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PYROPHORIC SLUG FLAME THROWER

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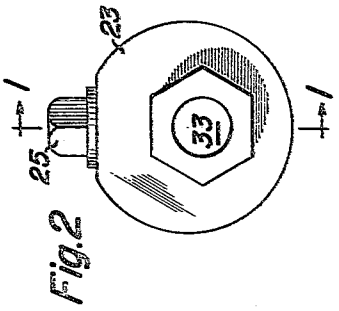


Fig. 2

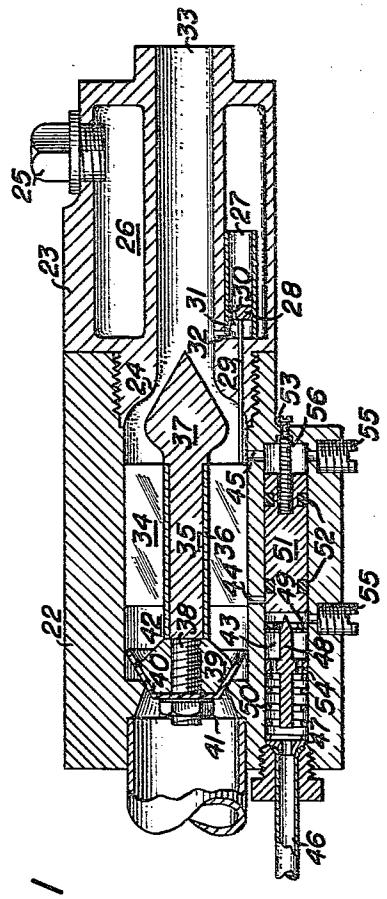


Fig. 1

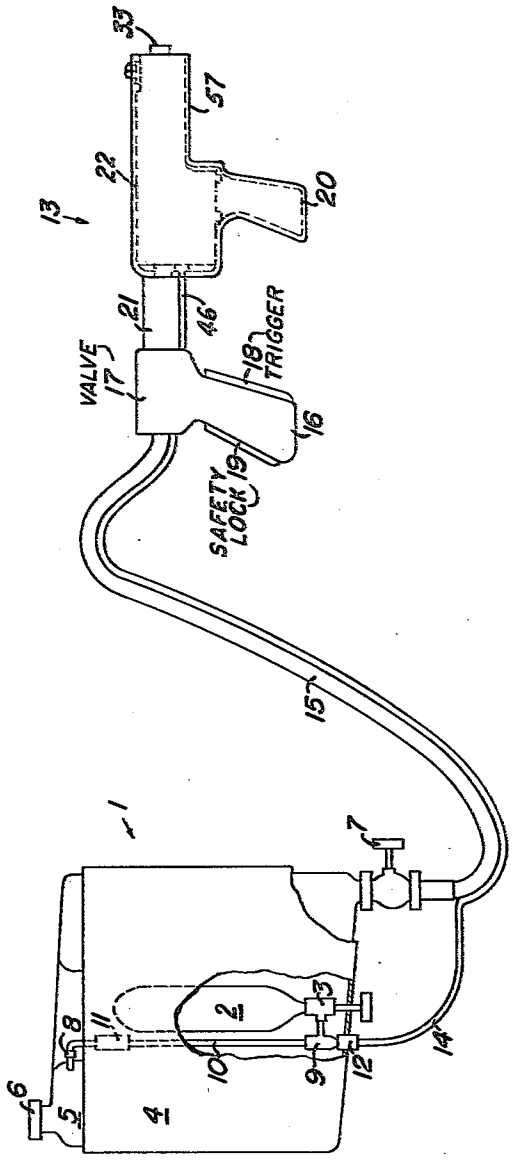


Fig. 3

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PYROPHORIC SLUG FLAME THROWER

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

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 to me of any royalty thereon.

This invention relates to portable flame throwers of the type in which the fuel is ejected in more or less discrete pulses or "slugs."

It is one of the main objects of this invention to provide a portable flame thrower that is lighter in weight than the conventional ones.

It is another object of this invention to provide a flame thrower that ejects the fuel a greater distance as compared to the existing ones.

It is a further object of this invention to provide a flame thrower that can use thicker fuels than the existing flame throwers with a greater range.

The portable flame throwers of the prior art as exemplified by the patent to Graham 2,417,981 consisted of fuel tanks operating under a pressure of 270–300 p.s.i. operating to eject the fuel through a nozzle at which the ignition takes place by means of a flame derived from an auxiliary fuel such as hydrogen gas. This auxiliary fuel of course demanded an additional storage tank.

In contrast to the above device, the instant invention requires fuel tanks designed to withstand pressures in the neighborhood of 10–20 p.s.i. Hence, they can be made of much lighter gage steel or lighter plastics, or even of aluminum or other lightweight metals depending upon which is most economical or feasible from a design standpoint. The fuel container may also be made of an elastomer coated fabric material such as nylon, i.e. the so-called "pillow tank." See Chemical and Engineering News, April 25, 1960, pages 117 and 118.

