2,505,000

UNITED STATES PATENT OFFICE

2,505,000

BOMB FUSE

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Application October 8, 1941, Serial No. 414,119

11 Claims. (Cl. 102—70)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention relates broadly to bombs and more particularly to an improved arming and firing mechanism for the type of depth bomb adapted to be discharged from a Y gun or dropped from an aircraft. This invention also relates to an arming and firing mechanism which would be suitable for use with aerial bombs, supplementing the inertia firing mechanisms usually provided, to give underwater detonation.

It is an object of this invention, therefore, to provide an improved depth bomb, the detonation of which is initiated by the hydrostatic forces which act thereon after the bomb has penetrated a fluid to a predetermined depth.

It is also an object to provide an improved fuse which may be used in a conventional aerial bomb, whereby upon impact with a fluid surface the bomb will penetrate the fluid to a predetermined depth before its detonation is initiated.

It is also another object of this invention to provide an improved hydrostatic fuse for a depth bomb which prevents the possibility of premature detonation which may be produced either as a result of the high inertia forces set up in the bomb upon impact, or as a result of the hydrodynamic forces which act upon the fuse when the said bomb is penetrating a fluid at a relatively high velocity.

It is a further object of this invention to provide the firing mechanism of an aircraft depth bomb with an interlocking safety mechanism which must be operated upon before the firing mechanism is armed. This interlocking mechanism involves the proper positioning of a booster charge to bring a primer into alignment with its firing pin and to bring a detonator into ignition conductive relationship with said primer and booster charge.

It is a further object of this invention to provide in a firing mechanism for a depth bomb, the detonation of which is initiated by a spring-actuated firing pin, a new and improved method of releasing the said firing pin by the combined action of two hydrostatic pressure-sensitive devices, each of which must move a predetermined distance in opposite directions.

It is a still further object of this invention to provide a hydrostatic arming and firing mechanism for an aircraft depth bomb with a baffle arrangement positioned at the fluid entrance to each hydrostatic sensitive element so that upon impact there will be no direct application of the hydrodynamic forces upon the sensitive elements.

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Another object of this invention is to provide a fuse having two hydrostats positioned one at each end of the body with an equalizing tube connecting the respective passages leading to each hydrostat, so that unequal hydrodynamic and hydrostatic forces acting on different portions of the bomb will be equalized when acting upon the hydrostats.

It is still another object of this invention to provide a new and improved lock adapted for use with an aircraft depth bomb, which will maintain the arming and firing mechanism thereof in an immovable, unarmed position so long as the bomb is retained by the aircraft, and which will automatically unlock said arming and firing mechanism, allowing the same to operate, upon the release of the bomb from said aircraft, whereby the arming and firing mechanism will be free to function as a result of the actuation of the hydrostats.

It is another object of this invention to provide an improved depth setting device for a depth bomb adapted to be dropped from an aircraft, said setting device being capable of adjustment after the bomb is placed in the bomb-rack prior to leaving the ground.

When a depth bomb is dropped from an aircraft at either a high or low altitude the impact with the surface of the water, or the penetration through the water, will set up dynamic pressures and forces of great magnitudes. These forces could cause a premature detonation when acting upon the movable members of prior art hydrostatic pressure sensitive fuses. Various provisions have been made for safeguarding against such premature detonation, including the use of a plurality of hydrostatic diaphragms or pistons which are usually set to operate at different depths. This invention aims to improve upon these prior art provisions in order to simplify their structure, make their operation more positive, more exact, and to make their safety provisions more reliable.

The significant feature of this invention, which tends to prevent a premature detonation, resides in the improved means for releasing the firing pin in response to the movement of the two hydrostats in opposite directions along a common axis. If, however, a bomb containing a fuse constructed in accordance with the significant feature of this invention should strike the water moving in a direction along the axis of the fuse, a dynamic pressure would be produced at that end of the fuse receiving the impact tending to move the hydrostat inwardly along the said axis, and inertia forces set up as a result of the impact would act upon the movable members, including the hydrostat positioned at the opposite end, tending to move it inwardly along said axis. Such a coincidence of circumstances would probably cause premature detonation, and it is to obviate such behavior from arising as a result of such possible circumstances that baffle plates are provided at the fluid entrance to each hydrostat.

