July 19, 1960 C. C. VOGT 2,945,440

DISCRIMINATING FUZE

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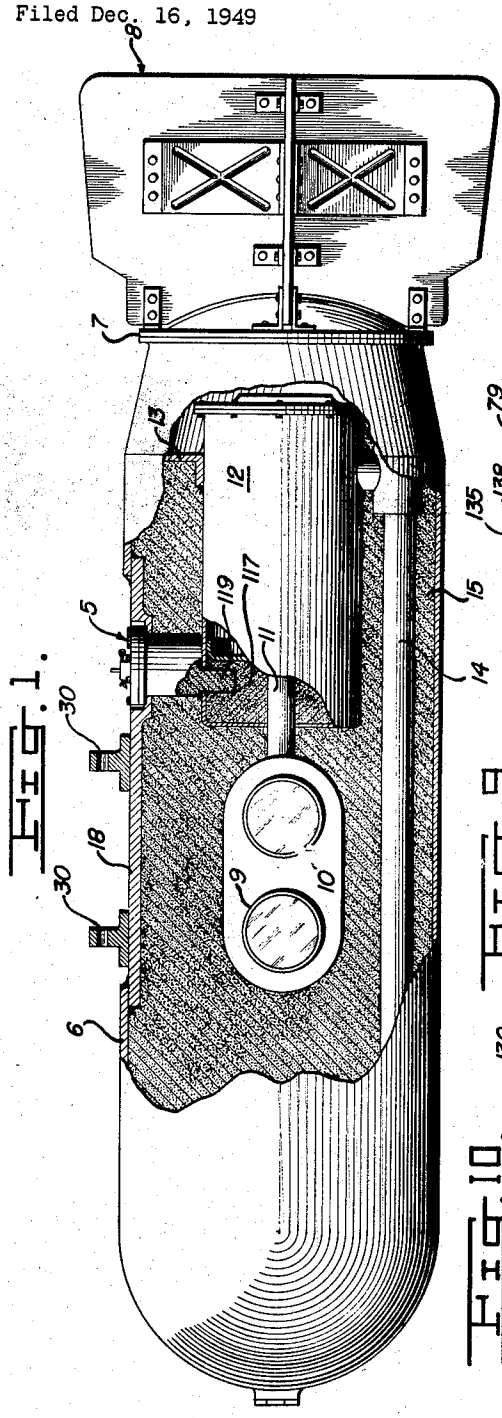


Fig. 1.

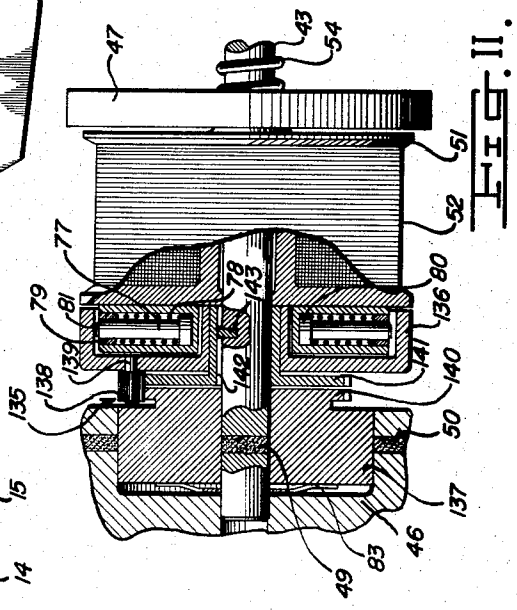


Fig. II.

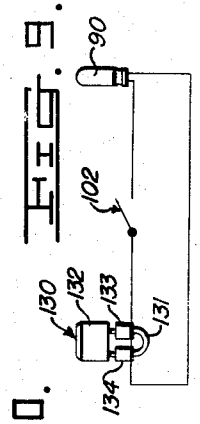
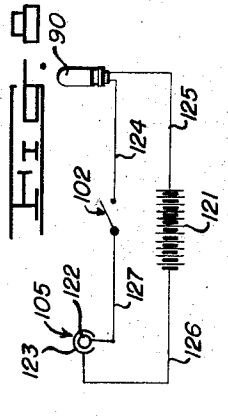


Fig. 9.



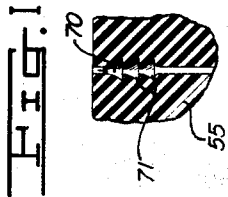


Fig. 10.

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Fig. 2.

