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 firearms and more particularly to grenade launchers which are mounted thereon to provide diversified fire power for shoulder arms.

It is one object of this invention to provide a self-energized grenade launcher which is supported by a firearm but is independent thereof in operation.

It is another object of this invention to provide the launcher with a cooperating cartridge having a barrel functioning as which is disposed parallel to the firearm barrel when mounted on the launcher with a plurality of grenades being housed in the case in tandem arrangement so that the center of gravity of the firearm is maintained as close as possible to the center line of the firearm barrel.

It is a further object of this invention to provide such a launcher with a firing mechanism for initiating action to project a grenade from the cartridge each time the trigger of the firing mechanism is actuated until all of the grenades are projected from the cartridge case.

The specific nature of the invention as well as other objects and advantages thereof will more clearly appear from the following detailed description of a preferred embodiment as shown in the accompanying drawings in which:

FIG. 1 is a reduced elevation view showing the grenade launcher with cooperating cartridge mounted on a rifle;

FIG. 2 is a longitudinally cross-sectional view of the launcher and cartridge;

FIG. 2a is a forward extension of FIG. 2;

FIG. 3 is a view taken along line 3--3 of FIG. 2 showing all three firing pins seated in cocked position;

FIG. 4 is a view taken along line 4--4 of FIG. 2;

FIG. 5 is a view taken along line 5--5 of FIG. 4;

FIG. 5a is an extension of FIG. 5;

FIG. 6 is a view similar to FIG. 3 but showing the sear-ejector device trigger actuated for release of one of the firing pins to project the first grenade from the cartridge case;

FIG. 7 is a view taken along line 7--7 of FIG. 6 showing the associated primer detonated by the released firing pin;

FIG. 8 is a view taken along line 8--8 of FIG. 6; and

FIG. 9 is a sectional view showing the sear-ejector device disposed forwardly for ejecting a fired case from the launcher.

Shown in the figures is a self-energized grenade launcher 12 which is fixedly mounted on a barrel 14 of a firearm 16. Launcher 12 includes a breech housing 18 having a front wall 20 and a support 22 which extends longitudinally forward from the upper section thereof for mounting a cartridge 24 so as to be parallel with barrel 14. Cartridge 24 includes a case 26 which is closed at the rear end by a base 28 and three grenades 30 which are disposed within the case 26 in tandem arrangement. The inside of case 26 is provided with rifling so as to act as a barrel for the inclosed grenades 30 which have engraved rifling bands.

Support 22 is of arcuate configuration in cross-section and is provided along the underside with a longitudinal channel 29 having the same radius as the outside of case 26. Provided axially within channel 29 along the edges thereof is a pair of grooves 32 which receive mating flanges 34 on the outside of case 26. Cartridge 24 is mounted on launcher 12 by registering flanges 34 with grooves 32 and then pulling back on the cartridge until base 28 thereof is in contact with front wall 20. Cartridge 24 is releasably held in such battery position by conventional latching means as shown at 36. The section of case 26 which is disposed on the underside thereof, when cartridge 24 is mounted on launcher 12, is increased in thickness at 38 to provide supporting structure for three boxes which extend longitudinally therethrough and which include a right-hand bore 40, a middle bore 42, and a left-hand bore 44 as shown in FIG. 4.

As noted hereinbefore, cartridge 24 includes three grenades 30 which are disposed in tandem arrangement in case 26. Grenades 30 are ovoid in configuration and, therefore, an inclosed chamber 46 is formed between the largest diameter portion of the rearmost one of the grenades and case base 28 and similar chambers 48 and 50 are formed respectively between the rear and middle grenades and the middle and front grenades. Three pairs of ports 52 provide communication respectively between right-hand bore 40 and chamber 46, middle bore 42 and chamber 48 and left-hand bore 44 and front chamber 50.

The combined cross-sectional areas of each pair of ports 52 is equal to the cross-sectional area of the associated bore 40, 42 and 44. A safety blowout plug 54 is threaded into the front end of each of the bores 40, 42 and 44.

Three primers 56 are located in base 28 so that the centers thereof lie in the same arc, the center of which is located on the longitudinal axis of case 26, and an orifice 58 provides communication between each of the primers and the adjacent ones of the bores 40, 42 and 44. Thus, when primer 56 associated with right-hand bore 40 is detonated, the gases produced by the detonation pass through the associated orifice 58 into the right-hand bore and therefrom through the associated ports 52 into chamber 50 to energize the front one of the grenades 30 for projection from case 26. The second and third grenades 30 are similarly energized by successive detonation of the remaining primers 56.

