Dec. 21, 1954 W. P. SPAULDING 2,697,325

POWDER IGNITER

Filed July 24, 1944

Fig. 1.

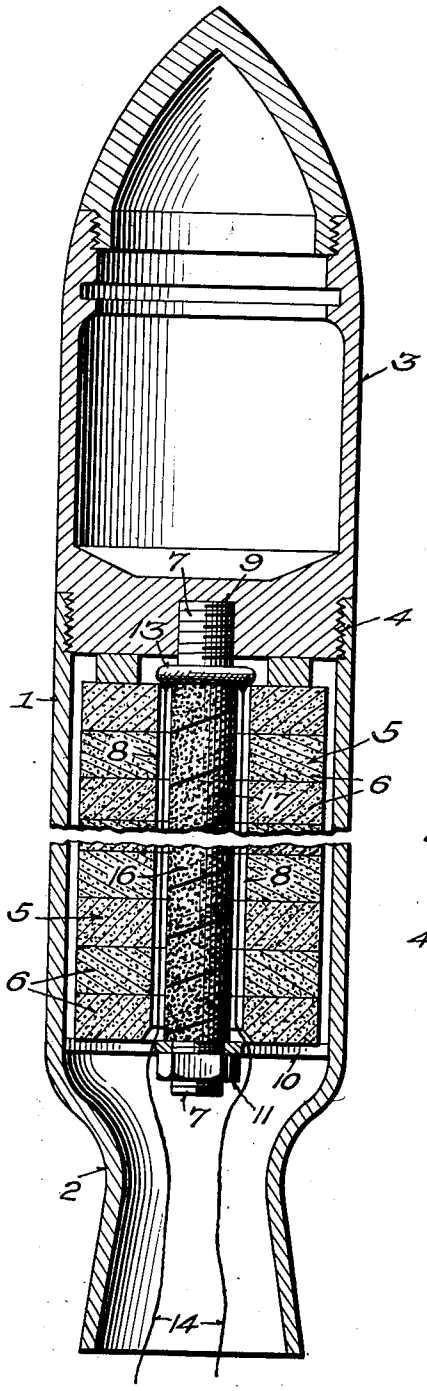


Fig. 2.

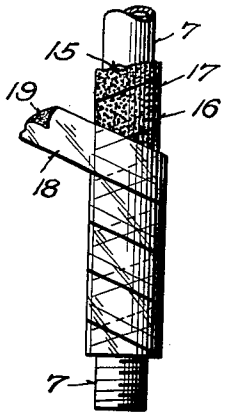


Fig. 3.

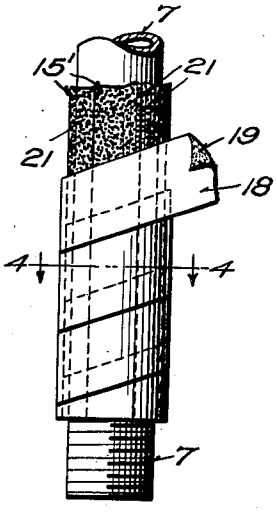
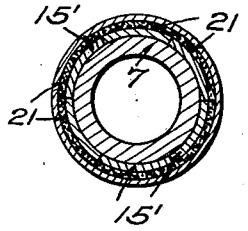


Fig. 4.



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POWDER IGNITER

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8 Claims. (Cl. 60—35.6)

This invention relates to an igniter for igniting the propulsion charge of a rocket projectile.

Prior art igniters utilized to ignite a rocket propulsion charge comprising a stack of disks or washers of powder strung on a rod and axially supported within a rocket motor of a rocket projectile have not been very satisfactory. This was due primarily to the inability of such igniters to obtain uniform ignition. It is appreciated that in this type of propellent assembly it is extremely difficult to obtain uniform ignition, and particularly simultaneous ignition, of the entire area of the contiguous surfaces of the disks. One form of prior art igniter utilized a plurality of muslin bags containing black powder which were electrically fired by a squib. Such bags extended longitudinally of the chamber and were positioned around the outer periphery of the propellent assembly. Obviously to obtain complete ignition of the propellent laminations a sizable quantity of black powder had to be used, resulting in relatively high ignition pressures with consequent damage to the propellent charge. Further, uniform ignition could not be consistently attained because the direction of flow of the hot gases liberated by the black powder is generally axially of the combustion chamber thus minimizing the propagation of the flash radially between the disks.

Accordingly, it is an object of this invention to provide an igniter for a powder charge to uniformly and simultaneously ignite the entire charge.

A particular object of this invention is to provide an igniter to uniformly and simultaneously ignite a rocket propulsion charge comprising a laminated stack of disks or washers of propellent powder.

The specific 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 rocket projectile embodying this invention.

Fig. 2 is a detailed view showing the construction of one form of igniter.

Fig. 3 is a view similar to Fig. 2 showing an alternate type of construction utilizing longitudinal strips of combustible material.

Fig. 4 is a cross sectional view taken along the plane 4—4 of Fig. 3.

While it will be apparent to those skilled in the art that this invention has application generally in all types of rockets, it is particularly well adapted for use in rockets employing laminated propellents and is so disclosed.