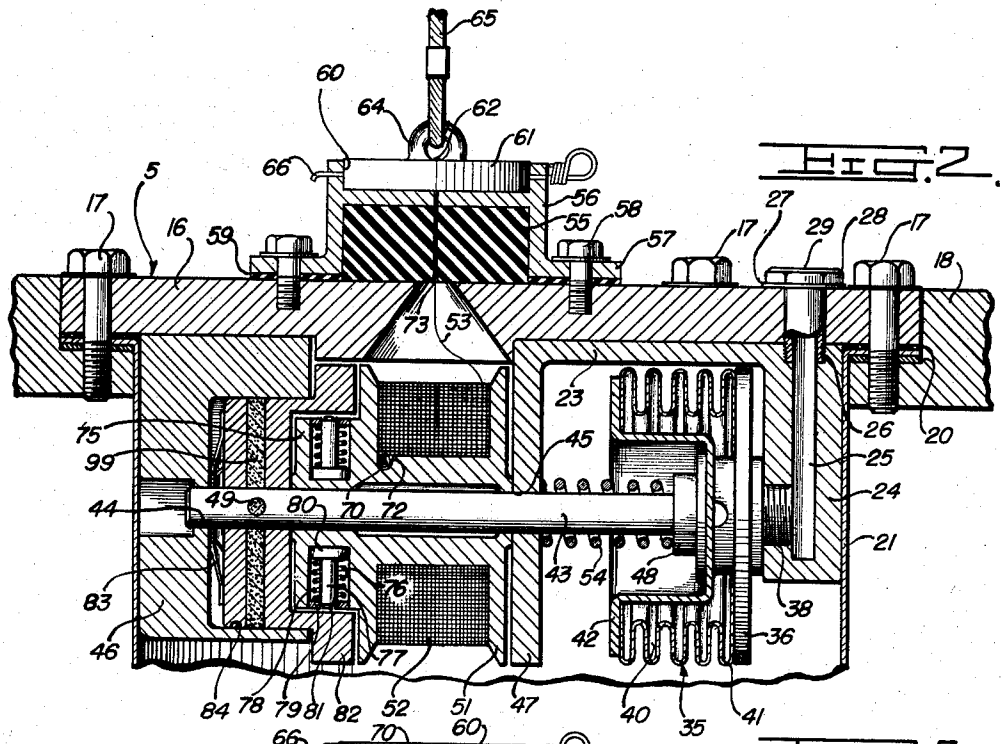

Fig. 3.

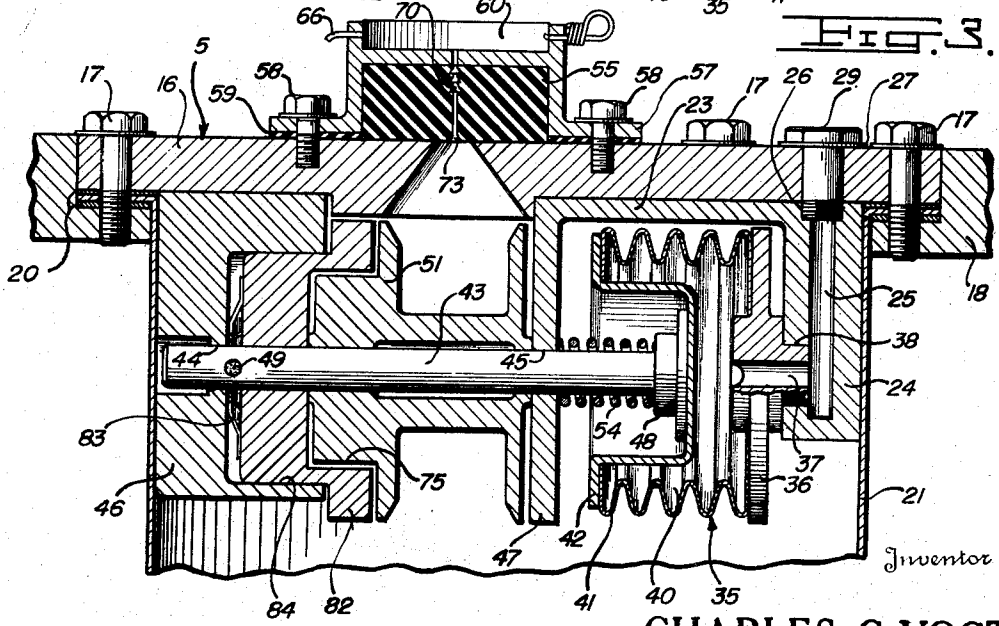

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Fig. 4.

