

1

3,366,058

IGNITION DEVICE FOR LIQUID PRIMERS

John J. Scanlon, Jr., Willingboro, N.J., assignor to the United States of America as represented by the Secretary of the Army

Filed Oct. 19, 1965, Ser. No. 498,161
3 Claims. (Cl. 102-70)

ABSTRACT OF THE DISCLOSURE

An ignition device consisting of a combustion chamber, secured in a housing; a piston operative within the housing and combustion chamber to ignite a liquid propellant and expel a flame through a small hole in the combustion chamber.

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.

Since the advent of caseless ammunition the need for a clean, combustible primer has been ever present. During repetitive firing the solid particles in the conventional lead styphnate mix, such as antimony sulfide, would collect on the seal area and on the firing pin and cause deterioration thereof.

The invention consists of a device that can ignite alkyl nitrate liquid propellants and expel a flame through a small hole.

Therefore, the object of the present invention is the provision of an ignition device using a completely gaseous primer.

Another object is to provide an ignition device that does not require the use of a firing pin.

The above objects as well as others together with the benefits and advantages of the invention will be apparent upon reference to the detailed description set forth below, particularly when taken in conjunction with the drawing annexed hereto in which there is shown an ignition device 10, consisting of a cylindrical housing 12 and a combustion chamber 14. The combustion chamber 14 has an open end 16 extending into said housing and a closed end 18 extending outward therefrom. Said closed end 18 has an axial vent hole 20 therein. A piston 22 is provided extending through both the housing 12 and the combustion chamber 14. Said piston is of a diameter slightly smaller than the combustion chamber diameter and has a radial projection 24, the diameter of which is slightly smaller than the housing diameter. A spring or resilient means 26 is provided at the rear of said housing 12 between said projection 24 and a cap 28. Said cap 28 is secured to said housing by screw threads 29. A catch means or sear 30 is provided pivotally attached at 32 to housing 12. The sear 30 is biased by resilient means or spring 34 to remain engaged with a notch 36 in piston 22. The forward end of the piston 22 is provided with a high pressure seal consisting of metal rings 38 and 39, secured in radial grooves 40 and 41. Between the groove 40 and the tip of the piston is a vapor pocket 42. Inlet ports 44 and 46 are provided in the combustion chamber 14 and the housing 12, respectively. When the piston 22 is in the cocked position, as shown in the drawing, the inlet ports 44 and 46 are located a short distance in front of the tip thereof.

In operation, an alkyl nitrate liquid propellant such as ethyl nitrate is injected into the inlet ports 44 and 46.

2

The sear 30 is pulled down against the action of the spring 34 thereby releasing the piston 22 through the action of the spring 26. The piston 22 travels forward compressing the vapor of the liquid propellant in the vapor pocket 42. As the pressure in the vapor pocket 42 builds up, the temperature increases. When a temperature of 450° F. is reached the vapor in said vapor pocket 42 ignites thereby igniting the remaining liquid in the combustion chamber 14 and the liquid that is escaping through the vent hole 20. The liquid escaping through the vent hole 20 ignites the caseless cartridge (not shown) or the like which is placed directly in front of said vent hole 20. The flame which is produced at the vent hole 20 reaches 3000° F.

For example, the utilization of a vapor pocket of 0.062", a vent hole of 0.013", a combustion chamber bore of 0.250", and a 15 lb. spring will yield a piston stroke of 2.50".

The piston stroke can be decreased by merely reducing the diameter of the vapor pocket.

Obviously many modifications and variations of the present invention are possible in 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.

I claim:

1. An ignition device comprising a housing, a combustion chamber having an open end extending into said housing, and a closed end extending outward therefrom, said closed end having a vent means therein, said combustion chamber having inlet means coinciding with inlet means in said housing, said inlet means provided for the insertion of a liquid propellant, a piston extending through said housing and said combustion chamber, said piston defining a cylindrically shaped vapor pocket, located radially within said piston immediately rearwardly of the forward end thereof and being located before ignition immediately behind said inlet means so as to be able to collect the vapor therefrom during its passage through said chamber, a first resilient means located in the rear portion of said housing abutting a projection means on said piston and a cap secured to the end of said housing, a catch means pivotally attached at one end to said housing, the other end of said catch means engaging a holding means in said piston thereby holding said piston in a cocked position, said catch means being biased into said holding means by a second resilient means on the side of said housing.

2. A device of the type described in claim 1, wherein said piston has a plurality of grooves in the vicinity of its forward end, said grooves containing high pressure seals.

3. An ignition device comprising a cylindrical housing, a combustion chamber having an open end extending into said housing, and a closed end extending outward therefrom, said closed end having a vent hole therein, said combustion chamber having inlet ports coinciding with inlet ports in said housing, said inlet ports provided for the insertion of an alkyl nitrate liquid propellant, a piston extending through said housing and said combustion chamber, said piston defining a cylindrically shaped vapor pocket, located radially within said piston immediately rearwardly of the forward end thereof and being located before ignition immediately behind said inlet means so as to be able to collect the vapor therefrom during its passage through said chamber, a first spring means located

in the rear portion of said housing abutting a radial projection on said piston and a cap secured to the end of said housing, a sear pivotally attached at one end to said housing, the other end of said sear engaging a notch in said piston thereby holding said piston in a cocked position, said sear being biased into said notch by a second spring means on the side of said housing.

2,947,221 8/1960 Griffin et al.
 3,011,404 12/1961 Russell.
 3,097,602 7/1963 Turner.
 5 3,214,909 11/1965 Gordon.

FOREIGN PATENTS

5,317 1/1826 Great Britain.

References Cited

UNITED STATES PATENTS

2,740,385 4/1956 Haage.
 2,759,419 8/1956 Hitchens et al. ----- 102—39

10 BENJAMIN A. BORCHELT, *Primary Examiner*.
 G. H. GLANZMAN, *Assistant Examiner*.