April 27, 1948. L. A. SKINNER 2,440,305

ROCKET PROJECTILE

Filed Jan. 20, 1942

Fig. 1.

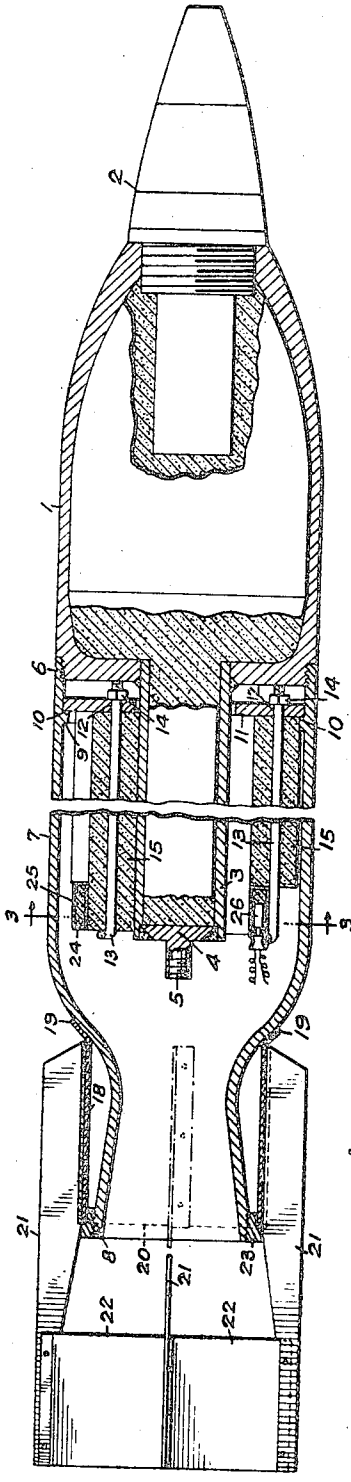


Fig. 4.

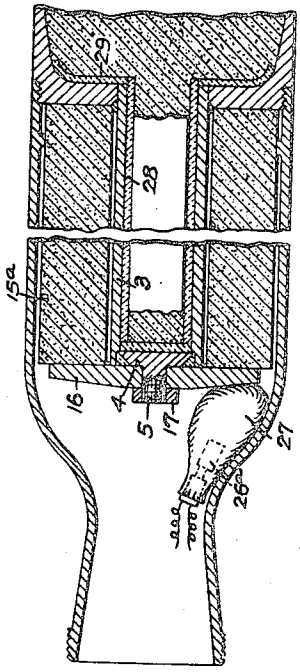


Fig. 2.

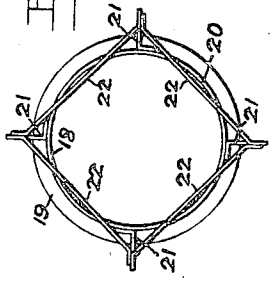
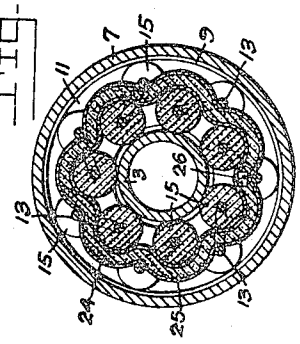


Fig. 3.



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Patented Apr. 27, 1948

2,440,305

UNITED STATES PATENT OFFICE

2,440,305

ROCKET PROJECTILE

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Application January 20, 1942, Serial No. 427,430

4 Claims. (Cl. 102—49)

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

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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.

This invention relates to a rocket projectile.

In the employment of explosive projectiles it is well known that the effectiveness of the burst is directly dependent on the size of the explosive charge carried. However, because of the severe recoil stresses involved, the firing of projectiles of conventional form of a size sufficient to have a highly effective bursting radius has been limited to artillery type weapons firing from relatively stable platforms.

It is therefore the primary object of this invention to produce an explosive projectile of great effectiveness which may be fired from a tube or discharger of light weight and without the production of severe recoil stresses which would bar its employment on aircraft and similar light structures.

It is a further object to produce a complete round of ammunition which may be discharged from the tube as a unit and which will, on the explosion of the bursting charge, be completely disrupted into destructively effective fragments.

It is an additional object to produce a rocket projectile which can be economically and conveniently manufactured and which does not require the services of skilled loading personnel to achieve uniformity in firing characteristics.