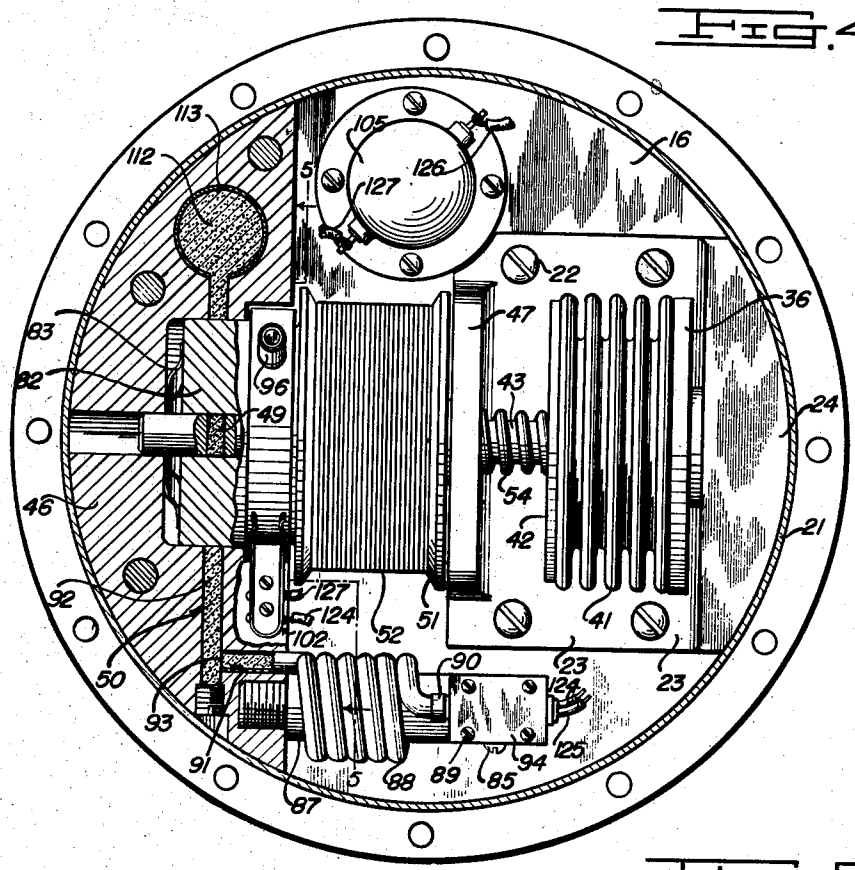

Fig. 5.

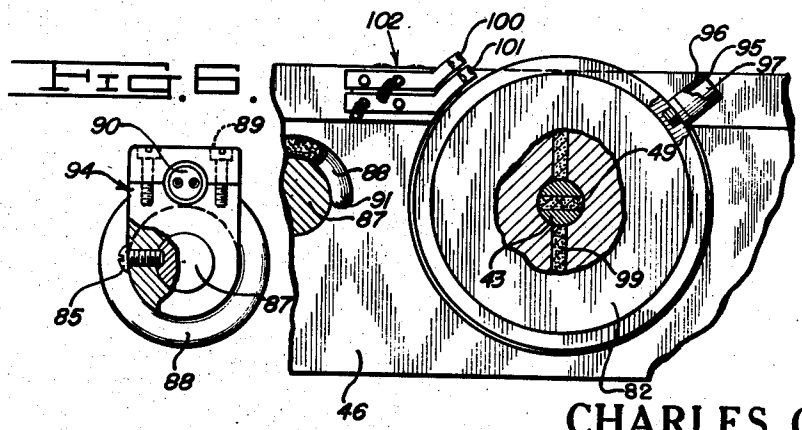

Fig. 6.

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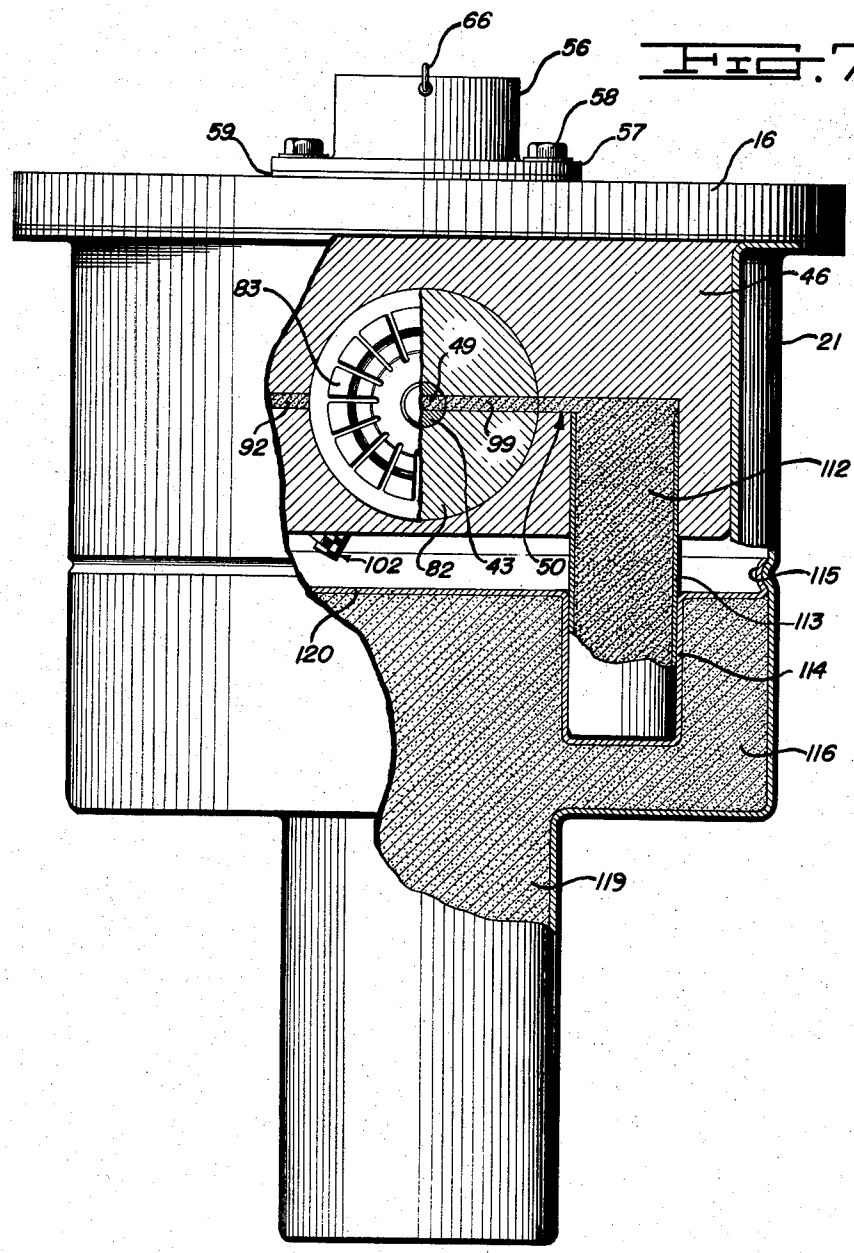
Fig. 7.



