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PRESSURE OPERATED ARMING MECHANISM

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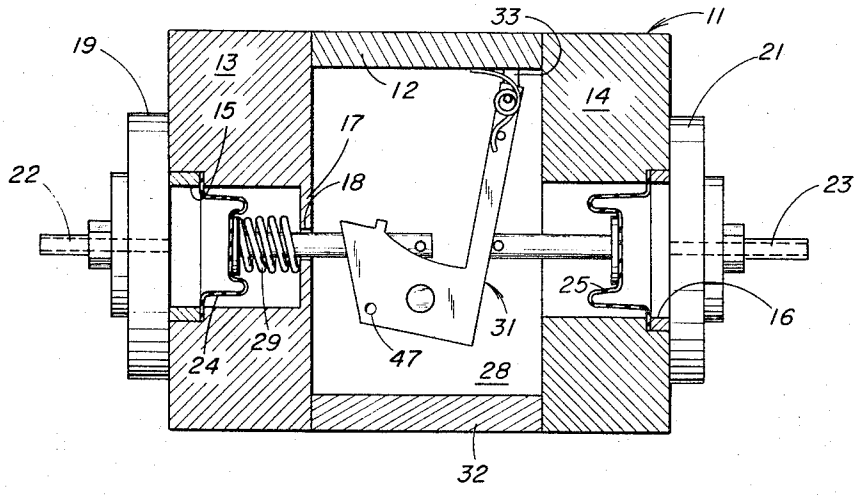



FIG. 2

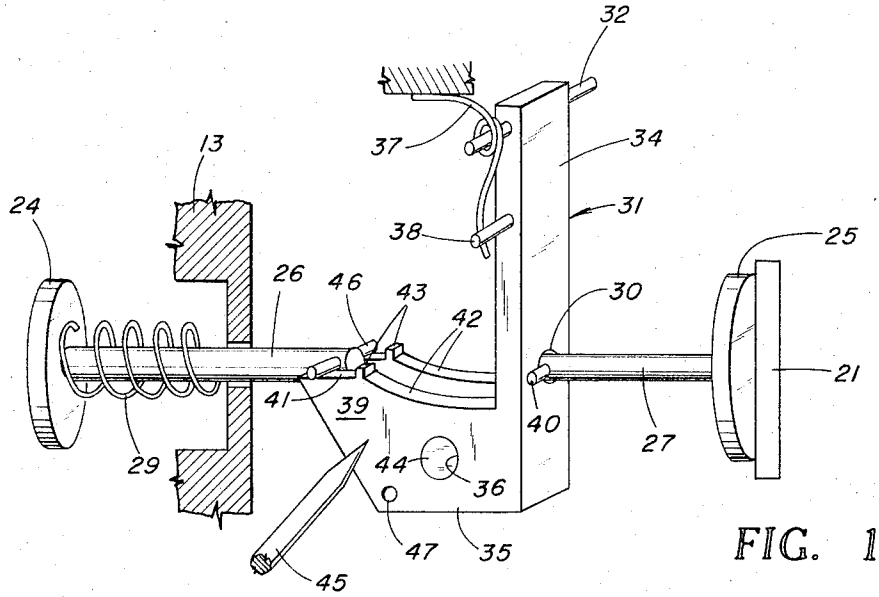



FIG. 1

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# PRESSURE OPERATED ARMING MECHANISM

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## ABSTRACT OF THE DISCLOSURE

The arming device includes a pivoted L-shaped shutter having an explosive charge normally spring urged to a position where the charge is out of alignment with a firing pin. The base of the shutter is provided with a flat surface upon which normally presses a crosspin mounted in a pressure responsive shaft and an arcuate surface over which the crosspin is located in response to a first pressure signal. A second pressure responsive shaft acts on the shaft in a manner that when a second pressure signal is applied it rotates the shutter to a position where the charge and firing pin are aligned. The shutter base is provided with a protuberance intermediate of its flat and arcuate surfaces which limits shutter movement only upon application of a particular sequence of pressure signals.

### *Background of the invention*

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.

This invention relates to arming devices and more particularly to a fluid pressure operated arming device for an ordnance fuze.

There are many stringent requirements for arming devices when used in ordnance applications. They include compactness, ruggedness and high reliability after long storage life. When applied to fuzes, arming devices have safety features incorporated therein to restrain the firing pin and interrupt the explosive train so that premature ignition due to shock or vibration forces or other causes will not occur. Many of the presently available arming devices use an environmental power source, such as air pressure or underwater pressure, for the operating pressure to eliminate electric energy storage problems.

One of the drawbacks to this type of arming device is the possibility of premature firing by accidental application of high pressure or shock and vibration forces occasioned by mishandling of the projectile or missile with which the arming device is associated. This and other drawbacks can be overcome by the use of a low pressure fluid operating system containing independent locking and driving means which must be independently operated in a predetermined sequence.

### *Summary of the invention*

An object of the instant invention is the provision of a fluid pressure operated arming device for use in an ordnance fuze.

Another object of the present invention is the provision of a fluid pressure operated arming device having independently operated locking and driving means.

A further object is to provide a fluid pressure responsive arming device immune to shock and vibration.

A still further object of the invention is to provide a fluid pressure operated arming device requiring a particular sequence of application of pressure signals.

Briefly in accordance with one aspect of the invention, the foregoing and other objects are attained by an arming device having a pivoted shutter with vertical and base portions normally resiliently biased to an initial position.