Primers 56 are successively detonated by a firing mechanism 60 mounted within breech housing 18. Firing mechanism 60 includes three firing pins 62 which are respectively disposed in axial alignment within prisms 56 and are spring-biased for displacement from a cocked to a primer striking position. Firing pins 62 are seated in the cocked position by a sear-ejector device 64 which includes a shaft 66 disposed in coaxial alignment with the longitudinal axis of cartridge 24 when mounted on launcher 12 and for translational and angular displacement respective thereto. The front portion of the shaft 66 is extendable forwardly from front wall 20 so as to act against base 28 of case 26 for ejection thereof from launcher 12 as hereinafter described. Sear-ejector device 64 is energized for its ejection function by a torsion-compression spring 68 which is operationally disposed between sear-ejector device 64 and housing 18 for biasing the sear-ejector device forwardly from a retracted to an ejecting position and in a clockwise direction from a firing pin release position to an extension position. Firing pins 62 are held in housing 18 by spring pins 66 which are respectively disposed for cooperation with the three firing pins 62 as hereinafter described.

Fixed to the rear end of shaft 66 is a disc 67 having three fingerlike projections which extend radially downward, which projections include, as shown in FIG. 3, a first sear 70, a second sear 72 and a third sear 74 which are respectively disposed for cooperation with the three firing pins 62 as hereinafter described. Spring pins 62 includes a body 76 which is of triangular cross-section and a cylindrical striker 78 which extends forward-
ly therefrom. The cross-sectional area of striker 78 is smaller than that of body 76 so that the corners of the body at the front end thereof are exposed. Body 76 of each of the firing pins 62 is slidingly disposed in a mating hole 80 and, therefore, because of the triangular configuration of the bodies and holes, the firing pins are held against rotation therein. One of the exposed corners at the front end of each of the bodies points toward the longitudinal axis of shaft 66 and it forms a forwardly facing lip 82 which is arranged to be contactable by the related one of the sears 70, 72 and 74 for reassemblably holding the related firing pin 62 in the cocked position and sear-ejector device 64 in the retracted position as hereinafter described.

Extending radially from disc 67 opposite sears 70, 72 and 74 a groove 84 with three ratchet teeth 86 formed on the top end thereof. Finger 84 extends into an opening having a right-hand wall 90 and a left-hand wall 92 which are contactable by the finger for limiting angular displacement of sear-ejector device 64 between the firing pin release position and the searing position. When finger 84 is in contact with right wall 90, sear-ejector device 64 is in the searing position with sears 70, 72 and 74 positioned for contact with lips 82 of the related firing pins 62 and, when sear-ejector device 64 is pushed into the retracted position, the firing pins 62 are seated in their cocked positions. When finger 84 is in contact with left wall 92, all of the firing pins 62 are released.

Sears 70, 72 and 74 are designed so as to successively release the firing pins 62 by incremental angular displacement of sear-ejector device 64. Thus, when sear-ejector device 64 is displaced one increment, first sear 70 is moved free of its related firing pin 62. When sear-ejector device 64 is displaced another increment, second sear 72 is moved from its related firing pin 62 and, when the sear-ejector device is displaced another increment, third sear 74 is moved free of its related firing pin. Sear-ejector device 64 is held against counterrotation by spring 68 after each incremental displacement through the contact of the released firing pins 62 with their respective sears as shown in FIG. 6.

Sear-ejector device 64 is incrementally displaced through the cooperation of a trigger 94 with ratchet teeth 86. Trigger 94 includes a cylindrical finger-piece 96 disposed for limited lateral movement in breech housing 18 and a pawl 98 pivotally mounted on the finger-piece by means of a longitudinally disposed pin 100. A compression spring 102 biases trigger 94 from a firing to a normal position. Pawl 98 is resiliently held in a lifted position, clear of ratchet teeth 86, through the cooperation of spring 102 with a shoulder 104 formed on the pawl above pin 100 as is best seen in FIG. 3. Trigger 94 is releasably held against accidental displacement to the firing position by a plunger 106 which is mounted for vertical movement above pawl 98 and which is biased downwardly against the pawl by a spring 108. Cooperating, vertically formed shoulders 110 and 112 on the bottom end of plunger 106 and the top side of pawl 98, respectively, prevent inward displacement of trigger 94 when such shoulders are in contact.

Trigger 94 is freed from plunger 106 by a safety 114 which is disposed for lateral displacement in axial alignment with the trigger. A spring 116 biases safety 114 outwardly so that the outer end protrudes from the breech housing 18. Formed on the inner end of safety 114 is a cam surface 118 which is contactable with a cooperating cam surface 120 on the end of pawl 98 so that, when the safety is pressed inwardly, the pawl is displaced downwardly free of plunger 106 and into engagement with one of the ratchet teeth 86 (FIG. 6). Because plunger 106 is spring-biased downwardly, pawl 98 is permitted to ride over ratchet teeth 86 when trigger 94 is released to the normal position.

### OPERATION

When launcher 12 is unloaded, sear-ejector device 64 is disposed forwardly to the ejection position by spring 68 so that the front end of shaft 66 extends farwardly of front wall 20 and sears 70, 72 and 74 are rotated by the spring to their respective searing positions in front of lips 82 of the related firing pins 62. A cartridge 24 is loaded in launcher 12 by registering flanges 34 on the cartridge with grooves 32 in support 22 and then pulling rearwardly on case 26 until base 28 thereof contacts front wall 20. Cartridge 24 is latched in battery position by latching means 36. As cartridge 24 is pulled rearwardly, the contact of base 28 with the end of shaft 66 moves sear-ejector device 64 rearwardly against the bias of spring 68 causing firing pins 62 to be displaced thereby to the cocked position by the contacts of the sears 70, 72 and 74 with lips 82 on related firing pins.