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2,945,440

DISCRIMINATING FUZE

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Filed Dec. 16, 1949, Ser. No. 133,451

11 Claims. (Cl. 102—16)

(Granted under Title 35, U.S. Code (1952), sec. 266)

This invention relates generally to fuzes and more particularly to fuzes of the discriminating type adapted for use in an airborne underwater ground mine to selectively distinguish between the landing of the mine upon land or water and to effect the destruction of the mine should it fail to fall within water of a predetermied depth.

Heretofore planes have been extensively employed to transport underwater land mines to enemy waters whereupon the mines are released to be directed into the water either by means of a tail fin structure or by a parachute attached generally to the after portion of the mine and adapted for being released therefrom by means of an inertia actuated device operable upon the mine striking the water to disengage the parachute therefrom allowing the mine to sink to the bed of the body of water and there await the approach of an enemy vessel.

Generally, for strategic reasons, such mine planting operations are conducted during the hours of darkness and from planes flying at considerable heights thereby greatly increasing the possibility of the mine missing the target area to fall either upon land or in such shallow water, or mud, as to permit its recovery by the enemy whereupon it may be dismantled and its secret control mechanism analyzed and countermining apparatus therefor accordingly devised.

In order to make a mine self-destructive should it, by chance, come to rest, after release, upon land, or in such shallow water, or mud, as to be discernable by the enemy, applicant has devised a new and improved discriminating fuze mechanism adapted to selectively distinguish between favorable and unfavorable conditions of rest of the mine and, accordingly, in the case of the latter, to operate to detonate the mine or otherwise render it unserviceable to the enemy if recovered.

It is an object of the present invention to provide a new and improved discriminating fuze mechanism for use in airborne underwater ground mines adapted to selectively distinguish between conditions of rest of the mine, after the launching thereof, on land or in water of a predetermined depth, and in case of the former, or if the water does not exceed the predetermined depth, operate to effect the destruction of the mine.

A further object is to provide a new and improved discriminating fuze mechanism for use in a marine ground mine adapted for launching from a plane flying above the surface of the water and wherein a powder train ignited as the mine strikes the water is broken by the submergence of the mine to a predetermined depth therein.

A still further object is to provide a new and improved discriminating fuze for underwater ground mines adapted to be launched from a plane flying above the surface of the water and wherein the arming of the fuze is accomplished by a predetermined rate of fall of the mine from the plane after the releasing of the mine therefrom.

An additional object of the present invention is to provide a discriminating fuze mechanism for an air launched

underwater ground mine wherein a section of the powder train of the fuze aligned as the mine drops from the plane is broken by the submergence of the mine to a predetermined depth within a body of water.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a view partly in elevation of the fuze mechanism of the present invention as arranged within an underwater ground mine of the type adapted for launching from a plane flying above the surface of the water;

Fig. 2 is an enlarged fragmentary view in section of the fuze mechanism when in unarmed position;

Fig. 3 is a view in section of the fuze mechanism as it would appear when submerged within a body of water of sufficient depth to hydraulically interrupt the burning of the powder train therein;

Fig. 4 is a plan view of the fuze mechanism in its initial or unarmed position with the booster charge and lower section of the housing cut away;

Fig. 5 is a fragmentary sectional view taken along lines 5—5 of Fig. 4 and showing the arming ring therein in its initial or unarmed position;

Fig. 6 is a view of the end of the primer and attaching bracket therefor as secured to the end of a supporting stud element of the fuze;

Fig. 7 is a view partly in section showing the first and auxiliary booster arrangements within the fuze housing;

Fig. 8 is a schematic view of the circuit arrangement of the present invention;

Fig. 9 is a schematic view of an alternate circuit arrangement of the invention wherein an inertia generator is substituted for the battery and inertia switch as shown in Fig. 8;

Fig. 10 is a fragmentary sectional view showing the arrangement of a closing plug within an opening through which the arming wire is discharged from the fuze; and

Fig. 11 is an alternate form of the invention wherein a planetary gear assembly is employed in the fuze and interposed between the clutch ring and arming ring therefor.

Referring now to the drawings and more particularly to Fig. 1 thereof, the fuze assembly of the present invention, generally designated 5, is shown as arranged within a conventional underwater ground mine of the type adapted for launching from a plane flying above the surface of the water. Such mines are generally comprised of an outer casing 6 to which is fastened as by a ring structure 7 a detachable parachute, or finned tail structure 8 for maintaining the mine in a proper position of orientation as it descends through the air to the surface of the water.

Positioned centrally of the mine case and with axis perpendicular to the axis of the mine is a pair of cylindrical containers 9 and 10 within which is disposed, but not shown, the pressure responsive or arming elements of the mine adapted to arm the mine as it descends through the water. A tubular connection 11, arranged as illustrated, provides a receptacle for accommodating electrical connections from the arming elements of the mine to the electronic controls therefor located within a housing structure 12 centrally secured within the base end portion of the mine as by an annular plate member 13. A search coil 14, disposed longitudinally within the mine case, operates responsive to the proximity of a vessel to the mine to produce an electric signal by which the controls of the mine respond to detonate the explosive charge 15 of the mine.

