United States Patent

Nee

[15] 3,677,131

[45] July 18, 1972

[54] DISPOSABLE PROJECTILE LAUNCHER OF THE RECOILLESS TYPE

[72] Inventor: **Michael A. Nee**, Melrose, Mass.

[73] Assignee: **Norris Industries, Inc.**, Los Angeles, Calif.

[22] Filed: **Dec. 16, 1970**

[21] Appl. No.: **98,662**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 199, Jan. 2, 1970, abandoned.

[52] **U.S. Cl.** **89/1.703**, 89/1.706, 102/93, 244/3.28

[51] **Int. Cl.** **F41f 3/02**, F41f 15/00

[58] **Field of Search** 89/1, 1.7–1.706, 89/1.8–1.819; 244/3.28; 102/93

[56] **References Cited**

UNITED STATES PATENTS

3,122,059	2/1964	Choate et al.	89/1.813
3,376,784	4/1968	Abramson	89/1.703
3,380,340	4/1968	Bergman et al.	89/1.706
3,494,249	2/1970	Choate	89/1.8

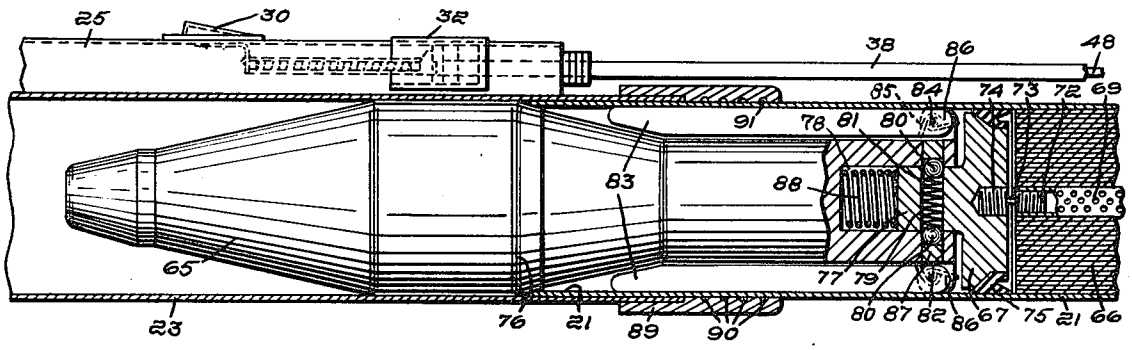
Primary Examiner—Samuel W. Engle

Attorney—Abbott Spear

[57] **ABSTRACT**

A disposable projectile launcher is disclosed in which a round of ammunition includes a tubular case section having a nozzle and enclosing a projectile and a propellant charge and slidably fitting within the rear end of a launcher section so that the two sections can have a shortened, inoperative relationship and an extended, operative relationship. Firing means are connected to the round and include a trigger carried by the launcher section and operable only in the operative relationship of the sections. A gas pressure retaining seal between the overlap of the sections in their operative relationship maintains internal pressures suitable for the efficient burning of the propellant. The projectile has a releasable connection with the case section at the nozzle end thereof.

33 Claims, 25 Drawing Figures



PATENTED JUL 18 1972

3,677,131

SHEET 1 OF 8

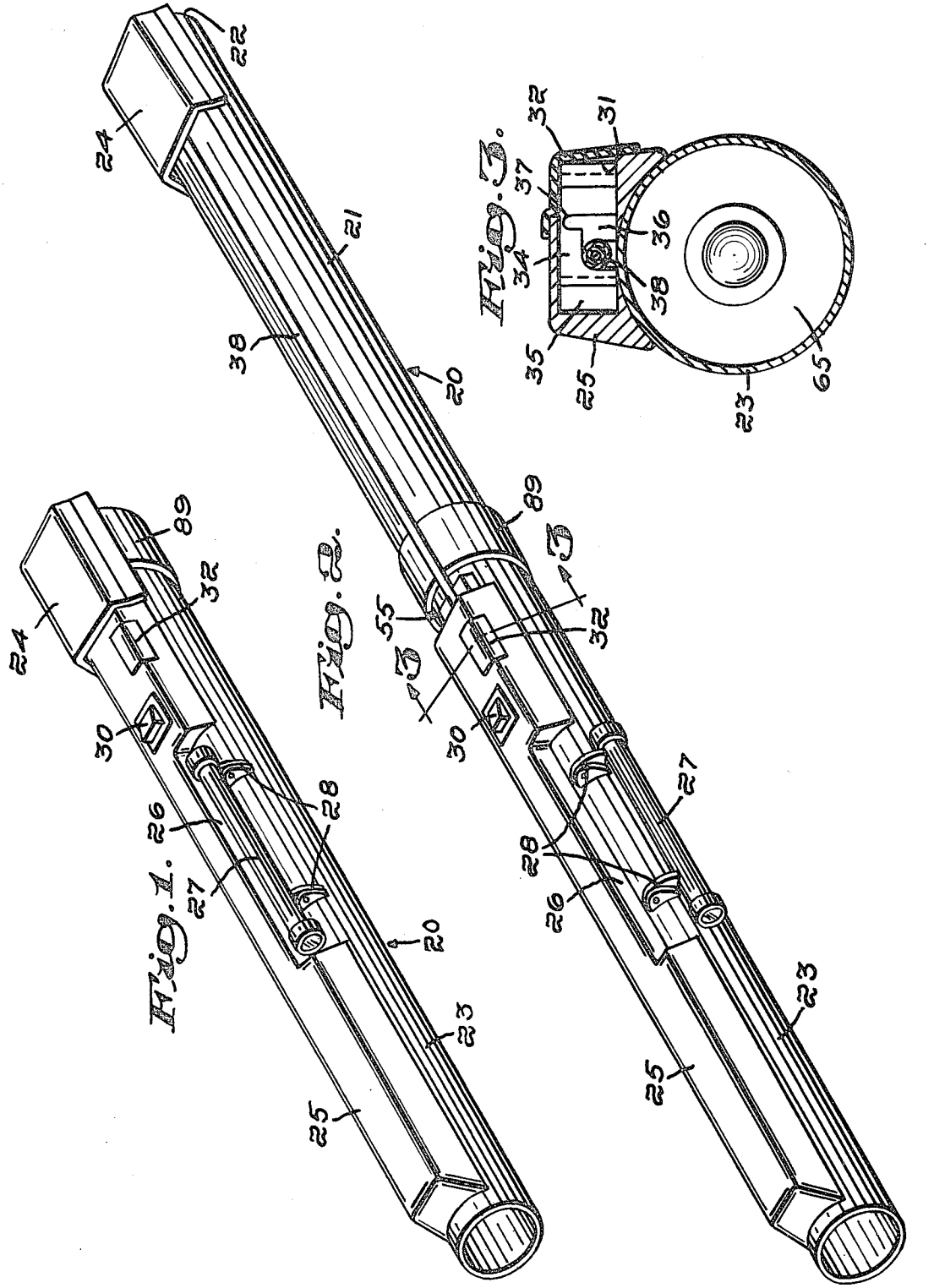


Fig. 1.

Fig. 2.

Fig. 3.

Inventor:
Michael A. Nee,
by Abbott Lowe,
Attorney

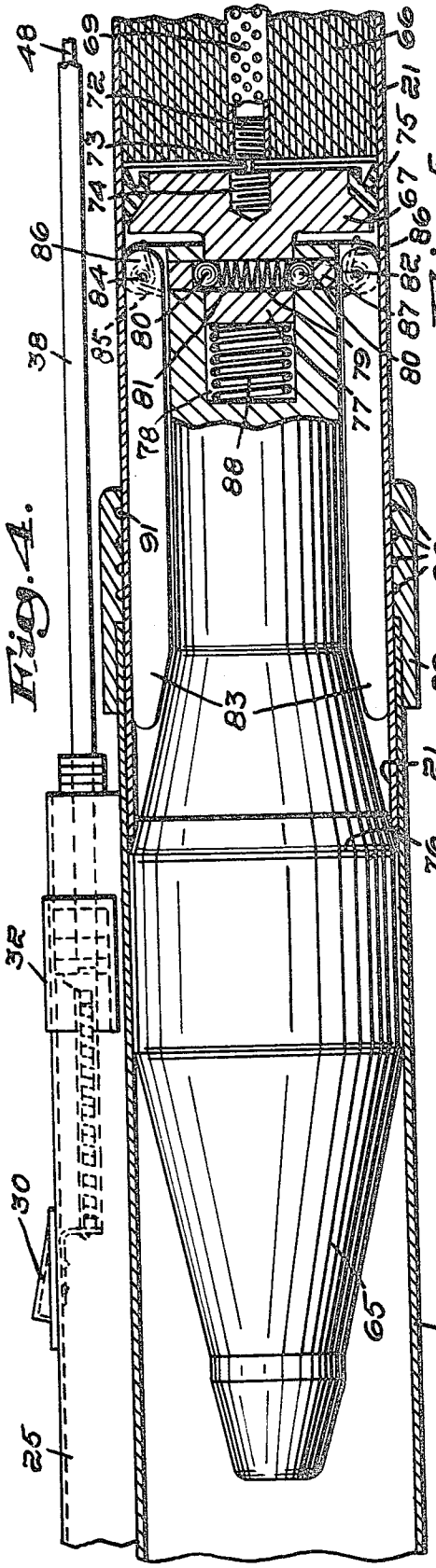


Fig. 4.