The base portion has a flat surface which initially engages a pressure responsive slideable element to lock the shutter in the initial position and a recessed portion over which the element is moved in response to a pressure signal thereby unlocking the shutter. A second pressure responsive slideable element engages the shutter and in response to a pressure signal urges against the bias on the shutter to affect movement thereof to a moved position.

### *Brief description of drawing*

A more complete appreciation of the invention and many of its attendant advantages will be readily appreciated as the same becomes better understood by reference to the detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a schematic representation of the essential operating elements of the arming device in an unarmed condition; and

FIG. 2 is a view, partially in section, of the arming device in an armed condition.

### *Description of the preferred embodiment*

As shown in the drawing, the delay arming device of this invention includes a closed casing **11** formed of a sidewall **12** and end bodies **13** and **14**. Cylindrical bores or chambers, **15** and **16**, are formed in end bodies **13** and **14**, respectively, chamber **15** being provided with a wall **17** having an aperture **18** centrally formed therein. Cover plates **19** and **21** are secured by conventional means over the outer openings of chambers **15** and **16** and are provided with pneumatic input connectors **22** and **23** which admit pressure signals into the chambers from a "fluidics" system, not shown nor part of this invention. Pressure responsive members **24**, **25**, such for example as pistons or low-pressure consumption rolling diaphragms, are positioned within chambers **15** and **16** and are provided with shaft members **26**, **27** extending into a chamber **28** centrally formed in casing **11**. Diaphragms **24** and **25** are formed of a resilient material, such as rubber, which deflects or rolls down when pressure is applied thereto. Shaft **26** is encircled by a spring **29** normally urging piston **24** toward cover plate **19**. The lateral movement of shaft **26** is restrained to a particular magnitude by aperture **18**.

An L-shaped shutter **31** is pivotally suspended within casing **11** by a pin **32** and bracket **33** secured to casing wall **12**. The shutter is formed of a solid vertical leg **34** having a bore **30** and a solid base member **35** perpendicular thereto and having a bore **36** formed therethrough. An explosive charge **44** is positioned in bore **36**. The shutter is normally urged counterclockwise by a torsion spring **37** acting against a pin **38** and the casing. Base member **35** has a pair of identical parallel spaced legs **39** upwardly projecting therefrom each of which has an end surface with a flat portion **41**, concave or recessed arcuate shaped portion **42** and a protuberance **43** intermediate of these two portions. The end of shaft **27** is disposed within bore **30** and is provided with a crosspin **40** to act against the urging force of torsion spring **37**, as will be explained more fully hereinafter.

Normally, torsion spring **37** urges shutter **31** counterclockwise until piston **25** abuts cover plate **21**, or in the alternative base body **35** rests against end member **14**, in which position the explosive charge **44** will be out of alignment with a firing pin **45** of the associated fuze thereby maintaining an unarmed or safe condition. In this position, by the action of spring **29** a crosspin **46** secured in shaft **26** presses on the flat surface portions **41** of legs **39** thereby preventing clockwise rotation of shutter **31** by any shock or vibration forces to an armed position where firing pin **45** is aligned with explosive charge **44**.

In effect, the arming device is locked in a safe position.

Upon application of a pressure signal of a predetermined magnitude to diaphragm or piston **24** generated by a "fluidics" system employing environmental pressure, such for example as the stagnation pressure at the nose of a bomb, spring **29** is compressed and shaft **26** moves crosspin **46** out of engagement with flat surfaces **41** and above arcuate surfaces **42** thereby unlocking shutter **31** from its safe position. Under this circumstance, shutter **31** is free to rotate in a clockwise direction, as determined by the depth of arcuate surfaces **42** except for the biasing action of torsion spring **37**. Upon the application of a second pressure signal of a predetermined magnitude to diaphragm, or piston, **25** by the "fluidics" system, shaft **27** drives against vertical leg **34** overcoming the bias of torsion spring **37** thereby rotating shutter **31** to an armed position where explosive charge **44** is aligned with firing pin **45**. Thus, it will be apparent that shaft **26** operates to lock the shutter in a safe position and shaft **27** operates to drive the shutter to an armed position. The shutter may be locked in the armed position by a detent **47** on engaging a recess (not shown) formed in the sidewall or by any other conventional latching device which in addition will assure alignment of the charge and firing pin.

It will be appreciated by those skilled in the art that the requirement of oppositely directed pressure signals to provide for shutter movement provides further protection against premature arming by accidental shock or vibration forces. It should also be noted that a further safety provision is provided by the small protuberance **43** formed on shutter arms **39** which guards against movement of the shutter **31** if a pressure signal from the "fluidics" system is first applied to chamber **16**.

Obviously, numerous 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 herein.

I claim:

**1.** An arming device comprising

a pivoted shutter having a vertical and a base portion, said base portion having flat and recessed surfaces formed thereon,

resilient means normally biasing said shutter to an initial position,

first pressure responsive means initially engaging said flat surface for locking said shutter in said initial position and movable into operative relationship with said recessed portion in response to a pressure signal thereby freeing said shutter for movement, and

second pressure responsive means engaging said shutter for affecting movement thereof from said initial position to a moved position in response to a pressure signal.

**2.** The arming device of claim **1** and including means formed on said base portion of said shutter for precluding movement of said shutter unless a pressure signal is applied to said first pressure responsive means before said second pressure responsive mean.

**3.** The arming device of claim **2** wherein said means formed on said base portion comprises a protuberance intermediate of said flat and recessed surfaces thereof.

**4.** The arming device of claim **3** wherein said recessed surface is arcuate shaped.

**5.** The arming device of claim **1** wherein said flat and recessed surfaces are formed on two parallel upwardly projecting legs of said base portion.

No references cited.

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