The fuze 5, Fig. 2, is comprised of an annular chassis member 16 shown as secured by bolts 17 within an an-

nular opening provided therefor within an eye equipped mounting plate 18 forming a part of the mine casing and by which the mine is secured by the eyes 30 to the release mechanism of the plane. A pair of ring gaskets 20 formed of rubber or the like and arranged, as illustrated, between the chassis, plate and fuze housing 21 provide the pressure sealing connection between these respective members as attaching bolts 17 therethrough are tightened.

Secured as by screws 22, Fig. 4, to the inner face of the chassis is a substantially U-shaped bracket member 23 within a leg 24 of which is provided an elongated bore 25 threaded at 26 for receiving therein a correspondingly threaded tubular fitting 29 adapted as the fitting is drawn into the threaded end portion of the bore to press about the flange portion 28 of the fitting a gasket member 27 thereby to provide a pressure sealing connection between the fitting and the outer face of the chassis 16.

Threaded into the inner surface of the leg 24 is a pressure responsive bellows assembly generally designated 35 and including an annular closing plate 36 wherein is provided a centrally arranged bore 37 adapted as the plate is threaded at 38 into the leg of the bracket to intersect the bore 25 and thereby to establish a fluid circuit between the inner chamber 40 of the bellows and the atmosphere or water whichever may be surrounding the mine.

Closing the end of the bellows 41 opposite the plate 36 is a substantially cup shaped member 42 wherein is secured as by soldering, or the like, an extending shaft section 43 adapted, upon expansion of the bellows in response to a predetermined increase in pressure therein, to be moved axially within guide surfaces 44 and 45 provided therefor in the body and leg members 46 and 47 respectively.

A spring 54 arranged about the shaft, as illustrated in Fig. 2, and initially compressed between the leg 47 of the bracket 23 and an extending flange portion 48 of the shaft, is effective to maintain, in this manner, the bellows normally compressed, as illustrated in Fig. 2, with the inner surface of the cup 42 resting against the inner surface of the plate 36 and thereby, for a purpose to become more fully apparent as the description proceeds, to initially position a powder filled section 49 in the shaft 43 within a powder train generally designated 50.

Arranged over the shaft 43 and adapted for rotation thereon is a reel 51 whereupon is wound a length of small diameter wire 52 preferably of the stainless steel type. The outer, or free end 53 of the wire is arranged through a small opening 73 provided therefor in a resilient member 55 preferably cast within a concavely formed cup member 56 invertedly secured by an extending flange portion 57 thereof to the outer face of the chassis as by bolts 58. A gasket 59 arranged between the flange of the cup and chassis member 16 provides a pressure sealing connection therebetween as bolts 58 are tightened.

Disposed in an exterior recess 60 formed in the base of the cup member 56 is an arming plug 61 to which is secured, as by brazing or the like at 62, the end of the wire section 53, the plug having thereon an integrally formed ring portion 64 to which a cable 65 is attached whereby the plug is secured to the plane carrying the mine to the place of launching. As the mine is released from the plane, the cable 65 is effective to withdraw the plug 61 from the recess 60 by shearing an arming wire 66 and thereby to withdraw the wire 52 from the reel at a velocity corresponding to the rate of descent of the mine from the plane. The wire 52 when drawn from the reel 51 in this manner is effective to apply a high rate of rotation to the reel for a predetermined interval of time depending upon the length of wire employed and thus to arm the fuze, as will become more fully apparent as the description proceeds.

Secured as by lead solder, or the like, to the inner end of the wire 52 is a plug member 70 having thereon a

plurality of flange portions 71, Fig. 10, and initially retained, as the wire 52 is wound upon the reel, within a recess 72 provided therefor within the hub portion of the reel, as indicated in Fig. 2. The plug is adapted, as the last of the wire is drawn from the reel, to be carried by the wire into the opening 73 whereupon the resilient member 55 expands to allow the plug to be drawn therein to the position indicated in Fig. 3 and there to become a pressure and water-tight closure for the opening 73.

Diametrically disposed within an enlarged hub portion 75 of the reel are a plurality of radial bores 76 wherein is respectively arranged elongated plungers 77. About each of the plungers is provided a spring 78 adapted by reason of a predetermined loading of the springs between an annular retaining ring 79 therefor and an extending flange portion 80 of the plungers, to prevent outward movement of the plungers from the reel except under conditions of high acceleration as may be caused by a predetermined rate of rotation of the reel resulting from the rapid withdrawing of the wire 52 therefrom. Inserts 81 of leather, or the like, preferably cemented within recesses formed, but not shown, in the ends of the plungers 77 are effective, as the plungers are centrifugally extended, to frictionally engage the inner surface of an arming ring 82 whereby the ring is rotated by the reel to the armed position thereof, Fig. 7.

The arming ring 82 is initially maintained in an unarmed position, Fig. 2, by pressure thereagainst of a spider spring 83 interposed between the ring and the base of a bore 84 formed in the body section 46 and within which the ring closely fits for rotation upon the shaft section 43 and freely within bore 84. The powder train 50 which is initially broken by the arming ring 82 when the latter is in safe position, Fig. 2, is completed for arming the fuze by rotation of the arming ring, in the manner described, to the armed position indicated in Fig. 7, the ring having a diametrically arranged portion 99 of the powder train which becomes aligned therewith as the ring moves to the armed position.