Likewise, with such low pressures the configuration of the fuel tanks is not limited to cylindrical ones but may include cuboids or elongated cuboids if such is desired to save space on the operator's back. The extra weight associated with the ignition gas cylinder is also eliminated by the instant invention since as will be seen it uses pyrophoric type ignition.

In the drawings,

FIG. 1 is a cross sectional view of the nozzle of the device.

FIG. 2 is an end view of the nozzle assembly.

FIG. 3 is a view of the complete assembly.

Referring now to the drawings in detail, the apparatus consists of a pack device generally shown at 1 made of perforated metal such as aluminum or fiber glass reinforced plastic fitted with a high pressure (i.e. 2000 p.s.i.) air bottle 2 fitted with a T outlet 3 containing a valve and a primary fuel tank 5. The bottle 2 is designed to fit inside the pack. Receptacle 4 and the fuel tank 5 are made to fit around said bottle. The pack device also has shoulder straps (not shown) to enable the operator to carry it. The tank 5 which has a sloping bottom and top, is provided with closure cap 6, outlet valve 7 and a quick disconnect inlet 8. The bottle 2 is connected to the fuel tank 5 by means of the T connection 9, line 10 and pressure regulator 11. The other side of the T connection 9 is connected to the gun generally shown at 13 by means of pressure regulator 12 and hose 14. The connection of the fuel tank 5 to the gun 13 is completed through fuel valve 7 and fuel hose 15.

The gun 13 consists of a rear grip 16 with shut off valve 17 (not shown in detail), valve release or trigger 18 and safety lock 19. The foreward grip 20 is mounted on the end of the barrel 21 and contains the operating mechanism shown in detail in FIG. 1.

The main valve body section 22 is fastened to the end of the barrel 21 and the nozzle section 23 is screwed in to the body section 22. The nozzle section 23 has a forward valve seat 24 and a cavity 26 for the secondary fuel, i.e. pyrophoric igniter liquid. A filler plug 25 serves to retain the liquid within said cavity. Mounted within the cavity 26 on the lower side thereof is a cylinder 27 fitted with a piston 28 and connecting rod 29. The piston 28 has an aperture 30 fitted with a one way valve 31. The cylinder 27 has an aperture 32 at the rear end of said cylinder which communicates with the nozzle opening 33. The connecting rod 29 is connected to one of the three fins 34 of the plunger 35 which are mounted at 120° from each other on a sleeve 36 so as to provide a sliding fit in the main valve body section 22. In order to simplify the drawing, two of the three fins 34 are shown in the cross sectional view FIG. 1. On the forward end of the main valve assembly 35 there is a pintle valve head 37, while on the rear end of said assembly there is mounted a threaded shaft 38 which holds the frusto-conical valve head 39, flexible diaphragm 40 and a nut 41 with an associated lock washer. The flexible diaphragm 40 is made of leather, neoprene or other oil resistant materials.

The valve cavity 42 communicates with the air cavity 43 by means of two orifices, the air port 44 and the fuel port 45. The lower portion of the ports 44 and 45 are made accessible by removing the two screw plugs 55. The air under high pressure comes in line 46, through spring seat 47 provided for spring 50, through the valve spider 48 and through the valve seat 49 when it is open. The spider 48 may take the form of a collar which has several spaced holes 54 through it, only two of which are shown. Alternatively, the valve spider can be made up of three or more angularly spaced fins mounted on a shaft similar to the plunger 35 and its fins 34. In the foreward end of said air cavity 43 there is a piston 51 with sealing rings 52 attached to a spring 56 which is also attached at the other end to a screw 53. The position of the piston 51 can thus be adjusted by turning said screw 53 in or out. A shell 57 which can be of one piece or two piece construction surrounds the grip 20, the valve body section 22, and the nozzle section 23.

through the nozzle, it commingles with some igniter liq-

In operation of this device, the operator opens the air valve 3 and the fuel valve 7. When the valve 17 is released by the trigger 18, the fuel is pushed into the main valve cavity thus pushing the main valve forward seating it on valve seat 24. Fuel will then flow past the flexible diaphragm 40 into the main valve cavity. Fuel will then flow through the fuel port 45 and push piston 51 to the rear. This action will momentarily unseat valve spider 48 from the valve seat 49 since the spring 50 constantly urges the spider 48 back to its normal position. Thus, there is created a series of air pulses which push piston 51 back and forth against the springs 50 and 56. When the piston 51 moves past port 44, the high pressure air (adjusted to 500 p.s.i.) escapes into the cavity 42 and pushes a slug of fuel out of the nozzle opening 33 with great momentum and at the same time pushes the main valve assembly 35 to the rear. As the slug of fuel goes uid from port 32 and the mixture ignites upon contact with the atmospheric air. After a certain amount of fuel flows past the valve seat 24, the pintle valve head 37 is closed by this flow. When the air pressure is turned off due to the spider 48 returning to the valve seat 49, the fuel again flows from barrel 21 into cavity 42 and through

port 45 to start the cycle over again. In this step of the operation the fins 34 have a dual role since they not only space the main valve properly in the valve body section 22 but reduce the turbulence of the fuel as it issues from the nozzle.