It is further conceivable that as a result of certain other circumstances the motion of the bomb through the water may not be in the expected axial direction and the pressure at one end might be different from the pressure at the other end. In anticipation of such circumstances, equalizing tubes are provided which connect the passages leading to the hydrostats at each end of the fuse to equalize the pressure acting thereon.

Additional features and other objects of this invention will become apparent when considered in reference to the construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawing, in which:

Fig. 1 is a horizontal cross-sectional view of an aircraft bomb of the demolition type showing a longitudinal sectional view of the hydrostatic fuse, the section through the fuse being taken substantially on line 1—1 of Fig. 4.

Fig. 2 is a view similar to Fig. 1, showing the baffle plates and equalizing tubes, and illustrating the preliminary movement of parts necessary to arm the fuse but insufficient to initiate its ignition.

Fig. 3 is a transverse sectional view through the detonator and primer carrier taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2, showing the baffle cap, the "jump out" pin and arming wire in detail.

Fig. 5 is a longitudinal sectional view through a modification having an adjustable depth setting mechanism; and

Fig. 6 is an end elevation of a fuse with an adjustable depth setting mechanism illustrated in Fig. 5.

Referring now to the drawing, and particularly to the modification illustrated by Figs. 1 to 4 inclusive, the bomb casing adapted to receive the particular fuse constructed in accordance with this invention is indicated generally at 10 in the drawings. It will be understood from these drawings that the bomb casing is generally cylindrical and is filled with a charge of high explosive (preferably TNT). The fuse is shown mounted diametrically of this casing and with a hydrostat located at each end thereof. The first hydrostat is indicated in its entirety by the reference numeral 20 while the second hydrostat is indicated generally by reference numeral 50.

The first hydrostat 20, as illustrated, includes a piston 11 movable within a cylindrical casing 12, which forms the body of the fuse. A cylindrical bellows-shaped member 13, commonly referred to in this art as a Sylphon, is brazed or otherwise tightly secured to the piston 11 and to the header 14. Mounted so as to be movable axially within said cylindrical casing 12 is the cylindrical shell 15 which contains a TNT booster 16, tetryl sub-booster 17, and associated transmission ignition lead-in train 18. This shell is secured to said piston 11 by means of a flanged bolt 21, one end of which projects outwardly through the

header 14 and end cap 34 so that the entire unit which is hereinafter referred to as the booster extender mechanism will be slidable within the body portion 12 of said fuse.

The movement of the hydrostat 20 is opposed by the stress of a compressed coiled spring 23 as well as the natural resiliency of the Sylphon 13. The spring 23, which is concentric with the bolt 21, is positioned about a movable sleeve 24 and engages a flange 25 formed on said sleeve at one end thereof. In order for the spring to be compressed upon the axial inward movement of said hydrostat, it is essential that the sleeve 24 be locked to the bolt 21. To accomplish this purpose the lock balls 30 are positioned within the apertures 29 formed within said sleeve and forced into engagement with the grooved portion 33 of the shaft 21 by a retaining sleeve 26. This retaining sleeve forms a slidable bearing surface for the movable sleeve 24 and also has a flange 27 formed integrally at an end thereof, opposite the flange 25, so that the spring 23 will be compressed therebetween upon the inward movement of said movable sleeve 24.

In order to hold the sleeve 26 in a secured stationary position relative to the bomb casing an inwardly extending collar 32 is formed integrally with the end cap 34 and is pressed about the periphery of the flanged portion 27 of the retaining sleeve 26, as clearly illustrated in Figs. 1 and 2. An annular projection 28 extends axially from flange 27 of the retaining sleeve 26. The inner diameter of this annular projection is greater than the inner diameter of said sleeve so that a void space is formed around the movable sleeve 24 to serve as a pocket for the lock balls 30 when the apertures 29 are in alignment therewith.