Extending inwardly from an edge of the body section 46, Fig. 4, is a stud 87 about which is wound a selected length of delay element 88 forming a part of the powder train 50. The element may be in the form of a powder filled lead conduit having one end thereof secured as by crimping within the shell of an electroresponsive primer 90. The other end of the element is adapted for being received within a bore 91 provided therefor in the body member 46 for connecting with the section 92 of the powder train as at 93. The primer 90 is supported from the end of stud 87 by a two section clamping bracket 94, Fig. 6, secured about the primer as by screws 89 and having arranged in the lower section thereof a set screw 85 adapted for being drawn into engagement with the end of the stud whereby the bracket and primer is secured thereto after the element 88 has been properly arranged over the stud and the end of the element inserted, as indicated, within the bore 91.

Secured to the periphery of the arming ring 82 is a stud 97 over which is arranged a metallic sleeve 96 suitably insulated from the stud as by an insulating sleeve 95. The metallic sleeve 96 when carried by rotation of the ring 82 between the flexible fingers 100 and 101 of an arming switch 102 is effective to complete an electrical circuit from the detonator 90 to an interia responsive switch 105 of the type shown and described in the copending application of Bob Norris et al. for Torpedo Exploder Mechanism, Serial No. 105,856, filed June 20, 1949.

The booster 112 is confined within an elongated casing 113 preferably pressed fit within the body section 46 and adapted for extending outwardly therefrom and into a well portion 114 of a partition 120 adapted to separate the mechanism of the fuze from a auxiliary booster charge 116 arranged within the lower portion of the housing 21, as illustrated in Fig. 7. The partition is se-

cured to the housing in any suitable manner as by rolling therewith as at **115**. The auxiliary booster **116** is adapted when ignited by the booster **112** to explode the mine or effect the destruction of the controls therefor by igniting a charge **117** arranged in the base end portion of the control housing **12**, Fig. 1, and within which the section **119** of the charge **116** extends.

The circuit arrangement of the present invention is shown in Fig. 8 to include the primer **90** adapted for being energized through a circuit including the battery **121** and the normally open inertia switch **105** and arming switch **102**. The inertia switch **105** includes an inertia responsive element **122** centrally disposed within a globular contact member **123**, the former being adapted to engage the latter upon impact of the mine with either land or water as the case may be. The arming of the mine by the closing of the switch **102** is effected, as heretofore described, in response to the falling of the mine from the plane. The connections **124**, **125**, **126**, and **127** are shown in Figs. 4 and 5 of the drawings as they connect with their respective elements of the fuze.

An alternate circuit arrangement is provided in Fig. 9 wherein an inertia responsive generator **130** is adapted to supply current for igniting the primer **90** in lieu of the battery **121** as shown in the previous circuit. The inertia generator may be of any type suitable for the purpose such, for example, as the generator disclosed and claimed in the copending application of H. J. Plumley for Magnetic Inertia Controlled Fuze, Serial No. 535,799, filed May 16, 1944, now Patent No. 2,775,941, and wherein a magnetic circuit established by a permanent magnet member **131** is closed by a keeper element **132** magnetically retained in the position indicated against the poles of the magnet and adapted in response to shock to be disengaged from the magnet and thereby to interrupt the magnetic circuit maintained thereby to induce in a pair of wire coils **133** and **134** arranged on the magnet a voltage sufficient for operating the primer **90** whereupon the primer is exploded to effect the ignition of the powder train **50** in the manner heretofore described.

Frequently it is desirable to arm the fuze only after the mine has fallen a definite distance from the plane following its release therefrom. Therefore, it is provided in an alternate arrangement of the invention, as illustrated in Fig. 11, that a planetary gear assembly, generally designated **135**, be interposed between a clutch ring **136** and an arming ring **137** whereby rotation of the arming ring to a position for arming the mine is affected only after a predetermined number of rotations of the clutch ring **136**. The planetary gear assembly **135** is comprised of a freely rotatable pinion **138** mounted upon a stud **139** secured as by soldering to the rear face of the clutch ring **136**. The pinion **138** has teeth for loosely meshing with correspondingly formed teeth about the periphery of a pair of gears **140** and **141** secured to the arming ring **137** and shaft section **43** respectively, the gear **141** having arranged in the hub thereof a longitudinal slot **142** adapted for receiving therein a pin **143** secured, as by press fitting, within the shaft section **43** whereby there is provided an arrangement suitable for preventing rotation of the gear **141** yet allowing free longitudinal movement of the shaft therethrough responsive to the expansion of the bellows **41**. The gear **140** may be either integrally formed as shown or separately formed and secured as by silver soldering or the like, to the inner face of the arming ring **137** and arranged in face adjacency with gear **141**, whereupon the idler pinion **138** is effective to mesh with each of the gears respectively. The gear **140** is provided with one or more teeth than the gear **141** whereupon, as the idler pinion **138** is rotated about the periphery of the gears, the gear **140** is caused to rotate the arming ring **137** gradually to armed position similarly to the armed position of ring **82** as indicated in Fig. 7. The particular safety features of this alternative form of the fuze reside in the fact that the reel **51** must be rotating at a predetermined velocity before the centrifugally responsive plungers **77** arranged therein will engage the clutch ring **136**, as in the fuze of Fig. 5, and in the additional fact that the clutch ring will rotate the idler pinion **138** several revolutions about gears **140** and **141** prior to complete movement of the arming ring to the armed position. This arrangement provides that the speed of rotation of the reel **51** must be maintained at, or in excess of a minimum velocity for a predetermined interval of time continuously until such time as the gear **140** has stepped off the required number of teeth to rotate the arming ring **137** to armed position. Should the speed of rotation of the reel diminish from the speed required to extend the plungers **77** into engagement with the clutch ring **136**, rotation of the clutch ring and idler pinion thereon is interrupted and the arming ring **137** is no longer moved in the direction of the armed position.