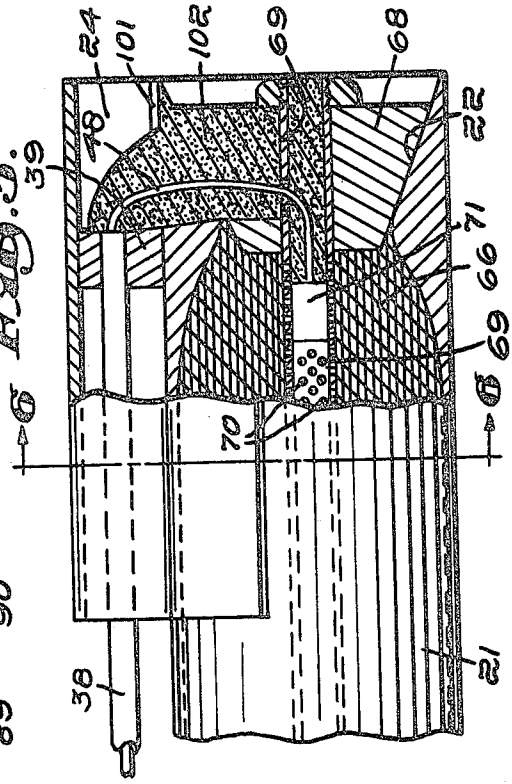


Fig. 5.

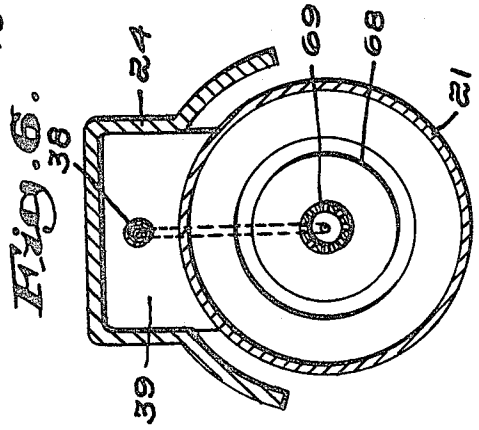


Fig. 6.

Inventor:
Michael A. Nee,
by Abbott Spear,
Attorney

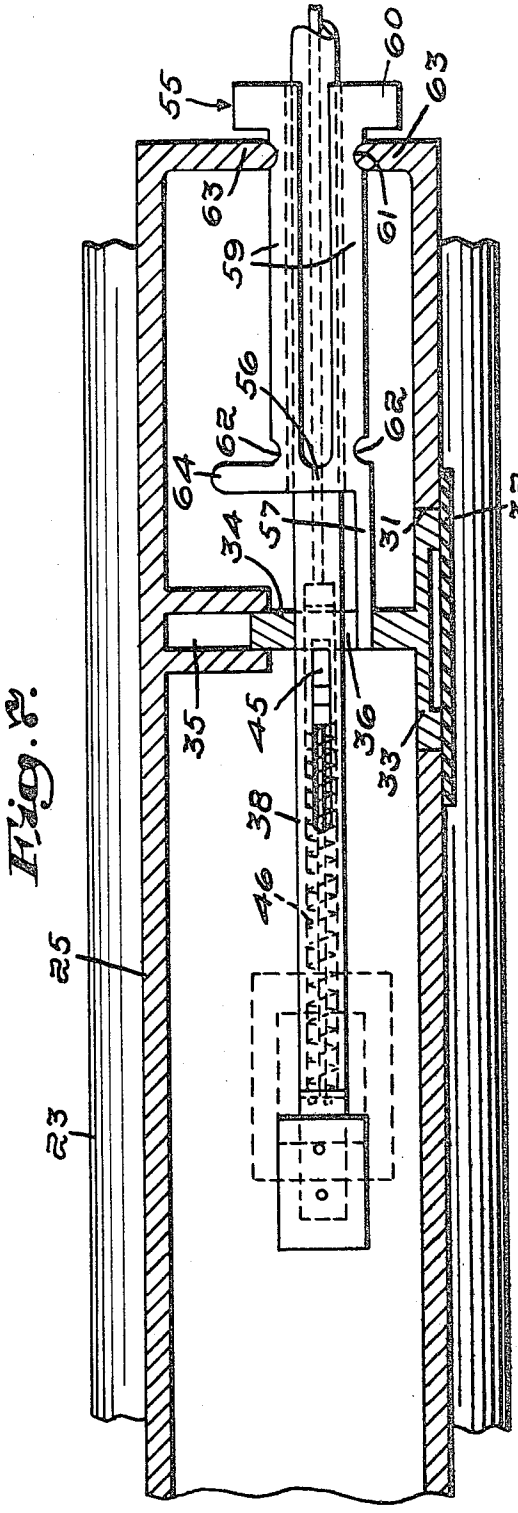


Fig. 7.

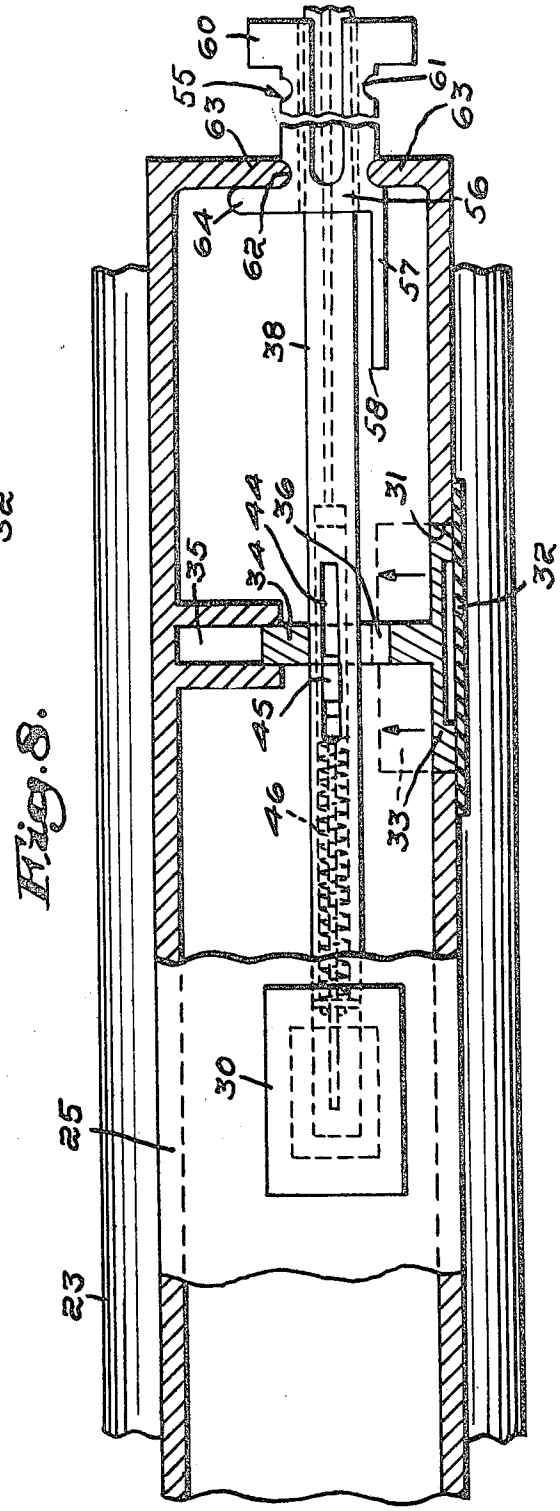


Fig. 8.

Inventor:
Michael A. Nee,
by Abbott Spear,
Attorney

Fig. 9.

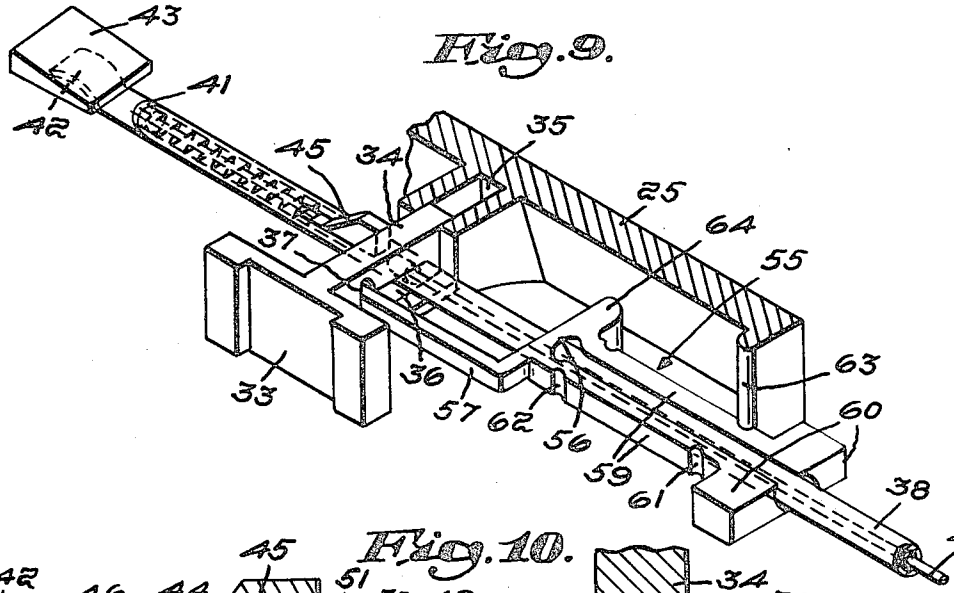


Fig. 10.