The radius of the balls 30 are preferably greater than the depth of the groove 33 so that the forces transmitted by the bolt 21 through the edge of the groove to the balls 30, to the movable sleeve 34 and to the spring 23, or vice versa, have an outwardly directed radial component which forces the balls out of the groove and into the pocket formed by the annular projection 28. When the balls 30 are thus forced into this pocket by the combined action of spring 23 and the bolt 21, the bolt will then be suddenly released from its locked engagement with the movable sleeve 24, with the result that the hydrostat 20 will be free to move within the shell 15 without the opposing forces of the compressed coiled spring 23.

In order to permit the fluid upon which the bomb impacts to gain access into the interior of said Sylphon so that the fluid pressure may force the hydrostatic piston 11 inwardly from its position illustrated in Fig. 1 to the position illustrated in Fig. 2, a number of axial openings 22 constituting entrance passages are bored into the end cap 34. A baffle plate 36 is disposed over these openings so that the plurality of transverse passages 69, each of which communicate with a radially extending passage 19 will be in alignment with the axial openings 22, as is clearly illustrated in Figs. 2 and 4. This baffle is secured to the end cap 34 and header 14 by means of suitable bolts 35.

A locking member in the form of a spring influenced "jump out" pin 39 holds the booster extender mechanism in its unextended position illustrated in Fig. 1. The operative features of the locking means are clearly shown in Fig. 4 and include a collar 58 through which an end of the bolt 21 extends. This collar is held in place by the baffle plate 36. The extended end of the bolt is provided with a bore 31 which is radially and axially aligned with a bore 49 formed in the baffle plate. The "jump out" pin 39 is retained in place against the force of the spring 66 by means of either the cotter pin 73 or the arming wire 74. After the bomb has been secured to the bomb rack one end of the arming wire 74 is inserted and the cotter pin 73 is withdrawn in order to arm the bomb rack.

At the inner end of the booster extender mechanism a truncated conical cam member 37 is secured to the booster shell 15. The inner surface of this cam is adapted to engage the outer surface of two slider members 41 and 42 which are supported in a conical retaining block 47 and retained in a position outwardly spaced from each other by means of the coiled springs 38. These two slidable members when moved toward each other against the action of the slider springs 38 bring the percussion cap 40, its ignition conductive passage 43 and the mercury fulminate detonator 44 into axial alignment and ignition conductive relationship with each other and with the projecting ignition transmission train 18 of the sub-booster charge 17. Furthermore movement of the primer slider 41 will also bring the percussion cap 40 into axial alignment and impact receiving relation with the firing pin 45.

Before the hydrostatic piston has moved the booster and cam a distance sufficient to bring the two slider members together, the movable sleeve 24 will have moved to a position within the retaining sleeve 26 where the ball retaining aperture 29 will be in alignment with the annular pocket formed by the projection 28. The hydrostat will then be immediately released from the stress applied by said compressed spring so that the slider members will be firmly brought together and the sub-booster transmission train 18 will be firmly pressed against the detonator 44 by the action of said booster extender mechanism. Release from the stress offered by the compressed spring 23 insures the positive action of said arming mechanism. Further movement of the booster extender mechanism causes the entire slider assembly to move the distance X against the action of the firing pin spring 46, compressing this spring and moving the firing pin retaining sleeve 48, together with the retaining block 47, into abutting relation with the partitioning member 51 which is held in its illustrated position by means of the cylinder 52.

The second hydrostat 50 includes a movable piston 53 adapted to be axially slidable within the cylinder 52 and a Sylphon 54 which is sealed to said piston and to the end cap 55. The piston 53 has an elongated outwardly extending portion 56 which projects through an opening 57 formed in the end cap 55 and through a retaining collar 58'. Movement of the hydrostat is opposed by the stress of the coiled firing pin spring 46 and the natural resiliency of the Sylphon 54. One end of the spring 46 is positioned about the end of a flanged plug 59 recessed in the closed end of the extended portion 56 of the piston 53, while the other end is positioned about a portion 62 of the firing pin 45 so as to press against a shoulder projecting therefrom.