Assuming that the fuze has been armed in the manner heretofore described during the fall of the mine from the plane, the subsequent impact of the mine with land or water, as the case may be, is effective to activate the inertia responsive switch **105** for closing the circuit to the primer **90** whereupon the powder train **50** is ignited. If by chance the mine rests upon land or within such shallow water as to permit its recovery by the enemy, the powder train **50** continues to burn to ignite the booster **112** whereupon the mine is exploded in an obvious manner. However, if the mine has fallen within water exceeding a predetermined depth, during the interval of the burning of the delay element **50** the mine will have sunk sufficiently within the water to cause the surrounding pressure thereof when applied to the inner surface of the bellows **41** to expand the bellows for shifting the shaft section **43** to the position indicated in Fig. 3 whereupon the section **49** of the powder train therein is moved from alignment with the powder train **50** and the burning of the train is interrupted. As the powder train is extinguished, the function of the fuze is completed and the remaining controls of the mine operate as usual in response to the approach of an enemy vessel.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

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.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A fuze for an aerially launched underwater ground mine adapted to selectively distinguish between the landing of the mine upon land or in water exceeding a predetermined depth, including, in combination, a housing adapted for mounting within the casing of the mine, a powder train arranged within said housing, a source of electrical energy, an electro-responsive primer adapted when energized to effect the burning of said train, a booster charge disposed for being ignited by said train to effect the exploding of said mine, means responsive to the impact of the mine falling either upon land or water for energizing said primer from said source, and pressure responsive means operatively connected to said train for interrupting the burning thereof when the mine sinks to a predetermined depth within a body of water.

2. A fuze for an underwater ground mine adapted to be released from a plane in flight including, in combination, a housing adapted for being received into the side wall of the mine, a booster charge arranged within said housing and adapted when energized to effect the explosion of said mine, means for igniting said charge including a powder train operatively connected therewith, an electro-responsive primer operatively connected to said

train for effecting the burning of the train when the primer is energized, an arming ring having therein a segment of said train and rotatable from an initial position to an armed position for aligning said segment with the train, means for rotating said ring responsive to the fall of the mine from the plane, a circuit including an inertia responsive switch for energizing said primer upon impact of the mine with either land or water, and a pressure responsive element operatively connected to said train to interrupt the burning of the train when the mine sinks to a predetermined depth within a body of water.

3. A fuze of the character disclosed for use in an aerially launched underwater ground mine and including, in combination, a housing adapted for mounting within the casing of the mine, a reel arranged for rotation in said housing, a length of wire arranged about said reel and adapted when rapidly drawn therefrom to apply a high rate of rotation thereto, a plurality of inertia responsive elements operatively associated with said reel and adapted in response to a predetermined rate of rotation thereof to be centrifugally extended therefrom, a booster charge arranged in said housing and adapted when ignited to effect the explosion of said mine, a powder train arranged for igniting said charge, means including an electro-responsive primer adapted when energized to effect the burning of said train, an arming ring arranged to be engaged by said elements and rotated by the reel when the elements are extended, said ring having therein a section of said train for completing the train upon predetermined rotary movement of the ring, means including an inertia responsive switch for energizing said primer upon impact of the mine with either land or water, and a pressure responsive element operatively connected to said train and arranged to interrupt the burning of the train when the mine sinks to a predetermined depth within a body of water.

4. A fuze for use in an aerially launched underwater ground mine of the character disclosed and adapted to selectively distinguish between the landing of the mine upon land or in water exceeding a predetermined depth, including, in combination, a housing adapted for mounting within the casing of the mine, a reel arranged for rotation in said housing, a length of wire arranged about said reel and adapted when rapidly drawn therefrom to apply a high rate of rotation thereto, an arming ring, a plurality of inertia responsive elements carried by the reel and operatively associated with said ring and adapted in response to a predetermined rate of rotation of the reel to engage said ring for rotation with said reel, a powder train having a section thereof arranged in said ring and rotatable therewith into alignment with said train, an electro-responsive primer adapted when energized to effect the burning of said train, a booster charge for exploding said mine, said charge being disposed in firing relation with respect to said train and arranged to be ignited thereby, means including an element responsive to the impact of the mine falling either upon land or water for energizing said primer, and pressure responsive means operatively connected to said train for interrupting the burning of the train when the mine sinks to predetermined depth within a body of water.

