June 14, 1938. M. W. FISCHER 2,120,246

PYROTECHNIC DEVICE

Filed Nov. 27, 1935

Fig. 1

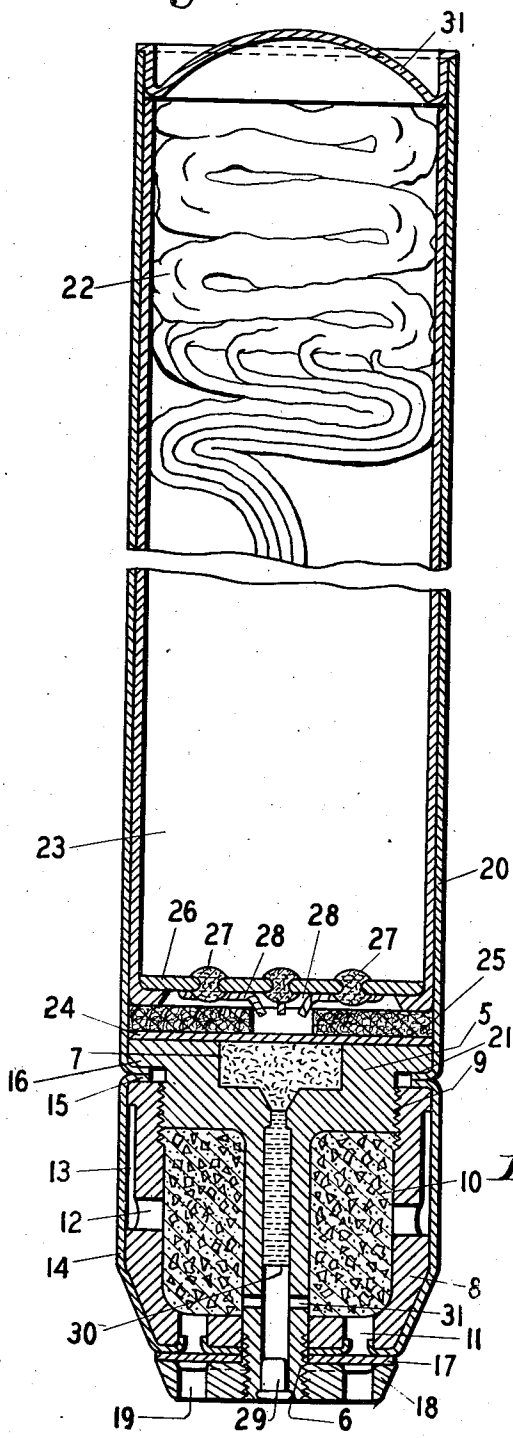
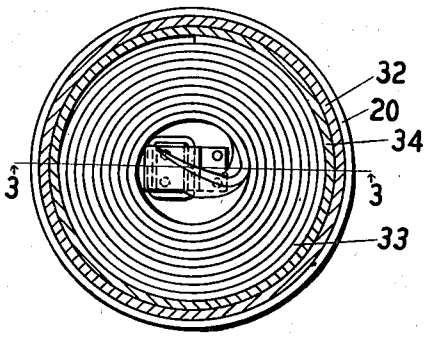


Fig. 2



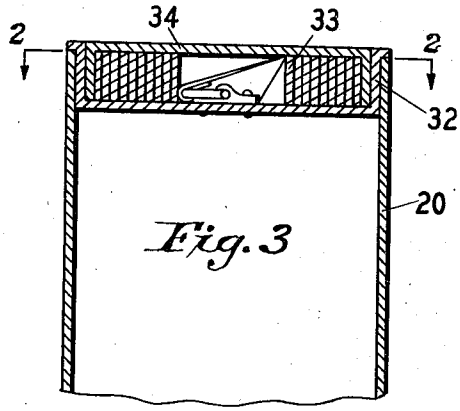


Fig. 3

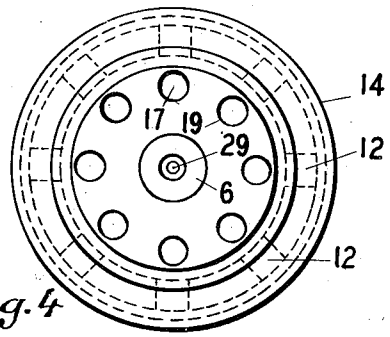


Fig. 4

Inventor:
Max W. Fischer

by Robert A. Lavender
Attorney

Patented June 14, 1938

2,120,246

UNITED STATES PATENT OFFICE

2,120,246

PYROTECHNIC DEVICE

Max W. Fischer, Washington, D. C.

Application November 27, 1935, Serial No. 51,814

8 Claims. (Cl. 102—24)

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

This invention relates to pyrotechnic devices and, more particularly, to rockets of the type that are fired from a mortar or a like smooth bore gun and has among its several objects to provide means for preventing the escape around the rocket of the gas of the charge that ejects the rocket from the barrel. A further object is to utilize the pressure developed by the ejection charge to expand a thin metal member to effect the obturation of the gases. Other objects will appear from the description which follows.