Referring to the drawing wherein like characters refer to similar parts there is shown a rocket projectile embodying this invention. A cylindrical motor chamber **1**, one end of which terminates in a nozzle **2** of well known Venturi construction, is provided to house the elements of the projectile. An ogival head **3** is secured to the forward end of rocket motor **1** as by threads **4**, and contains the "pay load" which may consist of a high explosive, a chemical grenade or the like. A propellent charge **5** comprising a plurality of disks or washers **6** of suitable propellent material is axially mounted within rocket motor **1** by a tube **7**, threaded at each end, which is passed thru the single axial perforation **8** in each of the disk-like powder grains **6**. Tube **7** is screwed into an axial threaded hole **9** provided in the base of head **3**. The stack of individual powder grains or disks **6** strung on the tube **7** are preferably retained on such tube by a

washer **10** and a nut **11** screwed onto the free end of tube **7**.

The laminar or contiguous surfaces of each disk or washer **6** of propellent material are more or less screened from any type of igniter. However, it is apparent that an ignition system located within the center of the charge would be best adapted to effect ignition of such charge.

An igniter embodying the features set forth above is shown in Fig. 1. Such an igniter is formed by wrapping tube **7** spirally with a layer of combustible tape **15** such for example as paper or cellophane, which has a coating of adhesive material **16** applied to the surface facing outwardly with respect to the surface of the tube **7**. Each successive turn of the tape is preferably arranged to overlap somewhat and thus secures itself in the spiral form. Tube **7** with its adhesive surface **16** is then immersed in a container (not shown) of finely granulated black powder **17**. The powder grains **17** adhere to the adhesive outer surface of the tape and provide a complete coating of the powder about tube **7**.

To assemble the tube **7** in the rocket motor **1**, the propellent disks **6** are carefully strung on tube **7**. An electrical squib **13** preferably shaped in the form of a ring is suitably secured to the forward end of tube **7** and is arranged to be fired by the lead wires **14**. Upon ignition of squib **13** the black powder coating **17** is ignited which acts as a quick match to substantially simultaneously and uniformly ignite the contiguous surfaces of the powder disks.

As illustrated in Fig. 2, a second wrapping of combustible tape **18** may be applied over the black powder coated first wrapping with the adhesive surface **19** inwardly disposed. Such a construction obviates the possibility of rubbing off any of the adhering powder grains during assembly in the projectile. A further modification in the construction of the igniter, illustrated in Fig. 3, comprises suitably securing longitudinal strips **15'** of combustible material to tube **7** having affixed thereon a layer **21** of igniter mixture secured by a suitable adhesive. Such longitudinal strips **15'** may also be wrapped with an exterior layer of combustible tape **18** as described above.

Thus it is readily apparent that an improved igniter for simultaneous and uniform ignition of a propellent charge for a rocket is hereby provided. As only a comparatively small igniter charge is utilized no high ignition pressures are built up within the rocket motor and hence damage to the propellent assembly is avoided.

I claim:

1. In combination, a powder charge having an axial recess, a tubular member extending thru said recess, a tape wrapped around said member, an adhesive coating on the exterior of said tape and a plurality of powder granulations secured to said adhesive coating.

2. An igniter for a powder charge comprising a tubular element, a tape having an adhesive coating on at least one side, said tape being spirally wrapped on said tubular element in overlapping relation with said adhesive coating on the exterior, thereby securing said tape in its spiralled shape, and a plurality of powder granulations secured to said adhesive coating.

3. An igniter as in claim 2 and a second combustible tape having an adhesive coating on one side thereof spirally wrapped over said powder granulations with its said adhesive coating on the inside.

4. An igniter for a powder charge comprising a tubular element, a plurality of strips of tape secured to the surface of said tubular element, a coating of adhesive on the exposed surface of said strips of tape and a plurality of powder granulations secured to said adhesive coating.

5. In a rocket motor, a propellent charge comprising a stack of powder washers, a support rod passing axially thru said stack of powder washers to thereby support said stack within the motor, a tape wrapped around said support rod and lying intermediate said rod and said powder washers, a coating of an igniter composition on the exterior of said tape and an electric squib supported on said rod and arranged to ignite said igniter composition.

6. In a rocket motor, a propellent charge comprising a stack of powder washers, a support rod passing axially

thru said stack of powder washers to thereby support said stack within the motor, a tape wrapped around said support rod and lying intermediate said rod and said powder washers, an adhesive coating on the exterior of said tape and a plurality of powder granulations secured to said adhesive coating and an electrical squib constructed in annular form and mounted on said support rod in position to ignite said powder granulations.

7. In a rocket motor, a propellent charge comprising a stack of axially perforated discs, a supporting member disposed axially of said propellent charge and a coating of igniter material applied to a surface of said supporting member which is adjacent said propellent charge.

8. The manufacture of an igniter for a laminated rocket propellent adapted to be supported by being strung on a central rod, comprising the steps of wrapping spirally on said rod a strip of tape having an adhesive surface, the adhesive surface being outward relative to the surface of said rod, overlapping the spiral wrappings of

adjacent turns of said tape so that said adjacent wrappings will be joined by said adhesive, and immersing the outer surface of said tape into a granulated igniter compound, whereby the granulations will adhere to said adhesive surface.

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