The exact nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing in which:

Fig. 1 is a longitudinal sectional view of a projectile according to my invention.

Fig. 2 is an end elevational view of the fin assembly.

Fig. 3 is a cross sectional view through the propelling charge chamber taken on the line 3—3 of Fig. 1.

Fig. 4 is a partial view similar to Fig. 1 showing a modification.

Referring to the drawing by characters of reference, there is shown in Fig. 1 a projectile comprising a bursting charge chamber 1 having an ogival forward portion and provided at the forward extremity of said ogival portion with threads for the reception of a detonating fuse 2 of any convenient type. A tubular portion 3 is secured in an axial opening in the rear part of the bursting charge chamber in a gas tight manner and extends axially rearward therefrom being closed at its rearward extremity by a plug 4 welded or otherwise secured therein and provided with a threaded rearward extension 5. A threaded portion 6 of somewhat reduced diameter may be provided on the rear portion of the bursting charge chamber 1. The propelling charge chamber may comprise a substantially cylindrical tubular motor body 7 engaging the threaded portion 6 on the chamber 1 and extending rearwardly therefrom. The rear portion of the tubular body is preferably constricted and then gradually flared to form a discharge nozzle 8 the rear end of which is externally threaded. A band 9 of greater thickness is provided near the front end of the tubular body 7 and provides an internal forwardly facing shoulder 10 against which a charge anchor plate 11 may be engaged. The anchor plate is formed with a central aperture through which the charge tube 3 may pass and is provided with a plurality of spaced holes 12 through which U bolts 13 may be inserted and secured by nuts 14. Propelling charge units 15, preferably comprising axially perforated, molded units of charge composition, are retained in the body by means of the U bolts 13 which are inserted through the central perforations before being secured to the anchor plate.

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In the modification shown in Fig. 4 the propelling unit charge comprises a single molded unit 15a of charge composition. The unit 15a is slipped over the tubular extension of the bursting charge chamber and retained thereon by a retaining plate 16 which is secured on the threaded extension 5 of the plug 4 by a nut 17. In this way the charge unit will be securely supported during handling and will not be displaced or broken up by the forces of inertia during firing.

Driving charges of either of the types described above may be formed by machine to exact specifications both as to dimensions and composition. Such charges can be loaded by assembly line methods without loss of uniformity in burning characteristics. The high degree of uniformity which may be achieved in this way should be contrasted to that which results from conventional practice in loading rockets in which even a fair degree of uniformity was only arrived at by the exercise of skilled craftsmanship in the loading and packing of the composition. Other and somewhat similar methods of loading which may be used in this projectile are described in detail in my copending application, Serial No. 411,512.

The guide fins are preferably formed as a separate assembly shown in place on the body in

Fig. 1 and shown separately in end elevation in Fig. 2. In its preferred form the fin assembly comprises a tubular member 18 having an end 19 flared to fit the shouldered portion of the body and having the other or rear end 20 faced square with the center line. A plurality of fins 21 are secured to the tubular member by spot welding or other convenient means in such a position that their minor dimensions form equally spaced radial lines while their major dimensions extend longitudinally of and behind the tubular member in parallelism with the axis thereof. The rear end of each fin is provided with a portion 22 which is offset at an angle to the minor dimension of the fin and secured by spot welding or other fastening means to the radial part of an adjacent fin as best shown in Fig. 3, the offset portions being thus secured in planes parallel to the axis of the tubular member and serving to tie the fins together in a rigid structure. The fin assembly may be slipped over the discharge nozzle 8 and the nut 23 drawn up in contact with the rear end of the tubular member to secure the tubular member on the discharge tube with its flared portion in contact with the shouldered portion of the tubular body and in coaxial relation with the projectile as a whole. It will be obvious that a fin assembly of this character will not interfere with the free flow of gases from the discharge tube, and will furnish accurate and complete stabilization of the projectile in flight. Obviously similar fins could be welded directly to the body of the propelling charge chamber.