The screw 53 serves to adjust the number of cycles per minute since it controls the distance which the piston 51 travels.

The ignition of the fuel is brought about by piston 23 moving to the rear with each movement of the main valve assembly 35. The one way valve 31 closes upon such movement and the igniter liquid is pushed through the aperture 32 to mix with the fuel as it leaves the nozzle.

The fuel used in this flame thrower is not critical. Since this device does provide a higher pressure behind the fuel where it will give a longer range, it is obvious that thicker fuels than are used in the conventional flame throwers may be used. Examples of the thickened fuels that may be used are found in Patents 2,390,609; 2,718,462; and 2,860,103. The igniter liquid used in the cavity 26 can be triethyl or trimethyl aluminum, triethyl boron, chromyl nitrate, diethyl zinc, or perchloryl fluoride.

Various changes in the apparatus described may occur to persons skilled in this art but I desire my invention to be limited solely by the scope of the following claims.

I claim:

1. A flame gun comprising a barrel, a barrel extension having a barrel passage and a plunger therein with front and rear alternately seatable valve heads, a rear valve seat, adjacent passage means alongside said plunger, biased closed valve spider means, and a piston; a nozzle section attached to and communicating with the forward end of said barrel extension and having a forward valve seat for said front valve head, said nozzle extension having a circumferential chamber, said valve spider means and said piston being slideably mounted in said passage means, means for supplying fuel under pressure to the rearward end of said barrel, means for supplying compressed air to said passage means under control of said valve spider means, fuel control means mounted in the rearward end of said barrel, said circumferential chamber adapted to receive and contain pyrophoric igniter liquid, pumping means in said chamber connected to said plunger whereby said liquid is pumped into the fuel ejected from said barrel extension into said nozzle section upon rearward movement of said plunger, said barrel extension having an air port interconnecting said barrel extension passage and said adjacent passage means forward of said rear valve seat normally closed by said piston, said barrel extension having a normally open fuel port interconnecting said barrel extension passage and said adjacent passage means forward of said air port and piston whereby the flow of fuel into said fuel port will push said piston against said valve spider means which will release the compressed air into said adjacent passage means to reverse the movement of said piston and release compressed air into said barrel extension through said air port to eject a slug of fuel out of said nozzle.

2. A flame gun as set forth in claim 1 in which said pumping means comprises an axially extending hollow cylinder in said chamber, said cylinder having a slideable piston therein, said piston having an axially extending aperture with a one way valve mounted on the rearward end thereof, said cylinder having an igniter port rearward of said piston interconnecting said cylinder and nozzle.

3. A portable slug flame thrower comprising a flame gun, an air pressure bottle, a fuel tank pressurized by said air pressure bottle, said fuel tank and pressure bottle being mounted together and each connected to said flame gun by flexible hoses, said flame gun comprising a barrel, a barrel extension having a barrel passage and a plunger therein with front and rear alternately seatable valve heads, a rear valve seat, adjacent passage means alongside said plunger, biased closed valve spider means, and a piston; a nozzle section attached to and communicating with the forward end of said barrel extension and having a forward valve seat for said front valve head, said nozzle extension having a circumferential chamber, said valve spider means and said piston being slideably mounted in said passage means, said tank supplying fuel under pressure to the rearward end of said barrel, said bottle supplying compressed air to said passage means under control of said valve spider means, fuel control means mounted in the rearward end of said barrel, said circumferential chamber adapted to receive and contain pyrophoric igniter liquid, pumping means in said chamber connected to said plunger whereby said liquid is pumped into the fuel ejected from said barrel extension into said nozzle section upon rearward movement of said plunger, said barrel extension having an air port interconnecting said barrel extension passage and said adjacent passage means forward of said rear valve seat normally closed by said piston, said barrel extension having a normally open fuel port interconnecting said barrel extension passage and said adjacent passage means forward of said air port and piston whereby the flow of fuel into said fuel port will push said piston against said valve spider means which will release the compressed air into said adjacent passage means to reverse the movement of said piston and release compressed air into said barrel extension through said air port to eject a slug of fuel out of said nozzle.

4. A portable slug flame thrower as set forth in claim 3 in which said pumping means comprises an axially extending hollow cylinder in said chamber, said cylinder having a slideable piston therein, said piston having an axially extending aperture with a one way valve mounted on the rearward end thereof; said cylinder having an igniter port rearward of said piston interconnecting said cylinder and nozzle.

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