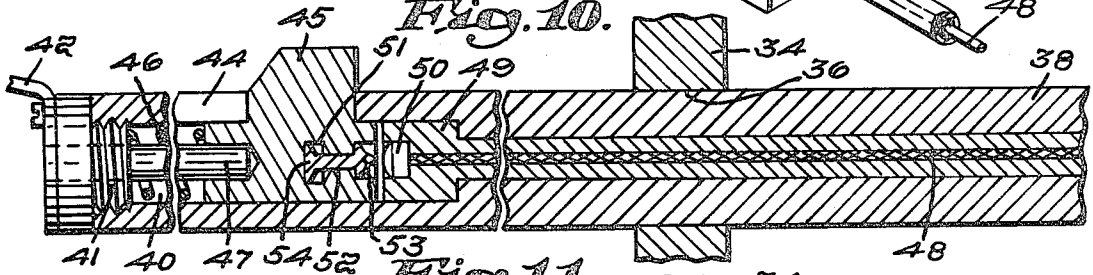


Fig. 11.

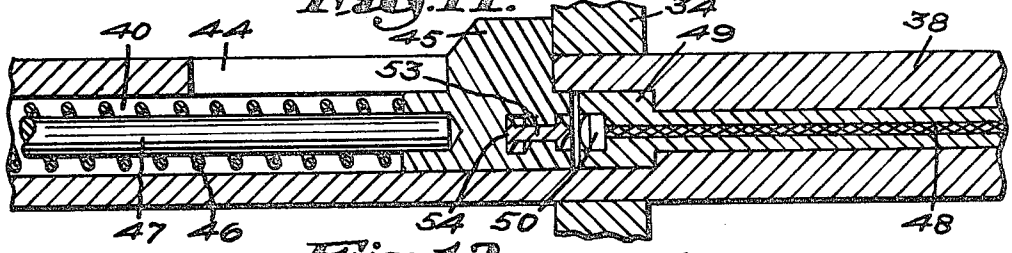


Fig. 12.

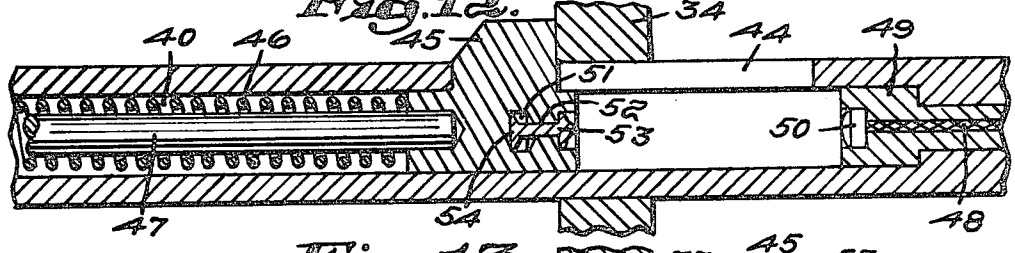
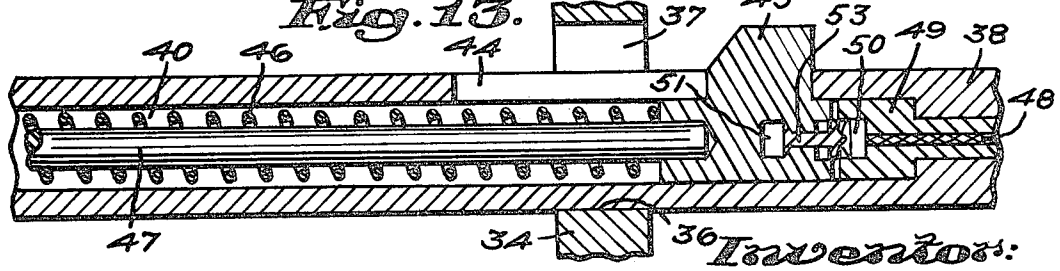


Fig. 13.



Inventor:
Michael A. Nee,
By Abbott Spear, Attorney

Fig. 14.

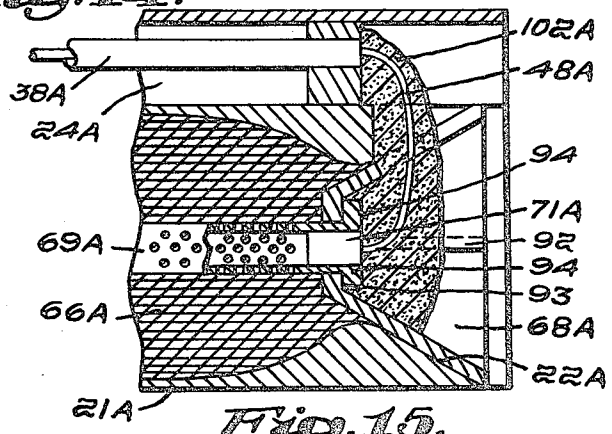


Fig. 15.

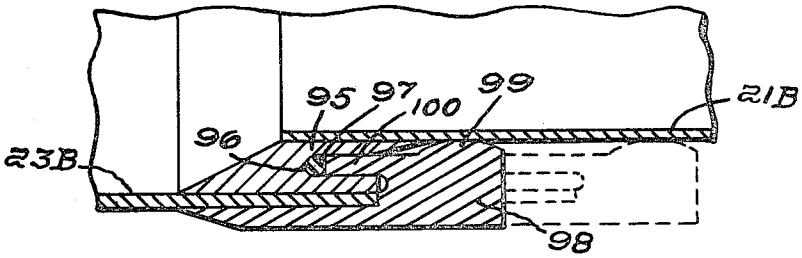


Fig. 16.

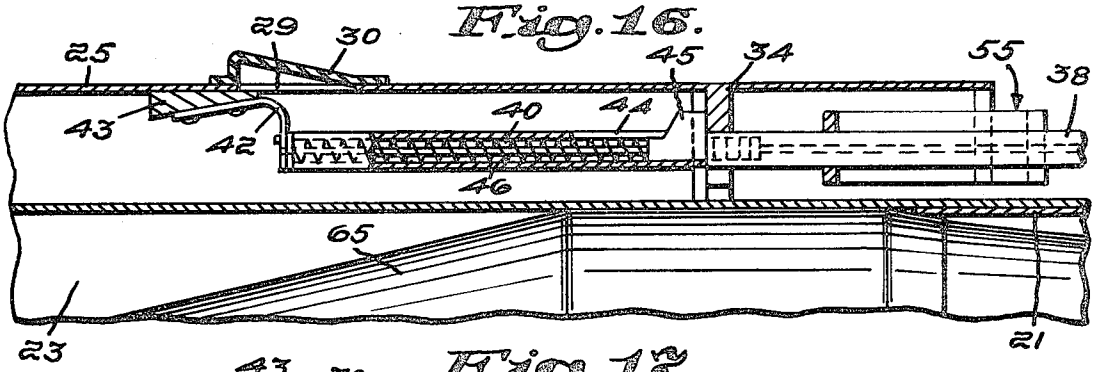
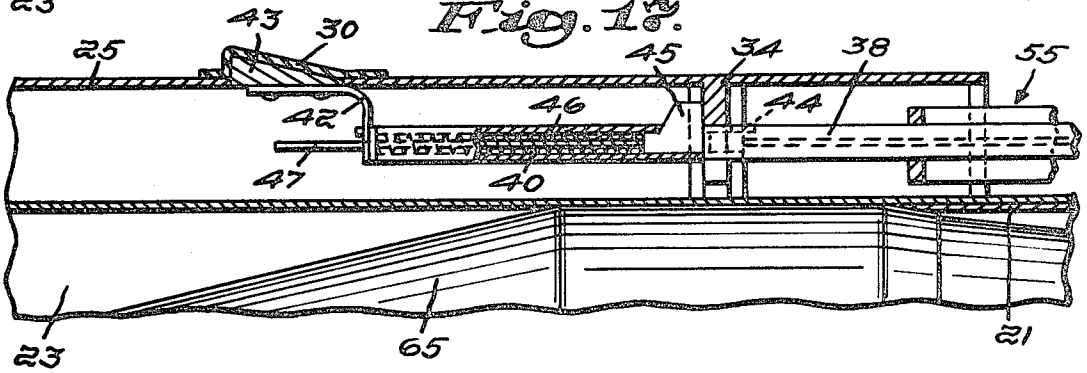


Fig. 17.



Inventor:
Michael A. Nee,
by Abbott Spear,
Attorney

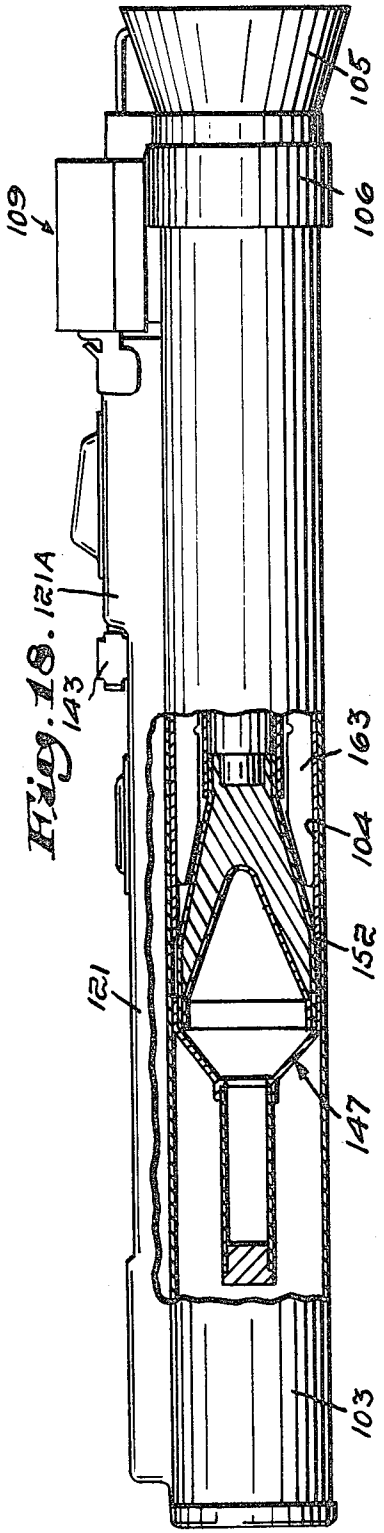


Fig. 18.