In the drawing:

Fig. 1 is a longitudinal axial section of a rocket embodying my present invention;

Fig. 2 is a section on line 2—2, Fig. 3, showing a flight-steadying element that may be used in connection with various pyrotechnic devices;

Fig. 3 is a diametrical section taken on the line 3—3, Fig. 2; and

Fig. 4 is a plan view of the base of the device.

The present invention has in view the improvement of that type of pyrotechnic devices that are fired by dropping them into the barrel of a mortar or rocket gun having a firing pin at the closed end of the barrel, which pin strikes a primer carried by the device and so ignites the charge that propels the rocket from the barrel. However, the rocket must be freely slidable in the barrel, otherwise the friction with the barrel will so diminish the speed of the rocket as to prevent firing the primer and when such looseness of fit does obtain there is a great loss of propulsive effort due to escape of the gases of the ejection charge around the rocket. The prevention of such loss of energy is one of the important features of my invention.

The base member 5 has a hollow spindle 6 extending from one face thereof and a cavity to contain the expulsion charge 7 in the opposite face. A container 8 is in screw-threaded engagement with the base at 9 and serves to inclose the ejection charge 10. The container 9 has in its closed end an aperture through which the spindle 6 extends and also in the closed end it is provided with a plurality of vents 11 extending parallel to the axis of the device. A plurality of vents 12 extend from the ejection charge 10 to a circumferential channel 13 for a purpose that will presently appear. An obturating cup 14 of thin, soft metal is disposed around the container 8 and has an overturned edge 15 that is tightly clamped between the container and the flange 16 on base 5 but is apertured in registry with the axially extending vents 11. The obturating cup is preferably of copper about 0.03 inch in thickness. The vents 11 are closed by a rupturable sealing disc 17 that is clamped in place by a nut 18 screwed on spindle 6 and which has openings 19 in alignment with the vents 11.

A cylindrical member 20 is preferably of metal, is secured by clamping the overturned edge 21 thereof between the container 8 and flange 16 of base 5, and is of sufficient length to contain the pyrotechnic unit consisting of a parachute 22 and a charge 23 of combustible material for a flare or the like attached to the parachute. A combustible sealing disc 24 is disposed over the expulsion charge 7 and against this disc is seated an annulus 25 of felt or like material. In the combustible disc 26 that incloses the lower end of the charge 23 are plugs 27 of a starter composition that will burn with a sufficiently high temperature to insure the ignition of the charge 23, the combustion of the plugs 27 being initiated by fuses 28 which in turn are ignited by expulsion charge 7. When the device is dropped into the barrel of the rocket gun, the primer 29 strikes the firing pin, is exploded thereby, and ignites the delay train 30. The hot gases from the delay train pass through vents 31 and ignite ejection charge 10, and as this charge burns the gases produced thereby pass through the vents 12 into channel 13 and expand the thin metal of cup 14 tightly against the barrel The pressure builds up further and ruptures the disc 17 whereupon the gases pass through the vents 11 and openings 19 and eject the rocket from the barrel. It is apparent that by thus expanding the cup 14 before the rupturing of disc 17 the gases of the ejection charge are effectively prevented from escaping around the rocket and their entire energy is used in the propulsion thereof.

The delay train 30 is so timed that the expulsion charge 7 will be fired when the rocket is at the highest point of its trajectory and the expansion of the gases produced thereby will rupture the disc 24, ignite the fuses 28, and expel the pyrotechnic unit from the cylinder 20, the closure 31 being blown out and thus leaving the parachute 22 free to open and support the flare resulting from the burning of charge 23.

In some cases it is desirable to provide means steadying the flight of the rocket and such means is shown in Figs. 2 and 3. Instead of the closure 31, I may substitute a cup 32 having tethered to it and spirally wound in it a tape 33 which is retained, until the rocket is fired, by a paper member 34 which is attached to the outer end of tape 33. When the rocket is fired the "set back" ruptures the paper 34 and thereafter when the

rocket turns end for end in flight as it will do since the base 5 and parts associated therewith make that end of the device the heavier, the paper 34 and the tape attached thereto will be caught by air currents and the tape caused to unwind and stream behind the rocket so it acts as a vane to steady the flight of the rocket.

Copperizing of the barrel from which the rocket is fired, due to friction of the obturating cup against the barrel, may be prevented by coating the outer surface of cup 14 with powdered graphite mixed with clear, thin lacquer and dried thereon. However, any other suitable friction reducing agent may be used instead of that suggested.