It is contemplated that the rocket will be fired from a tube or discharger either by an auxiliary propelling charge intended to give an initial acceleration or by the reaction of the rocket charge alone. In either case the launching tube may be of light weight and may be supported without provision for recoiling movement. Various means may be employed to ignite the propelling charge including the ignition devices disclosed in my prior Patent No. 1,994,490 or in my copending application, Serial No. 410,040 intended for use with auxiliary propelling charges. In Fig. 1 the charge units in the outer row are terminated short of the rear end of the U bolts and an elongated flat bag 24 containing black or other easily ignited priming powder 25 is interlaced through the U bolts as best seen in Fig. 3. An electric ignition squib 26 may be received within the powder bag. In Fig. 4 is shown an alternative method of using an electric squib in which the squib 26a is inserted in a bag 27 containing black powder and housed in the rear end of the tubular rocket body. It is obvious that a fuse of the type commonly used in commercial rockets may be used to ignite the propelling charge.

Upon ignition of the propellent charge, the gases generated thereby will be expelled from the discharge nozzle at the rear of the body substantially at the same rate as generated, so that no material pressure in excess of that required for such rate is developed and by reaction will propel the projectile through the air, the guide fins serving to direct the flight and stabilize the projectile. During the time that the projectile is being accelerated the forces of inertia will act upon the charge units tending to hold them in space and break them from their anchorage. However, as the charge units are engaged by the U bolts or the retaining plate the forces of inertia, or setback, will be unable to tear the charge free and there will be no possibility that broken portions of the charge may obstruct the discharge nozzle and cause erratic performance or possible premature bursting of the body of the projectile. As the projectile approaches or strikes its target the fuse 2 which may be of any desired type will function to detonate the bursting charge contained in the nose of the projectile and that contained in the tubular extension of the nose housed within the propelling charge chamber. The explosion of this latter unit of the bursting charge will cause fragmentation of the body of the propelling charge chamber with a highly destructive effect.

In the employment of projectiles of this type of small and medium caliber the time of flight is so short that no means other than the tube 3 and base of the head chamber 1 need be provided to protect the bursting charge from the heat generated by the propelling charge. In larger projectiles of this type, however, it may be necessary to provide heat insulating means in the form of a sleeve 28 of insulating material in the tubular extension 3 and an annular disk 29 of similar material on the rear inner face of the nose section 1 as shown in Fig. 4 and serving to protect the detonating charge from the heat generated by the burning of the propelling charge.

It is evident that the size of the venturi nozzle will prevent the development of high pressure such as would be manifest by propellants used in mortars or guns to fire projectiles or rockets, and that a relatively slow burning of the propellant 15 is involved, just sufficient to exert the sustained propulsion of a rocket at the rate of acceleration required by the nature of the launching described.

The screw assembly of the tube 7 and chamber body 1 makes it practicable to separate the two readily, draw out the cage work and remove or add parts to the segmented propellant, to adapt the performance to different climatic temperatures, which is a practice in use with these rockets.

I claim:

1. A rocket projectile comprising a tubular body having a discharge nozzle on its rear end, a main chamber body carried by the forward end of said tubular body, a tubular extension of said chamber body contained within said tubular body, a bursting charge in said charge chamber body and extension thereof, a propelling charge in said tubular body and surrounding said tubular extension, said propelling charge comprising a plurality of axially perforated propellant cylindrical members disposed parallel to the axis of said tubular body, a supporting wire for each cylindrical member through the perforation thereof, each said wire being fixed at the forward end relative to the rocket structure, the other end of each wire being deformed to constitute the sole rear support for the propellant cylinder carried thereby.

2. A projectile comprising a seamless tubular body, said body being necked in near its rear end and flared outwardly from the portion of least diameter to provide a discharge nozzle, stabilizing fins secured on said discharge nozzle, an ogival second body constituting a bursting charge chamber carried by and located forwardly of the forward end of said tubular body, a tubular extension of said bursting charge chamber extending axially rearward into said tubular body, a bursting charge in said bursting charge chamber and tubular extension thereof, a propelling charge surrounding said tubular extension within said tubular body, and supporting means for the propelling charge, said propelling charge comprising molded stick units of driving charge compositio

having perforations therethrough, said supporting means comprising an anchor plate engaged by one of said two bodies, a bolt extending through each said perforation and through said anchor plate, and fastening means for each bolt to releasably and independently fasten each said stick to said anchor plate.

3. A projectile comprising a body with a plurality of units of charge composition, U bolts supporting said units from the body, and an elongated bag of priming composition interlaced between said units and said U bolts for igniting said charge units.

4. A projectile comprising a tubular body, a driving charge comprising units of charge composition having perforations therethrough, bolts engaging said tubular body and extending through said perforations, an elongated bag of priming composition interlaced between said

units and said bolts, and igniting means for said priming composition.

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