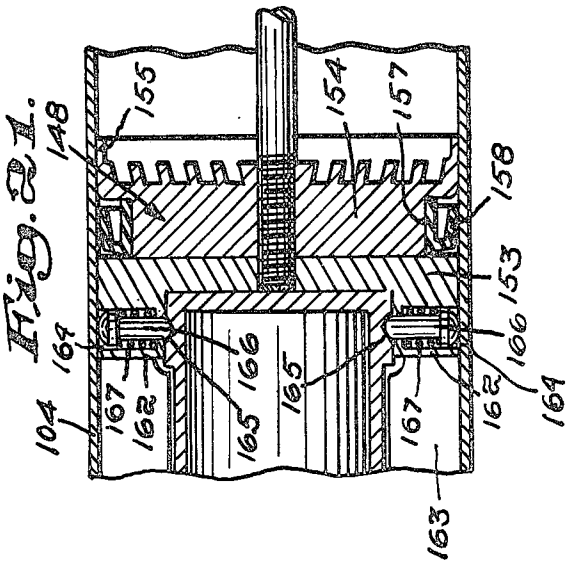


Fig. 21.

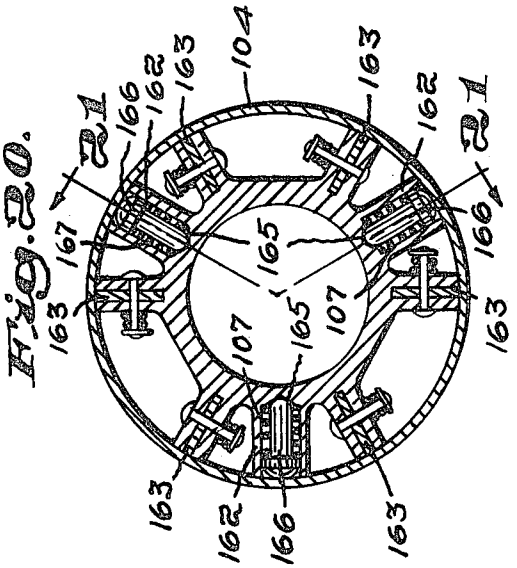


Fig. 20.

Inventor:
Michael A. Nee,
By Abbott Jones,
Attorney

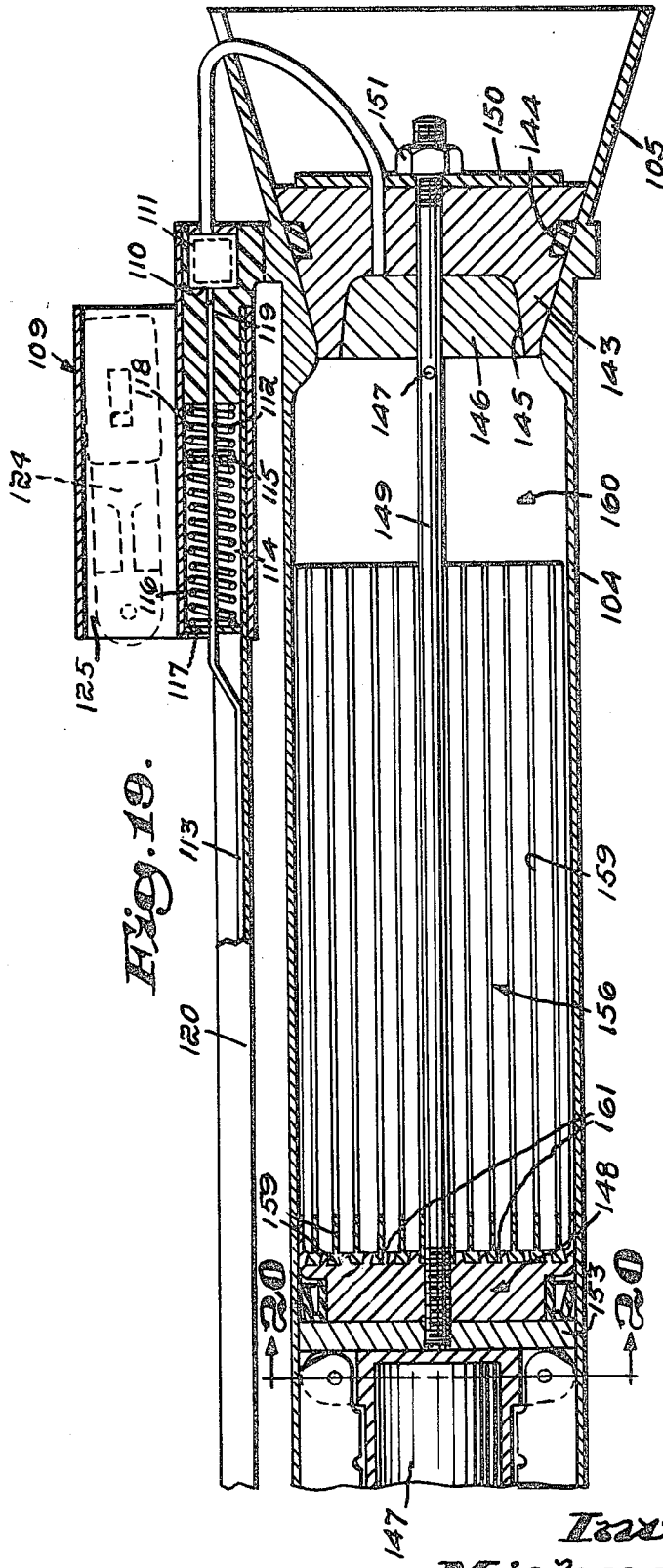
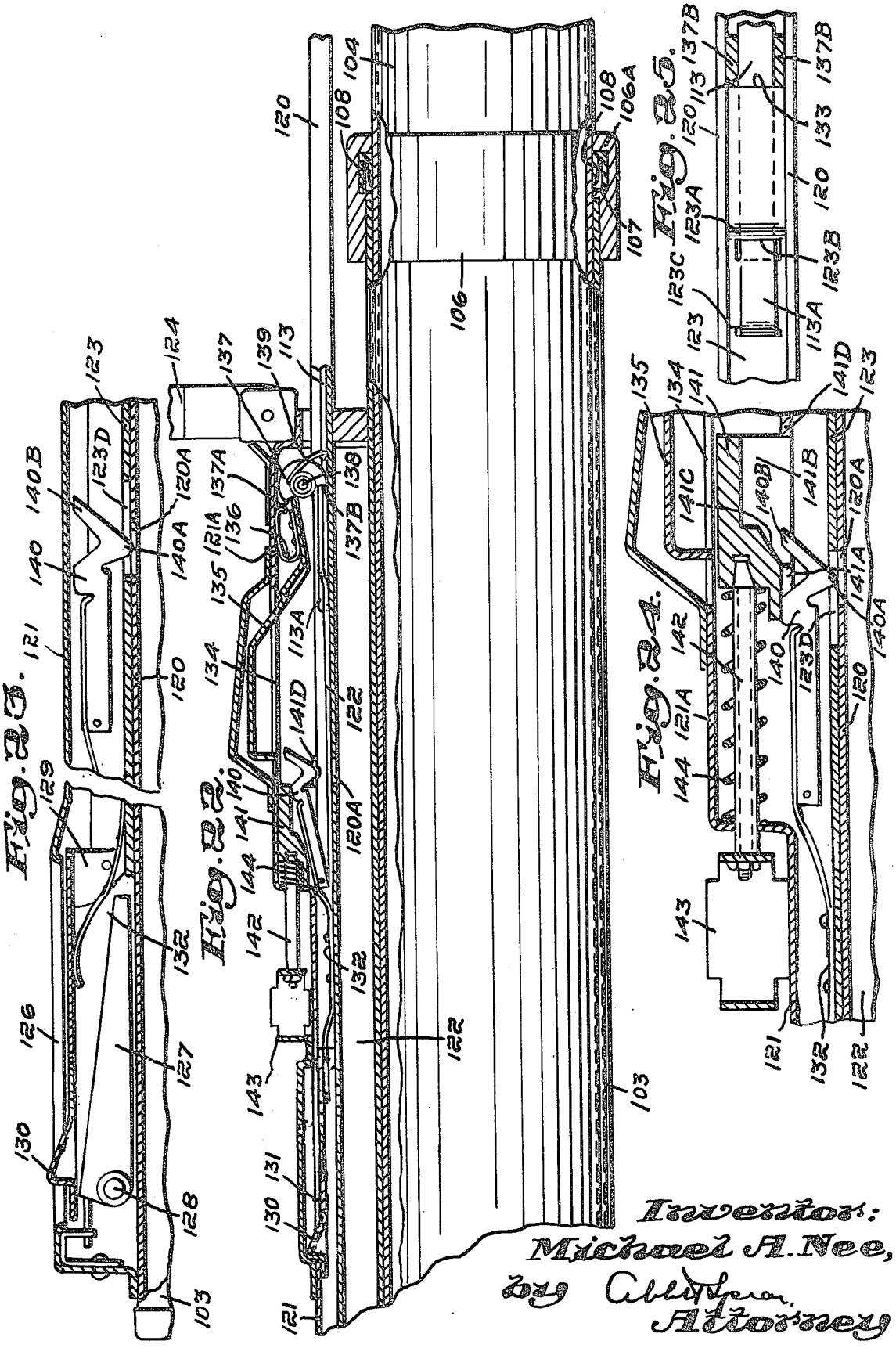


Fig. 19.