The front one of the grenades 30 in cartridge 24 is projected from case 26 by simultaneously pressing inwardly on trigger 94 and safety 114. This causes pawl 98 to be pivoted free of plunger 106 and into engagement with the first one of the ratchet teeth 86 which is the left-hand one thereof in FIG. 6. With pawl 98 moved clear of plunger 106, trigger 94 is free to be pressed inwardly. Sear-ejector device 64 is rotated one increment of displacement. This increment of displacement moves first sear 70 clear of lip 82 on the associated firing pin 62 which is released thereby to strike the corresponding primer 56. The gas generated by the resulting detonation of primer 56 passes through the related orifice 58 into right-hand bore 40 and therefrom through ports 52 into front chamber 50 for energizing the first one of the grenades 30.

When trigger 94 is released, sear-ejector device 64 is held against counterrotation by spring 68 through the contact of body 76 of the released firing pin 62 with first sear 70 (FIG. 3). At the same time, the second one of the ratchet teeth 86 is positioned for engagement by pawl 98. The middle and rear grenades 50 are similarly projected.

When all of the grenades 30 are projected, fired case 26 is ejected from launcher 12 by actuating latching means 36 which permits the bias of spring 68 against sear-ejector device 64 to act against the case. With case 26 ejected and sear-ejector device 64 in the ejected position, sears 70, 72 and 74 are positioned forwardly of the related lips 82 so that the sear-ejector device is free to be rotated by spring 68 to where the sears are positioned for searing the related firing pins 62. From the foregoing it is clearly apparent that there is provided herein a firearm supported launcher and cooperating cartridge through which a plurality of grenades disposed in tandem arrangement in the case may be successively projected with the launcher being provided with a firing mechanism which is simplified by having a plurality of sears carried by the same member and having that member also function as an ejector for the fired case and which provides for automatic cocking when a cartridge is loaded on the launcher.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. In combination, a cartridge, a barrel functioning case of said cartridge, a plurality of grenades disposed in said case in tandem arrangement, detonating means having respective communication with said grenades for separate projection thereof from said case, a launcher for releasably mounting said cartridge for discharge, firing pins disposed in said launcher for respective displacement against said detonating means, a compression-torsion spring, and a sear-ejector device mounted in said launcher
for cooperation with said spring to be angularly disposed thereby for searing said firing pin in cocked positions and to be translationally displaced for ejecting said case from said launcher when released therefrom, said sear-ejector device including a plurality of sears equal to the number of said firing pins extending radially in said sear-ejector device, said sears being disposed in cooperation with said firing pin for successive release thereof when said sear-ejector device is successfully actuated in an increment of angular displacement.

2. The combination as defined in claim 1 wherein said sear-ejector device is mounted in said launcher for translational displacement between an ejecting and a retracted position and for angular displacement between a searing and a firing pin release position, and wherein said spring biases said sear-ejector device to the ejecting position and to the searing position, the combination also including a shaft of said sear-ejector device contacted at one end by a base of said cartridge to displace said sear-ejector device to the retracted position when said cartridge is mounted on said launcher, a disc fixed to the opposite end of said shaft, and said sears having simultaneous contact with respective ones of said firing pins when said sear-ejector device is in the searing position so that the firing pins are displaced to respective cocked positions by said sear-ejector when actuated to the retracted position and for successively releasing said firing pins from the respective cocked positions when said sear-ejector is actuated in successive increments of angular displacement to the firing pin release position.

3. The combination as defined in claim 2 and including a trigger disposed for limited translational displacement in said launcher, and cooperating means on said trigger and said sear-ejector device for converting the limited translational displacement of said trigger to an increment of angular displacement of said sear-ejector device.

4. The combination as defined in claim 3 and including ratchet teeth formed on said sear-ejector device, and a pawl pivotally mounted on a finger-piece of said trigger for cooperation with said ratchet teeth to convert the limited translational displacement of said trigger to an increment of angular displacement of said sear-ejector device.

5. The combination as defined in claim 2 and including ratchet teeth formed on said sear-ejector device, a pawl pivotally mounted on a finger-piece of said trigger for cooperation with said ratchet teeth to convert the limited translational displacement of said trigger to an increment of angular displacement of said sear-ejector device, and a body on each of said firing pins disposed for contact by the associated one of said sears after being released to hold said sear-ejector device against displacement to the searing position by said spring.

6. The combination as defined in claim 5 and including a safety, means for biasing said pawl to a position free of engagement with said ratchet teeth, a plunger disposed for contact with said pawl when in the free position to block actuation of said trigger, and cooperating cam means on said safety and said pawl for moving said pawl out of contact with said plunger and into engagement with said ratchet teeth by actuation of said safety.

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BENJAMIN A. BORCETT, Primary Examiner.