A bushing 63 is secured to said piston 53 to provide a slidable surface for the firing pin sleeve 48. This bushing also forces the balls 60 which are retained in apertures 64 of the retaining sleeve 48 into the annular groove 65 formed in said firing pin 45, when the bushing covers said apertures, thus locking the firing pin to the retaining sleeve.

The outwardly extending portion 56 of said piston is also provided with a transverse bore 31' through which is passed a suitable "jump out" pin 39' which bears against the retaining collar 58' to hold the piston in an immovable locked position so long as an arming wire similar to that shown at 74 in Fig. 4 holds the pin in place against the stress of a spring similar to that shown at 66. A baffle 36' having vents similar to 19 in Fig. 4 is positioned over the end cap 55 so as to cover the fluid passages 69' communicating with the hydrostat 50.

In their secured or retained position the "jump out" pins prevent both the booster and firing pin extender mechanisms from moving axially in the body of the fuse as a result of inertia forces introduced as a result of the acceleration of the aircraft. The fuse is thus retained in a locked unarmed position. As soon as the arming wires are pulled free of the pins the springs 66 will force the pins outwardly of their position of locking engagement with the booster and firing pin extender mechanism, whereby each will be free to operate in response to hydrostatic pressure acting thereon.

In the construction illustrated in Figs. 1 to 4, inclusive, no means is provided for obtaining any adjustment of the depth at which said bomb will detonate, although an additional firing pin spring 76 may be provided, as is indicated in Figs. 1 and 2 to increase the depth at which the firing pin will be released to initiate the detonation of said bomb.

Figs. 5 and 6 illustrate a modification of a readily accessible combined locking and depth adjusting device, in which the firing pin 77 is releasably secured to a retaining sleeve 78 by means of a plurality of balls 80. The hydrostatic piston 79 has an annular projection extending laterally inwardly therefrom forming a bushing 81 movable with said piston and slidable over the retaining sleeve so as to force the balls 80 into the annular groove 82 formed in the firing pin 77. Movement of said piston will cause the bushing to move relative to the retaining sleeve, compressing the firing pin spring 84 and releasing the firing pin from the retaining sleeve when the apertures 83 are aligned with the shoulder formed by the enlarged portion of said annular projection.

A flanged stem 85 is threadably secured to the piston 79 through the threaded collar 86 which is keyed to the stem but movable axially thereof. A cup shaped member 87 provided with an integrally formed stud projecting rearwardly from the closed end thereof through a suitable opening formed in the end cap 88 is secured to the end cap by means of a nut 89. A portion of the inner surface of this cup is threaded about the collar 86, whereby the relative longitudinal position of said collar on the shaft 85 may be changed as a result of the rotation of the cup shaped member 87 about the flanged stem 85. A coil spring 91 is formed about this stem, one end of which is adapted to engage the collar 86 and the other end of which is adapted to engage the flange 92, when the flange and stem are moved with the hydrostatic piston. A disc 93 is keyed to the cup so as to be rotatable therewith and has a spring influenced button 94 which fits into an opening 95 formed in the end cap 88, whereby the disc 93 and cup 87 are locked in a set position.

The disc 93 may also be rotated to a locked position which is indicated at S on the drawings. When the cup 87 and disc 93 are rotated to a position wherein the spring influenced button 94 fits into the openings opposite S of Fig. 6, a pair of ears 96, which extend radially of the flange 92, are each axially aligned with the projecting ends of the diametrically opposed bolts 97 so as to prevent any relative movement between the cup 87 and the flanged stem 85. The cup is immovable, since it is secured to the bomb casing and the hydrostatic piston is secured to the stem 85 and is therefore immovable, consequently the hydrostat is locked. Other suitable markings may be provided on the outer surface of the disc to indicate various depth settings.

When the bomb is loaded on a bombing rack of an aircraft an arming wire 98 may be inserted into an opening 99 formed in the end of the projecting stem to hold the stem in its locked position after the adjustable depth setting mechanism has been rotated to the selected depth position. As the cup and annular lock are rotated about the stem 85 to the selected depth position indicated on the end cap, the bolts 97 are moved out of alignment with the projecting ears 96 of the flange 92 and the collar 86 is moved along the stem, moving the spring 91 closer to the flange 92. On penetration of the bomb in a liquid medium hydrostatic pressure will act upon the hydrostatic piston 79, causing it to move axially along the body of the fuse, compressing the coil spring 91 between the collar 86 and the flange 92. The hydrostatic pressure causing this movement is equivalent to the weight of a column of liquid having a height equal to the depth of penetration of said bomb.