Inventor:
Michael A. Nee,
by Albritton, Attorney


Fig. 2A.
Fig. 2B.
Fig. 2C.
Fig. 2D.
Inventor:
Michael A. Nee,
by Abbott Jeran
Attorney

DISPOSABLE PROJECTILE LAUNCHER OF THE RECOILLESS TYPE

This application is a continuation-in-part of my co-pending application, Ser. No. 199, filed Jan. 2, 1970, now abandoned.

The present invention relates to projectile launchers, particularly to those functioning as a container for a round of ammunition and disposable after the discharge of the contained projectile.

Rocket launchers that are sufficiently light and compact to be carried and operated by one man have proved to be effective weapons. Such launchers have first and second tubular sections that are telescopingly connected, the smaller or second section being the breech end of the launcher and housing the rocket, the launcher being extensible from a shortened, inoperative relationship into an extended operative relationship. Launchers of this type are illustrated by U.S. Pat. No. 3,122,059, No. 3,200,708, No. 3,256,777, and No. 3,371,578.

Such launchers are lightweight and strong and are sufficiently inexpensive so that they may be discarded after the rocket carried therein has been launched. As demands grow for more powerful projectiles so do the problems of maintaining the launchers sufficiently light in weight and low in cost for disposable uses.

In U.S. Pat. No. 3,494,249, dated Feb. 10, 1970, owned by applicant's assignee, a weapon is disclosed consisting of a forward launcher section and a round of ammunition whose casing is sufficiently strong to withstand the pressure of its contained propellant charge when ignited. Means are provided to enable the forward part of the casing to be detachably attached to the breech of the launcher section, the attaching means also functioning to provide a gas-tight seal. This construction enables each casing section to serve as a discardable launcher section with the forward section being reusable with other like rounds of ammunition but has the disadvantageous feature of the types that are not self-contained, i.e., the weapon and its ammunition are separate.

The general objective of the present invention is to provide projectile launchers combining the advantages of launchers of the type disclosed in said patents with those of the type disclosed in U.S. Pat. No. 3,494,249, an objective attained by utilizing a round of ammunition having a case section encasing the projectile and the propellant charge and functioning as the inner, rearward section of a disposable extensible launcher, the launcher including a gas seal between the overlap of the sections in their extended relationship that is adapted to maintain pressures within the launcher suitable for efficient burning of the propellant. The projectile, which may be a rocket, is attached to the case section at the nozzle end thereof by means of a connection extending through the propellant charge and releasable in response to pressures attendant the burning of the charge.

Another objective of the invention is to provide a round of ammunition having a bulkhead between the projectile and the propellant charge with retaining means extending axially through the propellant charge and having a connection with the nozzle end of the case section and a connection with the projectile, one connection of a type that is released once the projectile is air borne. Preferably the retaining means is releasable with respect to its connection to the nozzle end of the case in order that it may serve as a stabilizer for the bulkhead for a substantial part of its flight to ensure its travel so as not to endanger friendly personnel in the immediate forward area. Preferably the retaining means includes a plug seated in the nozzle end of the case section.

Another objective of the invention is to provide an obturator between the projectile and the propellant charge with the obturator being effective with respect both to the case section and the launcher section, the diameter of which is greater than that of the case section, an objective attained by means of a cylindrical, rearwardly disposed, expansible bulkhead flange or skirt, an annular seal mounted on the periphery of the bulkhead and of V-shaped cross section with its outer wall of a cross sectional shape providing increased resistance as it is

forced outwardly to the larger diameter of the launcher section, and preferably by means of both the flange and the seal with the seal then functioning as a back-up for the expansible skirt.

Yet another objective of the invention is to provide firing means that comprise a tubular member with one end fixed on the nozzle end of the case section and the other end extending freely into a housing on the launcher section and there having an axial chamber in the rear of which there is a primer for the ignition of a firing line extending rearwardly through the tubular member and operatively connected to ignition means within the round. A sear is slidably confined in the chamber and is moved forwardly therein against the action of a firing spring by its engagement with a trigger portion during the short relative movement of the launcher sections from a partly extended relationship into their fully extended, operative relationship.

Another objective of the invention is to provide a round of ammunition having a connection between its projectile and bulkhead that is self-releasing once the projectile is free of the launcher section with one such connection being actuated by self-erecting projectile fins and another such connection having radial pins held by the case section in a position interconnecting the bulkhead and projectile but spring-ejected once the projectile is air borne.

A further objective of the invention is to provide trigger mechanism having a sear-engaging portion transversely movable into a sear-releasing position together with a safety operable to block such movement.

Another objective of the invention is to provide firing means that includes a rotatable sear between the trigger and the firing member.

In the accompanying drawings, there is shown embodiments of the invention illustrative of these and other of its objectives, novel features, and advantages.

In the drawings:

FIG. 1 is a perspective view of the launcher in its shortened, inoperative position;

FIG. 2 is a like view but with the launcher extended into its operative position;

FIG. 3 is a section, on an increase in scale, taken approximately along the indicated lines 3—3 of FIG. 2;

FIG. 4 is a fragmentary, longitudinal section showing the forward part of the round and the rear part of the launcher section with the two sections in their operative relationship;

FIG. 5 is a fragmentary, longitudinal section showing the rear part of the round;

FIG. 6 is a section taken approximately along the indicated lines 6—6 of FIG. 5;

FIG. 7 is a fragmentary top plan view of the launcher with the two sections so extended that only short further movement is required to bring them into their operative relationships, the housing being broken away to show the firing means;

FIG. 8 is a like view but with the launcher sections in their operative relationship and the safety released;

FIG. 9 is a fragmentary perspective view, on an increase in scale, of the parts of the firing means within the housing;

FIG. 10 is a fragmentary section, on a further increase in scale, taken longitudinally of the firing means in the position thereof illustrated by FIG. 7;

FIG. 11 is a like section but illustrating cocking of the firing means as the launcher sections are being further extended from their position illustrated by FIG. 7;

FIG. 12 is a like view illustrating the travel of the sear when released by the trigger;

FIG. 13 is a like view showing the firing pin driven in firing contact with the primer when the rearward travel of the sear is arrested;

FIG. 14 is a fragmentary longitudinal section illustrating a round of ammunition in accordance with another embodiment of the invention;

FIG. 15 is a fragmentary, longitudinal section illustrating a seal between the launcher sections illustrating yet another embodiment of the invention;

FIG. 16 is a fragmentary section taken lengthwise of the launcher showing the firing means and the latch, the launcher sections being in a position corresponding to that illustrated by FIG. 7;

FIG. 17 is a like view but with the launcher sections in the position illustrated by FIG. 8;

FIG. 18 is a partly sectioned side elevation of another embodiment of the invention;

FIG. 19 is a longitudinal section, on an increase in scale, of the case section;

FIG. 20 is a section taken approximately along the indicated lines 20—20 of FIG. 19;

FIG. 21 is a section taken approximately along the indicated lines 21—21 of FIG. 20;

FIG. 22 is a fragmentary and partly sectioned view of the launcher of FIG. 18 with the launcher extended for use and the safety in its "off" position;

FIG. 23 is a fragmentary and partly sectioned side view of the front part of the launcher section;

FIG. 24 is a fragmentary view taken lengthwise of the trigger chamber with the safety in its operative position; and

FIG. 25 is a fragmentary plan view of the joint between the firing member and its extension.

In accordance with the invention, a round of ammunition generally indicated at 20 is shown as having a tubular case section 21 provided with a nozzle 22 at its rear end. The case section 21 is telescopingly fitted within a tubular launcher section 23 with its nozzle 22 exposed at the rear end thereof in the shortened inoperative relationship of the launcher and provided with a hand grip 24, see FIG. 5, to facilitate the extension of the launcher to effect the operative relationship of its sections.

The launcher section 23 is shown as having a lengthwise housing 25 having a recess 26 in one side accommodating a telescopic sight 27 connected to the section 23 by a hinged mount 28 to enable it to be swung laterally from a protected, inoperative position into a position in which it is exposed for use.

The housing 25 has a latch-receiving opening 29 in its top wall protected by a boot 30 and, rearwardly of the opening 29, there is an opening 31 in one side wall of the housing 25 protected by a boot 32 overlying a trigger shown as a bar 33 having a central, transverse wall portion 34 slidably entrant of a vertical channel 35 on the interior face of the other side wall of the housing 25. The trigger wall portion 34 has a transverse slot 36 with a vertical slot portion 37 opening into it adjacent the trigger 33.