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 pyrotechnic device, comprising a base having a hollow spindle extending therefrom and a cavity in communication with the bore of said spindle, an ejection charge container having a lateral wall and a base with the free edge of said wall secured to the first mentioned base substantially enclosing said spindle, said container having vent holes through its lateral wall and also through its base, and an aperture in its base through which said spindle extends, there being vents in said spindle in communication with said bore and said container, said container having a circumferential channel intersecting the said vent holes through its lateral wall, an obturating cup of thin, soft metal enclosing said container and having its edge overturned and clamped between said container and said base, said cup being radially expansible substantially throughout its length to provide a large area sealing contact with a barrel through which the device is being fired, said cup being perforated in registry with the vent holes through the base of the container, a rupturable sealing disc disposed against the base of said obturating cup, a nut screwed on said spindle against said disc and having vent holes aligned with the vent holes in the base of said container, a primer seated in the outer end of the bore in said spindle, a combustible disc over the said cavity in said base, a felt annulus disposed over the last mentioned disc, a pyrotechnic unit seated on said annulus, a metal cylinder enclosing said unit and having an edge clamped between said container and said base, a frictionally retained closure for the outer end of said cylinder, an ejection charge in said container, an expulsion charge in said cavity in said base, and a delay train in the bore of said spindle in contact with said expulsion charge.

2. In a pyrotechnic device, comprising a base having a hollow spindle extending therefrom and a cavity in communication with the bore of said spindle, an ejection charge container having a lateral wall and a base with the free edge of said wall secured to the first mentioned base substantially enclosing said spindle, said container having vent holes through its lateral wall and also through its base, and an aperture in its base through which said spindle extends, there being vents in said spindle in communication with said bore and said container, said container having a circumferential channel intersecting the said vent holes through its lateral wall, an obturating cup of thin, soft metal enclosing said container and having its edge overturned and clamped between said container and said base, said cup being perforated in registry with the vent holes through the base of the container, said cup being radially expansible substantially throughout its length to provide a large area sealing contact with a barrel through which the device is being fired a rupturable sealing disc disposed against the base of said obturating cup, a nut screwed on said spindle against said disc and having vent holes aligned with the vent holes in the base of said container, a primer seated in the outer end of the bore in said spindle, a combustible disc over the said cavity in said base, a felt annulus disposed over the last mentioned disc, means for operatively retaining a pyrotechnic unit seated against said annulus, an ejection charge in said container, an expulsion charge in said cavity in said base, and a delay train in the bore in said spindle.

3. In a pyrotechnic device, comprising a base having a cavity in one face thereof, an expulsion charge therein, means to retain an ejection charge in operative association with said base, said means being provided with vents to permit escape of gases, resulting from the burning of said ejection charge, parallel to the axis of said device and also transversely thereto, a member disposed around said means to be substantially uniformly radially expanded by the said gases escaping transversely to said axis, a rupturable member closing the said vents parallel to said axis, a delay train to fire said expulsion charge, means to ignite said delay train and said ejection charge, a pyrotechnic unit seated over said expulsion charge, and means to retain said unit so positioned until expelled by said expulsion charge.

4. A pyrotechnic device, comprising means to contain a pyrotechnic unit to be readily separable therefrom, a pyrotechnic unit therein, an explosive charge to expel said unit from said means, an ejection charge associated therewith to propel said device from a suitable barrel, means to direct a portion of the energy of said ejection charge to propel said device, and obturating means fixed at both ends and enclosing said ejection charge to be substantially uniformly radially expanded by the explosion of said ejection charge to prevent escape of the said propulsive energy around said device.

5. In a pyrotechnic device, comprising a base member, an ejection charge associated therewith, a container engaged with said base and enclosing said charge, said container having in it vents extending parallel to the axis of said device and other vents extending transversely to said axis, and a circumferential channel intersecting said transversely extending vents, a cup of thin, soft metal enclosing said container and secured thereon, said cup being perforated in registry with the said vents parallel to said axis, a rupturable member disposed to close said parallel vents, and means to retain said rupturable member in operative position.

6. In a pyrotechnic device, comprising a base member, an injection charge associated therewith, a container engaged with said base and enclosing said charge, said container having in it vents extending parallel to the axis of said device and other vents extending transversely to said axis, and a circumferential channel intersecting said transversely extending vents, a cup of thin, soft metal enclosing said container and secured thereon, said cup being perforated in registry with the said vents parallel to said axis, a ruptur-

able member disposed to close said parallel vents, means to retain said rupturable member in operative position, and a coating of dry lubricant on the exterior of said cup.

7. A pyrotechnic device, comprising a base member, an ejection charge associated therewith, a container engaged with said base and enclosing said charge, said container being adapted to direct a portion of the gases of combustion of said charge rearwardly of said device and a portion of said gases tranversely of said device, and elongated obturating means substantially coextensive with said container disposed to be acted upon by said transversely directed gases to be substantially uniformly radially expanded by said gases and prevent escape of the said rearwardly directed portion around said device.

8. A pyrotechnic device to be fired from a directing means, comprising means to contain a pyrotechnic unit to be readily separable therefrom, a pyrotechnic unit therein, a relatively heavy base and associated parts to contain explosive material secured to one end of said means, a cup-shaped member in the other end of said second mentioned means, a helically wound tape in said member and attached at one end to said member, and a closure over said member attached to the other end of said tape, said closure being adapted to be ruptured by the "set-back" when said device is fired from said directing means.

MAX W. FISCHER.