The operation of the hydrostatic bomb fuse, the constructional details of which are illustrated in Figs. 1 to 4 inclusive, and decribed above, is as follows:

In a completely assembled bomb the "jump out" pins 39 and 39' are inserted into the openings 31 and 31' formed, respectively, in the projecting portion of the bolt 21 and the piston 57. These pins are retained in position against the action of their springs by means of a plurality of cotter pins 73, so that the bomb may be safely handled or transported. When the bomb is inserted into the bomb rack of an aircraft the arming wires 74 are inserted into an opening formed in each of the "jump out" pins 39 and 39'. The cotter pins 73 are then withdrawn so that as the bomb is released the arming wires will be withdrawn from the pins 39 and 39', leaving these pins free to "jump out" of their position of holding engagement with the piston 57 and the bolt 21. The fuse is now unlocked and ready to function upon the proper application of pressure to the firing pin and booster extender mechanism. Upon the penetration of a fluid medium by said bomb the fluid will enter into the first and second hydrostats 20 and 50, respectively, by means of the ports 19, formed in the baffle plates, and in order to equalize the pressure acting on each hydrostat a tube 49 is provided which communicates with the entrance passages to each hydrostat.

As the pressure builds up in the booster extender mechanism 20, the hydraulic piston 11 is caused to move inwardly of the casing 12 and carries with it the bolt 21 and movable sleeve 24. The flange 25 formed integrally with the sleeve 24 compresses the spring 23 positioned between this flange and a flange 27 which is formed integrally with the retaining sleeve 26. When the ball retaining aperture 29 passes the shoulder of the retaining sleeve formed by the enlarged annular projection 28, the hydrostatic piston is immediately unlocked from the spring sleeve 24 and continues its movement in the same direction unopposed by the stress of the coil spring 23. The strength of the holding spring is preferably so proportion that the action of the booster extender 20 occurs at a lesser pressure, representing a lesser depth, than is required to cause the firing pin extender mechanism to function in the manner hereinafter described.

Movement of the hydraulic piston 11 causes a corresponding movement of the booster container 15 to which it is attached. As the booster moves in an inward direction along the diametrical axis toward the firing pin, the conical shaped cam member 37 causes the detonator slider 42 and the primer slider 41 to move together against the stress of the coiled springs 38. The detonator 44 is moved to the center line of the fuse and into alignment with the lead-in 18 of the sub-booster 17. Further, the percussion primer 40 is moved into impact receiving relation with the firing pin 45 and into ignition conductive relationship with the detonator. Continued movement of the booster container and cam member causes the retaining block 47, together with the primer and detonator sliders 41 and 42, respectively, to move the distance X against the stress offered by the firing pin spring 46, whereupon the retaining block will butt against the partition 51. This movement causes the retaining sleeve 48 to move axially in the bushing 63 moving the retaining balls 60 toward the shoulder thereof.

As the pressure builds up in the second hydrostat 50, the hydraulic piston 53 is caused to move, and in so doing compresses the firing pin spring 46. The bushing 63, which is secured to the hydraulic piston 53, is moved along the firing pin sleeve 48 a distance Y, whereupon the rim of the hydraulic piston will butt against the stationary partition 51. It should be noted that relative movement between sleeve 48 and bushing 63 continues to move the retaining balls 60 toward the shoulder of the bushing 63, since the outer bushing moves in one direction while the inner sleeve moves in the other direction as a result of the hydrostatic pressure acting upon each hydrostat. When the relative movement between the sleeve 48 containing the ball lock 60 and the bushing is equal to Z, as shown in Fig. 1, the ball lock is released by the bushing and the firing pin 45 is driven by the firing pin springs 46 and 76 into the percussion primer 40. This action fires the primer 40 which ignites the detonator and, through the lead-in 18, sub-booster 17 and booster 16, detonates the bomb.