As may best be seen in FIGS. 7–13, a rigid tubular member 38, extending freely through the slot 36, is secured to the mount 39 by which the hand grip 24 is attached to the nozzle end of the case section 21 and has its forward end provided with a counter bore 40 threaded to receive a plug 41, see FIG. 10, to which one end of a leaf spring 42 is secured. A latch 43 is fixed on the other end of the spring 42 and is yieldably urged thereby against the upper surface of the housing 25 thus to enter the opening 29 to releasably interlock the sections when they are extended into their operative relationship, see FIG. 17.

The counter bore 40 of the tubular member 38 constitutes a chamber and has a lengthwise slot 44. A sear 45, slidably confined in the chamber 40, extends upwardly through the slot 44 and is urged rearwardly by a firing spring 46, held in position by a post 47 extending forwardly from the sear 45 and freely through the plug 41. The exposed portion of the sear 45 is shaped and dimensioned to pass through the slot portion 37 of the transversely disposed wall portion 34. A firing line 48 extends through the tubular member 38 and is provided with a head 49 confined in the chamber 40 and having a recess in which a primer 50 is seated. The tubular member 38 is shown as extending into the round of ammunition through its nozzle 22 in a manner later detailed. The sear 45 has a chamber 51 opening through its rear face and having a central restriction 52 slidably supporting a firing pin 53 provided with a head 54 caught in back of the restriction 52 thus to permit predetermined movement of the firing pin 53 relative to the sear 45.

When the rocket launcher has been extended so that only a short further movement will establish its operative position, see FIG. 7, the sear 45 engages the wall portion 34 and, on such movement, it is carried forwardly, compressing the firing spring 46, see FIG. 8. It will be noted from FIG. 10 that when the firing means is uncocked, the sear 45 engages the head 49 of the firing line 48. While the firing pin 53 is or may be in contact with the primer 50, its permitted travel is too short to cause accidental ignition under any circumstances. When the sear 45 is in its cocked position and the trigger 33 is actuated, the momentum of the sear 45, under the influence of the firing spring 46, results in the firing pin 53 being impelled against the primer 50, causing its ignition, as will be appreciated from a comparison of FIGS. 12 and 13.

Until the trigger 33 is actuated, its wall portion 34 holds the sear 45 against being moved by the firing spring 46. When the trigger is so actuated, the sear 45 is free to move when the slot portion 37 of the wall portion 34 comes into registry therewith it. A safety, generally indicated at 55, and best seen in FIGS. 7, 8, and 9 includes a slide portion 56 through which the tubular member 38 freely extends and which has an offset, forwardly extending arm 57 terminating in a lock 58 dimensioned to fit the slot 36 and the slot portion 37, see FIG. 3, thus to hold the trigger 33 against movement until the safety 55 has been pulled rearwardly to a predetermined extent. The slide portion 56 has a pair of rearwardly extending resilient arms 59, each terminating in a finger grip 60 and having a pair of longitudinally spaced notches 61 and 62. The rear end of the housing 25 has an inwardly disposed shoulder 63 at each side to catch in the appropriate notch 61 when the safety 55 is in its operative position, see FIG. 7, and disengageable therefrom when the arms 59 are squeezed towards each other and to catch in the appropriate forward notch 62 when the safety 55 is then pulled rearwardly until the stop 64 engages one of the shoulders 63 and the arms 59 released, the lock 58 then being withdrawn from its operative position, see FIG. 8.

Turning now to FIGS. 4 – 6, it will be noted that the round of ammunition includes a projectile 65, a propellant charge 66, a bulkhead 67 between the projectile and the propellant charge, and a support 68 in the form of a plug closing the nozzle 22 and carrying an axial, tubular member 69 having a series of vents 70 and supporting an igniter 71 to which the firing line 48 is operatively connected.

The front end of the tubular member 69 is threaded to receive the plug 72 having an easily broken connection 72 with a plug 74 threaded axially into the rear face of the bulkhead 67. With this arrangement, the connection 73 releases the bulkhead in response to pressures developing when the propellant charge 66 is ignited. The bulkhead 67 has an annular obturator 75 ensuring the tight sealing of the bulkhead as it and the projectile 65 are discharged.

It will be noted that the projectile 65 has a shoulder 76 seated against the forward end of the case section 21 and is thereby held against rearward movement. The projectile 65 is connected to the bulkhead 67 thereby to prevent its forward movement, the bulkhead 67 being connected to the nozzle end of the section 21 as has previously been noted. The connection between the projectile 65 and the bulkhead 67 is shown as comprising an axial projection 77 on the front face of the bulkhead 67 and entrant of a socket 78 in the rear end of the projectile 65. The projection 77 has a transverse bore 79 containing a pair of detents 80 resiliently urged by a spring 81 into aligned radial bores 82 with which the rear projectile end is formed thereby to connect the projectile 65 to the bulkhead 67.

The projectile 65 is shown as having guidance fins 83 connected to its rear part by pivots 84 and held in their inoperative position prior to launch by the sections 21 and 23 but yieldably urged into an erected position by springs 85 once the projectile is air borne. Each fin 83 has a cam portion 86 seating a retainer 87 against a detent 80 and operable, as the fins become erect, to force the retainers 87 and accordingly the detents 80 inwardly to an extent sufficient to disconnect the projectile from the bulkhead 67. A spring 88 held compressed

in the socket **78** is provided then to ensure the separation of the projectile **65** from the bulkhead **67**.

From the foregoing, it will be apparent that weapons in accordance with the invention are well adapted to meet a wide range of requirements but its functioning depends on an effective seal between the overlapping portions of the sections in their extended relationship as leakage would not only imperil the user but would also effect the burning of the fuel as to impair seriously the effectiveness of the round, the burning of the propellant within a casing involving pressure problems not encountered with exhaust gasses discharged from rockets. At the same time, sealing means between the sections must not make their relative movement too difficult.

In accordance with this requirement, the launcher section **23** is provided with a rearwardly projecting sleeve **89** having a series of annular channels **90**, see FIG. **4**. The rearmost channel **90** is shown as having a seal **91** of the O-ring type confined therein and in engagement with the case section **20** while the other channels **90** function as gas expansion chambers to ensure a reduction of the gas pressure to a level that the seal **91** can withstand. With a seal arrangement ensuring gas expansion with corresponding pressure reduction, the round of ammunition can be safely fired without loss of propellant efficiency.

When the launcher is in its extended, operative position, the firing means is cocked but the safety **55** is in its operative position. It will be apparent that the firing means may be uncocked by releasing the latch **43** and telescoping the sections to return the launcher to its shortened, inoperative position. When the safety **55** is released, and it may at any time be returned to its operative position, the trigger **33** may be squeezed towards the opposite side of the chamber **25** with the resulting release of the sear **45** effecting ignition of the propellant charge **66**. When the pressure within the case section **21** builds up to a predetermined extent, the connection **73** fails with the bulkhead **67** travelling with the projectile **65** but being separated therefrom when the projectile is air borne. The plug **68** and tube **69** are driven rearwardly by exhaust gasses.

Rearward travel of the plug **68** is desirably minimized and in FIG. **14** there is shown a preferred plug construction with parts corresponding to the previously described embodiment distinguished by the suffix addition "A" to the appropriate reference numerals. The plug **68A** is shown as in the form of a cup consisting of identical sections whose abutting edges have a tongue and groove interlock **92**. The firing tube **69A** extends through the end wall of the plug **68A** to receive the tubular member **38A** and has oppositely disposed flanges **93** one in engagement with each plug section and having a weakened area **94** thereby to respond to shear forces during the burning of the propellant charge. This construction not only has the advantage that the firing tube **69A** travels with the bulkhead of the round but also provides a plug of minimum weight consisting of sections that separate as the plug **68A** is dislodged.

As previously stated, the sealing of the overlap between the sections against gas leakage is essential and while that previously detailed is effective, the embodiment illustrated by FIG. **15** may be used if a substantial difference in the diameter of the launcher sections can be tolerated. In this embodiment of the invention, parts corresponding to previously described embodiments are distinguished by the suffix addition "B" to the appropriate reference numerals. The forward end of the case section **21B** is provided with an annular member **95** having a rearwardly opening annular channel **96** shown as having a sealing ring **97** lodged therein. The breech end of the launcher section **23B** has an annular portion **98** having a bearing **99** engageable with the case section **21B** and having a forwardly disposed, annular flange **100** shaped and dimensioned for sliding entry into the channel **96** and into sealing engagement with the sealing ring **97**.

In practice, the nozzle **22** is slotted as at **101** so that the firing line **48** is not exposed outside the nozzle. A plastic spray indicated at **102** provides an effective seal against moisture leakage into the round. It will be noted from FIG. **14** that a similar seal **102A** is provided for the plug **68A**.

The embodiment of the invention illustrated by FIGS. **18** – **25** is shown as employing an ignition system of the type illustrated in U.S. Pat. No. 3,256,777 but with important differences.

The round of ammunition has a tubular launcher section **103** and a case section **104** slidably fitted within the rear end thereof and having its breech end in the form of a nozzle **105**. At the rear end of the section **103** there is an annular band **106** whose rear portion **106A** is dimensioned to closely fit the case section **104** and has an annular cavity **107** between its ends for a sealing ring **108** of V-shaped cross section and disposed to expand to prevent any gas leakage between the sections when the round is discharged.