5. A mine fuze of the character disclosed adapted to selectively distinguish between the landing of an aerially launched mine upon land or in water exceeding a predetermined depth including, in combination, a housing adapted for mounting within the casing of the mine, a reel rotatably arranged in said housing, a length of wire arranged about said reel and having one end thereof extending outwardly through an opening in said housing and through which the wire may be drawn rapidly from said reel for applying a predetermined rate of rotation thereto, a tubular resilient member arranged within said opening and having said wire extended therethrough, the other end of said wire having thereon a plug adapted for being drawn into said tubular member to close the opening therein, centrifugally responsive elements operatively associated with said reel and adapted in response to a predetermined rate of rotation thereof to be extended outwardly from said reel, a booster charge arranged in said housing and adapted when ignited to effect the explosion of said mine, a powder train arranged for igniting said charge, a power source, means including a primer effective when energized to ignite said train, an arming ring arranged to be engaged by said elements when extended and coupled thereby to said reel for rotation therewith, said arming ring having therein a section of said train arranged to be brought into alignment therewith upon predetermined rotary movement of the ring, means including an inertia responsive switch for energizing said primer from said source upon impact of the mine with either land or water, and a pressure responsive element operatively connected to said powder train and arranged to interrupt the powder train when the mine sinks within a body of water below said predetermined depth.

6. A mine fuze of the character disclosed adapted to selectively distinguish between the landing of an aerially launched mine upon land or in water exceeding a predetermined depth including, in combination, a housing adapted for mounting within the casing of the mine, a reel rotatably arranged in said housing, a length of wire arranged about said reel and adapted when rapidly withdrawn therefrom to apply a high rate of rotation to said reel, inertia responsive elements operatively associated with said reel and adapted in response to a predetermined rate of rotation of said reel to be centrifugally extended therefrom, a booster charge arranged in said housing and adapted when ignited to effect the explosion of said mine, a powder train arranged for igniting said charge, a power source, means including a primer effective when energized to ignite said train, an arming ring arranged to be engaged by said elements when extended and coupled thereby to said reel for rotary movement therewith, said ring having therein a section of said train arranged to be brought into alignment with the train upon predetermined rotary movement of the ring, means including an inertia responsive switch for energizing said primer from said source upon impact of the mine with either land or water, and a pressure responsive element operatively connected to the powder train for interrupting the powder train when the mine sinks within a body of water below said predetermined depth.

7. A fuze for an aerially launched underwater ground mine including, in combination, a housing, an explosive arranged in said housing and adapted when ignited to effect the explosion of said mine, a primer, an initially interrupted powder train connecting said primer to said charge, the primer being adapted when detonated to effect the burning of said train, means responsive to the fall of the mine from the plane for completing said initially interrupted powder train thereby to arm the fuze, means responsive to the impact of the mine with land or water for detonating said primer, and pressure responsive means for interrupting the burning of said train when the mine sinks to a predetermined depth within a body of water.

8. A mine fuze of the character disclosed adapted to selectively distinguish between the landing of an aerially launched mine upon land or in water exceeding a predetermined depth including, in combination, a housing adapted for mounting within the casing of the mine, a booster charge arranged in said housing and adapted when ignited to effect the explosion of said mine, a primer for igniting said booster charge when detonated, a fuze train interposed between said primer and charge, an arming ring interposed in said fuze train and having a train section adapted upon predetermined movement of the ring to be moved from a safe position to an armed position in which the section is aligned with the train, a reel rotatably arranged in said housing, a length of wire arranged about said reel and adapted when rapidly

withdrawn therefrom to apply a high rate of rotation to said reel, a plurality of inertia responsive elements operatively associated with said reel and arranged to engage said ring to rotate the ring from said safe to said armed position in response to a predetermined rate of rotation of the reel, inertia responsive means operatively associated with said primer and adapted upon impact of the mine with either land or water to effect the detonation of said primer, and means responsive to pressure of the surrounding water for disarming said fuze when the mine sinks below said predetermined depth of submergence.

9. A fuze for an underwater ground mine adapted for launching from a plane in flight including, in combination, a housing having an opening therein, a shaft constructed and arranged in said housing for axial movement in a plane substantially perpendicular to the axis of said opening, means for applying axial movement to said shaft including a pressure responsive element operatively connected thereto, a reel arranged for rotation about said shaft, a length of wire arranged about said reel and having one end thereof extending through said opening through which the wire may be rapidly withdrawn from said reel for applying a high rate of rotation thereto, an arming ring, an inertia responsive clutch operatively connecting said ring to said reel and adapted in response to a predetermined rate of rotation of the latter to effect the rotation of said arming ring, a booster charge arranged for exploding said mine when ignited, a power source, a fuze delay element, an electroresponsive primer adapted when energized to effect the burning of said delay element, an initially interrupted powder train ignitable by said delay element and operatively connected to said charge, a segment of said train rotatable by said arming ring from an initial position to an armed position in alignment with said train, an inertia responsive switch for energizing said primer from said source upon impact of the mine with land or water, and means carried by said shaft and effective to interrupt the burning of said train as the shaft moves in response to a predetermined pressure applied to said pressure responsive element.

10. A fuze as in claim 9 further characterized by provision of a reduction gear between said clutch and arming ring.

11. A mine fuze of the character disclosed for selectively distinguishing between the landing of an aerially launched mine on land or in water of a predetermined depth comprising, in combination, an explosive charge, inertia responsive means operable in response to impact of the mine with land or water, means responsive to said inertia means for firing said charge in predetermined time delayed relation to said impact of the mine, and hydrostatic means for disabling said firing means when the mine sinks within a body of water to said predetermined depth.

References Cited in the file of this patent

UNITED STATES PATENTS

1,295,097 Anderson ---------- Feb. 25, 1919

FOREIGN PATENTS

2,706 Great Britain ---------- of 1911