It should be noted that the distance Z is greater than either distance X or Y but is less than the sum of X and Y so that both hydrostats must combine in producing the required relative movement between the firing pin sleeve and the bushing before the firing pin will be released, and since these members move in opposite directions, it is impossible to set off this fuse upon impact. Furthermore, the fuse will not be armed until after the first hydrostat has moved a sufficient distance to bring the sub-booster and detonator into ignition conductive relationship and to bring the primer into alignment with the firing pin. It is, therefore, apparent that a new and improved operating mechanism is presented herein which renders the operation of the arming and firing mechanism more certain, and more positive, than the hydrostatic forces of the prior art. Furthermore, the structural features herein presented make the fuse respond to the predetermined depth setting with a greater degree of exactness than is obtainable in the prior art hydrostatic fuses and the safety provisions which are provided are far more reliable than those found in prior art.

Other modifications and changes in the proportions and arrangement of the parts may be made by those skilled in the art without departing from the nature of the invention, within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In a depth bomb, a firing and arming mechanism comprising a booster charge having an associated ignition train, a first slider containing a percussion primer and an ignition conductive passage leading therefrom, a second slider containing a detonator and an ignition conductive passage leading therefrom, said sliders being initially spaced from said booster ignition train, a firing pin, yieldable means retaining said first and second sliders in initial spaced relation so that the said ignition conductive passages are blocked and so that said percussion primer is out of alignment with said firing pin, means responsive to hydrostatic pressure for moving said booster charge to bring its said ignition train toward said detonator and into an ignition conductive position relative thereto, and means responsive to the movement of said booster for moving said sliders against the action of said yieldable means to bring the ignition conductive passage of the detonator into alignment with the ignition conductive passage of said percussion primer and with the ignition train of the booster and to bring the percussion primer into an impact receiving position with reference to said firing pin, whereby the firing mechanism will be armed only after the bomb has penetrated the water to a predetermined depth.

2. In a depth bomb, firing mechanism having an axially disposed firing pin, a first member having a percussion cap movable to a first position wherein said percussion cap is in axial alignment with said firing pin so that the percussion cap will be in an impact receiving relation therewith, a booster charge, a second member having a detonator movable to a first position wherein said detonator will be in ignition conductive relationship with said percussion cap and with said booster charge, yieldable means for retaining each of said movable members in a second position wherein said percussion cap is out of axial alignment with said firing pin so as to be incapable of receiving impact therefrom, and wherein said detonator is out of ignition conductive relation with the primer and booster charge, and means responsive to hydrostatic pressure for moving said first and second members to their first-named position against the action of said yieldable means, whereby the firing mechanism will be armed only after said bomb has penetrated the water to a predetermined depth.

3. In a depth bomb, an arming mechanism comprising a body member, a firing pin axially disposed therein, a first movable member containing a percussion primer normally retained in a position wherein said primer is out of axial alignment with said firing pin, a second movable member containing a detonator normally retained in a position out of ignition conductive relationship with said primer, a hydrostat for moving said first and second member from their normally retained positions to a position wherein said primer will be axially aligned with the firing pin to receive the impact therefrom and said detonator will be in ignition conductive relation with the primer, yieldable means opposing the movement of said hydrostat, and means for releasing the hydrostat from the opposing effect of said yieldable means after said hydrostat has moved said first and second movable member a predetermined amount in order to insure the positive action of said arming mechanism and to retain the bomb in its armed position after the bomb has penetrated the water to a predetermined depth.

4. In a depth bomb, a firing and arming mechanism comprising a booster charge, a first movable member, an ignition initiating means positioned therein, a second movable member, an ignition transmitting means positioned therein, yieldable means retaining said members in an initial position wherein said ignition initiating means is inoperative and said ignition transmitting means is in a nonconductive position relative to said first named means and said booster charge, and hydrostatic pressure responsive means for moving said members to a second position wherein said ignition initiating means is in an operative position and said ignition transmitting means is in ignition conductive relationship with said first means and said booster charge.