The nozzle **105** of the case section **104** is shown, see FIG. **19**, as supporting a housing generally indicated at **109** having a chamber **110** for supporting the ignition cap **111** in a position to be engaged by the firing pin portion **112** of the firing member **113**. The firing pin portion **112** is within a chamber **114** of the housing **109** and has a flange **115** engaged by the firing spring **116** backed by a retainer **117** at the forward end of the chamber **114**. A cushioning spring **118** is located between the rear end of the chamber **113** and the flange **114**. A passageway **119** between the chambers **110** and **114** receives the extremity of the firing pin portion **112** to enable it to strike the cap **111**.

A U-shaped channel member **120**, secured to the housing **109** extends forwardly into a housing **121** extending lengthwise of and secured to the launcher section **103** and within the housing **121**, the channel member **120** is slidably backed by a support **122**. The channel member **120** slidably supports the firing member **113** and its extension **123**.

As disclosed in said Patent No. 3,256,777, a self-erecting rear sight **124** is pivotally connected to the rear end of a trigger chamber **121A** defined by an enlarged rearward portion. The rear sight **124** is so mounted that it may be swung rearwardly to occupy, in the shortened inoperative position of the launcher, the chamber **125** with which the housing **109** is provided and then spring into its operative position, see FIG. **22**, when the launcher is extended for use.

Also, as disclosed in said Patent No. 3,256,777, the housing **121** has, at its front end, an upwardly opening slot **126**, see FIG. **23**, and has a self-erecting front sight **127** therein and attached thereto by a transverse pivot **128**. The front sight **127** is normally held within the housing **121** by a holder **129** pivotally connected to the forward end of the channel member **120** and including a latch **130**. The latch **130** in the extended, operative position of the launcher, engages the forward edge of a boot-covered port **131** thus to provide a releasable lock holding the extended launcher against becoming accidentally shortened. The holder **129** is yieldably urged upwardly by one end of a spring **132** centrally secured to the channel member **120**.

The firing member **113** and its extension **123** are interconnected within the trigger chamber **121A**. As may be seen in FIG. **25**, the extension **123** is wider than the firing member **113** and the connection is effected by means of a reverse bend **123A** adjacent the rear end of the extension **123** and having a slot **123B** through which extends the hook portion **113A** at the forward end of the firing pin member **113**, the hook portion **113A** being entrant of a slot **123C** in the extension **123**. This construction provides a shoulder **133** at the rear end of the extension **123**.

The trigger chamber **121A** has a boot-covered slot **134** in its top wall. A trigger **135** within the chamber **121A** is transversely pivoted thereto and has a portion yieldably disposed upwardly through the slot **134** by a spring **136**. The trigger **135** engages the shoulder **137A** of a rotatable sear **137** mounted on a transverse pivot **138** and having transversely spaced shoulders **137B** straddling the firing pin member **113** with each shoulder **137B** in a position to be engaged by the shoulder **133** as the launcher is extended for use. The rotatable sear **137** is provided with a spring **139** yieldably urging the sear **137** to turn in a clockwise direction.

The extension **122** of the firing member **113** and the channel member **120** are normally interconnected. To this end, a

latch **140** is pivotally connected to the front portion of the channel member **120** and is yieldably held seated therein by the rearwardly disposed portion of the spring **132**. The latch **140**, see FIGS. **22** – **24**, has a hook **140A** with a rearwardly and upwardly inclined extension **140B**. The hook **140A** extends through a slot **123D** in the extension **123** and into a slot **120A** in the channel **120** thus interconnecting them. It will be noted that the slot **123D** is substantially longer than the slot **120A** thus to enable the member **123** to be moved a short distance forwardly relative to the channel member **120**. In this connection, compare FIG. **23** with FIGS. **22** and **24**. It will be noted that until the launcher is substantially fully extended, the latch **140** is held in its operative position both by the rearwardly disposed spring portion of the spring **132** and by the top wall of the housing **121** until the launcher is nearly fully extended.

Relative movement between the launcher and case sections, results, when the launcher is nearly fully extended, in the sear shoulders **137B** coming into engagement with the shoulders **133**, see FIGS. **23** and **25**, thus forcing the firing member extension **123** and the firing member **113** forwardly relative to the channel member **120** tensioning the firing spring **116** with the latch **130** becoming operative then to secure the launcher sections in their operative relationship. The shoulder **137A** of the sear **137** is thus brought into engagement with the trigger **135**. The spring-tensioned sear **137** ensures a resistance to trigger actuation that will be uniform from launcher to launcher.

A safety **141**, see FIGS. **22** and **24**, is slidably supported within the trigger chamber **121A** and is provided with a rod **142** extending forwardly thereof and provided with a grip **143** by which it may be pulled forwardly from its operative "on" position into its inoperative "off" position against the action of the spring **144**. In the operative position, see FIG. **24**, the safety **141** underlies the trigger **135** to prevent its actuation. The safety **141** has a channel **141A** to accommodate the latch **140** when in its operative position, a chamber **141B** dimensioned to accommodate the latch when positioned in an inoperative position as will presently be described and having a forwardly and downwardly inclined cam wall **141C**. The safety **141** is also provided with a rearwardly disposed shelf **141D**.

When the launcher is fully extended, the latch **140** is still operative to limit rearward movement of the firing member relative to the channel member **120**. In order that the round may be fired, the latch **140** must be held in an inoperative position. When the launcher is fully extended, but with the safety **141** in its operative position, the latch **140** is so positioned that when the safety **141** is pulled into its inoperative position, the shelf **141D** engages and cams upwardly the latch hook until it is caught by the shelf **141D** thus holding the safety **141** in said inoperative position and permitting rearward movement of the firing member to effect engagement of the firing pin portion **112** with the ignition cap **111**. The safety **141** may be returned to its operative position with the latch **140** then being released.

Turning now to the launcher section **103** and the case section **104**, it will be seen that the nozzle **105** is closed by a plug **143** carrying an annular seal **144** and having an internal axial cavity **145** for the ignition charge **146** with which the tube **111A** from the ignition chamber **110** is in communication. The projectile **147** is or may be identical to that described in connection with the other embodiments and will, accordingly, not again be detailed except for its releasable attachment to the generally indicated bulkhead **148**, see FIGS. **19** and **21**, into which is threaded one end of a rod **149** whose other end extends axially through the plug **143** and a washer **150** with a clamping nut **151** threaded on its exposed end thereby to lock the projectile against accidental forward movement. Rearward movement of the projectile is prevented by the projectile shoulder **152** which is engaged by the front end of the case section **104**. The rod **149** is designed to break in response to pressures attendant the firing of the round and such separation is desirably effected close to the plug **143** in order that the rod **149** may function as a flight stabilizer for the bulkhead. The weakened area of the rod **149** is indicated by the transfer bore **149A**.

The bulkhead **148** is shown as consisting of a forward plate **153** and a rearward relatively thick member **154** having a rearwardly disposed cylindrical flange **155** providing both a cup to receive the sticks of the propellant charge **156** and an integral skirt sufficiently thin to be responsive to gas pressures when the charge **156** is ignited and become sized to the inside diameters of the sections **103** and **104** and in this manner secure the desired obturating functions. The member **154** has a forward shoulder which with the plate **153** provides a channel for the annular seal **158**. The seal **158** is shown as V-shaped and is disposed to have its outer wall expanded into sealing relation with the launcher sections **103** and **104**. Because of the two part construction of the bulkhead **148**, the seal **158** need not be expansible and may be of plastic or metal provided its outer wall can be temporarily or permanently sized to the inside diameter of the launcher section. Such a seal may be used by itself but the combination of the seal **158** and the expansible skirt **155** is desirable.

The propellant charge **156** is shown as comprising a multiplicity of sticks with their forward ends embedded in a plastic **159** and their rearward ends spaced from the plug **143** to provide a mixing chamber **160**. The rear face of the bulkhead member **154** is shown as having annular channels **161** which anchor the plastic mass.

The bulkhead plate **153** is shown, see FIGS. **20** and **21**, as having a series of arcuately spaced, forwardly disposed projections **162** positioned between the fins **163** of the projectile and having radial bores **164** which overlie seats **165** on the rear end of the projectile. Headed pins **166** are fitted in the bores **164** and these are dimensioned so that when they are entrant of the seats **165**, the heads are in contact with the case section **104**. The heads are backed by springs **167** ensuring separation of the projectile from the bulkhead once the projectile is air borne. The bulkhead, however, travels with the projectile for a substantial part of its flight with the rod **149** functioning as a stabilizer for the bulkhead ensuring that it travels a distance such as not to endanger friendly personnel located in the immediate forward area.

From the foregoing, it will be apparent that launchers in accordance with the invention are well adapted to provide an effective disposable unit meeting production and use requirements.

I claim:

1. A disposable projectile launcher comprising a round of ammunition and a tubular launcher section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, a connection between the bulkhead and the projectile releasable when the projectile is air borne, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said bulkhead, one connection being releasable in response to gas pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand gas pressures attendant the combustion of the propellant charge, said launcher section telescopingly receiving the case section within it with the nozzle exposed to enable the two sections to have a shortened, inoperative relationship and an extended, operative relationship, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means, obturator means between said projectile and said charge operable with respect both to the case and said launcher sections and comprising a cylindrical, rearwardly disposed expansible bulkhead flange providing an integral skirt sizeable to the inside diameter of said sections in response to said gas pressure, and means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge.

2. The disposable launcher of claim 1 in which the obturator means also includes a sealing ring carried by said bulkhead forwardly of the expansible bulkhead skirt, the sealing ring being of a V-shaped cross sectional shape disposed to be expanded by any gas escaping by the skirt into sealing engagement with the launcher sections.

3. A disposable projectile launcher comprising a round of ammunition and a tubular section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, a connection between the bulkhead and the projectile releasable when the projectile is air borne, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said bulkhead, one connection being releasable in response to pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand gas pressures attendant the combustion of the propellant charge, said launcher section telescopingly receiving the case section within it with the nozzle exposed to enable the two sections to have a shortened, inoperative relationship and an extended, operative relationship, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means, an annular obturator, said bulkhead including forward and rearward members, said obturator being operatively positioned between them, said obturator including an annular wall expansible into obturating relationship with said launcher sections in response to said gas pressures, and means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge.

4. The launcher of claim 3 in which one of the bulkhead members includes an annular shoulder in support of the obturator disposed towards and closed by the other bulkhead member.

5. The launcher of claim 3 in which the retaining means includes a member on the forward end of which the bulkhead members are threaded.

6. A disposable projectile launcher comprising a round of ammunition and a tubular launcher section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said bulkhead, one connection being releasable in response to pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand pressures attendant the combustion of the propellant charge, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means, obturator means between said projectile and said charge operable with respect both to the case and said launcher, means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge, and a connection between said bulkhead and said projectile releasable when the projectile emerges from the launcher section, said connection comprising a plurality of arcuately spaced, forwardly disposed bulkhead projections, each projection having a radial bore and overlying the rear end of the projectile, the rear end of said projectile having sockets, one underlying each bore, a pin in each bore entrant of the subjacent socket and backed by the case section thereby to lock the projectile to the bulkhead, and a pin-ejecting spring in each bore held compressed between the pin therein and the projectile rear end thereby to effect the release of the projectile from the bulkhead once the projectile is air borne.

7. A disposable projectile launcher comprising a round of ammunition and a tubular launcher section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said projectile, one connection being releasable in response to pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand gas pressures attendant the combustion of the propellant charge, said launcher section telescopingly receiving the case section within it with the nozzle exposed to enable the two sections to have a shortened, inoperative relationship and an extended, operative relationship, firing means connected to said charge and including a trigger mounted on said launcher section, a sear rotatably supported by said launcher section, spring means yieldably urging the turning of the sear in one direction, said firing means including a firing member engageable with the sear in the extended relationship of the launcher section operable to turn the sear against the action of the spring means and to effect the operative relationship between the sear and the trigger, obturator means between said projectile and said charge operable with respect both to the case and said launcher sections, and means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge.

8. A projectile launcher comprising a round of ammunition and a tubular section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said projectile, one connection being releasable in response to pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand gas pressures attendant the combustion of the propellant charge, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means, an annular seal, said bulkhead including forward and rearward members interconnected with said annular seal operatively positioned between them, said seal including an annular wall expansible into obturating relationship with said launcher sections in response to said gas pressure, and means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge.

9. A projectile launcher comprising a round of ammunition and a tubular launcher section, said round of ammunition comprising a tubular case section having a nozzle at its rear end and a projectile, a propellant charge, and an intermediate bulkhead encased by said section, retaining means extending axially through the charge and including a connection with said nozzle and a connection with said bulkhead, one connection being releasable in response to pressures attendant the burning of the charge, said case section having sufficient wall strength to withstand pressures attendant the combustion of the propellant charge, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means, obturator means between said projectile and said charge operable with respect both to the case and said launcher, means to seal the overlap of the sections in their operative relationship and operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge, and a connection between said bulkhead and said projectile releasable when the projectile emerges from the launcher section, said connection comprising a plurality of arcuately spaced, forwardly disposed bulkhead projections, each projection having a radial bore and overlying the rear end of the projectile, the rear end of said projectile having a socket underlying said bores, a pin in each bore entrant of the subjacent socket and backed by the case section thereby to lock the projectile to the bulkhead, and a pin-ejecting spring in each bore held compressed between the pin therein and the projectile rear end thereby to

effect the release of the projectile from the bulkhead once the projectile is air borne.

10. A disposable projectile launcher comprising a round of ammunition and a tubular launcher section, said round of ammunition comprising a tubular case section having a nozzle at its rear end, and a projectile and a propellant charge encased by said section, retaining means connecting said projectile to said case section to prevent axial movement of said projectile relative thereto in either direction but releasable in response to gas pressure developed during the burning of the propellant charge, the retaining means that prevent forward movement of the projectile including a connection with said nozzle, said case section having sufficient wall strength to withstand pressures attendant the combustion of the propellant charge, said launcher section telescopingly receiving the case section with it with the rear end of the case section exposed to enable the two sections to have a shortened, inoperative relationship and an extended operative relationship, firing means connected to said charge and including a trigger mounted on said launcher section and connected to said firing means and operable only in the operative relationship of the sections, obturator means between the projectile and said charge operable with respect both to the case and launcher sections, and a gas pressure retaining seal between the overlap of the sections in their operative relationship operable to maintain the gas pressure within the sections suitable for the efficient burning of the propellant charge.

11. The launcher of claim **10** in which the seal includes a forward, gas-expansion section and a rearward, annular compressible seal in physical contact with both sections.

12. The launcher of claim **10** in which the seal includes annular portions, one adjacent the front end of the case section and secured thereto and one adjacent the rear end of the launcher section and secured thereto, said annular portions being operatively engaged when the sections are in their operative relationship.

13. The launcher of claim **12** in which at least one annular portion is resilient.

14. The launcher of claim **12** in which at least one annular portion is resiliently compressible.

15. The launcher of claim **12** in which one annular portion has a concentric channel opening towards the other annular portion and the other annular portion includes an annular bearing in engagement with the section to which said one annular portion is secured and a concentric flange shaped and dimensioned for entry into the concentric channel in the operative relationship of the sections.

16. The launcher of claim **10** in which the retaining means includes a bulkhead member between the projectile and the propellant charge.

17. The launcher of claim **16** in which there is a connection between the projectile and the bulkhead member and including releasing means operable when the projectile is air borne.

18. The launcher of claim **17** in which the releasing means comprises an axial post extending forwardly from the front of the bulkhead member and includes a resilient detent, and the projectile includes a plurality of self-erecting fins, at least one fin including a cam portion, the projectile also has an axial bore to receive the post of the bulkhead and a radial bore in communication therewith and which receives the detent when the post is seated in the axial socket, and a release pin in the radial bore is confined between the detent and the cam portion to effect the release of the detent when the fins are erected.

19. The launcher of claim **18** in which an ejection spring is held between the post and the axial socket when the detent connects the projectile to the post.

20. The launcher of claim **10** in which the retaining means that prevents forward movement of the projectile includes a plug member seated in the nozzle, a bulkhead, a connection between the bulkhead and the projectile that is releasable when the projectile is air borne, a connection between the bulkhead and the plug member extending through the propellant charge and releasable in response to pressure developing during the burning of the propellant charge.

21. The launcher of claim **20** in which the connection between the bulkhead and the plug member is a member extending axially through the propellant charge.

22. The launcher of claim **21** in which the connection between the bulkhead and the plug member is releasable with respect to the bulkhead.

23 . The launcher of claim **21** in which the connection between the bulkhead and the plug member is releasable with respect to the plug member.

24. The launcher of claim **20** in which the connection between the bulkhead and the plug member is a perforated tube extending axially through the propellant charge, and the firing means includes a component within the tube.

25. The launcher of claim **20** in which the plug member consists of separable sections releasable from one another except when seated in the nozzle.

26. The launcher of claim **10** in which the launcher section has a lengthwise housing having a latch-receiving opening, and the firing means includes a rigid member extending into the housing and secured to the nozzle end of the case section, the member has a spring-pressed latch entrant of the opening in the operative relationship of the sections, a firing spring, and a sear movable forwardly to compress the firing spring, and the firing means also includes a trigger supported by the launcher section for movement transversely thereof with a portion thereof engageable by the sear during the short relative movement between the sections required to extend the sections into their operative relationship from a partly extended relationship and disengageable therefrom when the trigger is released.

27. The launcher of claim **26** in which the member is in a tube having a chamber slidably confining the sear and supporting the spring between the sear and the forward end of the chamber, the firing means includes a firing line extending from the chamber through the tube and into the round through the nozzle end thereof, the firing line including a primer within the chamber, and the sear includes a primer-engaging firing pin supported thereby for movement relative thereto.

28. The launcher of claim **27** and a safety slidable lengthwise of the housing and including a portion engageable with the trigger and holding it against movement into its sear-releasing position.

29. The launcher of claim **28** in which the safety is slidably supported by the rigid tube.

30. The launcher of claim **26** in which the trigger portion has a transverse slot through which the tube extends and a vertical slot opening into the transverse slot and disposed and dimensioned to receive the sear when the trigger is released.

31. The launcher of claim **30** and a safety slidably supported by the launcher section and including a portion entrant of the slot and operable to block trigger movement into a sear-disengaging position.

32. The launcher of claim **28** in which the rear end of the housing includes an inwardly disposed detent portion and the safety includes a resilient arm having a recess entered by the detent portion in the operative position of the safety and manually engageable to be forced out of engagement with the detent portion and a stop operable to limit the extent to which the safety may be moved when thus released.

33. The launcher of claim **32** in which the arm has a second recess entered by the detent portion when its movement is prevented by the stop.

* * * * *