5. In a depth bomb, a firing mechanism comprising a body adapted to extend diametrically of said bomb, a spring, a carrier member, a firing pin secured thereto, said carrier and firing pin being movable along the diametrical axis of said body and against the action of said spring, a retaining sleeve within which said carrier is movable, said retaining sleeve being also movable along said diametrical axis against the action of said spring but in a direction opposite said first-named direction, a primary hydrostat for moving said retaining sleeve a distance X relative to said carrier, a secondary hydrostat for moving said carrier a distance Y relative to said retaining sleeve, and means for releasing said firing pin from said carrier in response to a relative movement between said carrier and sleeve equivalent to the distance Z wherein Z is greater than either X or Y but less than X+Y.

6. In a hydrostatic fuse for a depth bomb of the type adapted to be secured to a bomb rack of an aircraft, having a body member, means movable therein to arm said fuse, means movable therein to initiate the ignition thereof after said fuse has been armed, a safety device comprising removable pins adapted to hold each of said separate means in a locked immovable position, a spring for each of said pins, and an arming wire for holding each pin in the position of locking engagement against the action of said spring means, one end of each arming wire being secured to said aircraft, whereby the pins will be automatically removed from their position of locking engagement upon the release of said bomb from said rack.

7. In a bomb, a booster charge, an hydrostat movable a predetermined distance in response to a predetermined hydrostatic pressure, means for initiating the detonation of said booster charge, a safety device for preventing detonation of said

booster charge by said first-named means, said safety device comprising a plurality of movable members, one of which contains a percussion primer and an ignition conductive passage leading therefrom and another of which contains an ignition transmitting means for conducting the ignition from said primer to said booster charge and a spring yieldably maintaining said members in an initial position, wherein the ignition conductive passages leading from said primer to said ignition transmitting means is blocked, said members being moved to a second position as a result of the partial movement of said hydrostat to bring the ignition conductive passage of said primer into ignition conductive relationship with said ignition transmitting means.

8. The invention defined in claim 7, wherein said means for initiating the detonation of said booster comprises a spring influenced firing pin, a retaining sleeve therefor, said pin being releasably secured to said retaining sleeve, a bushing secured to said second hydrostat so as to be movable therewith, said firing pin retaining sleeve being slidably supported in said movable bushing, means for releasing said pin as a result of a predetermined relative movement between said sleeve and bushing, and means actuated by said first hydrostat for moving said sleeve relative to said bushing after said hydrostat has completed said initial partial movement actuating said safety device to permit said detonation.

9. In a depth bomb the combination of a spring influenced firing pin, a sleeve therefor, said firing pin being releasably secured to said sleeve, a hydrostatic piston, a bushing secured thereto so as to be movable therewith, said firing pin retaining sleeve being positioned within said bushing, a stem having a flange projecting radially therefrom, said stem being secured to said hydrostatic piston so as to project outwardly therefrom, a coiled spring positioned within the path of movement of said stem, retaining means for said spring, angular adjusting means for changing the position of said retaining means to change the position of an end of said spring relative to said flange, whereby the movement of said hydrostat will be limited by the adjusted distance of said end of said spring and said flange and by the compression forces thereof, and means for releasing said pin upon movement of said bushing relative to said sleeve.

10. In a depth bomb, a body member, a firing mechanism comprising a spring influenced firing pin, releasably secured to a retaining sleeve at a distance spaced from its percussion cap, a hydrostatic piston, a bushing secured thereto so as to be movable therewith surrounding said retaining sleeve, said hydrostatic piston having a flanged stem projecting therefrom, a coiled spring positioned in the path of movement of said flanged stem, angular adjusting means for changing the position of said spring relative to the flange of said stem, whereby the compressive forces of said spring opposing movement of said hydrostat will be increased, and means for releasing said pin upon movement of said bushing relative to said sleeve.

11. The invention as defined in claim 10, wherein said angular adjusting means has an inwardly depending lug and said flange has a radially extending ear, so that in one angular position of said adjusting means said ear and said lug will be in axial alignment to lock said hydrostatic means.

HARRY H. MOORE.

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